



**Sixth International
Permaculture Conference**
Perth, Western Australia
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**Designing
for a
Sustainable Future**

Proceedings

Edited by **Peter Austin**

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*These proceedings are dedicated to the memory of
IPC6 delegate Dawn Janelle Gugler (1969 - 1996).*

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Introduction

Peter Austin (Australia)

These Proceedings are a collation of submitted papers, presentation transcriptions and presentation reports that cover most of the sessions presented at the Sixth International Permaculture Conference (IPC6), held in Perth, Western Australia, from September 24 to October 4, 1996.

A very small number of sessions are not included here because neither papers, recordings nor reports were available. I apologize for these omissions.

The structure of the Proceedings is as follows:

- Conference keynote presentations, arranged in order of delivery.
- Conference subject streams presented in alphabetical order of stream name. Within each stream, presentations are arranged in alphabetical order of the lead author's name.
- Field trip reports, arranged in alphabetical order of title.

Whilst participating in IPC6 and, later, collating the material for the Proceedings, it became evident that permaculture has come a long way since IPC5. The depth and quality of projects and research, as represented by the various papers, transcriptions and reports, demonstrates that permaculture has matured. As you read and digest the following chapters, I am sure that you will agree.

I am also sure that you will be inspired to continue with whatever permaculture activities you are currently undertaking or planning. Please remember to document your efforts and share them with the global permaculture community; the need for practical, experiential information is urgent. Time is running out and, by the time IPC7 is held, permaculture will need to be demonstrably main-stream!

Enjoy!

Part 1

Keynote Addresses

What is Permaculture?



Bill Mollison (Australia)

[Presentation Transcription]

I'm replacing Lea Harrison, who has a perforated ear drum and can't fly. So I don't have any lecture notes, I'm sorry to say. Her lecture was "What is Permaculture?" The more you know about it, the harder it is to say what it is. And I know a lot about it, so you won't get much satisfaction out of me.

Let's look at the etymology: 'permanent' is a Latin word meaning to endure or to persist throughout, and 'culture' is any of those activities that support and distinguish human communities. Probably the easiest way to understand it is through subsets of words like 'agriculture.' When I say the word 'agriculture,' you think, oh, that is the activity which produces food for the community - and you would be wrong. Agriculture is that activity that produces commodities for the international market.

It was originally an activity that produced food for our communities, but it drifted away from that after about 1940, and the death knell was sounded when Mr. Kissinger, who arranged the bombing of Cambodia, the butchery of Cambodia - somebody once said, "Irony died the day that Kissinger received the Peace Prize." Mr. Kissinger had a scheme which he sold to American capital, called the ZAP policy, in which he suggested they take over the food resources of the world. How they would do that was to move food onto the stock exchange, onto the commodity market. So you can trade in food and buy futures in food.

Secondly, he suggested you could patent the seed, so those who owned the patents effectively owned the food. So, at that point plant patenting was introduced, and today, as I stand before you, you're lost. You can elect who you like, you don't control anything any more. A hundred percent of the patents on soy beans are owned by three companies, and so it goes. All the food you eat is patented and can be forbidden to you by those patent holders at any minute. Now, all hybrid seed is patented; open-pollinated seed can't be patented, to my knowledge. Traditional seeds may be patented, although there is a good defence against that.

All that happened without your approval or knowledge. Operating through financial systems, agriculture has been sold out, its seed, its farmers, its consumers, to the international market forces. It was quite funny: two Lebanese, who are very good in the market, bought all the futures in soy beans in the year they came on the commodity market. They were not intended to do that, and a law has been passed to prevent them doing that, because other people wanted to buy it. So for one year, two Lebanese got extraordinarily rich by owning the world's soy beans.

Soy beans are used in tofu, soy sauce, and are sold as 'health food.' Well, it's not. It's probably the most unhealthy food grown in what is called agriculture. It was grown only to paint cars - all duco, all paint for cars, has to have a soy bean oil base. It grows as the number of cars grows. You can have unpainted cars and we can stop growing soy beans. But if you demand a colour on your car, you have to have a few acres of soy beans. The whole soy bean kick was started by Henry Ford. He pushed the soy bean because it was so valuable to him. He used to say you could have a car any colour you want, so long as it was black, because he didn't have many other colours.

Soy beans, too, have a powerful anti-nutritional factor which prevents the uptake of protein. So they have to be cooked for six or seven hours. There's hardly any other food which is that poisonous. So they are a nasty little poisonous commercial seed. A little bit is left over, a tiny fraction, 0.005%, is used in health food shops for what is rather a risky food; if they haven't rinsed it enough, you will get a protein deficiency out of that. People who make tofu cook it the minimal time. There are plenty of beans without these factors, but they are not much used. But soy beans have to be grown to paint your cars, and that leaves an awful lot of soy residue, and they make up a large part of the feed industry for chickens and pigs, poor things. I always said that I don't trust anybody who voluntarily eats beans. One of my more famous statements.

So, agriculture, although it may originally have been intended to feed us, no longer does. It basically operates in response to a remote commodity market. That's what sets the prices, and what sets the demand. Very few people plant the seeds they plan. If they are hybrid seeds, there is no point in trying to keep them for tomorrow.

Kissinger's plan is working extremely well. If he controls the think-tanks and those seeds, he is, in fact, in charge of the world. He just wanted to be a dictator of the whole world, that's all. I did, too. He thought of it first. I just want to be emperor, just for a week.

Agriculture, then, was intended to feed us, but it no longer is so intended. Very little human food is grown in agriculture. Ninety percent of some of our crops go to animal feeds. I travelled through Europe on the train a few years ago and took note of food growing on farms - I saw five acres of potatoes between Copenhagen and Switzerland. Very little food is grown on farms today. Mainly it is forage for animals, and fortunately that is backfiring; you can get mad cow disease from cows and you can get vancomycin-resistant enterococci from chickens and pork. Food produced by agriculture is becoming truly unsafe for you. There is a great word, 'agricolagenic' disease. That is, diseases that you have, caused by operations of agriculture.

The other disease rapidly spreading as a result of modern agriculture is the fact that you are all turning into women. When you look at the alligators down in Florida - they've got tiny little penises no good to anybody, no bigger than a wart, really. They don't have any testes. The number of males being born with penile deformities is large, and testicular cancer, and they don't have any sperm, to speak of, or at least none of the right shape to kick around. 85% of the sperm in some areas are deformed. This is due to agriculture, also, because they're pouring hormones and hormone analogs onto the soil and it ends up in the food of the chickens, pigs and cattle. Feminising chickens is a good thing...in the old days they used to cut open the males' backs and removed the testes. These days they just feminise them. When you go to Kentucky Fried Chicken, by all means, lick your fingers, but don't eat the chicken.

Vancomycin resistant enterococci - a great word - VRE, that's there because farmers used every antibiotic in their feed, and the only antibiotic we had left medicinally was vancomycin. But then the farmers used vancomycin. So now you are in the same position I was in when I was young: you don't have any antibiotics. You are in for an interesting time. When I was young, we all died of whooping cough, measles, diphtheria - I had that. Then all my friends died of TB. You are going to have to die of all of those, now. You will get accustomed to friends falling over in the playgrounds and being carried to the cemetery, which was the normality of life in Australia before antibiotics. So it is an interesting new game. We have forgotten how to die. You will have to swot up on that. To do it well is quite an art. Expectations of death - you are going to get it, anyhow - none of us is going to get out of this alive.

Agriculture went through a sad decline from 1940 on. What the agricultural scientists called traditional agriculture was never traditional. Traditional agriculture produced a high quality of food for people at the best level it could. What is practiced today is a very, very destructive activity for the commodity market, and farmers know that. Many farmers have left the land because of that. A lot of farmers in the States have pulled out of agriculture because the subsidies were so high. You could grow the rice, but you didn't have to harvest it. You could bale it up as hay and sell it, or give it away. That is always a sign of bad government when there are subsidies, because you try to give the people cheap food. In America, food is incredibly cheap. It keeps them quiet, keeps their minds off other things.

So we are not in a very good position today in regard to food. I saw it all happen, too. Unlike many of us, I was aware of it. I started up an open-pollinated seed company many years ago, 20 years ago, to save our seed. Jude Fanton and her husband Michel started up a seed library, where you could put seed in and take seed out, because libraries were immune from seed laws. I got attacked by 39 lawyers in my seed company, and you can't defend against that many lawyers based in New York and Sydney. We collapsed it; next day we gave its goods to a new seed company, had to change the letterhead, and it continues today. Interestingly, it was called the Phoenix Seed Company, because when the phoenix dies, from its ashes arises a successor, and as it flies up to heaven, followed by all the birds, it tells the story of the death of its predecessor. Our first catalogue told the story of how we were wiped out. It doesn't matter how small or inconspicuous you are, you are under heavy legal attack if you try to sell open-pollinated seeds that people can pinch without profit. So there is a witch hunt to eliminate all those seed companies, and mostly

they are gone. They have been absorbed into large and multinational companies. Multinationals have also taken over the retail of seed by buying most of the gardening business and shops. So it is pretty well sewn up. You sit there, a prisoner of Mr. Kissenger. Not a nice position to be in, I can tell you.

He experimentally switched off the bread in Chile when it looked like the socialists were getting in. Americans equate socialism to communism, and communism is bad, so as soon as the socialist government came in under Allende, they switched off the wheat. Had a little trial in food control, and it worked; Allende was brought down by bread riots. And they got Pinochet and repression, 40,000 people tortured and shot. Some of you may know about it and some may have experienced it. They tried it in Australia, but our army refused to fire on us. That's what saved us. But they did get rid of our government. Interesting, isn't it?

Permaculture was born in reaction to this mess. It subsumes organic agriculture. We just assume that we will grow food cleanly. It doesn't use sprays or hormones, or all these things. It's an eerie thing that all the books on permaculture up to 1970 were on gardening tips - plant your beans six inches apart, etc. Every book on permaculture was on gardening tips. There was no design. When I realised that in the late 60s, the hair went up on the back of my head. Nobody told farmers how to design for eliminating bad effects of climate and wind. You can take out wind, you can take out frost, by correct planting. And nothing was related to anything else. We didn't have any books on the design of agricultural systems. I wrote the first one in 1978. There were no precursors. There was a little book on design in landscape by PA Yeomans in Australia, on water design in landscape. There were no other books on design.

Dimension was recently added to design by Masanobu Fukuoka in Japan. He collapsed time. He planted his crop into the remains of the preceding crop, so he didn't have to crop, plough, reseed, start another crop. So he was able to get many crops more. That's the last word issued on design. There may be other dimensions to design yet to come. Now that we have started the process of issuing books on design, there will be smarter people among our students than we are, and if there are not, they are pretty, damn silly. So permaculture is a book on design. I think most people in the media think it is a book on gardening. It is a very sad, backward step, indeed. If I get on talkback radio, nobody asks me serious questions, they ask me why their lemon tree's leaves are going yellow. We know why that is; they planted it in a boggy place or they don't give it enough urine. So there's a way out: lift it up and piss on it.

That's what permaculture is about: very common sense. It is in response to changes in the rational economic control system which has been imposed, more and more upon us. It is an attempt to return to systems of small gardens. In some countries gardens produce 90% of the food. It is true in Russia. Agriculture produces very little food. It does the most destruction, it has the most land, it doesn't produce much food that people actually eat. Gardens do. So if you can increase your gardens, you can get rid of agriculture. I think, in the near future, it should be a banned activity.

Agriculture is the most destructive activity on the face of the earth. It is responsible for poisoning sixty percent of our water supplies, and ruining most of our landscape.

Mining is a minor activity compared to agriculture, when it comes to soil destruction. We can't lose much more soil in Australia. If you look at the number of acres of land available per head, plotted over the last century, it's in steep decline. We hardly have any land left on which to grow food. In the coming year, we are 45 days short of food. So you are running into real problems. The more soil scientists we have trained, the more land we have lost. I had a soil scientist the other day say she couldn't get a job. I said, "You've saved hundreds of acres from erosion."

If you don't know what permaculture is now, you will have to ask somebody. It's a design of systems with which we can live.

Integrating Food Security and Traditional Knowledge: Permaculture Approaches for Poverty Alleviation in South Africa



Tshepo Khumbane (South Africa)

[Submitted Paper]

Introduction

Food security is a system that rests with people. It is a system of meeting long-term food needs. It goes beyond production to include preservation and storage. Land, water, forests, grasses and livestock are important components of food security.

In situations of mass poverty as currently exists in South Africa, where malnourishment of children under 5 is almost at 60% in areas in which we work, food security interventions have to be addressed within the broader context of poverty alleviation. Through food security awareness building, avenues are created for questioning and debating the frame conditions provided by government policies such as the Land Reform Policy.

In South Africa food security is an activism issue. It starts with what people have, which is in most cases the right to occupy land without long-term security. Those alienated from land have lost the technologies, the feel for the land and production systems based on traditional patterns of co-operation which take ritualistic significance around the production cycle.

The future to me is not just to have enough food for one year but also take into account the next 2 to 3 years in case of drought. Food security is not just having vegetables such as spinach, cabbage, onions, tomatoes, green beans, pumpkins, etc. It means taking into account the basic food needs which sustain food requirements the households are accustomed to. Different food requirements of cultural groups of the indigenous people of South Africa vary from mealie-meal, processed

mealies, sorghum, millet, dry beans, peanuts, melons, sweet cane and the traditional pumpkin which also provides a green vegetable for a period stretching into winter.

All these crops are produced through multi-cropping in dryland fields. Without access to animal products food production is incomplete. Animal husbandry is an integral part of food security to ensure that households have milk, meat and eggs. The question for food security is, is the combination of crop production and animal husbandry possible for the majority of the households in the rural areas of South Africa?

Food security in historical perspective

The description I have outlined above existed historically when communities could still contain and control their own lives. There are presently very few households in rural areas able to produce enough to survive even for a day. I am not an academic to scientifically analyse how events unfolded to destroy the traditional subsistence food patterns which ensured food security for all in rural South African communities. The following case descriptions informs what I understand as food security and how communities were organised to ensure it.

I grew up in the Northern Transvaal in a rural village within the Tribal Reserve areas. The community relied on farming for a living. They produced from the dryland fields all their food needs. They preserved and stored away surplus for future years. The following discussion represents how production was organised.

Ownership of land was not through title deeds. Land was a communal property for all who lived in the village. Residential land was not planned according to the planning systems of today. The small communities or villages were spread out, each village with its own authority structures like headmen and counsellors to co-ordinate with the tribal chief. The tribal chief was the custodian of the cultural and social systems, ensuring that communal values and norms were respected and adhered to. Food security systems which existed at the time made it possible for people to be committed to working the land, they ensured that the food production cycle of activities was respected by all and that the means of production were accessible to all through people's social groups.

Food production activities started with the ploughing season in August, which marked the beginning of the new year. This was followed by the first rains called "Kgokgola Moko". During this time all crop waste from harvesting decomposes, grains scattered all over after thrashing the corn germinates, and wild green vegetable (morogo) grows in the fields. Kraal manure from cattle, goats, sheep and donkeys is scattered throughout the fields in preparation for ploughing. The chief then called for a sacred ceremony to bless the seed. This activity occurred in September. The custodian of the ritual in the form of the tribal traditional doctor performed an environmental cleansing ceremony. Old women and young girls dressed up in traditional clothes carried water from the river or wells to the chief's kraal. The traditional doctor would then perform the ritual, after which he would lead the community into the veldt to collect rubbish to be burnt at the chief's kraal. The occasion was then followed by dancing and feasting.

The ploughing start as soon as the rains fall. Ploughing carries on until December and January. Because of these ceremonies multi-cropping was a conscious process. Every household planted a variety of seeds, from sorghum and millet for food and beer, mealies (where conducive), beans, cowpeas, jugo beans, green lentils, peanuts, melons, water melons, pumpkins and calabashes. The process of planting in between the main crops occurred during weeding when the main crop would have gained height. The creeper crops cover the soil to suppress weeds and also to protect the soil from extreme heat.

In February the women and young girls started to pick melons, cowpeas and pumpkin leaves to preserve as dried green vegetable (morogo). This is then stored away in big clay pots and sealed with fresh cow dung to prevent pest encroachment. This activity continues into March and April. Beans, jugo and lentils from earlier crops are harvested, dried and stored away. To keep pests out wood-ash is added. These can keep for up to 3 years without pest infestation. During this period melons and pumpkins are also ready for harvesting. Women prepare mud floors (diboya) to thrash the corn while men prepare silos to store grain. Some of the melons are dried and stored away for the future.

To ensure food supply for the future, green mealies, cowpeas and jugo beans are cooked in big pots with the skin on and dried. These are then stored away in big clay pots or bags for the future. This method of preservation controls pests. The households can re-cook the preserved food whenever it is needed. Sweet cane and pips from melons are also dried and preserved. A variety of nutritious dishes are prepared by the mother in the household to feed the family (extended family included).

Methods of preserving grain varied from grass baskets able to take 10-20 bags of sorghum and millet buried in the kraal. The corn on the edge of the grass basket would soak up but not germinate. This would have the taste and smell of kraal manure, but the inside grain would remain fresh.

Processing grain was through grinding stones and stamping blocks to get a variety of products from a whole embryo meal rich in protein, oil and mineral salts to feed young babies. Other products would be mealie-meal, samp, mealie-rice and bran. The bran leftovers were used as feed for pigs and chickens. Cowpeas, melon pips and peanuts were processed into powder and stored away in clay pots or calabashes ready to be used as soft porridge mixed with milk and mealie-meal for children. The main use of peanuts and pips is to make nutritious dishes from mixing with preserved green vegetable. Fresh green vegetables (morogo) is also a delicious dish when mixed with either peanut or pip meal.

Most of the practices mentioned above still exist in some areas in the Northern Province and Mpumalanga such as Sekhukhune, Tzaneen, Athol, Bushbuckridge and Venda. However, the majority of the people have no land. Where they have access to land, it is so small that people can only produce food at less than subsistence level, and they are compelled to supplement their food needs by purchasing. What needs to be addressed is why there is hunger and malnutrition in the rural areas of South Africa when there is potential for the achievement of food security.

Factors which contributed to the destruction of food security systems in rural South Africa

In South Africa land dispossession has been going on from as early as the arrival of the European settlers, a gradual grinding machine for the displacement of the South African indigenous people through state legislation. The Land Acts of 1913 and 1936 dispossessed people of their land, and the separate development strategies which introduced the Betterment Schemes were the last blow. The consequences of these strategies are clear and visible – the once content, coherent and confident communities able to control their food needs are presently going hungry and live under conditions of immense poverty.

I would like to explain the Betterment Scheme which was part and parcel of the separate development strategy of the National Party government. In my area the Betterment Scheme was explained as the best way to deal with district planning for rural areas. Small scattered villages were clustered in small homestead plots of 50m x 50m for those who owned cattle and 30m x 20m for those who didn't. Those who had cattle were designated as small farmers and some land for farming was allocated some 10km away from the residential area. The betterment strategy was explained as a process which would ensure that people got infrastructure services such as water, schools, roads, telephones, etc. This promise was made when people got resettled in the late 1950s but to the time the new government took over in 1994, nothing had happened except for small piece-meal solutions.

The consequences of this strategy was the disorganisation of the social systems on which food security systems were anchored. Migratory labour escalated and most of the able bodied men left the villages leaving mostly women and children at home. Subsistence farming was undermined and the small farmers did not emerge as was expected. The donkey and goat cleanup campaign by the Department of Agriculture of the time dispossessed the majority of the people of the means of transport and draft power. The reason given was that goats and donkeys destroyed the environment. People resisted but were unsuccessful. The donkeys were railed to the game reserves to feed the lions and the owners got 25c compensation per donkey.

Evictions from the white owned farming areas in the neighbouring farms intensified, increasing the population density in the resettlement areas. Those who tried to work the land gave up because of vandalism. The mode of life simply changed. Working the land was no longer feasible. People resorted to other ways of survival, throwing out the values and norms which sustained their survival. Survival by any means – selling of dagga and beer, stealing cattle and chickens from those who had them – became the order of the day. Tribal structures to deal with the situation failed. Communities moved from a situation of pockets of poverty to mass poverty. In communities such as Mmalebogo in Bochum where there was intense resistance to betterment schemes in the form of reduction of cattle populations, planning of villages and fields and imposition of the authority of the Bantustan Lebowa government, the government of the day designed a strategy to undermine the resistance. Communities from other areas such as the Batlokwa Ga-Machaka, Ga-Makgato and Ga-Senthumule were dumped in Bochum with their chiefs and headmen. More people from white-owned farms were evicted or settled voluntarily in Bochum.

The same process was pursued for Sekhukhune. Removals of communities from Lydenburg-Boomplaas were brought to Leboeng next to the Strydom Tunnel. Some came from Doornkop and went to Ga-Mampuru in the Praktiseer district of Sekhukhune. Most of the people came from the farming areas through evictions from white farming areas around Rossenekraal, Lydenburg, Ohrigstad, Loskop, Stofberg, Middleburg, Grobblersdal and Marble Hall. Around Jane Furse population density left people with no land except homestead plots. Many more villages in Sekhukhune are swelling up, taking more land for residential purposes and leaving people with small areas for field crop production.

Another factor that disturbed the social systems around food security was the church. As people got converted into Christianity, everything that was associated with traditional culture was undermined. This process affected or spilled over into the traditional tribal institutions for mobilising efforts and commitment around food production activities. The converted looked down upon the traditional technologies. Traditional knowledge and wisdom gradually faded away, leaving the present generation with no skills for survival except in very exceptional villages such as Manganeng, Mohlaetsi, Rakgoadi and very few others.

What is to be done

With many people not able to access land, the systems described above have no meaning. The norms and values that sustain food security are no longer respected. Through community development by non-government organisations working with community-based organisations (CBO), some efforts to revive some of the skills and knowledge are in progress. In Sekhukhune, Tsoga-O-Itirele group around Jane Furse, with the help of EDA, has launched food processing workshops which started in 1991. EDA gave this group support in accessing grains such as mealies and beans as well as peanuts, cowpeas, lentils, jugo and soy beans. The technology used for food processing is traditional. Government officials from agriculture, health and welfare in the region as well as civil society groupings working in the area were invited. This process is now built into Hlatlolanang, a primary health care CBO serving the people of Sekhukhune. EDA facilitated a process of capacity building in permaculture design, training and implementation integrating the food processing component to make sure that the poorest of the poor can have a base of support in their own communities to begin the struggle to achieve food security, given what is available in terms of land and traditional knowledge and skills.

This has now been institutionalised into an annual event following harvesting. The women's groups come together for a week to hold a special event to re-educate the youth so that we can reach a level where some of our cultural systems of production can re-emerge through community efforts. Through Hlatlolanang this process reaches out to 48 villages in the Sekhukhune region. Using permaculture designs around homestead gardens, fruit tree planting was also introduced. Some of the poorest households have reached a high level of fruit production on homestead plots, using water harvesting methods of catching rain water from the roof, run-off water through swales and trenches, recycling the household grey water, mulching and composting to maximise what can feasibly be produced on household plots. Awareness of the environment and conservation has reached levels where permaculture

approaches are institutionalised within the women's groups' approaches to production. The groups are calling on the local government to give a hand in soil reclamation activities to fight the degradation of the environment through community efforts. The move is to take the struggle out of the homestead into the surrounding communal land, to draw in government resources and available technologies to deal with dongas that are as deep as 10m and 10m wide, cutting across some residential land as well as fields around villages.

These are just but some of the potential existing in some of the village communities. Much can still happen, but food security is a much deeper and broader issue which will remain a struggle for a long time to come. It requires institutions such as non-government organisations and governments to understand and acknowledge the knowledge and institutions of people affected by poverty, so that their strategies can affirm them and re-dress the injustices of the past. The pressing issue is land access and ownership, so that people are enabled to engage in food production for food security within ecological perimeters.

Thank you.

The Global Movement Towards Eco-villages



Max O. Lindegger (Australia)

[Presentation Transcription]

I'm really glad to be here; this is my sixth international permaculture conference. I'm not sure how many of us would have been at the last conference in Copenhagen. I feel we have matured and permaculture has come a long way.

I had a letter from Ted Dragen at the University of NSW about a week ago. He says, "Would it be an exaggeration to claim that the emergence of the eco-village movement is the most significant event of the twentieth century?" He goes on to say, "I don't think so." However, and that's his opinion too, I want to argue that it is very important to think carefully about what sustainability means. He feels, and I agree with him, that the village movement is not going far enough – we have a long way to go. He quotes some disturbing facts, and Bill mentioned some disturbing facts earlier today as well, in regards to the greenhouse problem. If you cut fossil fuel by 60%, Australians and most of us in the industrialised world will only get one-eighteenth of the amount we are using today, which would mean we have to cut back considerably from what we are doing today. It is not sustainable. So, when I talk about ecovillages, specifically about Crystal Waters, we all must realise that we are only at the beginning; all eco-villages are babies, maybe juveniles, at best.

Tonight I would like to give you a summary of where I think Crystal Waters is as an eco-village, having been designed about eleven years ago, and having been settled about eight years and still being settled – not all the houses having been built on the available lots. I would like to show what has influenced me personally in my thinking when I design human settlements as I work as a consultant in different parts of the world. This then will lead into some slides from Crystal Waters.

I would like to give you some very basic facts about Crystal Waters. When I speak of 'we,' I mean the designers who were involved in the process of designing Crystal Waters. This includes Robert Pat, Geoff Young and Patty Woodman and myself.

When we work on larger projects in permaculture or anything else, we must realize we must learn the working rules.

Crystal Waters is located near the east coast of Queensland. The climate is sub-tropical, but in winter we do get some early-morning frosts, which put some limitations on what we can grow. Our total land area is 640 acres, 259 ha. 14% is owned privately, in the form of 85 residential allotments of approximately one acre, 4400 square metres each. Six percent of the land area is cooperatively owned: this being the village lot and the visitors' campground, which has been partly developed. The rest of the land, 80%, is commonly owned by all of us living at Crystal Waters. This 80% includes a number of dams and small lakes which we have built, creeks, internal roads, environmental, agricultural, horticultural and forest areas.

For many people, mainly coming from densely populated urban areas, the number of people we expect to live eventually at Crystal Waters, 300 for 640 acres, sounds ridiculous. The fact is that under our local subdivisional laws, this is quite a high density. Originally, only a proposal of sixteen sites would have been accepted: now we have 85 sites. So we have to look at legal requirements and also cultural requirements. Here in Australia people still dream about the 5-acre allotment; in our case we have the 1-acre allotment.

The nitty-gritty details of the design process – how to finance, how we got it through council, how we decided on internal roads, on the dam work – will be discussed in my workshop tomorrow.

Things that I feel work well at Crystal Waters at the moment are that people do consider the altered landscape, that we developed, is beautiful, and that it is a nice place to live, comfortable, and recently was described as 'paradise.' I think it shows that development need not always be bad, as many people involved in green politics feel.

I believe that the infrastructure that we have established works well, too. We have an internal water system, a fire-fighting capacity at Crystal Waters, an excellent phone system, which is important for people who work at home. We have an internal electricity system which we connect into the grid. Our internal road systems are working too. I think we have been successful to date in the care of the old and the very young. It is a really good place for children to grow up in. Our cluster system, too, is developing and working better month by month. People who were looking at their own individual needs now are moving toward their cluster.

The buildings, too, have been innovative. There is no fixed style; they range from the conventional Queensland style to domes to A-frames. The choice of material, too, varies considerably. You find traditional steel roofs, wooden shingle roofs, clay tile roofs, and so on. Innovation is alive and well at Crystal Waters. I can honestly say I have never heard anybody remark negatively about somebody else's religious or spiritual beliefs, or non-beliefs, for that matter. It is something we should not take for granted, and I am rather proud we have achieved this at Crystal Waters.

I think the potential is huge for Crystal Waters as an eco-village. I don't think we have fully utilised the potential. Most importantly, we have not destroyed the potential.

There are areas of difficulty, and I think we need to look at them as well. Conflict about perceived extremes are not common, but do appear from time to time. Such as, when is a chemical not a chemical? How extreme do you want to be about common substances? Or the tolerance or lack of tolerance towards smokers from non-smokers. We need to give from both sides, to eventually meet somewhere in the middle. I think we have a lot to learn about the care of teenagers: those not children any more, but not yet adults. I don't think it is a very successful place for young adults. We are not always willing to give them the chance to learn from their own mistakes.

Work is another issue I feel we have to do more about. While unemployment in our area is not quite as high as it is in the bioregion, it is still much too high. For people who don't have the ability, the talent or the will to be self-employed, the rural environment is not very supportive. It is very difficult to find someone to give you a job. We need to become more innovative in the field of job creation.

The use of the common land: at the moment it's held back by legislation which has not caught up with the reality that exists at Crystal Waters. The legislation was not written for a rural group type of development. It was really designed for a different, more commercial application. We need to work to get politicians and legislators to overcome that, too, rather sooner than later.

While we don't lack management skills, we lack people being willing or able, due to time or financial limitations, to apply these management skills to community issues, being our cooperative and also our body corporate. These are both business-like structures which need to be looked at as a business, not as something that can be handled on a part-time situation, otherwise we 'burn' people out.

While we have volunteers, I don't feel we make the best use of the willingness of people to give us time. It's probably part of the management of people to get the best out of the people who are willing to give that time.

In regards to environmental care, while this is a very beautiful place and wildlife numbers are high and very diverse, I think we have to watch the plants we introduce. We are permaculturists and would like to encourage diversity, but we have to be aware that most of the food plants we use are not indigenous to the area or even the continent. Most of the food plants are introduced. We have to make sure that plants that have any potential to be assets do not become problems.

Recycling: I think we all recycle at Crystal Waters, but to cut a long story short, the Council tip is still too close; it is too easy to pass the buck on, to leave it up to someone else.

Communication: sometimes I feel it is working very well. We have an internal newsletter, which I think helps, but I don't think we are the best communicators on the planet.

Distances are a main issue. I don't think we are lazier than other people, but we need to overcome our tendency to use the car. We need to learn to enjoy walking; walking is so much better than driving, not only for the environment but ourselves,

as well. We have to make sure that our pathways are improved, not only by shortening distance but also by providing shade. When talking to people, you find that that's the main limitation to walking: it's too hot.

We are making improvements in food production every year, but we are a long way from being self-reliant. We have lots of social activities, but they seem to be centred on the clusters or individual families, groups of friends, and maybe what we need most is a community hall big enough for all of us to meet. We haven't, at the moment, a building big enough for all of us to sit down together and have a meal.

The design of Crystal Waters was very strongly influenced by my belief, and the belief of other people, that unlike common subdivisions, we needed to give the opportunity to satisfy all, or hopefully most, of the basic needs, the basic rights, of human beings.

To summarise in just a few lines: we sat down and brainstormed just what are the basic needs and basic rights that should be provided to people living here. Number one is the need and right to clean air, clean water and clean food. We must also include the freedom of spiritual expression, opportunity for social interaction, the right to meaningful activity, call it work, the right to safe play for children and adults, and adequate and healthy shelter.

Bunya trees are very numerous in our area, and the seeds were an important food source for Aboriginal people. Books tell us that they would leave the area with fat bellies; it is a high-starch food and obviously you could fatten up on it quite well. To us, the name is used in a different way. We have a local LETS currency, our alternative financial system. Again, try to make the connection between the old and new.

In talking about communities, they can never stand in isolation. Ecovillages are part of a bioregion. In our case, the town of Maleny is an important place. Maleny is a unique place. It has a strong LETS system, it has a credit union, a recycling centre and a food cooperative, and many other successful cooperatives, and I think Crystal Waters benefits by being nearby.

[Slide]

This is a photo of a town in Switzerland called Raza. It is a place I used to visit with my parents when I was a child. As I grew up, it was a place that, to me, oozed sustainability. It is the place I thought about when I was talking about sustainability. The land cleared is only the land needed for agricultural purposes. The people very much lived within the means of the land and themselves, they knew the limits. The population was 112, and never grew or shrunk much from that. I recently saw an aerial photo taken a few years ago. The caption read: Raza, formerly a population of 112, now 13 people. And I wondered what had gone wrong with this village which was sustainable for many hundreds of years. Next time I was in Switzerland, I went and visited. An old resident explained that in the 60s and 70s, men would take chestnuts into a bigger town to exchange for money and tools, and they observed that life seemed to be easier in the bigger towns. Education was better, and money easier to obtain. Slowly, they moved their families down. The only ones left were the old ones.

Times change. I think we need to be aware when we design a community, live in a community, that times change. We have to be ready for the change, move with the change.

[Slide]

This is not an aerial photo of an African village; it is a stone from Noosa beach with a cluster of limpets. It is a natural system. If you try to go too far to the front, or on the steep side, you will not survive. The limits are given. It is a simple, natural example for the word 'enough.' The world has become our backyard. It is worthwhile, occasionally, to reflect, "What do I actually need? And when does need change in degree?"

[Slide]

Another town in Switzerland that has had the heart taken out of it; sustainability has been destroyed. On the hill in the background, small houses have been built. It's a beautiful view over Lake Lucerne. My father was concerned about the amount of land which has gone under bitumen and concrete, the loss of security. I think you have to realise that any village, any community, can only survive and prosper in connection with a successful agricultural system. The two cannot be separated, as they are trying to do at the moment.

I do most of my work in rural environments, but we also have to look for solutions in urban areas. We have the choice of simply allowing cities to expand constantly, or we can look at cities as being a collection of ecovillages. If we choose the second thought, then I believe even cities can be made more sustainable. The suburbs lend themselves exceptionally well to being turned into eco-suburbs.

[Slide]

Which brings us to Crystal Waters. I always show a slide of Old Dave. We call him 'Old' Dave simply because we had five Daves and he happened to be the oldest one. He is 86 and is symbolic of all the people of the world, young and old. When we talk of design of villages, design of structures, we tend to be more involved in infrastructure, the nuts and bolts, the roads, wastewater systems, the water systems, when, after all, what it is about is people. So I think we must always remember, that's where we start from, that's what it is for. Dave knows he's important, he knows he's important for many reasons. The most important reason is that we need to be a certain age, maybe we need to be 80, before we have enough wisdom to pass on to the young. And if you haven't got the wisdom of the old, you need to go and make the same mistakes again, unnecessarily. You haven't got the old people to ask when you have questions

When we started Crystal Waters, we were very lucky. We started off with clean land. We also started off with clean air, and we started off with clean water. With that also comes a responsibility. Our responsibility is to make sure that not only the next generation, but many generations,... native Americans talked about the next seven generations, and I think that is the sort of scale we need to look at,... we have to make sure that the next seven generations will inherit clean land, clean air and clean water. If they can't, then we have failed all of the way.

It is a beautiful place for children. Last year we had a visit from a person from Hong Kong, specializing in the design of children's playgrounds. As I showed her around, she asked, "Where is the children's playground?" Probably, coming from Hong Kong, it is difficult to imagine that a playground could be 640 acres. That's exactly the point. To meet that responsibility of adults and children alike, it is very important not to be overprotective or underprotective either. We need to know how far the children can reach. We have to allow them to make some of the decisions.

We do develop, make changes. We build roads. We try to keep them as narrow as possible. We sealed them for a number of reasons. We wanted to reduce the dust and extend their life. We build houses and lakes. We can place the houses so they do not impact on the general landscape. We look at the impact the materials have, where they come from. We look at minimising transport and energy. What does the material do to us when we live in the house. Will it be healthy or will it be like living in a plastic bag? What will happen when we are finished living in the house? Will it become a burden for the next generation, or will it melt back into the soil?

Our lakes provide water for limited irrigation, possibilities for fishing and aquaculture, recreational aspects, habitat for birds and wildlife. They also have a real spiritual quality. I walk across the dam wall twice a day. I think I choose to do this because it is something like walking in a beautiful church. It is something which does touch you.

There are people successfully employing themselves and some of the others. We have to help each other, create ideas. That is where the village network, started a year ago, is really successful; learning from other communities what has worked and what is more difficult.

Our community restaurant is where we get together Friday nights and Sunday mornings. I hope, in the future, it will become even more popular. It is also used for courses. In the business area we have accommodation for 24 people in a bunkhouse. It is a good example of income generation; it has a good flow-on effect. Not only teachers are employed, but also cooks, cleaners, transport people, and those who grow food. Eco-tourism and educational aspects are really important and worthwhile in ecovillages.

We have 16 by-laws. One by-law that is most controversial is that we cannot keep cats and dogs. It is often interpreted as meaning that we hate cats and dogs. Not so. Many of us love cats and dogs, but most of us can see that having cats and dogs would mean losing our wildlife. We have about 150 species of birds, some very rare, and a large and trusting population of wallabies and kangaroos. It is a matter of choice. I think it is a matter of right, as well, the right of native animals to continue to exist in their home territories.

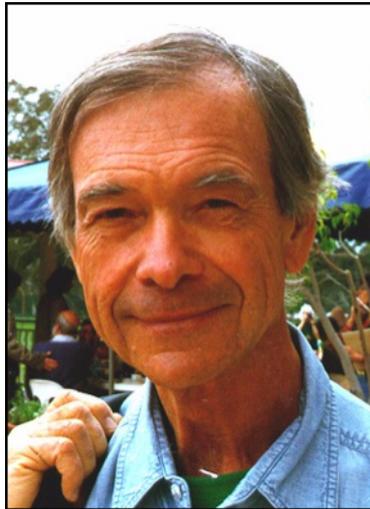
It is often too easy to look at the big picture. I think what makes a difference between living in a subdivision or an eco-village, is that there are lots of little things to look at. There is a trend these days to advertise once-a-year holidays with nature. I don't think that is enough. I think we need to be in contact with nature on a daily basis. We are on the edge in our generation. If, in generations down the track, nature can only be remembered in the stories of the parents and the grandparents, we have

done something very, very wrong. It is our responsibility to make it possible for as many people as possible to have that constant and daily contact with the small things which make it worthwhile living.

At Crystal Waters, we have no church, no mosque, no temple. But we have the freedom of spiritual expression. When we went through the design process, whenever we came across an area that was special, it was very tempting to design your own house block there. We know from the books we have read that to place a structure on the best view will actually destroy the best view. We totally support aboriginal people of any country who say we should protect their sacred sites. We too need to create and respect our own sacred sites.

To summarise, people living in ecovillages may make mistakes, but they also have successes. Many people learn from each other. We need to learn from history and nature. We need to seriously consider these, learn from them and combine them with the latest knowledge and wisdom available to us. My message is that ecovillages soon will be common in urban and rural areas, in poor and rich countries, north and south. It's up to us. I think the sky is the limit.

Permaculture's Role in Sustaining Civilization



Allan Savory (USA)

[Submitted Paper]

Civilization is, by definition, city-based, and also unfortunately in people's minds. The fact is, however, that civilization is impossible without agriculture. Without agriculture you cannot have a government, an army, a university, a civil service or any of the trappings of civilization, for the simple reason that everyone would be out hunting and gathering food.

Agriculture is what I call a key business. I make that distinction not only because it sustains civilization, but because in most countries it is the largest business, and when it fails all businesses do.

While agriculture made civilization possible, it has also, through environmental damage, destroyed some twenty-odd civilizations to date. The mainstream or petrochemical agriculture of today is damaging soil, air and water at a faster rate than any other factor has in human history. America, held up as the leading example of modern production agriculture, "exports" a greater tonnage of eroding soil annually than the combined tonnage of all grain, beef, timber, commercial and military exports as far as we can determine. And this is occurring despite that country's having a greater concentration of scientists and agri-business schools than any nation on earth.

As a consequence of this rapid deterioration in our environment, many people, led by farmers, are attempting to recreate the agriculture of the past where no petrochemicals were used – organic, Biodynamic, Low Input Sustainable Agriculture (LISA) and so on. Of all the efforts to find a permanent form of agriculture that can sustain civilization, Permaculture is one of the best and most innovative in my opinion. A major feature in its favour is that it looks to more than just the growing of crops, recognizing the importance of the culture in which those crops are grown.

However, there remains a major hurdle that most of these efforts, including Permaculture, need to address. All those attempting to move to sustainable practices are agreed on the basics of what is needed: a move away from large monoculture cropping practices, and away from a reliance on petrochemical inputs; a move toward complex cropping mixes and rotations and eventually polycultures; a move toward natural nitrogen agents, composts, legumes, manures, etc., and the removal of livestock off arid and semi-arid rangelands and onto intensively managed pastures. None, that I am aware of, including permaculturists, disagree with these basics.

I ask you, how does this in any way differ from the agriculture that destroyed those civilizations of old which had not yet discovered uses for coal, gas or oil, nor the ability to cultivate vast monocultures? It differs very little. What's more, those people of old had an immense amount of knowledge that we have lost. This is the hurdle that must be overcome.

Thus we know that Permaculture cannot lead to sustainable agriculture or a sustainable civilization, despite the good intentions and innovation of its practitioners. Since we all, I am sure, want to be able to sustain our civilization, we need to find out what is missing so that Permaculture practitioners and others can play the vital role they should be playing.

What is causing agriculture to fail, and with it civilizations?

The only wealth that truly sustains nations comes from biological communities through the photosynthetic process. Agriculture begins to fail as these biological communities deteriorate. When soil cover, organic matter and structure are damaged, there is a corresponding increase in the frequency and severity of droughts, floods, insect and animal pests, weed outbreaks, and disease outbreaks. Costs of production also rise or yields fall and product quality drops. The agriculture of Australia, America and other developed nations is now exploiting biological communities formed over past millennia, in the form of coal and oil, in order to maintain agricultural productivity on damaged soils, but this has only escalated their costs of production.

So what is causing this damage to biological communities and the loss of biodiversity, soil cover, organic matter and structure? Most scientists agree on the answers. If we look at countries in Africa where the damage is extreme, numerous papers, reports and articles by consultants, academic researchers and international aid agencies list one or more of the following causes:

- Overpopulation.
- Overstocking with livestock.
- Communal land tenure (where people do not individually own their own land and therefore do not care for it).
- Poverty.
- Over-harvesting of trees.
- Slash and burn cropping.
- Low education and ignorance.
- Poor and corrupt administration.
- Lack of capital and credit.

- Lack of adequate technology.
- Cultivation of steep slopes and unsuitable soils.
- Lack of adequate extension services.

Some scientists argue the importance of one cause over another and would re-arrange the list; otherwise there is little disagreement among the experts on these being the causes of Africa's decline. It is a formidable list of causes. No government has been able to realistically tackle such enormous political, social and economic problems, let alone succeed in resolving them. If these are indeed the causes and we've been unable to rectify them over several thousand years, it would appear we are doomed. Yet, what if we are wrong? What if there is a deeper underlying cause we have not detected? One that, if rectified, would begin to restore the biological communities we have so damaged?

It would be difficult to fund the research needed to find out, given the widespread agreement on the causes. So we have done the best we can and gone to a part of the world where there is a similar climate with low and erratic rainfall but none of the causes listed prevail – West Texas. When you look at this area within the United States, you'll find a low and declining rural population that would be considered relatively wealthy and highly educated, no communally-held lands, relatively few animals on the land, too many trees on the land (in the opinion of many residents), no slash and burn cropping or cropping on steep slopes (the land is flat), generally good administration, plenty of capital, credit and technology available, and a larger agricultural extension service than any other country provides.

If the scientists are right in their opinions on the causes producing Africa's problems, then in West Texas we should find Utopia. A place where rivers run clear, underground water is rising, soil is covered and not eroding, and communities are thriving and prosperous. In fact we find the opposite. Sand dunes are forming in places just as they did in the Roman Empire's granaries in North Africa. Rivers are so filled with silt in places there is nowhere for the water to go but to flood. Millions of dollars are spent annually on problem plant outbreaks, increasing droughts, floods, and so on. Crime is increasing, gaols are overflowing, and many small towns and villages are being abandoned. All that is occurring in Africa is occurring in West Texas.

What does this tell us? It tells us that we have no idea what is causing the massive loss of bio-diversity, soil cover, organic matter and so on, and that unless we find out, we will do no better than ancient peoples who watched their civilizations collapse and could do nothing about it.

Is there an underlying cause?

Of course there has to be an underlying cause that hasn't been considered. And I believe the answer has been staring us in the face all along. It is something common to every culture, past or present, to developing and developed nations alike. It clearly is not our increasingly sophisticated technology, because these problems existed before we had it. Nor is it related to our political or economic systems of which we have had many. There is only one common denominator. That is that in all cases

the decisions which led to environmental deterioration were made by humans and something in the way humans make decisions is the cause that has to be addressed.

Universal Decision-Making

What we have discovered is that all humans only make decisions in one way – what I term universal decision-making – and have done so from time immemorial. Although I do not know most of you in this audience, there is one thing I know about every one of you with certainty: how you make all the decisions in your life. I know this because it is the same way I make decisions and the same way humans have always made decisions.

We start with a goal or objective, or simply a desire for something: to go hunt, to go shopping, make a spear, build a bomb, buy a car, educate the children, grow corn, design a spaceship, and so on.

Then we consider how we might achieve it. All humans only accept and use certain “tools” to manipulate our environment to sustain our agriculture. Narrowed down to three broad categories, these are: rest the land, build a fire, or utilise some technology. Past agriculturalists and people turning to sustainable agriculture and Permaculture also accept and utilise living organisms (small animals, insects and plants) as tools to manipulate an environment.

All humans then base their decisions on whether not to use a certain tool on one or more of the following criteria: Who has expert knowledge and what do they advise? What do our friends advise? What does research tell us about it? What does our intuition tell us about it? What past experience do we have to go on? Will it do the job? How quickly? Is it allowable under prevailing laws and regulations? Is it cost-effective? Will it produce a positive cash flow? Is it profitable? What will our peers say? What will the neighbours say? Is it politically expedient? Often, due to conflicting goals, the final decision on which tool(s) to use is based on political compromise, or forced by the strongest view. At times it is based solely on fear of ridicule or condemnation. All that has changed over the ages is that our technology has advanced from spear to atomic weaponry, computerised lives and genetic engineering, and the questions we ask ourselves before making our decisions have increased.

Once a decision is made we assume it is correct. Inevitably, either intentionally or unintentionally, we monitor our decisions in various ways and often later find that their effects were more far reaching and complex than we realised.

I have yet to meet a person who does not make decisions in this manner. I know I do, and have done so in my home, in many a business venture, and in leading a political party in Parliament. The idea that the head of General Motors, the President of the United States, a hunter-gatherer bushman in Africa, and a European housewife all make decisions in the same way comes as a shock to most people. It did to me. There is a natural inclination to rush to defend this way of making decisions, pointing out that our experts have become even more expert, that our experience over the millennia has sharpened our abilities, and that laws and regulations are more enlightened, and so on. And I would agree. We have achieved and continue

to achieve incredible feats based on what we have learned. But there are also some notable failures.

Our most notable successes lie in the linear world of technology – from our first spear points to putting a man on the moon. But these can only be considered successful as long as we ignore their effects upon our environment. In the non-linear world of reality – the natural world and the world of human relationships – we have had our most notable failures: the spread of deserts despite enormous effort to stop them, faltering economies (despite the masking effects of stock market highs, creative accounting and corporate takeovers) and ever-increasing human conflict.

Many also rush to defend the many collaborative management systems and strategies developing in a number of developed nations. They say these strategies employ a different decision making process. But I am afraid this is simply not true. While I was running a workshop for government agencies in Sweden a few years ago we spent the better part of a day analysing a number of management systems – Total Quality Management, Ecosystem Management, Integrated Resource Management, Logical Framework Analysis, and Results-Based Management, to name a few. Many of them have been successful in helping to create a more collaborative work environment, in releasing the creativity and increasing the productivity of people in management teams, and also in increasing awareness of the complexity of our ecosystem and economies. But we found all were in essence re-arranging the deck chairs on the Titanic because they all used universal decision-making. People using these management approaches still had goals, utilised the same tools, and based their final decisions on expert opinion, intuition, research results, laws, regulations, and so on.

Where does Universal Decision-Making go wrong?

There is an immense amount of good in universal decision-making and we want to keep that. But there is also something lacking that has led us to damage our environment, stemming from the time when humans learned to light fires and make spears. Because my time is limited, I can't go into great detail here but will merely summarise what we've learned. (We have a video available that does cover much of what I am summarising).

First, humans never made decisions in whole situations but only in a fragmented manner. People are so tied to land, plants and billions of other creatures that it is illogical to believe we can make decisions independent of natural functioning wholes. The real world only functions in wholes – whole atoms, whole molecules, whole cells, whole organisms, whole people, whole families, whole communities. And in your communities you cannot even breathe or sit and listen to these words without your connection right this moment to whole green plants in whole communities of billions of organisms.

No management can be successful until it focuses on wholes.

Second, humans had goals that were inadequate for the task; most in reality were mere objectives. A goal, in the truest sense, must embrace people and land, and the moment and the future at the same time.

Third, when we look at the tools acceptable to humans to manipulate and manage our environment to sustain us and our civilizations, there is a notable gap. Fire, small organisms, rest, and technology. There is no tool in this toolbox that can keep carbon cycling between plants, atmosphere and soil organic matter over about two thirds of the world's land surface where atmospheric and soil humidity are seasonal. No wonder deserts are advancing relentlessly. No wonder carbon is building up in our atmosphere. It would have built up even if we had not discovered coal and oil, only more slowly.

There is a tool that can help keep the carbon cycling and sustain biological communities in the other third of the world where atmospheric and soil humidity are perennial – resting land. It does so here because in these environments most of the mass of vegetation is also perennial. Only a small proportion dies during a year and deaths are spread throughout the year. Insects and micro-organisms can complete the cycle of birth, growth, death and *decay* biologically.

Most of the world's land is in environments where rainfall and humidity are erratic and seasonal, whether high or low. In these environments, over billions of years most of the mass of vegetation above ground has died every single year and in a few compressed months. At the time that these billions of tons of vegetation died every year the insect and micro-organism populations also died down to remnant or dormant populations. The carbon cycling in these environments was maintained by vast herds of grazing and browsing animals and the micro-organisms in their digestive tracts. It was even more complex than that. These vast millions of herbivores were prevented from overgrazing, despite their numbers, by their attendant pack-hunting predators. As protection for females and young, the herbivores had little but bunching behaviour. Bunched herbivores have to move continually to avoid feeding on their own dung- and urine-fouled ground. This bunching behaviour we now know was the vital key to carbon cycling and maintenance of the whole biological community. Herbivores, wild or domestic, without their pack-hunting predators change behaviour and rest the land. I call this rest in the presence of large numbers of livestock and big game “partial rest”. This form of rest has almost the same effect as totally resting the land, as we see from many research plots established in the United States in the 1930's.

Unfortunately, not only was there no tool in the toolbox that could sustain the carbon cycle, but the tools used to try to do so – rest and fire – have enormously damaging effects. Rest, partial or total, we now know to be the most damaging tool known to science in the world's seasonal rainfall, or “brittle” environments. Fire and rest in combination become even more damaging and, tragically, these have been the two tools used here in Australia since humans arrived. The Aborigines, as we now know, killed off most of the large animals on this continent and attempted to replace their role in maintaining biological communities with fire. This simply does not work, as the continuing desertification of Australia and all seasonal rainfall areas of the world testify.

Fourth, when we look at the criteria we finally base our decisions on, we find a major flaw. It is simply not possible to make an economically sound decision unless it is also socially sound, other than in the very short term. And we cannot make a socially sound decision unless it is simultaneously environmentally sound, other

than in the short term. Thus it follows that we cannot make economically sound decisions unless they are simultaneously socially, environmentally and economically sound.

In studying this dilemma for some years, I find there are situations where, by accident rather than design, some decisions are simultaneously socially, environmentally and economically sound. But as a routine matter, never. Thus, as everything in modern society and civilization runs on the basis of economies, it should be of little surprise that our economic models just do not work, as most economists of substance now admit. I know the Society for Ecological Economists is desperately searching for economic models that might be even “approximately right.”

Finally we note that with universal decision-making our action of assuming decisions were correct was indeed arrogant and unwise in a world of such complexity that we will never understand it fully.

Holistic Decision-Making

For close to 40 years I have laboured to find a way to make a living from the land without destroying it. I have done so from many angles – as biologist, civil servant, Member of Parliament, international consultant, researcher, farmer, rancher, game rancher and soldier. Poor land means poor people, social breakdown, upheaval and war, and I have witnessed them all. Through no wisdom, but rather unending trial, error and study, I developed a new way of making decisions that has subsequently been vastly improved by the efforts of those who have adopted it. This I named Holistic Decision Making, described in detail in *Holistic Resource Management* (Island Press, 1988), which is currently under revision.

Holistic decision making is simple and straight forward. A number of villages in Zimbabwe and West Africa are using it, even though many of their people are illiterate. Everywhere that people are using holistic decision making we are seeing the same results: improved harmony and teamworking among the people, resolution of long-standing conflicts over resources, increased financial returns, and land improvement. Some have been going now for over quarter of a century and have shown consistently improving land even through the driest years on record in Africa. We have been able to start reversing the progress of desertification and at almost no cost, other than a little training, usually in fact while earning money.

It is perhaps easiest, in this short amount of time, to explain the new decision making by contrasting it with the old, as shown in **Table 1**.

Holistic Management with its decision-making empowers people in all walks of life to start making decisions that are simultaneously socially, environmentally and economically sound. It enables people to use all of the knowledge and expertise they have – and this is a great deal in most cases. And it will enable you to use all that is good in Permaculture – and that is most of it. But it will enable you to do what I have not seen happen with Permaculture projects to date.

We can analyse Permaculture practices with the Holistic Management Model, which we have done quite often on joint projects. The main areas of weakness in Permaculture are in dealing with arid and drylands on an extensive scale, and in not

CONVENTIONAL	HOLISTIC
World View	
Complex world of interconnecting parts	Complex world that functions in wholes
Goals	
Better life implied through many goals Problems treated as goals	Problems treated as one HOLISTIC goal with three aspects: Quality of Life (values), Forms of Production, Future Resource Base Description Problem-solving never a goal
Ecosystem	
Viewed mainly as a source of raw materials to sustain humans	Viewed as the foundation on which all human endeavour, all economies, and all life, are built.
Tools	
Human creativity Money and Labor Technology Fire Rest Living organisms (in sustainable agriculture) No tools that can cycle carbon in brittle environments	Human creativity Money and Labor Technology Fire Rest Living Organisms Animal Impact Grazing
Decisions Based On	
Expert opinion, friend's advice, past experience, research results, peer pressure, intuition, common sense, cost-effectiveness, profitability, laws & regulations, fear, compromise, sustainability, etc.	Factors on the left, plus seven questions that ensure decisions are ecologically, economically and socially sound, relative to the holistic goal
Monitoring	
Assume all decisions are correct, and monitor to record results Management is reactionary	Assume decisions affecting the environment are wrong, and monitor to produce results Management is proactive

Table 1: *Decision Making*

making decisions that are simultaneously socially, environmentally and economically sound. Other than in these areas, Permaculture is very sound indeed. As a consequence we are encouraging people wherever we can and where it is appropriate to get Permaculture training. The villages we are working with in Zimbabwe will, before long, have Permaculture trainers in their midst.

The downside of Holistic Decision-Making

There is a downside to holistic decision making and that is that it requires major paradigm shifts in several areas, and it requires learning through practice. It's no different from the pilot learning to fly. He doesn't really learn, no matter how many

books he reads, until he gets into the plane and does it. To learn the new decision making you have to practice using it in your daily lives – in your home, your business, your community, in learning groups that help support your efforts and, whenever possible, with a trained member of your community to assist you.

I like to think that each of you will want to be involved in strengthening your already good efforts, and tackling the cause of so much of the environmental deterioration occurring throughout the world, by changing the way you make decisions. We will give you all the support and help we can from our international Center in Albuquerque and through our developing cadre of trainers in Australia, Canada, Mexico, South Africa, Namibia, Zimbabwe, Zambia, Kenya, and elsewhere.

Why Integrated Permaculture for the Wet Tropics?



Professor George Chan (Mauritius)

[Submitted Paper]

Introduction

The wet tropics have everything needed for permanent agriculture (Permaculture), without any imported input such as fossil fuels, chemical fertilizers, toxic pesticides, or growth stimulants, and an optimum abundance of livestock, fish and plants all the year round. The wet tropics should supply the rest of the world with all kinds of foods, economically and ecologically, and leave the polluting but essential high-tech industries and goods, such as aeroplanes and chemicals, to the temperate nations.

Unfortunately, such has never been the case, and the wet tropics were forced during the past century or two to grow cheap commodities and even raw materials for export to those temperate nations for processing and added value, which were then re-exported to the countries of origin as manufactured goods at many times the original prices. The big bio-diversity of the lush tropics was gradually destroyed to give way to huge ranches of cattle or sheep, and vast plantations of monocultural oil-producing crops or commodities.

What made things worse was the replacement of proven and time-tested biological and cyclical systems, using the favourable tropical and environmental conditions, by unsound methods relying on imported agrochemicals and fossil fuels to produce cash crops, creating varied environmental problems, at the neglect of fresh foods and essential crops for local needs. Then chemically produced and processed foods of lower nutritional value were imported to feed the population, creating new metabolic and other serious diseases.

The Integrated Permaculture is designed to solve all these new problems and re-establish the traditional ecological and socio-economic systems, but enhanced with

appropriate biotechnological processes to meet the increasing demands of a modern society.

Mauritius as a case study

Mauritius is a small tropical island in the Indian Ocean of over 1 million people with various racial and ethnic communities co-existing harmoniously despite their different cultures. Since it became independent in 1968, it has made continuous progress in social and economic fields. Its economy was based on monoculture of sugarcane and processing into raw sugar for export, but lately the diversification of crops, tourism, clothing and various import replacement industries have become just as important, with full employment and reasonable social services available to all.

However, most of the staple foods are imported, and the future of sugar is not very bright in the post-GATT era, with over 100 countries producing sugar in a free market within 10 years, when free trade is scheduled to start, with tough competition from countries with lower wages. The ideal solution would be to cut out sugar altogether, and have 2 crops of sugarcane yearly for optimum fibre production. The syrup will contain enough sugar for new industries such as plastics, detergents, and water softeners. Other useful products, besides fibre for paper and board industry, are lignin as a clean-burning fuel, furfural and other useful chemicals. The material separation is done by steam explosion, which requires low energy input and is non-polluting.

For the diversification programme, 6 sugar estates have joined forces to build an Integrated Farming System (IFS) at Union Sugar Estate to demonstrate the viability of having livestock, fish and plants in a recycling system that produces its own fuel, fertilizer, feed and raw materials for a wide range of fresh and processed foods and goods to meet local needs, and is nearing completion. This is particularly interesting since most sugar estates have very ambitious diversification plans, which already include a big variety of livestock and various fruit, vegetable and flower crops. The culture of fish and prawns has started, but as monoculture which requires external sources of feed and energy, reducing the profits considerably. Especially with prawns, the high costs of feed and energy have now become so prohibitive as to make their culture non-viable. Savings in energy and feed from the IFS can make a very big difference.

A more ambitious integrated Permaculture project is the Integrated Biomass Recycling (IBR) complex, which is being implemented at the Government Agricultural Research and Experiment Unit in Curepipe. It is to demonstrate the treatment and reutilization of ALL urban, rural and agroindustrial wastes effectively and efficiently, using simple structures for bio-conversion into useful products for maximum profits at very little costs. It consists of three interdependent modules:

1. *Integrated Sewage Plant* for the wastewaters from a nearby housing estate of 220 families. It uses simple tanks with a combination of contact oxidation panels, soil absorption beds, oxidation basins, fish ponds and macrophyte channels. The nutrient-rich effluent is used to irrigate and fertilize aquaponic,

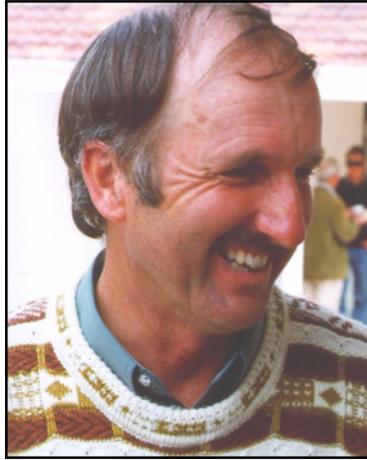
aeroponic, hydroponic and multi-level crops on the premises or on adjacent integrated farms.

2. *Integrated Compost Station* for the municipal garbage, septic tank sludge, night-soil and garden refuse from a nearby garbage transfer station. It uses special windrows to convert the mixed garbage into rich and safe compost within 3 weeks, and is used as a soil conditioner on agricultural land. The residual solids are recycled or buried without the methane and leachate problems plaguing all landfills around the world. The ICS is best located near an integrated farm for synergistic reasons.
3. *Integrated Farming System* to deal with livestock wastes, crop and processing residues, household and other rural wastes, as explained above. It is most effective when ample water is available. Where the surplus water from the aquifer flows into the streams and rivers, and is wasted into the coastal waters, sound water management should be practised, with construction of many small dams and diverting the water into as many large and deep ponds as possible for polyculture of many kinds of fish, fertilized with digested and oxidised manure. These ponds also act as reservoirs, and raise the level in the aquifer to prevent intrusion from nearby stream water which can easily be contaminated.

Conclusion

The Integrated Permaculture concept can be located in any convenient low-lying land in the countryside around any built-up area. In a bigger town, the sewer pipes are laid for gravity flow to the nearest integrated sewage plant, which is run by an integrated farming family that can also look after the integrated compost station with the help of hired labour. The income from Integrated Permaculture can be so substantial that there will be no more incentive for the young to leave the land and end up in urban slums.

Farming Within the Eco-System



Ron Watkins (Australia)

[Submitted Paper]

Payneham farm has been in the Watkins family since 1908, when Ron Watkins' grandfather began clearing the property. After seventy years of farming and gradual clearing, we began to see signs of increasing salinity and embarked on the process of integrated whole farm planning. Realising that water was at the root of the salinity problem, we sought to control and harvest surface and subsurface water flow to improve soil structure and create a large volume of stored water.

Controlling water

Since 1982 we have constructed 16 km of drains and connected dams on the property, with a similar number installed on neighbouring properties in the same catchment. The drains are surveyed on the contour with a slight fall of about 1 in 400. Drain lines are carefully surveyed with the use of a backhoe to ensure that the entire length of the drain is dug into the clay layer and that features like sand or gravel seams are avoided. The completed drain is often quite deep and must be fully lined with clay to prevent leakages. The depth of the drain also ensures that not only surface run-off is collected, but also the seepage water which flows along the top of the clay layer in these duplex soils. The positioning of the drains is associated with what I call "significant landscape features", such as dam sites and changes in ridge and valley slopes. The farm layout owes much to the Yeomans keyline system and the visit to the farm of PA Yeomans in 1980.

The drains are planted out with up to 1000 trees per kilometre in belts 4 wide, and protected with electric fencing. The deep drains cost around \$1700 dollars a kilometre including surveying, construction, levelling and tree planting (fencing not included). The impact on the farm, however, has been considerable. We now appreciate just how much protection these tree belts provide for stock and crops.

Controlling water has led to improved soil structure, and the increased water storage provides us with 3 hectares of irrigated lucerne and plentiful water supplies over the summer months when many of the neighbours are forced to cart water.

Towards the future

For many visitors to Payneham the drains, trees and dams are impressive but my visions for the future are far from being realised. What I'm trying to do – and it may take many years yet – but I'm trying to set up a system, I'm trying to work within the ecosystem to make everything a winner for me. Working within the ecosystem not only makes good common sense from a farming point of view, but also accords with my belief in an “environmental imperative” to repair the country. I am convinced that not only is it possible to farm and protect the ecosystem, but that the two must go hand in hand.

One of the keys to this vision is the promotion of diversity through the development of a host of integrated farm activities and the protection of the natural elements of the ecosystem. A truly sustainable farming system must improve and then maintain the health and vitality of the ecosystem as a whole. In an attempt to monitor environmental health and the sustainability of farming practices, the Land Management Society has produced a Farm Monitoring Kit. The Kit and accompanying handbook aims to provide the farmer with a simple set of replicable tests to build a database of environmental indicators and to monitor changes over time. The Kit includes tests of soil structure, salinity, pH, plant diseases, earthworms and bird and other animal counts.

I don't think a sustainable agriculture for the future is just wool growing; you've got to look at diversity and a stable ecosystem is a diverse ecosystem. The trees, drains and dams at Payneham have not only protected and improved our current enterprises, but have opened up a whole array of new farm activities. With so much water on the farm we are keen to develop aquaculture and explore the potential of other irrigated crops. The tree belts need thinning and pruning to produce quality timber and could be planted with a variety of higher value timber and fodder species. A small apiary enterprise could make use of the ample bee fodder with the additional advantage of perhaps improving canola yields through increased pollination. Regular farm visits have opened the door to the growing industry of eco-tourism. We plan to build chalets on the farm to allow for more extended visits.

This notion of diversity and integration is something many visitors to the farm have difficulty grasping. Someone said to me it's hard to get people to think in three dimensions, well we had a group on the farm and I said to them “let your mind run because I'm going to try to get you into 12 dimensions. It is difficult for people (1) to get to grips with the process, and (2) to absorb all that the future might be for us.

Even the woolgrowing side of the farm could be significantly improved through the development of a rotational grazing system and the establishment of perennial pastures.

Under a rotational grazing system stock densities are increased and rotated through smaller sized paddocks, with the speed of rotation determined by the amount of

feed available. The result is a more even grazing with a period of rest in which the pasture is able to regrow. Having been heavily grazed, a pasture plant sheds many of its roots before growing new shoots. If the plant is bitten off again before new roots have grown the plant is severely weakened and may die. Rotational grazing provides this protection from overgrazing with the added benefits of improved feed, reduction in parasites, increased organic matter through the shedding of plant roots and a more even spread of animal manure. Despite having only dabbled with rotational grazing, I am confident it would allow us to carry a significantly higher number of stock when fully developed.

People power

One of the problems of being a pioneer farmer is the deluge of requests for your time from people wanting to know more. It's a real problem for me, because as I'm developing the farm it's opening up whole new programs for me. I could be home here all the time and maybe three or four other families could be here, but I'm busy giving help to others.

While Suzanne and I look forward to the return of our son Brad from Muresk Agricultural college, our vision for the future of Payneham and the region will only come about with the return of more people to the country. We believe that not only is Payneham potentially capable of supporting two or three other families, but that returning more people to the land is essential to its future. We need more people in the country to look after it properly. The reason why most farmers have gone into chemical farming is because we've had this stupid idea of needing to get big or get out, and of course this has forced us to tear around at great knots with our cultivating equipment or chemicals to cover the country, and we're just killing it.

At a time when others were getting big, we decided instead to get more out of what we had, and at the same time avoid getting ourselves into debt. That's our whole philosophy, that's why we didn't get big, we wanted to make more use of what we've got here. We haven't got an air conditioned tractor or anything like that, we're just putting our priority that way. Instead of spending \$60,000 on a tractor we're saying we'll crank the old girl up for a year or two more and put some more trees and drains in.

This approach underlines my assessment of the economics of converting a farm to sustainable and organic enterprise. Whilst the price of change is often held up as the reason why many farmers maintain the status quo, I believe it is as much a matter of will and self-belief, and a determination to resist the pressures not to change.

There's a couple of pressures there; there's peer pressure because you're perceived to be a backward farmer. All the progressive farmers, whatever papers or "country comics" or farm journals you read, all the progressive farmers are the boys who are doing huge yields, all pouring chemicals into no-till farming, so you've got to fight against that sort of thing. And that questions your confidence; none of us really like to be left behind or be perceived to be weird. Then there's also the lack of research backing; there's just no research for non-chemical types of farming. And then you've got to look at your market development. Your grain pool and wheat board, they'll

only market the traditionally grown material so you're out in a really shaky piece of territory unless you've got confidence or a will to go that way. For me, even after all these years, I still wobble some times and think good grief maybe I've got it all wrong.

Despite international recognition, growing local interest and enviable margins on my no-spray Canola crop, I am not immune to the pressures facing today's pioneer farmers. While I have no doubt that current farming practices must change, I still find it difficult to "go the whole hog" and drop the last vestiges of chemical farming. As my system matures and confidence grows, the continuous use of "imported" fertilisers comes under closer scrutiny.

For those farmers wishing to make the change today, properties such as Payneham are showing that it can be done. While the system at Payneham is still establishing itself, I am able to show others a working example of what can be achieved in 14 years of redevelopment. It's still scary but when I started it was just an idea, a theory – now it's a reality.

As woolgrowers, our future looks remarkably bright. Aside from the healthy returns on canola, the improvements to be made to pasture and grazing management and the myriad of potential enterprises to be integrated into the overall system, there are other indicators of a positive future. Less tangible but no less important are the encouraging words of visitors to Payneham and the return of orchid flowers in spring in a patch of fenced off remnant vegetation. For me these are not only a reminder of the past, but also a sign of a future in which farmers will learn to respect the great diversity of life on which they are ultimately dependent.

Part 2

Earth Care Stream

Water: Lifeblood of the Earth

Johanna Benschop (Australia)

[Submitted Paper]

Of the world's total water supply, 95.1% is salt water. Fresh water accounts for nearly 5% of the total supply. Almost all of this is in ice or is underground. It is only a tiny amount, 0.01% that is not in ice or underground. FUTURE'S THIRST WORSE THAN FAMINE.

Clean water is a scarce resource to Al Miller, the Assistant Director of Advisory Services for the University of Wisconsin, Seagrant.

The amount of fresh water available after evaporation and run-off is barely enough, Miller said.

"Despite the precious nature of water, we place a great deal of pressure on it," Miller said. "The problem is resource consumption, increased thirst, and depletion of non-reusable resources.

An example of how modernisation hurts the water supply is in China. Urbanising means flush toilets, industry and a Chinese move up on the food chain. The stress on China's water resource became so severe that over 82 million people live with a water shortage.

Another problem is that countries withdraw non-renewable water, Miller said. In Libya, underground water is withdrawn at a tremendous rate to irrigate land.

"The source of water in Libya will last 40 to 60 years," Miller said. "When it runs out I don't know what they will turn to."

Additionally, pollution of water is endangering the world's fresh water supply. Water is polluted by agriculture, residential and industrial wastes.

Polluted water is a problem in Peru, Miller said. Twenty-nine percent of the poor's income is spent on boiling water to make it safe.

"Other countries spend a lot of money to have clean water," Miller said. "And in the United States we basically get it for free. However, this may not last for long."

Population growth also places a great deal of pressure on water, Miller said. Mexico will have a tremendous water shortage if its population continues to increase at a high rate.

"This isn't Mexico's problem, it is our problem," Miller said. "They don't have the resources to deal with the problem because it would take bold solutions and expensive options."

The future of the world's water supply is in trouble, Miller said. Already, 5.3 billion people experience a water shortage. And in 2050 half the world will not have enough water.

Miller said we have to address the global water supply now.

“I think the danger is not addressing the problem,” Miller said. “We may have a chance if we deal with the issue now.”

The United States needs to help with foreign policy, Miller said. Otherwise, he predicts the water supply will cause wars.

“We need to assist developing countries, promote alternatives to dispute water resolutions, and support technical improvements,” Miller said.

(The Global Water Supply is in Danger by Jennifer Gundry, spring 1996)

Another way of looking at it:

- FACT: The total quantity of water on the earth’s surface remains essentially constant.
- FACT: The world’s water is universal, and knows no borders.
 - Your bore water is also my groundwater.
 - The world’s overproduction of bottled drinks becomes your thirst.
 - Your drainage of nuclear waste is my polluted rainwater.
 - Your change of waterways is for me a desert.
 - The most essential component in the world’s manufacturing/industry is water.
 - The most essential component in our bodies is water. Water = Life.

I will organise a discussion workshop on these issues during this conference.

Auroville – Reaching Out

Joss Brooks (India)

[Submitted Paper]

Auroville presently brings together twelve hundred people from thirty-two nations, of which a third come from the surrounding area. North and South, East and West join on a shared plateau where the rural, the modern and the traditional co-exist. Auroville represents an attempt in an increasingly divided world, to establish the basis of a sustainable collaborative society, living in an atmosphere of harmony and mutual respect.

To attempt to describe Auroville is similar to the proverbial five blind people trying to describe an elephant, when each is holding onto a different part. One can only speak the truth of one's own experience, listen carefully to what the others are saying, and try to understand. It is a process that takes time. And because Auroville is at the same time growing, evolving, it is a process that continues.

"I want to insist on the fact that this will be an experiment, it is for making experiments-experiments, researches, studies."

Mother, 30 December 1967

"Auroville will be a site of material and spiritual researches for a living embodiment of an actual Human Unity."

Mother, 28 February 1968

"Auroville wants to be a universal township where men and women of all countries are able to live in peace and progressive harmony, above all creeds, all politics and all nationalities. The purpose of Auroville is to realize human unity."

Mother, 28 February 1968

How is Auroville attempting to realize this vision? It keeps on trying...The challenges are diverse; both the inner and the outer. There are contradictions, hypocrisies, injustices. There is also responsibility, generosity, competence, beauty, and a quest for perfection. Sometimes people are tired and frustrated; sometimes full of energy and joy. Consequently, one gets mixed reports about Auroville. We are trying...and piece-by-piece, succeeding.

In this spirit, we would like to provide information on a few of the projects at the local, national, and international levels that have recently been initiated within Auroville, along with a broader evaluation of the work that has been done with the local villages, to exemplify some of the dimensions in which we connect with the outside world

Appropriate technology

Solar and wind energy promotion

This year, in a joint venture between TATA BP Solar, Siemens, Integrated Finance Company, Indian Renewable Energy Development Agency (IREDA) and Auroville's Centre for Scientific Research (CSR) as a nodal agency, a major solar photovoltaic pump project, involving the installation and commissioning of 132 solar powered pumping systems in Tamil Nadu and Karnataka was completed.

Additionally, a Solar Photovoltaic Water Pumping Workshop was organized by IREDA and CSR with sponsorship from the Ministry of Non-Conventional Energy Sources (MNES) at CSR. The workshop, which focused on the economic viability, future potential, marketing strategies and the technical perspectives underlying solar water pumping systems in India, was attended by representative users, nodal agency decision makers, manufacturers, financing agencies and community developers active in the field of renewable energy applications. High level presentations and intensive deliberations were complemented by on-site visits to renewable energy and SPV installations in and around Auroville, and by video film shows on Auroville Renewables. A monograph bringing together all the presentations made at the workshop was published afterwards for reference and information of the renewable energy community in India and the world at large.

A Windmill Research Project, sponsored by Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Germany, to improve the overall efficiency and output of water pumping windmills by developing and field-testing various loadmatching devices was completed this year. In the course of this project a close working relationship was established with the Wind Energy Group of the University of Technology in Eindhoven, Netherlands. A 45-page final report, describing the work was published in December 1995.

Building technologies

For the second year in a row, the Auroville Building Centre (AV-BC) has won the Outstanding Performance Award, as the best building centre in India, from the Ministry of Urban Development and Poverty Alleviation. AV-BC is part of a national network of more than 300 building centres all over India, set up by The Housing and Urban Development Corporation to provide training and assistance in appropriate cost-effective building technologies.

Presently, at the request of Building Materials and Technology Promotion Council (BMTPC), Govt. of India, the Auroville Building Centre, in conjunction with the NGO Development Alternatives in New Delhi, is preparing India's Code of Practice for Ferrocement Roofing Channels.

Recently HUDCO has sanctioned a Rs. 13.25 lakhs grant to set up a Mobile Training Unit at the Auroville Building Centre. The aim of this grant, which is yet to be released, is to bring cost-effective technologies from the laboratory to the rural poor.

Information super highway

Auronet is a bulletin board service within Auroville. It has forums where Aurovilians can exchange information rapidly on a number of themes, from Sustainable Development to Current affairs. There are 250 users on Auronet now.

We have recently become a 'web-site' on the Internet. Internet users from all over the world can now select 'Auroville' and get a general picture of Auroville and more specific information on various topics, such as visiting or joining the community.

Work is currently beginning (Summer 1996) to drastically improve the ways in which we generate and share information within the community. The Archives, along with various working groups and units are collaborating to develop a comprehensive, on-line database of information from Auroville's early beginnings to current events. One problem in Auroville, is that we often do not know what each other is doing, and we miss many opportunities to coordinate and cooperate.

Working with the villagers

When Aurovilians first came to the area in 1968, what they found was a picture of poverty, both economic and environmental: to the eye, a bleak expanse of barren red earth scarred by gullies and ravines with only an occasional palm or lone banyan to dot the horizon. And to the heart, a mass of thin people complaining of not enough food, no money, of sickness and hopelessness.

The population is largely agrarian, or on the coast, fisherpeople, although there is a strong drift of young people to the cities for employment. Vanur Block was classified in 1984 as 'backward and in need of development,' and is a 'reserved' constituency allotted for harijans. The majority of the population is landless or marginal farmers. The average wage is about Rs. 500 a month; the literacy rate not more than 40%.

Auroville's efforts

As the poverty of the land and the population were clearly interlinked, it was possible for Auroville to make multiple efforts in many areas, each helping the other, despite lack of formal coordination. The good results, such as they are, depend on the people's effort. The people were very eager to work and, for instance, projects to plant trees, bund and fence the land, provided employment and cash to the people as well as directly working with the environmental problems.

Simultaneously, fledgling commercial and construction undertakings provided training and employment in crafts, trades and supervision, so that over the years, many people became self-employed and others skilled, responsible, salaried employees.

Also, small schools for village children were established in nearby villages, which coincided with a general trend among villagers toward appreciation of education, which resulted in an increasing number of young village people finishing school and entering university. A Health Centre began to treat the populace at its clinic, and village development societies were organised in several communities.

Auroville as an 'intentional city' has been modeling two rare qualities in city building. One, it has restored its environment, rather than ravaging it. And, two, it seeks to sustain the life and culture of its surrounding populace. The Auroville experiment wants to see that the surrounding area is nurtured by its presence, growing lush, green, prosperous and cultivated.

Education

The main village development approach chosen by Auroville has been intensive education of young men and women in the mechanisms of social work and communication, and immediate application in their own and nearby villages. The result is that in 32 villages and hamlets surrounding Auroville, groups of youth, groups of women, or both, are meeting regularly to plan and carry out small-scale village improvement projects such as:

- Deepening wells and water catchment tanks.
- Repairing and constructing schools and youth club buildings.
- Repairing roads, making culverts, etc.
- Running reading rooms and small libraries.
- Improving bus service.
- etc.

Education of children and youth

Since the beginning, the children of the villages have received special attention from Aurovilians. Schools for village children, nutrition programs, playgrounds and sports programs were part of the early activities. In some cases children were 'adopted,' singly or in groups and raised in Auroville. The result has been that today, there are many village-born young men and women who live in Auroville as members of the community, of which quite a few are holding responsible positions.

Presently there are six educational centres for village children located in Auroville, and three programs conducted in the villages.

- **New Creation** – a community and school for 200 children. The day school includes crèche, kindergarten, and classes 1 – 7.
- **Ilaignarkal** – an evening school providing classes in Tamil, English and general knowledge, especially for young workers from the local villages and Auroville units. Besides, there is a day program-cum-vocational training for 10 – 14 year olds.
- **Arul Varhi** – a project of the residents of the Auroville community of Promesse. There are no hired teachers, and a great deal of attention is given to individual students. There is a kindergarten program for 22 children of 4 – 6 years, and an after school, body awareness and cultural expression program for 100 children of 6 – 15 years.
- **Isai Ambalam** – a day school primarily for children who have dropped out of the normal schools for various reasons. Altogether, it serves 80 children from five villages.

- **Life Education Centre** – an experimental school to induce older, working children to continue schooling. The 25 students (mostly young women) are trained in vocational arts such as food processing, typing, tailoring, needlework. They also learn reading, writing, English, maths and social awareness.
- **Kuilapalayam School Trust** – an independent organisation whose Board of Trustees consists of educated young men from the village (two of whom are Aurovilians) who, with the financial help of an Auroville commercial unit, have created a school for children of the nearby villages. They plan to expand the school each year as the children are promoted; presently there is kindergarten through 5th standard. This school uses the conventional government curriculum and is accredited by the Dept. of Education. The difference is in the quality of the hired teachers who were selected with great care after massive interviewing, and who are encouraged to exercise creativity in their teaching.

Village health care

Auroville established its Health Center in 1973 which now serves the village population at its main and three sub-centres. It aims to realise 'Primary Health Care' as defined by the World Health Organisation, ie. a level of health care which concentrates on the most prevalent and most relevant problems of the whole communal body that is being served.

Auroville works at three levels in the field of health:

1. **Curative Services** – these include:
 - Doctor consultations (3380 visits monthly).
 - Dressings (3640 monthly).
 - Daily first aid at each of 26 villages.
 - Pregnancy check-ups and deliveries.
 - Dental care.
2. **Preventive Medicine** – current projects:
 - On-going training of 29 health workers about causes of illnesses, nutrition, and hygiene.
 - Follow-up of TB and other communicable diseases in all the villages.
 - Garbage collection and composting project in Kuilapalayam.
 - Sanitation: improving water supply, drainage, and building toilets.
3. **Health Education** – uses various approaches as appropriate:
 - Child-to-child education at the village schools four days a week.
 - Dramas and puppet shows on health education are played every fortnight at different villages.
 - Food demonstrations and kitchen gardens in all the villages.
 - Exhibitions of posters, films and slide shows on health education are frequently presented in all the villages.

Employment and business opportunities

Auroville employs over 5,000 people, many of whom have been trained on the job. Areas of work range from excavation to engineering and include cleaning, agriculture and gardening, driving, housekeeping, accounting, teaching, sales, store keeping, supervising, all construction and maintenance trades, handicraft and needle work, and computer related work.

Auroville is encouraging its workers to save for retirement and a Retirement Scheme has been set up. Under it, the savings are built up by contributions from the worker, the employer and the compound interest.

In addition to the jobs in the workshops and business, construction sites, farms and houses of Auroville, there has been a blossoming of small-scale business. Shopkeepers and building contractors, manufacturers of leather work, woodwork, lampshades, crochet and knitting, natural dyeing, batik, stone carving and many others are flourishing now in the area.

On-going challenges

Although many beginnings have been made, and even many good results achieved, in working with the challenges presented by the environmental and economic poverty of neighbourhood of Auroville, there are still many areas which require continuing effort and as yet unthought of approaches.

One thing to keep in mind, though, is that Auroville is not a village development society, but an experiment for a large group of volunteers interested in tackling the problems besetting humanity through preparing the ground for a radical change in human consciousness. To deliberately take up this essentially inner work is the basis of joining Auroville.

In this context, the villagers present a significant challenge, but not the whole focus of the Auroville endeavor. How to honour their rights as the original inhabitants of the land, the host to the experiment, as fellow humans in the effort toward human unity, remains as yet insufficiently understood. How to learn the quiet lessons of their traditional culture? How to avoid imposing on them and yet maintain the main thread of our endeavor?

To be sure, a deepening spiritual insight into the fundamental oneness will bring Aurovilians closer to the answers, and practical solutions will flow out of that insight. But meanwhile, ways and means of including the material and cultural needs of the villages in the Auroville development planning needs to be worked out.

Environment

When the first Auroville settlers moved to this plateau in 1968, they were confronted by a land that was visibly dying; the result of two hundred years of deforestation, overgrazing, and other bad land management practices. Occasional palm trees, mangoes, thorns, neem, cashews, and a few lone banyan trees dotted a vast open expanse of red earth scarred by a network of gullies and ravines, carved out over the years by torrential monsoon rains. Previously the land had been covered by scrub

jungle. According to temple inscriptions and local records, tigers and elephants once roamed the area.

The first needs to confront Auroville's earliest settlers were those of shade and water. When the first communities started, water had to be brought in barrels by bullock cart from as far as three kilometres away. Wells were dug, cartloads of compost collected, and trees planted. As the lands were fenced off to protect the seedling trees from goats, cows, and firewood foragers, tensions frequently ran high among villagers over grazing rights. Simultaneously, the first phases of land regeneration began with efforts toward an integrated soil and water conservation program. This eventually involved the digging of thousands of kilometres of 'bunds' (raised earth banks and ditches) to catch and hold rain water and control erosion due to runoff. It was a process of trial and error, and over the years bunding became more systematic and comprehensive.

As the trees grew and micro-climates formed, bird life returned to the area, and much natural dissemination of seeds is now occurring. Forests have started to propagate themselves, and it is now estimated that over two million trees cover much of the Auroville 2600 acres of area, spread out in patches of two to more than one hundred acres. The knowledge, dedication, and hard work of the people involved in this development have made 'Auroville' a household word in India's environmental community.

The work continues.

Aranya project

The International Development Research Centre has funded a project in Auroville to recreate coastal forest on degraded land. The East Coast Evergreen Forest, which once extended from Madras to Kanyakumari is now down to two tiny patches. We have planted 48 species of trees identified from these forests in the last year.

Interactions have also begun with persons from the nearby village of Manaveli, and a program of fodder cultivation is being worked out with them. The potential for tree crops and plants which can be used for natural dyes, to be planted on degraded village lands is also being explored.

Integrated watershed management

Integrated Watershed Management is being coordinated by Palmyra, the centre for ecological land use and rural development. To date, 1400 ha have been covered by this project. Over 20 lakh trees have been raised in the Aurobrindavan Nursery, of which 15 lakhs have been planted. Thirty-five earthen check dams have been constructed. A video documentary about this work, sponsored by the NWDB, is being made.

In addition, two workshops a month are being held, as well as a number of orientation courses for farmers, NGOs and Government officials. In December, a workshop will be held for thirty Indian Forest Service officials, in cooperation with the Ministry of Environment and Forests.

ARISE

In April 95, Palmyra organised ARISE (Agricultural Renewal in India for a Sustainable Environment). This conference brought together over a hundred people involved in organic agriculture – activists, farmers, and academics from all over India. They spent several days here discussing how to resurrect the ancient traditions of sustainability in India.

The conference resolved, among other things, to work on means for protecting biodiversity through the establishment of community seed banks, promotion of organic agriculture, and watershed regeneration, as well as promoting farmer-to-farmer interactions through the establishment of cooperatives.

Indian army officers environmental training

After a visit to Auroville by the Chief of Army Staff, ten army officers from different eco-battalions around the country were deputed here. They underwent a one-week training in environmental regeneration techniques. The interaction with them was of great value to Auroville as well, for the exposure we got concerning the techniques now being used for environmental work by the army.

Peacetrees

The very first Peacetrees project was held in Auroville six years ago. It brought together youth from different countries to plant trees and 'to heal the earth as they heal each other.'

There have been seventeen Peacetrees projects held so far in different parts of the world – urban ghettos, endangered wilderness areas, and war-torn countries, and this year it was Auroville's turn again. The program brought together sixty young people, of whom eight were from Auroville and the surrounding areas, and twelve from other parts of India.

Their activities included tree planting along the East Coast Road and in Auroville, desilting an ancient temple tank, and also work at the construction site of the new solar kitchen.

'Troubled Waters' video

After initial research conducted in the immediate area revealed that salt water intrusion was becoming a reality in local coastal villages, further research discovered that a much more advanced problem existed in a Southern part of the state. This led to a grant from DANIDA for the production of a video aimed at educating coastal farmers on sustainable water use patterns. 'Troubled Waters,' produced by Auroville Video in Tamil with English sub-titles uses local actors to dramatize the plight due to salt water intrusion because of over-pumping by farmers and villagers in a once-fertile coastal area of Tirunelveli district. It also provides indications as regards measures to be taken in watershed management to remedy the situation. Aimed at NGOs and farmers, the video's goal is to stimulate discussion and awareness of water as a common resource as well as encourage the implementation of sustainable techniques of watershed management.

Medicinal plants project

Years of work by Auroville greenworkers and botanists, that has increasingly been concentrated on research into the indigenous flora of the area, received recognition when the herbarium at Shakti and the seed centre at Pitchandikulam were designated as two of the forty centres set up in the South Indian states of Kerala, Karnataka and Tamil Nadu by the Foundation For the Revitalization of Local Health Traditions based in Bangalore. This Foundation and the centres it funds, in collaboration with State Forest departments, is working to save India's ethno-botanical heritage.

The Auroville seed centre has, to date, collected stocks and samples of 320 local seeds with medicinal properties. More than fifty varieties of seeds exist in sufficient quantities to be distributed to physicians and interested individuals of the local area and neighbouring states. In collaboration with the AV Health Centre, it has also produced a catalogue and manual on how to use the seeds. Sets of seventeen plants will be distributed to 200 local families.

Shakti has a herbarium of 500 plants and has raised 100,000 seedlings which will be distributed by the Pitchandikulam team to naturopaths and other interested people in the region.

Conclusion

In this document, we have briefly tried to illustrate what are just the legs and tail of this elephant of Auroville. The heart and soul are much more difficult to see or describe; yet this is where the real work is being done. If we are to live up to our destiny of being the 'city the earth needs,' it is this inner treasure that we need to develop and share.

Revitalisation of the Indigenous Flora (Particularly Medicinal Plants) and Traditional Knowledge of the Coromandel Coastal Region of South India

Joss Brooks (India)

[Submitted Paper]

Introduction

The indigenous vegetation of the Coromandel Coast bio-region is known as Tropical Dry Evergreen Forest (TDEF). This forest type is found only in South India and Sri Lanka and provides a rare biological richness due to its very high species density, but it is now close to extinction. There are only three small remaining areas (approximately 4000 acres) of this forest type in the bio-region and although they receive protection from the State Forest Department there is no official policy to revitalise them.

There are more than 7000 species of plants used for medicinal purposes by the people of India. This medical heritage represents one of the longest unbroken traditions in human civilisation. There are two main streams of medicinal knowledge in India; the local folk medicine located in the villages, and the codified knowledge systems of Ayurveda, Sidha, Unani and Tebatten. Of these two systems, local medicine is perhaps the most practical and accessible for basic health care needs in the villages.

This particular bio-region is home to at least 400 species of medicinal plants that have been used for centuries by traditional practitioners of herbal medicine. However, the few remaining areas of TDEF are under constant threat and genetic resources are being rapidly depleted from, for example, clearing by forest departments to plant monoculture exotic fuelwood species or from over exploitation by the pharmaceutical industry which collects 95% of its plant materials from wild sources such as these. A few local, plant doctors still know the uses of many of the medicinal plants of these areas and in some cases the knowledge has been preserved on palm leaf manuscripts, some written eight generations ago. However much of the knowledge is being lost in a negative cycle of cause and effect stemming from the degradation of the TDEF = lack of raw drugs = lack of practice = depletion of skills = cessation of networking between practitioners = loss of self esteem = lack of young people taking interest in learning the skills.

Strategies for revitalization

Within the bio-region is the international township of Auroville which was established in 1968. Land restoration both in and around Auroville has been an ongoing process since this time, with the result that "new" forests have been established and over 2 million trees planted. Pitchandikulam is a community within Auroville which has been heavily involved in this "Greenwork", particularly with regard to medicinal plants. Pitchandikulam is now, after 25 years, a diverse eco-system containing more than 400 species of plants covering an area of approximately 50 acres. Windmills,

Biogas and Solar Power are used for the communities energy needs and the gardens, orchards, woodlots and forest sanctuaries are often used as training sites for many aspects of eco-restoration work.

In 1992, The Foundation for Revitalisation of Local Health Traditions (FRLHT) incorporated Pitchandikulam as one of its Medicinal Plant Conservation Parks. FRLHT is a non-governmental organisation focusing on re-building India's vast traditional medical knowledge. In an effort to focus attention on India's ethno-medical heritage, one of the programmes that FRLHT has embarked on is that of conservation as well as sustainable use of medicinal plants, especially in the area of primary health care. The foundation's thrust areas include establishing a computerised information network on medicinal plants and natural products, promoting the utilisation of traditional medicine in rural and urban areas and establishing cooperative links with other traditional medicinal systems of the world.

In 1993, Pitchandikulam Bio-resource Centre was established as a focal point for indigenous forest regenerative work in Auroville with special emphasis on the medicinal plant aspect and interaction with the local community, particularly traditional plant doctors, school children and other interested organisations and individuals. An important aspect of this work is training of community health workers, village development workers and school children. The centre displays raw drugs, seeds, examples of local traditional technologies and a photographic presentation of medicinal plants; and includes a library, ethno-botanical and medicinal demonstration gardens and nurseries.

Examples of medicinal plants of the local area

- *Rauwolfia tetraphylla*: Snake and scorpion bites are common in this area and are often highly poisonous. All parts of this plant are considered to be useful in curing snake (most) and scorpion bites. The leaves in particular are useful, being applied in dosages of about 10 grams after being ground. The fruits are edible and are considered to act as a preventive medicine for snake bites.
- *Achyranthus aspera*: This plant is considered to be an important auspicious medicinal plant. All parts of the plant are medicinally useful. The roots can be used as a tooth brush to strengthen the teeth, cure toothache, to reduce swelling in the chin and to give freshness to the face. A preparation of the leaves (pasted with sesame oil) is believed to cure dog bites. Eating the roots (pasted with water) reduces the effects of scorpion and snake bites.
- *Leucas aspera*: The whole plant is considered to be medicinally useful and sacred. The flowers can be collected in the mornings (traditionally it is believed that plants have greater powers depending on when they are collected), boiled with water and then given as cough medicine for infants. The leaf juice is considered to be useful for many different types of skin troubles.
- *Tinospora cordifolia*: In Sanskrit, this plant is called Amruth. The word Amruth literally means immortal. It is a "wonder" plant known traditionally for its rejuvenating properties, particularly the leaves and stems. The liquid obtained from boiling the leaf can be used as a medicine for diabetes.

Continuing work

1. Establishment of a community register that documents the rich traditional knowledge of a given village's use of bio-resources, their availability and conservation practices related to these resources. The objectives are as follows: to collect information with community involvement of school children, youth clubs and women's groups to share the local knowledge of bio-resources for mutual benefit with other communities in India to revitalise local health traditions and technologies and to nurture respect for local plant doctors who are being devalued in the face of powerful advertising of western medicines.
2. An essential aspect of the overall work is the creation and maintenance of havens in which the indigenous forest may develop naturally and serve as a gene bank. The strategies are as follows: to reintroduce individual species into their former habitats, to regenerate whole communities and to conserve rare and endangered species to protect 2,500 acres of remnant vegetation using local community support in collaboration with the Forestry Department.
3. Spreading the message to local people about the importance of the indigenous forest. For example, to encourage the understanding that all remaining areas of the TDEF be left undisturbed and to coordinate efforts by communities that are aimed at the preservation and restoration of remnant forest.
4. Environmental education programmes are being developed, for example: developing curriculum for village schools and for adult education programmes using information about local bio-resources and traditional skills and technologies to empower and support local communities in running training programmes with the practitioners of local folk medicine.
5. To continue establishment of individual village gardens containing food and medicinal plants.
6. To establish Herbal Dispensaries in the villages which serve the local communities.

Conclusion

Through our outreach work with revitalising local medical knowledge and skills, together with protecting and re-establishing the bio-resources (in particular medicinal plants), we are endeavouring to establish a sub-culture that can survive within the wider reality of modern India. A sub-culture that can continue to seek and find its inspiration from the diversity of the biosphere and that has a firm enough base to sustain itself, that interfaces with the world as a whole and relates equally well to the traditional villagers who seek to maintain their lifestyles within the changed landscape of industrialised India.

Future Agriculture: Change of Attitude, Change in Latitude

Donald Cochrane (Australia)

[Submitted Paper]

Sustainable Agriculture on a broadscale is a fashionable expression used regularly by individuals and research organisations to describe new, often unproven systems for land use.

In Western Australia, millions of hectares of cleared agricultural and naturally vegetated land is affected by waterlogging, salinity, acidification and loss of topsoil through wind and water erosion. While the exact area of land lost to production is uncertain, what is certain, is the potential to lose many more hectares if we continue with our existing farming systems and the communities expectation of an even higher standard of living.

The changing uses of land and the impact it has on communities and social infrastructure, are rarely ever considered by Governments or economic rationalists. Every essential food producing hectare taken out of production by alternative unproductive land use, such as real estate or even worse land degradation, means another hectare has to produce twice as much to compensate. While it is acknowledged that vegetation within our landscape has economic, social and environmental benefits in the short term, a monoculture of any species could have detrimental long term affects.

This paper looks at "Alley Farming", the integration of trees and higher water use crops and pastures into our farming systems. Alley farming is the strategic placement of trees or shrubs in single or multiple rows with bays (determined widths) of untreed land between each replication. The trees play a multipurpose role in providing water table and possibly salinity reduction, improved microclimate, environmental benefits and potential timber production. The bays allow unlimited opportunities according to position in landscape and rainfall, varying from crops, grazing pastures, fodder and horticulture. The system described in this paper, was designed to maintain production from flat, waterlogged and milolu saline land.

While the earth's crust is in continual evolution and changing over millions of years to establish new latitudes, we as its inhabitants have brought about changes in only decades. If we are to be fed and clothed from our soil, we will need to adopt rapid changes in attitude as to the way we use our land.

The level of acceptance of broadscale sustainability in agriculture will always be determined by two factors.

- Current economic and social status (Producer).
- Expected economic and social status (Consumer).

Producers in Australia are having great difficulty maintaining a dignified economic and social status.

It is often a case of living to survive because our fragmented farming systems are not profitable enough to repay the soil for its yield and producer for their toil.

Consumers, meanwhile, have the expectation of a greater economic and social status. Expenditure on leisure and recreation takes precedence over paying the true cost of food and fibre. Without this debt to our agricultural land being met the health of our natural resources used for conservation and recreation will continue to rapidly decline. These two examples highlight the extremes of reality and expectation.

The reality is that our natural resources cannot cope with our current farming systems. We need to develop integrated Australian farming systems to cope with our environment, not expect our environment to cope with alien systems.

Society's expectation of greater affluence and better quality produce will be entirely determined by the health status of our soil and water.

Alley farming is one component of a farming system which offers soil rehabilitation, economic return, conservation and social benefits.

An initial area of 11.18 hectares of a mildly saline and waterlogged paddock was planted in 1992. The treed belts consist of 3 rows, 3 metres apart with seedlings 2 metres apart, because of the duplex soils (sand over hard clay). The tree lines were deep ripped with a bulldozer (connected to a savannah plough) to provide an unsaturated seedling bed. Cuts from the plough discs act as drains for excess water. These 3-row tree belts were replicated across the paddock, leaving pasture bays of 60, 40 and 30 metres (250, 375 and 500 trees/ha respectively).

Tree species were selected using a hand held EM38 (Electromagnetic Induction Instrument) which measures soil salt storage to 1.5 metres. Because soil salinity ranged from 25 to 220 milliSiemens per metre (mS/m), several tree species with multipurpose benefits were planted (refer to **Table 1**). Areas with an EM38 reading of >150 mS/m were planted to salt bush (*Altriplex Amnicola*, *Undulata*, *Cinerea* and *Semibaccata*).

Soil Salinity Range	Species Planted
100–150 mS/m	<i>E. Occidentalis</i> , <i>A. Saligna</i>
50–100 mS/m	<i>E. Camaldulensis</i> (4 Provenances), <i>E. Melliodora</i> , <i>E. Cladocalyx</i> , <i>E. Rudis</i> , <i>E. Microcarpa</i>
0–50 mS/m	<i>E. Maculata</i> , <i>E. Grandis</i> , <i>E. Botryoides</i> , <i>E. Cornuta</i>

Table 1: Allocation of species to salinity ranges

To generate income from pasture bays while the trees were too young to graze (3 years) some bays were sown to pure Balansa Clover, at 5 kg/ha, and others to Balansa and oats at 5 kg/ha and 20 kg/ha respectively. Prior to establishment, this

paddock produced less than 1 ton/ha of barley grass and other low value grasses. This change in agronomic systems produced up to 7 ton/ha of Balansa and oats with an average of 3.1 ton/ha.

	% Dry Matter Digestibility	% Crude Protein
Pure Balansa	74.2	12.4
Balansa and oats	65.0	6.5

Table 2: Pasture bay nutrient yields

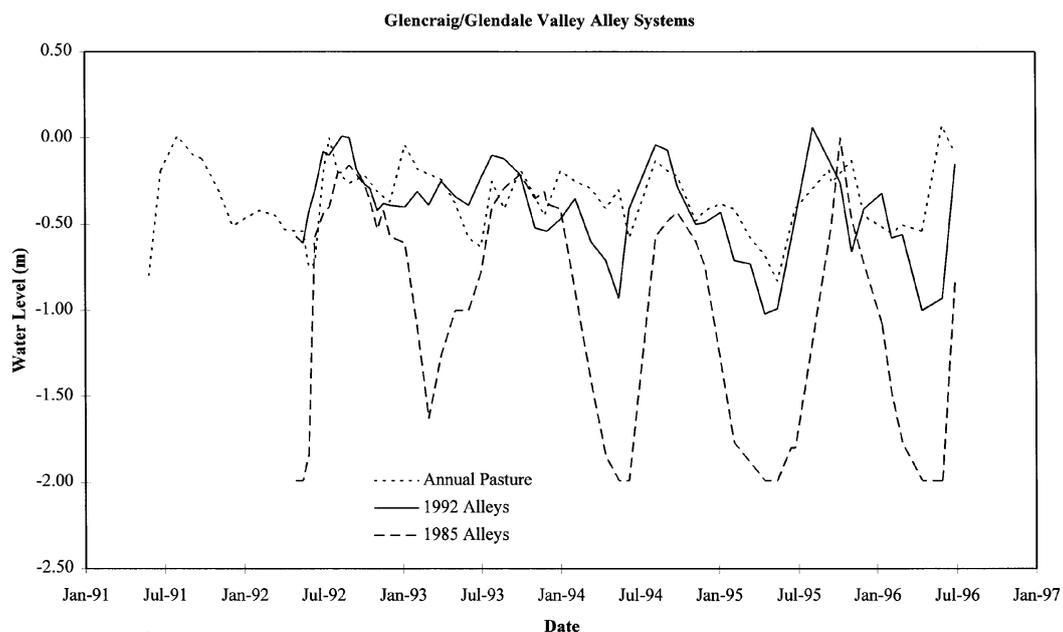
Hay was cut from the bays during 1992, 1993 and 1994. Grazing took place during 1995. In 1996 the alley bays were sown to perennial grass.

Tall wheat grass (<i>Agropyron Elongatum</i>)	10 kg/ha
Phalaris (<i>Phalaris Aquatica+Holdfast</i>)	5 kg/ha
Puccinellia (<i>Puccinellia Ciliata</i>)	2 kg/ha

Table 3: Perennial grasses sown

The initial objective of this system was to generate enough income during the 3 years of hay production to pay for the cost of establishment and maintenance (see **Table 4**). The initial cost was \$324.00/ha and, after 3 years hay production and excluding grazing, there is only a \$34/ha deficit.

A transect of Piezometers in groups of 3 (8 metres - 6 metres - 3 metres) were drilled in 1992 by Dr Richard George and Mr Don Bennett from the Department of Agriculture, Bunbury. These are being jointly monitored on a monthly basis and results recorded on hydrographs (see **Figure 1**).



Future trends in water table draw down will help determine tree density and bay width. Current ground water quality varies between 1200 and 2600 mS/m with a general water table level at the end of summer. An adjacent planting of narrow alleys with bays 15 metres apart and single rows of trees was established by my father Louden Cochrane in 1985 (now owned by Chris and Wendy Cochrane).

The tree species are predominantly *E. Occidentalis* and *E. Camaldulensi*. Hydrographs from bores recorded since 1992 show a draw down of water tables of 1.00 to 1.50 metres at the end of autumn. This significant reduction allows a greater time span for pasture development before winter water logging.

This system of farming could be adapted with modification to all land forms and rainfall zones. It allows unlimited options for future land use within the bays while benefiting from the multipurpose effects of trees such as shade, shelter, microclimate, water use, aesthetics, flora and fauna habitat and timber production.

The recent favour of placing a monoculture of trees over entire farms may have great benefit in lowering water tables for salinity control, but denies future land use options. On-going research and integrated agriculture offer the only long term hope for a sustainable future. To achieve this goal, we need to change our attitude towards land use and accept that the soil is a living organism.

Finally. Real change will not come until we all look to the land. We all come from the land, and when we look to it, we look into ourselves where we find the power to change.

The sowing rate used was Balansa 5 kg/ha and Oats 15 kg/ha. The area was sprayed (Sprayseed[®] and Rogor[®] mix) scarified, and then drilled with 200 kg/ha of 3:2 super potash before sowing in early May. The seed was dripped on the surface and covered with trailing harrows.

Germination would have been improved if the area had been rolled after sowing. Spraying for Red Legged Mite was repeated in June using Le-mat.

Acknowledgments

Rarely do people ever achieve goals entirely on their own. I would like to thank my father (Louden Cochrane) who had the foresight to plant the 1985 agroforestry. Richard George, Don Bennett, and also Tom Smith for their technical and physical support in the 1992 alley farming. Without their advice and encouragement, the paddock today would probably be nothing more than alleys of saltbush and puccinellia. Geraldine Capp for the use of the last paragraph which she wrote in earth 2,000, West Australian Newspapers 13 November 1995, and Colin and Sue Stock for their typing skills.

Donald Cochrane has owned his farm since 1974. Since 1989 have been involved with the Lake Towerrinning Landcare Group. We initiated a plan to divert fresher water 12Kl to fill and flush the lake to reduce it's salt bed. This was the social and environmental half of our plan. The other was to get involved with scientists and develop new farming systems to reduce salinity and other degradation on agricultural land. This has been very successful and hopefully will be ongoing. The landcare

group won the prestigious 1993 State and 1994 National Australia Landcare Awards for its work.

Cochrane's Alley-Farming – Summary Of Costs				
1992	Trees	Growing 8,500 trees	\$ 454.00	
		Site Preparation:		
		Ripping	\$ 1210.00	
		Drains	\$ 66.00	
		Mounding	\$ 405.00	
	Pastures	Fencing	\$ 450.00	
		Pasture Sowing:		
		Distillate	\$ 60.50	
		Herbicide & Pesticide (Red Mite)	\$ 150.00	
		Seed (Balansa and Oats)	\$ 118.00	
		Fertiliser (Super/potash 3:2)	\$ 459.00	
		Hay Making (792 bales):		
	Distillate (26 hours)	\$ 144.50		
	Baling sundries (twine)	\$ 100.00		
Margins	Total tree and pasture establishment costs (\$324/ha)		\$ 3620.00	
	Hay sales income (\$2.50 per bale)		\$ 1980.00	
	Deficit (\$149/ha)		\$1640.00	
1993	Margins	Total pasture establishment costs	\$ 937.00	
		Hay sales income (614 bales @ \$2.50)	\$ 1535.00	
		Profit (\$55/ha)	\$ 598.00	
		Deficit 1992 and 1993 (\$94/ha)		\$1042.00
1994	Margins	Establishments Costs	\$ 950.00	
		Hay Making Costs (contract)	\$ 252.00	
		Hay sales income (620 bales @ \$3.00)	\$ 1860.00	
		Profit 1994 (\$59/ha)	\$ 656.00	
		Deficit 1992, 1993 and 1994 (\$34/ha)		\$ 386.00

Table 4: Summary of costs (Total paddock area = 11.18 ha, Hay area = 7.14 ha)

Experiential Earth Medicine

Robyn Cuming (Australia)

[Submitted Paper]

Earth medicine in this paper means the intuitive connection we each have with the Earth which unites us with a spiritual essence that is healing for both ourselves and the Earth. The purpose of the workshop was fourfold:

1. To inspire each of the participants to trust in their own intuitive responses.
2. To encourage this awareness in their work as permaculture designers.
3. To encourage healing of the earth wherever they are and.
4. To use this awareness to revitalise themselves when not feeling well.

The workshop was experiential. We discussed 'connectedness' that unites us all with the Earth, with each other, and the consciousness of Spirit that heals and unifies and is sensed with the heart. We shared the importance of 'allowing' the experience of connectivity or intimacy to occur. Also removing doubts that we may have to being able to sense intimately the rhythms, the 'Dreaming,' the messages of the Earth. The importance of using these gifts wisely and to give of ourselves back to the Earth for healing – a two-way exchange.

We talked of the history of tribal consciousness. How those that have lived and still live relying on this connectedness for their survival, i.e. the indigenous people of the world, are often seen to have an intuitive harmony with the Earth. But this is not always the situation. The very nature of the evolving human soul is that we have all contributed to the weakening of the Earth, so obviously now in need of repair and regeneration for the good of all that dwell there upon.

This present global crisis is a great opportunity to encourage the changes needed in our consciousness. By being sensitive to the needs of the Earth and each other, we can join in understanding what the shamans, medicine (wo)men, sages and seers have shared before us. To encourage others to experience this awareness for themselves, and thereby help speed the recovery of an ailing planet and people.

This 'awakening' was likened to a sense of 'knowing.' Listening to and understanding our 'feeling mind.' Grounding and practical in its application and inspiring when communicated.

Recognising the body of Earth as a macrocosm of our own, body structure and energy were identified. The global brain being aware of every cell. The rivers and streams work as a circulatory system, swamps can be likened to kidneys and so on. There is a complex network of pathways that are like a nervous or meridian system, crossing and linking together at various places on the Earth's 'body.' These places can be utilised as healing centres, which work as major and minor points, harnessing energy in different ways like our own bodies' acupuncture points. Similar to Yogic 'Nadi' points and major and minor 'chakra' energy centres.

Earth has many 'bodies' within its overall structure, just as the earth itself is one cell in the Universe. These powerful energy centres of Earth are recognised by people past and present around the world as 'sacred places.' They can be used to heal and regenerate energy in many ways.

The pathways linking these sites are referred to as 'sacred pathways,' 'ley lines' or 'song lines,' and often located on natural travelling routes that animals and humans use. Being aware of Earth's need for this symbiosis of living with human and animal movement, plant growth and mineral distribution is just one small rewarding and awe-inspiring gift of Awareness. This stimulation of the planetary nervous system, assisting in keeping it strong, helps keep us stimulated and strong in the work we do as earth healers.

Being 'fine-tuned' to this nervous system we can read the impulses and better understand how a site can best be used, what it offers, and its needs, for example, regeneration. We get a feel for the 'big picture' and how our efforts in one small area can contribute to a greater good. It's a blueprint for living in harmony with the planet. This is the spirit of permaculture, the spirit of planning for a sustainable future. It's like seeing with an inner sight – like sonar vision. We need to trust in this interaction to teach us and better assist us in the work of caring for ourselves, each other and all that live together on this, our universal cell.

Soon after we gathered under the big trees on the oval for the workshop we took off our shoes and practised the 'rising breath' to help experience the energy flow of our own bodies. We then placed our feet together in a circle and lay down on our backs on the grass and practised 'Yoga Nidra' relaxation. Staying connected with our breath and the rhythm of our bodies we felt for the rhythm of Earth beneath us. Expanding our awareness through the sounds of the environment, the touch of the wind and 'reaching' for the inner sense of the ancient trees and the area itself, seeking the 'Dreaming' of the place.

We asked with open hearts and inwardly – "What was here in the past? How did it 'feel?' How does it 'feel' now? What does the area need to 'feel' better?" Most people felt a strong calling from the nearby trees. As a group we visited one of these old trees, circling it, and worked at intimately connecting with the tree's essence. Both giving and receiving energy, we felt for the roots within the earth and the upper branches above us. Feeling for its age and 'listening' to the message as to what was passed on from countless generations before, through its seed.

Many of us felt inundation of regular waters in the past. A wetland site rather than the oval we now stood upon. Some felt the presence of more birds and the need for the tree to pass on the genetic coding via seed into the future. Some felt the tree responding to our visit in a grateful way. We shared the value of not judging ourselves or each other in our experiences. By being open we allow ourselves to experience subtle sensations that can teach us more of the intimacy and unity of all living things.

We sat in a circle and shared our experiences both present and past of communing with nature. We shared around the circle some various items to feel the energy of each. These included a small vial of Ayurvedic medicine, a rock, some owl feathers,

some orange and its peel. We shared the value of walking the Earth with awareness, being mindful, the value of silence to help open our consciousness, and the value of regularly practising to extend our sensitivity.

Thanks to all who came. It is an honour to share.

Counteracting Bio-Engineering and Bio-Piracy: Participatory Conservation of the Genetic Basis of Tomorrow's Food

Jude Fanton (Australia)

[Submitted Paper]

If Vandana Shiva were here she would talk about intellectual property rights, the dangers of bio-engineering and the need to conserve traditional seed varieties. That is what her Foundation in India does. And that is what Permaculturists do. We are well-placed. We are familiar with plant regimes, we have applied skills and strong community links.

During this talk I welcome your questions and answers. Bio-engineering is a controversial topic, it is at the frontier of scientific investigation and invention. There are many boundaries of belief being broken. Our ethical values are challenged. Messing around with the genetic basis of food, university graduates play God. We have the obscenity of petrol and chemical corporations fighting for control of our food, and even for the ownership of human genes. There is little point in languishing in a state of emotionalism and depression which must be our first instinctive reaction. Grassroots galvanisation is the only response that will bring some sense into the picture.

My father, Graham Smith, was a peaceworker at the grassroots level, a Hiroshima Day peace march organiser. As a child I watched, from my pram, my parents painting "Ban the Bomb" under bridges. Last year we had a majority of Australians disapproving the French tests in the Pacific. This brought me to realise that you can achieve social change with small beginnings. I would like to dedicate this speech to the memory of my father.

Access to planting material

Globally, hunger and poverty are on the increase and, according to *The Urban Agriculture Network* that we visited in Washington this year, in Africa and South America urbanisation is increasing at 20% per year.

The media and the environmental movement have largely ignored useful plants. Cabbages, lemon trees, oong choys, durians, yuccas and sapodillas are somehow poor cousins of ornamentals and wild plants. It is essential that we conserve indigenous plants in wilderness areas and plant them in areas for regeneration and rehabilitation. But by far the most devastation is now occurring in cultivated areas and the nature of the cultivated plant needs thorough and concerted attention. That is one of the main messages of permaculture.

The lack of access to good planting material is a major hindrance in development work. Ali Sharif who is giving a concurrent session has asked me to help him source four cartons of seed for permaculture projects in Latin America. At Seed Savers here

in Australia we are inundated with requests for seed from projects, both permaculture and non-permaculture, around the world – one that came in this week from PNG is on our display board in the poster hall. But sending seeds is not enough.

As a result *The Seed Savers' Network* has focussed on Community Seed Bank Training over the last eighteen months starting in the Pacific and Caribbean. This is with a view to creating a Global Permaculture Plant and Seed Network, which I hope to inaugurate at this conference.

Questions of ownership

Because mankind can manipulate genes, they have become more important on a global scale as a resource. Questions of ownership arise and indigenous people's rights, particularly in relation to knowledge of the usage of plants.

The Rio Convention in 1992 determined that at a moment in time at the end of that year, plants in any one country are the property of that country. This created a watershed for members of the international community to declare on which side they stood. It also meant that remuneration for benefits gained from a plant species had to be paid to the government of the source country. It is like proposing a law protecting heritage fruit trees – people will run around cutting down those trees in order to avoid possibly breaking the law in the future.

The whole bio-piracy issue goes further back than four years, but the *Rio Convention on Biodiversity* speeded up bio-prospecting activity, by creating the very legal ground for ownership of plants.

Governments as plant owners

Third World governments are not the best guardians of plant rights. They are usually large and unwieldy, disorganised and often corrupt; they are in any case very often under the sway of the IMF and the World Bank with their structural adjustment programmes to facilitate the prospering of foreign companies and seek, on the agricultural front, solely to increase exports with all the attendant problems of plantation economies: the use of the best land for monocultures and the poisoning of agricultural workers, land and waterways.

There is a notable exception and that is Ethiopia which has had strong laws against anyone prospecting for plants without a government official hired to supervise so that rights can be paid for plants found. Ethiopia by the way is from where coffee originates i.e., the centre of biodiversity for coffee, along with several important African small grains.

Bio-prospecting in botanic gardens

Just in terms of bio-prospecting for medicinal plants and genetic material for breeding programmes for food plants, sometimes termed bio-piracy, developments are that large companies are, with increasing speed, prospecting in the collections of botanic gardens (BGs), which are mega-storehouses of plant biodiversity holding samples of as many as half of the vascular plant species of the world. Almost three quarters of all the world's BGs are in the North.

In their quest to discover new sources of plant-derived drugs, pharmaceutical corporations and biotech firms are now approaching BGs to sell them samples of tropical plant diversity. Buying plant germplasm held in northern BGs may be easier and more convenient than negotiating access with countries of origin in the South, but it is a giant loophole and clear violation of the spirit, if not the law, of the Convention on Biodiversity. Companies involved are Glaxo-Wellcome, Merck, Pfizer, Phytera and Shaman. Chelsea Physick Garden, Royal Botanic Garden at Kew, five botanic gardens in Hawaii, Missouri Botanical Garden conduct extensive collecting expeditions but generally 75% of plant accessions held in BGs are from other BGs by exchange, or bought from public or private sources with little documentation of the original site.

Historical Perspective

Let's take an historical perspective on plant movements from the days of early migrations. We have had movement of plants with every migration. In the Pacific, where we have been working establishing community seed banks this last year, studies of aboriginal introductions reveal the origins of the island people. Columbus arrived in South America with cucumber seeds, and took home chillies, tomatoes and many other useful plants to Europe. BGs were termed acclimatisation gardens where introductions were made so that plantation economies could be established. Plants originating in one country became the dominant crop of the best lands in other countries, such as South East Asia's sugar cane which is grown throughout the tropics, or great amounts of cocoa being produced in Africa and rubber in Malaysia with both originating in Central America.

The next historical era in the movement of plants came with the FAO collecting through the 1960s and 1970s for storing in eleven major genebanks around the world to facilitate breeding for the Green Revolution. Erna Bennett, now a great lobbyist for justice in all this, collected wheat samples in Afghanistan and Turkey, then blew the whistle on the destiny of these and similar collections. Large scale seed companies used them for breeding hybrids that perform well as long as they have large inputs of chemical fertilisers and biocides.

Bio-engineering

We have the spectacle of pig genes that carry the characteristic of fast growth being spliced into cabbages, of the cold resistance of the bottom feeding flounder in the strawberry, of the flashing genes of firefly in tobacco. It seems that anything is possible but:

- What if you are a vegetarian and want to know if you are eating pig as well as cabbage?
- What if you suspect that there will be an increase in allergies in the population at large?
- What if you are concerned that there may be contamination of crops growing nearby?
- What if you just don't support breeding for large scale monoculture food production and distribution systems?

Then you must at least support thorough labelling systems of bio-engineered food.

Global Permaculture plant and seed exchange

So we can see that it is very important what our intent is when we collect and exchange. It must be with the intent that seed flows freely. That may be naive: we may well be infiltrated by agents of corporations. We struggle on with the strong conviction that the more people who know how to save seeds, the more who recognise the difference between varieties, the more we can educate plant connoisseurs, the more the populace sees that connection between the garden and food, then the more informed it will be to resist these onslaughts on our food quality.

In the pre-conference papers and the *Permaculture International Journal* we floated the idea of a *Global Permaculture Plant and Seed Exchange* for the purposes of supplying seeds and other planting material to permaculture projects in the third and fourth world. I would like to talk to anyone interested in discussing how we can go about this global network. We have been working as a first priority this last year on a Pacific Seed Network. We have made modest beginnings in four countries now, that is Australia, Solomon Islands, Cuba and Tonga and there are many permaculture organisations with seed collectors and seed banks and seed networks. I propose that we create some kind of linking mechanism at this conference.

For what it is worth, in June this year, even the FAO's *International Plant Genetic Resources Institute* came up with a *Global Plan of Action* which recognised the need to support farmer-based preservation of seed. The trouble is that little funding has been allocated for this Plan.

My final plea to you is to go home and start organising bioregional and national seed and plant materials networks. We need to be swift, strong and work relentlessly to retain control over the genetic basis of tomorrow's food.

The Seed Savers' Network

Jude Fanton (Australia)

[Submitted Paper]

Access to good quality planting material is a top priority for the villagers, women's groups and agricultural teachers and students whom we recently trained in community seed banking in Tonga and the Solomon Islands. The seed production segments of our training were greeted with great enthusiasm as the concept is a relatively novel one to peoples who garden mostly vegetatively reproduced plants.

Our Australian-based Seed Savers' Trust facilitates the collection, multiplication and public access of a wide range of local seeds and other planting material for food and agriculture. This, in our view, is the essential first step towards household food security and regional economic self reliance. It also aids the conservation of agricultural biodiversity.

Our educational organisation, The Seed Savers' Trust and its network of 4000 farmers and gardeners, has been actively conserving useful plants in Australia for the last ten years. In the Pacific we are currently setting up:

- The collection and dissemination of local vegetable varieties suitable to sustainable farming systems.
- Databases on the availability and location of important fruit and nut trees and other plants of economic importance such as for fibre, perfume, cosmetics, soil regeneration, fodder and forestry.
- Living collections of important food trees in schools, church grounds, markets, and other public spaces.
- Training in home garden design, sustainable farming techniques and the promotion of under-utilised plants, including permaculture practices.
- A Pacific exchange network for seed banks and field collection.

Over the last year we have initiated seed and planting material networks in the Solomon Islands in collaboration with Appropriate Technology, Community and Environment (APACE); in Cuba, with the permaculture-oriented Australian Green Team and in Tonga with The United Kingdom Foundation for the Peoples of the South Pacific. In each case a team centred very much around indigenous NGOs was formed to administer the network with initially modest newsletters including lists of varieties offered.

During recent Community Seed Bank training in Tonga and the Solomon Islands, we found that many plants significant to their cultures are endangered, such as:

- Local varieties of fruit and nut trees that were once widely grown have been the victims of cyclones, disease or development, and are not replaced. For

example, the much-loved Tongan native nut, the ai (*Canarium* spp.), or the national emblem, the fragrant Heilala tree (*Garcinia sessilis*), are rarely grown nowadays in backyards or plantations.

- In the Solomon Islands, small populations of vegetable varieties of local cucumbers, watermelons, Chinese cabbage and open pollinated corn are disappearing through cross pollination with imported hybrids.
- Many medicinal, fibre, and dye trees and shrubs are increasingly difficult to locate because of land clearing for agricultural exports.

The promotion of a greater range of food tree and lesser known tree crops grown for posterity in public places, will not only help redress the poor diet of urban children and adults but will also link conservation and utilisation of plant genetic resources.

At IPC6 I am hoping to make contact with others who are working in this field with a view to coordinating a global network of seed saving groups.

Permaculture in Semi-Arid Areas and Patterns

Julie Firth (Australia)

[Presentation Report]

Julie Firth manages a small dryland farm on the coastal sands of Western Australia just outside Geraldton. In this talk she described the development of her farm and the patterns she has begun to observe in nature. It is important to observe the patterns in nature and to apply them. This is particularly important, from a management aspect, to make a project viable.

Julie began to recognise plant communities by their colour, and the natural patterns around them. For example, the way that *Melaueca* species were distinctive from the surrounding species and were a different, lighter green when the seed was ready for collecting.

To bring an income into the system initially, Julie picked seeds and sold them. The northern side of the hills had a better seed set. She chose plants which tended to grow on the northern side of the hill, as these plants matured more quickly and were more established than on the southern side. An example is the seed/flowers along roads. She never took more than 40% of the seeds and found they came back stronger after a few years. Pest resistance, seed tolerance are true to form.

Julie has concentrated her systems more towards efficient cells. These are rectangular areas with compatible or related species of plants. For example, all of the crucifera family are planted together, all brassicas together and so on. Companion plantings of marigolds and sunflowers are included to help with the pollination attractors and pest deterrents. Julie uses decoy crops such as sunflowers for the grey and red Galahs so that they are not attracted to her crops. All of the gardens are used for seed collecting.

She uses shade cloth to stop cross pollination of companion plants. There is also a system of multi-layered plantings where crops can grow up other crops and provide nutrients in the soil. Seeds are kept from healthy crops that show good survival ability in the environment and also are pest resistant and true to form.

Using the knowledge Julie observed on hillside ecosystems, she built a mound out of car tyres, where she could harden off her seedlings on the side of the hillside that she had collected the seeds from. She placed seedlings, out of the greenhouse, here in order to harden them up. The species are suitable for farm plantings to provide shade and be able to handle the harsh conditions in the desert. She offers contract growing to supplement her income.

A fruit garden was planted using the spiral technique but by inverting it. The spiral needed to work downwards in the hotter climate to provide shade and be more efficient in water use. She excavated all the white sand in a circle and replaced it with healthy composted soil. The trees were planted into the centre and then companion plants around them.

She found that as her size of production increased, her priorities changed accordingly. The layout of the gardens changed to accommodate the most efficient way of working. This happened to be a herringbone pattern so that plant produce was easily accessible.

The area has prolific wildflowers throughout the season, of many colours to suit pollinators. Julie learned to fine-tune varieties to come into flower at the right time to attract the main insect pollinators. Julie noticed that the colours of the wildflowers varied according to their pollinators and the temperature. For example, the acacias were the first to flower in the cooler, earlier winter months and the next colour was the pink and blue-pinks, following that was the blues and then the oranges.

Mulching systems

Thick mulch was used to provide protection and moisture through the hotter months. This was in the form of compost and sawdust and straw.

Insect activity in deep mulch adds water to an area that was not normally wet. Slaters can be controlled using chickens in the area affected. Plants with a white milky sap also control insect populations. Collars on the seedlings also deter slaters – use milk cartons. Another mulch was made of three sheets of newspaper and collected seaweed and sea grass to protect the soil. This combination was 60 cm thick. In summer the micro-organisms were not around to break down the newspaper.

Notes

Julie:

- Doesn't plant in the hot areas but waits until the first rains of the season.
- Uses living mulches, such as creeping saltbush and a lawn substitute.
- Raised the drippers to control an ant problem. It is a centralised system wired up at a height of 20 cm.
- Used an orientation of: tetragonias, carpobrutus, sweet potato.
- Planted peanuts around the eggplant.
- Planted succulents and cactus as a living mulch to hold the moisture in the soil. The cactus is a water holding body with an internal thermal mass.
- Plans to possibly create a living wall.

Julie Firth, author of Permaculture Guidelines and Species List for Hot Semi Arid Coastal Regions, manages a small dryland farm on coastal sands in Western Australia, designs parks, school grounds, and farms, has a local acclimatised Seed Bank, and manages a wholesale Permaculture nursery.

Requests for her to teach mine site rehabilitation has led to her publishing a field manual: Rehabilitation of Arid Shrublands. Julie also conducts courses which introduce permaculture practices in arid landscapes to remote aboriginal communities aimed at setting up food gardens and seed picking enterprises, and facilitating aboriginal employment in the mining industry.

Wetland Rehabilitation and Sustainable Land Practices: An Harmonious Coexistence

Robert Henderson (Australia)

[Submitted Paper]

Newcastle, New South Wales, on Australia's east coast has been recognised in the past as one of Australia's major industrial centres. Pollution and environmental degradation were associated with the region's industrial heritage. Dredging and land reclamation in the Hunter estuary began as early as 1859, initiating the industrialisation of Newcastle. In 1951 the Public Works Department of New South Wales commenced a 20-year dredging and land reclamation project that joined more than nine islands in the estuary, with a resultant loss of an estimated one thousand hectares of fisheries and other wildlife habitat.

In 1996, on the eve of the City's Bi-Centenary, the Kooragang Wetland Rehabilitation Project is restoring more than thirteen hundred hectares of degraded fisheries and other wildlife habitat in three locations within the estuary. The concept of a City Farm, as an integral component of the wetland project, was first proposed in 1992 to acknowledge the history of agriculture in the estuary.

The potential of the Kooragang City Farm

In the "Kooragang Wetland Rehabilitation Project – Strategic Landscape Plan"¹, the concept for a City Farm included suggestions as to the various agricultural pursuits.

"The establishment of a City Farm could provide educational and demonstrative displays of different types of progressive agriculture and agricultural techniques including aquaculture, permaculture, orchard, windbreaks, animal husbandry, land management, recycling of wastes, reversing land degradation, alternative energy, and attractions for the public and school experimental plots. Components of the City Farm should be self-sustaining systems that have no negative effect on the surrounding natural areas."

It may well be that the success or failure the Kooragang City Farm lies in the project's ability to meet the last sentence from that quotation. Agriculture for 200 years in Australia may be said to have failed dramatically in this regard. Kooragang City Farm will strive to set bench marks in appropriate land use in our fragile natural landscape.

However, as with many sites, Kooragang is not without its challenging existing conditions, which will require creative and innovative responses in order to realise the farm's potential. Kooragang City Farm enjoys: a temperate climate; modest rainfall

¹ *Kooragang Wetland Rehabilitation Project – Strategic Landscape Plan* (Land Systems EBC 1994)

(1000 mm/annum); a reputation as one of New South Wales' windiest locations; potential acid sulphate soils; a high saline water table; scant remnant indigenous vegetation complimented by an impressive selection of exotic weeds; a location within an aluminium smelter's buffer zone; and a one in one hundred year flood level in excess of two metres above natural ground.

Despite these challenges Kooragang City Farm has a number of priorities which will be achievable within five years:

- The entire west and south boundaries will be protected by wind breaks.
- Internal wild life corridors will be created along existing seasonal water ways.
- Grazing of existing pastures will be conducted using time managed grazing practices, which will assist with natural weed control and organic pasture improvements.
- Woodlots will be planted for a variety of yields, which will also act as wildlife corridors, wind breaks and shelter belts during growth.
- A multi-functional farm house, administration office and education centre will be built.
- Permaculture designed vegetable, fruit and herb gardens will be created around the farm house, leading to more extensive orchards of fruits and nuts, including indigenous foods.
- Trial gardens of water plants and demonstration aquaculture sites will be created.

The historic, existing and proposed agricultural land use

The Worimi and Awabakal Aboriginal tribes frequented the islands of the Hunter estuary, living on fish, shellfish, water birds, kangaroo and the many plant foods that were to be found in abundance. It appears that both tribes regarded the islands of the estuary as common ground, using the river as the dividing line between tribal lands.

From 1797, commencing with Lt John Shortland, the European occupation of the region began. Within two years both coal and timber were being removed from the lower Hunter, for export overseas. By the early 1800s most of the cedar had been removed from the estuary.

Farmers soon followed the retreat of the timber getters, with a major land grant of 2560 acres given to Alexander Walker Scott in 1829. All of the current City Farm, and most of Ash Island, were under Scott's ownership. Date palms planted by Scott still remain, as do the remarkable drawings of the flora and fauna of the island, prepared by his two daughters, Harriet and Helena. The detailed pictorial record of the islands' botany provides the foundation for much of the rehabilitation project's revegetation work.

From the mid 1800s to the early 1900s much of the fruit, vegetables and farm animal produce for Newcastle came from the island of the estuary. Cereals and

grains combined with dairying and continued up to the major regional flood of 1955. The New South Wales government then resumed all the freehold land and rezoned the islands for industrial use. From that time, to the current day, the major land use on Ash Island has been low grade grazing of beef cattle on short – term grazing licences.

Recognising the rich agricultural heritage of the island, and the need to demonstrate a method of agriculture that would not conflict with the objectives of the wetland rehabilitation project, the concept of a City Farm was developed.

Over the next five years Kooragang City Farm will develop demonstration sites that will have a far reaching appeal to educational and agricultural interest groups of the region and beyond.

The farm will be developed utilising organic principles that will not impinge upon the operation of the adjacent nature reserve and wetland project.

Integration of the farm within the wetland rehabilitation project

From early 1994, the focus of the City Farm project has been to adopt permaculture principles to design an integrated farm plan that would enable the creation of a land system trialing and demonstrating agricultural techniques that will preserve the integrity of wetland ecosystem while encouraging alternative and sustainable agricultural production.

To this end Kooragang City Farm will implement the following strategies, as part of a whole farm planning approach to the development of the land, which will facilitate the integration of the farm into the surrounding ecosystem:

- Areas of seasonal freshwater swales will be fenced in wide corridors and supplemented with appropriate natural vegetation to assist in the creation of a network of wildlife corridors. These corridors will link vegetation communities external to the farm.
- The northern boundary consists of mangrove and salt marsh communities along the bank of the north arm of the Hunter River. This area will also be fenced and a band of ground covers and sedge like grasses planted to facilitate the reduction of nutrient and sediment runoff from the farm land.
- Where required all wind breaks will be constructed with sufficient width and diversity of indigenous plant species that they will also function as wildlife corridors.
- Past land practices included uncontrolled grazing of cattle into salt marsh, water course and mangrove areas, a practice which will not be allowed to continue on City Farm.
- Aquaculture demonstration sites will be established focusing on the production of fingerling and nursery stock of species indigenous to the estuary for release back into the estuary.

- Artificial wetlands will be created to enhance habitat options for various native species.
- Secluded areas will be developed as sanctuaries providing habitat and roosting sites for birds.
- Remnant pockets of dry littoral rainforest will be protected and bush regeneration strategies implemented to enhance their expansion.

One can summarise the over riding objective of the above strategies as simple as endeavouring “to work with, rather than against nature”.

The importance of the project as an educational resource

An education program is under development to provide opportunities for students to experience and investigate estuarine ecosystems and sustainable land use, and encourage their appreciation of the dynamics of these systems.

The City Farm and adjacent wetlands appeal to primary and secondary school students studying science, geography, biology, agriculture and horticulture. TAFE and University groups are utilising the project for research and project work in fields such as biology, geography, environmental science, surveying, land care, bush regeneration and civil, electrical and mechanical engineering.

As the City Farm facilities become available, courses in land care, bush regeneration, organic farming and, of course, permaculture will be conducted on site in the field classroom and demonstration plots.

Numerous labour market programs for education and vocational training have utilised the project for their field experience.

The farm house will be an important educational feature providing a working model for sustainable housing, employing solar and wind power generation, solar design, grey water reuse systems and composting toilets. The University of Newcastle is involved in the design, construction and long term monitoring of the farm house as a field research station in alternative technologies.

Project research and its relationship with ecosystem management

The focus of the research is to provide direction to the adaptive management program, determining particularly how to plan and implement habitat rehabilitation that increases the use by birds, fish and other aquatic fauna. In addition it will provide base line data for vegetation management of the wind break/wild life corridors, pastures, orchards and woodlots once trials of organic, bio-dynamic and permaculture practices are commenced.

The research program is directed by scientists from The University of Newcastle, University of New South Wales, NSW National Parks and Wildlife Service and NSW Fisheries.

Research projects currently or recently undertaken on the Kooragang project:

- Measurement of tidal inundation.
- Pre-emptive competition of salt marsh with pastures.
- A study on benthic invertebrates.
- Mangrove trees and river bank restoration.
- Vegetation monitoring by aerial photogrammetric imaging.
- Vegetation monitoring by replicate quadrat analysis.
- Water quality.
- Ground water.
- Hydrology.
- Productivity of vegetation communities using infrared gas analysis.
- Mosquito productivity and habitat.
- Review of wetlands in Australia.
- A survey of the value of wetlands.
- Fish and decapod crustacean monitoring by sampling species distribution and quantity.
- Hydrologic modelling of ground water interactions.
- Acid sulphate soil mapping.
- Water bird and migratory shore bird monitoring.
- Impact of cattle grazing on mangrove and saltmarsh ecosystems.

Kooragang City Farm will directly or indirectly benefit from most of the above studies, giving the proposed alternative agricultural practices the luxury of detailed scientific research with a wealth of base line data supported by on-going independent research and monitoring. It is for this reason that Kooragang City Farm may find itself placed on the world stage for 'sustainable agricultural land use in harmonious coexistence with ecosystem management' in the next century.

Kooragang Wetland Rehabilitation Project was winner of the 1995 River Care 2000 Gold Award for Community Projects and Newcastle City Council's 1995 Environmental Achievement Award for Community Partnerships. Kooragang City Farm is proudly sponsored by the National Landcare Program of Australia. City Farm projects have existed for more than a decade in Australia. Diversity in the format of city farms, and their role in the community, is as varied as the cities in which they are found.

Saving Our Heritage Livestock

Alanna Moore (Australia)

[Submitted Paper]

The genetic diversity of domestic livestock is dwindling at an alarming rate. This is happening wherever there is factory farming, with its reliance on hybrid stock. The old purebreds are rapidly being lost. Animals that were common twenty years ago are now hard to find.

Purebreds have been developed to suit climate and ecotone, and for enhanced instincts. Factory hybrids are selected for production only.

For example, consumers supposedly regard white-skinned meat more refined or hygienic. When factory farming is phased out (already happening in parts of the world), white pigs will be particularly unsuited to life on the free range, as they would get too badly sunburnt. (Without an ozone layer the sun has never been this fierce.)

Pig farmers of the future will need coloured outdoor pigs, which can integrate with organic market gardening systems. It's already happening. Meanwhile, the rare pure breeds must be maintained and their numbers greatly increased if the demand for free range meat is to be satisfied.



Figure 1: *Imelda, the Berkshire pig*

A type close to the wild breed, the Berkshire has good foraging and mothering instincts. Imelda (see **Figure 1**) was rescued from a piggery (bought by the kilo) at age 5 months. Arriving at her new home, a forest yard, she fainted. Twenty minutes later she was rooting about in the humus for the first time in her life – with total delight.

Animals in Permaculture

When issues of welfare, chemical residue and environmental degradation are resolved – intensive animal monocultures will inevitably be outlawed. It is already happening in Europe.

Free-range and permaculture systems should prepare to become the sustainable alternative.

Future farms should have a healthy diversity of genetic material, sourced from ancient breeds of livestock and plants that are hardy under natural conditions.

Permaculture networks can help disseminate genetic material. It's already happening with seeds. Now we need to intensify efforts to preserve and maintain rare breeds of ancient livestock; and to incorporate more animal production into our design systems.

Breeds selected should be most suited to the climate and biome. If each permaculture farmer could maintain one appropriate breed of each type of livestock and breed it pure – then the threat of extinction will be averted.

Thinking bio-regionally – one sources animals within the region, reducing stress and fatality in transit. An exception can be made with poultry. Fertile egg settings can travel vast distances by air, courier, or ordinary post, easily and cheaply. (But suffer reduced hatchability with the longer treks, unless brought by hand on a plane.)

Similicure

Eric O’Gorman & Ben Rozendal (Australia)

[Submitted Paper]

Ben: In the fall of 1986 I was visiting a friend’s house in Switzerland. They had some problems with their fruit trees, and since the family had fared well with homoeopathic treatments, the mother argued, why not the fruit trees? She lead me around the back to where pear and apple trees were growing along on arched trellis. The leaves had dark red rings erupting and had been very demanding of water. This started at the end of the line and had spread through the trees very quickly. I thought that in a human these would be close to the symptoms of the remedy Belladonna and that is what I gave them. Just before Spring, I gave them another dose. The trees recovered, all but the first, and there has been no sign of rust ever since.

Her husband farmed grain on a nearby plot, and the summer of ‘87 brought him mildew, due partly to excessive rain. A plant sample showed a big lack of Magnesium, so that is what I gave, homoeopathically of course. Well that was a complete disaster and he lost the whole lot. I had not taken into account the synergistic effects of other minerals and on reflection I think Kali Phos would have worked wonders. My other mistake was not being there to antidote the remedy once it got obviously bad.

Later in England I tried a remedy made out of Aphids, and perhaps not surprisingly had good results. The aphids went away; but more on that later.

From these examples we can see a two things about homoeopathic principles:

1. That something which apparently causes a problem, is often also the cure.
2. That if you don’t look at the whole picture, you can stuff up badly. This is the same moral tale lived out today all through our environment.

Since then I’ve learned a lot, experimented much more, and I’ve come to a certain understanding about the fundamental similarities of plants and humans. These days I prefer to treat plants, especially as so many humans suffer disease through the contaminants and deficiencies in the food they eat: often treating people is like mopping the floor with the bath still overflowing.

Eric: When I first met Ben I was working as a herbalist. For those of you who know your natural therapies you’ll know that traditional herbal medicine is a sort of antithesis of homoeopathy. By then though I knew enough about homoeopathy to respect its effectiveness. Having worked with herbs the notion of plants behaving much like humans immediately made sense to me. Then I saw for myself some remarkable things. I saw completely degraded turf begin to re-knit overnight after a dose of Silica, and dormant seeds begin to sprout out of season.

After an application of Helix T. (toasted snail) the introduced species of snail all left my garden. They were gone for 3 months. Then I understood the enormous potential that lies in homoeopathy.

Fruit farmers can spend \$30 a hectare 10 or 12 times a year in poisons that do little but weaken the trees and make them more attractive to nature's little helpers, the bugs and diseases.

Entire crops are lost to the increasingly epidemic numbers of insects on conventional farms, and those who try to regenerate the bush, of which so much has already gone, face seemingly insurmountable problems. For a moment there, I was feeling like a great moment in the making of history. Well, I retain some of that enthusiasm but the important thing right now is to get this knowledge out to those who can use it the most — time is of the essence, and that's why we're here.

Our philosophy is to assist nature, by means similar to her own, to regain a productive balance. I won't waste time by defining all this too closely. Briefly, though, its important to understand that this is, effectively, medicine. When we spray a plot for snails or aphids or parrots it is the plant, not the pest, that is affected. It takes up the remedy and through forces that will probably never be scientifically proven, makes itself seemingly unpalatable to those pests. Of course, excessive pest infestation does not happen just by chance. It is a sign, or symptom of some other more fundamental problem in the immediate environment.

Lets cut to the chase and tell you what we can do. I must stress that we still have a lot of work to do in accurately defining the totality of our remedies effects, but here is the bones of what we know so far.

For a moment lets consider the soil as the foundation of a plants environment. Soil, as we all know by now, is a very complex thing. From our point of view a soil is an organism, and can be treated as such. Our remedies have a distinctly more profound effect on a real, alive 'organic' soil than on that found on most farms nowadays. It is because the soil organisms take up the remedies in the same way as the plants, and are similarly affected. Even on a 'chemical' farm however the presence of a minute number of microbes and soil water are enough for us to consider the soil an organism.

Many plant growth problems have been ascribed to mineral deficiencies or excesses, and the answer is rarely to merely add the element in question to the plants' water. You West Australians will be aware that Iron is present in most of our soils in very high background quantities but that most of it is 'locked up'. Simply put, Similicure soil remedies, properly chosen, trigger the soil to unlock the molecules in question and make them available to plants, and to whatever soil flora and fauna are present; helping to perpetuate the soil nutrient cycle.

Ben: We've also tried to concentrate on certain problem pests and diseases in modern agriculture. We understand that what these farmers are doing is by no means sustainable, and that without changing their ways problems like this will continue to recur; but in the meantime farmers need food too and ultimately it will be agriculturalists who will lead the way to a new understanding of our environment. When a broadscale grain farmer sees the part of his crop treated by us miraculously free

of its usual smut problem, the first reaction is “ how does it work? What’s in this stuff?” Most people find it hard to swallow that it is mostly distilled water and less than one part in 10,000,000 active substance – and never more than 500ml per hectare. But that’s what it is. There is no strength to a homoeopathic preparation other than what is known as potency. Broadly speaking, this refers to the number of times the substance has been ground, diluted and shaken. Many of you will no doubt be familiar with a similar concept of potentiation from Biodynamics, in their 500 and 501 sprays. We won’t go into the differences here.

OK, I know some of this is a bit tedious but bear with us. There are a class of remedies called nosodes, and this means the remedies are made from a physical manifestation of the disease in question. A human example is the remedy made from the scabies vesicle. A plant example is a remedy made from a particular mould, fungus or insect pest. Of course, not all pests are the same. When we make a pest remedy, many things have to be taken into account. How generic will the remedy be with subspecies? Are there other beneficial species that will be adversely affected? How long will the plant remain resistant to this pest? Will the plant develop a resistance to the remedy?

We don’t always get all the answers, but there seems to be a general principle at work here. Namely, that nature moves always towards what is appropriate. In the case of a mild infestation of, say, scale the remedy is not quite entirely effective. It’s as if nature requires a few to be left around. The remedies are much more dramatic as the infestation gets worse, but do not have as long a duration of effect. When you get up to massive invasion, I suspect that the remedies will trail off in effectiveness steeply; we presume nature has a strong will in these regards, and not having experienced much biblical pestilence of late, we really don’t know for sure. Resistance to the remedy is so far unseen, and as in most cases we will only ever treat a plant twice or maybe three times; thus disproving the remedy for this case or curing the problem, we don’t expect it ever to be an issue.

Some of the pests we’ve made successful remedies for so far include; snails & slugs, thrip, cabbage whitefly, citrus leafminer, aphids, fruit & vinegar fly, scale, procession moth, African and Tasmanian black beetles, couch fly ,...well the list goes on. A note, though, about aphids: They have the odd tendency to take up the energetics and to an extent the chemical properties of the plant on which they feed. This effectively multiplies the possible varieties of aphid by the number of plants in the world. Still, the aphid remedy works more than half the time.

This brings us to diseases. They are much more complex, as a disease will have more of a ‘character’ than pest infestation. We don’t have enough time to go into it in detail, but diseases we’ve treated with good result so far include; rusts and blights, ergot, smut, downy mildew, blue mould, anthracnose and many others. The one we’ve really got hopes for is phytophthora, or rather, the collection of occurrences we call dieback. Many diseases are equally well treated by addressing the soil directly. This makes very common sense where there is much salt present, or a great imbalance of elements available.

Eric: I want to speak for a minute about Silica. As an element, it comprises most of both the earth’s crust, and the material of plants. We got the idea that here on WA’s

mostly sandy soils we might consider Silica itself a 'problem'. We've used it in many situations with some very interesting results. In some ways it could be compared to the Biodynamic 501 spray, but it's not. It can best be described as bringing a cool light into the soil, and magnetically unlocking other nutrients 'hidden' by the Silica, thus also dispelling much of the water-repelling charge that builds up. It also has applications with fungal root and collar diseases, and can improve germination rates of most seeds in terms of time and number of survivors. You do have to be careful though, and we can't stress this too much. This is powerful stuff, and if you don't learn from our mistakes you'll have to learn from your own. If you use silica more than once in a growing season on a plant, it very likely will flower prematurely, or not at all, and will not likely set seed or fruit. In broadscale agriculture this may prove very useful for weed control. Enough of Silica and elemental imbalance. Where to from here?

First let's bring you up to speed on what we're doing right now. Well right now we're here talking to you and what we really want is for you to talk to us too. We're in expansion mode, as they say, putting out feelers and trying all sorts of things at once. We're treating a few farms locally, smaller suburban plots, and planning a project with a company that rehabilitates mine sites. We are also working on ways to decontaminate soils (indeed the environment at large) of various pollutants and radioactive waste products. We're donating our services to the next Greening of the Goldfields project, and the rehabilitation of Rottnest Island. I'm not shy about this – we need to make some money so that we can continue. That's why we are already selling those remedies we are sure of, complete with appropriate instruction. By this stage you can all draw your own conclusions about the sort of opposition we can expect, and from whom, but once we've got a few more runs on the board we'll be harder to stop.

One way to make sure we don't get buried by the mob like so many other good ideas have is for you all to go back to your friends and colleagues and talk about it. Our next big step will be to publish our findings so far, and start teaching others how to diagnose and treat plants safely and effectively.

Ben: To conclude, then. I strongly urge all those of you who've been interested to come and talk to Eric or myself during this weekend. We need your feedback and inspirations to improve our ability and knowledge. Thank you all for listening well.

Similicure is a company specialising in the homoeopathic treatment of plants and soils. They offer professional assistance in diagnosis and management of farm and garden problems, land degradation and rehabilitation. Similicure also produce a large range of remedies for plant diseases, animal pest infestation, soil imbalances and other plant growth problems. All their products are natural, non-toxic, and simple to use.

Ben Rozendal was born in 1946 in the Netherlands. He worked throughout Europe on tree nurseries, organic dairy farms and in other agricultural areas until 1980 when he moved to India and studied classical homoeopathy. He has been treating humans since then and began experimenting with treatment of plants around 1986. Ben moved to Australia in 1991, continuing work as a homoeopath and founding Similicure.

Eric O’Gorman was born in Sydney, Australia in 1969. He has worked on various farms in the south west of WA and has studied in Environmental Management, Permaculture, Tree Surgery and Herbal Medicine. He met Ben in 1994 and they together devised the system that is the core of Similicure.

Rock Dust Puts Out More Than You Think

Barrie Oldfield (Australia)

[Submitted Paper]

Twelve thousand years ago the great glaciers of the last Ice Age finally melted away revealing a deeply scoured, rock-strewn landscape pregnant with new life. Ice sheets three kilometres thick are heavy. They creak and groan their way down the valleys. They grind the igneous crust of the earth mercilessly. And in 90 thousand years, the length of an Ice Age, they leave behind a bed of pulverised rock dust up to three metres thick.

This rock dust is the mineral base of the soil; rich in elements needed for plant growth, complementing the hydrogen, carbon, oxygen and nitrogen in the atmosphere.

In Europe, North America, and Russia, agricultural soils have been renewed ten times in the past million years. But not so the soils of Australia, for our country was too close to the equator to be covered by ice.

Australia's soils are, as a consequence, extremely poor. Phosphorus, copper, zinc, molybdenum, cobalt, and sulphur, are all in short supply. Our native vegetation is highly adapted to scavenge for every last atom of these elements in the litter of past life. Conventional farming knows nothing of this, pours on synthetic plant food to grow a crop, treats the soil as a hydroponic base, the cruelest blow to the last surviving life forms in the darkness of our land.

Six years ago Men of The Trees in Western Australia began work on rock dust, a by-product of the quarrying industry, to see if they could restore our 'non-glacial' soils. The results were astounding. Tree seedlings grew at five times the normal rate in the nursery. When planted out they continued to leap ahead, helping restore degraded farmland in our semi-arid wheatbelt.

But was it the plant food in the rock dust that did the trick or were other factors at work? Certainly adverse effects were apparent when rock dust was tested on wheat crops at the Society's trial farm, Amery Acres, near Dowerin.

Rock dust improves soil hydrology, it tends to buffer acid soils, it can provide potassium to plants on demand. But, most striking of all, it may defend trees from the effects of harmful electromagnetic radiation such as the excesses due to our thinning ozone layer.

This paper explores our observations to date.

Rock dust – a lesson from the ice ages

In the past million years or so the Earth has gone through possibly ten Ice Ages. For reasons we don't quite understand the planet cools down by a few degrees. As a result, the ice sheets, which normally cover only the poles, spread out and

extend as far as the mid latitudes. In fact they reach almost half way to the equator. This period of glaciation lasts for about 90,000 years. Then, just as inexplicably, the Earth warms up a little and the ice recedes back to where it is today down in Antarctica, or up around the North Pole.

Ice sheets are very thick. They can be anything up to 3000 metres deep. Not only that, they move slowly, slipping their way down hill, grinding out valleys and rubbing down mountain sides. They are tremendously heavy. You know how heavy a bucket of water is. Imagine lifting that bucket if it were solid ice and twenty times as high as the Central Park tower!

This slipping, grinding ice scours away at the bed rock of the Earth itself. As it moves it loosens bigger rocks and boulders and these too help grind away at the granite underneath. And after 90,000 years of this there can be a whole new layer of ground-up rock up to three metres deep!

So when the ice melts there's this deep new bed of freshly ground rock containing all the minerals needed for the foundation of a good soil. This is why the soils of Russia, Europe and North America are so good today. They are rich and deep and farmers can go on ploughing them year after year.

Australia missed out. Our soils are millions of years old. The minerals in them have almost leached away so that what is left will only grow crops if we pile on superphosphate, potassium and all sorts of trace elements such as copper, zinc, manganese, boron and molybdenum. Of course if the soils are lacking in the essential minerals the plants will be lacking too. In fact some plants won't grow at all unless we constantly feed them with all kinds of supplements.

The role of micro-organisms

Now even though plants may take up some elements directly through their roots, there are other minerals essential to life which feed the micro-organisms in the soil. Every gram of soil contains perhaps a billion living organisms! Astounding isn't it? And only when all these single-celled creatures are healthy and thriving do all the processes of life come into full play. The micro-organisms provide food for other creatures, they help fungus to spread through the soil, the fungus attaches itself to plant roots and helps the plant to take up nutrients whilst the fungus takes a wage in sugar from the plant. And there are probably many other little games going on about which we know very little. All we can be sure of is that when everything is in balance the whole system is healthy and the plants really flourish.

Now that is what Men of The Trees is all about. We want our trees to flourish. We want them to grow fast and reliably under the most exacting conditions of our semi-arid country. So we are adding rock dust to the potting mix.

The first time we did this we made an astounding discovery. Every species we tried grew twice as tall as the control – and twice as healthy too! So that is one reason why Lucy Rogers has rock dust included in all the potting mix we use today at St Barbe Grove Nursery. It's also the reason why Men of The Trees has leased 23 hectares of land just east of Dowerin so that field trials can be undertaken to find out what we

can about rock dust, how it works, and how it might benefit not just trees but all our crops and pastures as well.

But it will take many years before we can really be certain how rock dust works. One thing is sure. Being in at the beginning of a research project like this, discovering how to reverse the trend to desertification, how to grow healthy crops to feed healthy people, how to restore prosperity to our country is very exciting. And there's plenty of room for you to share in this venture too!

We hope that what we learn may also benefit farmers throughout the third world who also missed out on those Ice Ages and finished up with impoverished soil like ours.

Background

The Men of The Trees is an International Society of volunteers dedicated to tree planting for the protection of landscapes from desertification. The Society began in Kenya in 1922. Its first task was to save the tribal lands of the Kikuyu people from the advancing desert. The work was largely successful, not only in planting trees and stabilising the soil, but in bringing about a new ethos, that this task was the responsibility of all people. Social forestry was born.

The idea spread world-wide. Today the Society is active in 48 countries around the world. In Australia there are branches in all mainland States. In Western Australia members number 1500. In 1996 they collectively planted 589,030 trees. mostly in the wheatbelt.

The quest for excellence

Being volunteers, the only reward members seek is the knowledge that they have done the best possible job. This has led to a considerable sharing of observations and experience over the years and the undertaking of a number of specific trials related to improvement of tree survival under semi-arid conditions. Today the Society holds an enviable record in this regard.

Trials aimed at improving seedling quality included, among other things, the incorporation of granite quarry dust as a fraction in the propagation mix. The results were outstanding. *(Slides were shown demonstrating the growth rates and vigour of nursery seedlings grown in the 1991 trials.)* Granite dust from the Pioneer quarry at Herne Hill was added at a rate of 15 to 20 tonnes/hectare. As the seedlings are grown in 50mm square pots this means each plant gets about 3.75 to 5 grams. Not very much indeed – yet sufficient to set that tree on its way, growing anything up to five times faster than without dust. Moreover, experience has shown that once the seedlings are propagated in this way they need no more rock dust even when planted out. They just keep on growing!

The success of the nursery trials in 1991 brought pressure on the Society to continue these trials in the field. In particular it was felt that the technique of using rock dust, sometimes referred to as 'remineralisation', should be assessed under semi-arid farming conditions for its possible value in improving the inherited non-glacial soils of Australia.

The establishment of Amery Acres

Largely drawing upon its own resources, the Society in short time leased an area of land from the Dowerin Shire Council and set about providing machinery, accommodation, infrastructure and a resident Manager to establish a 23 hectare trial farm.

We were delighted to receive offers of active support from the outset in the practical conduct of the field trials and in the tabulation and assessment of results:

1. Bob Gilkes, Professor of Soil Science, University of Western Australia, provided considerable support and encouragement. In 1993 he supported the setting up of eight initial trial plots under the supervision of Visiting Fellow Dr Philippe Hinsinger from INRA, Montpellier, France.
2. Dr Mike Bolland, Plant Nutrition Officer, WA Dept of Agriculture and Mike Baker, Technical Officer worked with us in the field giving excellent instruction in the setting up and conduct of field trial plots. At harvest they assessed and tabulated results and provided commentary.
3. In 1994 support continued in the work of Masters Student, Catherine Corneos, working under supervision on pot trials at UWA. Her report showed not only a potential for uptake of potassium from rock dust but also a greater availability of this element to the plant than in the soluble form.

A side effect upon which she made comment was the increased water infiltration rate noted in non-wetting soils in the presence of quite small amounts of rock dust.

4. In 1994 a complex field trial was undertaken involving the setting up of 96 trial plots in an attempt to observe a range of hitherto anomalies and anecdotal observations in one scientific trial precinct. The result of these trial plots was to reinforce an observation made by a neighbouring farmer, Malcolm Borgward.

The local farmer who showed the way

Malcolm Borgward farms 3040ha at Minivale, East of Dowerin. He has been applying modest dressings of rock dust (not granite) since 1991.

He describes the land as 'medium mallee country', sandy loam over clay, maintaining a steady pH6 because he always puts the trash back and reckons this is the key to preventing acidity.

In 1992 the paddock had produced a Lupin crop. The land was top dressed with 250kg/ha rock dust and the Lupins were sown with 40kg/ha 'double super' in the box.

In 1993 he observed that weeds were becoming a 'rare and endangered species' so he decided not to cultivate nor apply herbicide. He spread another 250kg/ha rock dust. Having ascertained that the residual phosphorus in the soil was 25ppm he decided to use no artificial fertilisers at all, and with an offset disc air seeder put in the wheat crop. The wheat (Cadoux) was sown direct into the previous year's lupin stubble.

As the crop emerged, he again observed that weeds were no real problem, and decided against using a post emergent herbicide. As the season moved into September he noticed some germination of the Lupin, but again, before the critical flowering stage was reached the wheat took hold and out-grew the competition.

At harvest his crop went 2.2 tonnes/ha with protein in the range 9.5 – 10.8%. He had broken out of the exclusively chemical approach to cereal farming and demonstrated the possibility of meeting the Australian Wheat Board's target of 'Two by Ten by 2000' whilst reducing his costs and, in all probability, improving his soil.

Linking with other researchers at home and overseas

Malcolm Borgward's experience goes down in our books as 'anecdotal'. Much more work needs to be done in the field to verify his observations and to replicate his results.

The Society is therefore engaged not only in promoting field trials at Amery Acres and in providing every assistance to researchers but it is also forging links with those engaged in similar research overseas.

1. In 1994, Sallie (Oldfield) and I visited Austria to make personal links with those who have already done a great deal of research in this field.
2. A videotape was produced featuring Professor David Bellamy (explaining the principles of remineralisation) and Georg Abermann who markets rock dust successfully to dairy farmers in Austria. (That tape, *Bellamy's Big Bang Theory*, is available for \$50.)
3. The Society produces a report describing work done majoring on results of scientific trials. The emphasis in these reports is upon good science although interesting observations and anecdotal remarks are included to give insights into possible future directions for research.

A mailing list is maintained numbering some 550 recipients as at October 1996. Two thirds of these are in Western Australia. All are named individuals who are on the list as a result of expressing interest in the work. I am happy to include your name and address as a free service provided you give me a request in writing.

The cost of printing and mailing the Rock Dust Reports is met by Pioneer Quarries.

The field trials at Amery Acres for 1996

It is our policy to follow local farming practice in all we do at Amery Acres. The crop sown last year was Lupin as we were then in the legume phase of the rotation.

Feedback from Austria and earlier observations made in the nursery trials phase lead us to believe that soil bacteria, and particularly N-fixing bacteria, may be enhanced by the rock dust. The results were most interesting. Lupins grown on granite enriched soil outperformed those grown on the plot with the superphosphate/urea treatment. A heavier yield had been obtained at a 'fertiliser' cost of one twentieth that of conventional farming practice.

Yet when the trials had been conducted for wheat a year earlier the performance was quite the opposite. In one plot we even managed to grow headless stalks! And so simple explanations based on nutrient supply do not necessarily hold up. Other factors are at work.

Rockdust trials – the scientific imperative

The following is a brief summary of our experience in the application of rockdust as a soil amendment. We believe that whilst numerous theories exist on how rock dust works, and even more anecdotal stories abound, none of this work will come to anything unless there is good science to back it up.

Whilst our nursery and field trials have been conducted under scientific supervision even these results must be treated with caution. Field trials on one location, over a four year period of contrasting seasons, can have only modest empirical value. Nevertheless they do give an indication for further trials on wide ranging sites. If resources and funding can be found we will extend the trials and fit together the mounting evidence.

Two things beyond all: we need the trust, gifts and goodwill of those who share the vision of healthy landscapes, and we need the patience to do all things well. May both prevail!

A summary of our reporting to date

- Granite dust promotes the fast and healthy growth of tree seedlings in the nursery.
- Granite dust particularly benefits nitrogen-fixing trees.
- Granite dust can provide some potassium to plants on demand.
- Although granite dust has a high pH it does not seem to raise significantly the pH of acid soils.
- Granite dust has been shown to reduce the yield of wheat under field conditions.
- Diorite dust may reduce weed competition to the benefit of a wheat crop.
- Quarry dust improves water infiltration rates to the benefit of non-wetting soils.
- Quarry dust improves water retention in free draining soils.
- Quarry dust benefits dairy pastures by promoting legume growth at the expense of less productive species when applied as an additive to slurry from cattle sheds.
- Granite dust has given a marginally higher yield from a lupin crop than either chemical fertiliser or a commercial rockdust blend.
- Composting earthworms prefer a feed ration to which rockdust has been added.

- Quarry dust may affect the way plants respond to electromagnetic radiation, in particular excess solar radiation.
- Granite dust does not seem to benefit well-nurtured gardens.
- Nevertheless a granite and marble dust mixture appeared to benefit garden crops grown on an alluvial loam.
- Granite dust contains 27ppm lanthanum, a rare earth considered by the Chinese to be a plant growth promoter.
- Quarry dust may deter wingless grasshoppers.
- Tree seedlings raised in a soil mix containing 5% granite dust appear to resist insect predation.
- Tree seedlings raised in a granite dust enriched potting mix appear to continue fast healthy growth after planting out under adverse climatic and soil conditions typical of the West Australian wheatbelt.
- There could be a link between the use of rock dust and the noted absence of fungal attack in the early stages of seedling growth.

(Putting observations 10 and 19 together may indicate a direction for research into controlling Anthracnose, a fungal disease threatening a \$200million industry in WA alone!)

Valued input

Throughout the past seven years since the first very tentative rockdust trials were begun we have been well served by our Western Australian scientists:

- From Curtin University: Assoc Prof J. E. D. Fox and Assoc Prof Jonathon Majer.
- From the University of Western Australia: Prof Bob Gilkes, Assoc Prof Lynette Abbott, Dr David Jasper and Visiting Fellow Dr Philippe Hinsinger.
- From Edith Cowan University: Dr Frank Flanagan and Dr Adrienne Kinnear.
- From Agriculture WA: Dr Mike Bolland and Mike Baker.

To these and all their students who did so much of the field work and number crunching we offer our warmest thanks. As for the hundreds of days of voluntary work by members of Men of The Trees, well we just do that for the earth in the style of our founder, Richard St Barbe Baker, who set so rich an example.

The radiation stress theory

Let me conclude with an observation which may be just as valid as any based upon more conventional science. It has been suggested by a group of Austrian researchers, among them the late Dr Gernot Grafe, Dr Maria Felsenreich and Dr Alexander Fries Tersch, that our planet and the life forms upon it are now suffering radiation stress. Their experience stems from the desperate need to restore Europe's

dying forests and their observation that the worst affected forests were close to the alignment of the old Iron Curtain along which both sides were in the habit of aiming high intensity radar at territory on the other side.

In order to find a remedy they began by using humus materials in a logical move to restore good organic material to the soil. They chose grape remains from the vineyards. Grafe had already spent many years perfecting the composting of this material, one of the best ingredients for any compost heap! But as their work developed they found a need to include fresh minerals, and this they derived from quarry rock dust.

From the rock dust they developed a range of cylinders, castings and egg-like stones whose properties were able to benefit life forms, and particularly the water bodies over a wide range. Placed in the ground they acted rather like acupuncture treatments for the forest and the farmlands.

Have I an explanation for all this? There is one good example. Think of your watch. Possibly it is called a 'quartz watch'. If so it has a crystal of quartz (Silica) as its regulating mechanism, and it keeps very good time too! Granite comprises up to 70% of quartz. When stimulated by a small voltage the quartz crystal oscillates at a very precise rate.

All plants require solar electromagnetic stimulation for their life energy. Perhaps, just perhaps, there is something in the rock dust, a crystalline resonator for instance, that amplifies the beneficial radiation energies whilst blocking out the spurious radiations which we have inadvertently introduced through weakening the protective ozone layer and introducing all our communication technologies, our power grids, X-rays and atomic accidents, etc.

From around Australia, and many parts of the world, evidence is mounting that electromagnetic stress needs all the study and remedial treatment we can muster. The Felsenreich observations open a window of opportunity and action. In her wake a small but expanding group has taken up this work in Western Australia.

Like DDT, electromagnetic radiations of our making do not disappear harmlessly. But unlike DDT it is inconceivable that civilisation, as we know it, could not exist without its radiation generating tools of communication and welfare. Protection and remedies are therefore imperative.

References

1. Philips A., Mayhew N., and Williams T., *Living with Electricity*, Powerwatch UK, 2 Tower Rd. Sutton, Ely, Cambs CB6 2QA. £9 +p&p.
2. Kervran Prof C. Louis, (English translation, Abehsera M.), *Biological Transmutations*, Happiness Press, Magalia, California.
3. A number of information sheets are available on our rock dust trials taking place on our farm 'Amery Acres' at Dowerin. Drop a line to Barrie Oldfield, 3 Over Avenue, Lesmurdie WA 6076.

4. *Remineralise The Earth*, a periodical published two or three times a year by Joanna Campe, 152 South Street, Northampton, MA 01060, USA. Subscription \$US25.
5. *The Felsenreich Manual*, published by the Natural Resonance Study Group, \$25. Chair: Anne Miller, 23 Morley Street, Maddington, WA 6107.

Close Packing of Plants in Water Harvesting Systems

Halin Orion (Australia)

[Submitted Paper]

Hello. My name is Halin Orion and a few of us run a Arid/Tropical Permaculture Research Facility in Western Australia's northern mountains. We have two adjacent houses on half an acre. One is our home and the other is a small backpackers called Nomad Heights. This backpackers accepts WWOOF and TERN members who wish to work for accommodation with our BIOTEKNOMADIC Research and Development facility. Although we've been going for over 11 years, not all of that time has been spent on permaculture, as the necessities of life and money have also consumed large amounts of personal time.

Region and climate

The region we are sited in is called the Pilbara or the North-West and is 1,500 km north of Perth. This area has a very extreme climate, with summer temperatures exceeding 45 °C and winter temperatures rarely below 4 °C. We have an extreme dryness which can be appreciated when you find that although we get 100-400 mm of rain per year, we always have at least 2.5 m of evaporation. This severe dryness is driven by the desert that lies 300 km to the east and south of these mountains. Whether it is summer or winter the wind from these directions is our major water thief. The main difference is that summer winds can blow very strongly all day and night for three to four days by which time the wind can burn the skin.

Because we are in the mountains between 350-1200 m above sea level, we have some very unusual weather patterns, rich and diverse soils and the highest rainfall of the region. This area is the highest country in WA and spans across the Tropic of Capricorn which is the natural boundary between the temperate and the monsoon climatic zones. So sometimes we get summer and winter rains, either one or the other and sometimes neither. The mountains also stand between the desert in the south and east whilst the ocean lies in the north and west.

This 'mountain' climate brings sudden and extreme changes in the weather such as full cloud and *no* sun for three weeks, or six consecutive weeks of bright hot days over 42 °C. Our summer rain is driven by cyclones, tropical depressions and electrical storms which can dump over 250 mm in one hour, with 12-50 mm per hour downpours being the norm during this hot period. Winter rain is almost always gentle and steady rain with little or no wind. Cyclonic wind speeds can reach over 250 km/h as they cross the coast and still be gusting at over 150 km/h when they are in the high mountains. Recent indications are that our changing weather patterns are going to see increases in all of these extremes, especially wind.

The many seasons that have come and gone have been an incredible teacher over the years. Slowly, out of the variety, the bigger cycles became more obvious. These cycles and many minor ones have all been conditioning my designs. The main aim has been to design for extremes even if we only see them every 12-50 years. This way,

when times are good everything flourishes and when they're extreme everything not only survives but, with astute design, these peak events provide the energy to move the whole system to another level of order.

Some of the very important cycles in our climate are the rain, wind and temperature cycles. For our region our rain cycle spans 10-11 years between 'Superwets', during which we can get double our 'normal' year's rainfall. This has occurred in my time here between 1984/85 and again in 1994/95, when we received 850 mm in one year ('normally' it is 280 mm). In the period between, there was a three year drought which depleted the water table to the extent that average rainfall in the following two years did not achieve much. This protracted 5 year drought, as is common throughout Australia, was broken by the floods of the 'Superwet'.

Water harvesting

The weight of water on the landscape, as measured in mm/h, is a far more useful figure for designs than an annual or monthly rainfall figure. We could easily have an above average rainfall per annum but, if it came in 20 mm) increments every second day, the soil at 2 m or more deep could easily be dry. Under these conditions large, deep rooted plants can be dying while smaller adjacent plants, with shallower roots, are thriving. Also, by acknowledging mm/h figures and using 250 mm/h as an upper figure (that may only occur every 10-20 years) we can design a water harvesting system that won't be destroyed by big rains.

Our annual cycle however sees the opening rain start in December or February followed by a severe 6-8 week dry period without follow up rains until February or April. Then, within 4-8 weeks of this second rain period we get our finishing rains which can come monthly through to July if we're lucky.

By March/April, evaporation has slowed through a decrease in temperature and wind so that many second rain germinated plants get the follow up rains without dying. These 6-8 week gaps between major rainfalls are what we design our water harvesting around. When rainfalls exceed 12 mm/h surface flow occurs, which we trap in clay lined basins and channels to hold and compound it, so that it goes deeper into the soil (see **Figure 1**).

By getting the deeper soil damp for at least three weeks, the growing time of the plants nestled around each basin doubles. This extension of the growing time for 6-8 weeks gets us to the next rainfall and so plants that would normally start suffering, go on growing without having gone through a dry period.

These basins are lined with 25-50 mm red clay and hold water between 100-600 mm deep before it can spill into the next basin. Each basin is roughly 1 m x 2 m in size and varies in depth according to its position in the catchment system. I initially designed for 50 mm/h downpours which might only occur once a year if we're lucky, but now I work with a lower figure for surface flow of 25 mm/h which can occur as often as 4 times a year.

The depths, dimensions and functions of each basin is determined by its position in the overall water harvesting channel and zone location. For instance, a basin at

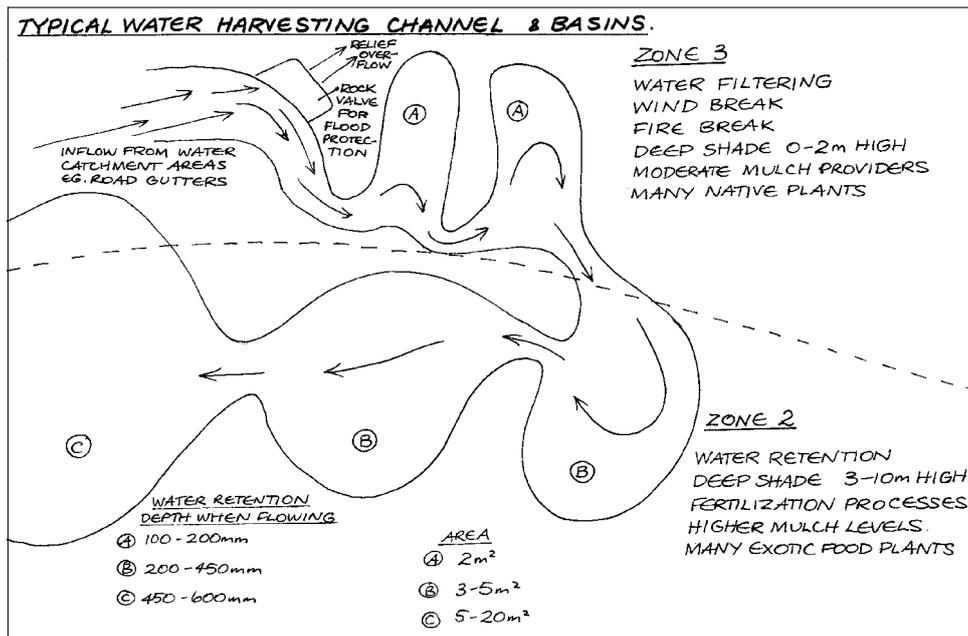


Figure 1: Typical water harvesting channel and basins

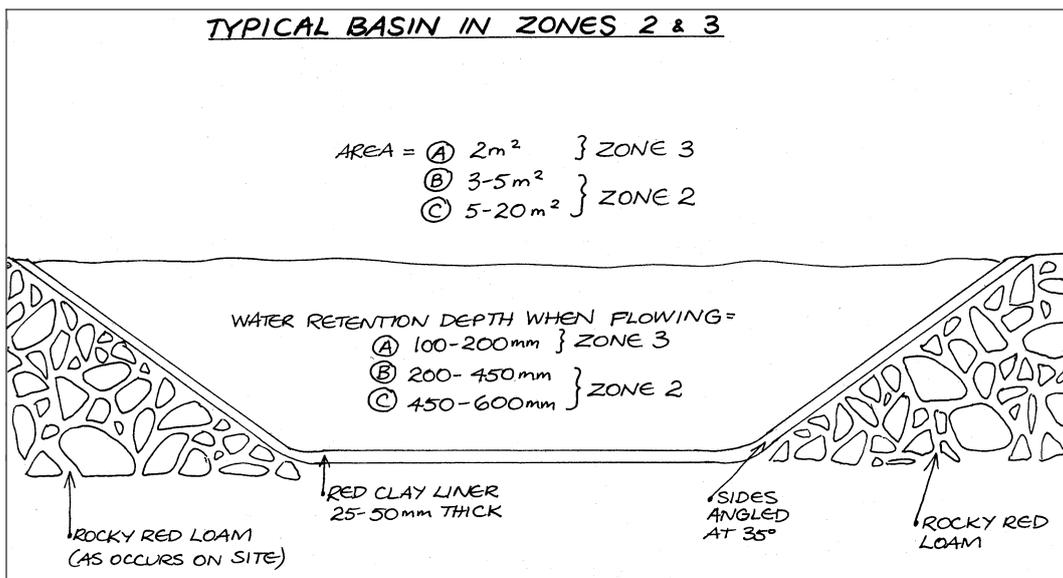


Figure 2: Typical basin in Zones 2 and 3

the beginning of the water harvest channel always gets the first flow from even light rains and is located in zone 3 or the outside edge of our intensive system.

In zone 3 are our buffer plants against wind which are a very hardy mix of exotics and natives. These basins are therefore shallow (100-200 mm deep) while being long and sinuous to act as filters for removing unwanted materials and seeds from the water flow (see **Figure 2**). Basins further along the water channel are broader and deeper (200-450 mm deep) as they only get water from moderately heavy rainfalls. These basins water the larger (3-10 m) shade, mulch and fertiliser plants that are found in zone 2.

The final basin in the water harvesting channel is the largest, being 450-600 mm deep and from 5-20 m² in area. This basin gets rain water only in the largest flows which occur when the rain is heavier than 25 mm/h.

Our entry point into the water harvesting channel is guarded by a special rock valve which is designed to 'blow out' when rainfall exceeds 100 mm/h (see **Figure 3**). This stops flooding within our system although we are restructuring to handle up to 250 mm/h with no spillage out of the system. We also have a water harvest channel that extends through zone 1 where, within the protection of zones 2 and 3 we grow most of our food plants.

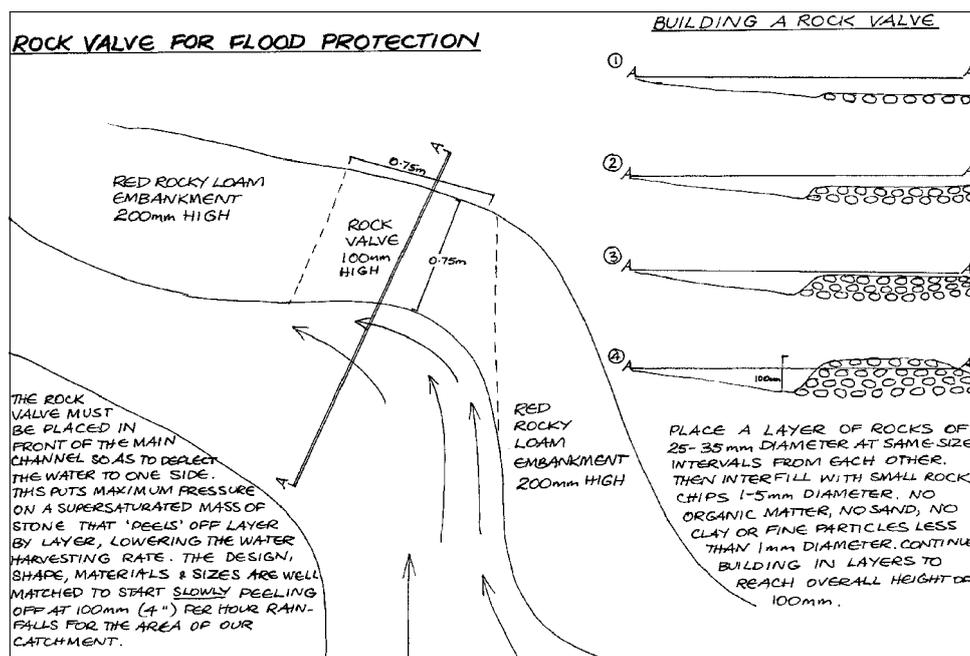


Figure 3: Rock valve for flood protection

Unlike the basins in the outer zones, all zone 1 basins are filled in with sand and organic material to create a 'sand dam' basin (see **Figure 4**). On the mid slopes, the heavy red rocky loams are low in organic material and far too heavy and dark to grow many of our food plants. So we turn basins into a large natural food pot full of a potting mix type soil for better growth and soil performance.

Each basin is already clay lined so depending on its depth, we select hardwood branches of a diameter roughly one third of the water depth (ie. if water depth is 100 mm then branch diameters are 30 mm maximum). We completely line the basin with these branches to a third of its depth, then spread a mix of sand and manure over this layer, filling any gaps between the closely layered branches. This layer about half fills the basin. The rest of our manure along with leaves, twigs, sand, loam and 15% clay is well mixed and used to almost fill the basin.

The very last layer is quartz sand from 10-15 mm deep which is our *mulch*. This layered sand dam basin is the best design we've yet achieved, after our experiments with many other structures, when integrated with a water harvest system. Also the sand and pebbles over clay is a common feature of our regional landscape. The exact mix of ingredients for a sand dam basin is relatively critical in relation to wood and

clay content but can be varied quite a bit in relation to manure, sand, loam, leaf and twig content. These are varied slightly for plant type and depth of basin.

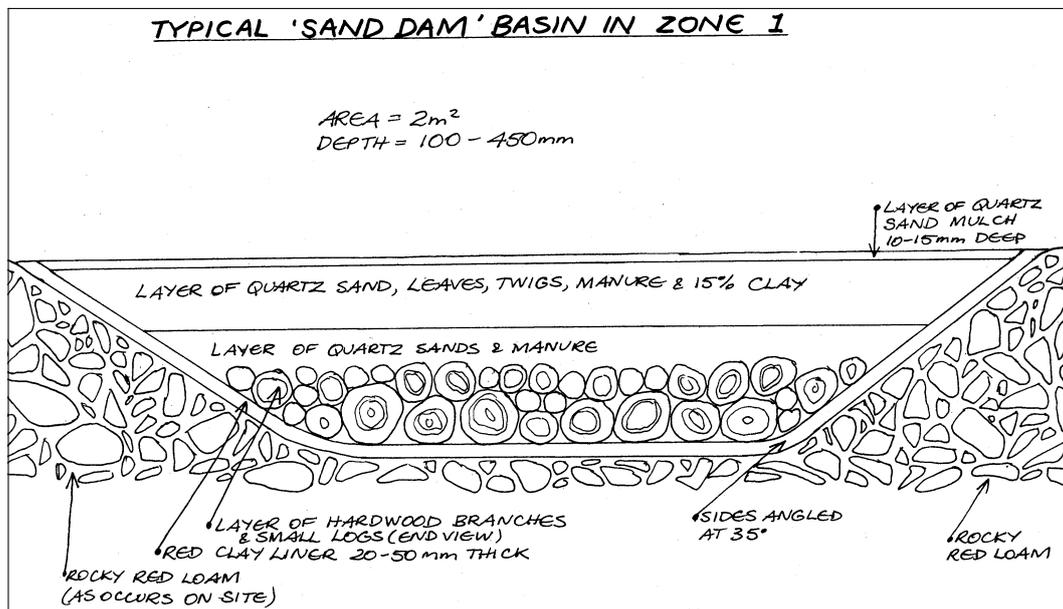


Figure 4: Typical "Sand Dam" basin in Zone 1

Sand dam mixture:

- 30% (min) hardwood branches and/or logs
- 15% (max) clay, 30% sand OR 10% clay, 15% sand, 20% loam
- 15% manure
- 10% leaves and twigs

The virtue of a sand dam basin is best described by the special attributes each of the materials have.

Clay

Clay lining provides a water seal and slows downward losses while providing many minerals not so common on the mid slopes where we are sited. It also provides a definite underground boundary of nutrient and moisture that larger plants send a fine mat of feeder roots into. Within 3-6 years, when it has been invaded and altered by these roots, they are then basin shaped and our clay liner is slowly replaced by a similar shaped root net which performs in a similar manner to the clay.

Keeping the clay content below 15% of the total mix avoids a common problem when these soils dry out in that they can set like concrete if higher levels of clay are used. Clay also acts to give the soil more ionic character thereby helping water to mobilise nutrients, although too much can create nutrient binding.

Woody material

The next layer of woody material is a must in most Australian soils and is often totally overlooked by the excessive attention applied to mulch and compost. Within a year mulch and compost can totally disappear into the soil, as it breaks down into

very fine compounds doing often only a mediocre job of improving the soil structure and long term soil fertility. This leads to large annual applications of compost and mulch to keep soil health happening.

A quick observation of nature reveals one of the backbones of Australia's soil improvement processes are the activities of perennial acacias and other short lived *woody* herbs and shrubs. Not only when they die do they leave vast quantities of woody matter in the form of dead roots behind, but even as they live, dead sticks and a huge variety of fibrous woody pod material is constantly returning to the soil.

This woody material, unlike grass, compost or mulch, is particularly rich in lignin. This resists breakdown and is very attractive to wood mould, soil fungi and other micro-organisms which, like many of us, prefer a more permanent home than an annual tent city. Once established within such a semipermanent home, these soil organisms get busy creating many compounds our composts and mulches would find difficult to match.

The woody matter retains moisture better, distributes it better and can easily persist from 1-4 years. Also, let us remember that the fungi are often the micronutrient generators of elements such as zinc, phosphorous etc and directly couple up to root hairs of plants to act as nutrient corridors. The deep black open soft soils of old forests are more a product of lignin than compost. The comparison between refined starches and sugars, and fibre rich foods is as appropriate to the soil as it is to ourselves. At least 30% woody matter will save a lot of extra feeding of nutrients and water to your Australian gardens.

Sand

The sand helps to fill cavities between the other materials and avoids air gaps. Sand also allows air to seep in and water to easily percolate through. If a white or quartz sand is used then light transmission deeper into the soil is achieved, this improves microbial activity to a greater depth.

Manure

This is not only rich in micro-organisms itself but acts to attract and accelerate existent micro-organism populations. It also helps offset the high carbon levels of the woody matter by supplying nitrogen. Dead animal bits and offal are excellent manures but watch the dogs, they may dig up a new garden looking for bones and rotting meat. We've used dead chooks, sheep, dog bits and road kill kangaroos.

Leaves and twigs

These materials provide many complex chemicals, microbial colonies and soil organism foods. They get the decomposition process under way quickly and with a good variety of organisms. Leaves and twigs are halfway between manure and woody matter in their useful lifespan being relatively exhausted within a year. Their other effect is to spread moisture sideways and more evenly through loose or sandy soils.

All of these materials together enhance the performance of all others and this gives long term fertility for minimum effort.

Close packing of plants

The close packing of plant species is a prerequisite for the survival of exotic species in the harsh summer conditions. This area has the highest daily temperatures and solar radiation levels in Australia. Summer sun angles are overhead and to the south of us in the tropics and so intense that only half sky exposure is needed for most plants. The best light period for most plants is from sunrise to 11 am then again, when it cools down from 5.30 pm to sundown. However, autumn and winter (March to September) is our main growing period for vegies and herbs and we need almost full sky exposure. This change from needing full to half sky exposure occurs within 4-6 weeks.

To build this into an ecosystem meant an involved study of sun angle and seasonal requirements for each plant. Also, growth rates and heights unique to the Pilbara needed to be factored in as well as root profile relationships between plants. This took quite a long time and is still being studied. However, we have evolved a planting arrangement that suits most plants and is functional over the full year.

We have embodied this knowledge into a 'Plant Protractor' which helps us to place our major shade and deciduous plants (see **Figure 5**). Once we get their angles to each other and to the sun correct we have then created a 1-3 m strip on the north side of these larger plants that is ideal for growing smaller plants. These smaller plants are also placed relative to their heights, roots and sky needs in different locations within the ideal growing strip. This general cluster of larger plants is in a boomerang shape and the self shading effects of this shape have certainly allowed very close packing of plants and extended yield periods. We repeat this shape in an offset formation across the landscape like fish scales and find this modular approach to plant positioning is very practical for large exposed sites.

We have also incorporated this design strategy into 'Guild planting' when we put from 4 to 7 plants in close association (1 m) on 2-3 drippers. This economical and strategic placement gives all plants in the group mutual support which leads to quicker growth rates, higher levels of complexity and better long term survival. The guild is simply a plant from each of the very broad groups such as grass (G); herb (H); shrub (S); tree (T), creeper (C); vine (V); and legume (L). They are placed in the following general patterns and sequences and immediately work together as a Guild.

OUTSIDE CANOPY (full sky conditions)			INSIDE CANOPY (light well conditions)		
	G			L	
H		V	C		S
	T			T	
S		C	V		H
	L			G	

It is necessary to have a good knowledge of plant characteristics, climate needs and relationships for your area to be able to select the most compatible Guild members. This planting arrangement will enhance the correct selection and can be varied

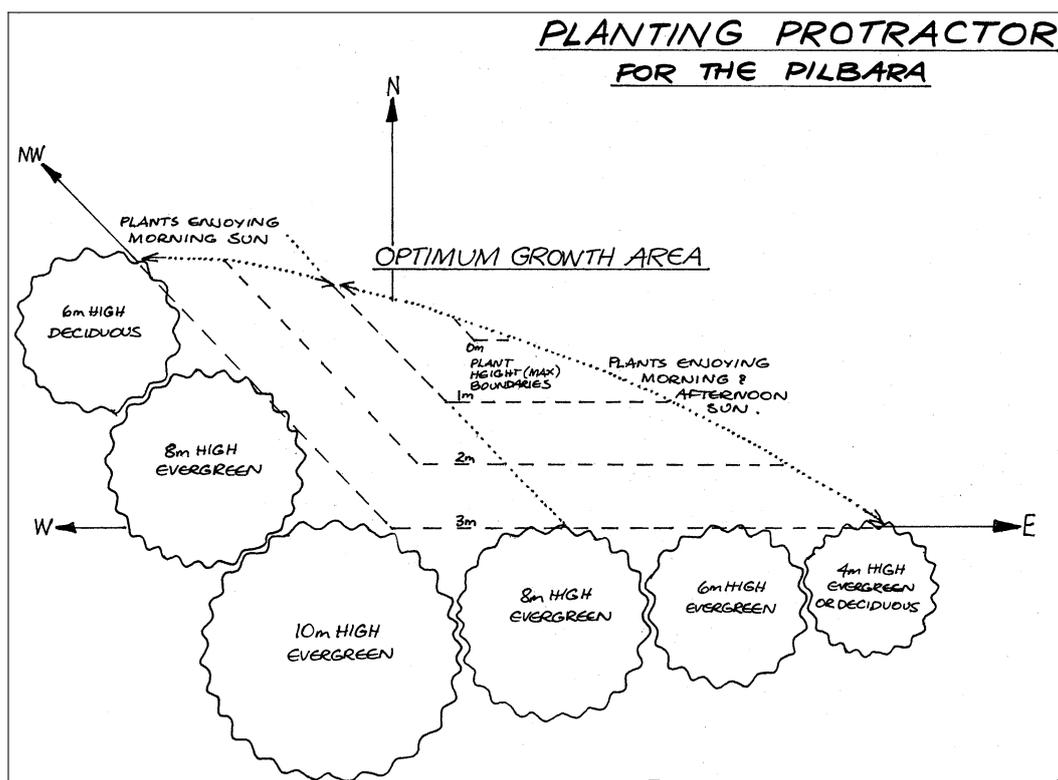


Figure 5: Planting protractor for the Pilbara

slightly for other site conditions. Since developing this technique I no longer plant single plants on drip lines but always little Guilds.

Fire

Of all the great myths going around I think the one that says “The Australian bush needs fire”, is a terrible one. This lie has seen most of Australia decimated by fire to a point where it is caught in a vicious cycle of increasingly fire prone communities that burn further, hotter and more often each time around. Most native bush foods and soil improvers are *fire sensitive*. Many native plants seed well only every 2-4 years. Almost all Australian soil needs more woody matter in it to re-establish soil texture, micro organism habitat and water retention qualities.

Fire frequency has been steadily increasing from Aboriginal impact but accelerated out of control with European impact. Places that may have only seen a fire every 80 years have been exposed to one every couple of years. These places are *totally* different to what was originally there so great have been the effects.

Let us first look at seed cracking. While many seeds are cracked by fire and smoke, which are not the same thing by the way, there are numerous other events that crack seed dormancy. Weevils, birds, beetles and rodents all penetrate hard seed coats and leave *some* seeds in a condition ready for germination. One of the most powerful and gentle agents for weakening the seed coat is the opening rains which increase the salt, chemical and liquid concentration of the immediate soil. This natural soup easily invades the seed coat but often doesn't germinate the seed. If

the rains continue, then germination of 20-30% of a batch of hard coated seeds will follow.

In Australia more often than not we have no immediate follow up of the opening rains. The 4-6 week dry period causes the seed coat on un-germinated seeds to shrink, fracture and fissure. Generally the second lot of rains continue a lot longer and the weathered seed coat allows easy germination of the first batch of seeds. By this time also the soil liquids are diluted and only a small percentage more seeds are weathered to the point of germination. By the end of a season 30-50% of a plant's seed stocks may have germinated leaving the rest for a later season. This hard coated seed reserve in the soil allows for sporadic ongoing germination such that up to 3 years later the last seeds from a batch can still be germinating. This is a natural insurance against poor rainfall patterns and a very practical one at that.

Now if we have a fire go through just before the first rains and have no follow up rain then we have a very big problem. First, over 80% of the soil's seed stock can be woken from dormancy. Secondly, the woody, water containing mulches are destroyed so the need for follow up rain becomes even more urgent. Thirdly, the soil chemistry is very corrosive from ash and charcoals so the next rain generally helps crack many of the remaining seed coats. Fourthly, the germination of so many seeds so close together creates an incredibly dense growth pattern such that competition is voracious for the diminishing resources of water and mulch created fertility. These features of fire are very destructive and the short term gains are often only good for one season, thereafter the stage has been set for an ongoing cycle of destruction.

Fire and forest roads

Apart from spreading disease, feral plants and human impact, roads often create fire. Cutting through a forest canopy for a road allows wind and air circulation to reach the forest floor. The increased air and wind access has an incredibly drying effect on all the mulch and leaf litter. This tangle of branches and leaves normally holds much moisture over the dry period so as to help to forest through drought, and is relatively fire proof. Once it is aired and dried it becomes a fire bomb.

Many large wildfires have occurred in forests within 2-3 years of a road going through *tall* timber stands. The *tall* forest is most vulnerable because it takes so much longer for its canopy to reunite with the ground. Also, the *tall* forest occurs at the 'heart' of the forest that may be well over 100 km across. It has been sealed up against light and dry air and has a huge mulch content on the floor. Because it has been heavily mulched and sealed up for so long there is often little or no pioneer seed stock in the soil of the heart of a *tall* forest. These pioneer plants are the quick growing, short lived plants that would be needed to quickly seal the canopy back to the ground. They are often only found around the edges of an old growth forest many kilometres from its heart.

One useful strategy for remediation is to select local pioneer species from the edge of the old growth forest. The species need to be fire retardant, quick growing pioneers that get from 4-10 m high in a couple of years and vines that reach at least 6 m high to help bind together a substantial wind break. These pioneers need to be planted/seeded along the edge that has become exposed and encouraged to seal up

the canopy again. In Queensland tall timber forests seal up quickly quite naturally because it is warm and wet, however NSW and WA are too dry and Victoria is too cold for rapid regrowth.

This general strategy is quite applicable to other types of ecosystems with local species choice, canopy height and shade being more relevant in open canopy systems. Grass suppression through shade and displacement by herbs is the general technique used in open canopy systems, although getting a canopy around a water way is still aimed for.

Fire and species composition

The advent of a fire tends to create a significant shift from one species composition to another. In earlier times *Callitris* (pine) and *Eucalyptus* were co-dominant. However, fire has altered this. If fire is more frequent than 15 year intervals then *Eucalyptus* wins and *Callitris* loses. If an evenly mixed stand only gets fired at intervals greater than 15 years then it will still take 100-500 years for the *Callitris* to win. One can easily see the repercussions of regular burns. *Callitris* tend to inhabit ridge and mid slopes and so if they burn, the fire is not opening up the water ways. However, *Eucalyptus* have (due to increasing fertility) moved into the waterways and now bring fire into them also. *Callitris* is a great creator of soil fertility and feeder of fungi. While they can suppress growth around themselves, their removal exposes a useful soil which will support healthy growth of most plants. The *Eucalyptus* after 40 years of dominance of an area often leaves behind a chalky, collapsed soil that is in sharp contrast to what the whole pine family achieves. (*Pinus*, *Callitris*, *Casuarina* etc.)

The increased fire incidence that *Eucalyptus* introduce lowers fertility, destroys many food and soil improvers and hosts more of the fire prone hot burning plants. These plants such as *banksia* tend to bring more ants (which help open collapsed low mulch soil) which predate more soil organisms and also the downward spiral of soil fertility is formed by the increasing incidence of fire and fire promoters.

There are species that are very quick to disappear after fire and I always look for them to get an indication of ecosystem health.

First are the ferns which live mainly on decomposing woody material. Once fire removes the woody material stocks they disappear quickly.

Second are the fungi which also live on woody material although are not as sensitive as the fern because they can live on living plants and underground. The level that they occur above ground and variety does indicate how intact the canopy is. The higher humidity that comes with a good canopy also allows fungi to be successful higher up the trunks of trees. Lower humidity from damaged canopies sees most fungi only at ground level and very little humidity.

Third are the vines which help bind a canopy together against wind invasion. They are often found densely along water courses and the edge areas of larger trees. They are often shallow rooted, use old sticks and low branches to access the canopy and are easily killed by fire. The seeds and roots often don't survive fire and without

their binding effect, very few canopies are very wind proof. Once fire invades the waterways there is a rapid loss of vines from an ecosystem.

More remediation of edge areas at risk from wind invasion and protection of high mulch areas from fire and drying out needs to occur at least on private owned forest.

Selective removal of Eucalyptus and fire promoters and replacement with local pine types, fire retardant pioneers to 10 m and vines to 6 m would see a giant leap forward in fire protection.

A plan of a forest block showing high mulch areas, dry wind directions, unsealed canopy and problematic plant areas would help make a holistic strategy possible. Long term privately owned land with sensitive stewardship could create forest that wouldn't burn at all if done correctly.

The use of strategic logging and fire should not be ruled out as a management plan if they are followed up by careful seed and plant selection for replacement. It is the lack of astute seed/plant and rain follow up planning that makes the whole process fail severely. Because the demise of the forest has been under way now for quite a long time, only correct management can interrupt this destructive spiral, not standing back and doing nothing.

Creating the Forest Garden

Jerome Osentowski and Peter Bane (USA)

[Submitted Paper]

(From an article in The Permaculture Activist #31)

After observing the diversity of tropical systems in Nepal and Nicaragua and in particular their rapid establishment, Jerome Osentowski, inspired by Bill Mollison's elaboration of the succession of sub-tropical systems, (*Permaculture International Journal* 40:24) brought these ideas home to Basalt Mountain in Central Colorado. There the basic design principles of permaculture systems took on different clothing:

- Diverse polycultures.
- Emphasis on perennials.
- Use of succession in both establishment and yield.
- Dense multi-story plantings (stacking).
- Little or no cultivation of soil.
- Using multi-functional plants, animals, and structures.
- Matching yields and needs of the elements in the system for mutual benefit, and most importantly.
- Close interaction between the resident/designer and the evolving system, based on observation.

Though little demonstrated in the cold climates, the forest garden has taken many forms throughout the tropics, especially in highland regions such as East Africa, Sumatra, Ecuador, Mexico and Guatemala, but also in the tropics of Malaysia, Java, and Kerala, India. Always a densely stacked polyculture of edible and useful species, the forest garden is characterized by a structure of seven cropping layers: canopy, mid-story, shrub, herb, ground cover, root, and vining verticals. Classically it has provided the basis of a subsistence economy for small farmers and villagers in which most, if not all household needs are met from the immediate environment. Plants are often kept together with animals, and both are closely managed.

Already familiar with intensive production in his year-round market garden, Jerome had created an infrastructure for his integrated greenhouse/garden production which later supported the rapid establishment of a forest garden.

The greenhouse and market garden occupied the main south and east facing slopes of Jerome's sheltered site at 7,200ft on Basalt Mountain, while just west of these in a small ravine below the house he had attempted to create an orchard over the years, planting some apples and apricots. Though some of the trees had taken hold, they hadn't flourished, and the mulch around their roots kept slipping away on the steep slopes, leaving the hillside under and around the young orchard barren and unusable when it emerged from the snow each spring.

Key to all that followed was the creation of appropriate earth-works in the form of stone terraces. Providing a rich variety of landforms increased the "edge" of the sloping ravine, while the stones added thermal mass which enhanced the microclimate

of the partially shaded slopes. In this way, Jerome laid a foundation for the diverse abundance of plant species which now occupies the forest garden.

The clay soil of the little valley had been an inhospitable terrain for the annual garden plants, but it made a good subsoil base for trees when topped with 18" to 24" of course organic matter: spoiled hay, fallen leaves, unfinished compost material, and wood chips. These materials were piled in behind the terraces using sheet mulch techniques. Gypsum, which helped to lighten the alkaline clay subsoil and make calcium available in the beds, was added at the same time.

The stone terraces not only proved their worth by retaining organic matter on the slopes, they continue to serve multiple functions in the garden. Besides affording several critical degrees of frost protection (in a climate where frost can occur any month of the year) and enhancing fruit ripening, the stones provide ideal habitat for garden snakes which keep down both mice and slugs. The crevices between the stones have become a useful edge into which Jerome plants insectary species such as dill and cilantro.

By defining discrete planting areas, the rock walls lend themselves well to two important permaculture strategies: spot mulching and guilds. Each terrace becomes the site of one or more fruit trees supported by a host of beneficial companion plants. These "companeros," as Jerome calls them, include nitrogen fixers: Siberian pea shrubs, fava beans, clovers, alfalfa; aromatic and insectary plants such as fennel, celery, horseradish, garlic mustard, and walking onions; bee attractants like borage; medicinals such as sweet annie (*artemesia* sp), the native mullein, and purple coneflower; mulch plants, of which comfrey is the queen; and a raft of smaller edibles: bush cherries, elderberries, Jerusalem artichokes, peas, sunflowers, currants, and gooseberries. Besides enhancing overall yield, these smaller fruits and vegetables provide forage for the gardener making his periodic rounds to pluck weeds. Throughout the profuse growth, scarlet runner beans and squash meander, tall herbs lean over beds below, and grapes send their tendrils out in search of supporting branches.

Deep mulch, renewed annually in the autumn just before snowfall (which helps to moisten and hold it in place), ensures fertility and moisture in the beds. This is supported by drip irrigation, important insurance for the establishment phase in this dry climate. Nutrients in the mulch are supplemented with periodic thinnings from the garden, straw yard compost, and foliar sprays of seaweed, manure and comfrey teas. Undesirables such as pigweed (*Amaranthus*) and all annual crop residues are tucked several inches under the mulch where they feed a happy crowd of earthworms, busily manuring the soil with their castings. In the dry mountain air, vegetable wastes left lying on the surface would oxidize without adding any nutrient to the soil. Tucking them under helps to close the energy cycle.

While the stone terraces defined the ground of the forest garden, stacking of taller elements on upper terraces (to avoid shading plants below) created the vertical dimension. Jerome incorporated large existing fir and juniper trees on the east-facing slope as canopy, adding in apricots and standard apples. Below these in the mid-story he planted plums, semi-dwarf apples, and mulberries. The shrub layer consists of bush cherries, elderberry, high bush cranberry, and caragana, while the

herb layer is composed of perennial salad greens such as burnet and miner's lettuce, favas, dill, fennel, comfrey, and lovage. Leguminous ground covers such as fenugreek, birdsfoot trefoil, clovers, and alfalfa have proliferated. Below ground in the root zone, yields come from garlic, walking onions, and Jerusalem artichokes, while vining scarlet runner beans, squash, grapes, nasturtiums, and hops weave the whole together.

Seeing solutions, not problems

Jerome's design for the forest garden evolved from four to five years of struggle with a difficult site. Most of the problems he encountered had their roots in the view of elements in isolation. Conventional concepts of the orchard and salad garden were inadequate for the extremes of aridity, cold, slope, and variable weather which his Rocky Mountain location presented. To counter these daunting conditions he needed the synergy of beneficial plant, animal and structural assemblies. Only when he began thinking of the orchard and the elements within it in all their possible relations was he able to move toward solutions appropriate for his needs and his landscape.

Large and thorny problems defied hard work and persistence. The ravine and the existing orchard lay within the fenced zone of the homestead; they were of high value but low productivity. Steep slopes and clay soils resisted conventional mulching, while cultivation would have been disastrous. Terraces and deep mulch turned things around. The annual salad green operation, while financially successful, was too labor-intensive to maintain permanently. Its demands didn't mesh with the declining labor availability of Jerome's own human lifecycle. Perennials, no cultivation, and mulched pathways cut labor requirements dramatically. Permaculture courses and workshops were an integral part of Jerome's local economy, but the permaculture ideology of diversity and succession hadn't been tested on his ground. Today the forest garden strategy demonstrates permaculture in all its many dimensions.

Design and establishment were aided by working with guilds. A whole guild which was created on the deer fence (incorporating the structure) included hops, Russian olive, sweet peas, gooseberries, and garlic. Apples were planted with clover (a N-fixer) and borage which attracts bees, aiding fruit-set. Garlic, favas, dill (an insectary plant), native lupins, and wildflowers were added in. Under the existing fir, currant, caragana, salad burnet (a shade-tolerant perennial green), crotolaria, and frost-hardy marigolds, (which are effective against nematodes) contributed their different strengths. The guild plantings both support tree establishment and create diversity from the beginning.

Planning for a succession of yields was as important as careful staging of the foundation to make most of high initial labor input. Jerome established his rootstocks in place the first year and concentrated on building soil. Early yields came from the production of annuals, while perennial and self-seeding companions were gotten going. Volunteer plums (from composted kitchen waste as well as native species) were grafted in place to a variety of European plum scions. He continues to observe which varieties survive and propagate these. Adapting this rough strategy to other fruits, he has brought in selected rootstocks, later grafted in place from initial purchases of scionwood varieties as these reach bearing in their fourth year.

Heavy mulch greatly aids the young trees during the stress of transplant and root establishment. Soil moisture is supplemented by drip irrigation and spot composting, and all help build fertility. Umbels are easily reseeded as they mature by shaking ripe seed heads across the beds. When broadcast red clover volunteers elsewhere on the homestead, it is potted into the greenhouse and later transplanted into forest garden beds. Left to Fukuoka-style benign neglect, its cousin yellow clover has already become self-propagating throughout the garden.

Jerome has learned to locate elements for beneficial function. Mints and nasturtiums growing under the greenhouse eaves benefit from extra roofwater and at the same time they fumigate the greenhouse interior, repelling whitefly from the nearby intake vents. In ten years Jerome has had no whitefly problems in the greenhouse. Bee attractants in the same area ensures that pollinators do find their way inside. The chicken straw-yard adjacent to the forest garden yields copious quantities of composted manure for improving the terrace beds, while caragana is planted everywhere for use as mulch and fertilizer.

Determining the right combinations requires careful observation to reveal the microenvironmental conditions of each spot. The ravine into which the forest garden was planted was cool, but protected from frost by drainage. Sensitivity to solar access for all areas was essential. The addition of heat-loading stone to west-facing slopes made a large difference in the micro-climate of that side. The cooler east-facing slope was protected by an existing fir tree from settling frosts. Jerome left the tree and planted shade-tolerant berries and herbs below it.

Problem solving has become a habit! The integrated pest management strategies which Jerome employs stem directly from the diversity and multi-functional elements of the forest garden design. No one approach is expected to meet every need, but multiple strategies, diverse floral plantings, soap sprays, releases of beneficial insects, row covers, trap crops, attractants, and plant vigour from deep mulch all contribute to environmental balance with virtually no insect damage in the forest garden. While the deer fence controls predation by these creatures, smaller wildlife abound: squirrels ate the fava beans and rabbits were also a pest. An annual crop of cats, themselves controlled by local raptors, provided an effective response. Mice loved the mulch environment and sometimes girdled young trees, so it became necessary to keep mulch away from direct contact with the bark. Snakes and cats did their part too.

Other influences are less obvious but no less effective. Walking onions which reseed from bulb-lets at the top of their stalks walked around in the pockets of the gardeners spreading their beneficial influence through the orchard. Horseradish worked as a trap crop for grasshoppers. Though the leaves were ventilated, the roots were still harvestable. Comfrey, a fine source of mulch and a medicinal and food perennial, also wiped out quack-grass.

Diversity has both economic and unexpected benefits. The garden is easily maintained by "no work" methods. It provides a format for diversity, a context for medicinals and insectaries. The complexity creates niches for unique plants: fenugreek, various edible flowers, and uncommon fruits such as currants and gooseberries. Apples on dwarfing stocks permit a greater variety, including many antique and

heritage cultivars, to occupy a small space while maintaining high yields. The apples give not only crop, but a generous supply of scion-wood for nursery stock and repeated opportunity for grafting workshops. They yield at four years instead of seven, the norm at this altitude. Fruits are smaller, but incredibly sweet, luscious, and flavorful. Salad vegetables grown in partial shade are more tender and succulent. Diversity is also pleasing to the eye, nose, and tastes. In a very short time the forest garden becomes the preferred environment for human inter-actors.

Putting the philosophy of maximum intelligence and minimum effort at the heart of the design, Jerome hangs in his hammock in a scrub oak copse near the center of the forest garden. From this observation point, he continually refines his work using subtle principles and small manipulations to guide the development of the garden now. Intelligent observation, select genetics, foliar nutrient sprays, aromatics, flowers, compost, and manure teas all work to enhance the health of the system. He adds that most plants which are healthy for the forest garden are healthy for humans as medicinals. Ultimately the highest-value yields of the forest garden are just such subtle and intelligent products as inspiration and refreshment, education, medicinals, tinctures, scion wood and seed, other propagating materials, and fertilizer teas.

In time, the forest garden takes over, and the designer becomes but one more element in it. Jerome plans to extend his terraces downslope to envelope a pond using forty tons of salvaged stone from construction excavating. Trellised grapes and espaliered apples are appearing in the original market garden now as the separate annual planting beds disappear, converted to perennial polycultures. The forest garden has become a self-seeding, self-maintaining system continually adjusted by observation, harvest, and small routine nutrient exchanges with the household/greenhouse/market garden. Orchestrating a perennial system proves the effectiveness of permaculture principles. It's fun!

River Rehabilitation Work in Dry Tropical Environments (Mexico)

Skye (Mexico)

[Submitted Paper]

The Rio Laja has a massive catchment area in the high-altitude, dry tropical part of Mexico known as the Bajio. For eleven months of the year it is a dry, wide and gravelly river bed. When the summer rains (av. 400mm) do come, the catchment, denuded of vegetation and often soil (by centuries of overgrazing by the donkeys, goats and sheep introduced by the Spanish and by the forest removal needed to smelt silver to keep Europe of the seventeenth century financially afloat) runs wildly with silt laden run-off. Overnight the river becomes a raging flood capable of destructive erosion.

With little to hold any moisture (both soil and vegetation are largely non-existent) the flood is quickly followed by months of drought. During this time the women collect water from small holes dug into the stony river bed, using plastic cups as they lie on the hot bare rocks. For some women of Pena Blanca it may take hours of walking, digging and careful slow collection to gather sufficient water for the families daily cooking and washing needs.

This area is also a major stop on the migratory flight path of many of the species of bird that move between the Northern and Southern continents of the Americas. For this reason the San Miguel de Allende chapter of the Audobon Society was able to obtain funding to employ the services of Bill Zeedyk, a retired engineer from the Californian Forests and Wildlife Service.

Bill understands the dynamics and forces involved in the massive floods of this type of dryland river system. The locally-traditional "pressas filtrates" (dry stone dam walls) would be swept away with the first major rain event, while steel-encased gabions or major concrete flood control systems are simply beyond the resource possibilities of the region. However rock dams, only one rock high will sit underneath the flood and quietly collect silt and organic material. These lowly structures are one rock high and eight rocks deep (across the stream flow direction). Once they have collected silt one year, another "one rock dam" can be built slightly upstream of it. Within a few years a great deal of moisture-retaining silt will be accumulated.

In conjunction with this collection of silt, it is important that the river system be lengthened. Fairly simple mathematics shows that by increasing the length of the river by 20%, the speed of the water in flood will be reduced by half, and that the size of the rocks that can be moved (ie the erosion capability) will be reduced to one eighth. To accomplish this, Bill works with the shape of the river and builds "deflector banks" on the inside of existing curves in the river. Again these are only one rock high. Where possible both of these types of structures are enhanced with appropriate planting – in this case Bill used the local "seep willow" as it was the

only thing surviving in the river system, obviously the only thing the goats did not eat!

Bill worked with the local school children of the community of Pena Blanca, and also with workers from local community support groups within the area, CASA and Fundacion A Infantiles. After the rains of 1996 almost all of the built structures survived the heavy flooding and performed well. Bill is returning in November to follow-up on his fine work, and will soon publish a book on the subject. As a strategy for saving and rebuilding damaged river systems and their local communities and habitats the system Bill Zeedyk has developed is certainly effective, relevant and cost efficient. I recommend anyone working with this type of river system to seek out Bill's book as soon as it is published. The work of Bill Zeedyk is another tool that every serious permaculturist needs to be aware of.

Creating and Managing Productive Pastures in the Dry Tropical Regions of the World

Robyn Tredwell (Australia)

[Presentation Report]

Robyn manages land in the Kimberley region, on the border of the Northern Territory. This an arid tropical region of degraded land, consisting mainly of sand-dunes, that has been overstocked. The station is called Birdwood Downs. Savannah Systems has been set up by eco-technicians who work with Robyn. The area in the Kimberley was chosen due to its political stability. Up to 45% of the land in the region is small-leased and the area is considered by the Government to have the least possible potential.

As the land had been over-grazed, the topsoil had been removed and the remaining soil was compacted. All of the perennial seed species had been removed. Some tree species from the region were no longer in existence.

To be able to make changes in this region, it was essential to look not only at the land and the land use but to understand the culture. For the local people it was a lifestyle and therefore it was difficult to change attitudes. So it was necessary to maintain some of the ways that land had been managed, and integrate new methods.

The variance of rainfall is a major contributor to the poor soil.

Cleared areas were worked in strips with a bulldozer that had a rake on the front. Legumes were planted into these areas. Local native species could not grow so introduced species were bought in as they could establish themselves readily. The first plantings failed as the cattle weren't moved off the land early enough for the seed to germinate. Wind dispersed the seed so it was randomly placed onto the areas that had moisture. These areas were concentrated growth areas. The contours of the land had led to large quantities of the soil eroding off, leaving huge erosion gullies. Contour drains and spoon drains were installed to help channel the run-off.

The following decade was a drought, so it was decided to place troughs on the top of the dune caps. The seed types planted were varied to experiment as to what would survive. The cattle grazing and seed scattering was much more controlled and Robyn was able to observe the species survival. The seed was cut and collected and fed to the cattle, along with molasses, to speed up the digestion process. The cattle became an important part of the seeding process.

The harvest was done with combine harvesters that would take the first 'seed set' and then collect the second seed layer from the later maturing plants, the cattle were then left to graze on the stubble.

De-stocking of the cattle was important in the drier years but in more recent times Robyn has leased other people's cattle, to help with the seed sowing.

Year after year she noted a small but significant change. The species types were obviously going through a process of succession. These were species that became the 'indicator' species for how the soil and the conditions were changing. The dune caps began to sustain ground-covers for the first time in years.

The Acacias that were pulled out of the grazing areas were thrown in to the water hole areas to deter the cattle from eating plant species that were needing to be established.

The introduced species helped to create the 'right' environment for native Eucalypt species to become established for the first time in years. The EPA were impressed at the change, which was encouraging, as they had only previously offered scepticism. The species diversity was also increasing.

Robyn's work is an example of how to manage an extremely challenging region when the climate, soil, and poor management were against you.

An education base is also the focus of the station where people come from all over the world to work and study the principles and practices. Nutrition, hygiene, animal husbandry, organic farming and machinery are part of the courses that are run.

Permanent Forestry: Commercialising Earth Care Through Restoration Forestry

Tim Winton and Gary Cowan (Australia)

[Submitted Paper]

An alarming percentage of the planet's forests have been destroyed by human beings. This forest destruction has led to a great increase in material wealth in industrial society while drastically decreasing the ability of forest ecosystems to function in the biosphere.

It is time to start reversing this trend by bringing capital out of the existing economy and investing it in a sustainable economy based on permanent forests.

Since human beings are the only ones who can guard forests from their only major threat – other human beings – a 'permanent forestry' must be based on a symbiotic relationship between a human organisation and a forest. The human organisation, using appropriate legal and commercial strategies, secures initial investment resources, designs, establishes and maintains a fully functioning forest ecosystem on previously degraded land, and it ensures the forest's continued existence. The forest then provides yields which pay back the initial investment, support the continued existence of the human organisation, and form the basis of sustainable local livelihoods.

This paper gives an analysis of a proposed permanent forest, PermaForest Pty. Ltd., located in the humid sub-tropics on the east coast of Australia. A considerable portion of the paper is given over to examining the commercial, social and environmental context which makes a permanent forestry model relevant, in the belief that good design is only possible after a thorough understanding of the needs which necessitate that design. The specific techniques of re-afforestation, sustainable forestry management, investment (including proposed legal and financial structures and projected returns) while outlined, are not given exhaustive treatment here. This analysis of permanent forestry is part of an on going project which will seek to demonstrate a model permanent forest and a method which any small group or community may use to create one.

Before giving some background on the context which defines permanent forestry, we will justify the creation of the term itself, and give a definition of exactly what we think it is. There are many forestry practices in use today, and as Michael Pilarski has pointed out in *Restoration Forestry*, industrial forestry operations have recently adopted terms such as 'sustainable forestry' for less than sustainable practices. Pilarski's term, restoration forestry, allows for a distinction between an industrial forestry with the trappings of permanence and a new forestry which recognises all forest values equally, including their role as complete ecological systems providing critical biospheric functions. We believe that the concept of permanent forestry,

although based on the principles of restoration forestry, is different enough to warrant a new name for a number of reasons: it is a specific method which is designed (1) to be highly commercial in nature (2) to create an explicit symbiotic relationship between a group of people and a restored forest, and (3) to be an easily replicable model of earth repair which is prolific by virtue of its ability to generate environmental health, material well being and enough surplus to spread these practices.

The term 'permanent forestry' as the subtitle of this paper suggests has at its core the intent to commercialise earth care. Commercial systems, regardless of how one considers them now, are capable of supporting enormous amounts of work. Great material surpluses have been built on a commerce of natural resource exploitation, typically because this was the easiest way to secure resources for trade and wealth building. It is our view that modified commercial systems, based on the ethic of earth care, have great power to restore naturally functioning ecosystems, replacing diminishing natural resources with resources from consciously designed and maintained ecologically restorative systems. Large scale, industrial forestry practices act to separate people from their resource base. This separation is perhaps the most costly of the diseconomies of large scale operations: it allows for the real costs of short term forest 'mining' to be passed on as environmental degradation, for which no one accepts direct responsibility. A human scale forestry based on an intimate relationship between a community dependent on a specific forest and a forest dependent on that community will ensure responsible management of the forest's resources. Permanent forestry is also a method of appropriate investment, establishment and management strategies which is designed to be easily replicated by any group of motivated people anywhere.

Based on the rationalisation stated above, we would like to offer an initial definition of permanent forestry as:

A consciously designed, complete and readily replicable method, which any group of people may learn, of securing initial investment resources, designing, establishing and maintaining a fully functional forest ecosystem on previously degraded land, using appropriate legal and financial strategies to ensure the forest's existence in perpetuity, and from which that group of people may secure their livelihoods.

It is important to state that permanent forestry is not just an idea, it is a working model: this paper is part of the initial stages – that of idea formulation and communication of that idea – of an on going project by the authors. As an idea, permanent forestry has been stated in *Permaculture a Designer's Manual* by Mollison when he states: 'Forests ... are another permanent agriculture.' As a real possibility and a set of techniques and practises, the essence of permanent forestry has been well documented by Michael Pilarski in *Restoration Forestry*. It is only as a synthesis of many ideas and proven practices into a *working model* which we hope will be a vigorous, replicable method of earth care, that we forward this paper.

Good design may be seen as a problem solving exercise, where the problem is the context and the solution is the design. The success of a design then depends on an understanding of the entire context. The context is composed of all the needs which must be filled by the design; in the case of permanent forestry the needs

are for right livelihood, environmental restoration, ease of replication and financial, legal, and management systems which support these ends. Often permaculture systems are an excellent fit to parts of the context, for example a well designed market garden in response to the need for fresh local produce; but other parts of the context, such as the need for marketing of the produce or securing start up capital are not acknowledged in the design at all. In designing permanent forestry we have attempted to understand the entire context – social, ecological and commercial – to create a complete system. Permanent forestry is based on three main ideas: the need for *commerciality*, which is presented as the context of its origin; the need for a direct *human/forest symbiosis*, which is the practice of permanent forestry; and the need for ease of *replication*, which will constitute the conclusion of the paper.

Commerce is simply exchange or trade, and it is the key to successful systems. It can be positive, life affirming and incredibly productive, but to see past the inefficient and destructive commercial systems which dominate human society at present, it is necessary to look to nature. Ecologies may be seen as a complex web of energy exchanges dependent on a balance of cooperative and competitive interaction. If ecologies are in balance and there is a good interaction between cooperation which fosters efficiency and competition which keeps the system vigorous and dynamic, resources cycle freely in the system and there is a place of productivity, complexity and life. If they are out of balance or if parts of the cycle are omitted the system is destructive, polluted, and life destroying. The human system of commerce, the economy, is in fact an ecology for we are not outside nature; and it too can be restored to become a healthy part of the total ecology of the planet. Commerce must be seen to be just as 'natural' as gardening: to exclude commerce and the financial, legal, and managerial strategies which accompany it as 'unnatural' is to view only a limited context and to design only a limited solution.

Permaculture philosophy states that everything must be seen as a resource. As destructive as our current economic system is, its capacity to support enormous amounts of work must be seen as a resource: we believe that the driving forces behind commerce can be channelled through good design into earth repair. Such is the power of design. It is not a very large step from designing more productive and restorative agricultures, to designing more productive and restorative systems of commerce to accompany them. The existing commercial systems, despite all the dogma about competition in business, foster a great deal of cooperation; it is the ability of the different specialists to cooperate in trade which increases productivity in all systems – ecologies and economies. This is the extraordinary power of commerce. If one thinks about it carefully the various financial, legal and managerial structures are designed to foster honesty, collaboration, inventiveness, efficiency, thrift and optimism – cooperative behaviour – *and* competition. Although dishonesty and destructive business practices make the head lines, they are only a small fraction of all the honest, cooperative transactions which get taken for granted. Getting rid of business is not the answer. As Paul Hawken has made clear we must retrofit commerce if humanity is to survive into the future, 'because no other institution in the modern world is powerful enough to foster the necessary changes.'

If a functional economy can be as life affirming as a functional ecology, why is our current economic system so dysfunctional? And, how do we fix it? The current economy is dysfunctional because the basic pattern is wrong; changing the pattern

to an ethical one is the way to fix it. This idea is at the heart of permaculture. The pattern of existing commerce is a system of production and exchange which destroys living systems and invests surpluses in enlarging this destructive system. The ethical pattern is a system of production and exchange which restores living systems and invests surpluses in enlarging that system. Just as in nature, where one species is selected to inhabit an ecological niche over another because it is more efficient at using the resources available in that niche, ethical businesses must be more efficient than industrial businesses in order to inhabit their market niches. By operating ethically, by selecting the best elements of commerce and through good design, restorative businesses will be more efficient and productive than industrial businesses, and they will inhabit their market niches. They will have to – nothing else has been able to stop destructive commercial practices.

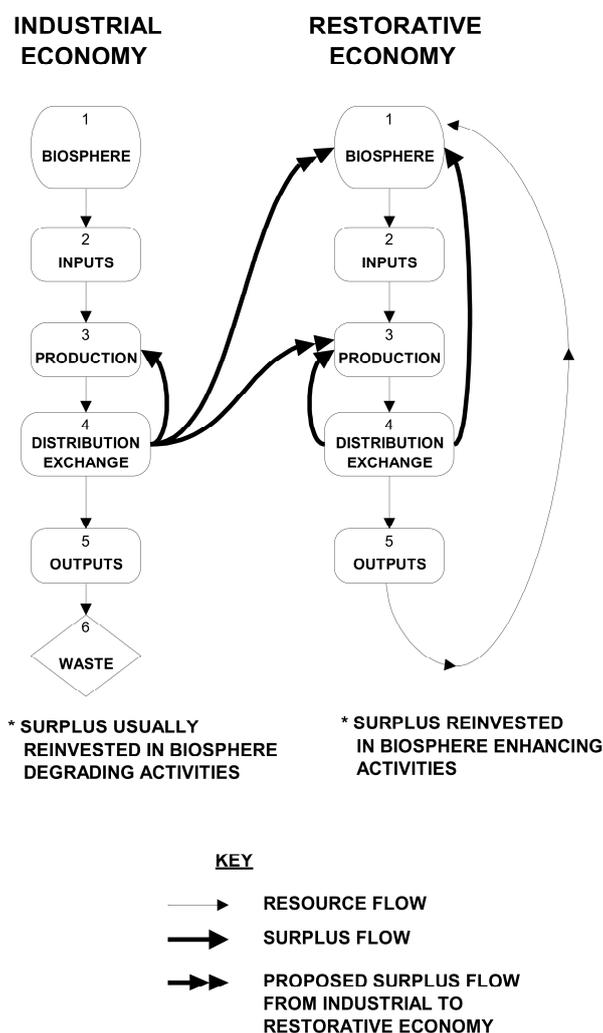


Figure 1

It is realistic to think that ethical commerce can out compete industrial commerce. The premise here is that industrial commerce is not changing voluntarily and that it is in fact incapable of this change: if it were capable it would have changed by now. The planetary ecology has changed and information about this has changed

society. People are becoming more informed as to the true 'costs' of existing production and exchange. Growing sections of society no longer wish to invest their resources in destructive industries and destructive commerce. The strategy at the core of permanent forestry is to design a restorative commercial venture which will attract resources from existing financial markets (refer **Figure 1**). This does two things: it removes resources from a destructive economy, and it puts them to work repairing the damage which was done in their initial creation. It is quite conceivable that money which was made by destroying a forest could be invested in permanent forestry to restore a forest. The commercialisation of earth care is a means of completing the cycle of resource flow in the economy back to the environment. This is the definition of ethical behaviour: the return of surplus resources to earth care and people care. Commerce and the production of surplus or profit then takes on a whole new meaning: profit is not ugly or destructive – it is life affirming, and the ability to generate it ethically becomes critically important.

The great irony of commercial earth repair is that, certainly in the case of permanent forestry, it is far more profitable to restore the environment than it ever was to destroy it. Sustainable systems which yield in perpetuity will always be more profitable, in the long term, than systems which are destroyed after a limited number of harvests. Critically, they can also be more profitable in the short term. Natural resources are in short supply due to over harvesting, making products from reconstructed systems competitive in dollar terms. More and more people are demanding ethically produced products, and designed systems out yield natural systems in terms of human useable resources. For instance, the World Watch Institute has stated that, "establishing ... plantations on just 5 percent of the area of tropical rainforest already cleared could provide almost twice as much wood as is currently harvested from all tropical forests." Not only does good design make physical systems more productive, it can make business organisations more productive by using an ethical pattern in their construction. Operating in an ethically based business provides the desire and commitment to cooperate efficiently towards a common vision which is the hallmark of elite business organisations.

The methods used to create permanent forests will be as varied as the trees themselves, but in the modern world of global commerce it is unlikely that any will survive without appropriate legal, financial and management structures to support the establishment and maintenance of the forest. To illustrate a method which we think will be successful, and which may be modified to suit other conditions, we will outline the creation of a proposed permanent forest by the authors, PermaForest Pty. Ltd., located in the humid sub-tropics on the east coast of Australia.

The first step is to gather a small group of people (in our case two) who are committed to establishing a permanent forest. The group must learn how local forest ecosystems function and how to establish them economically. Members of the group must be recognised as having competent business skills in both the re-afforestation and forestry industries or they must enter into business in a related field which will allow them to gain the necessary skills. Not much is possible until this stage has been reached, but there are many people in most bioregions who if they joined together would have these prerequisites, either immediately or in a short time. It is possible in the future that education could be provided by those who have established permanent forests. At this stage the group needs to incorporate into some form of legal

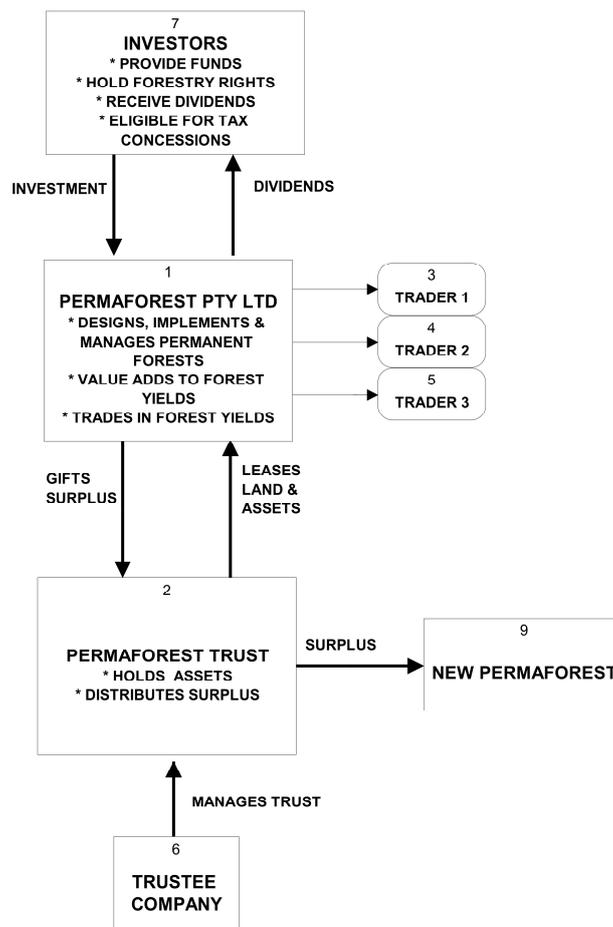


Figure 2

body for the purposes of conducting business. We think that the easiest and most flexible body is a private limited liability trader; we have called ours PermaForest Pty Ltd (refer **Figure 2**).

PermaForest Pty. Ltd. cost less than \$1000 to set up and it allows us to do business under various trading arms, it can hold assets, employ us and provide limited liability. It is also flexible enough to take in investment funds from investors providing we do not solicit these funds from the public at large. As part of the legal structure it is also advantageous to have a non-trading, discretionary trust attached to the Pty. Ltd. This entity holds all debt-free assets, and does good work with surplus resources. The assets are given (tax free) to the trust by the Pty. Ltd. and then the trust leases these assets back to the Pty. Ltd. so it may use them in the course of business. This arrangement allows any profits to be used tax free, by the trust, to set up other permanent forests.

At this stage it should be mentioned that it is not necessary for PermaForest to own the land on which it establishes the forest; it is only necessary that PermaForest be able to lease the land perpetually and to hold a forestry right on any trees it plants on the land. In the case of PermaForest, the land will be leased from a third party in perpetuity and then one hundred acres of local provenance, naturally occurring, mixed eucalyptus forest will be established. Investors will buy a 'forestry

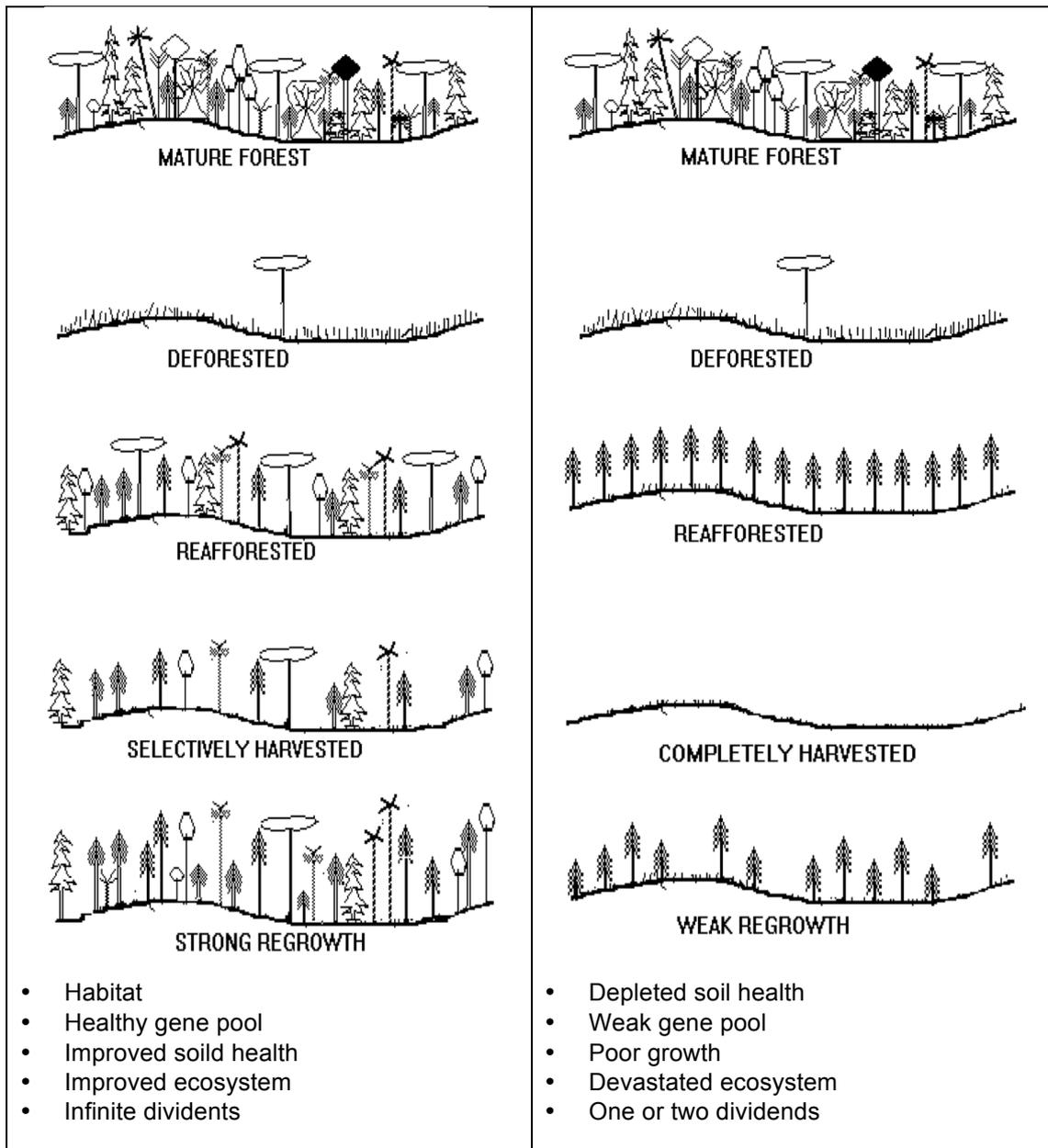


Figure 3

right', which is a standard well recognised legal arrangement, entitling them to the proceeds from any harvested timber. PermaForest will receive income for establishing the forest, for maintaining the forest, and through returns from all other forest yields such as, education, tourism, fungi, cut flowers, medicinal plants, seeds as well as many others. PermaForest may also accept investment in return for shares in the company. This would allow for the development of infrastructure to secure income from other forest yields such as education and tourism. Each permanent forest should be treated as capital, which only provides dividends or yields at a rate which does not diminish the capital. Just one yield of the forest, wood, is all that is necessary to remunerate investors at a competitive rate. But, unlike conventional

reforestation investment schemes, PermaForest continues to provide dividends indefinitely into the future! (refer **Figure 3**).

One of the great drawbacks, as seen by investors who would like a short term return, is that PermaForest will not harvest all the timber as soon as it is mature. To do this is to have forest management dictated by economic concerns. Restoration forestry practices recognise that forests yield at their own rate, and that through careful observation greater yields can be produced over time, while maintaining a standing, ecologically functional forest, than if the whole forest is harvested at once. PermaForest has designed a financial system which suits investors who would like a short term return on their investment, while letting the forest dictate the rate of harvest. PermaForest will have the standing timber in the forest independently valued periodically as a percentage of its value at maturity (if a tree is worth \$100 in 20 years then at year 5 it will be valued at 5/20ths or 1/4 that value, equalling \$25). Should any investor want to receive a full return on their investment at any time, they are free to sell their forestry right on the open market at the assessed value. PermaForest will also undertake to arrange a guarantee from an ethical fund, allowing PermaForest to purchase the forestry right of any investor at any time after year ten should they need to liquidate. The ethical funds guarantor acts as a bank lending funds on the value of the forestry right until PermaForest on sells the right to another investor. This system makes it possible for investors to receive a return in the short term, without the need to 'liquidate' the forest in the process.

All of the strategies in this paper are dependent on permanent forestry being a good financial investment in the strict commercial sense. In order for it to work it has to pass the scrutiny of investors' accountants and funds managers, who will insist on competitive returns relative to conventional investments. Permanent forestry does offer competitive dollar returns over conventional time periods. This is not difficult to prove, but it is project specific, complicated and time consuming and for the sake of brevity, we will not deal with it here.

The financial and legal strategies outlined above are also dependent on the correct design, establishment and management of the forest. Forest design is a fascinating subject, but it too is largely site specific and it will not be dealt with here either. We believe that it is also a more well known subject than the one we have chosen as the focus of this paper – the creation of systems which support the continued existence of designed forests. Establishment is the most critical phase of the project: once eucalyptus trees are established in a natural forest configuration – typically after one year – they are a very low maintenance proposition until maturity. However if there is a point where a forest is likely to fail it will be in the establishment phase, and if there are limitations imposed on growth, they too are most likely to occur at the time of planting. The techniques for establishing eucalyptus plantations and forests, in the humid sub tropics on the east coast of Australia, are well known, as are the growth rates, quality and value of the timber. These techniques include proper site and species selection, weed control, deep ripping, proper micro-site cultivation and selection, correct timing of planting, quality tree stock and control of grazing animals. Having the skill and experience in dealing with these factors gives a very high percentage survival at establishment and healthy trees.

As the forest matures and begins to yield wood and other products there is an opportunity to value add locally through milling, craft and carpentry. Opportunities for education, tourism, marketing, bee keeping, seed collecting and almost limitless other livelihoods will arise as the forest matures and expands in size. The management of the permanent forest's resources must also be based on an ethic of earth care. As long as all the people in permanent forestry understand this need for ethical behaviour – the forest certainly understands this need – then management of resources will follow as a self evident pattern. Organisational decisions regarding the efficient use of resources will be centred on a principle of ethics, not on a principle of material wealth accumulation. Critical, practical day to day management decisions will still need to be made, but providing the managers are sufficiently skilled in permanent forestry, these decisions will be evident. They will be guided by a principle; and as Stephen Covey has outlined in his book, *The Seven Habits of Highly Effective People*, already a management classic, "Principles are guidelines for human conduct that are proven to have enduring, permanent value. They're fundamental. They are essentially unarguable because they are self evident." This ethic does not exclude the right for one to do the best they can for themselves and their families. There is an incredible stress associated with not being able to secure the resources one needs to live, but once that level has been attained, there must be a method by which physical, information, and monetary surpluses can be cycled through the system. Surplus resources can be used to establish more forest each growing season, to foster the development of a community which strengthens the permanent forest and to create another independent permanent forest in another region.

Replication of any permanent forest may take place very early in its development as the critical resource needed is information. Provided a permanent forest has set up as a functional system (secured investment and established a healthy, productive forest) this information is a surplus which must be passed to another group. This, in a sense, must be its primary goal. Replication is the key – one permanent forest is not enough. Timber plantations have become a large, global industry as natural forests have declined, but they are largely an extension of damaging industrial forestry practices. Timber plantations are exactly that-timber – not a functional forest ecology, and as a consequence they are in all likelihood just one more rotation before that part of the earth they are grown on is incapable of supporting a forest at all. Permanent forestry offers an alternative which is competitive enough to displace the timber plantation industry market niche by market niche, to bring those degraded areas of the planet which are capable of supporting productive forests under ethical control. And it is a strategy which industrial systems cannot resist or deny, because it appeals to all the sensibilities which justify industrial practices.

Most of the emphasis of this paper has been focused on commerce, legal and financial strategies because it is our belief that in permaculture we need to become better at securing the resources which will allow us to do good work and to sustain ourselves. We have learned the hard way, as many others have too, that to have great ideas and good intentions, but no resources is a frustrating and ultimately unproductive situation. So, we have concentrated on strategies which allow a small number of committed people to pull initial resources from existing sources to establish productive, ecologically sound systems. It may be the only effective strategy

to bring enough natural resources under ethical control. At the very least it is a proactive strategy for those of us who feel powerless to influence the corporate and government systems which do control planetary resources. Humanity has come to a critical point in its evolution; we must make a fundamental change in the way we behave, or we shall destroy ourselves. It is our sincere belief that the commercialisation of earth care through permanent forestry will prove to be a powerful method for making that change.

Tim Winton and Gary Cowan currently operate Wollumbin Reafforestation, based out of Tyalgum, NSW, Australia. Further information regarding PermaForest Pty. Ltd may be obtained by contacting them at: PO Box 1377 Murwillumbah, NSW 2484. Phone: (066) 793 271, fax (066) 793 033, email: garco@coolgold.com.au.

The Use of Earthworms to Convert Hardpan to Arable Soil, Without Mechanical Tillage, Followed by Cycling with Poultry for the Sustainable Production of Food in the Dry Tropics

Bill Withers (Australia)

[Submitted Paper]

Ladies and gentlemen, my interest in your field of knowledge and enthusiasm was generated by ignorance and fear whilst a Member of Parliament in Western Australia's Legislative Council. I represented the Electorates of Kimberley and Pilbara. After 11 years I resigned from Parliament because I could no longer represent, to the standards I had set, from a Kimberley residential base. To remain in Parliament and represent effectively I would have to abandon our demonstration which became the reason why I am standing before you today.

In 1974 I won a scholarship to study remote area development around the world. I advised each country I would share the information gained during the study. Consequently, I received cooperation at the highest level from governments regardless of their political philosophy.

When I completed the study in March of 1975, I realised the world was in a mess with people demanding more goods and services than they could rightfully expect from their own level of work output. I also realised the World was being poisoned.

I could see the World heading for economic recession so I endeavoured to warn my colleagues. This caused me to lose credibility because they thought I had spent too much time under the tropic sun. Luckily my family believed me. My wife, Judy, agreed to radically change our life style.

In March of 1976 I wrote to my leader, Sir Charles Court, and advised him I was about to give a practical demonstration of those things I had been espousing in Parliament. We would obtain a virgin block of land in the Ord River district and conduct three demonstrations.

They were to:

- Design and build a home, using indigenous materials where possible. It would be built without the use of trades persons or hired labor.
- Develop a commercial orchard using alternative technologies and to reduce reliance on fossil fuels.
- Develop a factory for the production of frozen confections and fruit juices, using the reject fruit from the commercial orchard. The food was to be produced without the addition of preservatives, artificial colouring or artificial flavouring.

We did not have any farming experience, nor experience in the manufacture of frozen confections. I had previously built two homes using sub-contractors but I had never attempted the building of a home whilst doing all trades myself.

The Lands Board thought it was strange that we requested the worst block of land available, with 66% of hardpan. The hardpan was heavy red soil with high clay content and no fibre. It was considered "dead" soil – thus suiting our requirement for demonstration. The land was 22 acres or 8.7 hectares on the west bank of Lake Kununurra, 17 kilometres south of the town site. It also had the highest point of irrigable land in the valley.

Kununurra is located in the east Kimberley, approximately 15° south of the Equator. It has a monsoonal climate with 780mm of rain falling between November and March. It has a winter similar to a Mediterranean summer. Winter minimum mean temperature is around 19°C. The summer temperatures average forty days per year in excess of 40°C.

When we obtained the land in April of 1977, we had not heard of names like Mollison or Podolinski. We thought we were alone in our quest. We decided to rejuvenate the soil by using earthworms so we investigated earthworms to find they needed moisture, shade and food. We then sought plants which could offer such an environment. We found a legume which was high-protein, self-mulching, evergreen and would regenerate on only 300mm of rain per year. It was *Verano Stylo*.

Each time we planted a tree, we added a few worms and a few seeds of *Verano Stylo*. We also placed a flat rock near the tree to give the worms a shaded, moist area. For a few years we thought the politicians and departmental officers could have been correct with their doubts of our endeavour. Then the wonder of natural symbiosis became evident. With the growing evidence we broadcast *Verano Stylo* seed between the trees during the monsoon.

In the mid 1970's to the early 1980's, solar pumps and solar technology were not readily available, except for water heating, which we had in the homestead. For this reason we designed a low input system using a recycled 20,000 gallon squatter's tank on the block's highest point. It was filled from a single phase 1 HP pump at our lake jetty. A similar, interchangeable 1 HP pump, at the tank, could be used to irrigate the whole property, in rotation, through a five line octopus.

The system was also designed to allow 250 trees to be watered using gravity only. We limited our mango trees to 200 in the orchard and a further 20 around the homestead. The orchard, with immature trees, was watered for the first six years and then cut off.

The orchard has not been irrigated for the past 10 years. We limited our Mango trees to 220 because we did not wish to become reliant on the hiring of labor.

Now the trees are mature, they are given an annual application of an organic fertiliser, Dynamic Lifter, around the drip line. The application is usually 5 kilos per tree. If the tree needs more mulching than the slashed natural grasses it is given an application of hay or mulch from our mulch pile. Our mulch pile is comprised of prunings, rakings, grass cuttings, paper and ash. In addition to the mulch pile we have always maintained a worm/mulch pit which will be described later.



a: 1978



b: 1982

Figure 1: Homestead in 1978 and 1982



Figure 2: Homestead in 1990

Figure 1 a shows the red hard pan and the building of our house which was two steel farm sheds surrounded by water-worn cobblestones. The slow progression of the verano stylo and earthworm activity can be seen from the bare ground in 1978 through 1982 (**Figure 1b**), until 1990 (**Figure 2**) which shows it was highly successful.

Note the Golden Shower (*Cassia fistula*) in **Figure 2**. We couldn't grow this tree when neighbours were spraying heavily with insecticide. When we developed our own clean island in the sea of poison, the birds returned and consumed all the looper grubs which ate the Golden Shower leaves. The Willy Wag Tails also returned to eat the spiders under our verandah awnings and reduced their webs to an aesthetic level.

Figure 3 shows the commercial result of our endeavour – organically grown Kensington Pride Mangoes.



Figure 3: Organically grown Kensington Pride Mangoes

In 1980, when it appeared our Earthworm and Verano Stylo experiment might work, we had the soil from our worm/mulch pit analysed. It should be noted that we occasionally used water weed from the lake in this early pit.

Table 1 shows the result of the analysis from the Government Chemical Laboratories. Note the comment from the laboratory:

The concentrations of this organic soil are very high. The values for both nitrate and zinc are about ten to twenty fold normal soil levels for the Ord River.

We then decided to conduct another experiment using earthworms in a cycle with poultry. Once again this was to be conducted on non-productive hardpan. This is probably the most successful experiment I have ever been involved with.

Prior to describing that experiment I will show you the result of a trial conducted by the West Australian Department of Agriculture which was done without consultation with us.

In February 1984 we found an officer of the Department in our orchard taking leaf samples. When asked what he was doing, he advised us he was conducting a trial comparing the nutrient uptakes, through leaf analysis, of mango trees. At this stage I must comment that we were at loggerheads with the department of Agriculture. We had lost our first 500 very expensive mango trees because we followed the advice of the Department. They had given us instructions for the planting and potting of Mango seed which we had followed meticulously. I had hand picked 500 mangoes from selected trees in Broome and arranged nursery care after potting them. After 12 months we arranged special road transport and maintenance to travel the 1,000 kilometres to our property. We had been advised the information given to us by the Department was a result of trials from their Research Station. The Department of Agriculture and the CSIRO had the Kimberley Research Station, on the Ord River, near Kununurra.

After 18 months and two pot changes as directed, our trees began to die. The Department was unable to determine why they were dying and we were frantic. We

**Tropical Farm - Ord River, Kununurra
(W.R. & J.M. Withers)**

**Analysis by the Government Chemical Laboratories,
125 Hay Street, Perth W.A.**

Soil sample taken from the Worm/Mulch pit on May 1980.

Analysis was conducted on the understanding that soil sampling was carried in strict accordance with procedures recommended by the Department of Agriculture.

Lab No. Samples 13787/80 & 17395/80	pH (1+5) 8.0	Reaction Mildly alkaline
Less than 2mm dry basis		%
Total Nitrogen, N		0.463
Organic Carbon, C (Walkly Black)		5.90
Item		Parts per million
Nitrate		68
Zinc, Zn (extr in ammonium carbonate/ETDA)		18
Calcium, Ca (extractable in 0.1M HCL)		5400
Magnesium, Mg (extractable in 0.1M HCL)		1440
Phosphorous, P (extractable in 0.5M NaHCO ₃)		300
Potassium, K (extractable in 0.1M HCL)		1020

The concentration of plant nutrients in this organic soil are very high. The values for both the nitrate and zinc are about ten to twenty fold normal soil levels for the Ord River. We suggest you discuss these results with the local office of the Department of Agriculture.

Agricultural Chemical Laboratory.

Copy to O.I.C., Ag Dept, Kununurra.

Table 1: Soil analysis results

quarantined the trees in the nursery whilst watering them with the hope of salvaging some. We lost the 500 trees.

Remember we were not farmers. With the thought that it may be some form of Die Back or other disease, we planned to burn the pots and trees and fumigate the soil prior to disposing of it as directed. As we were removing the trees from the pots we noticed that all trees had a bulging knot about 10cm beneath the soil surface.

Further investigation proved the Department had not done trials with Mangoes at the Kimberley Research Station even though trees were growing there. The information, from trials, had come from their Tropical Research Station which was in Carnarvon. Carnarvon is not in the tropics.

We had followed directions for non-tropical growth and did the pot transfers, without disturbing the root system, at the times recommended. Our growth rate was three times that of Carnarvon so we were transferring a coil of knotted root from the bottom of the first pot into subsequent pots. Eighteen months later the trees choked themselves to death.

Our anger and subsequent comments about the Department of Agriculture did nothing for public relations. It is understandable why they may have endeavoured

to prove we were not practical in following the pathway of organic growing which was strange to them.

When we found the Departmental Officer taking leaf samples, and heard his explanation, we asked if the results of the district trials would be available to us. He replied in the affirmative.

After 12 months of pestering the Department, we received the results of the trials which proved to be most interesting. Only three orchards had been tested. One was the Department's trial orchard which had labor inputs with fertilisers and sprays beyond economic realities. The other orchard belonged to Chris Wilford, a very efficient, conscientious farmer who was receiving some assistance from CSIRO. He had optimum fertiliser and irrigation programs including nutrient and trace element additives.

Code	% Dry Basis					PPM Dry Basis		
	N	P	K	Ca	Mg	Mn	Cu	Zn
Wilford	1.14	0.11	0.64	1.97	0.46	83.8	8.1	13.2
Wilford	1.42	0.10	0.51	2.27	0.42	101.0	7.8	10.6
WA Dept of Ag.	1.45	0.11	0.79	1.31	0.28	83.6	4.9	12.4
Withers	1.43	0.13	0.75	0.91	0.34	31.0	8.6	14.7
Withers	1.56	0.13	0.85	1.06	0.43	50.2	6.8	12.5

Table 2: Leaf analysis by the West Australian Department of Agriculture

Table 2 shows the result of the trial conducted by the Department of Agriculture in February 1984. I have a sneaking suspicion the trial results were not what they expected. That is now of historic interest. I must say that our relationship with the Department in 1996 is now amicable.

And now back to the other experiment we conducted in 1980 with the earthworms and poultry.

Figure 4 shows our Organic Survival Unit MKII. It is comprised of an all-steel shed in three sections: the laying room with food and water hoppers (A), a double mulch/worm pit with bricked sides and no bottom to allow the worms to travel into any of the three surrounding yards (B), and a workshop and tractor shed which is convenient but not really necessary (C).

It works as follows; mulch and earthworms are placed in the mulch/worm pits and moistened from an in-situ tap. Yard One is covered with protein – hay, grass cuttings, torn newspaper, hessian bags or whatever is available. It is moistened from the in-situ overhead mains pressure or header tank sprinklers. One rooster and a dozen hens are introduced.

After approximately four months, the poultry is shifted into Yard Two, where the process is repeated.

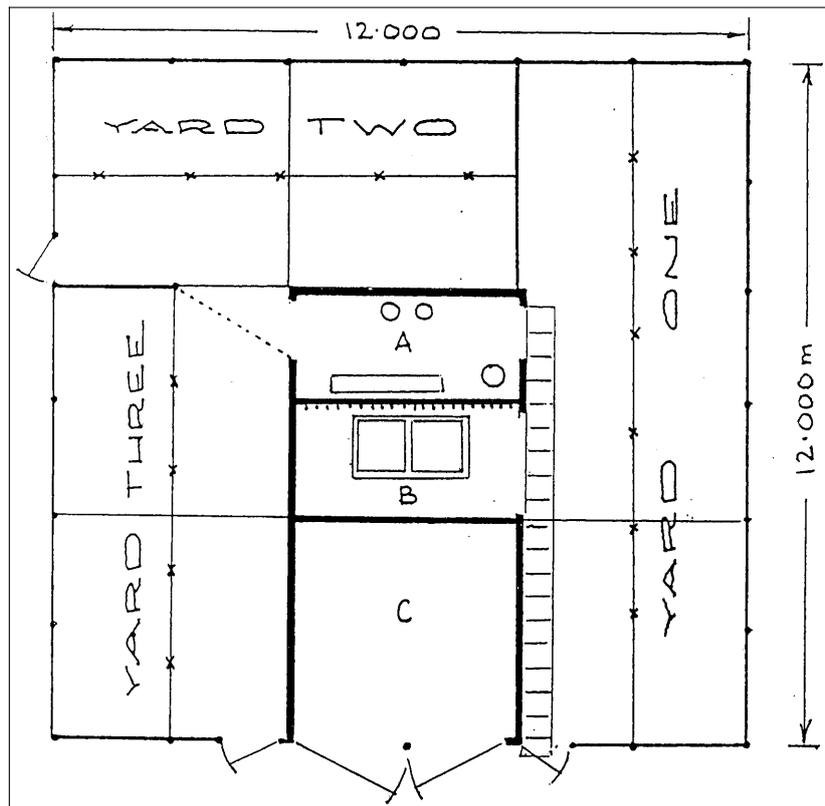


Figure 4: Organic Survival Unit MKII

Lets us now see what we have in Yard One. The soil has been deep tilled by the earth worms moving from the pits to get the moist protein. The soil has been surface tilled by the poultry scratching for the earthworms. The symbiotic fungi beneath the damp protein has conditioned the soil which is now weed free because the poultry eats everything which germinates. The soil has been fertilised by the poultry and the earthworms. The earthworms surface during the evening to seek food and to defecate when the poultry is asleep. The yard is now bug free because the poultry eats every moth, grub, pupae and every other living piece of protein they can get their beaks to.

The soil is now ready for planting vegetable seeds.

In early trials we found that insects would eat and infest the vegetables unless they were heavily mulched. At first we thought the protection was due to protecting the root systems from heat stress but soil analysis showed an increase in available zinc after heavy mulching and earthworm activity. We now suspect the combination of earthworm activity and symbiotic fungi is maintaining the plants in balance with the soil, without stress. The resulting balance is not tempting nature's forces to destroy the plants.

After the vegetable seeds germinate we immediately mulch around the young plants and maintain the mulch throughout the season. Besides maintaining healthy plants it is also a form of weed control whilst reducing evaporation.

Figure 5 shows the unit with the first crop planted in 1989. Note the little self-sown Paw-Paw tree on the right of the photograph. It will be mentioned later.



Figure 5: *The first crop in the Organic Survival Unit MKII*

Figure 6 shows the poultry yard. As soon as the cockerels start raping their sisters and aunts they are converted to table birds.



Figure 6: *The poultry yard in the Organic Survival Unit MKII*

Remember the little self-sown paw paw tree. It proved to be bi-sexual. **Figure 7** shows a paw-paw picked at 8 months. At the age of 21 months it had six bearing branches with 102 mature size fruit.

The paw-paw is just one example of many self-sown fruits, including melons and pumpkins. We have also grown many vegetables, not shown here, which demonstrates that dead soil can be regenerated and produce quality vegetables and fruit using organic principles.



Figure 7: Paw-paw picked at eight months

One of the enjoyable segments in this little project is that of domestic and farm waste disposal. In the home we have a three bin waste system;

- Bin One contains paper and cardboard.
- Bin Two contains hard waste for recycling or erosion gully land fill.
- Bin Three contains protein waste.

If you build your own unit you may enjoy doing this. Each morning, whilst still half asleep and weather permitting, don your slippers or “wellies” and do the following;

1. Take Bin One (paper) and Bin Three (protein) up to the Organic Survival unit which has the mulch pile outside its wire walls.
2. Tear up the paper & cardboard and put it on the mulch heap.
3. Give the protein to the poultry and waste a bit of time talking nonsense to the chickens.
4. Rinse out the bins at the worm/mulch pit tap and collect the eggs in one and put the vegetables and fruit you have picked in the other.
5. Return to the house, wash the eggs and place in the cartons provided by your eager neighbours who barter or illegally buy your surplus eggs. That money goes to the purchase of grain and pellets. Surprisingly, at the end of the year, you find the unit is self supporting and your fruit, vegetables eggs and table birds only cost you some enjoyable labour.

After those five morning exercises you find that you are fully awake and your psyche is in excellent shape to face the challenges of the day.

In winding up this session I will show you another project at the homestead which was an aesthetic and ecological success but, in our case, a total failure as a food producer.

Judy wanted a Japanese bridge and pond. I thought I would make it part of an experiment in aquaculture. Two waterfalls were put in place to oxygenate the water. Water weed and lilies, from the lake, were added to allow an eco system to develop. Two baby Sleepy Cod were caught from the lake and put into the pond.

The Sleepy Cod are now 40cm long and they feed themselves from the eco system which has developed in the pond. No chemicals are added to the pond but the water is filtered through a plastic membrane. An occasional tit-bit from the table is offered when visitors wish to see them. Sleepy cod is a delicacy which costs A\$80 per plate in Singapore.

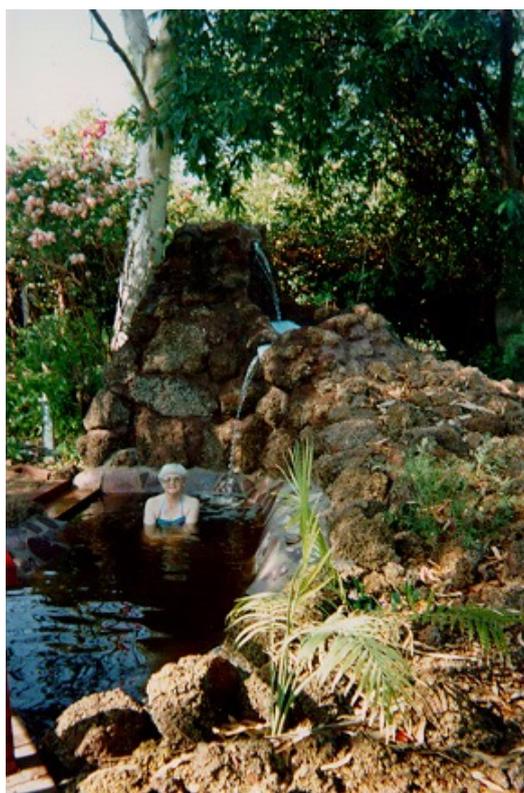


Figure 8: *The pond*

Figure 8 shows the pond with Judy near the waterfalls coming from Mount Judith (she doesn't like that name for some reason). We have a problem. When I am in the pond, cleaning the filter, the cod rest on my feet and look up at me. They let me tickle their bellies. One has turned pure white whilst the other is a mottled black. They are named Angelica and Diablo. They are family – we can't eat them!

Before closing, I should mention another simple system we use to convert hardpan to arable soil. When we select a particularly degraded area and use it to stack iron, timber, seldom used farm implements and things we will keep but never use, the area becomes a microcosm.

Small reptiles, insects and birds use the stacks as havens. They dig, hunt, nest, mate, breed, defecate and die in and on the ground beneath the stacks. The wind carries seeds which hit the stacks and drop to the ground. After rain the moisture is retained for longer because of the micro tillage and reduced evaporation. The natural

mulch from wind blown vegetation and old growth plus the moisture allows the growth of fungi. The environment is now suited to earthworms which may discover it on an evening migration. Natural symbiosis is at work.

Within three years we need to extract our stacked material from the mini jungle and find another degraded area for storage. The once degraded soil has been tilled, fertilised and conditioned by a host of microbes and animals in symbiotic relationships.

That wraps up this session. It has all been fairly simple and I hope you may have gained some of the joy we experienced in discovering how to convert hardpan into arable soil without mechanical tillage or chemicals whilst enjoying the surrounding beauty and first class food.

Dryland Water Management and Organic Farming

Peter Woodward (Australia)

[Presentation Report]

The main areas discussed in this presentation were the water cycle, soil fertility and crop establishment, and methods developed by Harry Whittington, a Brookton farmer. WISALTS Inc (Whittington Interceptor Salt Affected Land Treatment Society) was formed in 1978 – the aim of the society is to retain and promote the theory of salt encroachment and the method used to control it.

The Water Cycle: Rain falls onto the earth and is used by the plants and micro organisms, some evaporation is lost from the soil, the rest sinks into aquifers, and the overload goes into the rivers for fresh running water all year.

Water harvesting: Four-sided dams retain water the most effectively, with clay from beneath the dug-out soil being used to seal the dam. If necessary, plastic sheeting is put beneath the clay-soil to retain the water. Humus is important in the water cycle to help soak up moisture.

Soil Fertility: The aim is to grow healthy food for the community. Green manure crops, such as lupin and barley, are planted between December and February, not too soon. They are ploughed in in May to add nitrogen to the soil; the food crops are sown in June.

Soils need to be re-mineralised after years of superphosphate application; dolomite and gypsum or magnetite are added. Oxygen aeration (by earthworms and animals) improve the soil.

Much time is necessary to observe and examine the soil.

Crop Establishment: If a high clover content is evident then a crop can be sewn in. However, if there are weeds they can be grazed. There is usually a three year rotation. Plough in the weeds after germination, apply the rock minerals, then seed. Harrow the weeds if necessary, then harvest.

On leaving Agricultural College and returning to the family farm, Peter became interested in water control. The opportunity arose to attend a WISALTS course. This led him into becoming a senior consultant with the organisation. The work helped to increase his awareness. He realised that by changing the water-oxygen balance in the soil, one can significantly change the entire ecosystem of the soil.

Part 3

Economics Stream

Farmer-Consumer Co-partnership Agreements in Japan

Helen Kavanagh (Australia)

[Submitted Paper]

Introduction

Hi, my name is Helen Kavanagh, I am a post graduate student from the University of Adelaide studying alternative communities in Japan: communities which combine sustainable agriculture with an industrial capitalist urban lifestyle. The system we are going to look at is called *teikei*; or farmer-consumer co-partnership agreements (character based languages can be very precise!) *Teikei* is an experience which has radically changed both the farmers and the consumers involved in it and it is something like subscription farming. I have just begun to study this subject and I hope to travel to Japan next year for a first hand look at the system, especially at their decision-making processes.

Why look at this particular topic?

Well, given that our conference theme is **'Designing For a Sustainable Future'**, I think *teikei* is important in several regards:

- It is a middle class, urban consumer driven movement. It was the city housewives who demanded organic food. Which is precisely what needs to happen all over the world. So, we will look at what prompted these Japanese women to not only demand organic food, but to be prepared to support farmers financially and physically in growing it for them.
- It has been going for over twenty years and involves more than 16 million people¹. In other words it is pretty successful. It would be great in Australia! Even if this may be considered an optimistic figure, it is still a significant movement. (Japan's population is around 160 million.)
- Japan holds a critical leadership position in the South East Asian region. The sort of economic growth experienced in Japan, and especially its consequences, presents a vital lesson for other countries of the region, who are now repeating it, sometimes quite consciously.

So, the reason I am here today is to tell you about a successful system of farming and distributing organic food in a heavily urban industrial society. I think that there is a lot to learn from this and hopefully we can take home some kernel of an idea or an inspiration for our own lives and work.

During the next forty five minutes I will talk about the background of farming problems and pollution in Japan which lead to people developing ideas like *teikei*. Then you will engage in a group brainstorming session. (We can't have me doing all the

¹ See Japan Organic Agriculture Association IFOAM Asian Conference 1993 paper, p11.

work!) And, at the end, we will leave with a working knowledge of this particular method of providing, if not a perfect community, then at least a system which has the potential to occupy that important transition stage between what we have now and the sustainable future we would like to see.

Background – agriculture

Let's start with the state of agriculture in Japan today.

I will begin at the end of the second world war. Of course there was farming before this! But, just as obviously major changes occurred from this time. The American occupation leaders quickly realized the importance of land reform and increased food production in creating a stable political and economic environment in Japan. The country was in ruins, the people defeated and starving, and to top it off, the population was suddenly increased by 6.6 million returned soldiers and former colonists from places like Taiwan and Manchuria.²

The first initiative was to redistribute ownership of land from the large landlords to many small farms, this greatly helped to diffuse a very real threat of internal social revolution. You can imagine that the people were in a greatly agitated state around this time and ideas like socialism and communism began to appear admirable to some.

[Slide of farmer with ox]

This photo was taken in the 1950's and it illustrates the extent of Japan's modernization 'miracle'. It was aptly named in many ways. Even up to the 1960's it was not uncommon for peasants to share their one roomed dirt floor houses with their cow or horse.

Notwithstanding the success of the American occupation in this regard, Japan does have a very strong tradition of popular protest which continues to this day³.

[Slide of farming women at Narita]

This is a slide of two women who have been thrown out of their farms which are now part of Narita airport. This shows just one of many instances of determined, though often unsuccessful citizen protest, you may have heard of the furore over American Military bases in Japan for example.

The American occupation leaders very quickly realized the potential for Japan as a dumping ground for their agricultural surpluses which were extensive even in those days. As soon as it was set up, Japan's farming industry was offered as a sacrifice, first to the USA's cold war imperatives and endless agricultural surplus, then to provide labour, land and water to fuel the rapid economic growth of the 1960's and now to balance Japan's own immense industrial trade surplus⁴. (In other words

² Nozoe Kenji, 'At Dangerous Crossroads: Japan's Agriculture and Food Security', Japan Quarterly, 1981, 28(2), p218.

³ Hane Mikiso, Peasants, Rebels and Outcasts: The Underside of Modern Japan, Pantheon Books, New York, 1982, ch1.

⁴ Ohno Kazuoki, 'Japanese Agriculture Today: The Roots of Decay', Bulletin of Concerned Asian Scholars, 1992, 24 (4), p50.

the only economically feasible imports with which Japan can balance its high tech exports are agricultural products.)

All this adds up to a pretty miserable situation for farmers. Let me show you some recent statistics: Japan (1988) 2% of Gross Domestic Product (GDP). Australia (1993) 3.4% of GDP. It is interesting to note the difference between Japan and Australia in exports: Japan – (1989) 0.4% of exports, Australia – (1993) 27% of exports⁵ Also, Japan is only 30% self sufficient in food production (1990)⁶. The lowest of all ‘advanced’ nations.

In early times, of course, Japan was an agrarian society with most of its population engaged in farming, even by the end of the war 45% of the workforce was engaged in agricultural pursuits. By 1960 it was 27% and by 1988 it was less than 7%. (To illustrate this: in 1988, fewer than two thousand people took up farming, that’s for the whole country.⁷) The Australian situation goes like this: 1939 – 20%, 1971 – 8%, 1993 – 4.9%⁸

Japanese farmers are amongst the highest users of chemicals in agriculture in the world and you can imagine the cost in terms of health and environmental destruction. In 1980, the amount of money spent on agricultural chemicals per land unit was ten times that of the USA and the amount of undiluted chemicals used per hectare exceeded 10 kilograms⁹

The average farm size is less than 1.3Ha, with 90% of farms less than 2 hectares. (Apparently the average farm size in Australia is more than 40,000 Ha.)¹⁰ 90% of all farmers work part-time and on average less than one fifth of farm income is earned from the property. Also national farm debt exceeds income and that more land is used for golf courses and holiday resorts than farming.

[Slide of Golf Driving Range]

This shows how fanatical they are at golf. They won’t even stop long enough for the balls to be collected.

If you add to this:

- Rural depopulation and an aging workforce
- The trade and tariff changes forced through by GATT. (An aside: According to the Dunkel Plan (Uruguay round of GATT meetings), the international standard of acceptable chemical residues in rice will increase by five to ten times the existing limits in Japan. Why? Rice is not considered a staple grain in American or European diets, so they (we!) allow a chemical residue content

⁵ Commodity Statistics Bulletin, AGPS, 1994.

⁶ Yoneyama Shoko, Prescriptions from the Periphery: Japanese Farmers and the Search for a Survival Strategy, Japanese Studies Bulletin, 1995, 15(1), p49.

⁷ All previous Japanese statistics from Yoneyama, 1995, *ibid*.

⁸ Commodity Statistics Bulletin, 1994.

⁹ Yoneyama Shoko, ‘Organic Farming: Japanese Farmers’ Search for a Survival Strategy’, Asia Pacific Journal on Environment and Development, 1994, 1(2), p76.

¹⁰ James, G., Agricultural Policy in Wealthy Countries, 1971, p. 106

which would be unacceptable if it were eaten on a daily basis (which we all know nobody does!). Because of the inordinate power of these countries in GATT, these levels are now going to be forced onto all other countries. And if they are not accepted the cry of 'unfair trade barriers' goes up.)

Anyway – back to the subject – given the situation, you will not be surprised to hear that farmers are actually abandoning productive land in Japan to the tune of 380,000 hectares by 1990.¹¹ I think we can safely call this a rural crisis.

Background – pollution

Now, what is the background to consumer demands for organic food.

Of course there is a baleful history of pollution related diseases characteristic to Japan. There is no need to go into great detail, you probably know more than me about the pollution problems of the world. However, much of Japan's pollution directly affected people through their food.

Minimata disease, or organic mercury poisoning is probably the best known, caused by the high levels of mercury in fish and shell fish. Cadmium poisoning called Ittai Ittai, which literally means it hurts! it hurts!, is another.¹²

But the food poisoning which was most directly responsible for the creation of teikei was the so-called arsenic milk poisoning incident. Due largely to a push from America to dispose of ridiculous dairy surpluses, powdered milk formula was aggressively marketed in Japan from the early 1950's. With the full backing of government and the medical profession, women were encouraged to bottle feed their babies. Besides the claims that it was more nutritious than breast milk, bottle feeding also 'freed' young women to work in the burgeoning industrial sector. (Shades of what is happening in other parts of Asia right now.)

To prevent the formula from putrefying, sodium phosphate or soda, was added to the milk products (no doubt it still is). From April to July in 1955, the Morinaga Milk Factory, Japan's largest supplier of baby formula, used industrial grade soda, which was one third the price of that designed for human consumption. Unfortunately it also happened to contain arsenic and as a consequence over 12,000 babies were poisoned, 600 people died and 6,000 more were permanently impaired.¹³

To make matters worse the mothers' own milk was often contaminated with agricultural pollutants. (DDT, of course, was in use world-wide at this time as well as who knows what.) It was a no win situation. And neither government nor business was interested in redressing the problem. Not surprisingly! So it was up to the people, the mothers in particular, to cooperatively band together to fight for the rights of themselves and their children, a fight which continues to this day. One of the priorities of their campaign was the need to obtain safe, wholesome food.

Hence the birth of the teikei movement.

¹¹ Yoneyama, 1995, p51.

¹² J. G. Notehelfer, 'Japan's First Pollution Incident', *Journal of Japanese Studies*, 1975, 1(2), p351.

¹³ Kichiro Shoji & Masuro Sugai, Ch 3 – The Arsenic Milk Poisoning Incident, in Ui J. (ed.), *Industrial Pollution in Japan*, United Nations University Press, Tokyo, 1992.

Teikei

So, we have looked at the problems of farming in Japan and its history of food pollution, these elements provide the background for the creation of co-partnership agreements between farmers and consumers.

The Miyoshi Co-Partnership group

Now let's look at how one particular system (the Miyoshi Partnership) developed and what its guiding principles are.

In the 1970's a group of Tokyo housewives determined to seek out farmers willing to grow safe, organic food for themselves and their families. When they found people from the nearby Miyoshi village who were interested in the idea, they presented their case at a village meeting asking for the farmers to change to organic agriculture. The farmers agreed on the condition that they would not have to suffer a reversal in economic status.¹⁴

No doubt innumerable meetings of committees and sub-committees were held before the project finally got under way. These are the basic beliefs through which they developed teikei:

1. The function of food is to nurture life.
2. The basic function of farming is to feed the farmer's own family. (This is a novel idea to those of us who think that the basic function of farming is to make money!)
3. To feed your family you must be self sufficient.
4. In a teikei system, consumers are theoretically supplied by the farm's surplus which actually makes them part of an extended farm family.
5. Organic farming requires a higher labour input in which the urban dwellers need to become involved, this leads to a deeper understanding between country and city.
6. Packaging and selection of food is greatly simplified. (It is simply not necessary to present food attractively for sale. Sometimes the mud is not even washed off!)
7. Food is distributed by the members of the group, either the farmers and or the consumers, in this way wholesalers and retailers are removed and face-to-face interaction is fostered.
8. Consumers are required to buy all of the farm produce when it is in season: this leads to a remarkable reform in the diet and shopping habits of consumers. The teikei motto is to 'eat from root to leaf', The simplicity of a rice based diet is evident here: to provide bread or flour is not so easy.

¹⁴ Darrell Moen, 'Emergent Culture of Japanese Organic Farming: Miyoshi Producer Group - Tokyo Consumer Group Co-Partnership', *Journal of Social Science (Japan)*, 1992, 31(2) p80.

Prices are set by mutual agreement.¹⁵

The ten principles of Teikei

Now lets look at the principles of the teikei system.

1. To build a creative, personal relationship based on friendship, not business.
2. Planned production based on mutual agreement between farmers and consumers.
3. Consumers to accept all produce harvested.
4. Mutual agreement on prices which are fair to both parties. (This is very important I think, that there is usually no reliance on 'market prices' at all. The so called 'invisible hand' which mysteriously decides the fair market price of a product is a most harmful twentieth century myth.)
5. Exchange of information and communication to strengthen the relationship. The Miyoshi Teikei has the following committees:
 - Committee for the Purchase of Outside Produce,
 - Committee for Forwarding Deliveries,
 - Committee for Enno (Internal) Newsletter,
 - Coordinators of 'Everyone's House'- which is a building in the village built for the exclusive use of city helpers,
 - Committee for Children's Activities – to get city kids and country kids together for camping, nature hikes etc.,
 - Public Relations Committee contribute articles to magazines and journals,
 - Grievance Committee,
 - Committee for Study and Research – organizes meetings, produces a newsletter, runs a library of films, books and cassettes,
 - Committee on Food Life – prepares information and recipes.

There is a lot of information gathering and exchange going on here!

6. Self distribution of produce. Either by farmers or consumers. (Once again the 'market place' is completely avoided, there are no wholesalers, retailers or shops of any kind.)
7. Democratic group activities. (The actual arrangement of decision making is very important. Is it a form of majority rule or consensus? This is one of the things I am interested in and hope to research.)
8. Emphasis on self education programs. (I have already mentioned the amount of committees which concentrate on self education. An example of its importance is the oil crises of the 1970's which influenced the development of ideas such as local consumption of food and energy self sufficiency.)

¹⁵ Masugata Toshiko & Kubota Hiroko (trans. Iba Mikako), *Diversifying Organic Food Distribution in Japan: In Search of Alternative Systems for Farmers and Consumers*, 1992, pp2-20.

9. Maintain appropriate group size. In Japan that means keeping the groups small enough to maintain the important face to face interactions.
10. Consistent progress towards the realization of the goals of organic agriculture and an ecologically sound life.¹⁶

Conclusion

Well, that was a quick look at one example of a move towards a more sustainable future of one country.

I think some of the greatest assets of Teikei are what it does NOT have: there is no notion of *exporting produce*, there are no *shops* or warehouses, no *market pricing*. These are all good things to get rid of. Unfortunately, although it provides a stable and healthy lifestyle for the farming families, the consumers are still locked into wage oriented exploitative lives in a heavily polluted environment. Although perhaps they don't accept these conditions as easily than those city people who do not belong to a teikei group.

Of course it is not all roses and champagne and these groups experience their share of troubles too.

- Some problems at the moment relate to the age of these groups: the initiators who had the enthusiasm and drive are getting older and it is hard to find young people to take their place. The movement as a whole seems to be losing its momentum.
- Housewives, who do most of the distributing of produce, are much more likely to work now. A classic dilemma of modern times: on the one hand economic independence for women is often essential for the well being of their families and on the other it robs society of the ability to provide loving caregivers for its members, especially the old and the young.
- Some groups are just too big and unwieldy and they have lost that face-to-face element which is essential to all of the other principles of the system.
- Another problem illustrates the insidious nature of capitalism. Because of the increasing demand for organic produce it is more and more easy to find it in supermarkets and specialty stores, no doubt imported from Australia or somewhere as well! So the desire for safe and wholesome food need not go hand in hand with this unique method of also creating a sustainable community organization, but will be provided by the 'disinterested' market place instead.

Nevertheless, there is a strong commitment to reform in the movement to suit the changing needs, largely of the urban consumers, without compromising its most important principles.¹⁷ This is where I come in – maybe at the next conference I can talk about how these problems are being, or could be, overcome.

¹⁶ Masugata & Kubota, pp1-2.6

¹⁷ Ibid. pp18-21.

To reach a sustainable future we have to travel there, we have to get there somehow and it is how we get there seems to me to be the crucial question. Social revolution, for example, was once heralded as the saviour of the common folk and the world, but it's just not tenable any more. That leaves a gradual change or reform – but how to keep reforms strong enough to withstand the excesses of capitalism, to resist collapsing back into the commercial profit driven constraints, I don't know.

Archimedes Trading Network

Thomas Mack (USA)

[Submitted Paper]

Archimedes Trading Company Ltd. is an international trade and investment firm specializing in trade of regenerative biological and cultural resources.

Archimedes is engaged in making the economic and cultural links to connect a global worknet of ecologically based enterprises.

Archimedes is about investing in people; investing in the restoration of ecosystems; and investing in the people that steward them.

Archimedes leverages resources, people talent, design skills, technology and information in support of a global economic development web to support an ecologically sustainable future.

Based on a decade of research and involvement in ecological design and development, *Archimedes* has strategically selected three areas for trade, investment, and development:

- *Agroforestry products*, ranging from fine furniture hard woods to bamboo, to nurseries, gourmet mushrooms, natural fibers, and many other forest products derived from regenerative forestry practices.
- *Botanical pharmaceuticals*, essential oils, medicinals, food supplements, and cosmetics produced through ecologically sustainable cultivation methods.
- *Human-scale technologies*, or living technologies, which are ecologically sound and culturally appropriate, and which serve to benefit humans and their environment.

Permaculture

During the past twenty years, permaculture has grown into a global grassroots initiative, a diverse folk movement that is inventing itself with new cultural adaptations. There are permaculture institutes in over 50 countries and projects in over 100 countries.

By definition, these projects are developing local regenerative economic resource bases, and in many cases, services and product for trade. Many of these projects have been initiated by philanthropic contributions based on the worthy goals of sustainable land use and ecological design.

Out of this evolving network of projects emerges an opportunity to form a trade and economic development network. Permaculture is a growth industry. *Archimedes* is positioned to leverage the collective strength of the global permaculture worknet. *Permaculture is a growth industry.*

Global village worknet

Archimedes will arrange advance purchase contracts between large volume customers in the developed world with local producers trained in ecological cultivation and production systems in developing countries.

Archimedes will provide eco-village development projects with a link to appropriate technology sources. *Archimedes* may broker the sale of appropriate technology products or arrange licensing and distribution.

Archimedes will invest in capital assets to support sustainable agroforestry, botanical pharmaceutical and appropriate technology projects or enterprises in developing countries.

Archimedes will employ sophisticated *ecological land use design* matrices to prospect for undervalued land, and/or land which may have been subject to environmental degradation.

Archimedes will assemble training, finance and development teams to regenerate land and initiate biological systems to support economic botany and ecological village development.

Training and development

Training and education are essential to the mission of *Archimedes*. *Archimedes* will organize and mobilize earth restoration teaching teams that will conduct in-country intensive permaculture training. Permaculture education consists of training in a system of ecological land use planning and developing sustainable life skills.

Archimedes will invest in a community by providing training and follow up support to establish community-based agroforestry project, and village forest gardens which can supply an abundance and variety of regenerative products. *Archimedes* will establish global trade links which will help create economic self-sufficiency.

Philanthropy and development

Archimedes will link philanthropy with economic development to support sustainable living systems and ecologically designed human habitat. *Archimedes* will work with charitable foundations and organizations to transform grant money into sustainable local enterprise based on regenerative resources.

Philanthropic organizations may sponsor educational programs with grants directly to local non-profit organizations in developing countries. *Archimedes* will facilitate training and work with local communities to establish small enterprises that are ecologically sound and contribute to local economic self-reliance. *Archimedes* will then facilitate trade, marketing and distribution of products from the global village economy.

Guiding business strategies for Archimedes

- Leverage people, resources and information to develop sophisticated resource flows.
- Invest in people and projects which improve or regenerate ecosystems.

- Trade in products which are produced through ecologically and socially sustainable means, and which maintain a high standard of quality.
- Build on the collective strength of the existing worknet of the international permaculture community.
- Minimize administrative aspects of trade. Develop reliable contractors for shipping, custom's brokering, fulfilment house, etc.
- Develop an information rich, materials light, sustainable resource company.
- Utilize the visual and interactive information flow capacity of the World Wide Web to advertise product and develop project support.
- Maintain a long term view when using decision criteria.
- Apply strict ecological accounting principles on products and processes and maintain high quality standards for all goods in trade.

Long term vision for Archimedes

Archimedes is built on the premise that an investment in training of people in ecological design and sustainable land use planning offers a bright economic prospect for the next seven generations. Japanese corporations and the government of Japan have jointly developed a 100 year plan for Japan to become the leader in "clean" technologies and industrial ecology. Long term thinking is necessary if we are to transition to an ecology of commerce.

Following the lead of Sweden's industrial ecology example, large corporations all over the world are exploring The Natural Step, a shared framework for developing consensus on the systems conditions for sustaining life. Major corporations are redesigning their business to align with ecological principles.

Archimedes looks forward to participating in a form of global commerce that benefits all of life on the planet. It looks forward to participating in the creation of a web of beneficial relations which sustain a feedback loop that returns nutrients and biological resources back to the earth in support of life.

Archimedes is designed to provide a buffer for participating permaculture and eco-village sites against international currency fluctuations or market disasters, and to encourage non-currency economies, as a meta-LETS or barter system.

The long term vision for *Archimedes* is to create (or return to) a system of merchant transport that is environmentally benign. Economic globalization has created a huge transport industry that runs on and perpetuates the extractive industrial economy. From a strict ecological accounting standpoint, sailing is the only justifiable means of transport currently available.

This vision received its inspiration from Margaret Mead's original notion of "Ocean Arks." *Archimedes* may initially utilize currently available shipping and transport means, while developing plans to move product via solar-assisted sailing vessels.

These “*bioarcs*” would carry seed, products, crafts, technology, etc. while producing food and compost as they move, with the assistance of wind and sun.

Cooperative business structure

Archimedes is registered as a limited liability company in the State of New Mexico. The company’s principal shareholders are Director Danielle Leonard and Thomas Mack, Chairman of the Board of Directors. *Archimedes* intends to raise early capital through the sale of 49% of the company shares to individuals who present a high “value added” with their investment. The company is developing key contacts, partners and trade relationships in Africa, Europe, South America, North America, and Australasia.

The company is intended to be maintained at a relatively small scale with a limited number of private shareholder partners. *Archimedes* is not registered as a security, nor are there any intentions to take the company public. The ultimate legal structure of the company is yet to be determined, and the Directors are currently exploring off-shore facilities and a merchant bank charter.

Expression of interest

Archimedes welcomes inquiries from qualified individuals and organizations which a demonstrable track record in the areas of trade which Archimedes is dealing in. Interested parties may correspond via our response form, or in hard copy to: Living Systems Design / The Archimedes Project, 369 Montezuma #225 Santa Fe, NM 87501 USA.

Local Action for Economic Development in Indigenous Communities

Jo Maniapoto (New Zealand)

[Submitted Paper]

Tena Koutou Katoa.

Mihi.

Te mea tuatahi e mihi atu ke te Kaihanga irunga rawa. Nana i homai mana, tango atu. Nga mate ote wa, o ngau tau i muri, haere atu ra, e moe, hoki atu.

As I understand it, I have been invited to share with this conference, the strategies of the middle to late 1980's where community groups in New Zealand employed a diverse range of actions to make changes and in particular, to influence the Power Brokers which are not just governments, often they are government officials the people with whom communities negotiate, but we all know who the real power brokers are, the multinationals, the transnationals, who by their seamless borders wield economic power.

Thank you for inviting me to speak at this Sixth International Permaculture Conference. Firstly let me pay tribute to this land's first people, the Indigenous peoples of Australia. I bring greetings from my people, the Maori people of Aotearoa, New Zealand and in particular my own iwi Aihau in Whanganui. I pay homage to your Tupuna (old people) who have passed on. May your journey for equality and justice be fruitful and may your hopes and aspirations for the mokopuna (grandchildren) be realised. Secondly, let me pay tribute to other Indigenous peoples who are here today, for there are similar struggles throughout the global world. And last of all, let me congratulate the organisers of this Sixth Permaculture Conference. As someone who worked alongside others to bring about the Second Commonwealth Conference for COMMACT 1991 in Christchurch, New Zealand (Aotearoa) I am fully aware and appreciative of the long hours, dedication and headaches you would have experienced.

Let me introduce myself. My name is Josephine Rena Maniapoto. I come from Whanganu in the North Island of New Zealand.

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My iwi (tribe) is Aihau, and I am affiliated to Tuwharetoa and Tainui iwi (tribes.) I have 4 sons and 1 mokopuna (grandchild), all males. I am the Director of two small companies, Jo Maniapoto & Associates Ltd which was formed in October 1989 and Aotearoa & Pacific Resources Ltd in March 1995. Jo Maniapoto & Associates is essentially a community company and was set up to provide training and other services for predominantly, while not exclusively, Maori. The emergence of this company was three fold. The first was a deep anger and passion to provide our people

with the very best training the company could offer, as many of our people who entered institutions for education and training could not relate to the methods used and would often waste a year learning absolutely nothing, but within one week with the company, could produce a strategic plan and a corporate plan.

The second was to provide an entrepreneurial course of excellence, one which respected and valued people appreciating that people learn in different ways so different learning methods were required.

It was considered vitally important that the company research our history, focusing on the tupuna who traded in an effort to reclaim those entrepreneurial skills. Pat Dare faxed me papers on permaculture, and I see that it is holistic, that is how our people are. We are a spiritual people whose spirit encompasses all things, from our whanau (family), hapu (extended families) and iwi (collective extended families linked by whakapapa geneology). We do not compartmentalise our thinking or our actions. We want a better world for the mokopuna.

The third was to provide services which corporate bodies, or those who could afford were willing to pay, in order to subsidise or assist projects Maori were struggling to plan and implement. It is this company with myself as the head, which involved itself in political and social issues and we joined with others to action those strategies which were successful in the late 1980's and early 1990's. I guess these are some of the reasons I have been asked to speak here today, which leads me to make some assumptions. I am assuming that there are people here, who are angry, frustrated and dissatisfied with what is happening and want passionately to make changes (terminology comes in and out of fashion doesn't it? 'change transformation?') I must tell you that I don't have any miracle answers, that there is not one successful strategy, but to quote the General Manager of Whale Watch Kaikoura, "There are a smorgasbord of approaches which may lead to success."

[Slide]

Note! I say, may!!! I have been working for more than twenty years to bring about change, and so too have others. And I don't think that's something extra ordinary, it is my belief that we have merely carried on the work of the Tupuna (old people passed on). Every step along the way has been fraught with difficulties, however collectively along the way, we learned so much. It was a rapid learning curve. We shared information and became a formidable group.

Why did I get into this type of work? Quite simply one of my sons who had worked as a student through school holidays and worked for the same firm for 3 years became a victim of the Labour Government's restructuring policies and he lost his job. Our family came from that 'work ethic' era. We were conditioned into believing that if we worked hard at whatever job we had, no matter how menial and we saved, our future was secure. And when our son lost his job after 3 years, his father and I would make statements like "You can't be looking hard enough", "The jobs are there, just keep on".

We didn't know the world was changing. We didn't know what the global market place was all about. Gradually I watched my son's confidence deteriorate. That devastated me and I determined to find out what was happening.

In 1982 I studied Social Policy part time at Victoria University and worked at 5 part time jobs to pay for my fees, my board and I sent 3 pay packets home to my husband for the family. In April of that year my mokopuna (Renee) was admitted to the Wellington Hospital with Myeloid Leukaemia. As she was being treated at the Wellington Hospital, I continued my studies and kept my jobs so that I could pay her expenses and her mother's. I spent every available time I had spare with her. In November of that year, we brought her home to die in peace. So my decision to enter this type of work was based purely on the pain, anger and despair of those things which are out of our control and it affected my loved ones.

Aotearoa & Pacific Resources Ltd is a publication company, set up to publish a Maori Business, Service & Trade Directory. It is a commercial concern. It's intent is to assist the process of reclaiming our Tupuna's (old people passed on) trading history, pre-European times. My own iwi (tribe) Atihaunui apaparangi were plying their trade up and down the Whanganui river and trading with New South Wales.

[Slide]

Our people well knew the term "capitalism," and its implications.

[Slide]

Our people had wheat farms, flour mills and built ships among other things and fed those early settlers. The first ship that left these shores were filled with produce from our people.

[Slide]

The Settler government, in their greed to acquire land, justified their actions by going to war and called them (" Maori Wars"), while their troops killed our people and confiscated Maori land by force. Successive governments of the day did not even need to go to war, with the stroke of a pen, and their legislation the land was taken. Maori became manual labourers losing the entrepreneurial flair of the tupuna and so with those few words, it is plain to see Maori have been fighting for equality and justice for over 150 years and the mokopuna will continue the struggle for many generations to come. One can liken it to a rugby game, except that they own the playing field, the referee and the line referees.

In telling my story, I am also sharing the stories of many people "the movers & shakers" for that period, Maori and non Maori. We are all capable of visions and dreams, and we all have the capacity to make those dreams come true.

Almost from the moment of birth we have been schooled and goaded into using logic & reasoning. That's fine for certain things. But as individuals we are made up into many things – emotions, feelings, creativity, imagination, desire, our whanau,(family) our hapu,(extended family) our iwi, (collective families linked by Whakapapa) and we do need all of those things to make us whole. After all if we cut an apple in eighths and remove 2 eighths, we don't have a whole apple do we.

Nau mai ra haere mai ra i runga ite kaupapa whakapakari i te wahine Maori eee!
Haere mai, haere mai, haere mai ra!

I would like to quote an excerpt from Joe Williams, a Maori lawyer who works in Auckland, included in the New Zealand Planning Council's publication, *"Te Puna Wairere," Back to the Future: Survival in the 1990's.*

When I was a teenager, I remember speaking to one of the most knowledgeable kaumatua (wise old person) about a subject that has puzzled me for some time. I asked why the word for the front of an object, mua was the same as our word for the past (nga wa o mua literally translates as the time in front of us), and why was our word for the back of an object muri the same as our word for the future. The kaumatua must already have been thinking about the question because he answered without question. He said, "It is because our ancestors always had their backs to the future and their eyes firmly on the past."

"That" he said "is what makes us different from the Pakeha". At that point everything fell neatly into place. So that was why, whenever I attended hui, the old people spent more time talking about our ancestors and about the past than they ever did talking about the actual reason for the hui. That was also why, at those same hui, the ones who lived before and had passed on in to memory were the first to be greeted by Kuia in karanga and the Koroua (old man) in whaikorero (greeting). Many Pakeha detractors have said that Maori dwelt too much in the past, and they would probably be right, from a Pakeha perspective. The Maori response would probably be that Pakeha do not spend enough time thinking about and learning from their own past. That is why we are in the mess we are today.

"E kore e piri te uku ki be rino, Clay will not cling to iron." (The proverb comes from the famous haka 'Mangumangu Taipo', composed in Taranaki. Wet clay clings to iron, but as soon as it dries it falls off.. Similarly we must take pride in our ancient culture because western accretions will eventually fall off, and the Maoritanga will remain.)

One of the major difficulties facing Maori leaders and decision makers throughout New Zealand is the massive energy required to cope with even more massive 'take' (issues) and responsibilities, right across the board. The issues are so diverse and complex that there are times (Maori try to cope with everything), when energy dissipates, and efforts are fragmented. However when Maoridom organises its efforts, it is a sight to behold. We are only 12% of the total population.

One of the major triumphs for Maoridom in 1984 was the Economic Summit. The leadership was strong and well coordinated bringing together all the tribes to make their thrust. Strategically and tactically, Maoridom's strategy outmanoeuvred the three main sector interest groups (employers, unions, government).

Maoridom was 'awesome'. Leadership kept an eye on the trouble spots and moved quickly to bring it under control. So effective were the strategies that the Labour government could not refuse to give Maoridom \$1 million dollars for lending to small business enterprises at a low interest rate, not a lot when considering the amount of money government diverts into other schemes. Essentially to encourage the growth of Maori entrepreneurs. This money was distributed equally among the tribes and Mana Managers were appointed to work for the Maori Trust Boards and service their clients. Two highly qualified Maori were appointed at government level negotiated

a further 11.5 million for the next 5 years. They were contracted to liaise with government and the Maori Affairs Board who had the responsibility to oversee the project and work with the individual Trust Boards.

Maoridom was also successful in persuading the government to give them \$14 million for training purposes and iwi authorities had that responsibility as well. It was an exciting and exhilarating era for Maoridom. Its strange though, the more successful we get, the more threatened powerful people within the traditional institutions become, putting all kinds of obstructive matter along the path.

In 1985 a small group of fifteen Maori women met at Kai iwi, just out of Whanganui, for the weekend, to be trained in Structural Analysis introduced by Father John Curnow, Manuka Henare who was at that time the Head of EJD (Evangelism Justice & Development) and Sister Makareta Tawaroa, a catholic nun from Order of the Sisters of St Joseph of Nazareth.

Structural Analysis was introduced by Paulo Freire to assist oppressed peoples. a catholic priest who became disillusioned with his church. This training was happening in South America and Asian countries before being introduced in New Zealand.

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It describes the structures which govern our lives, and analyses the situation in which we find ourselves. It asks two questions, "who gains"? "who loses"? Structural analysis assists us to understand the process of uncovering oppressive structures imposed by the 'dominant ideology'. This allows us to think and question those influences imposed upon us. Who was the most powerful institution at that time and who were the most learned and what supported that particular institution, what was the dominant ideology. It is not my intention to give a workshop on the analysis, merely to highlight the issues, because this process of learning was the key factor in planning our strategies, particularly for Maori involved in the struggle.

From the training session one of the women who had been trying, from the Employment Conference to avoid the responsibility and expectation that she build an organisation which would service Maori in Whanganui realised that though the path was difficult she had the skills and ability to put it together, and there was the opportunity to have a model that other iwi could follow.

More importantly, Maori all over the country were in a crisis situation and it could not be shrugged aside

Maoridom has a hierarchical structure dominated by our men and there is a certain protocol and procedure to follow, which makes it awkward for people like myself. As I reflected, I decided that one of the best examples I could offer this conference was the initiative from my own people, because it became a model for Maoridom. It is significant, because it was the efforts of Maori people who became passionately angry enough to do something about Labour governments restructuring policies, the determination that we were not about to lie down and die And who were the most affected. Maori, because we were expendable. The Maori workforce were concentrated in the labour intensive industries, the mines, the forests, the freezing works, fishing. Of the 11000 jobs lost in the fishing industry 9000 of those jobs were Maori.

Let's look at the processes we used.

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- A small working party of 4 was formed.
- Consulted with iwi over a 12 month period.
- Set up a koha receiving system for small regular amounts.
- Set up the Te Wainuiarua Finance House.
- Put into place a strategy which coordinated all Maori training for access delivery and became a competitor with the local tertiary institution.
- Became the first Maori group to take on the radical 'Skills for Enterprise' training.
- Put into place a training package for rangatahi (youth) and secured funds for a detached youth worker, work development scheme coordinator & business skills training.
- Was the first Maori group in the country to successfully lobby for a health contract under Maori delivery.
- Funded the first small business enterprises from koha monies received.
- Was the first Maori group to receive government funds for small business enterprises.
- Decision makers saw it as a successful model and trustees were flown around the country to assist other Maori groups.

How did it happen, there were no recognised Maori leaders amongst them. What was their secret? Because all of this did not just happen. No one woke up in the morning and said, "Well, today I think I will take on the government and set up an Maori employment board". There were some major ingredients. First there was anger, passionate anger, and the determination to do something about it and their background was similar.

All but one of the trustees had come through poverty, deprivation and oppression, making sacrifices, working at a number of jobs in their childhood to supplement family income.

Most had been brought up in an environment of alcohol and abuse. So they had the 'work ethic'. All had succeeded at what ever level success was to each person. Most had brought up families or were bringing them up. Everyone had a concern for their mokopuna, their future. Most had worked towards strategies for fighting Maori social injustice, individually and at other times collectively with other networks.

Most had suffered personal pain in one form or another, most were working with unemployed youth and whanau during the early 1980's on subsidised programmes when unemployment Maori numbers began to rise so dramatically. Here they began

to pick up skills of advocacy, joining with other groups around the country on national issues. The Employment conference push came from similar groups around the country. After the conference the working party travelled the region to talk about the self sufficiency that could be created by building our own economy. The tribe came together at Te Ao Hou Marae set in the lower urban region of the Whanganui river to choose their trustees. I worked for this board for 3 years. At the completion of my term they were turning over \$2 million dollars. Small, compared to the figures thrown around, but wonderful considering their beginnings.

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That is one style of management and leadership that was different from the traditional hierarchical system that exists in Maoridom.

The second example I want to give you is Whale Watch Kaikoura, which is a commercial operation. At the time of writing the manual, Maori values and the cultural heritage were still intact.

Kaikoura is a beautiful little place in the northern part of the South Island of New Zealand (Aotearoa). The marae is situated on the top of a hill which overlooks the little picturesque town, surrounded by the sea and the mountains. It really is a sight to behold. The town's population numbers only 3000, but in the tourist season the numbers swell. 99% of unemployed were Maori, and while I know there is racism, it is usually covert, but in Kaikoura it was blatant. Normally in small towns Maori & non Maori co-exist in harmony, very supportive to each other. That was not the case in Kaikoura in 1987.

In the initial stage they consulted with a person who saw it as a such a good idea he went ahead with the project and claimed it as his own. The Ngai Tahu people do not become abusive or aggressive, they are clever, they decided to set up anyway, because their whakapapa links them with the whales and there are things only they know.

About 2 years ago Whale Watch Kaikoura bought him out.

In the setting up stages, their boats were sabotaged, their bus bombed, the conservation department were working against them, competitors were tracking them by sonar in an effort to be first at the scene. However despite all that they persevered and in the first year of operation their efforts injected \$2.6 million dollars into Kaikoura's economy.

A group of 5 Maori women from Whanganui trained in Structural Analysis were invited to Kaikoura by the 'Solomon' women to be trained in the analysis, in order to move their people from oppression. From those small beginnings has come a successful commercial operation which was voted the "Top Eco Company in the World". Wally Stone received the award in London. The women made many sacrifices, to make the dream for their people come alive. They planned, mortgaged their homes to get sufficient finance to purchase the first boats, trained their people, particularly their rangatahi (youth) set their strategies in place, brought in key resource people, and set about making their theory happen, and then an ex-Westpac bank manager offered to walk beside them. And like the tupuna they have adapted to

the complexities of commercial activities, without losing the culture and language which they hold dear to their hearts. They are an inspiration to Maoridom.

Who has brought this all together – first of all there are the women, wonderful Maori women who were passionate in their belief, who bring together the strands, who had undergone training, who have worked to right the social injustices for their people, using these skills of human relationships and business acumen. They have turned the old railway station into a tea shop and craft shop selling only quality goods. And then there was their leader, Bill Solomon a quiet, gentle man who tried to keep a low profile, whose leadership inspires, guides and encourages – a quiet, gentle man who tries to keep a low profile, – a leader who is not threatened by the creativity shown by others.

Two different Maori operations, two different models, but with common goals, building an economic base for their people and retaining their cultural heritage.

The experiences learned, lead individual members of the Whanganui Regional Employment Board then to begin working on National Collectives with employment issues still the strongest focus. Employment Resource Centres throughout the country were the only means by which unemployed people could get the type of assistance required, as the government enforced their draconian measures. The impact on Maori was devastating, but so too were the rural populations, particularly the small towns in the South Island in the 40 to 50 age group. These were people who expected to work in the one job until their retirement, no processes were put into place by the government of the day. Whole towns had their services withdrawn, banks, post offices, hospitals, medical services, government departments which lead to the withdrawal of chemists shops, manufacturers and so on. And so, the Employment Resource Centres became very active politically. The National Collective began to look at ways to persuade the government to fund these centres. The first task was to look for allies within government department, and elsewhere. to include them in the strategy. The outcome of that strategy was the government funded, ‘approved’ Employment Resource Centres and Enterprise Agencies, \$50000 each year for three years.

The New Zealand Collective Association of Employment Resource Centres sent a representative from the North and South Island to attend a Community Company Conference in Perth in March 1989, to analyse the situation, present a report and report back to the collective. A week was spent at the conference and the North Island representative spent the following week in the newest government agency for Employment, Training and Enterprise. This particular government agency seemed to work in partnership with the community.

This was a revelation, not heard of in New Zealand. A government agency that worked in partnership with the community? So the structure and organisational activities were examined and this was included in the report.

The South Island representative flew to Esperance to meet with the Facilitator and examine the possibilities of transporting that model back to New Zealand. Then he looked at an agency called DOME ‘Don’t Overlook Mature Experience’ This was really important to John Patterson because of the grief, his people were experiencing.

Strategically, the group lobbied allies within the government, set up conference calls to ensure the flow of information tracked progress, sent in skilled negotiators, then flew in the Director of the Western Australian agency amidst a publicity campaign.

New Zealand adapted the model and called the first government agency Community Employment Development Unit (CEDU) a division of the Labour Department. The National Government changed it to Community Employment Group (CEG) when it was elected, and while nothing's pure and there are politics to combat, by and large it does work in partnership with community, all community groups even groups like Local Authorities.

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It has supported many worthwhile projects including Main Street projects, designed to beautify the main street in many towns, which has increased the turnover of shops in the main streets. Another Australian model.

The New Zealand Planning Council was a non-government agency, although funded by government, It played an important role in influencing government about the changes it needed to make in order to compete on the global market. In particular it was instrumental in changing the direction of education.

It was made of people selected for their knowledge and expertise in specialist areas. My field of expertise was the Employment Monitoring Group, there were other groups like the Monetarist Group, Scientific Group, Education Group and so on. My contribution to this group was to challenge the attitudes of people who sat on this group to get off their comfortable seats and look at what the Maori community were already doing in efforts to assist themselves. Too often Maori were the victims of policies written for by people whose theory did not match the reality. I was sick of it. And they were made without making contact with our people or consultation.

As a result, research was undertaken and Grass Roots 1 & 2 produced. I have the last 2 copies here with me and I'm happy to offer photocopies of the document to anyone who would like a copy.

Maoridom and other indigenous cultures need to be part of the emerging information based society and it needs to move forward swiftly. Accurate information is power. We all must know how to get access to information, where to get it, and how to use it. We all need to look at the skills of training and retraining which will be required to transform resources and ideas into high value products.

Great businesses and great communities owe their success to a few individuals who developed their leadership skills and passed them on to succeeding generations of potential leaders. A foundation of excellence is a strong combination of strategy and culture. To unite strategy with culture, one must first develop a vision for the future. and then to implement the strategy, you need to nurture a culture that is both motivated by and dedicated to that vision.

Ten and twenty year planning is a thing of the past. It will be more and more difficult to predict the future because of it's uncertainties. While there will be detailed predictions of growth for specific industries, it is also certain that those predictions

to the year 2000 may be wrong, simply because the world is changing at such a rapid pace. However very broad based trends on historical events, patterns in more advanced economies, and some reasonably sophisticated 'crystal ball' gazing can be identified with some confidence.

Something we do know for certain, is that New Zealand's future will continue to depend on successfully selling our goods and services into highly competitive markets. And to do that meant that New Zealand had to equip the market place with a better educated workforce. (Paul Callister: *Skills for Tomorrow* (revised edition), New Zealand Planning Council.)

Community groups were doing a far better job than institutions. One of our colleagues Vivian Hutchinson who is the editor for the 'Jobs Trust Letter' developed the 'Skills for Enterprise' training package for non business wise people in the early 80's. Government agencies were not at all supportive. We had what was called the Regional Access Training Boards, and on those boards were a small number of community representatives, who knew the value of the course, therefore funding was approved. We all worked cooperatively, sharing information, writing up training packages, lobbying on behalf of new courses and ensuring that everyone involved kept to the same base fee, so they couldn't be played off one against the other. This was a co-operative era. The Skills for Enterprise training package has no copyright because as trustees we believed and still do that this information was community property. However, I get very angry because government agencies and educational institutions somehow always get their hands on good models and it goes from community & Maori into these agencies and institutions and the originators efforts go unrecognised. This package is now used by Business Development Boards on their Be Your Own Boss courses. With Vivian's permission, I adapted the training to suit non business wise Maori who required business skills training. along with my own material.

It was this work which enabled me to win the contract from the Ministry of Women's Affairs to research material suitable to train entrepreneurial Maori women selected from their iwi, write the manual and work plan book, and train 20 women in 1991, and a further 30 in 1993. The skills and information has been transferred to these women and they in turn have trained others. All but a few have gone on to University or Training College. Many now have Masters and Diploma's.

Some are Consultants who travel throughout New Zealand, others have successful businesses, and for those who already had careers their promotion has been rapid. This has been a very successful programme, however the key to its success is the Structural Analysis training which permeates and weaves its way through the personal development section of the manual, the successful Maori women contracted to provide their expertise in their specialist field, and the Maori values and culture. I was determined that our women would have the very best Tutors in the country and I contracted in the very best Maori women for their specialist modules. I selected a non Maori women for 'Conflict Resolution', because we did not have anyone skilled amongst our own. This women is the best in the country. The proven success of this course lead the Government Task Force to recommend its use on a national scale, consequently the course has been taken over by another government agency,

New Zealand Employment Service because of its success. I have bought my manual with me if people want to copy it.

New Zealand's education system required a radical change and I would like to quote an extract from "Freedom to Learn" by Carl Rogers to illustrate what I mean. It's called Facilitating Learning.¹⁸

"Teaching, in my estimation, is a vastly overrated function.

Teaching means 'to instruct'. Personally I am not much interested in instructing another in what he should know or think 'To impart knowledge or skill'. My reaction is, why not be more efficient, using a book or programmed learning? 'To make to know'. Here my hackles rise. I have no wish to make anyone know something. 'To show, guide, direct'. As I see it, too many people have been shown, guided, directed. So I come to the conclusion that I do mean what I said.

Teaching is, for me, a relatively unimportant and vastly overvalued activity. Why? I think it is because it raises all the wrong questions. As soon as we focus on teaching the question arises, what shall we teach? Are we really sure as to what they should know? Then there is the ridiculous question of coverage. What shall the course cover? This notion of coverage is based on the assumption that what is taught is what is learned: what is presented is what is assimilated. I know of no assumption so obviously untrue.

Teaching and the imparting of knowledge make sense in an unchanging environment. This is why it has been an unquestioned function for centuries. But if there is one truth about modern man, it is that he lives in an environment which is continually changing. The one thing I can be sure of is that the physics which is taught to the present day student will be outdated in a decade. The teaching in psychology will certainly be out of date in 20 years. The so-called 'facts of history' depend very largely upon the current mood and temper of the culture. Chemistry, biology, genetics, sociology, are in such flux that a firm statement made today will almost certainly be modified by the time the student gets around to using the knowledge.

We are, in my view, faced with an entirely new situation in education where the goal of education, if we are to survive, is the facilitation of change and learning. The only man who is educated is the man who has learned how to learn; the man who has learned to adapt to change; the man who has realised that no knowledge is secure, that only the process of seeking knowledge gives a basis for security. Changingness, a reliance on process rather than upon static knowledge, is the only thing that makes any sense as a goal for education in the modern world...

I see the facilitation of learning as the aim of education, the way in which we might develop the learning man, the way in which we can learn to live as individuals in process. I see the facilitation of learning as the function which

¹⁸ Extract from Freedom to Learn, by Carl Rogers. Despite the sexist language in this extract, we have included it for the views it expresses.

may hold constructive, tentative, changing, process answers to some of the deepest perplexities which beset man today.

But do we know how to achieve this new goal in education? My answer is that we possess a very considerable knowledge of the conditions which encourage self-initiated, significant, experimental, 'gut-level' learning by the whole person. We do not frequently see these conditions put into effect because they mean a real revolution in our approach to education and revolutions are not for the timid.

We know – and I will briefly describe some of the evidence – that the initiation of such learning rests not upon the teaching skills of the leader, not upon his scholarly knowledge of the field, not upon his curricular planning, not upon his use of audiovisual aids, not upon the programmed learning he utilises, not upon his lectures and presentations, not upon an abundance of books, though each of these might at one time or another be utilised as an important resource. No! The facilitation of significant learning rests upon certain attitudinal qualities which exist in the personal relationship between the facilitator and the learner.”

Traditionally, New Zealand's education system imparted information and teaching as if we had an unchanged environment. This is why it has been an unquestioned function for centuries, but in today's world that method did not educate children to become workers who could compete in the global market place.

New Zealand had to made radical changes and for Maori the best opportunity to equip themselves for the future. Maori took a stand in the late 70's and developed and maintained their Te Kohanga Reo (language nursery) on only \$5000.00. The parents fundraised and bought equipment and resources. It is here where our future lies, here are future leaders, fluent in the reo from babies. We now have bilingual schools and Kura Kaupapa schools, where they are taught every subject in the reo. And I have Te Kura O Kokohuia on tape which I would like to show you. They have just received permission to go to the Seventh Form. Let me assure you it has been a battle all the way.

[Slide]

[Video]

I want to move towards the end of my speech and speak to you of the growth and positive aspects of Maoridom in health, education & training, and business.

At the beginning of my speech, I shared with you the emergence of the Whanganui Regional Employment Board, the planning, the strategies. Maori health has always been a concern, so the Board put its energies into setting up an Iwi Health Board Te Oranganui which provides services to three individual iwi groupings, Atihaunui apaparangi, Ngati Apa and Nga Rauru. It now has a medical centre, staffed with 5 doctors, a Practice nurse, Maori Health Workers, Maori Mental Health Workers, Maori Youth Workers, three receptionists. Te Oranganui employs more than 40 staff including administration. Very soon they will have their own Dentist and Pharmacy.

Te Rangakura is a bilingual Teacher Training Unit which is based at the local Polytechnic. The new education authority is the New Zealand Qualifications Authority which sets the standards which all education institutions and training establishments must attain.

The Maori educator Sonny Mikaere, who provided the training package had his course recognised and approved by NZQA before every other College of Education had their courses approved. However, it seems as if the fact that you are Maori means you have to work harder and provide more proof than others before approval is gained. Unlike traditional institutions, where students must show non Maori qualifications before gaining a place, at Rangakura the first requisite is that you speak the reo, secondly, have the approval of your Kaumatua and marae, third, most importantly your whanau support. The course is a three year diploma course. The quality and calibre of Te Rangakura students after graduating is so acclaimed that schools are vying with one another to attract them and most of the former students have been retained by the schools with whom they were first placed.

For the first 2 years before finally gaining approval the iwi paid the salaries of 3 teachers and an administration person. Even then the Ministry of Education failed to respond. Then the fight was on. The Iwi Trust Board Chairperson negotiated directly with the Minister and refused to accept any Ministry of Education proposal or compromise.

However, when Sonny Mikaere (Te Arawa Rotorua), first presented the curriculum to NZQA the objections flew thick and fast, from traditional educators and education interest groups. When it was finally approved and registration approval was required, there were 22 people from all kinds of educational institutions and education interest groups.

And to add insult to injury, Rangakura had to pay for all 22 to be accommodated and fed, and travel costs had to be paid as well. On gaining accreditation approval, 25 people attended and the same thing happened. Then the Ministry of Education half funded the course saying that it was a language course. Now they are fully funded.

One of the recurring themes in nearly all of the reports, research papers and numerous analysis of Maori achievement as evidenced from educational outcomes is "the failure of the school system as a whole to inspire Maori pupils to do better. (He Huarahi 1980) The under-achievement of Maori has been well documented over the past 20 years, and still the gap between Maori and Pakeha in achievement is considerable and continues to be a cause of concern.

Many aspects of the education system has been highlighted as contributing to under-achievement. Some of these apply to all underachievers, regardless of race, but the increasing rate of under-achievement among Maori children indicates they are especially affected.

Judith Simon would argue that this pattern of under-achievement began during the early missionary years, when Tupuna sought 'Pakeha' style schooling, in the hope of gaining 'Pakeha wisdom'. and that it began to become more entrenched during the early years of the twentieth century, when schooling was perceived by

the great majority of Maori, as a means to surviving and succeeding within a Pakeha dominated world.

The increasing deprivation of Maori over the generations not only resulted in high levels of dependency, but the Government in its good intentions, began to implement educational policies that were based in the concept of "assimilation". The underlying idea being the sooner the Maori and Pakeha became as Hobson oft quoted "one people", Maori people would be able to discard their traditional ways which were no longer relevant and be modernised. We would argue that Maori children have thus far been subjected for more than 100 years in an education system that has not only eroded their uniqueness and tangata-tiaki, but continues to socialise them out of their essential Maoriness.

The development challenge has been to find ways to rearticulate cultural knowledge beside an alternative professional philosophy.

We want our children to operate in both languages, at a level of sophistication that demands in-depth thinking, that demands critical analytical thinking conceptual development, that's what we want.

[Slide]

[Video]

Now that we've seen the slides and video of Te Rangakura, let me show you the next stage of Sonny Mikaere's conceptual vision about where Indigenous education should go. Sonny has already lectured in the countries outlined on the overhead and gained approval from those same nations. On 5 October Russell Marshall a former Minister of Education will present this education package to UNESCO. Sonny's material is here if you would like copies. He has given me permission to share his material.

Why should I choose to speak about, health, education, and training you might ask? Because it is in these industries, that Maori are being employed in larger numbers. Sadly we may have to lose a generation or two, because energies must be concentrated on the mokopuna, who are Te Kohanga Reo graduates, and the energies required to rescue, those whom the system has damaged, and continually rescue has to be weighed in the balance. There are many Maori like myself who started there and the questions I find myself asking are things like "Why, when we've put so much time and energy into our people, are the jails still full of our people?" "If what we've done has been so good, why, can't we reduce those numbers?" "Why are so many of our children in Social Welfare care?" I know that's simplistic, and there are other deeper causes, as we continually treat the symptoms and not the cause. and that is why I say, we will have lost generations.

Which is why I find it really strange that Government funded agencies like Community Employment Group find it difficult to see that bilingual Teacher training, health, and the associated health industries do employ people after they have completed quality training provided by our own. What is good for Maori is actually good for the whole country.

No issue has been more contentious in the politics for education than the demand by Maori people for TINO RANGATIRATANG, 'self determination', the right to make decisions which affect their destiny. And Maori are determined to take on the government, as they have done on particular issues, as my people did when they occupied Pakitore.

Before ending I would just like to show you parts of the Pakaitore 77 land occupation.

[Video]

I would like to close my speech with this quote:

"To laugh often, to love much,
to win the respect of intelligent persons
and the affection of children
To earn the approbation of honest critics,
to endure the betrayal of false friends
To appreciate beauty, to find the best in others
to give oneself to leave the world a bit better

WHETHER BY A HEALTHY CHILD
A GARDEN PATCH
OR A REDEEMED SOCIAL CONDITION

To have played and laughed with enthusiasm
To know even one life has breathed easier
because you have lived

THAT IS TO HAVE SUCCEEDED!"

It has been my pleasure to share this journey with you, I hope I have offered something meaningful to this conference, and I am happy to share any resource which may assist you.

No reira, tena koutou, tena koutou, tena koutou katoa

Waiafa

How to Earn a Living Installing Productive Home Food Gardens

Lisa Ann Monckton (USA)

[Submitted Paper]

A good living can be made by installing, for both suburban and rural people, productive home food gardens. In Sacramento, California, we created a business doing just that, which we call *Foodscapes Organic*. Foodscapes Organic has been in business since 1992, employing three to eight casuals and bringing in an average gross income of \$2,100 per week. (For the purpose of this paper, all money quoted is in US dollars.) When we first came up with the idea, many friends had words of discouragement for us, believing there was no market for such a service. They suggested we grow vegetables for sale. Foodscapes Organic differs from market gardening in that it solves the problem of domestic food security at its root. Abundant veggies, herbs and fruits come marching into the kitchen directly from the backyard. This approach, we feel, is far more liberating and empowering for the individuals who employ our service.

Foodscapes Organic offers design and installation of biointensive and permaculture systems. Garden bed work is costed and charged on a square foot basis, \$3.50 – \$5.50 per square foot, which includes soil amendments (compost and organic fertilisers), plants, seeds and labour. These beds maximize floristics by containing up to 40% flowering plants and herbs to provide food and habitat for beneficial insects. They are planted in such a way that they are truly beautiful and colourful. Pruning is charged on an hourly basis, \$35.00 for the first person and \$15.00 for each additional person, plus a fee for hauling away debris. Irrigation service and installation is costed and charged on an hourly fee of \$45.00 per hour for the first person and \$15.00 for each additional person, plus a materials fee.

This service begins with a consultation appointment with the prospective client, charged at \$45.00 an hour; the first hour including a soil analysis from the site, which you take to your little lab set-up in the garage, and the result is mailed to the customer. These basic soil testing kits are available from Lamott Company for around \$36.00. It takes about 15 minutes to do one, including cleanup, and you can analyze up to six in under an hour. The soil is tested for macro nutrients N, P, K and pH. The results of this basic analysis are used to calculate the amounts of the macro nutrients, per square foot, to be applied to the garden bed or beds. Kelp meal is applied at a rate of .03 lbs per square foot to supply micro nutrients and trace elements. By using this approach, we are assured the garden beds have the necessary nutrients for optimum production. The area is carefully measured and your estimate is written on the bottom of your first invoice for the consultation appointment. Good educational aids include a picture book containing before and after pictures of your work (even if it is your own yard) and a local planting calendar which helps the planning process. Careful analysis of the client's experience and ability will help you gauge the size garden they can manage effectively for maximum

success. Keep it simple for new gardeners, for they will reward you with abundant expansion work as their confidence and experience grow.

Successful food production on every installation is mandatory. Sometimes you do find an unsuitable site you just know won't work; the soils too heavy or toxic, not enough sunlight, or the client is noticeably unmotivated, or like, they have a bunch of big dogs galloping around the place and indicate "they won't be a problem." Forget it! Unsuccessful installations cause more harm than good.

To get this good business off the ground you need to define what it is you are offering, carefully cost all aspects of installation and set your price so you are delivering a great product and making a profit doing it. Once you've done that, write up a brochure about your business and a local planting guide. You are now ready to develop a press release about your service which is mailed to the editor of every paper and magazine and the news desks of local radio and TV stations in your district. When they phone you for an interview, you are ready to discuss your service. Keep your interviews simple and to the point, stressing the angle of your work. Journalists will print anything you say. I once heard of a couple who were giving an interview about their permaculture landscaping business. The journalist led the conversation into a discussion about how the couple met and, bang, the headline read something like "Great Sex Ignites Permaculture Relationship." The slant of the article was more about the couple than their business. You'll soon discover articles about unique services doing good work get printed. Program into your work quarterly press releases featuring up-dates about your service and new services and equipment you are offering. Soon you will be approached to write articles for local publications and this you do gladly in exchange for ad space next to your article; and do some work for the editor. We often receive thousands of dollars worth of advertising for a couple of hundred dollars work. An early morning garden spot soon becomes available and then the TV evening news, after seeing your press releases for the last three years, wants to tape a segment on what you do.

Working with clients is fun and rewarding. During your first appointment find out all you can about their gardening experience, what they like to eat, time constraints, and site history. This activity, coupled with education about the process, results in all parties making well-informed decisions about the size of the garden which would be best for them, and what to grow there. Always do your job as you described. What you don't tell the client, which leaves them with a warm feeling for you and your team is: part of your program is to deliver a bit more than you promised and leave the site in a better condition than you found it by fixing leaking hoses and pipes, thoroughly sweeping paved areas, neatly arranging their hoses and picking up any trash.

The essential tools needed include: a vehicle capable of carrying up to four people with room for plants and a strong motor to pull a trailer carrying up to three tons of materials and tools. We use a Jeep Cherokee and the trailer just mentioned. Good quality tools cannot be over-emphasized. We use English-made, Bull Dog and Spear and Jackson brand digging tools. We carry tool buckets filled with everything we'd possibly need, including a tool-sharpening kit. Keeping a list handy assures you won't forget something. Many times when you are on-site, a client will ask you to do something more for them; if you have the tools on board, you've just increased

your income by providing an additional service at next to no additional cost for you because you and your team are already there.

The outdoor area of site you work from can be as small as 30m by 16m. There, seedlings are propagated according to your calendar. This is an essential component to the service. It is difficult to work without seedlings on hand, and purchasing them is generally unreliable and costly. Seedlings should be on an automatic watering system. A plant propagation area and nursery should have a supply of flats, plastic pots and potting soil. Seeds and records are kept and up-dated. Organic compost and mulching materials will need to be stored on-site as well as quantities of organic fertilisers. Find out what is available in your local area. We use feather meal, soft rock phosphate, greensand, potash, oyster shell lime and kelp meal, to name a few. Find a place to set up your mini soil testing lab, store irrigation equipment, store and maintain tools, set up a scale to weigh fertilisers for jobs and store boxes and bags to put the fertiliser into for transport.

At first, not much office space is needed (a corner of the bedroom will do) but a phone answering machine is critical to have. Making a habit of returning your calls will reward you. Many jobs are performed running a business like this, and as it grows, they can be delegated to others and additional income is raised through these endeavors. They include, but are not limited to: installations of gardens, mini farms, automated drip irrigation, ponds and orchards; services of consulting, designing, soil testing, pruning, construction and hauling; sales of plants, soil amendments, tools and irrigation equipment; and education, conducting workshops on everything from cooking to pruning, tours of work and trade shows; bookkeeping and marketing. In the beginning, the owner or owners of such a business wear many hats. It requires dedication and attention to detail. Working with a partner that will enable the two of you to split up the duties, each focussing on their strong areas, is so much nicer.

Finally, such work is 'right livelihood,' as it provides domestic food security and excellent nutrition in several hundred households a year, while also bringing great pleasure to workers and clients alike.

Minding Your Permaculture Business

April Sampson-Kelly (Australia)

[Submitted Paper]

The more professional and successful our permaculture efforts become, the more people, their businesses and workplaces will adopt environmental accountability.

“If we don’t know where we are going, we might end up somewhere else”

(Casey Stengel [Beckhard, Organisational Transitions 1987])

Permaculture business and projects

The ideas expressed in this paper are applicable to both business and permaculture projects. The two are treated as interchangeable although funding for projects may come from outside sources and so the projects sometimes have more restrictions or rigid goals (imposed by the funding bodies) than a business which simply has to be sustainable.

Why do permaculture people go into business?

Permaculture ventures can have a strong sense of purpose and tangible goals greater than money.

1. Profit to provide funding of other goals – reforestation, conservation, food forest, supporting third world projects.
2. Meet a community need for service or product.
3. Self development – building business, teaching, computer, design, organisational skills that can be utilised in other business projects (retain and development your education and use in community).
4. Self employment – increase individual productivity.
5. Build an organisation with ethical base and community value.

Short and long term businesses to support permaculture

For short term, (first-stage) business activity, examine the business objectives. Some are not in keeping with all the goals of permaculture but act to promote some of these goals and are useful first-stage activities.

For example: Better farming practices encourage a shift in consumption to support fresh organic produce but does not meet long term aspirations of permaculture. That is, to encourage individuals to become responsible for their waste and needs. There is an opportunity to develop this special market. The consumers can be encouraged to become more active consumer/producers as the food will be even fresher and not have added transport costs.

Examples of businesses that promote permaculture for long term include Rainwater tanks, composting toilets, solar architecture, permaculture plants, seed banks, rare species breeders, onsite building material technology, and soft technology (water wheels, wind power etc).

Opportunities for environmental products and services [AUSTRADE 1990]:

- Waste management technology including nitrates from agri-food businesses.
- Noise management.
- Clean paper recycling technology.
- Light metal recovery.
- Steel recycling.
- Textiles – durability, reuse, recycling and redesign for ease re-use.
- Used solvent recovery.
- Alternatives to hazardous chemicals (cellulose and paper industry processes; CFC; cadmium etc).
- Compostable materials as alternatives to dwindling reserves of peat and soil conditioner.
- Energy from land-fills, waste tyres etc.

Subsistence business

1. This requires *adequate long-term remuneration* for workers, not necessarily in the form of money or taxation advantages but also some self-development as mentioned above AND/OR improved lifestyle. This includes reduced stress in the workplace, adaptability to combine work with family (children and elders), self determination, pleasant surrounds, fresh organic produce, share of products and services produced by the business.
2. *Cash-flow*. If the business is not going to answer to conventional measures – it will need to be free of debt. In the way that permaculture promotes freedom from debt, our businesses must also operate in the same way. Work out a business plan that starts with small successes and can grow in planned stages. Examples include setting up a newsletter, developing it into a magazine, selling books which cover the best of the magazine articles.
3. *Staff*. The primary organiser of a business must evaluate his/her personal skills and create a business that they will feel comfortable in. They should be creative and aim for clever design in the organising of business hours, position in the market place, relationship to the community and public, promotion tools etc. In the same way we use clever design to match the nature of elements in permaculture design, you can match the basic features and intrinsic characteristics of workers and product and market to create a sustainable and harmonious workplace.

The life cycle of a project or product

Birth, development, decline and death. Most products have a shelf life, even services. It is important to recognise changes in the market place and keep improving your product if you want to stay in optimum operation. Example: watching market changes, adding value to your product (reliability, durability), promoting your business (demonstrating ethical practice, supporting local suppliers, attentive customer service, active in community).

Permaculture goals

True goals

Assess the true goals of the project, this may include unstated goals such as social status, employment, managing others, love of outdoors, avoiding indoor work, avoiding dealing with people (some people like the fact that plants don't argue back). There may be a genuine need in the community for the project, product or service. There may not be a genuine need but a wish to generate cash or employment.

Goals in business are not just profit growth, even large companies can develop an identity crisis. Is the business working for the customer, the share holders, or the workers?

Permaculture businesses ideally work for permaculture principles; care of the Earth, people and wealth distribution.

Consider all possibilities [Edward De Bono]

Once you have identified the true goals of the project you can consider *all* the different ways to meet the goal, even if only to determine what your 'competitors' or followers may do, to determine the cleverest way to plan the project. Having a range of plans fits well with the permaculture concept that diversity builds resilience and sustainability.

Here is an example of diversity of paths to meet the goal. The goal is to set up a community food production system. Land is donated but turns out to be flood prone. An intensive community allotment garden is not as clever as a community woodland with flood tolerant species, mobile species such as geese and silt collection areas to use on another flood free area or made available for people's home systems.

Co-operation vs competition

Permaculture fosters co-operation rather than focusing on competition. Our main aims are for *global* efficiency and reduced waste (human and material resources). Competition is the major driving force in modern business and immediately isolates like businesses from one another. Co-operation exists in supplier/customer business relations where one company supplies parts for another. Co-operation is promoted by networking. As permaculture businesses aim to break barriers of isolation and build better networking and trust, then the forces fighting co-operation will wane. Isolation in permaculture today results from the perception that our

market is small, and many permaculture businesses operation in geographical isolation from one-another. As permaculture itself becomes better known, and there are more demonstration sites, existing businesses will learn how better to meet existing markets and, as the number of businesses grows, these difficulties should lessen.

Support required from a global association

A global association to support business in permaculture would reduce human and energy waste and offer the possibility of sharing useful tools and experience. These could include professional indemnity, course re-development or review with input by a teachers forum, contractual and legislation obligation, taxation offsetting (minimisation not avoidance), disclaimers. It should work closely with existing network bodies to avoid redundant efforts. Appendix 1 shows the contract that we currently use for designs in Australia.

Layering and succession in the workplace

Permaculture uses *layering* or *stacking* in the garden system to increase the diversity and productivity of an area. Planting often involves *succession* which uses first plants that act to prepare the soil and micro-climate for more delicate species and eventually climax species.

This same technique can be applied to projects and business.

Pioneer people

Birth of a product involves *pioneer* workers. In the same way that pioneer plants are used to regenerate an area in a permaculture site, pioneer people build ideas, are confidently deep rooted, great at mining information, collecting ideas that blow by, sensitive to needs in the market place and can forecast community response to a product or service. They are not necessarily the right people to deliver the service but can lead its formation and growth, they may be useful on the team of administrators and active in the review of a product. They are useful to prepare projects and nurture those people required to set networks and development in place in the same way that pioneer species prepare the soil for finer species, and shelter them from competitors.

Diversity and Leadership

Product development requires exploration of the ideas, lateral thinking, looking for new and better ways to develop ideas. Permaculture links natural resilience to diversity. Aim to keep the workers and product lines flexible and diverse. Never criticise other worker's ideas, allow them to seed and watch them grow. *Canopy* people, as with canopy species in a mixed rich forest, must support the growth below them. *Supportive leadership* doesn't dominate its young but is strong enough to shelter other layers. Supportive leadership recognises its need of other layers and indeed other leaders. A tree alone is not a forest. Supportive leadership knows the wisdom of letting go. Permaculture designs and establishes a site to meet most human and nature's needs and then allows nature to determine much of the development of that system. We establish systems that benefit from self-propagation

and self-determination. We work with existing forces (wind and gravity) rather than suppressing them. Supportive leaders can do the same, they can initiate systems which nurture strong leaders rather than weak followers. Canopy people challenge their young to grow strong, they set examples of strength and are ready to share the canopy with younger canopy species as opportunity determines their productivity or their role.

Evolving or transforming work roles

Some people have strong specialist characteristics, they specialise and evolve in a field. Some may be likened to tubers (heads in research) others like vines, (able to view the whole picture, to see ahead, to think laterally, opportunists). Others can move from one role to another. They can happily adapt and change their work role like a period of transformation. Some people find that their pioneer qualities are needed for a short time and then, as the field changes, they rise to the challenge of either a new field as pioneers or develop a new role in the enriched territory. (Example: they establish a seed bank, then move on to specialise in raising a rare species for which they have a knack, then move on to again be pioneering a seed bank in another country)

Resource sharing

In the same way that individuals can share resources through hire and lease and community recycling. Resource sharing enables businesses to use equipment optimally and, for small projects, the hire of equipment reduces debt.

Advantages of community recycling

In some instances community recycling is preferable to individual recycling systems. For example, good woollen jumpers (pullovers) could be recycled for blanket filling, insulation in the ceiling or mulch in the garden. The best use of woollen jumpers and sweaters is to pass them on to others for re-use before recycling. Secondly the wool could be re-used for another jumper or jumpers could be re-designed to be modified easily for many purposes. Similarly in the home system organic material is more useful if re-used as mulch rather than recycled into compost.

Another advantage of community based recycling is that the item often gets re-used more frequently than if kept in storage by the individual. Community based recycling can build a bigger collection of materials for large projects than the individual would be able to acquire for the same costs.

This applies to businesses and projects too. A network of businesses, re-using equipment, linking waste with resources (paper waste of one business becomes resource for paper-hungry business) builds co-operation.

Share of surplus

Business and commercial projects are storing their surpluses in many forms, in real estate, equipment, staff, stock (forestry, food, animals, minerals, manufactured goods etc), technology.

Not only business but also people in general who aim to share surpluses, have an indicator, a trigger or measurement that tells them they have a surplus. This measurement indicator can be seasonally or even socially adjusted.

Surplus indicator model

One model indicator could be: when the goods or services will not maintain peak performance and optimum use. (Fruit rots, seeds are not propagated, technology or equipment or skills under-utilised).

I know in our home system, that when fruit is over-abundant, at risk of decaying and becoming insect-infested then we definitely have a surplus. This indicator is quickly adjusted if I know that others around me would enjoy sharing the fruit (there is a demand) and so I share the fruit rather than preserve it for myself (which is also converting it into a non-optimum form as it loses freshness and nutrition).

The costs of storing surplus

It is good business practice to maintain a cash flow in the event of something requiring funds or energy. It is also good business practice not to store too much product and have a high turnover of goods. So price is usually used to disperse a surplus (economists call it supply and demand).

There are two types of storage:

1. Flow equalising storage (short term security).
2. Stock piling – build-up (greed).

Five 'R's

Re-design

When researching and writing about waste reduction and the 'four R's' mentioned by Harrison and others we (April Sampson-Kelly, Paul Kelly and Megan Sampson) realised the importance of a 5th R – Redesign for durability; ease of maintenance and repair, use of materials that are easily re-used and re-cycled without high energy input or toxic by-products. The use of modules in equipment can be seen as a design feature to increase waste. Modules in many products such as white goods and cars are self-contained, and can usually only be opened when broken. If we design for common parts, sizes and materials with ingenious combinations and application then the design has greater capacity for re-use and repair. Few cars or even computers have common parts from one brand to another, this has often been promoted as the uniqueness of the product, 'It's different, better, sophisticated and new'.

When consumers demand repairability, items will be promoted less on uniqueness but commonness or 'standards' and availability of parts.

Permaculture is mainly about re-design. Clever design finds multiple functions and use for the waste. Waste is unused output [Mollison]. We need to re-design

our cities into self-reliant villages and our home and work systems into responsible multi-function productive spaces.

Reduce

You should aim to reduce imports into the system. Packaging and transport costs are reduced when you grow your own foods. Furniture and white goods (if repaired to maintain efficiency) could be used longer. Buy less gadgets, or buy one that fits several functions. Share equipment. We don't see the justification for a paper copier in our office, it is more ecological but a bit more time-consuming to share/hire some office equipment. We also choose re-useable storage equipment such as computer disks rather than paper and have needed very little paper for printing. We re-use envelopes without needing to re-address them by simply including them with our return correspondence to the student, they then post the next item to us with that returned, unchanged envelope. They usually post back our envelope addressed to them.

Re-use

Choose products that are able to be re-used. Avoid so called disposable items that cannot be recycled, much less re-used. Computer disks have a good life for re-use, rechargeable batteries are best but mains electricity means less toxins in soil on disposal. Writing on disks, files and large envelopes in pencil enables them to be re-used and remain tidy.

Repair

Buy goods designed for repair. Less than 20 years ago you could buy even small items such as pencil sharpeners with replaceable blades. They cost more than the plastic ones, and hard to find. Choose office equipment and tools that are repairable with reliable service plans. In the long term they prove more economical.

Recycle

Most organic items can be recycled in the home system and the office, plastic can be recycled too, but there may be harmful gases let off during the process. Get some worms onto the job if you only have a home unit, paper waste is best recycled, ensure your paper consumption is minimal. With the emergence of the so-called paper-less office more paper is being consumed and this grows at an alarming rate. One option is print only originals, learn and use review software for others to add comments. Originals should only be printed when they are required as we are now entering the era of the evolving document. The document is rarely complete.

Environmental Management Systems (ISO/CD 14000)

System aims

- To implement or enhance existing systems for *Sustainable Development*.
- Environmental management is to be an integral part of an organisation's overall management responsibility.
- By having a standard, businesses and projects can examine the impact of changes in processes. Without standardising, it is hard to determine what may be the cause of unwelcome or even welcome outcomes.

Potential benefits

The potential benefits associated with an effective EMS include:

- Meeting customer's environmental expectations.
- Maintaining good public/community relations.
- Satisfying investor criteria and improved access to capital.
- Obtaining insurance at reasonable cost (currently many businesses with QA enjoy lower public liability costs).
- Enhanced image and market share.
- Meeting vendor certification criteria.
- Ability to dispose of waste.
- Cost control.
- Liability limitation.
- Demonstration of due diligence.
- Conservation of input materials and energy.
- Easier site selection and permitting.
- Technology development and transfer.
- Improved industry-government relations.
- Improved environmental performance and state of the environment.

“To move from the view that environmental management is just another added cost to the view that it provides for competitive advantage requires new understanding and culture change.”

[ISO/TC 207/SC 1 N 48
– Draft Guidelines for the application of EMS in Australia,1994.]

Measures of success

Create wealth rather than just money

You could 'invest' your time and energy in products or services that will serve you as well as your customer. For example you can start propagating plants that provide food, or worms, or other useful items and if you don't maintain a healthy link with the market, you can still use them in your home system.

Set and review expectations as product evolves

Our measures of success in the teaching project are:

1. That the standard of graduates is high, they develop a confident application of permaculture and they become advocates of permaculture.
2. That the fees ensure further research and input.
3. That the market we serve gives us rewards immeasurable in terms of money – empowerment, building sense of community and sharing.
4. That our efforts encourage our own community to act ethically.

Business materials, supply and disposal

Business as much as individuals are becoming conscious of the need to nurture the resources that their business depends upon. Businesses can make an extra effort to use recycled packaging, refillable cartridges and pens, biodegradable packaging manufactured without harmful by products. For many this has become their market edge.

They promote special unbleached, biodegradable, even reusable or returnable packaging as a special feature for their product.

As customers become responsible for the waste that their purchases contribute (some already pay for the waste collection by weight), you, the manufacturer, will be expected to bear the cost of disposal. Support suppliers with biodegradable packaging and set up systems that accept the return of packaging as well as used purchase items.

Care for people outside the market community

Permaculture business should also consider their impact on the community in which they operate and in which their competitors operate. Product and service 'dumping' (subsidised price cutting) can erode the services of competitors and eventually it will ruin your own business. Community support is essential. Employ local people, use local supplies where possible. Aim to operate as an example to others.

Dispersal of surplus

Dispersal of surplus is a permaculture ethic that may appear to go against the grain of modern business operations. Share of surplus with workers is a recognised boost

to business, large businesses supply workers with productivity bonuses or share issues. Permaculture businesses would naturally share bumper harvests with workers and community. Dispersal of surplus is also a keen guard against theft. You are most likely to be robbed if you appear wealthy and insensitive to the surrounding people's needs. You will also probably worry about it more. What good is there in setting up a very rich and diverse permaculture system, let alone a permaculture business, if outside your boundaries there is hunger, sickness and pollution? Energy will be spent in treating the symptoms (building security measures) rather than treating the illness (unequal distribution of wealth).

About debt

Money for permaculture business or permaculture projects

“If enough people lead the leaders will follow”

[Earth Repair Centre, Hazlebrook]

The best funding comes not from above but at the grass roots level. In fact, if the project is worthwhile, and meets the grass roots needs, then have confidence that it will succeed and connect well with the customers. Plan the project to start small and grow. History shows that splashing a lot of money about doesn't solve fundamental environmental problems or world poverty. Permaculture offers people a way to get involved in the repair of the world and encourages westerners to ease up on their consumption. When people start to direct money away from degenerative, energy consuming gadgets and wasteful, fashion driven purchases, they can put that same money or energy into pro-creative investment. Then they will have more money to fund projects – their own and their community's.

Appropriate technology

Some projects such as video are high-technology input and suited to the grass roots level. Russ Grayson (Permaculture Extension, Sydney) believes that video is a very useful tool for demonstrating permaculture in action, and would like to see more video projects. He writes:

“Our (APACE) project worker (in the) Solomon Islands is back in Sydney and he said how useful video is there, where there is a high level of illiteracy. Tony uses the Indian instructional video – Growing Together – which you have most likely seen, as an instructional media for workshops in the Kastom Garden Project.

Tom Jumeraii of the Lae (PNG) based South Pacific Appropriate Technology Foundation, with whom I work as project officer for the CanCare Lae non-ferrous metals recycling project, would be interested in producing a video version of the Lik Lik Book, a well respected volume of appropriate technology, village agriculture, cooking and small scale production used extensively by development assistance and extension workers in PNG. Tom also supports the practice of using video as an instructional media. It would be good to find funding to enable Tom to realise his proposal. The video could form part of a book/video instructional kit.”

In many cases, old technology still produces good material. The video filmed in India didn't require high technology and is very useful. Older-style technology includes cartoon and stills. Our project is dependent on an office computer. The computer was privately subsidised and shared. The publications are only printed when ordered and all advertising material is minimal and modest.

Customer's debt – your responsibility

Permaculture teaches freedom from debt. We know that debt contributes to poverty and this is most noticeable in third-world countries. The western world benefits greatly from their debt to us. The realisation that debt is not good in western culture comes fastest to those in the lower economic threshold. We aim to reverse this economic decay. Permaculture encourages people to free themselves from debt and develop investments and savings which builds more control over their needs and resources.

To promote the use of debt processes to acquire products should be reviewed. We should *avoid promoting the convenience of credit cards* in our businesses, and support the alternative processes which can be just as fast such as Eftpos in Australia, cheques or the use of trust by sending an account (these are some of the older style proven methods).

LETS as a business resource

Lets (Local Energy Transfer System) should be offered and its use maximised in business, using the customer LETS dollars to pay suppliers and workers. There was some concern when we started up that accepting LETS payments from overseas would defeat the main aims of LETS – that is to keep money local. After some deliberation we decided that the customer benefits in that they are required to work for their own community for the 'energy' used for the transfer to our business, and in turn we are employing people in our own community to support the service. This requires further research and discussion.

I am concerned that the international exchanges would defeat the primary aims of LETS, that is to be a local currency. Currently, our LETS accepts other LETS currency and sends a letter of acceptance to that body. Students have to check with their own body if this is acceptable. Their LETS body benefits from the students commitment to the local LETS body, in that they get energy injected in the form of services or other items offered.

Our own body, Illawarra NSW Australia, already spends currency with other bodies, mainly for organic produce from the next-door LETS body, occasionally for holiday accommodation and I have received currency from several other bodies.

I can see where this may become a problem when a richer LETS body coerces an indebted LETS body to repay in some way. Also George of Austria Permaculture wrote:

“Very recently I encountered another problem with this: between us here in Austria and a LETS body in Switzerland there is quite a **difference in the amount of unit** (Talents) that are asked for a similar **time-unit** of a similar service. Around here most LETS bodies do not have time-currency, but are

still being linked to the local money value of the respective service. And of course, Switzerland is a high income country compared with Austria.”

[George – Permakultur Austria,
c/o Institut für Freiraumgestaltung und Landschaftspflege.]

Many Australian LETS systems have a minimal wage of 10 units per hour, and all transactions are negotiable, allowing inter-exchange freedom of negotiation and choice of supplier. In the same way so many tourists to our country enjoy a good exchange in the money market, this could be used for the LETS system. Then there is the problem of being regulated by government policies on the exchange.

A professional permaculture image

- Decide upon the market you wish to serve, set up a business plan and image etc that fits this market.
- Be consistent. Set up a structure for dealing with customers that can be maintained. (This requires a degree of honesty and long term planning – we operate predominantly by mail and Internet and explain why to our customers.)
- Be reliable. Being punctual and reliable means that you do care about the customer, that the business and, for that matter, permaculture, are important to you.
- Practice what you preach.
- Work on *quality* not *quantity*.
- Aim for business to grow via word-of-mouth.
- Be grateful to all those customers who write a complaint, there are many others who didn't. Deal with all complaints.
- Accept that permaculture is a highly complex field and fast growing. There is much new research daily. Team up with, or refer to, specialists where required.

The nature of wealth

Wealth is an abundance of energy provided as vegetable, animal and other materials and or services. Energy stores potential wealth. A community can aim to contain its wealth by buying local products and services. It can also maximise its natural resources such as solar and wind, clean water and soil. Through the passive use of free energy sources our energy supply is not limited. We can increase the storage of the energy supplied by the use of natural stores such as trees (which store water and sun through photosynthesis) We can increase storage of rain water with dams and swales and soil cover (mulch) and we can increase the capture of condensation with canopy on food gardens.

By ensuring that all persons in the community are valued and well employed we also maximise the community's wealth. When we view wealth as that which comes from energy, especially natural energy sources, we can see that we all have the potential

for greater clean wealth. One of the current abuses of wealth is the use of ancient stores of wealth to our own detriment – ie. pollution from fossil fuels, loss of diversity from forest destruction, loss of soil from broadacre farming and more.

Future generations are going to have two major debts to carry before they can even store wealth:

1. They will be accustomed to the false wealth levels enjoyed by the generations which used up fossil fuels (stored wealth).
2. They will be spending wealth cleaning up the mess (and many today are already doing this).

We can aim to both enjoy clean wealth and store it for future generations. We can establish and develop cultures that are in tune with the resources they depend upon. We can all aim to be productive in a wide range of skills including being responsible for our food on the table. [These views also supported by Carmela Leone (Email: cleone@ozonline.com.au) and Dean Robertson (Email: SOLARROB@aol.com).]

Wealth, community and business – internet responses to the issue

Here's the scenario. Once you establish a permaculture village, people start to interact socially and economically. People work for one another as well as for their own systems. Community banking, co-ops, dairies etc are dependent on shared wealth, and likely to play a major role in the lifestyle of the community.

How should permaculture businesses or co-operatives operate, how should we apply the *Care of the Earth* (eg. Environmental Management Standards) and *Care of People* (Management, leadership) ethics in our management of the business systems. And just how should we address *Share of Surplus* (some use the term dispersal of surplus)? Given that many global stresses are linked to unequal distribution of wealth, our businesses must be designed to be accountable.

Question posed to the permaculture mailing list: What alternatives are there to sustain the business except planning for growth. How can we gently shift the patterns of greed?

Two striking responses were:

“Distribute the net profits equally. No one is an employee, everyone is a stakeholder. That has an amazing way of ‘leveling the playing field’ of class differences created by hierarchies of authority and wealth. Rotate tasks so everyone learns how to do everything and no one is excluded from doing the yucky stuff as well as the pleasant work. As far as the people who made the initial start up investment, the entire community could create and agree upon a payment plan so that over time, and according to the amount of profit, the initial investor could be repaid.”

[Danielle Hyatt. Email Giannora@emf.net]

“Cultural method of ensuring wealth sharing. Pressure to foster the morals of generosity and self sacrifice can be developed and is seen in some societies.”

[Vasilakes, Neil (MN10). Email: Neil.Vasilakes@HBC.honeywell.com]

Ethical accountability

Many businesses today are feeling the effects of ethical accountability. (Including cigarette companies, hazardous chemical manufacturing companies.) Accountability is good business practice as it reduces the risk of litigation. If we act out the basic principles to care for *all* people (within and outside of the immediate market or business) and for the Earth on a global as well as local basis, then we are well on the road to accountability. Increase our awareness and research all possible pitfalls is improves standard of accountability.

The web of wealth and nature

Some argue that there is finite wealth [Bell in *The Permaculture Way*] and whilst one person accumulates wealth another loses this energy, definitely some resources are limited but a small few are not finite (pro-creative energies have potential growth and expansion). Natural energies such as solar energy are only limited by our capacity to harness the energy.

Good business practice, including those with *Environmental Management Systems* ISO14000, investigates all links of the business and staff, manufacturing and service providing with the immediate and global environment.

Appendix 1: Example contract

The following is an example of a contract used by designers at *Leisure Coast Permaculture Visions*:

Contract

Copyright:

The designs are the copyright of the designer. To photocopy or alter the actual design is illegal and unethical. Additional Copies will be provided at minimal cost. We do not seek rights regarding the implementation as it is your own project, (but do expect acknowledgment for the design). We intend the design as a guide for implementation.

Professional Indemnity:

For any major earth works such as pools or water courses we advise that you seek input from a professional engineer. Many of our designs have had professional engineer advise, but this you must confirm for legal reasons.

Confidentiality:

All personal records are treated with strict confidentiality. We aim to publish these designs for permaculture conferences, teachers and students, as they are of interest to many persons. Your street number and name will be suppressed in the publications unless you advise us otherwise.

Interview times:

The initial consultation will require approximately 90 minutes with interested members of your family.

Design Portfolio and Support:

Our Design Portfolio will be available for your perusal, and a Video explaining permaculture concepts will be loaned for a short period.

Our demonstration garden is open on appointment. Telephone 042-729619

To be Signed upon commission of design:

I/We understand that the design is a conceptual guide for implementation of a permaculture system and will respect the designers copyright.

Thank you for supporting our service,

April Sampson-Kelly

Leisure Coast Permaculture Visions

280 Cordeaux Rd., Mt Kembla Village Australia 2526

April Sampson-Kelly ADPA, BCA, PDC, Grad DipBioSci, MCA has a family history in small business and has developed two of her own businesses. After she started in gardening and nutrition she gained her PDC with Jude and Michel Fanton. She and her family live on their second permaculture site, one acre in an historic village surrounded by rainforest. Her business, Leisure Coast Permaculture Visions researches and teaches permaculture to isolated persons all around the world by mail and the Internet. Her projects are constantly evolving under a dynamic review team. She designed the workplace and gardens for 'workers' and children, employs others part-time including disabled people, and is currently Head of the Illawarra LETS system. April Sampson-Kelly has designed for a variety of sites [inner city through to 6000 acres]. Her designs will be on display during the poster sessions. Her business home page address is "<http://www.permaculturevisions.com/>".

New Economic Strategies

Jim Scott (Australia)

[Submitted Paper]

In this paper I will look at why our current economic model is unsustainable, and provide an alternative we can move towards.

Most current economic models are based upon continual growth which involves a growth in resource use and in service use.

Overhead 1

The first problem from the current system is that it encourages population growth which will lead to a point where the planet can no longer support the population.

Overhead 2

There is also a drift to the capital cities of the world. For example Mexico city had 8/9 million of the population in 1970, and 20.0 million in 1990. In 1911, Perth had 1.4% of the WA population and by 1991 it had 72.7%.

WA is a prime example of the exploitation of our current system. It has a high infrastructure system of industry, in area far removed from the capital city. However the resources exploited in the distant regions are channelled through the capital city. This system is still based on the colonial system, where the colonies are exploited and the produce taken away raw to be processed. This leads to an exploited colony and high taxes in Britain, due to the cost of maintaining colonial armies and navies.

Overhead 3

In WA, population growth has been presented as giving a bright future, but most will be living in the city.

Overhead 4

Overhead 5

The Department of Commerce and Trade presents a bright picture for the future. Iron Ore in almost half the economy of the Pilbara, with a tiny amount is services, tourism and retail. Most of these materials are exported raw.

Overhead 6

In the Pilbara, mining provides the greatest employment, but the area lacks commercial centres of any great size. This is the central point of this paper, how to get away from the current system which channels resources out of the area rather than providing needed services and manufacturing within the area.

Overhead 7

There has been a decline in construction in the Pilbara, and a decline in dwellings. Thus, despite the huge amount of wealth generated in the area, NW people are heading south. In 1992/3, the Pilbara demonstrated a 6% population decline.

Overhead 8

To exacerbate this companies operating in the area are moving to contract based employment, which has led to many people being employed on a 'fly in, fly out' basis. We need to change the balance as rural communities decline and the population of Perth increases.

So, has employment and conditions improved in these areas as a result of the so called 'boom-time' of industry? No. And this situation is not unique to WA, it is a world wide trend.

Overhead 9

This is bad news for the unemployed because although there is an economic up turn, this does not mean there is hope.

WE need to change to a system of economics which increase sharing of wealth and growth in Australia, and move from a system which sees high GDP as good, when some day we will have nothing to exchange for money any more.

Overhead 10

The North West Shelf development resulted in contracts with the then called SEC that they would purchase 9.66% of the gas produced. This turned out to be far too much than required, and would have bankrupted the state. So high energy using industries were encouraged to settle in the state, and we are encouraged to use as much as possible by receiving cheaper prices for higher use.

We also have a declining area of farmland due to urbanisation but mainly due to land degradation, particularly salinity. The government has been of little help, for example CALM has plans to clear fell 98% of the remaining vegetation in the Blackwood River Catchment area which makes up 50% of the shire. The Blackwood already has an increasing level of salinity. Thus in ten years there will be no forest greater than ten years old except in the buffer zones, and regrowth will be a problem in a saline environment.

Overhead 11

Christabell Chamarete completed a study of carrying capacity for Australia, which shows that by 2040 our water resources could support 150 million people. But our petroleum could only support less than one million, and we currently rely on many petroleum based products.

If we look at all these facts, it is clear that we need a drastic change.

We need to encourage regional development, so that people are closer to their support bases, and the states should be abolished to encourage this. WE should be responsible to our own systems not international money markets. We should be

encouraging self contained systems which do not export all raw materials. An example, to close, of the problems we now face is that although most of our oil and gas is produced in the Karratha region, it is more expensive there as it first comes to Perth.

Part 4

Education Stream

Permaculture Education: Kolding Folk High School Model

Ole Bodholt (Denmark)

[Presentation Report]

The Folk High School model has its roots in conditions and developments of social need in the mid 1800's. The system gradually built up through development of teaching home-based technologies. It now attracts an audience from the age of 18 upwards. The activities are geared towards age groups: for example, from dynamic activities for the younger age groups to maintenance activities for the older groups.

The Danish permaculture environment is in four areas: the Folk High Schools (Kolding and Rodkilde), Eco-villages, Eco-Communities and through Urban and Rural Interaction. (Address: Permaculture Denmark, Istedgade 79, DK 1650 Kobenhavn V, Denmark.)

The permaculture principles are: action learning, co-operation, flexibility, and the alternation of theory and practice. The objectives are to train and practice in holistic permaculture thinking, planning, management and co-operation, and to organize observations and transfer experience to others.

The overall pattern is: I – me – myself – values and preferences, my local community, my bio-region, my climatic zone, the continent, the Earth. The idea is to be clear about issues close to oneself before attempting to solve problems of much greater magnitude. The method assists in clarifying motives etc.

The education program goes for a period of usually around 18 months, but can be longer depending on the duration of projects undertaken as part of the course. The programme is divided into 10 phases, gradually building up responsibility and initiative as the course progresses. Theory and practical projects alternate. The students are encouraged to travel and work, bringing with them a log book with all details of previous work undertaken. When the work is completed the book is signed for the student who submits it for final examination.

Teachable moments and each student's learning are aspects of the teaching ethic.

Zimbabwe Schools Program

Isabelle Chirere, Simba Muzuwa, Rob Sacco (Zimbabwe)

[Submitted Paper]

History – Simba Muzuwa

Zimbabwe has 6,000 schools, each one covering 4 to 10 hectares – a lot of land to permaculture. Natural Farming Network negotiated with the Curriculum Development Unit to develop a pilot permaculture schools project for 18 months. It was an opportunity to raise awareness about permaculture with Ministry of Education officials. They were given a three-day exposure. Then the heads of the schools went through the same process.

Eighteen schools were involved – two per region, so that everyone would get to know what permaculture is. Eighteen teachers in the pilot went through a two-week permaculture course. The idea was that teachers would be used as resource bases, to help build relationships with the surrounding communities.

After eighteen months there was an external evaluation which produced a good report. The Ministry has now given the go-ahead for a further fifty-four schools to be permacultured.

A team of twenty writers consisting of those participating in the process – teachers plus NGOs – produced two books, for primary and secondary. These are currently at the editorial stage and will be sent to education/permaculture people around the world for comment.

The process in the schools – Isabelle Chirere

The first activity in the schools aimed to empower the local community. Everyone was invited to attend a meeting, at which awareness was raised of particular issues, giving people the information they needed to make the decision to support the permaculture project at the school, for example problems with animals – goats, cattle – wandering into the school grounds and eating the plants. Also, informing parents of the need for them to give permission for children to tend gardens during school holidays.

Then they conducted the first observation, inviting teachers, kids, parents, and community to observe – ie to be involved in a Participatory Rural Appraisal, or environmental analysis. They mapped resources, discussed problems and identified solutions.

Then came the planning stage. They did a permaculture design, led by the permaculture teachers and a representative from the NFN, and asked the community to come up with a common goal (Holistic Resource Management).

The whole process was documented.

One school – the Nyahode District Union learning centre – Rob Sacco

Shortly after Independence, former combatants settled near the Chimanimani Mountains and formed eleven co-ops. These subsequently formed a district union, and in 1980 built two primary schools. When the first students graduated they had no secondary school to go to. There was also nothing in the way of adult education. And so Rob and Leisl Sacco were asked to set up what became the Learning Centre, based in abandoned commercial farm buildings. It opened in December 1985, catering first to adult education, then becoming a secondary school.

In 1990, the Centre hosted a permaculture course, and John Wilson conducted a design course. This led to the drawing up of a permaculture land use plan, involving the Centre's 100 acres and two dams.

In 1994, they received funding from the United Nations Development Program and implemented the permaculture design, using students. (They also have a system whereby ex-students return to work for periods of 20 days, organising themselves into work teams.) There are nine interlocking dams, a nursery, gardens, keyline system, fish farm, etc.

The Centre won the UN's Global 500 Prize.

Then Nyahode realised that despite the school, the graduates were still going into unemployment, so it developed another level of education. Fifty-nine students went into a school-leaver program consisting of one full-time year in which students could study permaculture, cabinet making and other practical skills/knowledge.

Agriculture is taught nationally in forms 1 – 4 and the Centre introduced permaculture concepts into its agriculture syllabus. Every student designs and implements a project. Because of its success, the Ministry asked the Centre to provide input into its Agriculture Syllabus. Step one: permaculture will be an option in the agriculture syllabus. Step two: permaculture will be completely integrated.

Currently the aim is to get schools to redesign school grounds. An evaluation has shown that 14 of the 19 schools in the pilot project have made major progress. Ultimately, the aim is to have every school a working demonstration of permaculture.

At Nyahode there are now permaculture clubs, voluntary clubs run by the students (65 students) along strict lines. They have their own garden, go on trips, develop projects, etc.

The school-leaver permaculture program

Two students went through the two-year Fambidzanai permaculture program and the Holistic Resource Management Program. They are now trainers, teaching eleven full-time students involved in permaculture. They run an extension nursery and fruit tree nursery, replant trees, maintain the whole 100 acre area.

Community extension work started in 1992. The Centre established a 3 hectare orchard in one of the co-ops, to raise consciousness. One thousand fruit trees

were planted. Very successful project. The team has been setting up permaculture clubs in the co-ops, working with women to design and set up kitchen permaculture gardens.

Gradually permaculture is moving through the valley. As people see the success of permaculture strategies, they replicate them on their own land.

The latest development at the Centre was the setting up of PELUM – Participatory Ecological Land Use Management – a regional organisation consisting of nine countries and thirty-three organisations (sixteen in Zimbabwe). They have divided the Agro-Ecology Syllabus between them.

Creative Education

Robin Clayfield and Skye (Australia)

[Presentation Report]

This one hour presentation consisted of examples of interactive processes and fun to assist people in learning about permaculture.

Based on the understanding that different people have different learning styles, as facilitators we need to account for the variety of learning styles which may be present in our group. We may be able to explain things rationally but not everyone can learn just by listening. Information can be integrated more easily for some by DOING and subsequently integrating a practical experience.

Robin and Skye have produced a teaching manual of processes which they are willing to share to assist people in teaching permaculture principles. They believe that our education system is so left brain oriented that we learn to become “half wits”! Permaculture requires that we use both sides of the brain, because we need design skills as well as management skills. Their teaching and learning processes encourage left brain/right brain activity, and also provide fun and practical learning skills.

Robin and Skye involved the group in some of their processes to demonstrate these learning techniques.

Mental relaxation process – to bring participants into the here and now. This process involved backtracking over the events leading up to the arrival at the conference. With eyes closed, participants are led through a guided visualisation process – to see themselves packing their bags and being on their journey to the here and now. They are encouraged to explore any issues they were involved in along the way that could be considered ‘distractions’. Then imagining that those distractions can be placed in a brown paper bag, the top folded over and the bag stored in a safe place until after the conference is over – or even thrown away! This process helps to clear the brain in preparation for learning.

Physical relaxation process – the group stands and walks around the room, casually making eye contact with each other. The facilitator leads an auto suggestion process where the group visualises their body parts becoming heavier and heavier. Starting with the left foot, imagining a creeping sensation of heaviness coming up through the body, through the left leg, right foot, right leg etc, until the body feels so heavy it becomes immobilised. Progressive tension and relaxation of the various muscle groups can also be used to release tension and stress.

Learning game for permaculture principles – Robin and Skye have produced a card game based on permaculture concepts. The pack of cards consists of blue, purple, green and yellow cards which contain the following information:

- BLUE cards depict a word which is a permaculture principle – buzz word if you like.
- PURPLE CARDS show a simple definition of the permaculture principles contained on the blue cards
- GREEN cards give the official definition, as per Bill Mollison.
- YELLOW cards have a graphic/symbolic representation of the principles.

The cards are shuffled and given out to the group who have to match the sets of cards; ie, the principle, simple definition, official definition and graphic.

The team successfully collate the cards amidst much debate, discussion and laughter – learning about the principles as they interact. Each blue card is then presented to the group by the facilitator and the principle revised.

Cross crawling exercise – to integrate left brain/right brain functions. This process is like a physical tongue twister! It is an energiser – good to use after lunch or at low energy moments. The group sits on the floor on their knees (Vajrasana posture for those who practice yoga). The group sings a well know nursery rhyme (Humpty Dumpty in this case) while simultaneously carrying out hand co-ordination skills. To the beat of the rhyme, the hands are clapped together on the knees, in the air, left hand holds the nose and right hand holds the ear – then reversing the process on the next round.

Skye and Robin have been facilitating Permaculture Design Certificate Courses at Crystal Waters and around Australia for over 5 years. These courses combine many creative, fun and interactive processes to help people learn as opposed to teaching people by lecturing at them. They have also run many “Advanced Teacher/Facilitation” courses which assist people to become more fluent and confident using creative facilitation methods. Skye and Robin are also the authors of The Manual for Teaching Permaculture Creatively, now used in 16 countries around the world. It details many tools that the permaculture teacher can utilise.

Using Simulation Games in Development Education

Jill Finane (Australia)

[Submitted Paper]

A simulation game takes a real-life situation as a model and draws out from it the key features, struggles, roles and dilemmas. In doing this, a simulation game imitates reality while reducing complexity to manageable proportions. Players 'walk in the shoes' of another person, becoming part of a situation they would not ordinarily experience, along with its feelings, dilemmas and conflicts. Taking on a role can require players to think and act in new ways and from unfamiliar perspectives. They need to give themselves permission to let go of their own life goals and try to think and make decisions like the person whose role they are taking on. This can be both challenging and enlightening, and participation in a game works best when people freely choose to take part.

Rules, symbols, goals to be achieved, set time frames and often a bit of fun, provide a structure that aims to involve and motivate the players. The degree of freedom within the structure varies between simulation games. Simpler games tend to be something like role plays, while others develop different scenarios according to the way players choose to act out their roles and interact with each other.

Involvement in a simulation game gives players the opportunity to begin to come to an empathetic understanding of a situation. However, real learning takes place as a result of the carefully facilitated debriefing and discussion process that immediately follows the playing part of the game. During the debriefing, players are helped to move out of role, look back on what happened and distance themselves from it. At this point, players share their experiences of the game and how they felt about things. Then they move on to discuss how those experiences can apply to real life. It is often during this part of the process that participants come to an 'Aha' experience where they say something like, "So that is what it is like to be faced with...." or "Is that what it was like for you (in such and such a role)? I didn't realise."

The simulation game process is not designed to introduce new material. Rather it gives participants an opportunity to apply and integrate theoretical knowledge they already have. It might help them to bring together a range of issues they are familiar with, or perhaps they may become more aware of the assumptions under which people act, or find new ways to interpret local situations in the context of wider social changes. Hopefully, the process leads people to ask deeper questions, to analyse situations more thoroughly and to seek out more knowledge. For some, the empathy they develop may lead to a more profound commitment to justice and development concerns. For each person, the direction and degree of learning will be different and may continue to unfold for a long time into the future.

Ideally, facilitators should have played the simulation game they are facilitating. Being familiar with the principles of facilitation and having had some training to

develop facilitation skills will increase the effectiveness of the experience for all involved. Because so many things happen at once in a simulation game, it is also advisable to have an assistant facilitator, especially during the debriefing.

Action for World Development has produced three simulation games that particularly relate to agricultural issues.

Is it the Real Thing? (Junior secondary to adults) is a simple, fun game that raises the dilemmas faced by rural communities when choosing between cash crops and subsistence crops.

Living in the Pineapple Republic (Senior secondary to adult) is a game that starts with a scenario where peasant workers in an imaginary tropical country have formed a Co-op to take over a pineapple plantation. The other landowners, the export company, the military government and the bank all have different interests and concerns related to the doings of the Little Pineapple Co-op.

Which Rice? (Senior secondary to adult) is a game that points to the links between consumers and producers when it comes to evaluating and responding to the effects of the 'Green Revolution' on agriculture.

A Participatory Approach to Designing School Grounds

Robyn McCurdy (NZ and South Africa)

[Presentation Report]

Based on her experiences in schools in South Africa and New Zealand, Robyn indicated that there are two ways in which schools are approaching nature and conservation: a Western approach, which is generally environmental education, and an Indigenous approach, which is for basic needs such as food, water, etc. Recycling globally is the first step.

There is a government initiative in South Africa called 'The Feeding Scheme' which gives students sandwiches and a drink several times a week. With permaculture there is potential to enrich the programme to a deep level of nourishment.

An effective way to apply permaculture design is to give children a problem to solve, together with an introduction to permaculture principles. For example, at one school a herb garden is created, then a chicken house with a general forage system, and the eggs are used in the school canteen. There is a cow to milk and the proceeds of the garden all go to the canteen, to be prepared for the children. Recycled items are used – for example, orange/pumpkin mesh bags are cut up and sewn into shade cloth, and a four-way fireplace was built to enable a fire to burn whichever way the wind was blowing.

In Adelaide, a Mt Barker Waldorf School teaches gardening and landscaping with a permaculture emphasis in the curriculum. At first the student has their own small garden to tend, then a shared garden between 2 or 3 students. Following on they work in a group, then they produce commercially. Between the ages of 10 and 12 they grow market produce, and from 14 to 15 they learn landscape gardening, develop team projects; for example, growing herbs, then processing into oils, dried, cut, moving into the world of commercial enterprise. At the Mt. Barker school a shade house was created using brushwood from eucalypts. They also use worm farms.

When designing playground equipment permaculture is also important, often using recycled items. In Africa, seating was achieved using hessian bags, packed with earth, then covered with cement; moreover, a whole series of learning situations developed from the seating requirements, such as the comfortable 'body' space needed by each person, handcraft and functionality. Swales are also developed.

One creative way in which the permaculture process became incorporated was an instance whereby a 9 year old in Australia wished to develop a BMX track, creating a whole permaculture site around it (as parental criteria required) showing that children are capable of designing in this way if supervised by an adult.

Some preparatory elements of the design process are:

- *Observation*: know the territory; a detailed study of the vegetation.
- *Interviewing*: students, and students interviewing each other regarding likes, dislikes, visions for the school – students chalk their wishes, needs on the pavement, etc.
- *Historical perspective*: interviewing older people about previous use of the land.
- Free-range wandering and observation.
- *Soil studies*: recording details on a chart.
- *Water harvesting*: experiment with topography, water flow.
- *Mapping on the ground*: use ash or sand to draw with, create a replica on the earth using recycled materials, then on paper.
- *Large scale*: use our bodies to look at sectors. Zoning using string – the connections between elements, employing a string game, then form guilds.
- Use of element cards on the ground – indicating how they work in reality.

Another way is to start with a 'problem tree' to look at causes and effects, noting how permaculture addresses the root of it. Before designing look at goals – use templates, build up collective goals based on values. Make a resource inventory – draw inputs and outputs on a chart, and future elements which are desired, then test future ideas. What aspects are possible to begin immediately?

Analysis of elements: input/output charts to check for viability.

Now all details can be transferred to the master copy – zones, sectors, waterflow, windbreaks etc placed on a map of the school grounds.

In a two week permaculture course the organization of design is taught: in week 1 permaculture principles and practical application, in week 2 the design process.

PRA (Participatory Rural/Rapid Appraisal) – Holistic Resource Management – goal setting is another teaching model, and some of these techniques are integrated by Robyn into her approach to permaculture design.

Robyn McCurdy (Dip. Perm. Des.), co-founder of Tui Community in New Zealand, has designed permaculture food systems and school environments, taught permaculture courses in Aoteroa/NZ, Australia, Lesotho and South Africa, where she has implemented and refined the "Pattern System" approach for agricultural land, village and school design.

A Pattern System for Permaculture Design

Joanne Tippett (UK & Southern Africa)

[Submitted Paper]

Introduction

The Pattern System for Permaculture Design integrates *goal formation*, *participatory design* and *permaculture design tools* in an easy-to-follow, step-by-step process. Templates are used in the process of collecting and analysing information for design. The physical design is built up in layers of analysis, using permaculture principles to inform design decisions.

The templates used in this approach are based on patterns found in natural systems, with a branched, spiralling form. They employ *mind-map* techniques. A mind-map is a graphic technique for representing ideas, developed by Tony Buzan. A mind-map has a central image for the main idea, and branches for major themes radiating from the centre, with associated ideas and topics connected to these branches to form a “connected nodal structure” (Buzan, 1993, pg. 59). A node in this sense is a dense centre, or area, of information. This structure, and the categories of the templates, encourages participants to look at the resources they have, to search for local resources and to see ways of making functional connections between elements and resources. The inclusion of permaculture principles in the templates helps to make these principles easily applicable to design.

The aim of this paper is to introduce this system, including where and how it was developed and how it is integrated with permaculture training, concluding with the advantages and a few of the potential applications of this approach.

Development of the process

I worked for two years in Lesotho, a small mountainous kingdom, completely land-locked by the Republic of South Africa. This involved working with community organisations, schools, government extension workers and farmers. This work was done through Holocene design company, which was established in 1994 with the idea of combining Joanne’s work in permaculture and systems theory with Buddy’s experience in ecological design, architecture and site planning.

The context of working in Lesotho is one in which the worst of chalk and talk and linear thinking from the Western education system has become deeply entrenched. This has resulted in a degraded ability to analyze problems in a holistic context, a degraded traditional knowledge base and a lack of knowledge about ecosystems. This is intensified by the ecologically degraded environment. It is difficult to learn how to design with ecology when there are few examples of un-degraded systems available to learn from.

I was working in this environment as an outsider, in an ambiguous position of saying that working with nature and traditional knowledge offers a more sane path for

development than to follow the paths set by the large development organizations which abound in the region. I was aware of the need for a system of making permaculture principles comprehensible and applicable to design, at the same time as encouraging participation in the design process by people from many different walks of life, including those with little formal education.

This pattern system of permaculture design began as a new way of teaching the permaculture classic, the 'Parable of the Chicken', in a way which helped to graphically represent the principles behind the parable. Once started on this path, my fascination with design and patterns took over. I have studied with Christopher Alexander in California and have always felt that pattern languages and holistic thinking were key to ecological design. I have seen, however, that it is easy to feel attracted to these ideas, even to teach them, without making them very practically applicable. This design process evolved as I experimented with ways to use mindmaps, integrated with ideas from Alan Savory's work with Holistic Resource Management and my permaculture design experience. Its development also included looking at what was working in the areas of sustainable agriculture, seeing what made sense to people and experimenting with how to translate that into principles which people could understand and apply to their own situations.

Working at Tlholego Development Project, near Rustenburg in South Africa, I was able to put the process and integrated method of teaching permaculture principles to the test, teaching two full permaculture design courses, one for school teachers and administrators, and one for community development workers and agriculture extension agents. This process was also used for a permaculture design which Holocene Design Co. carried out for an NGO in Lesotho, called Ketso ea Bua, or Action Speaks.

Permaculture training and the pattern system approach

Permaculture principles inform this design process, in the types of questions asked and the structure of the process, as well as by applying principles directly to design and decision making. The principles I have used in this process have been reorganised slightly, in order to make them more structured and easily applicable to practical design.

One of the permaculture principles which has a major influence on the design approach is Pattern Application. This involves learning from patterns in nature, including branching structures, patterns caused by flows (of water and air), and the way in which these patterns are self-similar at different levels of scale. Patterns in nature inform the design process, in terms of templates and the way in which design is applied on the land.

As well as permaculture principles, this design process is based on systems thinking. This way of viewing the world is different to a 'mechanistic' way of thinking which sees distinct objects, which work as a machine. One of the major differences in the two ways of thinking is in the view of cause and effect. A mechanistic way of thinking tends to see a linear relationship between cause and effect, where any action produces a direct effect, which is in direct relationship to the action, on the object being acted on, but does not affect the whole system.

As these three concepts are integral to the design process, I will describe the design course structure which has been integrated with the teaching of the pattern system for permaculture design.

Permaculture principles form the backbone of the first week of the design course. Group work, practicals and topics (such as agroforestry and natural pest management) are used to reinforce the principles. On the first day, participants are introduced to the tool of mind maps, which are used in participatory work, teaching posters and exercises throughout the week. Principles are reinforced and elaborated on in the second week, in which the design process is taught.

In the first week, participants look at how ecology works as a whole; how if you affect one part, you affect the whole. The design tools and approaches which are taught throughout the course have systems theory as their foundation – viewing a whole system, seeing connections as more important than the objects themselves, understanding that every element has an effect on the system of which it is a part, that every sub-system, or guild, has an effect on the ecosystem of which it is a part.

The principle of edge effect helps to clarify the relationships between element, guild and whole system. Every element is embedded in a whole; it cannot exist without the whole, or as an independent entity. Each element, however, does have an edge, which defines it as an entity.

This edge is not a rigid boundary, but is a diffuse area of exchange. The edge is a very important area – it defines, it is an area of opportunity, exchange and productivity. It is a very distinct area, which often has special properties. Think of the membrane of a cell. It defines the cell, bounds it and holds it together. It is also semi-permeable, allowing in some substances, keeping out others. When designing guilds in the first week, participants are encouraged to think of the edges between elements and of the edges between guilds.

The second week begins with the final permaculture principle to be taught – pattern application. Participants are given leaves, flowers and other natural objects, and pieces of chalk and asked to draw patterns they see in the pieces of plants they have on the ground – concentrating on copying the patterns at different levels of scale and how their drawings interact with those of their neighbours. This is used to introduce the idea of learning from patterns in nature and using them in design, especially in order to increase beneficial edge effect, and as an introduction to the pattern-based design process.

The concept of roles and functions is then introduced with a game, and the first exercise of the design process is carried out, looking at organizational structures and roles within the group for which the design is being carried out. The rest of the second week focuses on introducing the design process, mainly through group work and practicals, in such a way as to consolidate the ideas and principles learned in the first week.

How the design process works

This process is structured in a series of steps, focusing at first on the **BIG IDEA** then **small details**, analyzing the existing situation, deciding what the group needs

(goals, elements and activities), then working out how to achieve those goals in a sustainable way. This design process can employ a sliding scale of participation, from a full scale community design process to a professional designer using templates to gather and analyze information from a client.

There are ten types of templates which have been developed for broad design, and three for detailed design. These are:

- Quality of Life Values Template.
- Observation Template.
- Resource Inventory Templates (Within The Project).
- Project Inputs And Outputs Template.
- Goal Formation Template.
- Future Economic Elements and Activities Template.
- Local Resource Inventory Templates.
- Limiting Factors Templates.
- Analysis Of Elements Templates.
- Design Information Charts.
- Analysis of Components of Elements templates (Plant, Structure and Technology, and General).

For group work, the templates can be copied onto large sheets of paper. Small pieces of paper can be used with these charts to build up a mind map of the group's ideas, using "bluetack" to stick the papers down. It is also possible to use the templates to cut out charts with separate pieces of paper for each major section, or branch of the template. These can be used to build up a large mind-map with participants. This process allows for flexibility, as pieces of paper can easily be moved around and changed. The use of large templates, colour, symbols, string and small pieces of paper for recording ideas helps people try new combinations of ideas. When using large templates in this way, the template can be tailored to the needs and interests of the group. Symbols or objects can be used instead of words to represent ideas.

The design process encourages integration of information. One of the principles of permaculture is stacking in space and time. This process gives tools for integrating many different types of information into an ecological design. The fact that this process is structured in a step-by-step way makes it possible to collect a lot of information and organize it in a way which makes it useful for design.

The brainstorming processes start with each individual writing (or sketching) their ideas down on small pieces of paper, all of which will be included in the initial building up of the template. This allows every member of the group to have a part in the discussion (often a problem with large group processes), as well as allowing all ideas to be placed "in the picture" for consideration. Once a full picture of the thought process of the group has been built up, ideas can be consolidated, refined, and adjusted to best represent the ideas of the whole group. The use of mind-map structures in the templates encourages creative thinking and making connections and associations between ideas. At the end of the session, the large chart can be copied onto a blank template to record that stage of the design process. Each template is revisited at some point in the design process, to allow feedback loops between information and ideas from different stages of the design to be developed.

Once information about the project, area and goals has been collected, and the list of future economic elements and activities has been decided upon, permaculture principles are applied to these elements and activities, by filling in Analysis of Elements Templates and Design Information Charts for them. There follows examples of a Resource Inventory and an Analysis of Elements Template, filled in during a permaculture course in South Africa.

Detailed information about the land is then collected, including making a base map. The land is analyzed in terms of zones, sectors, soils and vegetation. Overlays are used to build up a physical design. This includes designing for sectors and a water harvesting plan (if applicable). A plan for wildlife areas includes habitats to be protected, areas for developing as wildlife zones, and corridors to be developed between various habitats. Information for a physical design is built up in layers.

The information from the templates is then used to plan the relative location and patterning of future elements on the land, in a process called Bubble Map. Elements from the Future Economic Elements and Activities Template are written or sketched on pieces of paper, and grouped in the guilds which were determined using Design Information Charts. These guilds are then placed on the overlay of zones and sectors on the base map, and are moved around and discussed until the designers are happy with their relative location on the land. The bubble map is the stage where you COMBINE the information in the **Design Information Charts** and the **Analysis of Elements Templates** with the information about the LAND itself (collected during *observation*). The use of pieces of paper and bluetack encourages a sense of flexibility to try different ideas which could be lost if going straight into drawing and writing on the paper. Discussion during the bubble map process is centred on how the changes proposed will affect the land, and how to apply permaculture principles, such as Stacking in Space and Time, Pattern Application and Edge Effect, to the design.

The Bubble Map is combined with the previous steps of design on the land (wind-breaks, water harvesting and waterworks, wildlife areas, etc.) and a plan for access routes, to produce a rough sketch of the future design. After discussion, this rough sketch can be consolidated into a broad design for the land.

After the broad design has been completed, detailed design for sections of the broad design can be carried out. The detailed design is the stage at which the elements which have been placed in the broad design are planned in more detail, looking at issues such as : species, smaller pathways, fencing, minor waterworks and irrigation, structures and shapes and sizes of buildings.

As the broad design has been completed *before* this step, the designer can be reasonably certain that the placement of elements will work well in terms of energy, zoning, conditions on the land, what the people involved want, productivity, recycling and beneficial relationships.

The same principles and methods used in the broad permaculture design apply to detailed design. Much of detailed design can be done by staking out and marking elements on the ground, and by using Analysis of Components of Elements Templates.

Following the design, an action plan for implementation is devised, including financial planning, assigning areas of responsibility and roles, and working out priorities and timing.

Advantages and potential applications of the pattern system approach

This method of teaching permaculture principles, and of using templates in design, helps to make principles easily understood and applied in a practical way. It offers a framework for design, especially participatory design, which involves collecting and analysing information from many sources. The potential for group work and input into design could be used for integrating Local Agenda 21 into permaculture. This process has been used in the design of a school in South Africa, and could be further used in participatory school designs.

One of the features of this process is the focus on analysis, using templates. Whilst encouraging participation and input from many members of a group, this focus on analysis helps to steer discussion away from personalities and prejudices. The aim is to make a comprehensive graphic representation of the situation, which can be analyzed in its entirety, whilst following steps to use the information gathered in decision making processes and design. This can help to solve many problems which often arise from participatory work, such as foundering on detail and personal prejudices early in the process.

By giving a series of simple steps to follow, the design process can facilitate creativity. This works in a similar way as the Pattern Language elucidated by Christopher Alexander. Simple patterns, once learned, can be applied again and again to design, each time producing a design suited to the site and the needs of the users. Templates can act as a quick way for a designer to compile information. The filled-in templates can act as a bank of information about the elements used in design, and the decision making process for the particular design, acting as a useful resource of information for future developments.

The use of templates helps to facilitate communication between people in a group, and between different projects and groups. Interdisciplinary thinking involves exchange across edges of disciplines (eg. communication between forestry, livestock, crops departments). Permaculture makes edges between areas of knowledge more productive and meaningful by giving us a framework for understanding and communication. Permaculture principles can be applied over and over, with infinite possibilities and differences, but using the same basic language. These templates can act as a tool to facilitate this process. In this way, this approach to design could be helpful for integrating permaculture into education programmes, using a principles – based, interdisciplinary approach to analysis and teaching.

Summary

The aim of this design process is to integrate pattern application and permaculture design tools in a new way which helps make information useful and applicable to design. As each area of land and group of people carrying out a design is different, each permaculture design is different. This implies that the design steps should

be adapted to suit the circumstances of the group. This design process is a tool to facilitate people's creativity and to empower people to look at their situation through the lens of permaculture principles, focusing on regeneration of human and physical resources and ecological sustainability.

The structure of the design course focuses on permaculture principles and making them applicable to practical design. Every idea is reinforced and introduced in several different ways, with the teaching methodology aiming to help people work out how much they already know about ecology and design and giving them a framework for using that information.

This design process comes out of experience of teaching and working with permaculture in Lesotho and Southern Africa. I have taught and used this design system in those countries, and am now planning to teach and trial this process in the UK and USA. A manual about this process, with examples and photos, is forthcoming. I will be available for running two week design courses and advanced design courses after mid-February 1997.

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The Getting of Hope: Personal Empowerment Through Permaculture

Caroline Smith (Australia)

[Submitted Paper]

“The world belongs to those who give it greatest hope.”

Teilhard de Chardin

In 1993, as part of a research project on permaculture education, I began surveying participants in Permaculture Design Certificate (PDC) courses. One of the most intriguing and exciting comments frequently made was the extent to which people felt empowered by permaculture and that for so many permaculture was a source of hope and inspiration. People from all walks of life talked of permaculture giving them a sense of hope and direction for the future, for the rest of life's journey.

Empowerment has been described as:

“increasing self-esteem, assertiveness, self-actualisation and a feeling of control over one's life rather than a state of dependency.¹”

This was exactly what PDC participants were describing:

“I feel wonderful. The feeling of power, of being able to achieve the plans I have in mind, is very strong.”

“I feel inspired, more optimistic, hopeful, enthusiastic, enlightened, more direction.”

“I feel as though I have had my eyes open to new hope.”

“I now feel empowered by the knowledge and skills I have gained and can't wait to start sharing it with others.”

“I see my life and contribution to the earth's environment and my community on a much broader scale.”

“It has given a whole new perspective to the future.”

“Because of what I've learned I have a responsibility to use the knowledge widely. I feel empowered by this experience and more hopeful for the future”

One comment in particular sums up the feelings expressed by many:

“The permaculture course was almost like a religious experience. I felt inspired with hope, excited that I could make a difference, touched by the realisation that I could be in control, empowered.”

¹ Gross, S.J. (1985) Personal power and empowerment. *Contemporary Education* 56,(3), 137-143.

On reflection I realised that I too had been empowered by permaculture. How else could I explain my continued interest, growth, understanding and participation as a permaculturist? And how else can we explain the phenomenal expansion of permaculture in less than twenty years into a worldwide movement with representation in at least eighteen countries on six continents?

My research took the direction of exploring the empowerment process, by immersing myself in two PDCs where I surveyed, listened, talked to, read and partied with a range of people, both PDC participants and experienced permaculturists.

The answers are wide-ranging and complex, varying in emphasis from person to person, but there are common factors. In retrospect, much of what I will say is probably blindingly obvious. But for me it has been a gradual unfolding of understanding the scope of this remarkable thing called permaculture. What follows is a synthesis of a range of ideas, concepts and insights gleaned from some of those inspiring people with a few of my own thrown in.

Twentieth century sickness

As William Blake reminds us, reason alone leads to despair. Information without the means to seek solutions can, at worst, lead to depression and apathy.

Although we in Australia appear to live in a time of greater democracy than ever before, paradoxically our economic and social systems have taken away from individuals and their communities the means of control over our very basic needs: shelter, warmth and production of food. In short we have become a dependent society. Our democracy remains representative rather than participatory, vesting power in representatives over whom we have little real influence. Our so-called leaders behave far more like followers – of Big Business and arid narrow economic dogma. Their thinking is linear, limited and short term, mostly as far as the end of next year's election, next month's investment return, next week's balance sheet. They operate in a framework where resources are seen as infinite, human ingenuity for solving problems through science and technology as boundless; whose values are that growth is good and affluence is better.

As we enter the next millennium, we in the West find ourselves living in a society which is affluent in material terms but increasingly impoverished in environmental and social terms. Many of us live with a widespread sense of foreboding and pessimism about the future. Our lives have become highly stressful; we experience a growing sense of social isolation. We witness environmental destruction on a vast scale worldwide, due largely to over-consumption made possible by the harnessing of fossil fuels. Many of us are employed in jobs which we are terrified of losing because we have bought into and are trapped by the economic machine. Our jobs may bring little meaning and see us working yet longer hours, taking us further from family and community. At least 10% of us are unemployed, subject to fast-dwindling, top-down government schemes which attempt to shoe-horn us into jobs which hold little attraction. We are using up our social and environmental capital at a frightening rate. Dependency is disempowering. We are not in control of our destiny.

How are we reacting to this gloom and doom? Psychologists refer to an epidemic of stress and neurosis in Western affluent societies. Depression is now the fourth most debilitating community disease. Australia has the highest rate of youth suicide in the world, surely rooted in a sense of loss of hope. Indeed, research on young people's views of the future paints a stark picture of hopelessness; of growing environmental destruction, violence and inequality in an increasingly dehumanised, machine-dominated world.² In one of his recent surveys, Hugh Mackay found that the majority of 35-45 year old Australians believe they lead stressful lives, and yearn for simpler ways to live. These people, unbelievably fortunate in the eyes of the poor of the world, have concluded that affluence is anything but synonymous with a high quality of life. We seem to have created an individualistic, competitive, anxiety ridden society.

The dominance of economic rationalism, particularly in English speaking developed countries, has reduced the daily discourse to a narrow economic one. The prevailing economic view is that we are not *Homo sapiens* but merely *Homo economicus* – beings motivated entirely by market driven economic interests.³ Our erstwhile rulers equate a casino culture with progress, while waiting with bated breath for the latest ruling on our credit to be handed down from on high by Standard and Poors. Telstra reports record profits while in the same breath announcing massive job losses without so much as a blush. We are given a health report on the stock exchange, the almighty dollar, currency exchange rates and the price of gold several times a day. Where is the daily pulse of the social and the environmental state of the world taken and reported?

Such a narrow view of human beings is deadening and dispiriting. It denies much of what we know is deeply and fundamentally important to us – our connection with each other and with the natural world. We know that in order to survive, we need to change to more sustainable and human centred ways of living. For many of us, permaculture provides the vision, ethical base and practical means to achieve this.

Permaculture education: holistic education for life

“I've learned more things of use in these 10 days (of the PDC) than in the whole of my schooling.”

Environmental education as taught in schools can be merely depressing, presenting issues and problems but offering few positive insights into ways forward. Such education often lacks both a critique of the social and economic structures underpinning the environmental crisis and indeed the contribution of the curriculum itself to the perpetuation of the consumer society.⁴

In sharp contrast, through permaculture education we learn to take back power into our lives; we become empowered through achievable actions in an ethical and, for some, a spiritual framework. Permaculture gives us the tools for personal action to take back our sense of control, whether it be growing food or growing community.

² Hicks, D. (1996) A Lesson for the future: Young people's hopes and fears for tomorrow. *Futures* Vol. 28 (1) 1-13

³ Hamilton, C. (1994) *The Mystic Economist* Willow Park Press, Canberra.

⁴ Fein, J. (ed.) (1993) *Environmental Education: A Pathway to Sustainability?* Geelong: Deakin U. Press

It allows us to start where we are, be it the window box in the city, the back door or the large farm. David Holmgren believes that the home represents a crucible for experiments in redefining our relationships with each other and with nature.⁵

We don't need formal qualifications to practice permaculture, we just need to tap into our deep sense of wanting to work with nature instead of against her. For many of us, this journey begins in practical ways. I wonder how many of you began your permaculture journey by creating a no-dig garden? And I wonder if Robyn Francis realises just how many people she has motivated and inspired by her video "*The Mandala Garden*"?⁶ Permaculture's great contribution is the use of sane and natural design. Design for the garden, the farm, the house or design for our lives.

An experienced permaculturist describes this as:

"You can start where you are at, you do not have to have any prerequisites to do this... you can do it at home."

From learning how to lay a simple no-dig garden to harvest clean, fresh food to developing the ethic of conserving energy, recycling, reusing and distributing excess, we learn to tread more lightly on the earth. Living with less becomes the new ethic – an old car with its low embodied energy and the op-shop outfit become a badge of pride.

Permaculture is human centred, not techno-centred. It is a positive rather than negative response to, and critique, of the social and economic crisis. It operates at the human scale while keeping in mind the global picture. Permaculture offers a holistic, transformative view of thinking about the way we live. It gives us the means to re-examine and renegotiate our practices and relationships with each other, our communities and nature herself. It frees our minds from the limitations of the present and opens up a natural but often untapped creative energy to construct a sane, flowing, harmonious way of living our lives. The best permaculture teaching mirrors this view, valuing all participants, seeking to create connections between people and between areas of the curriculum.

Through permaculture we become less dependent on materialism; we experience a greater self-reliance in food production, a reduction in energy use and the chance to experience a renewed sense of community through becoming involved in local groups, community gardens and alternative economic systems such as local economy/employment trading systems (LETS). This is empowering because it gives back control over those basic aspects of life in a way that is achievable, and a personal value that does not depend on our dollar earning power. A high standard of living is replaced by a high quality of life involving a renewed sense of belonging, be it in the community, with like-minded others, or to the earth itself. A permaculturist described the development of that sense of belonging as:

"I think (the home) is where you can start putting things into place, and then you can network in the local community. That sense of belonging with a group of like minded people is empowering."

⁵ Holmgren, D. *Permaculture paths to a sustainable future*. (1995) 6th Australian Permaculture Convergence, Adelaide

⁶ Francis, R. *The Mandala Garden*. Lismore: Permaculture International

Permaculture gives people both a vision and the practical means to take back control into their personal lives, generating in turn a renewed sense of hope and purpose for the future. It gives us the means to move towards a sustainable world.

Passion for a cause, action involving sometimes fundamental changes in world view and lifestyle which Permaculturists articulate are the elements of empowerment.

Redefining our relationship with nature: the re-emergence of spirituality

I find it difficult to write about spirituality because for a long time I have been an agnostic and have largely rejected the traditional religion I grew up with. I still feel uncomfortable talking about this in certain circles. However, like many of us I have experienced intense and powerful feelings of connectedness with nature and the universe, both in the bush and through gardening. Practicing permaculture, working with soil and plants, getting down to their level, slowing down, being still, looking at the incredible way in which they grow together and attract a myriad of tiny creatures is to me a spiritual experience. The growing awareness of the incredible complexity and workings of nature is nothing short of awe-inspiring.

In this context, a definition of spirituality which appeals to me as a non-religious person, is that

“spiritual knowing is about our capacity to experience wholeness and unity, and our ability to experience connectedness with the larger order of things.”⁷

This sort of spirituality is far from the institutionalised notions I had grown up with.

Since the rise of rationality in Western thinking in the 17th century, we have been subject to, and constructed our societies within, the paradigm of scientific and technological reductionism. Indeed the economic rationalism described earlier is a reflection of this.

This way of knowing the world glorifies control over nature through the rise of technology. We in the so-called developed societies have been urbanised on a large scale for no more than 200-300 years – a very short time in the history of humanity. The dominance of science and technology, made possible firstly through the rise of rational thought and then embodied in the industrial revolution fuelled by fossil fuels, has brought obvious benefits to some of us. But it has also removed from many of us profound, crucial experiences which have been part of human evolution and culture for hundreds of thousands of years – a deep understanding of nature through food production, care of the land and human scale community living.

To construct a sane, sustainable future, we need to

“de-centre the machine and the technocrat, instead returning to a human scale vision.”⁸

⁷ Catholic Education Office (1994) *Quality learning and teaching: Tutor training program*. Melbourne

⁸ Slaughter, R. (1995) *The Foresight Principle: Cultural Recovery in the 21st Century*. London: Adamantine Press Ltd.

In many cultures there were and still are ancient taboos which assign a sacredness to the land. Indeed indigenous peoples have spoken passionately and eloquently of their spiritual loss on being disconnected from the land. Many of us in the West, and now increasingly other cultures, have lost our ancient ties to the land, and I believe we too are suffering a spiritual loss deep inside us – our barren, materialistic existence offers little meaning and is unable to quench our thirst.

Through the practice of permaculture we are able to reconnect with this deep and ancient need. Through learning to grow our own food and to look after the land, we are able to reconnect with the cycles of nature. We experience the joy of seeing a plant's whole life cycle from seed back to seed, and to save that seed for future abundance. We tune into the seasons, the angle of the sun, the wind, the dry and the wet, the cold and the heat. We celebrate the turning points in the seasons – the solstices and the equinoxes. We learn to recognise when to plant – not when the back of the seed packet says, but when that tree is flowering and those birds appear. We learn what will grow in our conditions and what will not. We learn to bring the soil back to life and marvel at its fertility. We learn that nature is at once predictable and unpredictable, and the nurturing of new life and new growth generates for us new hope. We begin to value precious time over money, we learn to slow down and tune into the ebb and flow of the natural world. We learn to design our lives around natural energies and cycles.

Literature on empowerment stresses the importance of supported participation. Through food production, allowing us to participate actively in earth-care, we begin to take back responsibility for the earth. With its emphasis on small and local communities, permaculture gives us back our sense of belonging – our place in communities which extends to our place in nature.

Although my background is in the biological sciences, it was not until I became involved in permaculture that I really understood the wonder of the cycles and energy flows in nature which I had studied in such a sterile way in the classroom. Through the practice of permaculture emerges our sense of belonging to a greater whole, a sense of power with the universe. Yes, Bill Mollison, nature is surely the best teacher.

Complexity, synergy, resonance and flow

In contrast to the mechanistic paradigm, natural systems exhibit the qualities of complexity and emergence, which arise as a result of a myriad beneficial synergistic connections. In a natural system this leads to abundance and a self-perpetuating system. At the level of design for food production, permaculture attempts to mimic a natural system, achieving high productivity by the use of high biodiversity through the construction of complex garden systems. But these same principles of connectedness, diversity and complexity operate in a range of systems on a range of levels. Through trying to understand permaculture, I have come to believe that a permaculture system by its very nature provides a model for our own lives, one of richness and diversity which leads to synergy. The synergy between elements in a permaculture system parallels ways in which we can become energised and empowered, through the multiple positive connections to each other and to the earth. In the

same way, learning about and practicing permaculture seems to release the locked or numbed energy we have about social and environmental concerns.

At some time in our lives we have all experienced the sense of connectedness leading to feelings of expansiveness, well-being, responsiveness, acceptance, tolerance. This sense of abundance and creativity is within all of us, unleashed by reconnecting with each other and with nature. This is the flow experience, described as:

“... an intrinsically rewarding experience, from doing something we love and are good at, we derive the pleasure of effortlessly stretching ourselves beyond our usual limitations, into a 'peak performance' ...⁹”

We recognise, respond to and flow with permaculture because deep down inside it touches us, there is a sense of resonance with its principles, it *feels* right. PDC participants often comment on this feeling:

“Permaculture is common sense, plain common sense, common sense illuminated. I can recognise it, I am instantly familiar and comfortable, I am not fighting any of it.”

and:

“I feel I am on the right track, I feel this is the thing that perhaps has been missing all along, this sense of connectedness with the planet. It has become the framework for our future, somehow for me it is a real framework for living.”

When you think about it, there are many examples of complex, effective connected systems, such as traditional polyculture agriculture, an insect colony, a rainforest, a mycorrhiza, a symphony orchestra. Such systems can be variously described by terms such as “belonging”, “connected”, “supportive”, “loving”, “integrated”, “meaningful”, “purposeful”, “constructive”, “functional” and “empowered”.

Indeed the father of the Gaia hypothesis, Lovelock himself, takes the view that the whole planet Earth acts as such a system; a self-regulated and reactive system which, through a series of feedback loops, creates and maintains the conditions necessary for life to exist, a system of increasing diversity, complexity and stability.¹⁰

It is also possible to describe in similar terms situations which are clearly dysfunctional. These have factors in common which are the antithesis of a diverse, functional system. They exhibit little diversity and few connections. Think about not only the monocultures in agriculture, the single isolated trees left after a clear-fell which quickly die, but also the lonely, disconnected immigrant who has left all networks behind, the socially isolated unemployed person, the school child who appears different, repetitive factory work, the secondary school timetable which places learning in boxes, Rhesus monkeys in Harlow's experiments, the untouched, unloved Mexican children who died before they reached three years old. These can all be described by terms such as “disconnected”, “lonely”, “unsupported”, “unloved”, “destructive”, “isolated”, “powerless”, “hopeless”, “purposeless”, “meaningless”, “desolate”.

⁹ Bouchon, M. (1996) Business and its environments. *Earthwise Women* 3 10-11

¹⁰ Lovelock, J.E. (1979) *Gaia: A New Look at Life on Earth*. Oxford University Press

Journey to empowerment

The empowerment process through permaculture is a journey whose beginnings for some may even be forgotten. For others it has a definite starting point, a crucial event or realisation that things have to change. Empowerment emerges and grows through connectedness with each other, by supporting each other in our journey, by helping each other to acquire knowledge and insight. Our empowerment is synergistic, as we empower each other so we become empowered ourselves. It is far from the zero sum power games of deadening, outmoded authoritarian structures, where my power gain means your power loss.¹¹ Like love, empowerment is enabling, it is boundless. It grows when we are able to be affirmed for our work, when we participate, be it in our local group, at this conference, in our garden. We gain confidence, increased knowledge and understanding. We gain a sense of rightness, of flowing with nature rather than battling against her. Our empowerment manifests in passion, action, commitment and advocacy. As we continue to grow, experience and learn, we are continually confronted and challenged by the contradictions of life in this period of our history. Our sense of empowerment through participation and action will ensure new meanings and ways of seeing will continue to unfold.

In my worst nightmares I see a bleak, socially and environmentally degraded technocentric future, fuelled by nuclear power as the fossil fuels run out. It is a future where the worst of human values predominate.

In my sweetest dreams I see a just, sustainable future where the very best of human values are our guiding principles. Permaculture may not be the only solution to our crisis, the “global problematique”. But it provides a powerful philosophy, ethic, knowledge base and practice upon which to build a sane, sustainable future. By its vision of reconnecting us to nature and to human scale sustainable communities in a practical, accessible way, permaculture offers purpose, energy, means to action and most importantly, hope.

I'll leave the last word to another PDC participant who described permaculture thus:

“This feels like following the soul or instinct ... the content of the course has confronted me with a huge sense of guilt, inadequacy, ... but also of great hope.”

¹¹ Macy, J.R. (1983) *Despair and Personal Power in the Nuclear Age*. New Society, Philadelphia.

Part 5

People Care Stream

Fun and Games Session

Robin Clayfield and Eugenio Gras (Australia)

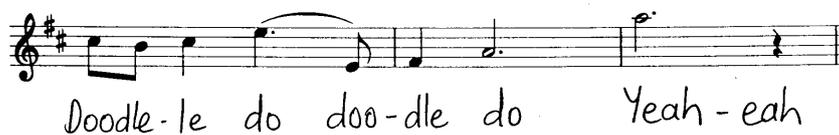
[Submitted Paper]

Inspired by an (over) abundance of slide and talk sessions Robin Clayfield and Eugenio Gras found themselves outside one morning planning a fun hour for people who needed a bit more physical activity. The following processes were used. Most of the descriptions of the games and the pictures are taken from *The Manual For Teaching Permaculture Creatively* by Earthcare Education (Robin Clayfield and Skye).

Waddlee-Ilee-Archer

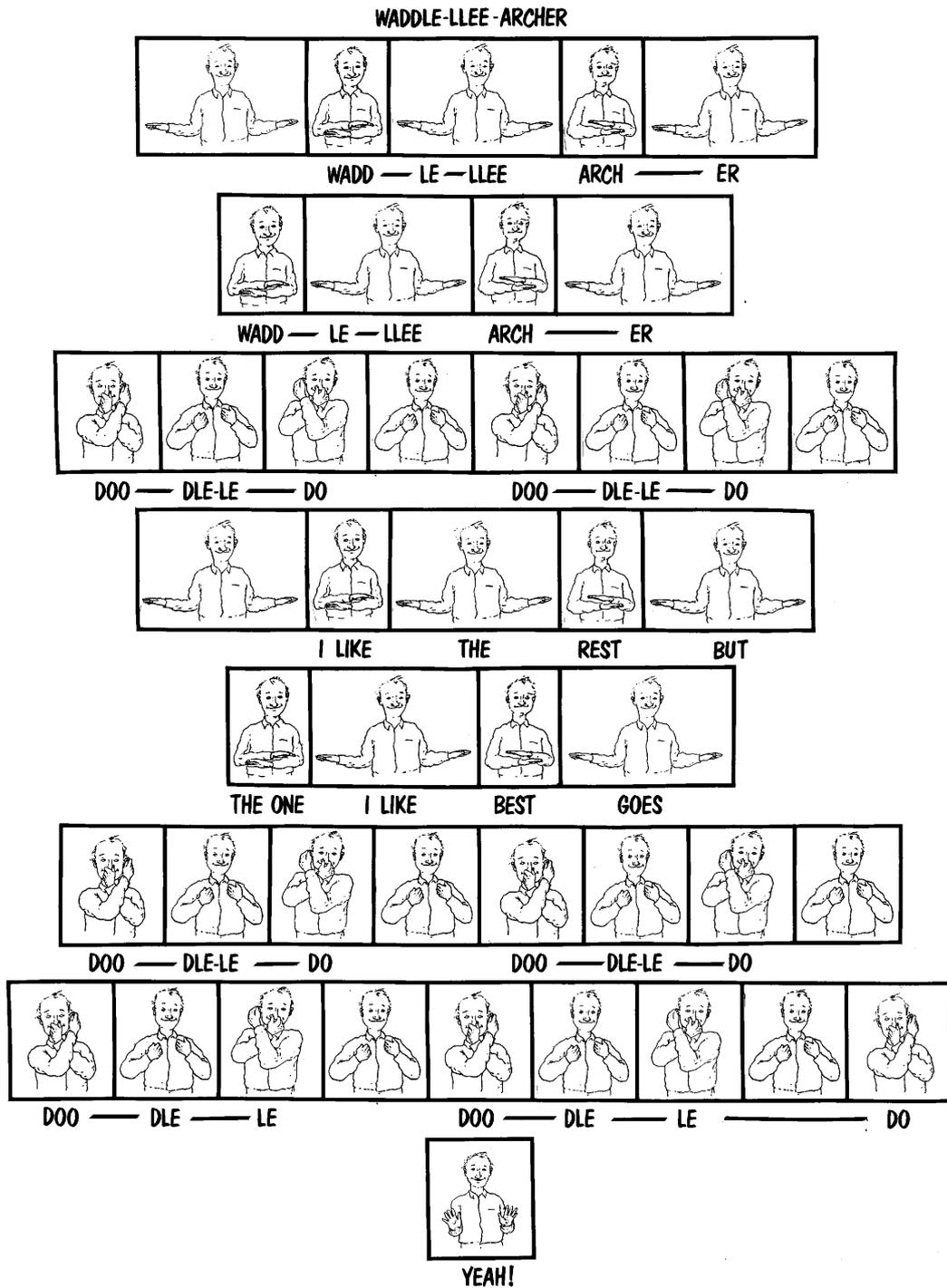
(This one comes from Brendan O'Hara's book and cassette "The Children's Song Book". Brendan originally learnt it from a ten year old girl in Sydney, it originates from the Girl Guides) This is a song/activity that encourages left/right brain integration and is an effective coordination exercise. It does not really matter which side you start with as long as the next action alternates. This one can be done with everyone standing in a circle.

Anon. Arra. Brendan O'Hara 1991



Knots

- Everyone stands in a tight circle, shoulders almost touching (in larger groups form a few circles - 8 to 16 per circle seems to work well).
- Both hands are raised in the air.



- On the signal all reach into the centre and take a hand in each hand but not the hand of an immediate neighbour, nor can anyone be holding both hands of another individual.
- Now unravel that!

Often groups can get out to a circle (with inevitably a few people facing outwards), but sometimes we have ended with two or three interlocked circles and other times

the knot is simply insoluble but fun trying! (For these insoluble knots tell everyone to quickly let go hands, throw hands in air and shout Aaarh!)



Car Car

(This is a great game to watch.)

- Everyone pairs off.
- One person becomes the "car" with eyes closed and hands in front of their chest, open palms outward (bumpers up) while the other is the "driver" who steers and directs the "car" around the room WITHOUT TALKING although appropriate noises are allowed (acceleration, gear changes, tyres squealing).
- After a few minutes everyone changes roles.



- Ensure that all drivers are instructed that the aim is NOT to crash into others cars near misses are permitted!

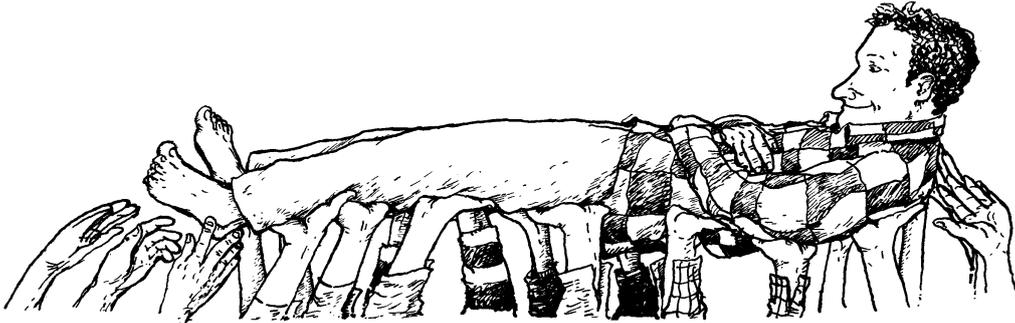
Blind-folds are handy for this one.

Body passing

- Everyone lies down with their heads close together, with alternate people laying in opposite directions (so heads are in a straight line, but bodies alternating left and right)
- Arms held straight up in the air.

- First person lays down over hands of people at the end of the line (may need some help from facilitator to get into position).
- They are slowly passed down the line by each person.
- At the end of the line they take up position so the next person from the other end can have a turn.

This is very much a trust activity and it helps to explain to people to be gentle.



Blind noises

- Everyone pairs off.
- One person is blind folded (or eyes closed) while the other chooses a distinct sound as their own 'call'.
- They share the noise with their partner and then move around making that noise.
- Their blindfolded partner follows the sound in amongst many other sounds and bodies to dodge.

Clapping rhythm

Words can not really give justice to this activity. It really has to be seen and experienced to be fully appreciated.

Even numbers are important for this game.

- Everyone stands in a circle and learns the rhythm and clapping actions.
- Like a 'round' every second person starts the game and when they are half way through the other half start.
- The nature of the clapping is such that people clap their neighbours hand at one point then two people simultaneously who are on the other side to their neighbours then the next moment they clap with their other neighbour. It can get very fast and trancelike if everyone is confident with the pattern.

Establishing a Sustainable Local Group

Naomi and Rick Coleman (Australia)

[Submitted Paper]

Features of a sustainable group

- Requires minimum input for maximum output.
- Clearly defined functions needs and products.
- Initial leadership role in implementation stage no longer required as the group evolves.
- Self seeding; smaller groups may form within the larger group for specific purposes.
- People keep coming back and new members feel welcome.

Identifying priorities

Functions needs products analysis

- Important to define what people want to gain from the group.
- Newly formed groups should make this a top priority and people new to the group can be encouraged to express their needs once the group is formed.
- Needs may change over time; a flexible group will cater for this.

Applying principles of permaculture to establishing a group

Starting up a local group can be treated as a design exercise in itself. Applying relevant permaculture principles can help keep the group focussed and truly permacultural in its practices.

Relative location

Elements of the group are placed in relationship to each other to assist each other, eg:

- Teams of people may be formed based on interest in order to take on specific projects
- A telephone tree may be established based on locality so people who live near each other contact each other. Encourages more interaction.
- Try to link the group in with other established groups (eg LETS, Community houses) so that resources can be shared effectively and more people can access the group

Each element performs many functions

- Meetings perform many functions (social, bartering, information sharing, etc).
- Working bees can be designed to be multifunctional (resource sharing, building gardens while building knowledge, social, etc).
- Multifunctional groups more likely to be diverse therefore more stable; attracts more people.

Major functions supported by many elements

- Determine the major functions of the group:
 - Social interaction with like minded people.
 - Information sharing.
 - Resource sharing (tools, seeds, skills, bartering).
 - Achieving a specific goal or project (providing a community with food, community garden, demonstration site, etc).
 - Spreading the word about permaculture (recycling projects, composting workshops, etc).
- Need to support each of the stated functions in as many ways as possible; brainstorm all the ways the group could meet each function, then form a strategy for achieving this. For example, information sharing could be met by:
 - Courses.
 - Workshops run by members or guests.
 - Subscribing to *Permaculture International Journal*.
 - Developing a shared library of books.
 - Informal study groups on topics of interest.
 - Videos.
 - Newsletter.
 - Site trips.
 - Working bees.
 - A sharing session at meetings, etc.
- Encourage different people to have input and contribute in different ways, possibly in teams.
- Ensures that if one person leaves the function will still be met
- Keeps the group focussed and productive

Energy efficient planning

- Determine zones of energy for the group.
- Develop a strategy for each zone (see handout for example).
- Utilise resources wisely, link with other groups.
- Give long and protracted thought to processes and develop strategies before jumping into action.

Small scale intensive systems

- Develop an ethic of keeping the group local and small; when the group becomes large it can split into smaller local units.
- Ensures that everyone can still have input and that individual needs are met.
- Group stays focussed and productive.
- Can still retain the larger group entity with special functions, a newsletter, insurance purposes.

Attitudinal principles

- Turn problems into solutions.
- Be prepared to be labour intensive at first and look forward to reaping the fruits later.
- Always examine your own motivations in establishing the group, and try to ensure that your role is that of facilitator rather than group leader; a truly sustainable group is one that will function without you after it is established.

Good luck with seeding your own local groups!!!

Establishing a Strong Local Permaculture Network

Geoff Lawton (Australia)

[Submitted Paper]

A group of certificated permaculture designers or an individual designer can begin the process. A locally identified permaculture group name, using the name *permaculture* will attract attention. Decide on points of contact to inform the local community, this can be with newspaper adverts, carefully placed notices or local radio. Organise sites to meet and teach from, with times for regular monthly or weekly meetings. Set up a permaculture education and information service offering consultancy and design service, introductory courses weekend and midweek.

Advertise a permaculture design certificate course taught part-time and as soon as there is enough interest locally, plan to teach at least two part-time design certificate courses per year. Aim to develop a collection of slide shows, photo albums and promotional material as posters and displays. Obtain access to sites for demonstrations, reference and hands-on workshops where permaculture can be practically taught.

PET (Permaculture Energy Transfer) is a great group-building activity, where energy is exchanged to complete permaculture projects for participating group members.

Identify group members who are keen to become activists and members prepared to serve on a committee to form a non-profit community group. Establish an accessible bank of information, newsletter, seed-saving and plant production for sale at meetings. If possible, buy, access or liberate a photo-copier to produce cheap promotional material.

As the membership increases try and identify members with skills that will benefit the running of the group. There will be a need for some professional skills, accounts, insurance, architects, etc. With the growing membership, the ability to promote permaculture and profit the group increases, with it, our effect locally and globally.

Keeping a simple action orientation strategy caters for the continuous stream of new members who are always keen to see the practical side of permaculture. Specialist sub-groups will naturally evolve as the numbers and diversity increase, but the main focus should always be how best we can effect beneficial change on our local community. This whole process of establishing a strong local permaculture network can be achieved within two years.

Solution to Pollution, Natural Step, and the Permaculture Labyrinth

Carol McDonough and Chris Phillips (Australia)

[Submitted Paper]

Carol

We are glad to welcome all of you to this session of the conference entitled *Solution to Pollution, Natural Step, and the Permaculture Labyrinth*.

At first sight you would think they were three unrelated topics. But I believe that the Labyrinth is a symbol of our time awoken from an 800 year sleep, and as it circles the globe it is a way in which many people are finding the connectives of earth, air, fire and water, and of all living things in harmony.

As we know, one of the biggest things that threatens our survival on this planet and of all living things is pollution of many sorts. Paradoxically, a major source of pollution comes from the by-products of trees under the ground forming petrochemicals, which we human beings now use in increasing quantity.

And The Natural Step which started in Sweden, as I have discovered in the last 2 days, has a marvellous systems approach which is very simple and guides us to reduce biosphere pollution, increase bio-diversity and increase justice and sharing among all.

I am Carol McDonough, and I personally have been injured by chemical exposure and have had to search for clean air, clean food and clean water in order to survive, because I am one of the canaries of this planet. That is, a human canary as distinct from the many animals, birds, insects, trees and water ways threatened with extinction because of pollution.

My body misreads the signals from many of the petrochemicals that we take for granted in daily life and causes all sorts of immune responses and polysystemic responses.

This syndrome is often called Multiple Chemical Sensitivity. And with me to present the workshop today is Chris Phillips, Barrister and Solicitor, and founder, with his wife Diana, of Pristine Ecoscene. Chris will tell his own story of how as a barrister he represented persons suffering from bodily illness caused by exposure to chemicals in the workplace. He has moved on to look for the Solution to Pollution. In other words, he and I are both on about healing this planet so that all may live in freedom, harmony and justice.

And that is what brings us to the permaculture conference. Chris met permaculture four days ago and sees that, with its enhancement of planet Earth and its values, that it is consistent with what his organisation is trying to bring into effect. I met permaculture about 15 years ago and I have been happy being a quiet permie and

at the property at which I now live there is most days of the year clean air; from the South Pole through to South America the cleanest body of air on this planet. However, may I just say even it is polluted. In the year the Berlin Wall came down they discovered in ice samples from the polar ice cap pollutant substances only found in the Northern Hemisphere.

So there is no clean air left on this planet but, anyway, I live in the cleanest air that there is at the back of sand dunes on limestone sand with which you are so familiar in this State. And I'm creating an ecosystem there, that is in harmony with the wild coast protection zone and with the needs for organically grown vegetables, and our water comes from the Aquifer about 40 metres below the ground which runs out to sea, which of course we then filter.

People have come to live with me and Ca-naan Community of friends is a growing event. I liken it to a small child with the rapid changes that a small child has in its development. So do we. There is the core group and the network and the people that live at Ca-naan and we welcome, as part of our service of hospitality, many people that are suffering from Multiple Chemical Sensitivity and who are devastated and desperate. The permaculture gardens are a source of peace and healing and I have been led to build 5 circle gardens. There is the herb garden which suggests the rose window in the west face of Chartres Cathedral, the brumerage which is a peaceful place to sit, the vessel of a fish garden which is an ancient caritas symbol of two interlocked mandala with an olive tree in the centre of it as a sign of peace. The large Labyrinth, based on the Chartres Cathedral Labyrinth integrates the symbols of earth, air, fire, and water which are: body, mind, spirit, emotion and whose colours are yellow, gold, blue, fiery reds, purple and silver.

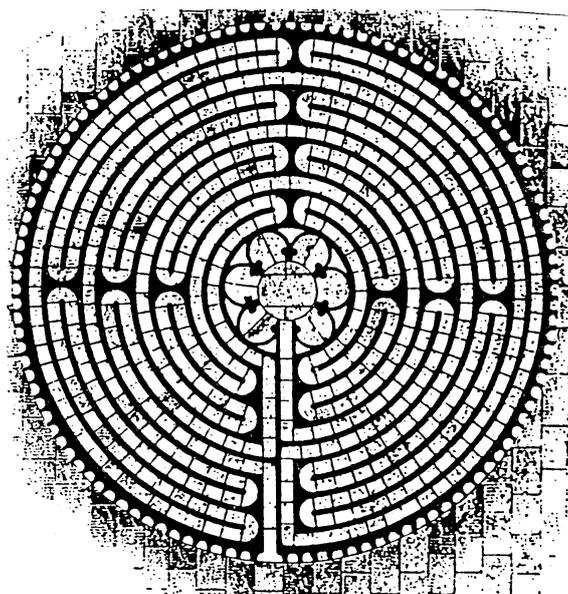
And then we have built the permaculture medicinal garden and it is fascinating that the symbol at the centre of the permaculture garden is precisely the symbol of the Chartres Cathedral Labyrinth and it has risen spontaneously at this time as this ancient Labyrinth has woken up.

For I believe it has been sleeping peacefully at Chartres for 800 years and now is bringing back its ancient message of balance and harmony and wholeness as human beings journey on this planet.

I will read to you a brief article that was written about the Labyrinth by one of our permaculture members, John Elderidge.

The Labyrinth was constructed in May – June 1996 at Ca-naan community of friends on coastal bush land bordering Point Nepean National Park – the property of Carol McDonough, as a Permaculture Dromana member. The Labyrinth was built by Robert Hosking and Carol McDonough, with assistance from many others, including some WWOOFers, Permaculture Dromana members (assistance with site preparation) and friends.

The Ca-naan Labyrinth painted on green cloth and used here at this conference was an English Turf Maze. It has been modelled on one found at Chartres Cathedral in France, which dates back to between 1194 AD and 1220 AD.



The Labyrinth is a circle with one entrance and one path to the centre which is retraced to leave. It symbolises the sacred path which every seeker treads through out life. It is a visible representation of the way. Those who walk the Labyrinth will find the necessities of following this way into the centre. As we walk on, we should let go of the cares of life to find a new direction in the centre. As we walk out, we should find strength to continue our journey through life.

The Labyrinth has universal meaning in so far as it transcends culture and religions. It has its roots in pre-Christian times.

Labyrinths are found in many northern hemisphere cultures, Greek, Celtic, Indian and American India. The Labyrinth is a great pattern which maps the inner soul. Walking the Labyrinth opens the seeker to those age-old mysteries associated with the pilgrimage and the great journey. With this in mind the Labyrinth is:

- A mode of spiritual cosmology or map of the soul.
- A form of mandala which unties the opposites of our lives.
- A metaphor for the path of life, or the way.
- A great archetypal form.
- A symbol of the unified mind, uniting the left and right brain (rational and intuitive consciousness).
- A map of human development from birthing to death.



The Labyrinth is complete (except for half moons). Note centre of Labyrinth traditionally dedicated as the Madonna. Ours has red brick outer circle blue brick rose petals (blue is her colour). Oak seats in the petals (traditionally animal, vegetable, mineral, human, angelic, desire) and her traditional, plants – red, white, gold mini roses and thyme and pennyroyal. May 1996. Vesica Piscis ganlen with slice tree across in back ground, bromeliad circle garden through trees.

The form of the Labyrinth is a spiral – reflecting that which is found in nature – and a shape of particular note in the understanding and use of pattern in permaculture.

There are numerous meanings that can be ascribed to different aspects of the Labyrinth design – too numerous to mention here. Some of the physical features of the Ca-naan Labyrinth are:

- 13.5 meters in diameter, making the path to the centre approximately 275 meters.
- A rose shape at the centre of the Labyrinth with 6 petals.
- The Labyrinth is divided in to four sectors each denoted by use of different bricks, stone and plants.
 1. Earth (body) sector, by yellow bricks and yellow flowering plants.
 2. Air (mind), by limestone and blue flowering plants.
 3. Fire (spirit), by red brick and red flowering plants, and
 4. Water (emotions), with stones from the sea and silver foliaged plants.

There is no correct way to walk the Labyrinth. When walking the Labyrinth you are invited to let go and be led, be receptive. Experiences range from dramatic insights to bursts of emotion and very little. The Labyrinth may be walked (or even danced) in many ways:

- Mindful of your present life and the transitions through which you are going.
- Meditatively.

- Pondering a question as you walk in, allowing the question to become part of you in the centre and then 'know' the right answer as you walk out.
- With a mantra, in prayer, etc.

Well, there you are – a bit of zero zero zero for you – I hope you can see the earthcare connections. I can.¹



The children on the Labyrinth. Labyrinth builder, Robert Hosking welcomes children, then the adults. Morning after Winter Solstice June 1996.

Today I have with me a five circle Labyrinth. It was impossible to bring our own Labyrinth with its thousands of bricks and plants and so I have borrowed the five circle turf maze Labyrinth from England, which is similar to the Cretan-Minoan Labyrinth found in Crete. Both of these are about 3000 years old.

The Labyrinth you will walk today is made on green sheeting sewn together, then the design of the Labyrinth sketched in chalk and gold spray paint used to mark the paths. As you walk this Labyrinth be open to the feel of it. Be open to what you are to receive from it.

A Labyrinth is a maze with one entrance; you walk to the centre to receive and then walk out gaining strength to the next step of your journey. As you walk I will read the poem written about the Ca-naan Labyrinth called *Journey of the Labyrinth* by Vicki Renna. It also will be available to you after the work shop.

We walk the Labyrinth one step at a time, which is a Natural Step; and now I hand you over to Chris Phillips to tell you about Pristine Ecoscene and the Natural Step. Thank you.

¹ (a) John Elderidge for Permaculture Dromana Network Earthcare – August 1996
(b) Robert Hosking and Coral McDonough, Welcome to the Labyrinth Ca-naan Community, June 1996
(c) Lauren Artrecc, Walking a Salvaged Path, Riverhead Books, NY 1995

Chris

Over the last six years I have acted for clients injured by chemicals in the workplace, where I believe the exposure was caused by the neglect of the employer, and clients recovered up to \$520,000, including workers compensation payments and legal costs. However, in each case, settlement was reached before trial and the defendant usually insisted on a secrecy agreement, and in each case maintained a denial of liability.

The clients were injured as a laboratory assistant or microscopist separating and identifying minerals, in petrol dispensing, and in sterilising and disinfecting in the health industries. I have also been asked to advise clients who have complained of chemical injury as a result of exposure to chemicals in the X-ray departments of hospitals, in the application of pesticides, in a laboratory working with hydrogen sulphide gas as well as carbon tetrachloride, ammonia, para-kerosene and petrol, in a bank mixing chemicals for laser printing, living next door to a service station emitting significant petrol fumes, living in a home where strong fumes were emitted from glue used to stick down cork tiles, working with art paints and inks, working in "sick" buildings, working as a hairdresser with dyes, bleaches and perms (bladder cancer), working with resins and glues in wood flooring, working in chemical transport with chemicals such as formaldehyde, as a patient by general anaesthetic, working in the dry-cleaning industry, and working in the construction industry with surface retarders, lubricants and resins. Injury has mostly been by inhalation and skin contact, with inadequate equipment, training, instruction and supervision.

In many cases cumulative damage occurred and, frequently, the multiplicative effect (synergism) seemed operative with certain mixtures of chemicals. In addition to more common symptoms such as dermatitis or occupational asthma, many of the victims of chemical injury have suffered severe intolerance to a wide range of chemicals after initial over-exposure in the workplace, causing them to seek isolation from modern society. There is a growing body of literature on this condition under the heading "Multiple Chemical Sensitivity" (MCS) and the impression I have gained in my law practice is that this group of patients is growing.

Clients overexposed to chemicals also complain of difficulties in memory, concentration, speed of information processing, chronic fatigue and so on.

You will be aware of a range of other conditions, including various forms of cancer, where chemicals may be a contributing cause.

Many of the dangerous chemicals concerned occur naturally in oil, coal, and natural gas and these chemicals are collectively termed "industrial organic solvents". Important uses of organic solvents, according to a Worksafe Australia publication entitled *Industrial Organic Solvents* of November 1990 are:

- cleaning (degreasing) agents to remove oils and grease from machinery, metals, plastics and textiles;
- dry cleaning;
- constituents of paints, varnishes, lacquers, thinners, waxes, floor and shoe polish, inks, adhesives;

- motor fuels, antifreeze mixtures;
- pharmaceutical products and preservatives;
- manufacture of artificial rubber, leather, plastics, textiles and explosives;
- therapeutic, pesticide, fumigant and disinfectant formulations;
- extraction of fats, oils and medicinal materials from seeds, nuts and bones;
- use in various chemical reactions and laboratory procedures.

Variation in individual susceptibility can lull exposed people into a false sense of security, and the contribution of factors such as increased heat, smoking or drinking alcohol, eating contaminated food, sucking on a contaminated cigarette butt (where chemicals are transferred from fingers) or wearing inadequate gloves are too often overlooked.

There seems to be a great need for preventative education as to chemical hazards and precautions, for safer labelling, closer attention to systems of work and more attention by the medical and legal profession to the problem.

My wife Diana, a Zoologist by training, did the chemical research in the chemical cases I have mentioned. She and I have started an organisation called Pristine Ecoscene and we hope to advance awareness of environmental hazards and safe alternatives. We are pleased to find that there are beautiful alternatives for most, if not all, hazards created by man. For example, we have recently been informed that one school in Queensland stopped using industrial organic solvents and the asthma rate dropped from the state average of about 30% down to 10%.

We were then encouraged to come across an organisation founded in Sweden called the Natural Step.

The Natural Step is based on a series of principles designed to link ecological responsibility with long-term corporate viability and profitability.

The Natural Step sought to obtain scientific consensus, to use systems thinking, to address core issues in a simple way, to use upstream thinking, looking to the source of the problem, to focus on cyclic rather than linear thinking (so that there is no unwanted waste).

The Natural Step set out to develop a model which could apply to any operation, which could promote good examples, which could encourage industry and government to do what we can now without moral judgement and which could allow ecological responsibility whilst maintaining economic viability.

The Natural Step was founded by a cancer medical research scientist called Carl Henrik Robert who, with 50 scientist colleagues and after 22 drafts, arrived at four system conditions which are described as compass points for all in our society to endeavour to follow.

The system conditions are:

1. Substances from the earth's crust must not systematically increase in the ecosystem.
2. Substances produced by society must not systematically increase in the ecosystem.

3. The physical bases for the productivity and diversity of nature must not be systematically deteriorated.
4. There must be fair and efficient use of resources with respect to meeting human needs.

So far, the Natural Step has met with tremendous success and we understand that sixty corporations have taken up the Natural Step in Sweden with considerable profit resulting in each case.

Also, forty municipalities in Sweden have taken up the Natural Step. The Natural Step has spread to the United States and the United Kingdom and has commenced in Australia.

As examples of success, McDonalds Sweden claim that as the result of taking up the Natural Step they have reduced their waste by 98%.

The Scandic Hotel chain has radically reduced its waste, its use of toxins and its use of materials derived from fossil fuels, which cannot be dispersed in the ordinary cycles of nature.

Electrolux has managed, in taking up the Natural Step, to remove hard freons from it's refrigeration equipment, turning to substitutes that no longer harm the ozone layer, developed paints which are water based and will not contaminate the planet, a solar powered lawn mover, the use of train instead of truck, a range of recycling initiatives and other measures.

Furthermore, the Natural Step has commenced a project called *Challenge* where ten corporations are networking with each other so as to create ecological advances both with in and between each company which would not otherwise be achievable if each company were working alone.

The Youth Parliament for the environment has been started by the Natural Step and has spread to some twenty three countries, including Australia which has it's first conference in the National Parliament of Australia on the 16th and 17th of October 1996.

It is very exciting to see the potential for the Natural Step to be used in tandem with the principles of permaculture since both call for harmony with the natural patterns and cycles of nature.

It is interesting to ponder how permaculture can add to the principles of the Natural Step since permaculture is about not only the preservation of the biodiversity and productivity of nature but it's enhancement.

If we add to this mix the new understandings we have of holistic thinking, the path forward of planet Earth looks ever more fruitful.

Political Economy of Permaculture

Reema Nanavaty (India)

[Submitted Paper]

The picture

Permaculture for the rural and poor women of arid Banaskantha is not an environment or agriculture issue, but it is an economic and political issue. Here, by economy we mean the informal or self-employed economy, as 80% of the rural poor women are a part of the self-employed economy. Here, by politics we mean politics of power over day-to-day decisions of living and working. We do not mean the politics of political parties who have by-and-large almost always failed to reach these rural and poor women. By permaculture we mean any local initiative by the local women to revive or recover or rebuild local ecological or environmental assets of land, soil, and vegetations with local labour and local resources. Having agreed to the definitions of economy, politics, and permaculture, we will try to understand their interplay through the past seven years of experience of Self Employed Women's Association, (SEWA), working with 40,000 rural poor women in the 64 villages of arid areas of Banaskantha district in the Western State of Gujarat, India.

The setting

Banaskantha is known for its deserts and poverty. Repeated visits of droughts are marked with occasional floods. Most of the population – men, young and able – migrate with cattle, in search of fodder and water, leaving the women and children behind without work or water. The past fifty years of development efforts of the independent India's government agencies have largely remained ineffective and without results. But there is hardly any community present and organised to demand effective and sustained development.

SEWA's experience

Self Employed Women's Association, (SEWA), a representative body of more than 200,000 women of the informal sector, has been involved in the struggle of the poor women to fight deserts and poverty. SEWA's approach is to organise women around the world of work. SEWA believes in the joint action of struggle and development of labour and cooperatives. In Gujarat, SEWA works in the 9 out of 18 districts. Established in 1972, SEWA will celebrate 25 years of its existence in 1997.

Since 1988 SEWA has been involved in the struggle of the local women of Banaskantha to generate local economy and regenerate local ecology. The women try to generate local economy through 72 DWCRAs Groups of handicraft and artisan workers, gum collectors, and salt farmers; 15 dairy cooperatives; and 75 savings and credit groups. It must be noted that all these groups conduct activities that are environmentally friendly, are led by women, and are economically viable. The women try to regenerate local ecology through their efforts of building water harvesting structures, watershed management, augmenting traditional water sources, wide-spread

nursery plantations, soil conservation efforts, and agro-forestry. In short, it can be summarised that for the poor families of the area the woman's capacity to work, her health, her knowledge, and her skills are almost the only resources to count on for survival. SEWA's efforts in Banaskantha are to recognise this and try to harness this precious potential of women in leading their families out of poverty. The response of the local women can be summed up in what Ranbai of Anternes village said: "we want work, work, and work. If we have work, we live. If we have work we eat. No work, no future".

Let me recount some of the measures we have taken to promote permaculture in Banaskantha.

- **Food security system:** Shakti Packet, an alternative food security system initiated, designed, and run by and for the poor rural women of the six desert villages, unreached by the government's Public Distribution System or the profit driven market forces, is unique. It bridges the existing profit-oriented food market with the alternative access, consumption, and production patterns. It is still in the making, and details keep on changing while more experience and insights are gained. But the access and ownership of their own source, supply, and distribution of food for the 300 women is encouraging. The levels of savings and nutrition of the women and their families have gone up. Now, finally, the government is offering to handover its own PDS shops to local women to run it. The mainstream interests joining the "marginal" forces!
- **Fodder security system:** Fodder is food for the animals. And animals are mobile assets of the desert and arid area communities. They are non-polluting, life-long income-generating assets. And they remain outside the planning framework. In Banaskantha, where seasonal forced migration is widespread, the local women initiated the Fodder Security System in ten villages which acts as a buffer to the droughts and famines. Saving additional fodder for the lean months is not a new idea. But its implementation is. There were examples where the supply of fodder maintained the production of milk by the cattle which the local dairy was unable to buy. Now attempts are being made to move on from distribution to ownership of fodder production sites by the women. It will start with production on farms and move on to become an integrated fodder-water-soil conservation farm.
- **Reviving milk co-operatives:** Women do most of the work of cattle care but the milk co-operatives are owned by the men. And when a co-operative goes defunct hardly any efforts are made to revive it. Like a consumable good it is disposed off and new is made. SEWA decided, and revived the 15 defunct cooperatives by first feminising them: that is, women members joining and taking over the management of the cooperatives. They have in the short time of two years made the co-ops viable by adding integrated services of fodder, seeds, vet and health. Permaculture promotes multiple forms of organisms. In the wasteland of economic plunder, promotion of multiple forms of organisation is easier. Corporate dominance should be balanced by introducing cooperatives and self-help groups capable of dealing with the market forces.

- **Water as regenerative input:** Augmenting existing and new, traditional and modern, decentralized and centralized sources of water in arid areas has regenerating impact, not only on the local ecology but also the economy. The living and working conditions both improve, especially for the women. There is a new regional water supply scheme of the Gujarat Water Supply and Sewerage Board, (GWSSB), funded through Dutch aid. All aspects of the supply of piped water, the way it is now, may not be desirable but the fact remains that if there is a pipe it must bring water to the women. This is a question of accountability. This is a question of performance. Investments already made, assets already created, must perform and give results. The women's Pani Panchayats, Water Committees, demand so. They also oversee the use and reuse of water which is a scarce resource. The women can not just be occupied with the use of water. They, in their own way, found themselves involved in augmenting existing wells and ponds; reviving traditional structures; reforming existing ponds into rain-water harvesting structures; and now, since past one year, taking up integrated watershed management that includes soil conservation and leveling, matching, contouring, protective hedges, and rain-water recharging. The scope of work is increasing.
- **Gum collection:** In an arid area women cut the last few trees to cook their food. No fuel, no food. That is the reality. The most common tree in an arid area is Babul. It is thorny and hardy. It also secretes gum. But there was no market for gum. So SEWA organised the women in groups to collect gum, which was linked up with the forest development corporation which purchases gum. Collecting gum became an income generating activity. It was in the interest of the women to collect gum. That means gum producing trees have to be maintained. It also means more trees means more gum. So more trees were planted. Now 150 women maintain such desert forests to collect gum. From distribution to conservation was not an easy journey. But the difficulties were worth the outcome.
- **Salt farming:** The area is arid. The soil is saline. There is no water. The underground water is saline. So the women decided to turn the disaster into a development opportunity. They harvested the underground salty water to farm salt. Though the market linkages are yet to be fully satisfactory, and the global economic forces have local impact, the production of salt is very well worked out. The income is rolling in which can be far more regular or secure. Some changes in the positive direction are taking shape.
- **Planting trees:** Importance of vegetation in any permaculture activity needs hardly any introduction. The scale may be of interest. Each year more than 300 women raise 100,000 saplings in the arid areas of Banaskantha. The effort is like a drop in a big ocean. But the number of drops have increased. Some areas are facing a mild drizzle! That is the plus point of most of the permaculture activities. The efforts, however small, can add up. By planting one tree each day you can create a forest in two years. By producing one shoe each day you can not build a shoe factory.
- **Handicrafts and artisans:** Handicrafts? What does that have to do with permaculture? First, they are the local skills and knowledge. Second, they are

the local arts and crafts. Third, they provide items to use for living. Fourth, the materials used are eco-friendly and have no side effect or environmental hazard. And, also, it provides supplementary income at family level to add to other incomes from farming or forestry.

Economics of the poor women

Whatever the economists or the development experts may say, in our experience, much greater attention must be paid to the poor women working in the informal sector of the rural economy. We do not have to reach them. We have to start from them. This is SEWA's approach. Therefore, any economic planning or intervention has to be in tune with the needs of the informal sector rural poor women.

Now what are their major concerns that are direct and measurable ? Let me enlist them from our experience in Banaskantha :

1. Any economic intervention must provide work that will lead to higher wages, lead to sustained work, that will lead to home-based work, that will lead to meaningful work.
2. The approach has to be to build the above mentioned work security. But it must be first built at local, at micro, at family level and later may add up to the macro level work security. Do not start with the structure. Start with the elements of the structure.
3. Prefer work that is based on local labour markets, and local use of the surplus if any.
4. Focus on asset formation. That is, productive asset, asset that is economic asset, asset that is ecological asset, asset that is human or social asset. Prefer asset production over consumption. Economies based on consumption expand fast but also collapse fast. Economies based on asset formation – economic, social, physical, or environmental – last longer, can absorb the shocks of disasters and conflicts.
5. Take economic decisions in favour of the domestic economy over regional economy, settlement economy over State economy, survival economy over consumption economy, and environmental economy over industry economy.

The above list of income-generating and ecology-generating activities can be enlarged, but we will for now focus on the above as far as the economy is concerned.

Politics of poor women

The politics of political parties to gain control over the State is of no interest to us here. Because, to the parties, the poor and rural women are of no interest beyond once-every-five-years for votes. I think too much attention is paid by those who are in favour of the poor and women in bringing women in to the mainstream of politics. But is it worth it ? Our interest has been in bringing the mainstream to the poor women. Let them come and join us.

But is it possible ? And what do we do to achieve this ?

1. We have to shift our attention from the State to the citizen. That is, let us not bother what the State does. Let us focus on the women as citizens.
2. The shift in attention in favour of the individual would be such that the individual, in our case poor and women, gain greater control over their day-to-day life of work and living.
3. In this group formation, cooperatives or self-help groups or Panchayats are of great use. Prefer them over parties.
4. Build leaders. Not leaders who can lead a nation or a large party following. But leaders who can lead their own life on their own, on their own moral values, as per their own political belief. A need for great leaders shows lack of day-to-day and operational leadership. That is, it shows that most individuals are not capable of taking well thought out decisions on their own.
5. We do not try to say that the politics for the poor women should be reduced to their poverty-removal needs only. That is there. But also, in addition, and simultaneously, investments must be made, opportunities offered, to let them participate in the larger democratic processes. And here we do not mean "Participate" as a method or tool of doing things but as a culture of consultation and accommodating considerations.

Sure, here also the list can be enlarged and improved upon. But the basic aspects are covered as far as the poor rural women are concerned.

Permaculture for the poor women

Allow me to define what I think is the relevance of permaculture to the rural poor women. It may be a different point of view, at least on the surface. But it makes sense to the women we work with, and therefore, to us.

1. That such a permaculture activity must show immediate, adequate for making a living and sustainable results. That is, the rain-water harvesting must have enough water in the pond so that the women can use it. In other words, the gains must be for the present, and not deferred to the future. We can afford to wait, they can not and should not.
2. The efforts must start with the women in the centre. That is, the choice between feeding the women and their families and loss of local species must be in favour of the food for the families. Once the people have food, they will be open to revive or retain or rehabilitate local species. Otherwise, the women will never get interested in the permaculture activities.
3. As and when possible, the preference should be given to the local or traditional methods of agriculture, irrigation, or forestry. Even when it conflicts with the international ideas on permaculture. The reason is that we know very little, even now, about the local variations in the global wisdom on permaculture.

4. Population as a limiting or negative factor needs review. As there can never be too many trees or too many flowers, there can never be too many human beings. Every human life is sacred. The potential of any human life to contribute to the revival of our earth is limitless.

The challenge is not in reducing the number, but in finding the people, especially the poor, meaningful and sustainable work. There can not be enough children harvesting water, there can never be enough youth channelling the solar power.

5. Permaculture must be based on the frugal or austere or what we call Gandhian way of living. However environment-friendly, limitless consumption, even of organic food or solar energy or harvested rain-water will not work. Levels of consumptions of the well-to-do must fall.

Reema Nanavaty is General Secretary of the Self Employed Women's Association (SEWA).

“Zone C”: A Place for Children

Salli Ramsden and Tania Strebl (Australia)

[Submitted Paper]

Synopsis

Australian presenters Salli Ramsden and Tania Strebl led a fun, memorable one hour workshop which examined the process of creating beneficial systems around (western) children via slide presentation, roleplay and discussion formats. The role of children in cultures around the globe, and their place in permaculture, was considered with interest. Reader input is invited as part of an ongoing exploration of this important global theme.

Design against children (slide show)

From a (western) child’s point of view, conventional homes, schools and gardens can be alien, inhospitable places with hard surfaces, straight lines, sharp angles and tall structures. Plantings, if any, are often inappropriate, sometimes toxic; animals may not be found at all. The real needs of the child may be denied in the pursuit of cheap efficient structures and safety first.

Needs analysis and childhood reverie

Why not begin to explore those ignored needs with a needs analysis for children, just as you might for any ordinary element in a design? Basic human needs of food, water, company and shelter head a list of physical, emotional and spiritual needs which are often far more pronounced for, and sometimes specific to, children.

Many of these needs suggest companion elements, as can the products and inherent behaviours of children. A reverie into your own childhood will reveal your favourite places, activities, animals and plants, and how those varied as you grew.

What elements match? Ask any child! “What do you want to play?”, “What do you want to do?”

Unusual elements (slide show)

In design for children we find additional , often invisible factors:

- Now-ness. Rapid results needed.
- Change. Rapid – in scope, needs, likes, size, habit, etc.
- Distance and energy – Zones of activity move outward; some as far from home as possible become an important daily ritual (they forgot to read the permaculture text on efficient energy planning).
- Risk and challenge.
- Imagination. Transforms surrounds (rock becomes steed, hollow becomes lake).
- Adaptability is a must.

- Nature a teacher.
- Awe and wonder.
- Size and line of sight.
- Ownership and sense of place.
- Increasing need for shade.

Designing with children (slide show and roleplay)

The slide show and roleplay were developed by Tania and Salli to inspire a fresh look at design for children, and at the art of adapting permaculture features or concepts to make them fun for children and “child-stacking”. Is it not true that children are our most precious resource, and that we can design systems around them, even better with them, to the benefit of all concerned?

An Ideal Childrens’ Garden

A couple of delegates (each in touch with their inner child) play the children who design their own garden. The group suggests appropriate companion elements and the “children” place delegates (each volunteering to model an element) around themselves to satisfy their needs, rearranging with the help of the group to maximise positive interactions within the system and with neighbouring systems. At this point we usually have a diverse system teeming with life and interest, a rich cooperative learning space with connection to the outside world.

Roleplay as a Learning Tool

Up to this point the role play is a fun way to demonstrate principles of permaculture as well as exploring design for children. We can go on to look at how the system evolves with time. Which elements act as pioneers, which are climax species? Does the design provide for possible changes in needs ,and changing climate, as years go by and children grow? Can features evolve from function to function?

(The author uses a similar roleplay with adult permaculture students to design a model property or village. Students roleplay appropriate elements and place themselves in relation to each other. The design is tested and adjusted by the “designers” who model going about their daily routine according to season – to ensure energy efficient design.)

The Average Backyard

In the second part of the “Zone C” role play, your wonderful garden is reduced to a conventional home environment. Which elements no longer exist? (Those playing elements which don’t belong in the average Australian suburban backyard, for example, are asked to step out of the roleplay.) There could be a swing or a sandpit without shade, maybe a misplaced tree, a flower or two, a birdbath the cat drinks from and the odd worm.

Are you having fun still? Gone are the slopes to roll down, the pond brimful with life, the frogs and animals to watch, the fountain, the strawberries and peas to pick, edible climbing trees, shady spaces, flowers of all colours...

The Teachers' Schoolgrounds

Now imagine your yard is a conventional schoolyard! What elements remain now? (Those playing elements which don't belong are again asked to step out.) The animals and plants have all moved out – there are no worms now that the soil is compact and dead. A “do not climb” tree struggles in a bare part of the “keep off the grass” lawn. A sandpit cowers in a cage. Concrete, wind tunnels and carparks abound. What is there left to do – fight?

Learnsclaping schoolgrounds with permaculture (slide show)

Fortunately, permaculture is bursting into life in schoolgrounds around the world, thanks to visionaries working alongside children to improve the quality of life and education in the school environment.

In Australia outcomes include sheltered, rich learning spaces and gardens that bring the entire school, the curriculum and the school community together. Food forests and gardens can provide a focus for education as well as cleaner food, air and water. They have been shown to improve morale, integrate varied cultures and generate income for schools. Everyone wins!

Permaculture and children: mutually beneficial?

That permaculture design has much to offer children the world over is quite clear! What are the unique qualities children bring to permaculture in return? Does the role of children vary between cultures, climates or nations, or is there a common thread? This discussion is open ended; your participation is actively encouraged!

- Around the world children learn and they teach – each other , their parents and their communities. Their schoolground models may impact on national landuse practices, food security and quality of life.
- Children care for animals the world over.
- They have excellent memories, and attend to minute detail.
- They walk and run, share their joy, sing and grow together.
- They gather in groups, providing wastes for biogas for fuel.
- Children are harvesters, sometimes hunters, for themselves alone, for friends, for family and community according to situation.
- Most children overflow with energy. In some cultures they use it to work and in others to play or cause nuisance. How can we harvest the surplus energy of children with care and respect?

A place for children

Across the global nation, please design with children, not against! Give them their rightful place in home systems and our communities.

Design your children back into your lives. Children, take your place. “Zone C”!

Author Salli Ramsden is an Australian permaculture designer/educator involved in projects in schools, community groups, child care centres and backyards. As well as facilitating "Zone C" workshops around Australia, Salli develops programs for school-children, and is bringing permaculture schools and volunteers in contact with each other through a comprehensive listing of projects in Australia. Please mail your comments and requests for directory, bibliography or relevant mail order books and resources to: Salli Ramsden Windover , Mt Darragh , via Bombala, NSW 2632, Australia.

Living Biogenic Nutrition

Yvonne Swindell & Manny Stuhl (Australia)

[Submitted Paper]

Living Biogenic Nutrition was designed By Professor Edmond Bordeaux Szekely. He classified foods into four categories according to their quality and functions, generating life and health in our bodies:

- **Biogenic:** cell-renewal, life regenerating – germinated cereal seeds, nuts; sprouted baby greens.
- **Bioactive:** life sustaining – organic, natural vegetables, fruit.
- **Biostatic:** life processes slow down, aging processes accelerate (cooked, stale foods, *but* legumes must be cooked *after* sprouting first).
- **Biocidic:** life destroying – processed, irradiated foods and drinks.

Biogenic foods

These should compose 25% of daily food intake.

Cereals, seeds, nuts when sprouted create a star-burst of enzymes that liberate transmuted amino-acids, vitamins, hormones, minerals, dextrinise carbohydrates plus essential fatty acids.

Bioactive foods

These should compose 50% of daily food intake when eaten together with biogenic “sprouts”.

They synthesize entirely new compounds which perform superior biogenical and biological functions:

- Destroying biostatic and biocidic processes, microbes, and faulty digestive processes.
- They strengthen the oxygen transport and cell respiration.
- More efficient metabolic action accelerates cell renewal and stimulates natural self-healing (even in some cases of carcinoma).
- No destruction of enzymes, hormones, some vitamins and minerals by heat.
- No heating of fats and oils (when they become toxic).
- No deterioration of the quality of proteins; amino acids are ready, transmuted and pre-digested.
- Astronomic increase in all vitamins.

- Biogenic and bioactive foods are digested without increase of leucocytes (white blood cells) in the stomach which always occurs with foods denatured by heat and processing.
- This leaves the leucocytes free and active in the blood-stream for more efficient defence from multitudes of invaders in the air, the total environment. Note: we breath 700 quarts (1200-1300 litres?) of air per hour.

During and after eating a normal cooked dinner our blood pressure rises and our pulse rate can double which can, if smoking and drinking is added, predispose to heart attacks.

So plants in their vital freshness give us:

- Fats in the form of unsaturated essential fatty acids.
- Carbohydrates which digest slowly, releasing energy for long periods.
- Complete proteins in the form of pre-digested amino-acids.

There is a way of storing fresh vegetables to our great advantage – **Sauerkraut**. It synthesises the whole vitamin B complex (including B12) and vitamin K by a natural lactic acid fermentation. It must be made with organic vegetables. No salt, vinegar, water or anything is added.

Unpasteurised goats milk yoghurt, soft cheese, keffir, etc are all lactic foods.

Note: Antibiotics kill all intestinal bacteria, so it is most important to take acidophilus products to reline the intestines with the right “friendly” bacteria, destroying the harmful gas, odour, and disease-forming bacteria.

Biostatic cooked foods

These should compose 25% of daily food intake.

- Zarathustra bread is a 5000 year old recipe from Zeno Avesto. We have made, and are making, unyeasted bread made from crushed sprouted grains and legumes.
- Sour dough bread, made with organic or biodynamic flour.
- All legumes (except alfalfa and mung bean sprouts) must be sprouted and toasted or simmered for 10 to 20 minutes. All dried beans, lentils, peas etc must be soaked for 8 to 12 hours and that water thrown away. Rinse several times and leave to drain for 8 to 12 hours. Wash and drain again until tiny shoots appear. Simmer in fresh water until soft(ish) or toast at 100°C for 10 minutes.

Note: Soy beans need double soaking. When cooked, all legumes can be blended into “Humus” to your taste!

Legumes have developed many toxic chemicals to protect their nascent seeds from nematodes, micro organisms etc. This is called allopathy.

All seeds contain phytates in their outer seed coats. When seeds are soaked and germinated, enzymes are created which will split and neutralize phytates. Zinc is one of our body's most important minerals, but it is immobilised by phytates in a chemical compound which our digestion cannot utilize, unless we "sprout" seeds, whole grains etc. So here is another job of major importance for enzymes and a reason for sprouting first and then eating!

In addition to phytates, legumes contain other harmful ingredients that can be eliminated by sprouting and germinating and then heating. Raw soy beans have a substance that stimulates goitre, and also a trypsin inhibitor. Trypsin is an enzyme necessary in the digestion of protein. Lima beans have a toxicant, glycoside, which yields hydrocyanic acid. Raw fava beans can lead to hemolytic anaemia.

So *always* soak then throw away the water, *germinate* for 2 – 3 days, washing and draining, then *heat* before eating. Then your metabolism will work in peace, and you will never more experience indigestion, wind and pain after consuming your favourite winter pea soup!

Sprouting and vitamin liberation

How does sprouting's star-burst of enzymes affect vitamin liberation? The research results from several American universities are shown in **Table 1**.

Researcher	Source Material	Sprouting Effect
Dr Burkholder, Yale	Oats	Vitamin B2 increase of 1300%
	Baby green oats	Vitamin B2 increase of 2000%
	Wheat	Biotin increase of 50% Inositol increase of 100% Pantothenic Acid increase of 200% B6, Pyridoxin increase of 500% B3, Niacin increase of 500% Folic Acid increase of 600%
Dr Bailey, Minnesota	Wheat	Vitamin C increase of 600%
Dr Mack, Pennsylvania	Soy beans	Vitamin C increase of 553%

Table 1: Research results for vitamin liberation

Note: The above figures are found in *The Chemistry Of Youth*, printed in 1977. Similar figures are found in *Nutritional Science and Health Education*, printed in 1978, but not in earlier editions of the above title by Dr Curtin Shears.

The *Chemistry of Youth* gives us a mind-blowing encyclopaedia of knowledge, much of it gained by Professor Szekely's 33 years research as a medical doctor at his ranch "La Puerta" in Baja, California. He had personal consultation daily with over 30,500 people and gave 56,00 lectures. His findings, a few of which have been given in this paper, were all backed by laboratory and clinical statistics. He pioneered organic growing at the same time as Sir Albert Howard, the "Father of Composting".

Jesus said "... eat always from the table of God: The fruits of the trees, the grains and grasses of the field, the milk of beasts and the honey of bees."

The Essene Gospel of Peace – Book 1.

“They ate only fresh fruits and vegetables, seeds, grains, nuts and legumes, germinated seeds and grains, and tender small ‘baby greens’ taken fresh from their gardens and orchards right before their meals.”

Translated from the Plinius' manuscript (great Roman Naturalist)

Note: After the discovery of the Dead Sea Scrolls at Qumran, Professor Szekely translated two of them – *The Manual of Discipline* and *The Thanksgiving Psalms*. See the *Teachings of the Essenes from Enoch to the Dead Sea Scrolls*.

Has there ever been a man in history, who has given the world so much knowledge and insight, both scientific and spiritual? Microbiology (graduate of the Pasteur Institute), biochemistry, medicine (physician), clinical psychology, nutrition, organic husbandry.

The professor mentions desperate planet pollution and radiation. His spiritual writings are prolific from many facets: *The Essene Jesus and Sermon on the Mount*, *The Living Buddha*, *The Zend Avesta of Zarathrustra*, etc. Some 80 books.

Yvonne Swindell and Manny Stuhl are both Diplomaed teachers of the International Biogenic Society, founded by Professor Edmond Bordeaux Szekely and Romain Rolland 1928.

After being chosen to study in the Vatican in 1923 and finding 25 miles of parchments and manuscripts, Prof. Szekely visited the Benedictine Monastery at Monte Cassino and completed the Essene Gospel of Peace. Prof. Szekely is the author of over 80 books, including two autobiographies: Search for the Ageless: Vol. 1 & 2.

Part 6

Projects Stream

Manono: An Experiment with Community Based Eco-tourism

Fay and Leiataua Ala'ilima (Western Samoa)

[Submitted Paper]

Manono is a small island about one mile square lying in the channel between Upolu and Savaii in Western Samoa. It supports four subsistence villages and a population of about 1200, living from small plots of taro, banana, breadfruit and coconuts, a few pigs and chickens and fish from the lagoon around them.

200 years ago, Manono's double canoes conquered all four highest titles of Samoa in great double war canoes, but today the excitement centers on Apia with jobs that earn money, stores that sell goods from everywhere, and a new central government in Apia. Many of its youth have followed the action but their elders in Manono's small villages have continued their traditional family and village organizations and customs reminiscing of the past. Two hurricanes in the early nineties wiped out their plantations and their houses. Timber and roofing irons to rebuild them must now be purchased from Apia – and they need to pay the motor boat and bus to get there. No one can enjoy the new government improvements without paying school, hospital, electric and phone fees. Subsistence was once a fine and hospitable way of life but unfortunately it was never designed to earn money. For the first time the villages in Manono felt poor.

The chiefs discussed building a hotel but that would take even more money. If they borrowed it they would risk losing their land. The tour office suggested the family with the best house become a “bed and breakfast.” But that could cause trouble in these tightly-knit villages too. That family might get rich, showing tourists about village life, but how about everyone else? As any chief knows that is a sure recipe for trouble. Villages rise or fall together.

Their member of parliament suggested another possibility. He knew an elderhostel organizer in Honolulu who was organizing a three week tour for American and Canadian senior citizens through Fiji, Tonga and Samoa. They were interested in experiencing life in a typical traditional village for a week-end. Why not offer them a traditional “So'o.” In Samoa a So'o refers to two villages who become friends and exchange visits every so often – not as individuals but as a group. It is a time to get acquainted, gossip, find spouses, compete in sports, exchange gifts and honors, and provide each other reciprocal entertainment, organized in a series of hospitality ceremonies. Manono was well acquainted with such ceremonies and a So'o was fun for everyone in both the host and visiting village. Every family shared in the work, but also in the feasting and distribution of gifts.

No one had ever heard of a So'o with a small group from America, but why not if they were interested in Samoan culture? They might not bring tapa, fine mats, and roast pigs as gifts – but why not something they were good at – money – to be shared later among village families? With the help of the MP and the elderhostel organizer

in Honolulu the traditional hospitality ceremonies were arranged with guests to be assigned to different families in So'o style. They were to be:

1. Greeted at the boat by their host family with flower garlands;
2. Taken to the village meeting house for a kava ceremony and honored by title;
3. Participate with the chiefs in their "kava refreshment" (fono o le 'ava) prepared by the women's committee;
4. Invited to watch the women weaving mats;
5. Learn the basic Samoan dance steps for the evening entertainment;
6. Taken to their homes to meet the family and given a tour of the premises and facilities;
7. Given lunch with the family and a chance to rest;
8. Offered a chance to take the village boat around the island, swim, visit a school, and walk or ride home through the villages;
9. Given fresh water for a bath;
10. Taken to the church hall by 7 pm for the evening where they would:
11. Participate in village prayers (lotu);
12. Be feasted by the women's committee;
13. Participate in an exchange of gifts (aiava) – crafts from the hosts, and a check from the guests which both would distribute among themselves next day;
14. Exchange items of entertainment with the village band, and girls and boys dance groups;
15. Be escorted home for the night by family members.
16. Shown how food was prepared for the earth oven next morning;
17. Then to church with the family for Sunday service;
18. Join with the family or the pastor for the traditional Sunday meal (to'ona'i);
19. Farewelled at the wharf for their return boat and bus ride to Apia.

The elderhostelers came with their leader who interacted with an the village elder-hostel committee composed of the village mayor and a woman chief who were completely responsible for organizing the villagers for the visit. The ceremonies were familiar to everyone and posed no learning problem, but there were still plenty of adjustments to be mastered since people of a different culture were involved and they had requirements of their own:

- Elderhostelers must be supplied with lifejackets whenever they go by boat so the village had to purchase these.
- Wharves had to be built since it was too difficult for older people to wade and climb the rocks. The government gave the supplies and the village provided labour.
- Elderhostel required flush toilets and showers in every household. These were new to most families. Public works provided a design complete with a septic tank, and Australia provided a revolving fund sufficient to buy six families the necessary appliances. The families built them. The outstanding problem was water which is short on the island particularly at certain seasons when even roof-tanks run out. At such time buckets had to be brought from another island and carried up to the tank on top of the shower.
- Traditional so'o ceremonies require a visiting chief of a status commensurate with that of the host chief and Americans do not have titles. The village solved this by giving the elderhostel organizer in Honolulu a Samoan title. Each group thereafter had a different leader but they were seen as her representatives.
- At a kava ceremony all visiting chiefs (not just the leader) are also greeted by title. Since the elderhostel guests were all seniors, the village decided to present the kava to each of them in turn using as their titles the name of the occupation from which they had retired. This was a good decision since the ceremony is meant to introduce chiefs and their ranking order to each other, and occupation gave them clues as to these guests.
- There are important customs about dress, postures, seating, and responding, that are important in traditional villages but of which Americans are completely unaware. (eg. Don't point your feet across the floor at a chief, shoulders and knees should be covered at all times, no one eats before grace, tip the cup and say "manuia" when served kava etc.) These are important in maintaining respect. It was decided that the MP and his wife would provide an orientation for guests in Apia, before they left for the village.
- Many elderly Americans are uncomfortable eating on the floor and lose their appetites when faced with the head of a pig or raw fish which are guest food in Samoa. When hostesses saw this they bought canned spaghetti from Apia believing this was American food while the guests were actually craving salads which are considered "grass" in Samoa. The upshot was a lesson in local greens, and the introduction of a buffet table at which each could select its own.
- The most sensitive issues involved money. The village decided how to divide the guests check, (after deducting for the bus, boat, administrative costs, and rotating fund). 20% was divided among the host families (which took turns) and about 10-15% to village group that participated (chiefs council, women's committee, girls group, boys group, school, craft demonstrators, pastor etc.) which redistributed it their own way. This allowed everyone something even though they were not hosts? Americans assumed it was divided only among hosts, and soon inquired what their own was getting, unaware that the families

was also benefiting from the shares given their chief, wives, girls, boys from their various organizations. The result was accusations of stealing even though the check and distribution was public knowledge. But at least everyone got some introduction to the idea of administrative costs, bank charges, exchange rates etc. even though some hosts and guests never completely understood it.

The island agreed to have the village of Lepuia'i host the elderhostel tours first since its homes were least damaged by the hurricane and it has been going there once or twice a month since February 1994. Many guests have shown their satisfaction by sending photos and continuing to correspond with their host families. Four children are now in school thanks to elderhostelers who have paid their school fees, and two primary schools, and the preschool now have libraries, educational toys and school supplies provided by visiting groups. Those who interact with guests in the families have noticeably improved in English though there are always complaints from visitors about "why don't they sit down and chat with us." The easiest relationships seem to be between grandmotherly type Americans and small children who do not seem to depend on language to relate to each other. The village wants groups to come oftener and during the week, but the MP has discouraged this lest they neglect their plantations and begin to rely only on money. This could be risky since tour groups fluctuate in response to their own economies over which villagers have no control. Another benefit has been the return of adolescents who have gone to Apia, at least on Elderhostel week-ends. They have considerably improved their skill at Samoan traditional singing, dancing, and serving and substantially assisted their families because of their better command of English.

Things, even in Samoa, however, are subject to change. The most noticeable change to impact the elderhostel was the arrival of electricity on the island last year. This involved cutting of many shade trees along the path around the island (no cars) and the installation of posts through the center of each village. The first purchase of every family after purchasing a florescent light was of course a television with inevitable complaints by elderhostelers that "they are watching TV instead of chatting with us."

It has also resulted in a sudden influx of small resorts along the shore and increasing numbers of visitors on the paths and beaches where elderhostelers used to feel they had "discovered a unique place." Most troubling of all was the sudden clearing a few months ago of a scenic point in the middle of Lepuia'i by a son who had been dancing in nightclubs in America. With funding from a businessman in Apia he erected an outdoor bar complete with colored lights, a boom box, and a pleasure craft to bring tourists from the hotels in Apia for a "night of fun and frolic."

This is not what most elderhostelers have been coming for and may introduce problems a traditional village never had to cope with before. The church pastor and MP have voiced their concern about the future of their once genuine hospitality but too many influential chiefs see this as progress, "now finally we too can make some money." It may be time to move it to another village.

Leiatua, Vaiao, is founder and president of KAMA and former member of parliament from his district. He was educated in the US and has served the country variously

as: public service commissioner, and minister of public works and justice. Leiataua is the highest title of Faleu village. Fay Ala'ilima, his wife, is a liaison officer for KAMA and has written several books on Samoa. They have 7 children. Both are interested in sustainable development and have Permaculture Certificates.

Community Gardens: Places for Food Production, Places for People

Neal Bodel and Martin Anda (Australia)

[Submitted Paper]

Community gardens as community places

“Restore the commons!” we are beginning to hear more loudly. The ‘commons’ can again be a means of having urban food production, as well as quality public open space offering a variety of activities and creating a sense of community. The ‘commons’ in the modern city will be known as the ‘green corridor’, ‘community garden’ or ‘city farm’. It will be integrated into the restructured, low density, automobile city as part of urban renewal towards sustainability and it can be done by means of permaculture ethics and principles.

Food production will not tend to be helpful in the city, if it is seen as a way of giving large numbers of people a big block of land on the urban fringe to grow their own food and rear their own animals, ie. if it is seen as being a totally privatised pursuit, needing comparatively large areas of private land for each household. This will tend to spread the city, creating similar problems to traditional low density suburban sprawl, with everyone needing to own two or more cars, drive long distances to major destinations around the city without any viable public transport system, while generating a big demand for petrol and high production of automotive emissions.

Where food production can be constructive in our cities is where it can be integrated into a philosophy of more compact urban design and housing and efficient use of land, such that it will provide more greenery and a closer, more practical and useful relationship with nature right in the city. Urban food production can be more effectively practiced in community gardens or city farms within a communal framework, with individuals sharing and pooling their skills, rather than on a privatised basis. For example, Vancouver in British Columbia has many high density housing developments built as housing cooperatives and surrounded by extensive gardens and other horticultural activities. The houses are designed on passive and active solar design principles and are located in good proximity to other urban activities, accessible by foot, bicycle and public transport. These qualities are what many people are seeking on a suburban or peri-urban block of land, but in too many cases it is not what is achieved – cars are the only viable form of transport, there is little contact with nature, the land is wasted and it needs large quantities of water and other resources to maintain it.

This paper will provide a background to the creation of Community Gardens and will then discuss a number of examples in Perth, Western Australia. The focus will be on the suburban sites City Farm in East Perth and Florence Park in South Fremantle.

Conventional parks and gardens

Conventional parks and gardens can be uninviting, inhospitable places with little creativity. They are characterised by that great Australian icon – the lawn. George Seddon (1994) has noted that the lawn has its origin in the forests of Europe of centuries past where tribes would clear areas to see the enemy as they approached to attack. The lawn also featured in previous centuries' lavish country estates of the French and English upper classes. The fruit and vegetables were grown elsewhere by the servants. Today many ordinary Australians and local government authorities are preoccupied with emulating these vast, open, green spaces. Growing food is relegated to beyond the city limits. However, for the large part, Australia needs oases in the desert with efficient use of water.

Lawns take some 40% of Perth's metropolitan water supply after it has received sophisticated treatment, followed by chlorination and fluoridation, to meet NH and MRC standards. The application of garden fertilisers in residential areas contributes more phosphorus to catchments than sewage disposal, detergents and animal wastes. Residential areas are second only to orchards in the amount of phosphorus and nitrogen they contribute to catchments (Gerritse, 1993). Lawns are not an environment-friendly option for private gardens or public open space in drier climates, catchment areas or above aquifers and should perhaps be restricted to sporting venues with careful maintenance.

In addition to 'backyard self-sufficiency' (French, 1992), we can consider the conversion of lawns into more productive systems as a step towards a sustainable urban landscape. For example, if open space around housing is required for play areas a variety of 'weeds' can be used including deep rooted species such as dandelion that will bring nutrients to the surface from deep in the soil; nitrogen-fixing species such as clover; and a mix of grasses to ensure all-year-round greenery. Such a lawn need only be mown occasionally, if at all, and will provide mulch for garden beds. Excessive open spaces of lawns can be sheet mulched providing excellent pre-treatment for conversion to humus-rich vegetable beds and orchards.

Plant small orchards of fruit trees in gardens and on common land along paths and streets, in parks, in neighborhoods: wherever there are well-established groups that can themselves care for the trees and harvest the fruit. (Alexander, 1977)

The features of a community garden

The community garden also has its origins in the past – but not in that of the aristocracy. The 'commons' was once a feature of urban and rural areas alike where ordinary folk could graze their livestock, grow some crops and pick produce from fruit and nut trees.

Communal gardens have been a traditional land use in Europe and the United Kingdom since the early nineteenth century. As early as 1819 in the United Kingdom and 1830's in Western Europe, allotments were set aside for the urban working classes. (Eliot, 1983)

Recently, a survey in the United States found 12,316 community garden sites (Somers, 1985). They have begun to appear in Canberra (Cornhill, 1993). Melbourne

is well known for its community gardens and city farms. Of these, the successful Nunawading Community Gardens Cooperative was established in 1977. The Centre for Environmental Research in Environmental Strategies (CERES) in Brunswick and the Collingwood Children's Inner City Farm, both established in 1979, have been attracting tens of thousands of visitors each year. At APACE in North Fremantle for as little as \$20 per year you can rent a few square metres of land to grow vegetables as part of a larger area dedicated to individual allotments. Individual allotments is also the format of the community garden in the suburb of Karawarra.

Beside this fundamental need for vegetable gardens in cities, there is a subtler need. Parks, street trees and manicured lawns do very little to establish the connection between us and the land. They teach us nothing of its productivity, nothing of its capacities. Many people who are born, raised, and live out their lives in cities simply do not know where the food they eat comes from or what a living garden is like. Their only connection with the productivity of the land comes from packaged tomatoes on the supermarket shelf. But contact with the land and its growing process is not simply a quaint nicety from the past that we can let go of casually. More likely, it is a basic part of the process of organic security. Deep down, there must be some sense of insecurity of city dwellers who depend entirely upon the supermarkets for their produce. (Alexander, 1977)

The values of community gardens are manifold. They provide opportunities for the public to garden, grow food, and work with nature, while at the same time living in a medium density urban environment. They provide a space for learning, social activity, cultural exchange, community art and 'community science'. They can provide a place of beauty for contemplation, or a pleasant stroll. In short, they are productive, empowering and regenerative of the human spirit (Anda, Stocker & Carr, 1994).

One survey (Sommers, 1985) found the following reasons for participation in community gardens:

- better tasting/more nutritious food 42%
- to save money 39%
- for exercise 36%
- therapy 33%
- education 32%
- social interaction 29%
- neighbourhood improvement 14%
- as a family activity 14%

Even the oft-heard expression "backyard permaculture" seems to reflect a culture where growing food is kept out of sight. House fronts, streetscapes and public gardens are ornamental only. Public open space is either for sport or passive recreation with lawns and amenity plantings. Why is this so? Even individual allotments were tucked away. What are the constraints to bringing food production out into the open? Into the public open space? Some of the following examples in Perth, Western Australia throw light on how some people are trying to answer these questions and put the above ideas into practice.

Miller Street Community Food Garden Inc.

For a number of years a group of people in the Perth suburb of East Victoria Park have been meeting at their Community Garden site on the corner of Miller Street and Carnarvon Street on the first Sunday of every month at 11 am. As well as to tend and nurture their developing garden this group of committed, community-minded people have met to discuss ways of overcoming the enormous bureaucratic hurdles that confront them.

The 2,500 square metres of land used to be the backyards of a group of houses and is thus well-endowed with a number old olive trees and grape vines which still yield profusely. The land is owned by the Planning Commission and faces the threat of one day having a new road go through it. This hasn't discouraged the local community, however, and a detailed permaculture design has been prepared for the site.

Because of the land tenure complications the local council, Town of East Victoria Park, have not provided any support to the people in their initiatives. In fact, rivalry amongst the Councillors has resulted in complete neglect for this dedicated group. A water supply has not been secured and although a windmill is included in the design, funds have not been gained. Accordingly, the group has had to hand-water what they have planted each summer.

So far they have planted herbs, vegetables, fruit trees, nut trees and a range of companion and windbreak species. The group decided on the collective Community Garden instead of individual allotments.

Onslow Road Community Garden, Shenton Park

As a result of the deft negotiating skills of Warwick and Gillian Rowell a number of years ago they were able to convince the private landowner of an empty block of land on their same street to let them establish a Community Garden on the site. Once the landowner decided to develop, however, it would all have to be cleared again. Fortunately, this hasn't occurred yet and this beautiful anomaly in the homogenous suburban landscape still remains.

A local community group was established and within a number of years wonderful yields of produce were achieved. In fact, Warwick even kept a record of the amount of hours of labour that were put into the site's development and compared this against the amount of fruit and vegetables and herbs produced. Permaculture courses were conducted there by Warwick and Gillian and this too contributed to the fecundity of the place.

The variety of innovative features in the garden's design included stormwater harvesting from a nearby carpark which was directed into a depression to create an ephemeral wetland – a lush winter 'bog' and cool, green summer meeting area. Windbreaks have grown all around from Banna Grass and there are numerous zones of production and places for contemplation. A crop of wheat was even yielded in one season.

Earthwise Permaculture, Subiaco

The garden system at Earthwise is centred around a communal space which provides an environment for people to meet, relate and work together in non-threatening ways. For many years Earthwise has existed as cooperative “op, swap and second-hand stop”. Earthwise is a fully autonomous group and receives no funding. The cooperative space is provided by the Youth Services of the Uniting Church.

The young people who built the permaculture garden were involved through the Landcare Environment Action Program (LEAP) which ran for six months. Their involvement, however, was absorbed into the community of Earthwise. Currently, many of the young people who graduated from the project are continuing on with their work through the formation of an Earthwise garden co-operative.

The garden serves as an extension of the community-focus of Earthwise for two main reasons:

- As a permaculture system it is oriented towards diversity and utility. There are many different varieties of edible, drinkable, smokable plants which people unfamiliar to gardening can relate to and enjoy. It entices people to want to grow and maintain a garden;
- It serves as a meeting point for the (somewhat conservative) Subiaco residents and young people from Earthwise. It is a medium through which sharing can take place – from sharing of interest and a few words to sharing of seeds and growing techniques.

Florence Park: the FINCA community garden

The above projects indicate some of the processes that local groups may have to go through until community-based, urban food production is more widely accepted in Australia. In South Fremantle, a number of residents had spoken of the need to enhance their public open spaces (POS) and street verges with more intensive native plantings, groves of fruit and nut trees and spaces for vegetables and herbs. They formed themselves into an alliance known as FINCA (Fremantle Inner City Agriculture), and set about organising to develop a site into a Community Garden. FINCA is also Spanish for ‘small farm’ or ‘plantation’.

Florence Park is the result of about 3 years of community promotion, organising and training; lobbying Council and Councillors; preparing grant applications; many, many meetings; and then 12 months of enthusiastic work by dedicated volunteers supported by a team of professionals in facilitation, permaculture, bush regeneration, community arts and greywater reuse. The Park was colloquially known as King William Park (an uncared-for patch of half-dead couch grass) – after the adjacent street which was actually called Florence Street up until the 1950’s. FINCA had consulted with local Nyoongars involved with the project and agreed on the name “Ngulla Jenu” which literally means our track although it actually has a much deeper ecological and community significance. Fremantle City Council conducted a very limited survey of houses around the Community Garden and out of 15 responses Florence Park was the winner.

An interesting outcome of the numerous public meetings was that local residents were not keen on an individual allotments, fences or a predominance of annual species. These were seen to require a large amount of maintenance. People were more interested in a Community Garden with general access for all. The chief aspiration was enhancing their urban aesthetics as well as social interaction. It is more than likely that in an area of great poverty there would be a greater desire for inclusion of higher food productivity annuals as well as trees.

A water-sensitive design approach was a high priority for FINCA and included greywater reuse, rainwater harvesting, use of endemic species for windbreaks and a framework and low water-use plants in general.

A feature of FINCA's formulation of Community Garden objectives was the nexus of bush regenerators and permaculture advocates. During the process they worked to resolve a number differences in viewpoints. Many local native species were identified for their function within the permaculture concept. The use of environmental weeds was minimised through careful selection and management techniques.

The Arts were seen as a vital part of the project not only to add beauty and creativity to the site but to mobilise and involve other sectors of the community, to connect with the areas heritage and allow those interesting elements of the past to be brought into the present.

Today the Community Garden is a complex web of flowering and fruiting plants, artworks, greywater irrigation systems drawing from the adjacent houses, children's play areas and places for contemplation and meeting. Kate Barnett, a dedicated FINCA member and Community Gardener, has conducted a very detailed analysis of the process that occurred over the several years, an Honours thesis in fact, and she refers to the site as a "community place". A very special place treasured by the local and not so local community where they can come and relax and garden and dream and play.

The lessons learnt by FINCA are that there are many non-technical barriers to the introduction of the community garden concept to urban areas. A policy barrier existed in that the Council did not have a policy on Community Gardens. There are currently no well known models by which to assess the FINCA proposal as a 'Parks and Gardens' strategy. Social barriers to Community Gardens will include a lack of time on the part of local residents to assist in design, development and maintenance. Earlier sites which FINCA was unsuccessful in securing for a Community Garden presented cultural-historical issues. There will be institutional barriers, for example, in obtaining certain land use approvals, reuse of wastes on site, water connections or stormwater harvesting and conditions imposed on the use of grants. FINCA underestimated the time-consuming machinations of Council process. However, the time taken proved advantageous for FINCA in that it was able to develop a clear vision and a set of objectives through community consultation.

Kate Barnett has illuminated the complex uncertainties, rivalries, scepticism of each other and other difficulties experienced within FINCA and its relations with residents, council officers and professionals supporting the group. Nevertheless, the most common feeling was that so much was learnt and so much was achieved beyond most people's expectations.

Many of these constraints or problems can become opportunities and these will emerge out of a concerted effort in community consultation between residents, Councillors and Council officers. In fact, out of necessity, the problems for a Council will become the community's opportunity. If the various constraints and opportunities can be understood at the outset it will nearly always be possible to negotiate the acceptance of Community Gardens in the urban planning process.

East Perth City Farm

City Farm has been operating for over two years and is run by volunteers. It is located in the suburb of East Perth on Brown Street between the railway line and the carparks serving "silver city" – the nearby State Government office buildings. The 7,400 square metres of land was an old scrap metal yard. City Farm is run by the Planetary Action Network (PAN) which is a sub-group of the international society of The Men of The Trees.

City Farm aims to provide a living example of the productive uses for unused inner city land. This has already been achieved on a short term basis but a common scenario which has faced other community gardens faces City Farm – the threat of development. The site may one day be resumed for a car park. City Farm seeks to be a living example of permaculture where people can come and learn and harvest organically-grown food for free.

City Farm provides learning and work experiences for people with disabilities. It caters for employment programs such as LEAP (Landcare Environment Action Program), school student tours and provides a calming effect for people who are angry or troubled. Working at the City Farm gives them a feeling of ownership and contribution to the general community. In fact, they and the general community are encouraged to participate in the design and development of this community space.

A number of problems have been encountered at City Farm. The area was littered with the results with vandalism and graffiti. The four large warehouses had been abandoned for over 10 years and were covered with graffiti art. So as not to allow this to continue in areas where it was not wanted the existing works were left and encouragement was provided for the artists to come back with their paint and use the walls as a legal canvas for more positive and creative murals. As a result only 3 minor incidents of unwanted graffiti have occurred in the past 2 and a half years.

Farmers have problems with feral animals and City Farm has had its problems with feral people. The poultry has had several lethal attacks where they were not taken for food. While this was disturbing it was not a deterrent to keeping livestock.

Training unemployed youth is a volatile occupation. They come to City Farm unmotivated, uninspired and often with a criminal record. There have been several situations where violence has erupted toward fellow students or lecturers. These situations need to be defused without aggression and without fear.

Nevertheless, City Farm provides a safe haven for people of all ages from the community to gather and not feel pressured into spending money which is the common pressure from meeting places such as bars and cafes.

Conclusion

The creators of community gardens live by a noble philosophy. Not only are they an integral part of the global permaculture solution but all the hard work that goes into creating a permaculture oasis is for the community. The selfless workers are committed to building a more natural and holistic lifestyle not only for themselves but for the greater good of the whole community and the planet. Along with the rejection of personal ownership and the encouragement of community involvement, City Farmers place themselves in the critical eye of the public. The visible creation of a positive outcome from negative occurrence is what makes the difference to the public. They can see the creation of a permaculture garden and the determination to achieve is open to anyone to be a part of. Community Gardens are a form of therapy in the desert of suburbia or the heart of the concrete and bitumen, traffic and smog-ridden city. They provide hope for sustainability and renewed community spirit. Wherever there is degraded, abandoned land, under-utilised public open space, vast areas of lawn or vacant land owned by developers waiting for property value increases – there is potential.

Garden Djama in Arnhem Land: Permaculture Design with the Barrara and Djinang

Dave Calland (Australia)

[Submitted Paper]

Introduction

For the past 3 years I have been developing and coordinating a TAFE training program in sustainable horticulture designed to make accredited training accessible to remote Aboriginal communities in the Northern Territory. To date over twenty communities and outstations in the NT have been involved in the program, the majority in the Top End region. Many of the participants in the program are developing small sustainable gardens on outstations in the Arnhem Land region.

In this paper I would like to tell the story of a group of six outstations near the floodplains and the estuary of the Blyth River in central Arnhem Land; the traditional estates of the Burarra and Djinang people. This story is about the garden djama at Ji-balbal, Gamardi, Wurdeja, Ji-malawa, Ji marda and Yilan.

This permaculture story, like all stories, is a personal view of events, shaped by my own values and experience, my culture. I can only tell this story from the perspective of an outsider, from my own context, from the world view of a 'Balanda' (Whitefella). Perhaps I am stating the obvious, but an awareness of the power of cultural values is important to this story about working within a culture which in many ways is almost the opposite of western culture.

Cultural renewal is one of the themes of this gathering. To the people of Arnhem Land it is the maintenance of culture rather than the renewal which is a key concern in a rapidly changing world. Perhaps change is inevitable and aspects of culture may change over time, but effective design in community development is dependant on the recognition of cultural values of the 'client' community.

Background

The six outstations or homelands in this story are small settlements composed of extended families or clans living on traditional lands. These outstations are about 120 km to the east of Maningrida. They are serviced by the Bawinanga Aboriginal Corporation (BAC) which is a resource centre for about 25 outstations in central Arnhem Land. They are all situated near traditional camp sites positioned to allow exploitation of the rich resources of surrounding woodland, floodplains, monsoon forest, water holes, mangroves and tidal mud flats. Not surprisingly each outstation is on or near the intersecting edges of some, or all of the above systems.



Figure 1: Woodland (Photo: Kami Gosford)

Woodland yields bark for paintings and string, timber for building and tools, sugar bag, (honey from native bees) seasonal fruits and herbs and the meat of kangaroo, and other animals. Monsoon forests yield yams at the start of the dry season and many fruits and medicinal plants. The floodplains are burnt in the dry season and turtle and goanna (some times already char grilled) are harvested; at other times buffalo and geese are shot. As water holes shrink with the advancing dry season, water lily tubers, fish and more turtle are eaten as are the seeds of the abundant pandanus tree. (*Pandanus spiralis*) Mangroves and tidal flats yield a variety of shell-fish, crabs and fish throughout the seasons.

The wet/dry monsoonal climate has an extreme effect on the region. The wet extends from November to March with total rainfall averaging 1300 mm. In the wettest months, January February and March, average monthly rainfall is 300mm. Virtually no rain falls in the dry season between May and September, a period of intense annual drought. Evaporation for the year, on average exceeds precipitation by about 600mm which makes surface storage of water difficult. April and October are transitional times October being the infamous "Build Up" or "Suicide Season". Day temperatures are near 30°C year round with cool nights of 18-22°C. The local people recognise five seasons but that is a different story.

The local flora exhibit a range of techniques to cope with the extreme seasonality of the climate. Eucalypts tend to remain active by tapping into deep soil moisture, other woodland trees and shrubs defoliate for the dry season. Many herbs are true

annuals, surviving the 'dry' as seeds, others have perennial roots with annual tops. Dry season gardens are not possible without irrigation.

Interwoven with this physical environment is a rich mythology which connects all aspects of the physical and spiritual world in a way which contrasts sharply with the Western world view. The relatedness of all of the elements of the world; people, animals, plants, places and spiritual beings is accepted in a way which does not conform to western concepts of linear time or quantification. The custodians of this country have many obligations to protect, maintain and renew their world through important ceremonial activities.

Garden djama

The design of appropriate sustainable gardens and communities in this remote region and difficult climate is one of the challenges of working in the region, but the design of gardens and communities appropriate to the cultural needs of Aboriginal people is the greater challenge at the centre of this story.

With the establishment of access, reliable communications, shelter and water to the outstations, people have identified the need for gardens and training in horticulture as a priority for further community development. Garden djama fits well with Community Development and Employment Programs (CDEP) by providing meaningful 'employment' for people which is seen to benefit the community, especially the children through the provision of fresh food. CDEP is also empowering people in the bush by giving them choice in the type of 'work' they want to do in developing their communities without too much outside interference.

Some of the early gardens in the region tended to be based on a conservative western model, they seem to have been 'installed' with little if any community consultation and were dependant on materials, skills and technology not available in the communities. For example the garden at Gamardi was down hill and away from the living areas, and far from a tap. When the garden was irrigated the rest of the community had no water! The garden was never really a part of the community, and due to the isolated position, snakes, and on one occasion, a water buffalo, were unwelcome visitors! Despite the keen efforts of one family which included composting and making and applying liquid manures, the garden struggled and little food was produced from their labour.

Gardens at other outstations were better positioned but until recent years a shortage of water in the dry season was a problem. Reliable good quality ground water is now available to all of the outstations via solar-powered submersible pumps. When the sun shines the pumps pump and once tanks are full the excess water overflows. Most *shelters* in the communities (not officially houses because they have no internal bathroom or rotary clothes line out the back!) have a small concrete slab situated nearby with a water tap. These areas are used for washing clothes, dishes and people and for the supply of drinking and cooking water. These wet areas have now become the nucleus of gardens on the outstations, often starting with a few banana and pawpaw plants.

Since 1991 when I got plants from Darwin, I planted them and sometimes I collected seeds to plant as well. The overflow from the tank used to run away into the bush

and make the grass grow long. Now it goes straight into the banana and sugar cane garden, and we make trenches for irrigation all around the garden. (Jimmy Gulanmina Pascoe, Ji-malawa)



Figure 2: Jimmy Gulanmina Pascoe (Photo: Dave Calland)

Recently BAC has installed laundry and shower blocks on some of the outstations. These areas concentrate nutrient rich water which is used to irrigate larger gardens based on banana, sweet potato, pawpaw and sugar cane. After twelve months the tap and laundry gardens at Jibalbal are producing large crops of bananas and paw paw with no direct input beyond initial planting – simple solutions are the best! An earlier garden, remote from water, has inferior plants which are struggling with their first crop of bananas after three years.

The initial plants successfully grown in all the outstations have several things in common;

- require little attention,
- are quickly productive,
- can survive short periods of drought,
- people are familiar with their use.

Fruit trees, predominantly mangos, tamarind, coconut and cashew are planted on all outstations and jack fruit, guavas, citrus and others are thriving at Ji-malawa. A range of local ‘bush’ trees is being planted on outstations for shade and traditional uses, and chooks and ducks are being integrated into the garden designs.

As people become more confident in their gardening skills other crops are being tried, these include snake beans, peanuts, watermelon, pumpkin, tomatoes, lemon grass and cassava. The concepts of crop rotation, sustainability and green manures are now becoming relevant to the local context.



Figure 3: Composting using local materials (including buffalo manure and seaweed) at Ji-Marda. (Photo: Dave Calland)

Working with aboriginal communities

It is important, but often difficult for Westerners to recognise the polarities in Aboriginal and Western world views without imposing culturally biased value judgements. Because of the deep fundamental differences, I don't believe that the Aboriginal world view is fully accessible to western minds (or vice versa). However an acceptance of cultural differences is vital for all who work with Aboriginal people if they are to be effective in their occupation.

The story of the word *djama* highlights one of the differences between our cultures. It is one of many words borrowed by the people of Arnhem Land from Macassan trepang fishermen who came each year with the monsoon. There was no word to describe the new practice of paid employment introduced by the Macassans. *Work* did not exist in traditional society. The contrast with the dominant position of work in Western culture, and our distinction between work and other aspects of life is extreme. The term *djama* is now usually used to describe work done for or with the white people.

Much has been written on Aboriginal learning styles by both Western and Aboriginal authors. An Aboriginal perspective by Hughes (1987 in Byrnes 1993), which I have found helpful, lists the following general characteristics of Aboriginal learning styles:

- Group rather than individual orientation;
- Spontaneous as opposed to structured approach to learning;
- Learning by imitation and repetition rather than questioning;
- Uncritical rather than critical approach to learning and information;
- Personal versus impersonal;
- Listening rather than verbalising;
- Indirect questions in preference to direct questions.

Although there is not one contemporary Aboriginal society and culture, but many (from traditional remote communities to more Western-oriented urban communities), the above basic characteristics of a cultural style of learning reflect a world view which has remained strong in all. The successful facilitation of community development and training in Aboriginal communities must acknowledge Aboriginal styles of learning. There is a need for the development of appropriate curricula which do not impose a western world view but which address Aboriginal educational and community development needs in a culturally appropriate way.

I am sure that many permaculture facilitators will have recognised the similarities between Aboriginal learning styles and the humanistic approach to education and training which many will be using in their own cultural contexts. Perhaps it will not be too difficult a task to develop or customise a permaculture curriculum to suit the distinct cultural needs of Aboriginal communities.

Outstations throughout Arnhem Land and other remote areas of 'Aboriginal Australia' are becoming established and there is a growing need for sustainable community development programs which can address their unique environmental and cultural needs. It may not be appropriate to have a tractor tyre pond and a banana circle on every outstation, but the principles of permaculture, if creatively and appropriately applied, sit comfortably with the needs of contemporary Aboriginal community development. Starting at the tap instead of the back door works best for us!



Figure 4: *Groups of friends working together (Photo: Dave Calland)*

The key to the success of the NTU Horticulture program is the ability to support training on-site in communities and the flexibility to accommodate traditional life styles. "On-the-job" training in partnership with local agencies allows the program to be context specific and allows learning to occur in a setting which is more comfortable to participants than a classroom in an alien town or city. Flexible structure allows for self-paced learning and elective modules support individual or group aspirations. Groups of friends or 'relations' working together and exchanging knowledge

with each other in familiar surroundings best reflect the needs of community-based Aborigines in the Northern Territory.

To achieve compatibility with Aboriginal world views, education and development programs must exhibit flexibility in their content and processes so that they can be responsive to the diverse and changing needs of participants. Programs must provide participants with choices in structuring their learning and their community development to suit community needs without conflicting with traditional values and lifestyles.

Within the current social, economic and political context in Australia it is also important for training programs to be accredited so that funding may be sourced to support the expensive task of facilitating training in remote areas. (A Traineeship in Permaculture Community Development may best fit the current agenda).

Conclusion

Working in Aboriginal communities has given me many opportunities for observation, a shared characteristic of Aboriginal and permaculture learning styles, and occasionally I have had to remind myself that permaculture is about solutions in an arena where problems can be complex and confronting. Working within a culture where learning involves an informal exchange of information among friends has its own rewards. As time progresses my own education about Aboriginal taxonomy, plant uses, and a way of being within the natural world continues through the subtle efforts of my adoptive family in Arnhem Land.

An Aboriginal permaculture is evolving utilising useful exotic plants and animals to complement a complex system which has sustained the Burrarra and Djinang for countless generations. As people shift towards a more settled way of living on the country they belong to, sustainable community gardens are allowing people to supplement their diet of bush tucker while keeping their culture strong.

I would like to end my story with a few thoughts on working in Top End communities:

- respect culture,
- start small,
- use simple technology,
- work with people,
- temperate gardening techniques may not work in the wet/dry tropics,
- flexibility is the key to survival in Aboriginal communities.

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Dave Calland, coordinator of TAFE training programmes at NTU involving practical organic gardening skills with urban based Aborigines and other clients. He regularly facilitates introductory organic gardening courses in Darwin and has co-taught a PDC with Frances Lang in 1993. Dave maintains a small Permaculture site at NTU, which is used for demonstration, practical training and the supply of propagation materials for people "out bush". Currently, Dave is coordinating a training programme in Horticulture at NTU, designed in 1993 meet the needs of community based Aboriginal people in a culturally appropriate way.

Developing Community Gardens

*Fiona Campbell, Russ Grayson,
Supapon Raffan, Morag Gamble (Australia)*

[Presentation Report]

Brisbane City Farm – Morag Gamble

Brisbane City Farm has been operating since April 1994 on four hectares of land, three kilometres from the town centre. It has more than one entrance and prides itself on being very open. The design respects the maintenance of paths that were already existing there. The group formed about a year before they actually obtained the piece of land. The land is owned by Brisbane City Council with whom the City Farm has been working right from the start, firstly to find the piece of land. One of the members of the group was actually a councillor on the City Council and so the group found it comparatively easy to find and obtain a piece of land. The land was a residential area until the 1974 floods and the council resumed the land. It consisted of three small parcels of land, and the council did not know what to do with it. In 1988 attempts were made to grow an orchard there but no one maintained it and so there were bonsai fruit trees already existing when the group started on the land. These included mangoes and mulberries.

Their first step was to establish a vegetable patch demonstrating no-dig gardens, sheet mulching and also a food forest. For the first year of the project the group had no funding whatsoever. People donated equipment and tools and they brought in water with a bucket from the far end of a nearby creek. In the second year, the group received funding from a Community Benefit Fund which went into their nursery. The council then contributed a shed and then an ample supply of tools, provided mulch and connected the Farm to the local water supply. The gardens have evolved organically over time with the people that have contributed and the ideas that have come from these people, without incorporating a master planning process. They are an incorporated association and the management committee welcomes new members and their input. Anyone can have an input into the decision-making process. They have so much happening there now that a number of sub-groups have developed, each of which are managed by one person.

The group set up a demonstration backyard in the City Farm about a month ago (early September, 1996) which covers an area equal to that of the average Queensland backyard (and which incorporates a hills hoist clothes line). With this area the group is aiming to demonstrate to visitors what they can do in their own backyard. They will also put canopies over this area to demonstrate the layering of plants possible.

Their nursery is going to be one of their first enterprises. Recently, they have been producing herbs for the local naturopathy college. All the work in the City Farm has been done by unpaid volunteers who have spent three days a week there. So they are now looking at ways to set up small enterprises, including their nursery, worm farm, and a few other projects on the site which can generate income.

One of their major functions is education. They are currently working with a primary school. There is also a secondary student who is on placement once a week, some university Social Work students who work there regularly, and visiting TAFE and LEAP groups who also put in some work there. The Farm is also participating in a recycling exchange with the community.

There is a bush foods garden and a native corridor as a windbreak in the City Farm, through which the group hopes to have an interpretive trail and from which they hope to run courses on the uses of bush foods.

The Brisbane City Council continues to be very supportive of the project and the City Farm and the Council are currently negotiating the possibility of a 10 to 15 year peppercorn lease. The Farm is not required to pay any rates.

UNSW Community Garden – Russ Grayson

This garden began two years ago after the Student Guild at the University of New South Wales approached Pacific Edge Permaculture to run a one week course in permaculture design. It is a medium-sized Sydney community garden at twenty square metres (the smallest Sydney garden is eight metres by fifteen metres). The students also wanted a memorial to a student who was killed in the Dili Massacre. Pacific Edge has been involved as an advisor and workshop co-ordinator. Some of the students have now completed registered Permaculture Design Courses and are taking on the training role. The student energy has been very dissipated in that the students tend to go away on holiday and neglect the plants, so the process has been quite slow in comparison to other community gardens. Other members of the community who have completed a PEP design course have begun to participate.

It started as a large patch of lawn, behind which there is now a new child-minding centre. The area consists of sandy soil with a pH of about 8.5, which is very alkaline. It's near the Randwick Racetrack so there is an ample supply of manure and mulch. The garden has been spreading out in manageable 'chunks.' The students 'transplanted' metre-deep tanks from outside the Chancellor's office to the garden and these tanks are now supporting various water plants. Pacific Edge is encouraging the students to do some experimental work. For example they were looking at which indigenous plants fixed nitrogen and could be used as mulching groundcover, experimenting with *Hardenbergia violacea* (Native Sarsparilla) and *Kennedia rubicunda* (Running Postman) [ed: Running Postman is *Kennedia prostrata*] which grows to about ten centimetres thick. These, they found to be excellent groundcovers under orchard trees.

Communication is critical and the students use a blackboard that is kept in the tool shed to advertise meetings and show watering schedules and they meet sometimes on Friday evenings and Saturdays.

Fairfield City Farm – Russ Grayson

Fairfield City Farm in western Sydney is the biggest City Farm in the world. Fiona and Russ were employed there for a number of years as landcare educators working with secondary school geography students. The Farm is on the urban green-belt

and has also been taken over by National Parks to be revegetated over time, working with Greening Australia. The site is very degraded as it has been farmed for 100 to 150 years. The soil is very compacted, eroded and slumped. All the slopes demonstrate the degree to which the soil is eroded. There is remnant bush of the Cumberland Plain clay soils and when there were labour market programs, bush regenerators were working there to rid the bush of problem weeds. A program called City Landcare in Your Own Backyard, funded by the National Landcare Program, was developed to demonstrate what people could do in their own back garden. It was designed by a Sydney permaculture designer, Bronwyn Rice, and was a 'larger-than-life' urban backyard which integrates a large herb spiral, a worm farm, different types of orchards (cool temperate and subtropical), and a chicken rotation system. The herb spiral – about 5 metres in diameter and about 1.6 metres high – was designed to be interactive so that children could walk along the edge of it and brush past aromatic herbs – a catch to get children interested in plants. The chicken tractor system consists of five yards which integrate existing trees and planted fruit trees. The chook house is fitted with a solar thermal system to keep the chooks warm.

Russ finished by stating that people join community gardens for social reasons first and foremost.

Blue Mountains Community Gardens – Supapon Raffan

These gardens were started four years ago. It took three years to obtain the land from the council, as the council was not very enthusiastic about the project. It is situated in six and a half acres bounded by National Park. Therefore a main concern is to prevent nutrients entering the surrounding National Park. To this end, they have built culverts, bridges and bunds. The site is in a valley but gets a lot of light and has a lot of remnant vegetation which they are revegetating. The council gave the group two tasks to fulfil in order to get the land. The first was to build a huge carpark and the second was to build a disabled toilet and building and so on. They have just built the building from mudbricks that they made themselves from donated soil and completed some gardens designed entirely by permaculture designers. Supapon believes that by having access to a community garden, society changes to become more responsible because they can see what can be done. The group is teaching at schools and has got schools involved in the garden and two radio programs being broadcast. Their main function is education. The group has also obtained a site that covers an area of 20 acres on which they are working with many groups including an Aboriginal cultural centre and the Arts Council and many other groups. All the work completed in the community garden has been voluntary. Supapon also stressed the important role of social interaction in community gardens and that she had made so many friends through these projects.

They have planted an Heirloom Apple orchard, pear orchard, and quince circles and there is an orchard system in swales that is being constructed at the moment. They have planted native species down the bottom of the slope, closer to the watercourse and they are in the process of taking down all the fences.

The Blue Mountains Community Garden group is looking at setting up a seed bank with other community gardens in Australia to export surplus seeds to similar projects in developing countries.

National networking

A national register of community gardens and city farms has been published to strengthen the community garden network in Australia so that these groups may learn from one another.

In Brisbane community garden groups met in August this year and are now planning to meet every six months to collaborate. They are also organising a 'green fair' together and are looking at how they can buy resources together and do courses together.

Australian City Farms, Community Gardens and Enterprise Centres Network

Fiona Campbell and Russ Grayson (Australia)

[Conference Report]

The Sixth International Permaculture Convergence (IPC6) took place just in time to announce a new initiative in community supported agriculture – the formation of the Australian City Farms, Community Gardens and Enterprise Centres Network. Holding IPC6 in Western Australia was opportune for the network on another way – it made it easy to find state contacts for the network and to visit inspiring examples of urban agriculture in the state.

Significant among these was the East Perth City Farm and the work of FINCA, which has permaculturised an urban park into a true multi-use landscape. Also inspiring was the work of Murdoch University's Remote Area Development Group who are trialing renewable technologies and integrated living systems for remote communities.

During IPC6, community garden activists got together on a number of occasions to talk about the new community gardens and city farms network and to get to know each other. With the national network now in its early stage of development, the immediate task is to define a more focused role for urban agriculture in Australia. This role will exist within a global context in which urban agriculture is growing and, particularly in developing countries, is feeding people.

As a network, our task is to provide evidence for civic authorities, land managers and landowners which shows that community based agriculture and the associated sustainable living demonstrate projects and enterprise centres are a legitimate, socially and environmentally responsible form of land use which contribute to the amenity and productivity of public open space.

Specifically, community based agriculture, demonstration and enterprise centres fulfil roles in:

- Urban food production.
- The productive rehabilitation and utilisation of disused and derelict urban land.
- Building community through shared organisation, co-operation, work and goals.
- Improving the urban environment through increased environmental, social and recreational amenity.
- Supporting public health through the self-provision of fresh, nutritious food.
- Supplementing the incomes of low income people.

- Educating participants in horticulture, appropriate technology, land and resource management,
- Organisational and social skills.
- Providing learning opportunities for schools.
- Preserving the world's agricultural biodiversity through seed saving, seed exchange and increasing the supply of non-hybrid seeds by growing them out and returning supplies to the Seed Savers Network for distribution – this is community gardens as seed saving hubs.
- Preserving rare and threatened, locally indigenous plants.
- Providing wildlife habitat.
- Providing positive recreational opportunities, playspaces for children and socialising opportunities for adults.

The potential for community gardens and city farms to play an increased role in the preservation of agricultural biodiversity through growing out and increasing the supply of seeds provided by the Seed Savers Network is now being explored. If successful, community gardens will curate a number of food plants adapted to local climate and soil conditions and return a certain quantity of grown out seeds to the Seed Savers Network. They could also become the focus of local seed exchange networks.

The network has only recently published its inventory of city farms, community gardens and enterprise centres in Australia (\$20 posted from the national address below). In planning are state conferences, an updated edition of the inventory, a new edition of the network's national newsletter and a community gardens education kit.

Contact details

1. Pacific Edge Permaculture (community gardens network NSW state contact). Russ Grayson and Fiona Campbell, PO Box 446, Kogarah, NSW 2217. Australia. Phone: 02 9588 6931. Email: pacedge@magna.com.au.
2. Morag Gamble (community gardens network Queensland state contact and contact for Northey Street City Farm). 107 Victoria Street, Windsor, Qld 4030. Australia. Phone: 07 3857 8775. Email: syzygy@mailbox.uq.edu.au.
3. Australian City Farms, Community Gardens and Enterprise Centres Network. Symbioun Australia, 2nd floor, 158 Collins Street, Hobart Tasmania 7000. Phone: 002 248 767. Email: darrenp@netspace.net.au.

Fiona Campbell and Russ Grayson have experience in the design and establishment of the successful UNSW community garden and are participants in other community gardens. They have been employed at Fairfield City Farm as Landcare educators and have produced primary and secondary teaching kits for the farm as well as running Permaculture Design Courses in the Sydney region. Their current project is to develop a permaculture and appropriate technology education site.

The Formation of an Organic Produce Cooperative of Small Farmers

Ranjith de Silva (Sri Lanka)

[Submitted Paper]

I am presenting an experience in Sri Lanka in the District of Kandy in a village in the mid-country where small farmers have been able to purchase or receive tea land which was fragmented at the time of the land reform in Sri Lanka, during the years 1973-1974. The tea lands were fragmented because they were uneconomical to be maintained in the form of tea plantation estates. The original idea in the distribution of land was to diversify the crops on this land, as they were eroded after 100 years of tea cultivation. The diversification process was supported by the World Bank and thereafter by the World Food Programme. But the farmers did not benefit very much by the infrastructure arrangements.

The Gami Seva Sevana (GSS), which is an NGO involved in rural and social development, started organising farmers in the form of group savings schemes. This was supported by the International Fund for Agricultural Development which worked through the Central Bank. The farmers were brought together and meetings were organised, the programme was explained and groups of seven to ten members were formed. They were to save Rs 10/- per week (US\$1 – Rs 56/-). Extension workers were appointed by GSS. They did visit these farmers, collected the savings on a particular day of the week, which was also a group meeting day, receipted for the money received and banked them through the Institution GSS the following day. There are today 25 such groups, and as of 30th April 1996, these groups consisted of 73 men and 116 women and had a total savings amounting to Rs 181,332/50, plus the accrued interest of Rs 24,517/52. These groups were in operation for 29 months. Since these were very poor farmers this proved to be an achievement and assurance that if the poor are motivated that savings are possible.

Another part of this programme was training and education activities that the farmers were interested in, and they were encouraged to get involved individually and collectively in income-generating programmes. The NGO with the help of the Central Bank was able to assist the farmers with small loans guaranteed by the group and hence, no co-lateral was needed. Out of these farmers, ten groups opted to produce tea in an integrated way. Of the groups there were 35 families who already had marginal tea lands.

Gami Seva Sevana discussed with the Cooperative Commissioner the possibility of forming a Cooperative by making the small groups of seven as primary Cooperatives and an NGO to become a co-opted member of this Cooperative. This was done in order to make the Cooperative efficient, as the NGO could provide the training and extension. The Cooperative Commissioner was willing to incorporate this organisation as a new method of Cooperative formation in Sri Lanka. Today, the farmers belonging to the groups are producing the green leaf, and these groups have obtained the services of a nearby tea factory to do the processing for them. The NGO Extension

Workers are visiting these groups and helping them to conserve soil, improve soil fertility, operate nurseries in order to produce vegetatively propagated new plants and plant the vacancies. The tea that is manufactured in the factory is collected by the producers and packed into five different grades – viz. BOP, BOP Fannings, Dust No. 1, Dust No. 2 and mixed grades. Items 1 and 2 are kept for export while 3, 4 and 5 are sold locally. This is due to the different tastes that people have. The local people are interested in strong tea with milk, hence Dust No. 1 is very popular. The other two grades are lighter and consumed very often without milk.

How do the farmers benefit from this? Since the farmers are practising organic agriculture, the inputs are locally found, hence reducing the cost. The local sales are sold at the same prices to the consumers. Samples of BOP and BOP Fannings have been submitted to Third World Shops in Europe, which have shown interest and placed orders for same. Due to the export price, the farmers can now receive a higher price for their green leaf. Thus they are able to benefit from added income to the family.

Gami Seva Sevana (Rural Service Centre)

Gami Seva Sevana (Rural Service Centre) is a brainchild of the Christian Workers' Fellowship (CWF). On 28th July 1979, the CWF Working Committee endorsed the following as its basic objectives:

- A programme of development education including the training of people for service in farming and rural work. To begin with, the Centre will give basic training in the practical aspects of animal husbandry and agriculture, and later hold courses covering management techniques and motivation, elementary book-keeping and any other skills that may be required. Follow-up courses and seminars will also be planned;
- A viable model farm unit to promote new methods and forms of farming;
- A place where people can come together for adult education, health programmes and other educational and cultural programmes of interest to inhabitants of rural areas. This Centre will also serve as a meeting place for inter-religious dialogue and meditation, open to people of all faiths and races. It will seek to foster community-building activities and programmes.

On 7th January 1981, Gami Seva Sevana was registered as a limited company.

Gami Seva Sevana is based at Galaha, a small village in the mid-country plantation area of Sri Lanka, in the Kandy District. A hundred years ago the British selected the area to begin planting tea. Today, the land has no topsoil and tea can no longer be grown economically. Hence the plantation estates have been fragmented and used for village expansion

Most villages do some backyard farming (dairy, poultry, goats) and grow vegetables and spices. The marketable produce of the area includes milk, eggs, meat, black pepper and vegetables. The objectives outlined above are aimed at helping these village communities develop on a self-reliance basis.

Since 1979, the programmes initially implemented have evolved according to local needs. The farm operated by the Centre has provided a place for practical training of young people. In response to popular demand a milk cooperative and a credit council were set up and a handloom workshop was established. Educational and cultural programmes have developed. The emphasis placed on using locally available resources to develop the soil has been of major importance, leading Gami Seva Sevana into organic farming and the study and use of appropriate technologies. With the experience thus gained, the Centre is now able to disseminate information on integrated organic farming and rural technologies appropriate to farming communities by way of seminars, workshops and a reference library with a question-and-answer service.

At Gami Seva Sevana trainees, instructors and other workers live together as members of an interfaith, multi-ethnic community which emphasises sharing and mutual responsibility.

Permaculture For A Sustainable Nicaragua: Consultation, Education And Action

Peter Devereux (representing Fundacion A. C. Sandino)

[Submitted Paper]

This presentation will explain the work of the Nicaraguan Fundacion A. C. Sandino (FACS) in its efforts to develop and promote a popular style permaculture booklet for use with the grassroots communities with whom it works.

FACS is a private non profit organisation. It was created in 1980 to complement and expand the efforts of Nicaraguan grassroots organisations, unions, and communities to build a peaceful, self reliant society.

FACS gives priority to programs that embrace:

- Integrated rural development.
- Rural economic recovery.
- Environmental protection.
- Microenterprise development.
- Reintegration of displaced returned, and demobilised people, and refugees.
- Preventative health and education.
- Housing training and technical assistance.
- Credit.
- Disaster and emergency relief.

The Foundation programs are designed to build leadership and problem solving skills by involving recipients in all aspects of project development including initial identification of needs, project implementation, and evaluation. Annually there is also a FACS assembly bringing together project partners: both local participants and donors to review the year's activities and plan together future activities.

Through this participatory approach the foundation works to strengthen the capacity of Nicaraguan communities and organisations to create realistic and sustainable solutions to pressing social and economic needs.

FACS's work is also part of the emerging and exciting permaculture work in Mexico, El Salvador, Cuba, Ecuador and Chile amongst other countries of the Latin American region.

The initiative began as a result of the translation of the Principles Of Permaculture chapter from Bill Mollison's *Introduction to Permaculture* book, by a Nicaraguan translation student. That happened before the completion of the Spanish version of the whole *Introduction to Permaculture* book which was printed in New Mexico in 1994. The translation was not an unnecessary duplication of the other though because it incorporated Nicaraguan Spanish words and expressions as opposed to simply the "official Spanish equivalent", an important aid for the more ready acceptance and integration of the ideas and principles presented.

FACS circulated photocopies of the finished translation to organisations working for sustainable agriculture in Nicaragua and received very favourable feedback. The organisations complained however, that the text was not directly accessible to agricultural promoters and technicians let alone poor peasant farmers or *campesinos*. So FACS set about the task of turning the Spanish permaculture principles chapter into a pictorial booklet that would be accessible and directly useful not only for agricultural promoters and technicians but also directly with *campesinos*.

FACS made a successful proposal to the Melbourne-based Permaculture Global Assistance Network (PGAN) for financial assistance with the facilitation of the Overseas Service Bureau. FACS sought out the skills of a popular education organisation to help translate the text from written Spanish to pictorial everyday Spanish and more importantly to show local examples of permaculture principles being applied in Central America.

The first draft was circulated amongst organisations working in popular education and sustainable agriculture, and amongst the grass roots communities that collaborate directly with FACS in their everyday work.

This consultation brought a rich diversity of clarifications, criticisms and acclaim to the document. With the incorporation of these changes and an important strengthening to the emphasis on the positive role of women, the booklet was ready to print but not before FACS decided it was so pleased with the result it would scrape and save from other bits of its budget to double the final print run on the document, to two thousand copies

The result has been very successful and positive through grassroots workshops. One hundred copies of the booklet called *Living Agriculture* or *agricultura viva* were also donated to the La Havana Cuba permaculture project.

What then were the reasons behind the success of this permaculture initiative in Nicaragua? It is always hard to be certain but central I believe were:

1. The request for permaculture assistance came from a local organisation with good local credibility and a strong agricultural social base in Nicaragua.
2. FACS managed development, production and promotion of the permaculture material with my permaculture input and funds and back-up support and guidance from PGAN as a result of Overseas Service Bureau facilitation.
3. The educational permaculture material was not only produced in Spanish, it was produced in Nicaraguan Spanish with Nicaraguan local sayings and jokes etc.
4. There was a long consultative process not only with NGOs working in sustainable agriculture but also directly with *campesinos* individually and through agricultural unions etc.
5. The material was not only text but had a large proportion of drawings and was told like a story not a textbook.

6. The booklet focused on permaculture principles but used local Central American examples to illustrate the principles and encourage integration of the different techniques into a holistic permaculture system.
7. The booklet was used in workshops on local existing “model” farms where the local campesino could show neighbouring campesinos what he or she had done and how, without large external inputs but with dedication and commitment to sustainable agriculture.

Peter Devereux worked for four years (1991-95) with the Sandino Foundation as an environmental adviser and has recently completed a Permaculture booklet entitled Living Agriculture.

The Work of the Jajarkot Permaculture Program

Chris Evans (Nepal)

[Submitted Paper]

In Nepal, 91% of the working population is dependent primarily on agriculture for their livelihood. Agricultural practices have developed to be finely in tune with climate and people's needs. They are intimately interwoven with the forest and other natural resources to maintain the balance of nutrients necessary to support agriculture and thus provide basic needs of food, fuel, fodder, timber, medicines, etc. Nationalisation of the forests, rising population, the move to a money-based economy and inappropriate "aid" programmes have combined to undermine the sustainability of traditional agriculture. Clearance of forest land for farming in an attempt to increase crop production has led to degradation of the very resources needed to support agriculture, and thus culture itself.

At present, the land cannot support the rising population. Apart from the clearance of forest land, this has led to the migration of villagers out of the region to India and urban areas in Nepal. The people of Nepal are faced with the need to integrate forestry with agriculture in order to supply the resources they need for farming and other basic needs.



Figure 1: Villagers involved in the program. (Photo: Chris Evans)

The Jajarkot Permaculture Program (JPP) is an indigenous grass roots NGO. Started in June 1988 with the acquisition of a farmhouse and an acre of land, the programme has grown by working with local people and utilizing traditional farming practices as well as labour and product exchange systems. The JPP has achieved a high degree of community involvement, and this has been used to help expand and develop a wide range of programmes in more than 45 villages over four districts, employing over 120 local men and women.

The success of the programme so far is largely because of its use of local resources and traditional skills, and the fact that the teachers are all farmers themselves. Further, the JPP looks to support and enhance indigenous systems by the addition of appropriate skills from new and improved technologies. These include beekeeping, weaving, fruit and vegetable propagation, tree seedling production, plantation and land rehabilitation techniques, leatherworking and drinking water systems without using cement. These technologies, and others, are applied following specific demand from participating villagers, and involving them in the process.

A variety of teaching techniques are used, such as non-formal education, in-situ training on farmers' fields, and residential training at the JPP's resource centres. The objective is for villagers to learn and in a way that they can continue to establish and develop the technologies independently. Along with this approach, the JPP is continuously working to strengthen the natural resource base of forest, soil and water in order to provide the foundation for agricultural and thus social development.

Methods of work include: village-based resource centres for demonstration, training and resource production; village development committees and user groups; extension work in farmer's own fields; schools programme; publication of technical bulletins and newsletters; non-formal education; festivals, local cultural activities, songs and dance used in teaching and extension.

By establishing resources such as beekeeping, weaving, fruit and vegetable production and other income generating technologies, in 1992/93 the JPP generated some 20-25% of its needs from within the programme. With all these resources in place, the JPP is ready to move forward with more active support to achieve its goals of agricultural and cultural stability within its working areas and to help use this as a model for similar programmes elsewhere.

From 1988 to 1995, the Jajarkot Permaculture Programme has been responsible for introducing the following techniques and approaches for the first time in the district:

- Collection of soft-shelled walnut seed from neighbouring Jumla District to raise in JPP and Forest Division nurseries, and distribution to farmers. Between 1988 and 1992 over 20,000 seedlings were raised and distributed;
- Horticultural grafting and budding to produce improved fruit seedlings for temperate (apple, pear, peach, plum, walnut, apricot, cherry and almond) and sub-tropical (mango, citrus) fruits. Programmes are run for training and commercial production;
- Establishment of the first integrated fruit orchards, and 'mother' orchards of selected varieties for local scion production;
- Manufacture and distribution of improved bee hives, and the successful establishment of hives; extraction of honey from improved hives;
- Training and demonstration of forestry and low external input and sustainable agriculture (LEISA) techniques such as green manures, alley cropping, bunding, companion planting;

- Demonstration and training in establishment and maintenance of kitchen gardens for domestic vegetable production;
- Establishment of drinking water systems without using cement, instead relying on local, high quality skills of stonemasonry and carpentry;
- Village training in weaving on hand looms; establishment and operation of cooperative weaving cottage industry and reintroducing traditional cotton production and processing;
- Introduction of angora rabbits for wool production to be used in the weaving programme;
- Establishment of village committees (user groups) for integrated community development;
- Establishment of the first women's working committee for forest protection and management;
- Organising festivals of dance and drama to integrate "development" with local culture;
- Establishment and operation of village-based resource centres (working farms) to carry out demonstration, training and research into the above;
- Re-introduction of a leatherworking cottage industry to produce shoes and bags;
- Generation of 250W micro-hydro demonstration from a traditional flour mill on one of JPP's resource centres.

In addition, the JPP has supplemented the work of local government agriculture, forestry and livestock development offices with villages to establish and maintain forest tree nurseries and plantations, devise and implement forest management plans, distribute (and grow) vegetable and fodder grass seeds, and construct pit latrines.

Since its conception in 1988, about 75% of the JPP's budgets have been spent on local resources (mainly wages). This has generated a local response and reciprocal investment from the villagers that is hard to quantify but has been absolutely essential to the success of the programme. It includes access to land in more than 30 village areas over four districts, barter of seeds, and the opportunity to research and propagate improved species preferred by farmers.

Chris Evans, co-founder (1991) and independent Technical Advisor to the Jarjakot Permaculture Programme, completed his BSc. (Hons) in Forestry, in 1984. During 1985-88 he worked for the VSO on various Community Forest Development Programmes in Nepal. Since 1989, Chris has been actively involved in Permaculture, he received his Diploma in 1991 and was awarded a Permaculture Community Service Award in 1992, for services to community development in Nepal. Chris has taught many Permaculture courses, lectured and presented on Permaculture & Sustainable Community Development in various places around the World, done fundraising for projects in Nepal and assisted with the organisation of both International Permaculture Conferences in Nepal (1991) and Scandinavia (1993).

Permaculture Training Centre, Uganda and Sustainable Agricultural Support for Orphans, Rwanda

John Hunwick (Uganda)

[Presentation Report]

John Hunwick set up the Permaculture Training Centre, Uganda, and Sustainable Agricultural Support for Orphans (SASO) Rwanda.

John would like to thank Tim and Maddie Harland from the British Permaculture Magazine and Alliance Airlines for making his attendance at the conference possible.

When John lived in Australia he had a peanut farm, and like a lot of farmers he used DMBP to control weeds in Peanuts. One day his son got accidentally covered in the spray and got very sick. From then on he switched to one hundred percent organic farming methods because of the experience within his own family. He converted his farm to mainly growing soy beans.

In the late 1980s, life on farms in Australia got very difficult particularly with the export enhancement program and the American subsidised grains which were sold all over the world. He made the decision to sell the farm and decided to spend a couple of years working in Kenya at an agricultural college. He worked there at Katali Agricultural College which teaches courses in biodiversity. After six months there many farmers asked him to go and visit their properties. This evolved into a situation where he started running community seminars. Also in the same surroundings he had people asking him to visit particular orphanages.

John visited some orphanages and saw some very hungry and bored children. He looked around and saw an area where they could be growing things. He told them that he couldn't give them money but he could give them something which is much more important which is sustainability and sustainable food production. He started working with orphanages through putting in food systems.

He made a mistake in Kenya, which is very dry. He looked around and thought old man salt bush would be a good inclusion, so he went down to South Africa to a salt bush research centre and brought back two kilograms of salt bush. This project was very unsuccessful. He made a very quick exodus to Uganda. The Ugandan people were very welcoming and he started running community seminars. The people in Uganda show a lot more interest in Development. They are really keen on developing themselves. They are not so obsessed with getting aid because for twenty years they were insulated from it. It was very fulfilling because he would hold a meeting and there would be people just jammed in everywhere. He also started working with some of the orphanages there and started an organisation called SASO to provide agricultural support for orphans because the AIDS epidemic in Uganda is chronic. In some parts of Uganda it is up to twenty seven per cent and in other parts it is as low as four or five per cent. Probably about eighteen per cent of the country is HIV

positive. So it is a big problem, particularly in areas where the military have been very active. Where the military are there is no real security for women or the civilian population. They are just exploited. So AIDS infection in those areas is very high. Consequently there is a need to bring food to the children in the orphanages. So SASO are doing that and they also work with the community because many organisations come in and say that they are just working with orphans and they shun the rest of the community. SASO make the orphans something special when the other children in the community are suffering just as badly. When the big organisations build these orphanages and give them special privileges it alienates the community against these children because they are perceived as getting everything, so it becomes a problem. Consequently John started working with the orphans and the community which has had phenomenal repercussions because some of the women in the community came and started doing things in the orphanage. Sometimes the women would come up and help build rock swales. With the community seminars he was becoming very aware that he personally could not heal Africa or heal Uganda. He realised that he needed to get a team of indigenous people around Uganda that were going to do this work.

The conception of setting up the Permaculture Training Centre of Uganda came about. They started the negotiations to get land. They looked at areas outside of Kampala and in other areas and then they were offered this land which is in Kampala in an inner city area. You would never believe that it is inner city because it was so basically open and very heavily treed. He took the option of being in Kampala rather than out of Kampala because many business people and many non-government organisations bring people to Kampala for seminars already. That means that they are paying for the women or the farmers or whoever to come from distant places. By having it in Kampala it means that they are able to network very strongly. It means that people coming to the seminars learn about the centre, have a look at it and at plants that seed. By having living displays they see an idea and they grasp it and say that they want to come back for training. They can apply to their NGO for funding to come and do it. There is a serious lack of information. It is very difficult in most African countries to get information so he also wanted to set up a resource centre.

They saw on CNN the massive out-flux of refugees from Rwanda and he went down to the refugee camp to have a look in the second or third week of the war and it was extremely bad, much worse than any of the television stations could ever show you. Down there he found that many of the young children had been picked from the massacre sites and brought out of the country and there was no milk. John went back to Kampala and bought milk and sugar and went back down to Uganda Red Cross and set up small child-feeding centres where they could at least feed the children. So they started this program. The greatest thing that was also a difficulty was that many of the children had witnessed an entire village being slaughtered. The way they slaughtered them was to send messages on the day back in the village because everyone knew the war had started. They said "quick, quick run to the church, you'll be safe there." The community ran to the church. It was all pre-planned years before. They devised these plans where everyone ran to the church and they were slaughtered there. It was extremely bad. That was how they

accomplished such an enormous number of deaths in such an incredibly short time. Many of these children were traumatised.

John was driving back to get some more milk and thought about what children want. He came up with the idea of African beads. So when he got back home he managed to get hold of a big box of beads. Those children that were somehow ok came and lined up very orderly but there were still many sitting in the houses but they just started the distribution. Then as these children left the queue and started threading the beads and getting excited it also excited those who were sitting in the houses. They started making a move to find out what this excitement was. Then adults started bringing them across. The Red Cross claimed that it was one of the most successful trauma control efforts that they had ever seen because it just got to so many people. They provided exactly what the children wanted. Because with westerners its very easy to come and dominate and tell people what is best for them. You need to really analyse and think what do these people really want. That's where many of the big organisations go wrong. They are blinded to the reality.

Because John was emotionally captivated by all of this he sold his house. Within three weeks of putting his house on the market he had a cash buyer as if it was meant to be. Then he continued to do what he had been doing and got in to Rwanda. There were still women and children wandering around massacre sites where there was nobody. There was nothing at all. When he drove in the first time from the Ugandan border to Kigali all that he saw were soldiers. John kept pouring injured people in to the back of his Toyota and taking them to receive medical treatment. He was particularly targeting women and children because he perceived them as the innocent victims. They set up an orphanage. He arranged for tourists to come down from Kampala and volunteer but they kept finding mines. From the experience that he'd had in the Australian army, John removed the mines himself. Then they started to bring in children. These children were very traumatised. Many of the children were totally mute, they couldn't talk. They took them back. The children saw the volunteers starting to implement a permaculture system. The children themselves decided to get involved. The therapy was unbelievable. The children really came out of their shells. The kids were so enthusiastic about tree planting , they seemed to know where to put the things. It was already within their thinking patterns. What we've got to do as permaculturists and trainers is just to build on the steps that are already there, to get back some of the traditional knowledge that's been taken off them by Westerners. Rwanda just got too unsafe and they had to pull out.

They went back to Uganda and pushed further along with their project. It took eighteen months to get clearances to buy three acres of land. Initially it was totally dilapidated. The soldiers looted it, there was not a tree around. John and his team took possession of the land on the first of August last year. John needed funds and there were tourists around. These tourists were a resource so John and his team turned half of the area into a campsite. They also developed plans to put in a biogas latrine. Tourists came and saw permaculture and they will take ideas back to their country. The Ministry of Tourism has put John's permaculture display board in the front window of their ministry as an example to the rest of the tourism developers of Uganda that they should also be looking at this system. He's given the Ministry a plan for Biolatrine and they are trying to get developers to use them. They want the people in charge of national parks to put in Biolatrine. Because if you don't do

that, methane is still going to go up in to the air. Why not capture it and put it to use.

Many of the murals that have been painted really excite the local tourists. There is going to be a permaculture garden restaurant. Many of the excess vegetables will be sold to the backpackers. The profits will leach across to the Permaculture Centre. It won't fund the entire Centre, you can probably never dream to do that because of the expanse of training that is needed. But it will certainly fund the base so that if no funding is coming in, the training within the centre will be able to continue.

They have collected more than forty medicinal plants. John is very, very keen on medicinal plants because many of the Governments in Africa, as a result of influence from drug companies, have passed legislation to ban medicinal plants. He has managed to turn that around, the governments have become more liberal.

They have established a resource centre which will have books on all different developmental subjects such as health, appropriate technology, permaculture, biogas construction and that will be accessible to the general public. They want to get a photocopy machine so that people can come and photocopy it and take the information away with them.

John wants to set up some volunteers. They have got some of the universities in England to send volunteers over with partial university funding. The students do this of this as part of their curricula.

The young children love being in and around permaculture. There are rabbits as an income generating source for people. So many people feed chickens artificial foods and grain. People can eat that grain too and there is not enough there to feed the people. Rabbits are eating the chickweeds and sweet potato vines and all sorts of other things which people don't eat. They have goats which they keep in a pen and hand feed. These goats produce three to five litres of milk per day which is a fantastic resource for the families to build the bodies and bones of the children. The local people are obsessed with the black and white cow mentality: they must have a European cow. These cows take an enormous amount of energy to feed them. Some of the goats out-produce the cow and it doesn't take so much work to feed the goats. Because its locked in a pen it is not running around expending energy, it is also prevented from eating the trees. On the swale they have comfrey, elephant grass and Tanzanian grass. The comfrey is used for the chicken and the pigs. On that one swale they are looking after all of their livestock. The goats are thriving. Any trimmings that are taken off any of the trees are also fed to the goats.

The biggest problem that they have is white ants. The white ants eat maize. Uganda used to be all lush tropical forests. Most of the trees are semi deciduous. When the forests were there the termites were in balance with the entire ecosystem. Now they've taken all of the trees and left termite mounds. The termites now have to eat something. Man just destroyed the ecosystem because in Africa they see all of these beautiful pictures of England where there's not a tree in sight with rolling lawns of grass for the cows to eat and they all want that because they think that that is success.

If anyone's got any interesting seeds then John is very keen to get hold of them. They have fifty inches of rain in Kampala. The altitude is four thousand five hundred feet. All of the north of Uganda is very dry Savanna country. The West which is coming in to Rwanda is very, very steep. The other big problem which Uganda has is hyacinths. America is now giving a grant to Uganda. They are now spraying chemical sprays on to the hyacinths. The grant is for the chemical companies, not for Uganda. There are phenomenal islands of hyacinths. You could run across them. The cause is the chemical fertilisers uplifting the nutrient content of the lake. The United States have just granted millions of dollars to spray Lake Victoria with chemicals.

Bill Mollison suggested the use of a nitrate fertiliser and to use some kind of beetle: in order to get rid of the hyacinths. If they spray the lake it will be an environmental disaster right down to the Mediterranean because that's where the river goes.

There is currently an information block in Uganda. Any seeds or any information that they can get will be gratefully received.

Urban Food Production in Bulawayo

Hayden Jones (Zimbabwe)

[Submitted Paper]

The problem

Almost 600,000 people live in the former African-only areas of Bulawayo – the western suburbs. The older suburbs were intended to house transient single male workers. Today, the dwellings house whole families. Housing built in the last twenty years has continued the tradition of small and inadequate homes built on small plots of land; hence they are described as the ‘high-density’ suburbs. While substantial numbers of the more affluent have now moved to the low-density eastern suburbs, the conditions of living of the majority have remained largely unchanged.

Characterized by high unemployment (around 50%), low wages (minimum wage is now Z\$500 = A\$60 per month), high inflation (25%), inadequate health, educational and recreational facilities, the high cost of food alone can absorb up to 80% of the family budget. In addition, many families are deprived of bread-winners by the AIDS pandemic, with at least 10% of the population being HIV positive. It was in this context that in 1994 an experiment in urban food production (urban agriculture) incorporating soil and water conservation was commenced at Njube Secondary School. Permaculture principles and practices were adopted.

The solution

Three demonstration models (or microcatchments) were constructed. Microcatchment I demonstrated water capture and soil conservation with the focal point being the growth and sustenance of a fruit tree. Microcatchment II added a food trench (fertility trench) producing vegetables within six weeks and continuously after that.

The practical knowledge and experience gained was then combined to construct a microcatchment, measuring only six metres by four metres which would comfortably fit into the plots of the two end homes of the typical Njube block homes. This microcatchment (microcatchment III), can almost provide vegetable self-sufficiency for the average family throughout the year. It contained four door-sized food trenches, planted at two-week intervals and, in addition, has one exotic and four indigenous fruit trees, all rich in vitamin C. Natural rainfall is captured in a swale or directed into the fruit tree basins. The microcatchment is surrounded by ridges which are stabilized by vetiver grass, which further prevented water run-off and top-soil erosion. Total food production amounted to Z\$1804 nett at 1994 prices.

Because of the success of this experiment in environmentally-friendly and sustainable urban agriculture, it was decided to extend these ideas to the community. The response of the local citizens has been enthusiastic. Many discussions held over six months led eventually to the formation of the Urban Conservation Society of Bulawayo. This Society is intended to be the vehicle through which the project will be implemented. As can be seen from its aims, the Society is clearly permacultural.

The word 'Conservation' in the title was used because it is a word with which people, governments and corporations are familiar.

Its aims are:

- Care of the earth, both living and non-living, including soils, flora and fauna, the atmosphere, forests, microhabitats and water through active conservation and the sustainable use of resources.
- Extension of this principle to benefit the community through:
 - Encouragement of urban food production based on maximum use of minimal water and intensive use of limited space based on permaculture principles and practices.
 - Conservation education and resource management, through demonstration centres, resource centres, schools, school-leaver programmes, youth centres, community centres, rehabilitation programmes for the disabled, prisons and so on.
 - Employment creation through small-scale ventures such as urban agriculture, nurseries, compost and mulch production, small-scale woodlots, tool and implement manufacture and waste recycling.
- Establishment and/or affiliation of other community organizations pursuing these aims.

The committee which emerged and which is now legally constituted contains a careful balance of community leaders (the city council representative, Resident's Association, Parents etc.) and other interested groups (the Permaculture Association of Matabeleland, Rotary, etc.). The emphasis has been on self-reliance, and what has been achieved so far has been without any external donor support. Having thus far perspired and persisted, we have now reached a point where a small external input is needed. For example, a hand-operated chaff-cutter is required before we can begin income-generating compost and mulch production. The cost of this is only A\$180 (but three month's wages in Zimbabwe). We would welcome any assistance or suggestions.

Permaculture in Malawi

Harrings Kachali (Malawi)

[Submitted Paper]

Malawi, 360 000 square kilometres, with a population well over 11 million people, is a small landlocked country in the south eastern part of Africa. The land is beautiful and its people cheerful. Its economic life is totally dependent on agriculture, counting tobacco as its main cash crop. However, people in rural areas live below the poverty line. With drought and exorbitant fertiliser prices, many people are unable to utilise their lands comprehensively.

Peoples' impression

The name permaculture at first sounded strange and difficult to be fixed in our current chemical farming philosophy. Mrs June Walker's determination and proper approach have indeed revealed the truth and advantages of farming organically. This time the local support and membership is available in almost all districts in Malawi. With local permaculture training, which involved members from all regions, chances to expand nationwide exist.

Availability of demonstration centres

I wonder if it is acceptable to say that having demonstration centre is paramount, and a most influential ingredient in the permaculture framework in Malawi. This was discussed at our previous permaculture meeting and we arrived at a resolution that areas should be identified to act as nuclei. When identifying these places, special importance should be attached to the following requirements:

1. Access to the place, dependable roads;
2. Close to town for reliable markets;
3. Local population and participation around the area so as to act as a training centre;
4. Water resources available to allow dry season farming.

Our place, 30 hectares and 12 kilometres away from the Northern Region city, has all the above requirements. If similar places can also be identified in the central and southern regions it would certainly be advantageous.

Personal assessment and vision

People I have talked to and worked with, of all classes, are emphatically excited and wish to go organic. This has also been revealed by the huge membership covering all districts in Malawi. With local permaculture courses, permaculture know-how has been planted in many minds. But their thirst to see practical achievements first, at demonstration centres, should seriously, urgently and effectively be quenched.

The identified places will work as a catalyst to accelerate the participation of the surrounding communities. People would come and see, and sometimes participate physically, once or twice a month depending on their interest.

Nucleus demonstration centres

These sites should be managed by somebody practically conversant with permaculture technology and should be socially motivated so as to capture people's attention. He or she should be working hand-in-hand with the permaculture main body and the people surrounding the area, monitoring developments taking place.

Financial support

The financing of such centres could be from a number of sources:

1. Individually, one can open up a demonstration garden if financially stable;
2. If the main permaculture body can financially support such centres;
3. Sympathisers could donate something to make such establishments a success.

Activities and goals of demonstration centres

These sites should have short- and long-term income generating activities to eventually create for themselves a financially stable future to stand independently strong.

Short term activities

These are fast money-making activities which would enable the formation of a future sister demonstration centre. The main centre would be engaged in the following short term income generating activities:

- Vegetable growing for: money, food, chicken food, compost manure, fish ponds;
- Poultry farming for: money, food, manure for vegetables, manure for fish ponds;
- Fish farming for: money, food, fish pond manure for vegetable growing;
- Woodlot for: money, timber, fuel;
- Cattle farming for: food, money (to fatten and sell), manure for vegetables and fish ponds;
- Crops (intercropping), one ridge having maize, beans and potatoes which are companion plants. This method is used for a number of reasons:
 - It increases long lasting fertility;
 - It is a cheaper way of farming;
 - It avoids soil and water chemical contamination.

Long term income generating activities

- Possibly Cob Building Construction projects

The money realised from the above-mentioned activities would be used for maintenance and expansion of the main demonstration centre and to be given on loan to capable local participants to start their own demonstration gardens in their areas, having the advantage of being supervised by a well-qualified trainer from the main centre.

To encourage participants, prizes should be given to the best three participants in the form of money or materials. The best of the three should be recommended to start a second demonstration centre. When the loan is fully paid back he can stand on his own and start sharing the fruits of permaculture.

This vision builds in me the understanding that people would be highly encouraged. It would also create a happy social atmosphere when people live and work together for the good of the whole community. This would mean a joy-giving and more sustainable environment for this and coming generations.

Native American Permaculture at Tesuque Pueblo: 1997 Program Description

Thomas Mack (USA)

[Submitted Paper]

In 1996, the Environmental Department of Tesuque Pueblo, in association with the Traditional Native American Farmers' Association (TNAFA), initiated an educational program for Pueblos and indigenous peoples that focuses on the restoration of ecosystems, the revival of traditional sustainable agriculture, and the ecological design of community infrastructure.

In July 1996, Tesuque Pueblo hosted the first Permaculture Design Certificate Course specifically for Pueblo and indigenous people. Tesuque Governor Rick Vigil presided over the design course graduation ceremony, and 35 Native Americans from six pueblos and 12 tribes received their certificates from the International Permaculture Institute. Course participants included elders, grandchildren, Pueblo officials, students, and a wide range of skilled individuals, with a near equal balance among men and women.

The intensive two-week training included theory and practice of ecological land use planning, watershed restoration, home and commercial organic gardening, alternative building design, natural waste treatment systems, soil building, forest gardening, seed collecting and preservation, animal forage systems, native plant lore, and regenerative economics.

After completing two years of practical application of the permaculture design system, graduates will receive their diplomas from the International Permaculture Institute, Australia, which entitles them to become certified permaculture designers and instructors.

As a system which honors traditional cultural practices of earth stewardship, permaculture was enthusiastically received by the course participants. A sufficient level of interest was generated to develop the program further for the 1997 season, April through September.

Definition

Permaculture (permanent agriculture) is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter and other material and non-material needs in a sustainable way. Permaculture design is a system of assembling conceptual, material and strategic components in a pattern which functions to benefit life in all its forms. The philosophy behind permaculture is one of working with, rather than against, nature... (Bill Mollison, *Permaculture: A Designer's Manual*)

During the past twenty years, permaculture has grown into a global grassroots initiative, a diverse folk movement that is inventing itself with new cultural adaptations. There are permaculture institutes in over 50 countries and permaculture projects in over 100 countries. Permaculture is a worldwide network of people, institutions and communities which are sharing practical strategies for creating an ecologically sustainable future. Permaculture is being used as an effective tool by indigenous communities around the world.

1997 goals

The goals for the second year of the permaculture program at Tesuque Pueblo include the following:

- Conduct 2nd Annual Native American Permaculture Design Course, July 15 to August 1st, 1997;
- Establish a one acre permaculture demonstration farm at Tesuque;
- Build an outdoor teaching classroom near the Tesuque day school;
- Start a nursery for native plants and selected exotic useful plants;
- Conduct a series of six weekend workshops throughout the growing season;
- Conduct a six-week permaculture training camp at Tesuque as part of a Field Scholars program;
- Develop comprehensive 5 year development plan to implement ecological design and restoration measures at New Mexico's Pueblos;
- Start on an information resource base, or library, on permaculture and related topics to serve as the basis of a permanent teaching facility at Tesuque.

Land care and ecological restoration

The permaculture program will work with the Pueblo's environmental standards program for watershed preservation and enrichment. Permaculture measures will include the following:

- *Erosion control* through the construction of swales and gabions to slow runoff and stabilize slopes;
- *Keyline contouring* for water harvesting, selected perennial planting and inter-linked pond systems;
- *Riparian repair* and regeneration through regeneration of willows and cottonwoods combined with bank stabilization, earthworks, and storm ponds;
- *Reforestation* of eroded pinon juniper areas to move toward climax Ponderosa ecosystem;
- *Broadscale revegetation* utilizing the above combination and the Fukuoka method of aerial seed balls.

Educational capacity building

A *library* and *database* to house information at Tesuque Pueblo on permaculture-related resources, such as institutional contacts, international network, journals and periodicals, technical references, supply sources, etc is proposed.

The permaculture program will require *audio visual production* capability for developing an on-going series of instructional videos. *Project documentation* will be developed in the form of reports on each workshop and each ground project, including photos, video, syllabus, class evaluations, designs, etc. This document would be made available in self-published form for teaching, fundraising and project development.

Practical ecology workshop series

In addition to the 2nd annual two week Native American Permaculture Design Course, a series of weekend workshops is proposed throughout the course of the 1997 season. These workshops will focus on developing specific skills for implementing permaculture, traditional or ecological designs. The following is the tentative list of topics covered in these short courses:

- Home garden design;
- Erosion control techniques;
- Bees and honey;
- Cold frame nurseries;
- Willow coppicing;
- Live fencing;
- Composting;
- Orchard design and layout;
- Seed collecting, selecting and preserving;
- Food processing and preserving;
- Seed pelletizing.

Culture and ecology

It is well documented that tribal traditions have highly sophisticated knowledge of land, water, plants and animals. Indigenous peoples have a legacy of sustainable earth stewardship. The Native American Permaculture program at Tesuque will continue its collaboration with the Traditional Native Farmers' Association (TNAFA) in exploring the links between applied ecology and cultural traditions of land care, sustainable agriculture and balanced human settlement. Historical and cultural research will be encouraged which may entail collection of old documents and photos, archaeological field trips, conferences, gatherings and exchanges.

Field scholars program

A field apprenticeship or **Field Scholars Program** will be initiated to take promising youths of Tesuque and other Pueblos to gain intensive hands-on practical experience and training in gardening, water systems, agroforestry and land reclamation.

The Field Scholars Program would provide part-time jobs for Tesuque youth. (The possibility of paid internship from highly selected 'outsiders', perhaps even from other countries, is being explored.) Field Scholars would also be groomed for assistant teaching positions in following years.

Ecological economic enterprise

Agroforestry holds major economic potential for Tesuque Pueblo in the mid- and long- term. For example, one fifty year old walnut brings in about \$30,000. The generations of grandchildren can plant their retirement funds now.

Arts and crafts has a very strong tradition at Tesuque Pueblo, and yet more can and is being done to renew cultural traditions of making arts and crafts out of native species and materials. The willow basket workshop that occurred during the 1996 Permaculture Design Course was very well received by grandparents and grandchildren alike.

Land restoration products such as high grade compost; specialized seed ball mixes; and bales of native grasses, herbs and wildflowers that can be spread over land as a mulch to help regreen desertifying areas.

Botanical medicinals have always played a role in Pueblo life. Botanicals offer greater economic return from on-site 'value-added' such as processing, preserving, extracting oils, etc.

Annual and perennial food crops grown organically at Tesuque Pueblo are currently being sold on-site and at the Farmers' Market in Santa Fe. Direct to restaurant sales and subscription farming are two other options worth exploring. Perennial crops like asparagus and wild crops like mushrooms offer a high return for work/input required.

A native plant *nursery* holds potential for economic return without excessive capital input requirements or overhead. Initially, the nursery is developed to service the ongoing restoration and forest gardening at Tesuque. Eventually, the whole Pueblo becomes one big nursery.

Permaculture demonstration farm

A one-acre community-oriented permaculture demonstration farm is planned which will also serve as a teaching facility as it develops over time. Permaculture food production systems include the following features:

- Intensive soil building techniques;
- Erosion control measures;
- Water conservation and optimization methods;
- Diversity of plants, companion planting or 'guilds';
- Beneficial insects, natural pest and disease control;
- Windbreaks, protective earthworks;
- Use of natural fertilizers made on site;
- Use of mulch to reduce evaporation and build soil;
- Incorporation of useful trees for crop, forage and fertilizer;

- Emphasis on perennial plants in combination with annual crops;
- Small animal integration for tilling and fertilizing;
- Efficient layout and utilization of space, including vertical;
- Stacking of functions, and beneficial connections;
- Conversion and reuse of waste.

An important feature of the demonstration farm will be the establishment of the nursery. Of primary importance for the demonstration farm is its function as a teaching model. Permaculture cannot be taught in a walled classroom, especially in this cultural climate. The demonstration farm is the most effective means of communicating permaculture principles as they apply to agriculture. A one-acre site for the farm has been designated by an individual tribal member. The cost to start the farm, including the first season's labour is estimated at \$10,000.

Strategic development

- Maintain long-term goal of ecologic and economic sustainability.
- Build organic alliances, worknets and trade among Native Americans.
- Use existing resources to their maximum potential.
- Focus on educating youth, not to 'get' jobs, but to create them at Tesuque.
- Create many diverse small-scale demonstrations and on-the-ground models.
- Develop comprehensive information resource system.

Proposed Budget Allocation/Grant

1997 Native American Permaculture Program

Two-week Permaculture Design Certification Course (includes teaching fees, course materials, scholarships) _____	\$10,000
Permaculture one-acre demonstration farm _____	\$10,000
Field Scholars Program (Youth) _____	\$5,000
Educational capacity building _____	\$5,000
Practical ecology workshop series _____	\$5,000
Total amount required: _____	\$30,000

Third International Eco-City Conference and Permaculture Design Certification Course Yoff, Senegal, January 1996

Thomas Mack (USA)

[Submitted Paper]

Background on Yoff, Senegal

Yoff is a 600 year old traditional fishing village situated on the western-most point of the African continent, known as Cape Verde, Senegal. Yoff shares the area with two other traditional villages of the Lebou Tribe, Oakam and Ngor. The villages are located approximately 30 kilometers to the north of Dakar, Senegal's capital and largest city of some 5 million.

The people of Yoff have traditionally lived sustainably from fishing, arts and crafts and subsistence farming. The Lebou are a highly cohesive group, sharing Wolof as a common language. With Islam well established some 700 years ago in West Africa, the Lebou integrate devout Muslim practice with ancient tribal (animistic) traditions. During the conference, the village of Yoff celebrated its annual ritual in honor of the protective goddess spirit of the village. A bull was sacrificed as part of this goddess ritual.

The villages of Yoff, Ngor and Oakam have been threatened culturally and physically by modern industrial developments, with increased severity over the past 100 years. In 1995 National Geographic featured a cover story on the devastation of fish populations, highlighting the plight of the traditional Senegalese fishing cultures. Factory fishing fleets, European and Lebanese, have been so voracious that local fish counts have dropped dramatically. Predictions of the collapse of fishing traditions in Senegal range to within a few years.

Additionally, years of French colonialism brought the "green revolution" and cash crops to Senegal. This drastically altered traditional agriculture practices and devastated the generational information base about self-sufficient natural farming. Huge monocrop plantations of peanuts deplete the land and deteriorate local nutrition, while primarily serving the French cosmetics industry. Aid organizations active in Senegal, such as the Peace Corps, are still recommending pesticides, herbicides, and chemical fertilizers.

With the local industry base wiped out, the increasing population flocks to Dakar and other urban areas in search of jobs and currency. Human and industrial waste problems are escalating, intensifying health problems. Financial and governmental aid programs attempt to address only the symptoms of the problems. The population of Yoff has jumped from 25,000 ten years ago to nearly 40,000 in 1996. The village is running out of land to support the new homes necessary. Part of this problem is cultural, as polygamy is practiced and it is a sign of status to have more than one wife. Traditional village life incorporates large extended families in compounds.

One striking impression is that Yoff, with its strong cultural traditions, has all of the “social software” of an eco-village. The social organization and cohesiveness as a community is as impressive as anywhere on the planet. There are no police and no jails in the village. A complex hierarchical structure of religious leaders, council of elders and council of wise elders, and women’s economic cooperatives (out-dating many recent developments around the world), hold the village together remarkably like a large family. Everyone in the village knows instantly if there is an important visitor, or if there is a special event, or if someone has a problem. Even the community dining and prolonged habit of greetings and introductions promote an extraordinary human intimacy.

The choice of Yoff as the site for the Third International Eco-City Conference is largely due to the work of one highly active and talented individual, Serigne M’Baye Diene. Serigne is known in the village as Khalifa, an honorary title which appears to bestow a great deal of respect, leadership and trust in a man who is not yet an elder. Serigne has a PhD in Nutrition from Cornell University, and his thesis presented ground-breaking insight into local community process as it relates to health and nutrition.

At Cornell, Serigne became involved with a community development project started by a group at Cornell, known as the Eco-village at Ithaca. Since 1992, Serigne has been working with this group (connected to Richard Register and Eco-City Builders) on plans to establish a sister village relationship and build an Eco-Center as a model for the expansion of Yoff village.

Following his completion at Cornell, Serigne now works on a US AID project in Dakar. He is the Director of a local organization, APECSY – the Association for the Economic, Cultural and Social Promotion of Yoff. Now active for over 10 years, APECSY has the full support of the village elders, and has successfully negotiated the return of tribal land from the government. APECSY is the organization that hosted the Third International Eco-City Conference and which sponsored the location and provided support for the first Permaculture Design Certification Course taught in West Africa.

The Third International Eco-City Conference

The Conference took place just outside Yoff, from January 7th through January 12th, 1996 with some 35 countries represented and several hundred in attendance. It is expected that full conference proceeding will be published through Ithaca. This report is primarily concerned with the Permaculture Design Certification Course, and therefore only lists some of the major topics covered by presenters and panels at the Conference:

- The model of the existing eco-city of Curativa, Brazil;
- Traffic, transportation and the urban environment;
- Traditional African village design;
- Waste water treatment systems;
- Food security and urban agriculture;
- Women’s cooperative banks;
- Solar and appropriate architecture;

- Population and urban stress;
- Health and Nutrition;
- Womens' role in development;
- Modernization and pollution;
- Appropriate technologies;
- Permaculture Design.

The conference included the participation of the Mayor of Dakar and Senegal's Minister of Environment as well as many Senegalese involved in urban planning, development, architecture and education. By all standards the conference was a huge success. It stimulated a great deal of enthusiasm for an ecological approach to future development. Most remarkable was the sharing of cultures. It became fully apparent how much traditional village cultures have to offer and teach the global eco-city and eco-village movement.

Permaculture Design Certification course

The Permaculture Design Certification Course was conducted just following the Eco-City Conference, from January 14 through January 25th, 1996. The course was comprised of 45 participants from the three villages of Yoff, Ngor and Oakam. The course was conducted within the old village of Yoff at the headquarters of **APECSY** (Association pour la Promotion Economique, Culturelle et Social de Yoff). B.P. 8502 Dakar-Yoff, SENEGAL tel/fax: 221.20.32.68.

Thomas Mack, of Ecological Design Arts, Santa Fe, New Mexico served as the lead permaculture instructor, greatly aided by Assistant Instructor Moustapha Barry, a Senegalese student in the United States who recently completed the Permaculture Design Course in Colorado. A number of Senegalese English teachers attended, some having been official translators for the Conference, and these participants were instrumental in translating all the course information into French and Wolof, and local idioms.

The composition of the student body, with 1/3 women, was highly diverse: gardeners, students, teachers, architects, engineer/surveyors, mothers, translators, etc. Several youths' associations from all three villages were represented, and quite a number of women's groups, including members of a women's dye and fabric making cooperative, garden/farm cooperative, women's rural and community development groups, with national networking within this latter group.

After a few days of positive reviews within the village of Yoff, several elders showed up and continued religiously throughout the remainder of the course. The elders offered contributions of tremendous value to the class, confirming the philosophy and describing how their fathers and grandfathers "did permaculture."

Near the end of the course, the eldest participant said that all this reminded him of a story about the man who suffered an ulcer for fifty years, when along came his friend and inquired about the obviously painful condition. Indicating the stomach, the friend replied by asking the ailing man if he knew what the nature of that tree growing in front of his house was. Drinking the tea from the leaves of the branches of the tree for a period of one month, the man was cured of his ulcer.

“The answer is right in front of us,” declared the elder. The participation of the elders was extremely critical to the success of the permaculture course in Senegal. Another significant connection was made with the Jaroffe, or Spiritual Leader of the village of Oakam. The Jaroffe visited APECSY to register his wife for the ten day course, at which time an introduction to permaculture was provided with ample photo examples.

And, in addition to the traditional leadership, an excellent rapport was made with elders of the Mosque. Many students in class had training in the Koran, in Arabic, and consistently found passages in the Koran or among the Hadith (sayings and manners of the Prophet) which confirmed the permaculture philosophy.

The classroom time, generally two short lectures per day, covered the basics of the Permaculture Design Certification Course:

- Earth Care Ethics;
- Observation and Pattern Recognition;
- The Elements and Bio-cycles;
- Design Principles and Design Methodologies;
- Zone and Sector Analysis;
- Energy Accounting and Ecological Auditing;
- Soil Regeneration;
- Water Harvesting and Management;
- Erosion Control;
- Drylands Strategies;
- Waste Treatment;
- Small Animal Systems;
- Homestead and Home Design;
- Environmental Restoration Strategies;
- Forest Gardening and Regenerative Forestry;
- Economics and the Biological Resource Base;
- Community Enterprise and Development Strategies;
- Urban Design Strategies.

Plenty of time was structured for hands-on activities, which were usually conducted by first forming into smaller groups. Several observational exercises were conducted both within the village and throughout a 150-hectare property adjacent to the international airport at Yoff, which cannot be developed for housing and which the village is considering for an agricultural designation.

The village design exercise included inventories of unused resources and convertible wastes; housing layout; building design; water drainage patterns, traffic patterns, local vegetation, etc. Field observation exercises on the farm parcel involved drainage patterns, erosion indicators, guild and biological associations, vegetative patterns, solar orientation, wind orientation, fire, access, etc.

The field exercises also included collecting, remarking on, and documenting local useful plant species. The class as a whole identified, categorized and notated 52 species. All the information from this was published in poster form for future references, as were the notes from all the permaculture lectures.

Other hands-on activities included the construction of a “peebox” toilet for urine, which is simply a box stuffed with a sufficient amount of straw or other dry carbon material to absorb quantities of urine. The urine dries and rarely smells. The now nutrient rich straw is later used as mulch in the garden. There is a slow release of nitrogen along with the breakdown of the carbon material.

Together, the class planted a spiral mandala tree garden, as a model for forest gardening in the neo-tropics. First the collection of materials: seaweed, cardboard, water, sheep manure, some healthy soil, dry mulch material, stone and plant material. On a completely barren section of sand within the APECSY compound where the class was taught, a spiral mound was built up from the successive layering of these material, articulated by stone, and planted with several stories of perennials, including mango, banana, papaya, and guava, with passion fruit climbing up a bamboo stake until the trees reached supportable size. The afternoon event became a neighborhood spectacle of apparent delight.

Additional practical class activities included hand manufacturing of the Fukuoka seed pellets for drylands regeneration. This system combines many variety of seeds, including trees, shrubs, flowers, herbs, grains, ground covers, leguminous, etc. To this carefully selected “mixed bag” is added a light coating of live forest soil inoculated with the mycorrhizal spores, and then an outer coating of finely sifted clay (which contains latent minerals). The “mud pile” is moistened with bitter herb tea. The mycorrhizals provide the homoeopathic dose to spur germination; the clay keeps the birds away, retains water and adds minerals, and bitter herb tea serves as a detractor for rats, mice and small animals. The class made about a thousand in a few hours.

Design exercises were assigned as part of the standard Permaculture Design Course Curriculum. The two relevant assignments were the 150-hectare farm area; and the compound for the planned Eco-Center which would serve as the model for the village extension area. This village extension will eventually serve upwards of 6,000 people (extended family compounds). Six groups of 7 students formed to illustrate designs for the farm. This exercise stimulated a great deal of interaction among the course participants and provided an opportunity for some in the group to assume teaching roles, as presentations on each design were formally made by one selected from each group.

Time did not allow for the development of fully illustrated designs for the eco-center compound, but the class developed several dozen design criteria and specifications for an urban design fashioned within the permaculture framework while preserving essential indigenous motifs. This exercise also required every student to assess his or her own home environment from an ecological design perspective, and again awakened a well-spring of contribution, dialogue and learning interaction among the students.

The overall response, while I cannot avoid subjectivity, was extremely positive. The Khalifa stated that something “magical” was happening with this group, and he was convinced that permaculture delivered the needed practical follow-up to the conference. One positive indicator of the course was the fact that people were already

making compost at home before the course was over. Village permaculture study groups were formed by the end of the course.

Perhaps the most striking indicator was the “talent show” on the final night of the course. Participants composed groups to sing, dance, drum, recite and perform. The women composed a traditional lyrical ballad that honored the return to the earth and offered thanks for permaculture; the youth groups made up various rap songs. The overall feeling was rather like a joyous embrace and a celebration of optimism.

Future directions

APECSY, with its history and track record, its political and religious support, and the International Conference, has established a solid foundation for future success. As APECSY embraces permaculture with a view to the design of its vision for its future development, there is a high degree of potential for building upon the base work set by the Permaculture Design Certification Course.

APECSY has the attention of such organizations as UNESCO, US AID, the Ford Foundation, as well as the recognition of the Ministry of Environment, the Mayor of Dakar, and the President of Senegal.

It is recommended that a second design course be organized as soon as possible to maintain the momentum of the Conference and the first course. This course is important for two reasons:

1. The first course was seen as a side show of the Conference and the response of the village communities surprised everyone. No pre-registration was done. All the arrangements had to be made by the teaching team when they arrived in Senegal just prior to the Conference. At first, nobody knew what permaculture was, so nothing was done. This is to some degree due to a lack of attention, or even neglect by the Cornell, Eco-village at Ithaca organization, which had its hands full with the Conference.

The main point being that with advance organization, with the cooperation of the full capacity of APECSY, the composition of the student body will be more highly targeted. Non-governmental organizations, and the leadership of many more cooperatives, would be guaranteed.

2. The second point is that the village of Yoff has got projects under way that need immediate assistance – the extension of its village on vacant land with the capacity for 6-8,000 people, and the design and development of a 150-hectare permaculture farm.

If possible, it is recommended that two people from Senegal be sponsored to attend the Sixth International Permaculture Conference in Perth, Australia, Autumn 1996. Efforts are currently under way to establish the Permaculture Association of Senegal (PAS), as an APECSY-sponsored program. A permaculture library was inaugurated with contributions of books and videos from Thomas Mack.

There are opportunities for trade with womens' cooperatives for naturally-dyed fabrics, and is exploring other potential products for trade with the “first world” to

support local development of regenerative economic enterprise, based on biological resources. Another promising opportunity would be to set up a seasonal village apprenticeship/eco-tourism venture. Student fees for a six week stay would include the cost of a Permaculture Design Certification Course, meals and lodging in a family home in the villages of Yoff, Oakam and Ngor. Paying field scholars would split time between training, practical hands-on application, tourism around Senegal, and instruction in dance, and song.

It is recommended that Yoff link with the Global Eco-village Network (GEN), as it would be a mutually beneficial alliance. Internet training is currently being conducted at APECSY and at high schools in and around Yoff. Facilities to allow World Wide Web access are being installed. GAIA Villages or GEN might consider sending a small team of emissaries from its international network to Yoff to conduct an assessment, a briefing on GEN and a short Web training session.

Capital support is needed for the construction of the Eco-Center, as a model compound for permaculture urban development. It is recommended that the GAIA Villages or GEN mission to collaborate with APECSY on a fundraising strategy that combines for profit elements with aid and grant funds.

High potential regenerative enterprises have been identified which would combine well with permaculture trainings. Eco-tourism, mentioned above, is one. Forest products based on regenerative forestry projects has vast possibilities while contributing to restoration efforts. The most intriguing aspect of a tremendous range of forest products, is botanical pharmaceuticals.

Once the value of Senegal's botanical resources is widely known enough to be targeted for exploitation it is essential that trained community agroforestry projects are in place and local needs are being met as a priority. The "value-added" of botanical pharmaceuticals is in the process, extraction, distillation, etc. This is relatively low cost, low technology, with high skill requirements. Senegal's human potential is its most remarkable and abundant resource.

In conclusion, valuable groundwork was laid in West Africa through the Eco-City Conference and the Permaculture Design Certification Course. Follow up is necessary to solidify this groundwork. With sufficient support, Thomas Mack and other permaculture staff are prepared to return to Senegal to conduct additional permaculture trainings, lead design and work teams to implement a model permaculture farm in Yoff, and to develop economic projects.

Permaculture In Nepal: A Decade

Thakuri Malla (Nepal)

[Submitted Paper]

The number of permaculture trainings conducted, the growth of individuals or organisations interested in permaculture and the use of its principles in practice indicate that the development of permaculture in Nepal is encouraging.

The history of permaculture design course training dates back to 1986 when INSAN in collaboration with APROSC and Winrock International organised it in Kathmandu which was facilitated by Bill Mollison.

As NECOS has also conducted the design course training, its number has further increased since its inception in 1991. The number has again increased when JPP (Jajarkot Permaculture Programme) started providing it independently since 1993.

It is roughly estimated that there have been more than 350 permaculture graduates in Nepal (308 graduates have been listed in the directory produced by NPG in 1995; a great number are missing from it).

On top of permaculture graduates, nine graduates have already received a Diploma from the International Permaculture Institute, Australia. As already mentioned above, there are three organisations in the country which provide permaculture design courses. Besides these organisations, AAA has been providing organic farming and sustainable agriculture training which is based on permaculture principles. Many INGOs and NGOs have become interested in permaculture — they have sponsored many people for permaculture training (many of their staff have received permaculture training) and have started working on a permaculture line.

Organisations like INSAN, NECOS, JPP and AAA have developed farms based on permaculture principles. Considerable interest has been shown by government organisations toward permaculture.

A number of individuals like Mr Surya P Adhikari have also developed permaculture farms. Mr Adhikari, a farmer in Begnas, Pokhara has improved a degraded barren land to productivity in a few years.

Recently Nepal Permaculture Group (NPG) has come into being to promote and coordinate permaculture activities in Nepal and abroad. NPG has identified its role, responsibilities and challenges.

The challenges include facilitating the development of a large number of productive and self-sufficient permaculture model farms, which are replicable in different farmer settings, help develop and disseminate appropriate alternatives and achieve an official favour of the government of Nepal. Besides, to make the majority of Nepali people aware of the threat of the so-called modern agriculture and fetch a better market for quality (organic, etc) produce are among the challenges.

Thakuri Malla, Secretary NPG and Chairman of "Chauteree", has been actively involved in Permaculture teaching and site development since 1989. He has co-taught four design courses in Nepal between 1991 and 1995 and thirteen introductory courses. Thakuri is currently working in Kalayanpur VDC among 160 households and community programs which involve: organic farming, agroforestry, watershed management, saving schemes, integrated woman-based income generating activities and sericulture, common property and natural resource management. "Chauteree" has been a model for sustainable farming since 1992.

Thlolego Project

Robyn McCurdy (New Zealand and South Africa)

[Presentation Report]

Thlolego is located in the north west of South Africa, which is now divided into nine provinces. Previously the area was Bhoputatswana. In South Africa since the end of apartheid, changes have been positive and negative. People had incredibly high expectations of the government: provision of jobs, education, health care etc. But these have been slow to be fulfilled. Progress is slow. Politicians have not been able to deliver on promises, but things are gradually changing.

The previous system forcibly removed people to a barren homelands area, in which rainfall is low and erratic. Families were unable to support themselves and the men usually were forced to migrate to the cities for work, leaving the women and children behind. This led to Soweto-type urban developments – townships with few services and virtually no ability to produce food. Families were split. The social system broke down.

To counter this, Thlolego is concerned to provide low-cost housing, permaculture teaching and demonstration, and to work towards village development using 'experts' where needed to advise how to counter linear development which occurred under apartheid.

Thlolego is a former Afrikaaner farm which badly degraded the land. Purchased three years ago, it is held by the RUCORE trust, an educational trust, of which Thlolego is part. Funding originally came from the South African Development Bank, which provided seed funding for sustainable development. Thlolego has 3 aspects:

- the courses, available to people from all over the northern province,
- the village, consisting of 18 adults and 15 children, who live and work there,
- the farm school, built under apartheid for children.

General history

Old patterns were circular, new patterns are linear. Moving back to old patterns. One of the problems is working with South African people whose understanding of the concept is that it means national park, not their own immediate environment. Thlolego is getting people to see that they can control their immediate environment and take responsibility for it. The government itself pays lip service to sustainability, sees permaculture as being very slow but is happy to support projects as demonstration sites.

The centre

There are demonstration gardens for teaching, open pollination testing for plants suitable for African conditions. Local people want seeds when they visit and see how effective it is. Seed saving is encouraged. Many people have never seen earthworms,

and all take a bag of earthworms with them when they leave. The area is deficient in large animals. They have started small scale animals such as rabbits and chickens, but need to upscale soon.

The Natural Farming Network in Zimbabwe has published several books, one on natural control of pests. At Thlolego they found that helicopter beetles love blue so they put blue buckets of water around the grounds and the beetles dive bomb into them and commit suicide. They have a chicken tractor system. Chickens are important but more work is needed to integrate the chickens into the gardens. A US architect made a chicken coop but it turned out not to be appropriate. But they have a good rabbit hutch system. Rabbit meat is an important part of the Tswana diet.

In autumn they save seeds. One Tswana woman is now training others how to save seed, in the Tswana language.

There is a composting toilet, which is in high demand from all who see it. Two aquaculture systems, gardens, large compost heaps. Greywater re-use system which is being replicated in other areas. They are now building in earth brick, according to a design drawn up by Buddy, an American, in consultation with village people. This popular design will be built several times by Thlolego village people and then they will go into business building for people outside.

They are teaching forest management. Teaching literacy. Using interactive methods to teach about budgeting and producing community designs.

Finally permaculture is a way for whites and blacks to work together positively and is seen therefore as a means of reconciliation.

Upscaling the Adoption of Ecologically Sound Agriculture in the Philippines

Teodoro C. Mendoza (Philippines)

[Submitted Paper]

Introduction

Farmers abandoned their traditionally diversified farming systems in favor of monocropped systems characterized mainly by large usage of agrochemicals and high yielding varieties. In rice, the national average yields had increased. The key inputs in increasing lowland paddy rice yield were also adopted in the production of other major crops like corn, sugarcane, vegetables including fruit trees, and in a reforestation program better known as Industrial Tree Plantation (ITP). It took more than a decade before farmers began to realize the negative impacts of green revolution. Farmers had noticed the deterioration of their living conditions (further indebtedness, unable to send their children to school, declining stamina). Mostly, through the efforts of non-governmental organizations and organized farmer groups, the criticisms against high external input agriculture were ventilated. Non-governmental organizations started their own trials and experimentation on organic farming or chemical-free agriculture. They started establishing demonstration farms (NGO staff-managed and farmer organization-managed).

Soon, conscience-stricken scientists/faculty members of the academe who were previously trained as reductionist scientists started to listen and study the farmers' complaints. A number of them have tried to validate and study the practical applications of organic farming by some farmers.

With the help of media (both print and broadcast), the popularization of the issues gained full speed and common knowledge. Ecologically sound agriculture became popular with a collective term 'Sustainable Agriculture' (SA). While debates are raging on what acceptable definition of SA is, everybody agrees on the need to reduce agrochemical use. SA became the buzzword. Even the politicians rode on the issue.

The mainstream or formal sector (instruction, research and extension) positively responded. There are at present some programs such as IPM (Integrated Pest Management), promotion of bio-fertilizers (commercialization of compost preparation and distribution) and training seminars/workshops sponsored by the formal sector. Politicians realized the urgent need to plant trees (but they were not prepared to pass a law on total log ban).

There had been a faddist type and bandwagon-like popularization of SA. From mere advocacy mainly led by Non-Government Organizations (NGOs) and People's Organizations (POs) and very limited number of scientists, SA suddenly became a mainstream agricultural research and development framework.

Ironically, SA's sudden acceptance did not result in its widespread adoption by farmers. There was an absolute increase in the number of farmers who have shifted their

farming practices and systems. However, in a village, they are the exceptions. The significant majority are still very much in the green revolution agricultural practices (monocropping, heavy use of chemicals).

Upscaling the adoption of ecologically sound agricultural practices from the domain of exceptionally outstanding farmers or early practitioners to village community level remains to be achieved.

Objectives of the paper

This paper aims to present the situations (ecologically unsound agricultural practices), the measures that were identified to make those identified agricultural practices ecologically sound, identify/test some interventions in response to farmers' inability to implement the identified measures; also, analysis of why a particular intervention seemed to be not working is included and options or remedial measures are being proposed to upscale the adoption of ecologically sound agriculture in the Philippines.

Scope and limits of the paper

The presentation and discussion shall be limited to the lowlands (rainfed, irrigated) and upland environment mostly grown with rice, corn and sugarcane. Uplands are mostly planted sparsely with coconuts.

The data and observations were synthesized from the series of farmers' seminars and workshops in 11 provinces, namely: Nueva Ecija, Tarlac, Camarines Sur, Negros Oriental, Negros Occidental, Mindoro Occidental, Mindoro Oriental, Iloilo, Agusan, Misamis Oriental. (The author served as a resource person/facilitator during the farmers' meetings). The series of farmers' seminars/workshops covered in this paper started in April 1995; the last one was in August 1996. The seminar and workshop were both done on-site (in the farmers' village) and off-site (outside farmers' village – conference hall/training room). The environment under which the seminars were conducted ranged from natural (under the trees) to artificially ventilated to air-conditioned rooms and the food served ranged from natural (vegetables raised by the farmers) to cuisine-type menu.

The seminar/workshop format is shown in **Table 1** and lasted from one (activities 1-3) to two days (activities 1-5) and farmers attendance ranged from 15 to 100 persons.

No.	Nature of Activity	Methodology
1	Surfacing of issues, concerns, problems	Use of meta-card. Group workshop followed by plenary presentations
2	Presentation/Discussion of output	Plenary
3	Lecture input from the resource person	Lecture + discussion
4	Planning workshop	Group workshop
5	Presentation/critiquing of workshop output	Plenary

Table 1: Seminar/Workshop Format

Discussions of findings

Summarized in **Table 2** are the lists of ecologically unsound agricultural practices (situation) and the corresponding ecologically sound practice(s) (measures). It is interesting to point out that farmers knew all along what constitute ecologically unsound agricultural practices from the lowlands to upland environment. These are as follows:

- burning of crop/weed residues,
- heavy use of chemicals (fertilizer, pesticides),
- monocropping,
- soil erosive farming practices in the uplands (plowing along the contour/orienting rows along the contour, etc.).

Likewise, it is also revealing to note that farmers are familiar with many of the measures needed to address or solve the ecologically unsound practices and transform them to ecologically sound practices. Nine out of the eighteen measures, or one-half, of the measures (**Table 2**) emanated from the farmers.

If farmers knew all along the measures, why were they not doing these on their farm? This question can be best answered if the reasons for their inability to do the identified measures are known. **Table 3** presents the reasons (farmers identified 20 out of 37) why the identified measures to transform their farming practices from ecologically unsound to ecologically sound practices are not being done or could not be done.

Farmers simply burn crop/weed residues (there are some farmers who incorporate crop residues in their soil). Five of the seven reasons mentioned by the farmers include:

- it is laborious to spread or pile crop residues,
- residues obstruct tillage operations,
- farmer wants to immediately establish new crop,
- hampers the growth of seedlings, and
- residues are intentionally burnt by some people (duck raisers).

On the other hand, farmers are not fully aware of the value of crop residues (monetary, environmental). Hence, they find it easy just to burn them. After discussing with them the value of rice straw/corn stover and asking them if they will still burn these materials, their answer was 'From here on, we will not *burn* our crop residues.' This answer was among rice farmers. It should be important to point out that rice farmers who raise carabao and cattle in the rainfed areas treasure very much their rice straw and they do not burn them.

It is the farmers in the lowland irrigated areas, who sold their carabaos and opted to use small hand tractors for land preparation (hence, they see no need for preserving rice straw as feed for carabao/cattle), who are quick to burn rice straw. The case in corn is different. Corn stovers are thicker and they take time to decompose. Incorporating corn stover in the field needs a heavy duty tractor (disc harrowing, deep plowing). Farmers generally custom hire a tractor. They economize on land preparation by allowing only two passes of disc harrows. This is minimum tillage

and hence, minimum expenses but at the expense of burning the corn stover to achieve satisfactory land preparation for easy corn seed establishment. The long term adverse effects on soil productivity are showing: Fertilizer application rate has more than doubled from 2-4 bags in the 1970's to 6-10 bags in the 1990's. Yet, yields are decreasing. This is not due to fertilizer alone. It is the combined effects of an increasingly difficult production environment (erratic rainfall, heavier rain downpour, drought, strong typhoons).

Farmers' dependence on the use of chemical fertilizer could not be attributed to their lack of knowledge on the value of using animal manure. The reasons why they do not use animal manure are as follows:

- no adequate supply,
- not available when needed,
- bulky,
- gives foul smell, and
- they have no carabao or cattle.

Green manuring is a practice which farmers find most difficult to adopt. They could not appreciate the idea of planting and then plowing under legumes at blooming stage. For more than 10 years, the use of Azolla in lowland paddy fields has been promoted. However, discontinuous irrigation and low soil phosphorous inhibit the sustained growth of Azolla.

It is not that the farmers do not know diversified farming or growing of crops other than corn, rice, or sugarcane. In their backyard, fruit trees, vegetables and some woody perennials (bamboo, acacia, narra, mahogany) are being grown. In their farm, it is essentially monocropping except for a few farmers. Some of the reasons why they do not adopt diversified farming are as follows: *lack of seeds/ seedlings, credit support to rice, corn, sugarcane only, they are habituated to monocropping and some farmers still do not own the lands they till.*

Some farmers have started planting trees. But they are exceptions. Reasons why farmers find difficulties in planting woody perennials include: Space occupied by woody perennials reduces the area for food crop production, presents conflict among farmers as to who owns the perimeter or farm boundaries, farmers are pre-occupied in satisfying their immediate food and cash needs, and some are merely tenants.

Equally difficult to promote is the adoption of soil and water-conserving farming practices in the uplands. Farmers find it difficult to plow, plant and harvest crops across the contour. For alley cropping, they perceived that the space occupied by the alley crops considerably reduce the space for their food crops, it is laborious to periodically cut the alley crops as green manure. They find difficulties in establishing alleys, and they do not know how to use A-frame.

The reasons provided in not adopting ecologically sound agricultural practices from the farmers' view point are valid. Time is running short as soil erosion is proceeding at an alarming rate (2 cm top-soil lost every year (**Table 4**)). It was estimated that fertilizer application rate increased at 0.2-0.5 bags per ha per year for rice and corn, 0.5-1.0 bag per ha per year for sugarcane (1 bag = 50 kg fertilizer).

The interventions listed in **Table 3** to mitigate the reasons for not adopting a particular ecologically sound practice were grouped together and are presented in **Table 5**. The conduct of farmers' seminar, training and information campaign tops the needed intervention (15 times cited). This conforms to earlier findings results (**Table 6**). Credit assistance, cooperative, supportive policies had equal footing (6 times). Agrarian reform was least (2 times). This may be found contradictory to reports presented by other workers (Jacinto, 1996; Mendoza, 1992; Patayan, 1990; and, Enriquez, 1990). It should be pointed out that the farmers' seminars were all conducted in selected agrarian reform communities (ARC's). It should be expected that land tenure issues are minimal in these communities.

Issues and concerns about the interventions to upscale the adoption of ecologically sound agricultural practices

The conduct of farmers' seminar and workshops

Participants. It is the standard practice to assess the outcome of the just-ended seminar/workshops. On the positive side, participating farmers are showering seminar facilitators with praises and thanks. They are thankful for the seminar because their knowledge was broadened. They are happy to have learned a lot of information. These are the common statements. But the question remains 'Do they practice what they learned from the seminar?' Some do but the majority remains to fulfil what they promised during the seminar. As one farmer-participant quipped, 'hanggang seminar lang tayo!' (We are only after the seminar!). In one informal discussion, we learned that the officers and selected farmers of one cooperative underwent training on sloping agricultural land technologies (SALT). But none of them practice in their own farm what they learned from the training.

Seminar/Workshop Venue. Costs, attendance, participation, control of time and output are key pointers in deciding where to conduct the seminar. There are two contrasting venues: on-site and off-site. Off-site venue generally results in a larger percentage of attendance, often exceeding the target number of participants. Very good participation among participants is obtained easily. Control of time (except arrival of participants) was very satisfactory and the output expected from the participants were realized quickly. The disadvantage was the high cost involved (10 times more expensive than on-site). On the other hand, holding seminar/workshops on-site was less expensive but control of participants, punctuality and sustained attendance, participation in all activities were difficult to achieve.

In one farmers' seminar/workshop, we initially targeted 35 participants (5 per cluster times seven clusters). But only 26 showed up during the first day and only 15 participated in the presentation of the seminar output the following day. We had to comfort ourselves in saying 'We stand for *quality and not quantity!*'

Critical mass of farmers. In one village where the seminar was held, there are 804 farmers but only 142 are members of the cooperative. Of the 142 coop members, 35 participants were targeted. But only 26 showed up and 15 finished the seminar. This presents the issue of when to reach out to the other farmers. Is there such a thing as a critical mass of farmers to propel the rapid adoption of ecologically

sound agricultural practice in a village? There are about 4.5 million farmers in the Philippines dispersed in about 42,000 villages.

Farmer-influencing-fellow farmers. The assumption in the seminar/workshop is that trained farmers will soon influence their neighboring farmers and so on. The rate can proceed exponentially. As it appears, this has not been the case. Many points were raised: Farmers are only after the training, other farmers simply wait for the efforts of their fellow farmers, farmers are not that influential, 'You cannot be a prophet in your own place!' In a way, this is questioning the farmer-to-farmer mode of extension. This methodology may still apply for farmers outside the village but not within the village. The role of farmers within a village is valid to impress that the idea is not alien to them. There are village examples.

Credit assistance

On a purely objective account, present credit assistance to farmers simply promote unecological agricultural practices. Loan package promotes monocropping and heavy use of fertilizer. A case in point is the credit programme designed to grow corn in the uplands. Corn is a sun-loving crop. Hence, farmers are not planting trees. Corn requires tilling the soil to be established. This promotes soil erosion. With soil erosion proceeding at a very high rate, fertilizer application also increases but yields are decreasing. This rendered the farmers unable to pay their loan. If only to get another loan, their previous loan were rolled back, thus doubling their loans. Farmers are into perpetual indebtedness.

But well-meant and intelligent farmers want credit assistance to be modified to truly help their fellow farmers. Credit assistance schemes could be devised to support ecologically sound agriculture practices:

- Credit must be extended on the basis of a prepared Farm Plan and budget. (Training output is the farm plan and budget). Trained farmers should help their fellow farmers to prepare Farm Plan. Some farmers do not attend seminars as they are illiterate;
- Credit should not only be extended to promote monocropping and high external-input agriculture;
- Credit assistance must be employed to promote better and improved crop husbandry practices – adequate land preparation, optimum spacing and time of planting, adequate weeding, etc;
- Credit should be designed to promote low external-input agriculture. Farmers should pursue practical/applicable nutrient cycling programme and ecological pest management practices as part of loan agreement;
- In the uplands, credit for corn production will be extended only if the farmers adopt alley cropping and other soil conservation-oriented farming practices (contour plowing, mulching, integration of woody perennials – fruit trees, nitrogen fixing trees, fuelwood/lumber trees). Hence, credit must not only be extended to corn production.

Farmers' cooperative and community organizations

The most prevalent thinking is that farmers are organized into cooperatives as a conduit of credit (both for GO and NGO Credit programme). Hence, organizing farmers was achieved with relative ease. The flow of credit assistance to farmers was facilitated. For many reasons, repayment rate is despairingly low. Alongside, is the proportional decline in the active participation of coop-members in their cooperative.

An orientational shift in terms of the dominant coop-norms and also on community organizing appear to be necessary. For small scale farmers, cooperativism will never be irrelevant. But cooperatives and the ensuing organizing strategies done by local CO or the NGO-CO worker should be oriented towards the adoption of ecologically sound agricultural practices. The coop management must be prepared to assume an holistic role to adequately address the *production to post-production* aspects and requirements of the agricultural system (Figure 2). The void space left by the landowner as in the conditions obtaining among agrarian reform communities should now be assumed by the coop management. It has been a contentious issue that farmers are unable to pay back their loans for ecological reasons. Following this line of contention, the farmers' cooperative should serve as the dynamic force in promoting ecologically sound agricultural practices to regain the economic viability of farming. Some suggestions are as follows:

- The cooperative can engage in bulk buying of animal manure in nearby farms. Arrangements/negotiations could be made ahead of time among poultry owners/cattle raisers for the bulk purchase of manure. Because of scale, then they could be competitive in terms of price and frequency of collection;
- The cooperative can also facilitate bulk buying of seeds for different crop species to support diversified farming. Current coop initiative on rice seed selection, multiplication and distribution among farmers (members and non-members) is an effort in the right direction. But this should be extended to other crops;
- The cooperative can also promote livestock production. Some of the activities to support coop-members in raising livestock include:
 - Maintenance of hog breeding stocks (sow + boar) to produce weanlings for dispersal to members. Boar can be used for upgrading purposes to minimize inbreeding;
 - Coop could initiate feed mixing instead of buying readily mixed feed. This would serve as internal marketing for their own corn. It was estimated that at P6/kg farm gate price of corn, feeding it to hog fatteners provides P3.0/kg value added. Excluding farmers' labour, the gross price for corn becomes P9/kg if directly fed to hogs plus the on-farm production of manure for farmers' use.

- Coop credit scheme should be revised to directly promote/support diversified farming. Instead of single commodity financing, it should lend itself to multi-commodity financing;
- Accordingly, the coop management should anticipate the marketing (or post-harvest) assistance/requirements of multi-commodity farming system. Marketing strategies should be devised to benefit the farmers and the consumers as well (Farmers' Coop to Consumers' Coop Marketing scheme?). Improvement in communication facilities (two-way radio, cell phone, Internet and electronic mail) can pave the way for efficient and timely delivery of market-related information.

Policy support (legislative and executive)

There are a number of policies which are antagonistic, non-supportive, or directly prohibitive to the promotion of ecologically sound agricultural practices. (It is not the intention to list and characterize them here). However, there is much elbow room to 'put the house in order' at the local level due to the local autonomy code.

1. A barangay/municipal ordinance could be enacted prohibiting the following:
 - Burning of crop residues;
 - Dumping/allowing hog manure to flow directly to rivers and streams.

The municipal agricultural officer (MAO) is now directly under the supervision of the town mayor for monitoring and supervision of these ordinances.

2. Barangay/municipal ordinance that will legalize the implementation of Zero Waste Management. Bio-degradable waste can be composted to serve as cheap biofertilizer for farmers.
3. Barangay/municipal ordinance regarding loose animals (dogs, goats, hogs, cattle, carabao). In one village, farmers cannot plant mangoes in their farm because of the practice of open grazing (goats, cattle, carabao) after harvesting rainfed rice.
4. Low enforcement – strict enforcement of animal/plant quarantine laws. Review/revise these laws to attune them to present situations.

Agrarian reform

Certain land tenure security (Jacinto, 1996) is necessary to achieve ecologically sustainable agriculture. On the other hand, land tenure alone does not assure the adoption of ecologically sound agriculture. This is revealed by the many agrarian reform beneficiaries (ARB) all over the Philippines. After receiving their certificate of land ownership agreement (CLOA), soil fertility restoration and/or soil and water conserving practices remain to be adopted.

To argue therefore, that agrarian reform is a necessary intervention to convince farmers to adopt ecologically sound farming practices does not match the existing realities. But this is not to diminish its importance. It is imperative therefore, to analyze the conceptual framework of agrarian reform implementation in the country.

In equation form, the current agrarian reform program is described as:

$$AR = (LTI + SSD) \times SIBS$$

where:

AR = Agrarian Reform

LTI = Land Tenure Improvement

SSD = Support Service Delivery

SIBS = Social Infrastructure Building and Strengthening

There is much change needed. Ownership change is a requirement (LTI). Providing support service like roads, post harvest facilities (SSD) is necessary. Organizing farmers into cooperative (SIBS) needs no further emphasis. But farmers can not pursue the same monocropping system and high external-input agriculture as the previous landowner. As earlier mentioned, the ecological soundness of agriculture is basic, hence, production systems reform (PSR) is fundamental. The agrarian reform equation should thus be rewritten as:

$$AR = (LTI + SSD) \times SIBS + PSR$$

The missing element (PSR) in the current implementation of agrarian reform is what practically happens in the field. Hence, the realization is to deliberately incorporate PSR into the framework equation of AR. PSR, in fact, is the most difficult battle to win compared with LTI. In the end, agrarian reform becomes merely as:

$$AR = PSR$$

There are still significant LTI issues as core feature of AR. The situation becomes a 'chicken and egg' case. But the suggestion is for the tenants to proceed to PSR to strengthen their 'claim-taking edge' of the lands they till. But such a push should be carefully planned and farmers should be made aware about the risks and benefits (Jacinto, 1996; Patayan, 1990).

Farmers' action

Individually or collectively, farmers remain to be the singular determinant to realize the goal of widespread adoption of ecologically sound agricultural practices. They can find more than a hundred reasons for not diversifying their farms, for burning rice straws/corn stover or sugarcane trash and for not being able to do green manuring. But only *one reason* is necessary so they could adopt ecologically agricultural practices in their farm. From thereon, they will find more reasons for doing it than *not doing*.

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Tables

SITUATION Ecologically Unsound Practices ¹	MEASURE Adopt Ecologically Sound Practices
Burning of Crop/weed residues	Stop burning crop/weed residues* Incorporate crop/weed residues or pile them in one corner of the fields*
Heavy use of Chemicals: <ul style="list-style-type: none"> – FERTILIZER 6-10 bags for rice, corn (4 month crop) 18-24 bags for sugarcane (12 month crop) – HERBICIDES – INSECTICIDES 	Use of animal manures (poultry manure, carabao/cattle dung)* Practice green manuring* Practice of crop rotations** Plant nitrogen fixing trees* Adequate and timely Land Preparation Optimum crop row spacing** Proper water management* (i.e. rice) Timely inter-row cultivation* Plants resistant varieties** (i.e. rice, corn) Improve crop husbandry** practices – timing of planting, optimum spacing, balances fertilization, reduce chemical fertilizer and increase the use of organic fertilizer.
Widespread use of HYV Seeds	Breed/select varieties for organic agriculture**
Mono-cropping	Multiple Cropping (annuals and perennials)* Integrated Crop and Livestock*: <ul style="list-style-type: none"> – Crops (main crop – rice, corn, sugarcane) – Livestock: cattle, Carabao, Hogs, Broiler Integrating woody perennials** for fuel-wood, windbreak, construction materials
Soil erosive farming practices in the uplands: <ul style="list-style-type: none"> – plowing along the contour/orienting rows along the contour – burning of crop/weed residues 	Adopt soil and water conserving farming practices Plow across the contour line* Practice alley cropping* Plant diverse crops that provide permanent cover** Use crop/weed residues as mulch/control for soil erosion by placing them along the established alley**

Notes: ¹ The ecologically unsound practices were identified by farmers during the series of farmers seminar/workshop. * Measure suggested by the farmers (9). ** Measures suggested by the lecturer/resource person (9).

Table 2: Summarised lists of ecologically unsound (situation) and ecologically sound (measures) farming practices.

MEASURE	Reason(s) for not doing the identified Measure	INTERVENTION
Soil incorporation of crops/weeds residues	Want to clear the land fast to establish new crop*	Use of Heavy Duty Tractor
	Crop residues are obstruction to tillage operation (plowing, harrowing)*	Crop residues manually or use disc harrows
	Hampers growth of newly transplanted crops/yellowing of seedlings*	Allow 304 weeks lead time for decomposition
	Laborious to spread or pile crop residues in one corner of the field*	plow under by using heavy duty tractor
	Intentionally burnt by other people*	
	In-adequate manpower to spread/pile crop residues. Harvesting is the priority**	Use heavy duty tractor to plow under crop residues
	Farmers are not aware of the value (monetary, environmental) of crop residues**	Conduct Farmers' Seminar

Table 3: Reasons of farmers for not doing the identified measure (Table 2) and the necessary intervention to promote their adoption.

MEASURE (Cont.)	Reason(s) for not doing the identified Measure (cont.)	INTERVENTION (Cont.)
Use of Animal Manure	No adequate supply of manure on farm*	Bulk purchase of animal manure (poultry manure) through the farmers' coop.
	Manure is 'dirty', gives off foul odour*	Use gloves/masks when applying manure
	Very bulky, difficult to apply* Not available on-farm when needed* Does not own carabao nor cattle*	Make arrangement to poultry owners to give local farmers priority in buying their manure
Practice Green Manuring (i.e. mungbean, Azolia)	Not the culture of farmers to seed and plow legumes especially at blooming stage. For them, it is a wasteful practice**	Plant multipurpose tree legumes on the farm perimeter/headlands
	Not suitable to their farm, no irrigation, low soil phosphorous**	Plant adapted legume
Practice Crop Rotation (rice-rice or corn-corn)	Rice Areas: No credit is extended for non-rice crop* Corn Areas: Credit is only extended for corn*	Devise credit scheme for diverse cropping
	Not immediately suitable for other crops**	Re-landscape the farm
	Risks in planting other crops/no crop insurance or other crops planted outside the program**	Address the post-production requirements of other crops
Adequate and timely land preparation. Timely inter-row cultivation	Does not personally own carabao plus tillage implements*	Devise credit so farmers can buy their own carabao Farmers Seminar WUE
Proper Water Management	Does not own irrigation pump**	Install supplemental irrigation facilities
	Relies on the water distribution schedules of National Irrigation Administration**	Devise credit scheme for shallow tube well pump irrigation
Optimum row spacing	Farmers believe that theirs is optimum**	Conduct on-farm trial to demonstrate optimum spacing
	High planting density gives high yield*	Explain the concept in a farmers seminar
Plant Resistant Varieties	No seeds available on farm*	Involve farmers/co-operative in seed production
	Prefer current variety due to high eating quality	Establish seed testing centres in many possible areas Implement participatory breeding

Table 3: Reasons of farmers for not doing the identified measure (Table 2) and the necessary intervention to promote their adoption.

MEASURE (Cont.)	Reason(s) for not doing the identified Measure (cont.)	INTERVENTION (Cont.)
Improve crop husbandry practices: <ul style="list-style-type: none"> – Timing of planting – Adequate land preparation – Ecological pest management 	Lack of draft animals**	Credit Assistance
	In-adequate information**	Farmers Seminar
	Literacy problems**	Literacy Program
Adopt diversified farming <ul style="list-style-type: none"> – Multiple cropping – Integrated Crop and Livestock production 	Lack of seeds/seedlings*	Support on-farm seed/seedling production
	Habitual to mono-cropping**	
	Government financial support to food security crop (i.e. rice, corn)**	Establish long term credit for diverse cropping Conduct farmers seminar
Planting of woody perennials	Do not own land	Agrarian Reform-Land Tenure Improvement (LTI)
	Space occupied by woody perennials reduces the space for food crop production**	Needs information drive – Benefit/Cost Analysis
	Perimeter planting needs mutual consent between two farmers**	Form conflict resolution team
	Farmers are pre-occupied in satisfying immediate food/cash needs	Needs information drive
Adopt Soil and Water Conservation practices: <ul style="list-style-type: none"> – alley cropping – contour plowing – planting of diverse crops – use crop/weed residues as mulch 	They are mere 'tenants' – do not own land*	Implement agrarian reform- Land Tenure Improvement (LTI)
	Space occupied by the alleys reduce the space for food/crop production.	Devise incentives/credit scheme to promote soil and water conserving farming practices.
	Difficult to establish alley* (does not know how to use A-frame).	
	Labour intensive.*	Promote co-operation among farmers. Scheduling of activities. Employ 'bayanihan' Co-operation among farmers. Conduct farmers seminar.

Notes: * Reasons provided by the farmers (20). ** Reasons provided by the resource person/observer (17).

Table 3: Reasons of farmers for not doing the identified measure (Table 2) and the necessary intervention to promote their adoption.

1. Estimator:
 - 100cm top soil has been lost for the last 50 years.
 - 2cm top soil is lost yearly.
 - 2cm top soil 200 tons per ha.
2. Note: It takes about 100 years to form 2cm top soil. Value of top soil = P150/ton.
3. Value of top soil lost per ha = P150/ton x 200ton = P30,000/ha.
4. Soil Erosion and Corn Yield – Value of Soil lost less value of Corn harvest: P30,000 – P11,692,80 = P18,308.00.
5. Total cost of Corn Production
 - cash cost = P 7,425.
 - soil lost cash value = P 30,000.
 - total cost = P 37,425.
 - on site environment cost = 100 tons soil per ton of grain.

Note: \$1 – P26.5

Table 4: Soil Erosion Estimates in relation to Corn Yield at Macaangay, Buhi, Camarines Sur (Mendoza, 1996)

Nature of Intervention	Times it Occurred
Farmers' Seminar, Training, Information Campaign	15
Credit Assistance	6
Co-operative/Community Organising	6
Policy Support	6
Agrarian Reform (Land Tenure Improvement)	2
Farmers Immediate Action	2
Total	37

Table 5: Grouping of interventions and the number of times they occurred

Mode of Assistance	Times Cited
Training/education in organic farming technology.	8
Economic support/capital.	5
Demonstrations.	4
Encourage farmers to use organic fertiliser or use compost.	2
Provide organic fertiliser.	2
Agrarian reform – land to the tiller.	2
Do not dictate to the farmer what they are supposed to do.	1
Do not allow farmers to use chemical fertiliser.	1
Appropriate support services.	1
Value orientation.	1
Food for work.	1
Moral support.	1
Support legume crop production.	1
Laws prohibiting chemical fertiliser and pesticides.	1
Launch campaign so that farmers will not burn their crop residues, collect animal manure etc.	1
Facilities for the production of more compost.	1
Technology to produce high-quality compost.	1
Programme on animal production.	1
Encouragement to adopt diversified farming.	1
Deforestation.	1

Table 6: Assistance needed by the farmers to facilitate the restoration of actual soil fertility

Working Within the Framework of Aboriginal Culture: Indigenous Initiatives for Sustainable Development Through Landcare

Joe Morrison and Mike Carmody (Australia)

[Submitted Paper]

Introduction and background

The views expressed in this paper have been developed over many years working with and for Aboriginal people and communities in the Northern Territory. It is important to point out that although one of the authors is an Aboriginal man, the concepts and issues as described below are an attempt to highlight processes through contemporary eyes, and as such may not represent the information in a way that Aboriginal people would themselves use. Approaching problems or projects from very different world views is part and parcel of working within the framework of Aboriginal culture.

Landcare is a relatively new term which for the purposes of this paper is taken to mean activity aimed at protection, rehabilitation and sustainable utilisation of natural resources. As such it has capacity to incorporate traditional land management with contemporary "Western" land management practices to provide a unique blend of projects and activity for sustainable development into the future.

The capacity for the blending of the traditional and the contemporary has largely come about as a result of indigenous land rights in parts of Australia. Essentially landcare has followed land rights, which in one sense is obvious, as unless people have access and rights of ownership to their land, they are unable to exercise the level of management control necessary to achieve results.

Historically this has led to a growth in landcare activity within Land Councils and other Aboriginal and environmentally based non-government organisations that has followed shortly after Aboriginal people have had their traditional rights to land recognised through land rights. The first projects the authors are aware of began in the 1970's with the Pitjantjatjara Council staff and members in northern South Australia, parts of Western Australia and the south west of the Northern Territory. Soon afterwards Tangentyere Council and Central Land Council began to service areas around Alice Springs, followed by Julalikari Council in the Tennant Creek region, and on up to the Top End with Northern Land Council and Greening Australia NT. Simultaneously activity in the Pilbara and Goldfields regions of Western Australia began to emerge, as well as more locally-based services in the Gulf country in Queensland, Arnhem Land and the Katherine region. The most recent developments have been in the Kimberley region of northern Western Australia where pastoral leases or community land areas have been purchased rather than granted under formal land rights.

Figure 1 indicates this spread of landcare activity on Aboriginal land following the success of land rights. Area 1 – Pitjantjatjarra Council; area 2 – Tangentyere Council and Central Land Council; Area 3 – Julalikari Council; area 4 – Northern Land

Council and ALEP at Greening Australia; area 5 – Pilbara, Goldfields and Gulf country regions; area 6 – Kimberley region.

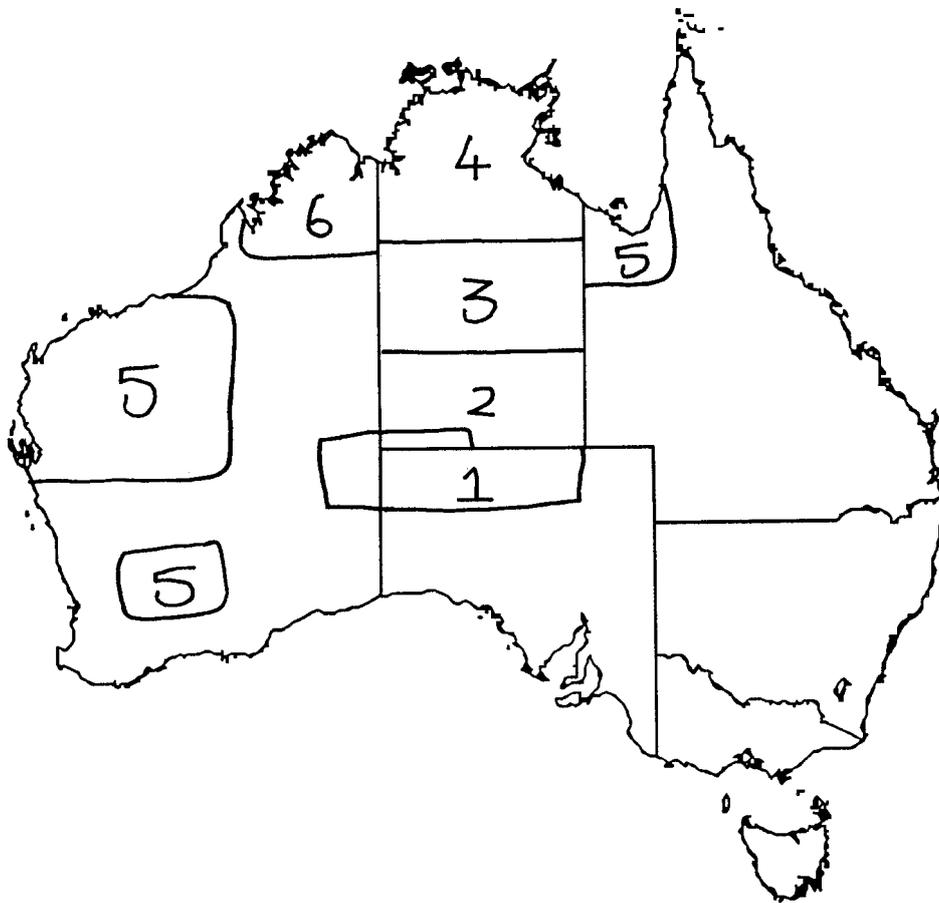


Figure 1: Spread of landcare activity on Aboriginal land

In general terms, the role of the Land Councils has been to support access to land through land rights claims, and then to help develop broad resource management strategies, and the other groups have focussed on practical community-based projects for environmental health and sustainable development through the creation of healthy living areas. As time passes the roles are becoming less distinct, and the groups are networking more strongly for common goals and outcomes.

Land, law and people – an unbroken triangle

Critical to the capacity to work effectively within the framework of Aboriginal culture, is a basic understanding of past and present world views of the cultural group. In this section a brief overview of Aboriginal reality is presented with the understanding that it is a non-Aboriginal conceptualisation of that reality, but never the less important to refer to. Unless practitioners work within this framework little progress can be made to support sustainable development processes. There is also an enormous diversity within Aboriginal groups as to how the world views are expressed and maintained.

Essentially the concept is that the land and its resources don't exist in isolation from the people. The two are intimately linked, where people are spiritually part

of the land, and the land is maintained and cared for by the people. It is not a world view that sees land as a saleable commodity for exploitation, but rather one where the land and the people are one and the same. The relationships between land and people are maintained through complex and all-encompassing system of traditional law, where certain people have rights and responsibilities to manage and maintain areas as part of the law, and transfer these rights and responsibilities intergenerationally through the law.

Thus land, law and people can be seen as parts of an unbroken triangle, where all elements must be in place together for integrity of the system, and this holistic mix is the reality throughout time.

Although through the colonising process in Australia over the last hundreds of years much damage has been done to Aboriginal culture, land and people, it is important to reinforce that today, even where people are living in urban situations the land, law and people are still intimately linked through a weakened but unbroken triangle.

A basic understanding and respect for the concepts presented above leads anyone working within the cultural framework to a point of being able to undertake research, project development or other landcare work through the proper channels. For example a local community government council may appear to have authority to make decisions about land within a community, but the Aboriginal reality still insists it is the traditional owners through the law that really have decision making power. The two may in fact coincide, but often council structures are set up independently from traditional decision making arrangements, and for projects to work they have to respect the law of the people adequately.

As such, even today, there is a traditional management system which is facing new and contemporary land management problems, and unless the two-way flow of ideas and information forms the basis of negotiation little progress at solving problems can be expected.

Of particular interest here is the assumption that many non-Aboriginal people make that the overriding ethic for Aboriginal people is one of conservation. The reality is that hunter-gatherer societies have always been based on resource utilisation and exploitation that is sustainable. The point, really, is that to be effective as a practitioner of landcare within the Aboriginal cultural framework, you have to get close to the local cultural reality which may not be any thing like a non-Aboriginal person may assume it to be.

Key land management issues in northern Aboriginal development

There is a huge diversity of local issues based on the history of land use, the geographic and climatic factors of the region, level of economic or social and cultural activity, pressure from external groups for access to and use of resources and so on. However the key issues still tend to be grouped around those based on environmental health and community development within the relatively recent sedentary dwelling patterns of small townships, and the sustainable management of surrounding rangelands, waterways and seas. Most of Northern Australia is not suitable for farming as such, which is why rangeland management is far more significant.

Community and township issues

As communities and towns have developed on Aboriginal land, a large range of issues related to landcare and land management and planning have arisen. From an environmental health perspective, (and health is a major issue in Aboriginal communities with conditions often described as fourth world) the need to develop strategies for dust control, soil erosion control, shade, shelter, food supply, recreation areas development, local economic activity such as market gardening and so on has emerged. In this arena the concepts within permaculture have a lot to offer when linked to the local cultural setting. It is obvious that in order for communities to become sustainable long-term residential and commercial centres, much work is needed to address the health of the local environment, which has major implications for addressing the fundamental causes of ill health within the Aboriginal community.

Sustainable management of rangelands, waterways and seas

Aboriginal people in Northern Australia face enormous external pressure to come up with strategies for management of Aboriginal land that allow for multiple land uses such as mining, tourism, pastoralism, conservation and so on. Added to that is the need to satisfy all the economic, social and cultural needs of the people themselves. In the context of an Aboriginal reality based on the unbroken triangle of law, land and people this is a unique and difficult task for the people to work through. It is also a process that is very recent in terms of land rights and access, and as such has a long way to go to achieve the desired results for Aboriginal people.

In particular, the regaining of land by Aboriginal people has usually been after a period of ownership and land use by non-Aboriginal people. Much of this non-Aboriginal land use has been exploitative and unsustainable or unmanaged to the point where land degradation is now a major issue. Prevention and rehabilitation of areas experiencing rapid and large scale soil erosion, the control of feral animals and weeds often on a massive scale, management of fire regimes in changed ecosystems, the maintenance of biodiversity and protection of species from extinction, and the rehabilitation and care of waterways and seas are probably the biggest of the issues that affect most Aboriginal groups in Northern Australia. The point is that Aboriginal people are now being asked to fix this degradation, which they generally did not cause, out of limited current resources, and many of the potential solutions have little or no cultural history for them to draw on. They are contemporary problems requiring contemporary solutions that must fit a cultural framework nevertheless.

A model for planning and developing integrated landcare strategies with Aboriginal communities

This model first came to the attention of the authors through discussions with Mike Last and other staff at Pitjantjatjara Council in the early 1980's. Mike had developed the concept during his work in northern South Australia in the 1970's. It is a model that has proved to be applicable in virtually every situation the authors have had to deal with in terms of planning and developing strategies for the last 15 years.

Essentially the model defines 'areas of activity' that can be readily identified and linked to ownership relationships, which then allows development of plans and strategies to deal with local issues in each of the areas of activities.

Area 1

Area 1 is defined as individual households. This is sometimes referred to as 'one camp fire'. In area 1, the people living in the household and its immediate environs are responsible for the management of that area, usually as tenants in community-owned housing. Strategies for tree planting for shade and fruit, ground cover plantings to avoid erosion from wind and water, privacy or aesthetic landscaping and so on are easily identified and integrated with construction, refurbishment and other infrastructure programs related to housing. Construction and maintenance of land-care works is usually the family responsibility.

Area 2

Area 2 is defined as the common or community-based area of activity within a township, community or outstation. This is sometimes referred to as 'many camp fires'. It is limited to the town or community boundary and includes all roads, schools, stores, recreational areas, vacant land and so on. In these areas no single person has responsibility for the planning and development, rather the whole community is responsible. The exceptions are where communities have grown up around areas where specific traditional ownership relationships for sacred sites, etc. are paramount, and the senior traditional owners maintain authority despite other community development structures. In Area 2 projects for soil erosion prevention and repair, tree planting, commercial gardening, landscaping, waste disposal etc. are common. They tend to be bigger projects than in Area 1, and often involve employment of individuals on community projects. Any landcare projects can be linked or integrated with other community strategies such as health, housing, employment and training, enterprise or economic development, and traditional or cultural strategies and events. The planning, consultation and negotiation, and project development requirements are more complex than for Area 1.

Area 3

Area 3 is defined as all areas of activity surrounding the community but external to the normal community boundary. Area 3 can be extensive rangelands involving cattle grazing, mining, tourism, traditional management and ceremonial sites, river systems and so on. There are often major roads, water and electricity supplies and infrastructures to be considered. Area 3 tends to be the responsibility of the traditional land-owning family, group or clan, and may be split up for planning purposes into defined cultural groupings so that people are making decisions about land management that reflect cultural relationships to areas. This is the area where planning and developing strategies is very complex, dealing with multiple land use pressures, sustainable economic development, many external agencies, and larger resource requirements. Projects tend to be large scale, resource intensive, and involve greater linkages to government and non government agencies, and often bring diverse groups of Aboriginal people together in new regional groupings to deal with problems or issues.

In summary, the areas of activity model allows for the full range of landcare and development issues to be included, whether they be traditional or contemporary in nature, in any planning and strategy development. It allows for detailed integration with any other community or economic development strategy as part of a broader process, and readily leads to local prioritisation of projects in each area of activity. Although simple in concept, it is a very powerful tool when working within the framework of Aboriginal culture, and has successfully been applied across a huge range of very diverse situations. We have yet to come across one Aboriginal group who has not been able to readily understand and work within the concept of the model. It also ensures that new non-Aboriginal participants are working properly with the right people on any projects, and can get a better handle on what is expected of them.

The Aboriginal landcare education program

A good example of the types of landcare services and projects that have developed over recent years is the Aboriginal Landcare Education Program (ALEP), which extends over Aboriginal communities in the 'Top End' of the Northern Territory. The program is jointly run by Greening Australia NT, a non government environment organisation, and the Northern Land Council, the peak Aboriginal body in the region. Funding for the program comes from Federal Government programs under the National Landcare Program and through the Australian Nature Conservation Agency, and other minor sources. It has its main base located in Darwin, but staff spend extended periods out in remote Aboriginal communities.

Figure 2 shows the extent of the program's influence, achieved in just over 2 years of operation.

ALEP employs a program coordinator and two Aboriginal landcare education officers, one of whom is Joe Morrison, co-author of this paper. Essentially, the program has four main elements which contribute to the process of sustainable development through landcare. They are:

- *Project development* – After initial consultations with a community, and by working through the areas of activity model described above, a number of projects are usually identified for priority development. The ALEP team provides support and professional advice for detailed development of individual projects within communities, often linked to other employment, health, recreation or similar strategies. Examples of projects to date include tree planting for shade, shelter, bush food and medicine, a major attempt to control woody weeds and feral pigs through a system of lagoons along the Roper River system, direct seeding of areas with native trees, shrubs and grasses for erosion control, and many similar activities. The ALEP team gets involved in all stages of project development and implementation, at a level that is needed by the particular community. For example, a community that already is involved in substantial tree planting may only need minimal support at the start-up stage, whereas another may need close contact and advice for several months in order to implement a project that is a relatively new concept to the people.
- *Education and training* – A significant activity for ALEP is the organisation of and delivery of appropriate education and training for community members to

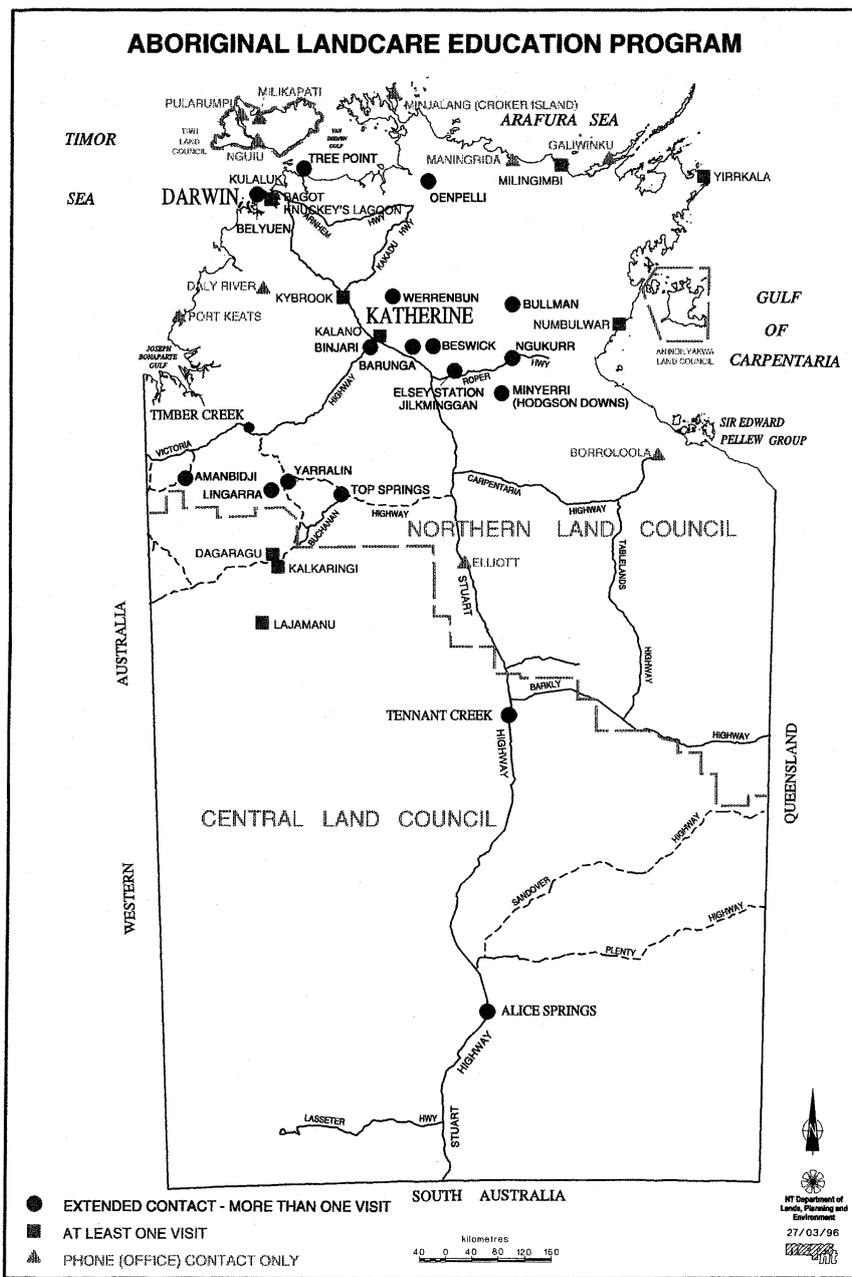


Figure 2: Extent of the program's influence

become competent in often very new skills (for example seed harvesting and propagation). ALEP is involved in the development and sometimes delivery of new courses within institutions that will meet the needs of client community members, and runs practical workshops in many communities around specific issues such as planning, irrigation design and installation, nursery practice, direct seeding, and so on. The education component also involves increasing people's awareness of the importance of issues related to landcare, environmental health etc., through the supply of information in a format that Aboriginal people can use. Often numeracy and literacy in English are not strong skills in communities, and visual aids, videos and so on are needed to pass on information in a useable form. The education and training role is very

important when communities are needing to develop skills and capacities that relate to long term development needs.

- *Planning* – ALEP assists communities with planning at a number of levels including whole community strategies for sustainable development through to small scale planting plans for individual projects. Again, for the development planning process the areas of activity model is utilised. Often the planning support needed relates to accessing funding for materials or labour or training etc., or the scope for integration of several community development strategies into one project. There is also an away-from-community planning role in letting other agencies know of proposed projects in order to have input at different stages, whether through direct involvement or indirectly by preparing education and training materials for ALEP use, for example.
- *Linkages and networks* – A key role of ALEP is to provide a linkage between Aboriginal people, often in geographically remote locations, and government or other agencies or sources of information. These linkages can be as simple as connecting a community to an education institution like the Northern Territory University so that people can access training courses, or as complex as bringing several agencies together to work on a particular community development project. In particular it is a two-way linkage process, as often non-Aboriginal agencies need briefing on traditional or cultural knowledge in order to understand how they can have meaningful input, as well as Aboriginal people needing access to 'Western' scientific or technical input. The linkage role is often described as the oil or lubricant needed for the machinery of development projects to work, and can not be underestimated in importance.

In order to undertake these roles effectively, ALEP staff often have to travel vast distances in four wheel drive vehicles just to get to a community. Camping out is essential as accommodation is scarce, and communications technology is often unavailable. The team also run plant nurseries in Darwin and some smaller regional centres to propagate and make available suitable native trees and shrubs for use in landcare projects.

To sum up, ALEP is a practical service which offers holistic support to communities to develop sustainable development strategies through landcare that achieve real results and outcomes for the communities involved.

Future directions

The future of all the Aboriginal landcare and sustainable development initiatives relies heavily on continued support financially from all sources. Programs like ALEP are continually having to fight for annual funding just to be able to survive, let alone expand to meet the increasing demand, and Aboriginal communities face a continuous struggle for economic development and independence sufficient to resource all the community development needs.

Having said that, it is likely that the process will continue in various shapes and forms. There is an ever-expanding network of Aboriginal resource groups providing landcare support services to Aboriginal community groups across Northern Australia, and probably elsewhere as well. Groups with practical functions like those

described for ALEP are building on their strengths, particularly by involving Aboriginal staff, and will adapt to any new challenges as they arise. The land councils are becoming more involved in regional resource management strategies that look more at the 'big picture', and are providing leadership and coordination that enable strong linkages to the ALEP type agencies.

Economic development through sustainable land use management, and the development of local and regional strategies to deliver that development is fundamental to progress for Aboriginal people and will remain a priority just as housing, health, education, social justice and cultural survival will.

What was once an activity based around a few dedicated individuals, has grown into a major industry that engages many Aboriginal people across vast areas of the continent. We believe that further growth and expansion of the programs is inevitable, as awareness of the importance of this work is raised within Aboriginal societies and also by the wider society and its bureaucracies.

Mike Carmody has worked extensively with Aboriginal communities and organisations throughout Central and Northern Australia for nearly 15 years. He established, developed and managed the Tangentyere Council Landcare Program, the joint Greening of Australia NT and Northern Land Council Aboriginal Landcare Education Program, and was instrumental in the establishment of the Northern Land Council's Caring for Country strategy. Mike is currently the Darwin Regional Manager for the Federal Department of Employment, Education, Training and Youth Affairs.

Joe Morrison is an Aboriginal man from Katherine in the Northern Territory. He jointly helped Mike establish the Aboriginal Landcare Education Program within Greening Australia NT, and continues as the senior Aboriginal Land Education Officer in that program across "Top End" Aboriginal communities of the Northern Territory. Joe is also a tertiary student, studying land management externally part-time through Orange Agricultural College as part of a Sydney University program.

Permaculture in Cambodia

Rosemary Morrow and Rob Allsop (Australia)

[Presentation Report]

Rosemary Morrow gave an overview of the situation in Cambodia in regards to living standards and the after-effects of war on the people.

The average family has between five and ten children while it is not unknown for a woman to bear up to twenty children. There is no contraception in Cambodia. Around 35 percent of households have no adult male because of the war.

Rob Allsop is a member of the Jesuit Refugee Service and has spent two years in Cambodia. On his arrival, he discovered he had an affinity with the people. He was posted to a vocational training school which was an education centre and home for eighty men who had been injured by land mines. Most were amputees with the loss of one leg below the knee being the most common injury. These men were still quite capable of working though they needed training to be able to function with their injuries. Most wanted to learn carpentry, electrical work or welding and the like but back in their home village, their skills in these trades may not have been of much use since most have no power, no equipment or tools.

Though these skills were still taught to the men, Rob also added classes in permaculture. There was plenty of land around the school and especially behind the men's dormitory huts. Because Cambodia has only two seasons, hot-wet and hot-dry, the decision was made that the future gardens were to be created around a system of connected canals.

There were many reasons for this. Firstly, the monsoon rains flooded the land where the gardens were to go which would have defeated the purpose. Also, because there are no tools such as hoses, sprinklers or even wheelbarrows, it was also easier for the men to walk the few paces to the edge of the canals to collect water in buckets then hand water each plant in the dry season.

The canals were dug to three metres down so that they are unlikely to dry out in the six months when the rain does not fall. This also added about 30cm extra height to the spits of land which were about 15 metres wide. With the design of the canals, it was possible to isolate the gardens, which measure about 60m x 60m from the marauding farm animals by simply fencing off a few short metres of open ground facing the men's accommodation because the canals themselves act as a barrier.

Around the entire garden/canal network, the men planted fodder and nitrogen-fixing trees to act as a windbreak as well as supply the gardens with mulch and later, building materials. They were planted three rows thick on three sides.

The gardens themselves soon contained thirty different crops which gave the men and the locals a much more varied diet than they had ever had before. Lemon grass and taro stabilise the banks of the canals and native fish soon found the canals.

The density of planting and the easy availability of water also shortened the dry season considerably in regards to water availability for the plants.

The gardens are now open to visitors from other districts as a demonstration garden and the men at the school are returning to their own villages fully trained to pass on the knowledge of a self-sustaining permaculture system.

Innovative High Risk Perma Projects with Ethnic People in Viet Nam

Rosemary Morrow with Mr. Ha (Viet Nam)

[Submitted Paper]

Background

This three-part project was designed at a Project-writing workshop for selected VACVINA staff, sponsored by QSA and funded by AIDAB in May-June 1993. It was designed to assist some of the very poorest people in Viet Nam. One major reason for poverty in many places in the world is simply that of 'remoteness'.

When people are a long way from capital cities and large centres, and the roads are hard and dangerous, then health, education, food, housing and other resources seem to run out.

In the case of ethnic people in Viet Nam, life is particularly hard. Forests which were traditionally sources of food security have been destroyed by the cities' needs for timber. Ethnic people also suffered dreadfully during the long wars because, often, each side saw them as collaborators. Today, many lack access to knowledge as simple as literacy, family planning and gardening for food, and to resources as basic as dental services, midwives and polio vaccine. Sometimes they are regarded as being of low status by other peoples and by Government officials.

UNICEF has evaluated VACVINA and made two main criticisms. The first is that they were not reaching the most impoverished people in remote areas (who are often, but not always, ethnic minorities), and secondly, that their teaching and training was of uncertain quality.

This project was designed to assist with the two above areas whilst simultaneously substantially assisting ethnic people to have a better quality of life, which means, primarily, some security of food supply, less physical hardship, better health, possibility of generating income, and, indirectly, to confirm their importance as ethnic groups with something to offer.

Three ethnic groups were nominated: the H'Mong from the high mountains of Hoa Binh whose opium fields had recently been destroyed; the Muong, who are the original indigenous people of Viet Nam and who have suffered terribly in the French war and the American War of Invasion; and the Nung/Tay people up in the mountains on the border of Viet Nam and China.

In 1992 the Dao ethnic project had already been funded by QSA for a VAC Ha Noi Project. There are many Dao people in Viet Nam, however this group of 1024 people was somehow isolated on Bavi mountain. They had earlier come to VACVINA to ask how they could make gardens, since the government had resettled the lower slopes of the mountain, and it was difficult to establish themselves. This was my fourth visit and they had now completed their first training courses and started their gardens.

On this occasion, I visited all of the four ethnic groups, and it is important to see the Dao as part of the project, although not under the same budget. They provide an important starting point for ethnic VAC projects.

The Dao project, once begun, showed some striking changes in people's ability and status. The Dao have changed from being fairly taciturn and lacking in knowledge and confidence to people who are talkative, participatory and positive.

There seem to be a few steps on the road to confidence. When a food and self-sufficiency project is introduced, the people are usually silent and passive. On the next visit, many people, after some training courses, are becoming hopeful, as measured by smiles and talking about their hopes to have enough food. The third stage is when they push aside the extension VACVINA officer and want to 'own' the project by doing all the talking to the project monitors, and by demonstrating their technical achievements and requesting small additions to the project where they feel there are gaps in their knowledge, and by saying what they will carry out in the future even with no further physical inputs.

Using this progress as a model of empowerment, this report discusses where each of the other three ethnic groups appears to be. For reasons of floods, droughts and rice harvests, most work has occurred first with the Muong people, then the Nung/Tay and finally the H'Mong.

The Muong people are very familiar with the project and highly motivated. They have completed their first training courses and are looking critically at their land to see what they can do with it. The Nung/Tay group show good knowledge of the project theory, and some people are very hopeful, especially the management team, but many participants seem not quite so confident. The H'Mong are still very silent, very depressed and are an inert sort of people – showing all the signs of disempowerment and poverty. However, they are willing to try and see if they can get 'independent.' They are also less willing at the moment for women to participate equally in the courses as the other ethnic groups have done.

In the Dao project, the whole 1024 people in 240 families participated in the project. This total participation was a fairly important factor in the success of the project. By this visit, they were very motivated, showed an increase in confidence and abilities, and were hopeful for their future. And, VACVINA was learning better techniques for working with ethnic peoples. For example:

1. A food bank which feeds people while permitting them to establish food gardens may be more important than per diems. Or supplying lunches during training courses more important than giving an allowance.
2. People never stick to the project numbers, so a class of, say 40 nominated people, quickly swells to about 80 or 100 people, with the additional people called 'listeners' sitting in the doorways, windows and aisles.
3. People want to learn in their own languages and these are often not written down, or if so, only a few are literate.
4. Materials need to be more visual, with posters and so on, developed to suit each group. Some of this has been done.

5. People want to teach others of their same ethnic group in different regions. So the Dao would like to teach other Dao in other Provinces, and so on for the Muong and H'Mong.
6. Courses need to extend beyond food gardens and orchards to animal health and useful forestry techniques, whether for larger areas of land or for the trees in garden fences.

Impact

In Lang Son, and in Hoa Binh Provinces, we met the Provincial People's Committees, and they all expressed interest in the projects. An interesting side effect (much like Amnesty International) is that once QSA focuses on a formerly neglected ethnic group, then the provincial and local Government authorities start to put in some resources.

For example, the Muong people reported that the People's Committee had provided paint for the Clinic: in the project proposal, this is to have a VAC garden around it. In Hoa Binh, Mr. Son, the Vice Chair of the Provincial People's Committee, and a VAC member and agriculturist reported that the central Viet Nam Government is watching the project with interest as a model for other ethnic groups.

It also appears that finally, some of the compensation to be paid to the H'Mong for loss of opium had got through and appeared as a few plum trees and a new school (also to get a garden under the VAC-QSA project).

No ethnic group was aware that it was the International Year for Ethnic People, even the Muong, who are the indigenous people of Viet Nam. They were very interested when we talked about it.

All the groups were concerned for their mountains and forests and wanted more help with these. The people I talked with appeared to favour 'food banks' which have an on-going impact of security for the whole community, more than food allowances.

There appear to be key people within each group. They seem to be the ones who decide about women's participation. With the Muong people, women are now well and truly prominent in the project. Among the Nung/Tay community, the women anticipate going to classes in quite large numbers, and among the H'Mong there were still doubts which I addressed in subsequent discussions with the H'Mong leader.

On our PCC (Project Co-ordinating Committee) visit we took the chief H'Mong man, Mr. Lu, to the meeting which was held in the Muong village, and then on to Ha Noi where he stayed with Mr. Ha. He was very pleased to talk to the Muong, and the surprise at Ha Noi was to find the Nung/Tay people had arrived to talk also. VACVINA had taken the initiative to bring people from the three parts of the project together. Well done, VACVINA!

The H'Mong project started its teaching programme late because people were fully taken up with the rice harvest, and this turned out to be fortuitous because more time was spent in making sure that the people really understood the project and its

objectives. The groundwork will pay off, I am sure, and will make the implementation more peaceful. For example, everyone I spoke to had a clear idea of criteria for families chosen to participate in training, or to be model farms, and they approved the selection criteria.

Mr. Ha of VACVINA is excellent in giving clear details about how the local Management Committees are to be organised, and discussed these points in detail and then wrote them down, for example:

- Map of the village to be drawn showing all demonstration centres/nursery and beneficiaries.
- List to be kept of selected families, of numbers, land design for each one, etc.
- Review of selection criteria for families.
- Discussion of the demonstration centres which are owned by VAC but with family contracts as to provide for the project afterwards with species, quality and quantity specified by VACVINA.
- Set out budget, receipts and bookkeeping procedures to be followed.

Summary

I feel these are fascinating projects and are very important for future work with ethnic peoples. Viet Nam appears to have a quite dated view of mixed cultures. It tends to favour assimilation and seems not to be aware of multi-culturalism. For example, it is a policy that all children are taught in the Vietnamese language from the first day of school, even if the teacher is an ethnic person and can speak their language.

Also, resettlement projects to 'protect' the land from further deforestation are rather harsh, with people being moved arbitrarily.

Recommendations

1. QSA-AIDAB assist with small funds for further short courses to consolidate the present project and experience.
2. QSA-AIDAB continue to accept Ethnic projects to consolidate the learning in this field of VACVINA, and of QSA, because the impact on turning around poverty and empowering people is so remarkable. In particular, those ethnic peoples who wish to teach others of their same ethnicity.
3. QSA-AIDAB assist with a general exchange of experiences among all the groups in about 18 months time.
4. VACVINA receive some specialist training in teaching adult ethnic groups and illiterate people (see TRAINING PROJECT 1993-4).
5. VACVINA teachers to have a special intensive course in modern forestry thinking, techniques and bush regeneration. For example, forestry as food security,

not just cubic metres of timber; techniques in reforestation according to succession principles, and Australian bush regeneration techniques.

Each project area is further reported separately in the supporting documents.

Permaculture in Zimbabwe

Simba Muzuwa, Rob Sacco, Brigid O'Connor (Zimbabwe)

[Presentation Report]

Fambidzanai Permaculture Centre – Brigid O'Connor

Fambidzanai (Fambidzanai means to reciprocate, to participate together) was working as a training centre through 1980's but by 1986 was looking for a new direction in training since the traditional approach to agriculture was failing. In 1987 Bill Molison ran a workshop in Botswana which was attended by members of Fambidzanai. It seemed like the right approach and in 1988 they ran their first permaculture course, having taken a year to develop an approach appropriate to the Zimbabwean conditions. Fambidzanai has a 40-acre plot 20 kilometres from Harare. It runs 30 courses a year and is incorporating other techniques. When asked to provide input, training, run extension courses for people interested elsewhere in the country, Fambidzanai decided it would be more appropriate for training to take place through groups already working in similar areas – eg organic farmers, natural pest control, reforestation groups etc. And so the Natural Farming Network was formed.

Natural Farming Network – Simba Muzuwa

This organization took over the responsibility for extension training after an exchange experience with Kenya in which twelve delegates were funded to visit the different organic farming organizations in Kenya, and a group of Kenyans visited similar groups in Zimbabwe. Five groups in Zimbabwe were involved in hosting and planning for the Kenyans' visit and it was out of these that the Natural Farming Network (NFN) was formed. Simba was asked to evaluate the effectiveness of the exchange in Kenya and some time later a similar evaluation of the Zimbabweans' visit to Kenya took place. From this exchange and evaluation process an umbrella organisation consisting of thirteen countries was formed. These are independent organisations which came together because they believed that it was crucial to the survival and promotion of permaculture and organic farming in general in Zimbabwe to network. The structure is important. NFN has a secretariat of twelve, plus a chair. Members own the organisation and make the policy. The two main activities of the organisation are the provision of information and training. NFN publishes pamphlets and books, such as the book *Production Without Destruction*.

PELUM: Participatory Ecological Land Use Management – Rob Sacco

In April 1991 the Botswana Permaculture (Society?) and ZIP (Zimbabwean Institute of Permaculture) met at Fambidzanai and decided there was a need to formalise and formulate permaculture training. The groups included Holistic Resource Management amongst others. John Wilson wanted to unify all these groups. A series of workshops were held subsequently with other East African countries. A syllabus was developed so that more trainers could be trained to become trainers themselves.

In 1995 PELUM was formed from nine member countries including Zimbabwe, Botswana, Kenya, Tanzania, Lesotho, South Africa, and Uganda. Country working groups were set up to organise training. PELUM is currently in the process of establishing country desks with coordinators working together with PELUM. PELUM has a mission statement and a constitution, and has established a pilot program: the PELUM College of Zimbabwe. It is hoped that this college will be replicated in East and Southern Africa. It is taking students at three levels.

1. Postgraduates who do a 2 year program.
2. O Level graduates who will eventually become trainers.
3. Farmer extensionists.

Accreditation is being negotiated with the University of Zimbabwe for postgraduate students, the Ministry of Education for the O Level students and internal accreditation for the farm extension workers.

There is no central organisation. Students are given some experience of how the different organisations work and get a perspective from the inside.

A Short Report on the Evolution of Permaculture in India (With Reference to Andhra Pradesh)

Koppula Narasanna (India)

[Submitted Paper]

“Man’s first and most unquestionable duty is to participate in the struggle with Nature, to support his own life and that of others ... to feed, clothe and take care of himself and those near to him, satisfies his physical needs, while to help others do the same satisfies his spiritual needs.”

Leo Tolstoy

“He is a wise man who grows two blades of grass where one was growing.”

Dr. Samuel Johnson

“We never can be, but by ourselves, undone.”

Savage

“The only ethical decision is to take responsibility for our own existence and that of our children. Make it now.”

Bill Mollison

Deccan Development Society (DDS), Hyderabad, AP, pioneered the introduction of permaculture in India. It organised the first one-day workshop on permaculture in India, at Hyderabad in December, 1986, which was conducted by Bill Mollison and assisted by Robyn Francis and Reny Slay. Twenty-five participants drawn from various organisations and governmental agencies attended it. This was indeed a historical event, for, the DDS announced its decision to invite Bill Mollison to conduct the first Permaculture Design Certificate Course – the full three-week course, some time in early 1987.

The first PDC course was organised by the DDS at the Central University of Hyderabad during July, 1987. Bill Mollison, assisted by Robyn Francis conducted it. Thirty participants from organisations all over India and Nepal attended it.

During the above course, the DDS announced its decision to establish a permaculture demonstration farm on its 3.25 acre property at Pasthanpur in its Project Area of Zaheerabad Taluq, District Medak, Andhra Pradesh, India. This lies in the semi-arid zone prone to droughts. Hence its relevance of applied permaculture to dryland farming, which is the dominant pattern in India.

The last three days of the workshops were spent on this bare piece of land with the hope of the participants that they will have a foot-hold for permaculture in the country.

After the certificate course, in the monsoon of 1987, the Permaculture Demonstration Farm at Psthapur was designed on permaculture principles and work on it commenced.

The strategy was to evolve it into a self-sufficient farm for a small family of five persons, to provide maximum food/fuel/fodder. More important was to demonstrate various FUNCTIONS pertaining to growing soil, harvesting rain water, arresting soil erosion, the role of trees, windbreaks, legume species and a POLYCULTURAL pattern of food crops and horticultural species.

It was borne in mind that replication of the farm was not possible on farmers' own lands. However, the demonstration of above functions fulfilling needs for Earth Care was the important role of the farm.

Over the years the Psthapur farm continues the above role for regeneration of degraded and eroded soils for evolution of farm lands for sustainable systems of production for 'subsistence farming' to ensure as much food security as possible.

After having succeeded in harvesting very good yields – comparable to and often better than conventional yields – of locally needed and traditional food crops, this farm has now been converted into a SEED FARM for the availability of needed seeds for extension of permaculture on to farmers' own lands in the region.

In November of 1989, a three day workshop on permaculture was conducted by Bill Mollison at Ghatkesar, near Hyderabad and was attended by more than thirty participants from all over, with visits to the Psthapur Farm.

The Permaculture Association of India was formally formed in November, 1989.

A National Conference on permaculture was held on the 15th to 19th November, 1990 at Hyderabad with Robyn Francis as the Chief Guest. More than sixty-five participants from all over the country attended.

The second PDC course was organised by the Centre for Education and Development (CED) of Bombay and held at Penukonda, Andhra Pradesh in 1990 and conducted by Robyn Francis and Venkat. More than forty-five participants attended, with a three-day stay on the Psthapur Farm.

In October, 1990, the first Indian edition of Bill's *Permaculture Designers' Manual* was brought out jointly by the DDS and Permaculture Association. It was funded by Misereor of Germany, Action for World Solidarity and some others. The run was of 2,000 copies. All the PD Certificate holders and graduates were supplied with a free copy. Many organisations were also provided complimentary copies and a large number was sold to various Government Agriculture Departments. It is out of print, now.

The Permaculture Association has been conducting short practice-oriented workshops (non-certificate) in Orissa, Kerala, Karnataka and in the Project Area of the DDS. It also has a wide correspondence network.

(An Important Note Here): It should be borne in mind that in Auroville, quite a few workshops and certificate courses have been held over the past few years. Permaculturists of Auroville have been undertaking permaculture projects on various farm lands in Tamil Nadu and elsewhere. There is a need to collect all this information and pool experiences and share resources.

Permaculture extension in Andhra Pradesh

The DDS runs many Balwadis (schools for non-school-going children of young age groups) and these children are provided a free, nutritious meal. Many of the Balwadis have endowed agricultural lands. On all these, basic soil/water conservation earth works have been completed, leguminous and horticultural species have been planted and are being cared for by some of the parents. The strategy for these lands is to produce food and fuel for the kitchens of the Balwadis.

There is a Green School in Machnoor Village in the project area, started and managed by the DDS. It has about seven acres of land on its campus, lying fallow, degraded and highly prone to erosion. This land has been designed on permaculture principles.

All the children and the staff are involved in the implementation of the design by practical participation and exposure to some aspects of permaculture. Highly efficient soil/water conservation works like trenches and bunds on contour, gully pluggings, diversion channels, and farm ponds have been completed and are functioning well. This land is getting greener and has already started providing some yields.

We have been struggling to evolve a regular permaculture curriculum as a regular subject for the students, but so far, not satisfactorily.

Another very significant extension occurred between January '93 and June '94. During this period, a micro-project for soil conservation and water harvesting was undertaken, funded by the WWF, Switzerland. A rough idea of the physical side of this project can be gauged by the following data:

- Total area of farm lands covered is 138.5 acres
- Number of villages covered is 12
- Total length of graded and contour bunds and trenches is 16,161 metres
- Total volumetric excavation is 11,590 cubic metres
- 1 large checkdam, 2 farm ponds, 14 gully pluggings, 1 diversion channel, etc., are completed
- All the bunds etc. have been consolidated by seeding and planting

During the execution of the above works, a workshop was held attended by 67 farmers, men and women, drawn from 27 villages. Topics discussed in this workshop were:

- Categories of water.
- Sheet erosion.

- Alarming lowering of the ground water table and the need to harvest all rain water into the soil itself.
- Land use and cropping patterns for subsistence farming to ensure greater food security.

The fall-out of this project has been:

- A qualitative and conscious designing of farmlands by micro-watersheds and creation of assets of natural resources like soil and water;
- Participation of a large number of local men and women farmers in the execution of earth works;
- Evolution of a local cadre of men/women trained in earth works and who are continuing the use of this skill on their own lands and at various other places, especially in regenerating wastelands under various projects.
- Very palpable and visual effects of soil regeneration on these lands in the first season itself.

Participation in local environmental issues: a need

“Provision for people to access those resources necessary to their existence” (Bill Mollison), is a fundamental ethic and approach of permaculture. Most of these resources form part of the immediate environment. And these resources are being denied to people and more often they are being used destructively, further degrading other resources.

One of the many local problems in Andhra Pradesh is the commercial cultivation of cotton with one of the highest consumption of chemicals and excessive ground-water utilisation. In the cotton growing districts, this has resulted in once-fertile lands being converted into deserts, inevitably, in its wake, ruining small farmers and forcing wealthier farmers to migrate to other areas either to purchase or take on lease, lands of small/marginal farmers to continue the ruinous cultivation of the cash crop. This is an issue in our area. An awareness campaign on this subject was conducted, and culminated in an upsurge whereby some local farmers have decided not to extend the lease of their lands.

This problem (as an example; there are many others) and the response of the farmers, is pregnant with rich potential and is now veering round on the crucial question of ethical land-use patterns for food production for subsistence, rather than cash cropping for the market. Since patiently working for food security at local levels is an urgent need, such opportunities have to be beneficially utilised.

Various issues like water resources, common property, polluting industries, village forests, etc., are getting aggravated with the globalisation of the market. Participation in all these will be necessary and we are getting prepared for this.

Thinking about the future and themes on which the permaculture association has to endeavor

1. Dryland farming is the dominant pattern. Nearly 60% of this is being done by small and marginal farmers, with very minimal or no resources of their own at their disposal except their own labour.

The task before us is to enable them to work out suitable and acceptable practices on their lands in conformity with their traditional and cultural needs, to ensure food security at the farm and local levels on a sustainable and permanent foundation.

2. To enable them to access needed resources, from wherever available, especially information resources, skills, seeds/plants, and fraternal linkages and bonds of solidarity for sharing and exchange.
3. To widen and broad-base permaculture resources in a non-structural framework.
4. To bring out simple, small publications in local languages on all aspects of building sustainable systems for food, energy, shelter, etc.
5. To undertake training at various levels and form 'small core groups' for extension and provide for them at least for three years.
6. To bear in mind to continue the practical work, at ground level, however small and localised it might be. (Suggestions are earnestly solicited)

Presented by the Permaculture Association of India and the Deccan Development Society (DDS) of Andhra Pradesh, India.

Permaculture in Palestine

Huda Odeh and Raafat Khufash (Palestine)

[Submitted Paper]

Before introducing the permaculture program in Palestine, it is necessary to introduce certain facts and figures on Palestine which resulted from more than 28 years of Israeli occupation, and which now justifies the permaculture program in Palestine.

The Palestinian society, currently with a population of 2,465,000 living on 6047 Km², underwent a number of changes which affected its socio-economic infrastructure, mainly due to Israeli practices since its occupation to the West Bank and Gaza in 1967:

- Land confiscation has been Israel's most destructive policy against the Palestinians' economy and social stability. Until now Israel had confiscated about 65% of the land of the West Bank and 40% of the Gaza Strip, including the most fertile areas of lands. Land confiscation was mainly for settlement construction and expansion, as well as other military and security reasons. Currently, there are 141,000 Israeli settlers living in 199 settlements in the West Bank, and 6,000 living in 24 settlements in the Gaza Strip, and about 150,000 living in 25 settlements in Jerusalem.
- Israel's land confiscation was coupled with water resources confiscation. Currently, the Israeli settlers consume 4 times the Palestinian's consumption. 20% of the Palestinian villages do not have drinking water or water networks, while almost each settlement has a swimming pool.
- Although agriculture was and still is the major contributor to the Palestinian economy, there was a significant decline in its contribution: from 36% in the 1970's to about 20% in the 1990's. This was mainly due to land and water confiscation which limited the expansion of agricultural land, uprooting of thousands of fruit-producing trees and immigration of the Palestinian farmers towards the Israeli labour market.
- About 120,000 Palestinians were registered officially as labourers in Israel before it started its closure policy since 1993. Currently only 15,000 to 17,000 workers are allowed to enter Israel provided that they have work permits. Israel was planning since 1990 to marginalise the Palestinian labourers by replacing them with foreign ones. Until now Israel has about 300,000 registered foreign workers mainly from Eastern Europe and Russia. Currently, the unemployment in the West Bank is about 35-40% and about 60% in the Gaza Strip. Due to this policy of closure, the Palestinian economy's loss is estimated at 6 million US\$ per day. According to World Bank estimates for 1995, 17% of the West Bank population and 32% of the Gaza population are living under the poverty line.

- The Palestinian farmer was organically treating his land and had a form of self-sufficiency prior to 1967. However, currently, Israel encouraged the Palestinian farmers to cultivate land with mono crops and extensively use chemical fertilisers. This was mainly to serve the gap in the Israeli market of certain agricultural products.
- Israel had put every effort to lead the Palestinians for a full reliance on its products. Currently, the Palestinian market is Israel's second major market. 88% of the Israeli goods are imported by the Palestinian market. External commercial exchange between the Palestinians and any other country is totally controlled by Israel which controls the borders, and imposes extremely complicated procedures for commercial exchange, travel and development of economy.

In addition to the above-mentioned factors which led to deforming the Palestinian economy, Israel had totally neglected the infrastructure and constantly violates basic human rights and international laws. Networks of water, electricity and roads are nonexistent in most of the Palestinian areas despite the high taxes which were regularly collected from the Palestinians. There has not been any development to the health, educational and social structures for the services of the Palestinian community. More than 100,000 Palestinians were imprisoned since 1987. House demolition and sealing is still continuing allegedly for security reasons. Israel denies the Palestinians family re-unification by imposing strict procedures on granting entry permits.

Due to the above mentioned factors, a debate occurred in the Palestinian community about the process and meaning of development. MA'AN Centre¹, dedicated to promoting social and economic development started its first permaculture development program in 1992, developing the Australian system for integrated agriculture into the community setting of the traditional Palestinian village agriculture.

This program is a Palestinian initiative to adapt the design approach to the particular traditions and current situation of the Palestinian people living in the West Bank and the Gaza Strip, creating a working example for the community to take what is appropriate depending on their resources.

Development of permaculture project in Palestine

The Marda Permaculture Centre opened in October 1993 in the village of Marda, 15KM south-West of Nablus in the West Bank. The opening followed a 12-month participatory development process involving all sectors of the community which led to the publication of the first permaculture report on the Occupied Palestinian Territories in July 1993.

¹ MA'AN Development Centre is a Palestinian non-profit community development institution which began work in 1989 and now provides a wide range of training and development services in the Occupied Territories.

Slide show on the project's evolution

- Our grandfathers' sustainable systems protected the land from erosion by terracing with lime stone rocks and planting olive trees . These have been there for hundreds of years and will continue for many generations to come.
- The Marda permaculture site began. We had stony poor land due to the effects of erosion factors ie the water flow and wind.
- In April 1994, the first permaculture design course (PDC) held in the Middle East was conducted at the Marda Centre producing qualified Palestinian permaculture trainers. The participants were taught how to study the nature and work with it rather than against it.
- We designed a house garden to utilise the house wastes (by products). We:
 - built a circle garden;
 - put porous clay pots in the ground for watering;
 - practiced companion planting;
 - planted a diversity of plants;
 - implemented grey water gardens;
 - made compost;
 - utilised elevation planning by using plants beside the wall which isolate the building from climate conditions;
 - built a nursery attached to the house which provides heat for the house in winter and coolness in summer (passive solar energy).
- We utilised our house space like the glass veranda and roofs as productive places and nurseries as an example for people who have no land.
- The land was terraced and planted with wind breaks for protection from wind and water erosion.
- We added compost and planted legumes in order to increase the fertility of the land organically rather than using chemicals.
- We utilised the edge effects of the stone walls which are rich in water and nutrient by planting trees near the walls which are more warm in winter and captured dew through the porous lime stone in Summer.
- We planted vegetables and grains between trees, as our agroforestry system.
- We built a hot house on the flat roof to be utilised as a productive area and as insulator in winter, consequently reducing the needs of heating inside the centre.
- We harvested the running winter spring water by installing:
 - a cement water tank and a plastic tank;
 - swales and, thus, increasing the water content of the soil.
- We reduced pollutants by:

- recycling tyres, using them for planting in stony areas and inclined edges, by filling them with soil and compost, and we also used them for land terracing;
- using organic residues from the village and the centre to make compost

- We cycled nutrients by harvesting wild nettles and other unused plants to make compost and mulch. We squeezed nettles to get their juice to be a fertiliser and insect repellent.

- Huge amounts of stones were available on site and used as mulch.

- The centre has been operating as a training and an extension centre of permaculture for farmers, women and engineers in the village and the area.

- We have been forming permaculture committees in the villages to work and extend permaculture through their communities.

The Nicaragua Project

Jerome Osentowski (USA)

[Presentation Report]

After years of Civil War, Nicaragua has been left with a legacy of dwindling rural resources and a lack of grassroots knowledge and finance at the village level. Nicaragua is still feeling the aftershocks of the war and internal feuding within the villages is still common.

Jerome Osentowski, Director of the Central Rocky Mountain Permaculture Institute (CRMPI), has been involved with a particular permaculture project in the small village of Teotecacinte which is within sight of the border with Honduras for the past five years. The demonstration farm Jerome, international volunteers and local villagers have now established in an integral part of the education process, source of education, seed supply and information for the local district and beyond.

The climate of the area is hot and humid most of the year and agricultural production is centred around cash crops for export rather than for feeding the population of approximately four million people, of which about forty percent still live in rural areas. Jerome, together with the sister city of Glenwood Springs in Colorado, first set up a garden at the local school in Teotecacinte. With the help of the children, manure, a resource which was plentiful and one that was not utilised, was brought to the donated land and the gardens were commenced.

The school children established the gardens with each class having their own plot which they established, seeded, weeded and finally harvested. The produce was often cooked in the school grounds. The aim of the course was to teach these youngsters self-sufficiency. These lessons they could not only take forward in life but also teach their parents and others around them on the way.

The second phase of the project, a demonstration farm, began in January 1995 and the goals achieved were green manures grown for seed production and trees.

Nicaraguan village kitchens burn wood and this is quickly becoming a scarce resource. The trees grown will supply fuel, fencing material, fodder, mulching material and have many other uses other than returning nitrogen to the soil after the trees are cut. The soils in the area are poor at best and need the addition of fertilisers before anything can be grown but farmers have no credit to buy either fertilisers or chemicals/pesticides so the permaculture approach has been welcomed by the village.

Chickens and pigs in villages take precedence over vegetable gardens so living fences have been established for protection. The demonstration farm itself has generated a lot of interest and participation from locals, especially now they can see the benefits flourishing around the farm.

Other goals achieved were: designing a more fuel efficient stove for village kitchens. The locals were fully involved in the designing and the logistics involved with actually shaping and making the special bricks used.

The school-farm connection is another project which brought high school children to the farm for hands-on learning in sustainable agriculture.

Composting workshops were organised for the locals by CRMPI and Dutch volunteers. With all the domestic animals around villages, manure is in ready supply so it was a natural step to head towards composting. This has already caught on with some of the local farmers. Green manure crops is another goal for this year. The ultimate goal is to hand the demonstration farm over to the locals but presently CRMPI is looking for a full-time manager who is prepared to give a full one year to the project. Fluent Spanish is mandatory as is a good grounding in permaculture/sustainable agriculture, management skills, experience in Latin America and, most important of all, a sensitivity to the culture.

Volunteers are always welcome and the project is looking for hard workers who are willing to support the project and its goals. Accommodation is usually with families.

Permaculture in Bahia – Brazil

Liliana Pires (Brazil)

[Submitted Paper]

Brief history

The *Instituto de Permacultura da Bahia* is located Lauro de Freitas, in the outskirts of Salvador, capital of Bahia. It was founded by Marsha Hanzi and Didier Bloch in September 1992, with the purpose of propagating permaculture and giving support to those people interested in developing projects and enterprises under its principles.

In which stage are we today?

We are working to propagate permaculture through several strategies, including the courses, talks and field days, the media and the participation in related events. In August 1995 we held the Brazilian Permaculture Conference, which brought together more than 130 people from all over Brazil. We intend to have a Conference every two years.

The creation of models for the main three different ecosystems of Bahia is also very important to give a solid basis to our work. We establish links with other non-governmental and governmental organizations, groups, Agrotechnical Schools and communities to give them technical support in permaculture. Some people have already developed models that are a reference for us, as for example, Ernst Goetch's agroforestry system. We are part of the Agroecological Exchange Network (*Rede de Intercâmbio em Agroecologia*), which encompasses 12 NGOs working with rural communities.

The publication of the Portuguese version of *Introduction to Permaculture* has been an aim of the Institute since its foundation, as it is necessary to have it available to the students. In Brazil, books are quite expensive to publish and purchase, and we have been trying to find ways of doing it. We are almost there!

We have been working closely to rural and urban communities through two different projects. In partnership with the Associação São Francisco we are developing the Project Self-Reliance at Colinas do Mar, an extremely poor community in the suburb of Salvador. Although we have been there since February 1995, we are at the first beginnings, as the community's history and reality (most people came from the semi-arid searching for jobs) creates competition for survival, being difficult to restore their people's self confidence and sense of cooperation. Even though, we have been making lost of progress working with the women's group and the children, going through an educational process to bring back and introduce traditional and new values, habits and practices important for the self-sustainment, dignity and citizenship.

In the Health Group the women get together to work on the herb garden and produce remedies from the medicinal herbs. They also produce leaf meal (solar dried leaf

powder) from *Cajanus cajan* and *Dolichos lablab* to be used as a food supplement and in the making of the green pasta. As an extension of the Health Group the Nutritional Education Workshop was created to be a space to exchange the knowledge to improve the diet without raising the costs, using local resources. There is also the Sewing Workshop, and as the group evolves we intend to stimulate the creation of a cooperative of clothes, alimentation goods, natural soaps and cosmetics and other possibilities. The Children participate in workshops of music, leather, toy making, gardening and capoeira (a Brazilian kind of dance and martial art with African roots), in which they can express themselves, discover and build their own knowledge, understand the historical facts determinant of their reality and be able to propose solution to change it.

The Leaf for Life Project is being developed with the Small Farmers Association of the Amargosa Region (APARA). This Association encompasses about 700 small farmers. They first came to us to ask for the creation of commercial alternatives, as they are very susceptible to the intermediary agent. We first had the opportunity to develop something more concrete with them when the American NGO Leaf for Life (Find your Feet in Britain) propose to us to develop a project with them to produce leaf meal from several kinds of leaves (The *Vigna unguolata*, *Cajanus cajan*, *Dolichos lablab*, *Moringa oleifera*, *Manihot esculenta*, etc.). The leaves are blanched and put in solar dryers to be ground in a powder when completely dry. The leaf meal is a very rich food supplement to be added in dishes created by the women. Once the Health Group at Colinas do Mar gets ready to produce and commercialize green enriched pasta and other goods, they can be supplied by APARA. Our intention is that this food supplement reaches the social market, as orphanages, creches, schools, etc. David Kennedy can be contacted for more information leaf projects in Latin America (Leaf for Life, 250 Radford Hollow Road, Big Hill KY 40405, USA).

This project has been giving us the opportunity to work more intensively with APARA (the farmers association) and address questions related to their production system, which is very much based on monoculture. As their immediate problem is the fair commercialization of their products, we are discussing the idea of creating ways of selling them straight to the consumer, for that they will have to offer more variety than they have today (mainly cash crops, as cassava, orange and cocoa). This brought out the discussion about biodiversity, soil conservation, water management, seed saving, subsistence agriculture and many concepts related to their self-sustainment as farmers. Together with them, we are working to develop an appropriated agricultural model for their conditions in 1 hectare of APARA's land, involving as many community representatives as possible through courses, field days and field trips.

The perspectives

Our fiscal and financial structure is quite small, but the demand has been growing a lot. Most people in the Institute work on a voluntary basis and it is being a heavy load to develop the community projects, teach permaculture and give the students the regular feed-back they need. Lately, we have been rediscussing our role and the strategies we should adopt. As our main aim is to propagate permaculture, we must focus our work on forming professionals to develop their own projects and

enterprises in permaculture. This way, we will be able to decentralize our work and permaculture will be reaching the people and communities through our students.

Permaculture in a War Zone

Mrs. Em Ponna (Cambodia)

[Submitted Paper]

In 1979 the world saw Cambodia emerge from a series of disastrous historic events, not encountered since the second world war. Much of Cambodia's infrastructure of roads, schools, resorts, restaurants, holy places, buildings and most bridges had been destroyed during the Khmer Rouge regime. In the first few years after there was a serious food shortage and goods were bartered as in ancient times until a currency was issued in 1980.

More than one million people died, mostly men, which led to a very unbalanced population structure. About 60% of the middle aged people are women. In some areas, 35% of householders are women, which means that women now have greater responsibilities due to the unusual socio-economic standard of living in Cambodia.

Cambodian women were faced with many social difficulties in the eighties, which they met unexpectedly following the death of their husbands. They changed from working in the house to working outside, sometimes beyond their abilities. Having lost a husband, aunts, uncles and parents meant there was very little family support, and no one to share the heavy load of material and spiritual family responsibility with. Most women had to feed many infants, some of which were the orphans of their friends or relatives.

After the Khmer Rouge regime, most women returned to their homeland to find their home, furniture, dishes and clothes destroyed. There was a shortage of animals and cultivation equipment and much of the land was damaged, mines can still be found in some areas. 85% of Cambodian people live in the countryside, and now 65% of farmers are female.

Farming is the main agricultural task and traditionally women were responsible for spraying seeds on the field and extracting, transplanting and harvesting the rice. Men were traditionally responsible for the reclamation of agricultural land and plowing. At the present time, women work both inside and outside the house to make their livelihood possible. To be able to generate an appropriate standard of living after the Khmer Rouge regime, people worked very hard, lacked sanitation and became weak and sick.

To improve the lives of people in Cambodia the following problems must be overcome:

- pollution of land, water and air by factories and agricultural systems;
- loss of some seed and animal species;
- declining natural resources;
- economic systems destroyed by the Khmer Rouge;
- lack of sufficient land and knowledge to grow multi-food fruit plants;
- lack of experience in agricultural land reclamation and use of available inputs;

- large family size; and
- lack of encouragement.

In 1993, the Department of Women's Affairs of the Pursat Province communicated with Mrs Rosemary Morrow (QSA) and she was invited to come to teach us about permaculture. The intention of this was to help the people of the Province understand how permaculture works and how it is useful in a war-torn country. The specific intentions were:

- to address the problems listed above;
- to provide education on land care and land reclamation;
- to provide education on human and animal health care;
- to redistribute the resources which exceeded our requirements;
- to reduce over-exertion of the available work force;
- to make people's homes more sustainable;
- to adjust irrigation principles to include agricultural work, forestry, animal feeding; and
- to organise a social and economic quiet location.

We have tried to publicise and train people to carry out permaculture projects in five districts, ten villages and 300 families in Pursat as the first phase, and we have also established a second demonstration centre. Also, permaculture works have spread to other provinces through:

- Teacher training college Takeo Province, primary school and junior high school;
- Teacher training college Kampong Chnang, eight districts, ten villages and 300 families; and
- Prek Leap Agricultural college has built a permaculture demonstration centre so students can pursue extension works.

Permaculture students currently understand the principles as follows:

- Permaculture is a system for building sustainable human homes by environmental planning;
- The combination of traditional knowledge and modern science to create a form applicable in both city and country homes;
- Taking a natural system as a model from which to create an environment which is sustainable and can provide for human needs and an economic structure which is supported by society; and
- It encourages us to solve problems we encounter locally and in the rest of the world.

It is very important for war-torn countries to implement permaculture works to provide appropriate livelihoods and sustainable food because wars destroy people's lands and family, and in developing countries such as Cambodia, this is even more important. In order to continue and to improve this kind of work we would like to request your assistance. Further information can be obtained from:

Mrs Em Ponna, President, Department of Women's Affairs, Pil Ngeok Village Pteas Prey Commune, Sampev Meas District, Cambodia. Tel: +855 (52) 951 473.

The Development of Permaculture in the Humid Tropics of South America: Brazil, Ecuador, Peru and Guatemala

Ahmed Ali Sharif (Peru)

[Presentation Report]

In 1989 in Ecuador, in a place called Madre Selve, a group was set up to teach permaculture to the local people. There were up to 120 people involved. A demonstration plot was established on a site in the wet tropics in San Lorenzo on the coast of Guatemala. There were eight indigenous groups involved. A process of working on chain gangs was an effective method to get the work done.

The process was in the form of a project, with fund-raising and professional expertise to have a professional approach to permaculture. Aquaculture was set up in the form of three ponds, swales and water diversion.

The region was an area of mass deforestation, due to mining and shred farming. A germ of an idea was needed to help the local people. The local population is about 1000 black people. The town is isolated with no roads, it was once an English colony but planning was never followed. As the town grew the mangrove forests were cut down. There was a mix of people involved in the permaculture project. The project was mainly led by volunteers. The crops used were perennials that were fast-growing and suitable for the poor soils. The land was poorly drained and therefore not suitable for annual cropping.

As the forest was diminishing, the need for a reliable food supply was essential. Tree crops were used as a subsistence crop.

As a water catchment practise had not been implemented before, it was essential to start with redirection of the rainwater. The water-runoff from the roofs was caught in a pond and redirected using solar powered pumps into large PVC containers. These containers were supplied from recycled Coca-Cola bins. The water was then led into large containers set up on towers to provide sufficient water pressure to gravity feed the showers etc. Although the region has a high rainfall, there are 3-4 months of little rainfall so water ecology is very important.

Composting toilets were installed to recycle the human waste to provide a nutrient supply for the gardens. After a few experimentations, the final design is completely functional, has no smell, has no moving parts and therefore requires little maintenance. The collecting bins are orientated towards the sun for maximum exposure which increases the break-down process.

A Mandala garden was installed, which was a raised bed, essential to facilitate drainage, and to help build up soil nutrients. Due to the humidity in the region the decomposition rate is very high. Weeds are a problem too, so mulching and cover crops are essential. Sawdust is available from the local timber mill so is used

for pathways and in the composting process. The growth is very quick so a turn-over of crops ensures a constant ground cover.

A banana circle was planted with manioc in the middle. Compost was constantly added to the middle. As the local people are not highly motivated, a very low-energy form of composting in layering was used, where leaf litter was laid straight on top of the garden beds.

Animals were included in the design as tractor systems, including chickens and ducks. Many volunteers were involved, both from the local area as well as from other countries.

A nursery was set up, growing up to 120 tropical fruit species and other tree types, including palm species.

The food forest was a trial and error process with 25 legume species used. Taller ones provided protection for the lower ones to get established. Alley cropping was used to contain and control the growth and harvesting. It was important to maintain a crop cover as topsoil washed off in heavy rainfall, taking all the nutrients with it. The plant spacing was determined by the crop type. Machetes were used to cut down the crop. Fruit was sold in the local market.

In the Barrio San Martin, a group of women were involved in creating a garden. Each of the women had up to 8-10 children each so food production was important. Nutrient deficiency was a factor that was considered in the crop types, and also child malnourishment. Composting was introduced but it took a while as there was a fear of using decomposing materials. There were two women teachers from Colombia, who had permaculture certificates, and worked successfully with the women.

Tree planting days were organised, and pageantry festivals were held. For example, Parrot Costumes and Marimba dance, which was specific to these people. The feminine influence from the forest is portrayed in their rituals and songs. Also the slave traditions and an anarchistic spirit where the slaves escaped to Madre Selva.

In the Andes, there was a school built for a group of Quecha people. The earth was compacted and unable to support any plant life. Swales were dug to plant trees. 2000 trees were produced from a nursery that was built by students while they were living there. Slowly there was growth and productivity.

On the Peru/Brazil border, the Shapibo tribe live on the edge of an ox-bow tributary river to the Amazon. The region is governed by a flooded forest ecology where the seasonal rains wash out the topsoil. The tribe are normally foragers but the clearing of the forest by large land owners has diminished their land movements. And also the main fishing trade has taken a lot of the fish that the tribe relied on. A gully was built to establish a dam, so that the flow of water could be controlled. Two hectares of water was caught and a spillway was built as a sluiceway to maintain the flow. Eight species of fish were introduced and it has now grown to twelve. Aquatic plants were installed, and harvested as a mulch crop for the gardens. A duck house was built, and turtles were introduced. An economic return was provided by the making of ceramics and textiles depicting cosmology and beliefs of the people.

A new design for water wheels and water distribution is needed as all of the existing ones are contaminated and disease-ridden.

In Guatemala, a tribe of the Mayan people live on the shores of Lake Catalan. The lake, which is sacred, is surrounded by three volcanoes. Food production is considered sacred and a ritual is performed after harvest. Alternatives to farming have been found in permaculture. The land had been abandoned by the Catholic Church due to flooding so the raised beds system was implemented to avoid the run-off problem. Swales were established and sand and organic matter were combined to form garden beds.

Financial assistance was minimal but the Gaia Foundation have been influential.

Permaculture Outreach Work with Impoverished Rural Communities

Shirley Sifunda and Mike Masuku (Africa)

[Presentation Report]

Shirley Sifunda:

EcoLink is a Non Governmental Organisation. Our mission statement is:

“To enhance the quality of life for people in their own environment. To do this by responding with knowledge, skills and equipment and an understanding of how people are related to the natural resources on which all life depends. EcoLink is wholly committed to assisting the disadvantaged people through self-help projects, while creating a better quality of life in an environmentally sensitive and sustainable manner.”

Permaculture is a tool which can be used to fight poverty and will enable the people to use their resources in order to develop. Its aim is to create systems which will help sustain life, not only in the present, but also for future generations. It is a useful resource because it shows us how to identify community needs and how to create job opportunities.

As a community worker, I work in many different situations, in schools, prisons, and communities, and see much poverty in all of these areas. My first priority is to show the women how to make a trench garden and plant foods that can feed their family. At the same time, they learn how to clean their area and use the waste for their gardens. A trench garden is dug 1 metre wide by 2 metres long and 45 cm. deep. It is then filled with tins (for iron), bones (for calcium), paper (for retaining water) and the soil is then replaced.

The next step is to grow enough vegetables not only to feed their own family but also to sell and make an income for themselves. As this develops, the women join together and form cooperatives, which in turn can grow into Eco-villages.

The juvenile prisoners with whom I work make Wonder Boxes which are sold to the communities. These Wonder Boxes have cushions with polystyrene fillings and are used for cooking.

Malnutrition is a serious problem in the communities, as many of their diets lack the three basic food groups. The physical weakness results in the breakdown of the natural immune system. Another problem which faces the communities is unemployment, which results from isolation and poor communication.

With the help of slides and photographs, I showed how the communities in which Eco-Link works are showing initiative and are earning incomes and creating job opportunities for others. Apart from gardening, many are now involved in recycling. I think this initiative must be encouraged and supported. I am looking forward to

helping the communities design two schools and two permaculture projects once I have the necessary sponsorship. I see permaculture as a development tool.

I am also involved in a project called 'Inforeach,' and read scripts which supply information to the communities on various subjects, eg. information on how to improve nutrition and health, how to plant fruit trees, storing and preserving, marketing, etc. Information is given over the radio and also written information is distributed and discussed with the communities. People in the communities then start implementing what they have learned.

Mike Masuku:

I welcomed the audience with a short song about permaculture which I composed myself. It goes like this:

Give me that old permaculture (x3)
It's good enough for me
It was good for Adam and Eve (x3)
And it is good enough for me.

I like this song because it relieved me of my stage fright, and it also captured my listeners' attention.

The topic was: 'Permaculture Outreach Work with Impoverished Rural Communities.' With the help of a map, I explained to the listeners where our province and EcoLink are situated and how we operate in our regions.

A Permaculture Design Course was introduced to the community members, teachers and pupils. Slides and photographs were shown to the audience. Through this they now know that we are still in the crawling stages with permaculture in our region. What impressed me is that although we are still far behind them, they showed a real interest in what we have done up to date.

We have many invitations from teachers and community members who are interested in permaculture, but we are unable to respond to them due to financial problems. It is really promising that we will be able to go ahead speedily if we can get some funds.

Shirley and I attended two workshops at Rustenburg which were conducted by Robyn McCurdy from New Zealand. Since then we found it very important to solve the problem of hunger in our community. People will no longer have to waste all their money on food, they can save some through permaculture. Permaculture is a solution to a major problem in South Africa, especially in the rural places that we are working in.

Our biggest aim is to get enough funds so that it will be easy to introduce permaculture workshops and to expand it, as it is still new here in South Africa.

Finally, I explained how permaculture fits in with EcoLink's projects.

International Volunteers, International Partnerships

Adam Tiller and Peter Devereux (Australia)

[Presentation Report]

Many people want to support and work in overseas developing countries. Peter and Adam coordinate these volunteers with the developing countries in need.

This meeting began with all people introducing themselves by name, country, interest and involvement in permaculture.

Peter spoke first by stating that his broad aims are dealing with philosophical issues with working overseas as well as dealing with the practical issues. Founded in 1961, the Overseas Service Bureau (OSB) now conducts its activities in close to 50 countries throughout Africa, Asia, the Pacific and Latin America. OSB provides opportunities for Australians to *live alongside* people in developing communities and work *in partnership* with them in order to:

- foster cross cultural relationships and international understanding;
- assist in the development of their own and other communities;
- and contribute to a peaceful and just world.

As a community-based non-profit organisation, the OSB's principal concern is human development. It gives emphasis to the importance of partnership, teamwork and consultation believing that the skills and contributions of all individuals should be valued equally.

OSB is best known for the Australian Volunteers Abroad (AVA) program which facilitates the placement of approximately 270 volunteers each year. OSB responds to requests received from organisations in developing countries by facilitating the placement of interested and suitably qualified Australians. Increasingly today requests are for people with direct permaculture or permaculture-related skills, for example community forestry, sustainable agriculture, rural community development.

Some examples of OSB placements:

- Wayne in El Salvador working in the early 90s with the Salvadorian Centre for Appropriate Technology, whose fundamental objective is to promote and develop projects that contribute to a process of sustainable development;
- The Vietnamese Community Forestry Project was funded by AusAid and managed by OSB. Three OSB personnel worked on the project, two horticulturalists and a forester. The Australians provided technical support and training to villagers in skills such as composting, irrigation techniques, crop selection and fertilisation in areas where, due to land-clearing and soil degradation, food supplies were being threatened. Three years later, apricots, pineapples and

cashews are among the new crops that have been added to traditional crops. Improved stove designs are using less firewood;

- In India Linda was an AVA horticulturalist in Orissa, northern India with a local NGO, Gran Vikas, on a social forestry project where women propagated and cultivated seedlings. Gran Vikas is a large organisation that runs a number of community development programs throughout northern India.

From OSB's long experience several key elements have been identified with the success of volunteer placements, including the length of their stay, their immersion in the local communities alongside local people under similar conditions, and the local organisation being the employer. These factors all lessen the importance of differences and allow greater opportunity for the diversity to be understood and celebrated.

OSB also does a great deal of important work building partnerships that do not involve volunteers. The Projects Partners program for example helped translate and submit a Managua reforestation project proposal developed by FACS Nicaragua to the former NGO Environment Initiative funding window of AusAid. The project proposal was successful and it is hoped the first release of funds will soon provide the impetus for this community-based tree-planting effort.

OSB aims to make its volunteer program a cyclic one that promotes long term engagement with development issues, not just whilst people are away, but also before they go and when they return.

OSB like permaculture attempts to work within the social, economic, environmental and cultural contexts for beneficial and sustainable development. That is why OSB hopes for continuing and strengthening cooperation with local, national and international permaculture organisations and people.

Adam Tiller spoke on the Permaculture Global Assistance Network (PGAN). PGAN is an Australian association which networks with permaculture groups around Australia to promote permaculture in international development. PGAN directly supports a small number of projects in poor communities around the world and assists many other projects, working with international aid organisations. It links overseas NGOs with AusAid which has a large budget per year. PGAN looks for funding on behalf of overseas projects.

Adam stressed the need for preparation before going overseas such as reading about other's experiences, working in Australia and making links with overseas. There is a need to humble oneself before going, to realize that much work has already been done on the project before the volunteers arrival, not to go in saying "here is permaculture, this is the answer" but to realise the enormous difficulties faced by the people.

Peter advises volunteers not to do it alone, to work within an organisation such as the local NGO which will give a bit of structure without the institutionalisation. A long stay is also suggested for maximum effect.

The meeting was opened to questions and comments.

Di Kilsby from International Women's Development Agency, stressed the need for volunteers to obtain a comprehensive background of the country, culture, work done so far and problems of the people before going overseas. She pointed out that, due to cross-cultural problems, the people may defer to volunteers by agreeing to a suggestion even though it may not be what they really want. Di also pointed out that much can be done to help overseas developing countries from home.

Finally Adam and Peter made two lists available for delegates to fill out;

- those wanting to go overseas as a volunteer, and
- known overseas projects needing assistance.

VAC and Permaculture in Viet Nam

Nguyen Van Man (Viet Nam)

[Submitted Paper]

The traditional agriculture of Viet Nam and the VAC system

For millennia the Vietnamese people, in the process of building their agriculture have made efforts to learn from nature in the establishment of their sustainable agriculture system. This is both productive to man and suitable for the prevailing environmental conditions. The wisdom of the farmers is manifested with their saying, “watch the sky, the clouds, the wind, the rain and the soils” and to “grow the right plant on the right site”.

Another saying is, “A piece of land is a piece of gold.”

The most famous among these sustainable land farming systems is traditional rice field farming and the VAC system of agriculture.

The Vietnamese ricefield system has been developed with a wide range of technologies which include relay planting, mixed cropping, intercropping, cultivation of drought resistant and water-logging tolerant rice varieties, building terraces in the mountainous areas, building irrigation systems for supplying water and improving soil quality, using mulch and green manure (such as azolla and sesbania), combination rice growing and fish and duck raising.

The VAC system is established around the dwelling house. This is an ecosystem where gardening, fish rearing and animal husbandry are closely integrated.

VAC is an acronym of three Vietnamese words: VUON meaning garden or orchard, AO meaning fish pond, CHUONG meaning animal sheds.

In the home garden, various species of crops are grown under different farming technologies which include inter-cropping, mixed cropping, overlapping and multi-cultivation to make full use of the available resources. In the corner of the garden are grown some medicinal and spice plants. Around the garden are timber trees and rattans and even some tuber crops such as Convolvulaceae, Dioscorea.

Various kinds of fish are reared in the pond so that feed resources at all levels are used so there are tench at the top, roach at the intermediate level and tilapia at the bottom of the pond. Taros are planted around the fishpond and marsh lentils are grown over part of the water surface as pig feed. Dome gourd or loofah pergolas are constructed above the water. Near the fishpond there are pigsties and poultry coops.

There is an interaction in VAC. Some of the products from the garden and their residues are used for animal and fish feeding while the fishpond provides water and the litter/sewage from the animal pens is used for feeding the fish.

In the traditional agriculture of Viet Nam, the rice field provides rice and grain to the family while a wider range of food and foodstuffs; eg. vegetables, fruits, meat, fishes and eggs come from VAC. Some vegetables, fruits and tuber crops from VAC can be stored and serve as reserved supplies for the farmer.

The VAC products which are not used can be sold at the local market for cash. The income from VAC is generally 50 to 70% of the total income of the farmer's family.

The traditional Vietnamese village as is commonly seen in the deltas were always eco-based units. Around the village there is a belt of bamboo for both protection from wind and as a shelter belt. It also provides the village with construction materials for housing, furniture, baskets and many handcrafts.

Inside the village, all the households have individual VAC systems which create a sound environment and a peaceful atmosphere.

With their ricefield farming system and their VAC ecosystem, a sustainable, self-sufficiency in food and a moderate cash flow into and out of the household has been provided. Local communities in their village have had their own regulations for the protection of their production, eg. the careless herdsmen have to pay fines for damage caused to the rice paddies, fruit trees and the natural resource such as the local forests and water sources.

There are also regulations concerning festivities such as wedding and burial ceremonies. For instance, the newly-weds have to contribute building materials, mainly bricks, for the construction of roads or wells at the village. At the birth a child, the parents have to plant trees; cash cropping varieties such as cinnamon, anise and canarium to create assets for their descendants.

There are long standing customs and regulations in the village which are more operational than state legislation because "King's laws can hardly beat down village rulings" as a popular saying goes.

It can be said that the package of agricultural land farming technologies of Viet Nam was inspired and developed through the wisdom of the farmers who, by their nature, laid emphasis on land use sustainability. Local knowledge and the correct management of communes and villages has continued the blossoming of the VAC system.

VAC recent history and its linkage with permaculture

With the modern development of the agricultural co-operative, the traditional family economy had become neglected. With the advent of collectivisation private gardens became unproductive. Many specially selected and protected fruit trees disappeared and many of the time-honoured techniques of the farmers were also forgotten.

In the last few years, a new policy for the Vietnamese Government has again seen the full promotion of the family-based economy. In 1986 the National Association of Vietnamese Gardeners (VACVINA) was established.

The main objectives of VACVINA are:

- To promote a large VAC movement all over the country.
- To introduce appropriate technologies to increase farmers' income, eradicate famine and alleviate poverty. Priority has been given to children and women and ethnic minorities.
- To protect the environment and set up a sustainable agriculture system.

The Association is a NGO and its members are working as volunteer activists, many of whom are retired civil servants. VACVINA began its activities with only 100 household members and some dozens of activists. By 1996 the association was working with its network spread to 250,000 members in all 53 provinces of the country.

When VACVINA was established, there was in Viet Nam almost no research in horticulture, in VAC or in fruit production. We had to collaborate with scientists, horticulturalists to investigate, evaluate collect and analyse the experiences and knowledge of the traditional farmers of different areas. It was only then that we could design and propagate the new VAC models and advance appropriate technologies for different regions. Today the VAC system is in use from the deltas to the mountains and along the coastline of Viet Nam. Cities and towns have not been excluded.

As early as 1988, UNICEF began to grant its assistance for the implementation of a nutritional VAC program to help poor families improve their diet. This was particularly aimed at pregnant women and children under five years of age.

1989 marked a new step in the development of the VAC movement and VACVINA activities. With the assistance of QSA, a VAC project was implemented in Bavi, Son Tay Province, to help the Dao ethnic minority and the project was further assisted with the arrival of permaculturist Rosemary Morrow from Australia.

That year many permaculture training courses were held for VACVINA staff and members. It was found that VAC and permaculture are closely related and the dissemination of PC knowledge to VACVINA members did not meet with any difficulty. The PC concept, ethics and principles have enlarged the view and knowledge of VACVINA members, making them more confident in their struggle for better habitat, for a better and more peaceful livelihood, for the protection of our planet and for a sustainable future.

VACVINA has three centres for research and teaching in which the main subjects are VAC and PC. With further assistance from QSA, VACVINA has been involved in a number of field projects in which PC and VAC principles have worked hand in hand for the benefit of the recipients.

One of these projects has been implemented at the coastal area of Quang Binh Province in the central part of Viet Nam where violent typhoons and strong, dry winds destroy villages and crops with blinding sand dunes which are being swept inland from the coast.

About 80% of the residents were considered poor and malnutrition prevailed in 60 to 70% of children. The project was implemented at two communes where over 28,000

ha of land had been destroyed by the sand which had been destabilised with the destruction of vegetation by continuous bombing raids during the war. Some 156 families were selected as 'pilot families' to start the project.

After local discussion meetings and training workshops for problem solving and the dissemination of VAC technologies, farmers were helped to establish windbreaks for the protection of their villages and ricefields using tough, drought-tolerant Australian casuarinas as well as indigenous trees species such as *Excoecaria* spp., wild agaves and local dune grasses. All can grow on virtually sterile soil.

The land was allocated to households which had the labour force and the willingness to work under the guidance of a team selected by the local VACVINA for future incomes from the trees and crops to be established. Along village roads, plantations of timber trees and fruit crops such as coconut, custard apple, jujube trees were established.

Members were encouraged to produce appropriate seedlings and planting material for the establishment of home gardens and for the replacement of missing trees in windbreaks and along commune roads. Most households, when starting VAC gardening, began their work with pig and chicken raising as well as digging farm ponds for fish rearing then later turning to fruit and tree crop cultivation.

VACVINA created interest groups and teams for the exchange of labour. Poor farmer households were assisted with "revolving loans" for the establishment of their VAC system. They were also trained on how to make farm manure, compost, the use of green manure and carrying out "organic farming" with success.

Beside specific VAC systems in each household, there were two other demonstration centres, one in each commune for the dissemination of VAC technologies at the project area and for the production of seedlings and planting materials. Local VACVINA members were also trained as teachers and the pupils in two communal primary schools and one kindergarten also received training within school gardens.

The kindergarten has particularly benefited from their gardens with improved nutrition with more eggs, fruits, vegetables, fish and meat in their daily diet.

After more than three years of project implementation, the results obtained are encouraging. First there have been changes in the landscape and the environment for the better with the formerly sterile, shifting sands re-covered with greenery. With the community now creating a cash income from produce, the percentage of poor households has been reduced to 10 to 15% of the local population. Most of these are found to be households of old people who have a limited labour force. The perceptions and knowledge of local farmers has also improved.

Of greater relevance is the fact that the beneficial effects of the project were not confined to within the boundaries of the two communes. They have become centres for the further expansion of knowledge. Other communities come to be trained. Bill Mollison, the man considered to be the world leader in PC concepts, was very satisfied with the results when he visited recently.

Another project was implemented on two other communes in the mountains in North Viet Nam. These communes are mainly populated by ethnic minorities and it is

noteworthy that two thirds of Viet Nam is hilly and it is here that around 60 ethnic minorities reside.

Due to deforestation and the prolonged effects of war, barren hills and valleys take up around 10 million hectares. The degradation is still continuing and water resources are also constantly being polluted or are drying up. The Hmong people still practice the primitive slash and burn method of agriculture to grow rice and now opium.

A pilot project to improve the living conditions of the Hmong was implemented in communes far away from any towns or services. The living conditions were of a very low standard with many people affected by chronic malaria and basic food production techniques were underdeveloped.

When the growing season arrived, most of the labourers in the families would leave to find land to grow their rice and opium. They would live in the fields until after the harvest was brought in six months later.

Only old people and children would remain in the villages so there were no home gardens and only a few pigs and chickens were kept to roam around the houses. Without care, they succumbed to diseases or were taken by wild animals.

Beside introducing VAC technologies to the villages, there has been an attempt to replace the cultivation of opium poppies with other cash crops.

The project was established in a number of steps. The first step was to help the households to improve their animal rearing, to construct sheds for the pigs and chickens. Later they began growing vegetable, tuber crops, maize, pulse and fruit trees around their homesteads and even on nearby hillsides.

In collaboration with the local authorities such as the chairman of the communal peoples committee and the heads of the villages, the elders of the villages comprising some 60 families, some were selected as pilot families.

Soon other developments followed such as the creation of village food security funds (a kind of rice bank) to provide loans in kind to needy households. The water supply was improved with the establishment of piping and water tanks, the provision of health care facilities, the provision of teaching materials to two primary schools in the communes, the establishment of two cultural centres equipped with TV and video. The project also included the building of check dams and a small hydroelectric power station for both water and electricity supply.

The project also contributed to the upgrading and expansion of the local road network. Nearly four years after it started, big changes have taken place in the communes. Most of the 314 households in the project area now grow home gardens and there is a small surplus which is sold on for cash.

The animals are now protected from harm in pens. Fish farming, new to these people, has also been introduced. The area for fruit tree growing has increased. Until 1995, some 21,500 fruit trees including longan, plum, persimmon, grape and orange have been planted. Some 20,000 Shan tea seedlings, a precious tea species for

mountainous areas, have also been established on the formerly denuded hillsides. The areas under opium cultivation have nearly disappeared.

Social activities have been organised at the two cultural centres and a better understanding of national problems has been promoted and this has helped them participate effectively in the mainstream development of all aspects of the VACVINA system.

Health problems such as childhood malnutrition, opium smoking and especially malaria are gradually declining. A number of authorities and organisations have collaborated with the communes to create this "participatory rural development model".

The success of these communes has attracted the interest of many other communities who are experiencing similar problems. Slowly, the message is going around that forests need protection and restoration and that sustainable development is the only sensible long term alternative. In a neighbouring province, over 10,000 hectares of barren hillsides and after three years, produces thousands of tons of vegetable and fruit products.

VAC development in the 1980's began its popularity in the deltas but soon spread through all of Viet Nam with a million households establishing home gardens and tens of thousands of hectares of formerly unproductive lands being restored.

Since 1990 the VAC extension work has been closely linked to permaculture concepts, ethics and principles. Planners and policy makers in many provinces and central agencies have paid due attention to the development and application of VAC technologies for sustainable land use. In particular the Department of Education and Training has issued its decision to promote VAC and permaculture in all schools.

VACVINA, with the assistance of Rosemary Morrow, has held many training courses and in 1995, a large program was initiated to train VAC and permaculture teachers for all provinces.

On the occasion of its tenth anniversary, VACVINA received a letter of congratulations from the General Secretary of the Vietnamese Communist Party. In its 8th Congress, the Communist Party has laid strong emphasis on the development of a sustainable agriculture system in the country.

Perspectives and challenges

With the recent formal backing of the Party and the Government, the further progress and success of VACVINA and permaculture projects in Viet Nam is assured and it is expected that there will be a slow turning away from monoculture to a much more diverse land use and sustainability.

However, some leaders are not yet convinced that it is necessary to have sustainable development and a number of them are not aware of the negative effects of the development of a conventional energy-based monoculture.

Legislation has been enacted in regards to land conservation but its enforcement is no easy task. Natural resources in particular, natural forests, mangroves in the

deltas, are all still being destroyed. Forrest products and biodiversity in such areas is still open to destruction and abuse.

Sound economic and social development in harmony with natural resources conservation often requires a traditional wisdom to look not only at the present needs and short-sighted demands of greed but also at the long-term future and the living conditions of the generations still to come.

Naturally there are big challenges that we have to cope with while struggling for industrialisation and modernisation.

The struggle for a sustainable development is continuing and VACVINA, with the support of the people, will work at the front line together with many other active and progressive institutions to achieve its goals and visions.

Urban Permaculture in Havana: Implications for Sustainable Cities of the South and North

*Sarah Wright, Toni Phillips, John
McKenzie, and Adam Tiller (Australia)*

[Presentation Report]

Adam

The project started with groups in Melbourne and Sydney wanting to support the socialist state of Cuba after the collapse of the Soviet bloc and the US blockade on trade.

In 1993 a group of permaculturists went and ran a permaculture design course, but there was some resistance from young people who felt that the country had already passed through the 'campesino stage'. A mandala garden was constructed but never planted (due to a change of government department).

In 1994 the Green Team, in association with the Permaculture Global Assistance Network, applied for funding and received a \$25,000 grant from the Australian government. Sarah and Tony went to Havana and worked for a year, and taught the first Permaculture Design Certificate course.

The main emphasis of the project was forming a link between two communities, the one in Melbourne, Australia, and the other in Havana, Cuba.

Sarah

The urban project started because there was a food shortage at the time of the collapse of the Soviet bloc. People in the city either could not get food because of a shortage in production, due to a shortage in availability of chemicals etc, or because of transport difficulties due to a shortage of petrol.

The government supported the urban food project in Havana. In 1989, because of the shortages, known as the 'special period', a new law was passed; allowing anyone to cultivate vacant land.

There were 30 extensionistas working in 15 different city sectors, to help city gardeners.

After the revolution the models for development were large-scale Soviet style. People in general have a high level of education but many are not interested in, or have skills in, gardening.

The aim of the project was to train trainers who would then take information back to their communities. Participants were chosen by their community extension workers on the basis of their capacity to serve their community. The workshops took place

over five days, with an emphasis on practical things. Agro-Alemaigne donated tools, which were distributed through city garden clubs. The Collective ethos is very strong in Cuba and people take equal distribution very seriously, but sometimes this is counter-productive (for example, they cut hoses into two metre lengths).

A strong emphasis was on the dissemination of information. In Cuba at the time of the project there were only two publications available – the daily newspaper and the newsletter produced by the project, *Se Puede*. People loved it, they had been starved of information, since there had been no paper available to make community publications. *Se Puede* was passed round and the shared knowledge was highly valued.

Jude

Seed Saver's Network went to Havana in January 1996 to work with the extensionistas and the Urban Agriculture Department. They worked in 15 different municipalities with the extensionistas, usually young women, working (ironically, Jude said) with the city gardeners who were usually older men. This related to one of the three issues flagged for discussion in the session – working under constraints, replication of similar projects elsewhere in the world, and supporting this particular project.

Part 7

Settlements Stream

The Farm

Albert Bates (USA)

[Presentation Report]

The holistic goal of this project was to create a secure settlement in which succeeding generations can relate to our natural environment in a sustainable and productive way serving as a base to draw upon the collective strength of the community to contribute to the positive transformation of the world.

There are four aspects of the Global Eco-village Network, called Earth, Air, Fire and Air.

Earth

This is the physical environment which should be created to encourage the diversity and interactions between and within both the natural environment and the people involved.

Water

Water is worked into the physical environment using the key lines of the property.

Fire

Fire in this context is taken to mean the social and economic networks within the community. Within these communities are so called FROG groups, Future Residents Organising Groups, which meet regularly throughout the entire process of establishing such a project. The essence of a community is a commitment to sharing and realising personal boundaries so that the community itself can then share with the world.

Air

This encompasses the spiritual and community feeling of the group. This is fostered and encouraged through many group sessions. There are recognised types within a community who have different roles to play and skills to offer. These are continually evolving and developing as people evolve and develop through the stages of life and experience.

Flexibility is recognised as the most important point to be made within this context. This is achieved by recognising the evolution and phases of a project, and developing the ability to avoid dogmas and a dogmatic attitude to the continually evolving processes of life.

East to West: Ecologically Sustainable Land Use and Settlement Patterns

Peter Cuming (Australia)

[Presentation Transcription]

What we heard from Bill this morning was a cry, a cry-out for people like us to be leaders. It doesn't matter what age we are, or what our background is, or what level we're at in terms of our learning curve, we all recognise that we have something to teach. We also have something to learn, and something to share. So what are we doing with local communities right through to State government agencies and think tanks and talking to ministers who make decisions in terms of policy?

It's about creating our future, it's about planning, being a transmuting bridge from now to the future. It's about what we know now and what we are not really sure of, and it's about moving forward into the future and estimating what we think we want, so we have some goal to work towards. Once we have that then we can come back to the present and we can live the present, so we don't have to live the future. Planning isn't about living the future; it's about designing it the way we want it to be.

To start off this session, I want us to start thinking, ourselves, internalising, and then we will start sharing with the people around us. Then we will work through some examples that I have been working on. I would like you to be part of that transmutation that will occur, that you will take it out into the wide world. I know you are already doing it because that's why you are here.

Focus now on who you are. Where have you come from to be here? Where are you right now? Where am I right now? Now, I've been given these things from tradition that I am bringing forward. There is the sacredness of tradition. And I'm taking it forward into the future and I have to bury it in the sands of time, to try out later. Something that is growing and living. I'm allowed to take one thing forward with me into the future, one principle. One ethic. I want you now to envision, what is that thing you are going to take forward into the future? That you are going to live now, in a whole way, and you are going to take forward to give to the children of the world. Picture it in your mind, in your heart and your hands right now. What I would like you to do now is turn to the person beside you and introduce yourself. It's going to be an openness, a sharing, it's starting today and it's going to go on for four or five days and beyond. Share it now, this thing you are going to take forward into the future. They are going to share with you, and what you must do is join those two things.

Now, what's interesting is that we have got the word, 'stewardship.' We are combining words in a positive way. What we are going to be doing is actually manifesting policies with government, with communities, and there's other people I can see in the room today, like Robyn Francis and Max Lindegger, who are doing exactly the same thing

with communities. It's amazing when you start doing it with words that actually go into documents and those documents become impressed into the community as policies to manifest resources to be spent. And I believe in those things; I don't believe we should throw them away. We have paid scant regard to those documents that are lying around. We say, "Oh, they are just done by the government," but they are our documents, we do them, we make them. And if we follow through, we can actually allocate our resources based on them.

Diversity is sometimes seen as adversity, but in a sense it could actually stretch our limits out, open our horizons. It might be better to talk with more people in the room rather than less, to look for different people to talk with rather than the same people. Not to focus on like-minded people all the time. Work with like-minded people and then go out and find other people. I'm encouraging the work you are doing in leadership in getting out into the community and doing design; include people – be inclusive.

Love – an all-encompassing word. How often do we use it when we are dealing with adversity or our adversarial – the people we are sitting across the table from in discussions? How often do we give love to them? In the work that I have been doing, I have been encouraging people of a wide range of backgrounds to actually work with love and to understand they are working towards a common goal, that is, to be sustainable, whether they are in business or whether they are based on community aspirations.

Equality means that when you are listening to somebody, you are actually hearing them. That's something it is very hard to come to terms with: active listening. Sitting in a room with somebody and listening to them, saying, "I don't agree with this but I'm going to listen." Often what that does to me is that it converts my thinking across and I start to broaden my horizons, and I see things I didn't see before. Some of the challenges we will face in the future are going to need a range of people in that room with us, on that journey with us. Just when we think we know everything, we are going to reach this point where we reach a crisis and not know how to deal with it. And there will be somebody there that has the information, has the idea, has the design, has the knowledge. And it may be in a package that we are not really used to. Out of the mouth of babes.

Life-long learning. We can learn from the landscape, we can learn from the people we are with. What we are actually doing as designers is facilitating; we are just linking things together, creating a web. In fact, on the earth at this moment, repairing the web. Biodiversity is critical. In terms of culture, it's important to hold on to what we have left, to repair it and sew it back together again. But it's going to be a different quilt, isn't it; it's not going to be the same. And that's fairly exciting.

Sustainability is about ensuring that what we are using now, working with now, we can actually pass on to the fifth generation without damaging their opportunities to do the same thing. Some core objectives are individual and community well-being, equity between generations and also equity within generations, between young people and old people.

A lot of the design work I have been doing includes school children. It is amazing to get input from young people and combine it with input from local politicians

and professionals. The kids are really clear about what they could support. What is scary is that 80% of young people, teenagers, don't think there is going to be a world to inherit. Now, they are the next leaders coming along. So there is this generation coming along that doesn't see very fruitful opportunities, yet when you look at the primary school students, they are full of passion. They know they can do it because they are already doing it: they are implementing recycling programs, they are out there doing landcare. The schools in my area are actually managing everything, like the tuck shop – they grow their own food and sell it to the tuck shop. The money from that they put back into growing plants that they plant out. Other schools are coming along to their school to learn. They actually have student teachers from the university coming along to learn how to teach: they learn from the kids. It's very exciting. So there is hope. But there can be gaps. We need to make sure that these webs are very strong. There are times when these older kids get very despairing that they are not going to make it.

We can't just do it with intellect; there is just too much information. So we have to go back to combining the heart and the head, and using intuition a lot more. I really believe in intuitive planning, the spirit of planning which is evolving through permaculture. It is going to bring out the whole of society. And I really believe positively that we can change the world with that. Another technology is about synthesizing that through genetics or microchips. You can program a lot of information on a very small parcel. We are doing the same in our head and our hearts. We suddenly realise we do have the answers when we read a book.

Think about this now: in the community where you live, or where you are travelling, what are you actually doing right now to manifest change?

Learning? Doing what is appropriate for the need? That is really important. It means that there is a need to be filled and you are filling it, providing information networking. Learning more about myself and understanding how I impact on others and interact with the wider community and the environment. Embedding myself in the community and the environment. What results when we embed ourselves in the community and the environment? It gives us a sense of place, which gives rise to a sense of being, belonging. That is what we heard this morning: that there is a loss of that sense of belonging. What I have been saying is that we must rebuild that on the local level, like planting a seed. Planning and design work is actually planting a permaculture seed in the minds of people. It is really exciting when you see it start to move out, and it starts to work in that process that permaculture calls stacking. Think about the community as a stacked environment. You have got those people who are really reaching like a vine, the movers and shakers, moving upwards. The others are just little rocks, they just sit there, but they see everything. There are those who flit through, you know, people who appear and disappear in a community, but they have a profound influence. So let's use them as permaculture designers, to advantage. Let's use this understanding of diversity and variety.

Can you feel the power that is in this room now? We all decided to bring some positive change. Opening doors, to me, means 'broadening.' You can't really change things unless people have broad minds. The power of words: it's what we use every day, our communication. It's what will heal the planet, or damage it, because it is coming from our minds and our hearts.

The work we are doing with communities is like that, working on specific issues to do with communities, but they manifest as action voicing. Sometimes we are not actually voicing what our concerns are. As I said at the beginning, some people don't actually say anything. We encourage them to come out, and if they don't say anything, to write it, or act it out. In doing this, when they identify the issues they've got to deal with, they start finding their sides of the issues and it becomes a challenge. A challenge actually brings people together. How many times, through adversity, do our communities work together? They do amazing things. I'm surprised how often there seems to be no hope at all, and people pull through. I find myself crying when I see people survive things or work together, and you find out later that they never talk to each other. It's just this one time, there's this hope, they come together. We're at that point right now on this planet, where we have to take up the challenge of the issues that are facing us.

What we have to do to get back in contact with the earth, if we are going to renew the earth, we have to understand it, get our fingers back into the dirt. Now, everybody has to do that, you don't just do it with the little group you are with, a group of conservationists, and then slam those over there that cut the trees down. Anywhere I have been involved where there's been any environmental action, it is at the end of that period, when you are working together, that the change happens. And it doesn't happen until you are all part of that change. There is a certain amount of people who make that critical mass that you need. It is really exciting, that's what's happening. The community has been working here in the southwest, at Balingup. A small group of people worked together to influence quite a large process, the Cape-to-Cape strategy, This is a major strategy from Cape Leeuwin to Cape Naturaliste, which makes up a sub-region and is now looking to provide these basic guidelines, based on a vision of the future of protecting that coastline and promoting sense of community and caring for the earth. There are actually words in there like sustainable economic development, protect the earth, developing a sense of community. They are permaculture words to me. This is a document coming out of government, it is a document of the people, created locally along with people representing the Ministry for Planning and the Department of Agriculture. They have all got their hands in the dirt together. The key elements in the policy are about settlement, cultural heritage and resources and protecting these things. The strategy has actually set up a settlement hierarchy. This is like the work I have done with Robyn Francis in developing an approach to rural settlement, where we have clusters which then protect a wider area around, whether forest or agricultural land. This is just another example where these things are actually happening in government now. It's happening from the people up, and it's happening from the top down. And that's the approach we need to do.

Bill was talking this morning about agriculture becoming a monoculture which has moved across the landscape and doesn't relate to the people. So we need to bring food back into the community. Urban farming is critical. The city farms you visit here, or wherever you live in the world, are part of that movement. The backyards are critical to the future. Let's not always take on the big picture; you should realise there is a lot of work we can do to protect the earth with just the small things we are doing every day. I want us to think about that while we are here at this conference.

Are we permaculturists? Are we bringing change, or are we part of the process of decay? It starts with us and then we build outwards into the rest of the community.

The other thing I wanted to say was about visioning. Some people think visioning is quite an esoteric experience. But it's real. If we create a vision of something we want, we put it into words that other people can understand, we actually then have a common goal. Once people start to understand they have a common goal, then they lose some of those pretences and they become more open-minded. They recognise there are different ways of achieving the goal. And that goal may mean different things to different people. And that's OK.

With that process, you need to find a way to get from visions to actions. Here's the issue, turn it into a challenge, find some solutions. They can go anywhere, that's what we're doing. That's a process of logic. Visioning is actually going out there and understanding what you can manifest, then stepping back into the present and then working towards that. Everybody relates to that? How many people do it? I don't do it...very often.

We have got to go back to that process to get things done, go through it step by step, and we need to make sure we've got performance indicators there. For example, greenhouse gases. To reduce greenhouse gases we have to know why and how we are doing it, how to make sure we don't do it, and we have to know some indicator of what level we are at now so we can see if we are actually improving. There may be something you are putting in place that isn't actually working.

Changing the consciousness of the world, that's the most important thing to do. If you are going to change consumerism and dependence, people have to understand that they don't have to be dependent, that they have their own power. Like they were saying this morning, they have got the land out there to do the farming they need to do, they have the traditions they can follow through to teach. It starts off with the vision, not with the issues. But you have to explore the issues first and convert them into some challenge. Because the challenge brings people together. And when it is a challenge, people look for solutions. Actually, it's a lot of fun – these workshops we do can be a lot of fun. Sometimes it seems quite negative and fearful, people really start to enjoy looking at it, and at the end of the period they might work on a vision, something they might work towards together. Now they can go back to their own lives but they are always touched by that. They are never the same.

Here is a more corporate approach, something I have been using with governments, but the basics are exactly the same. Some vision or mission statement, a corporate direction, whether it's a large company or a government agency or a community, a sustainable present and future – let's not always project out there – what about right now? It's easy to put off things rather than working on them right now. We need some universal principles, and they are the things we were talking about earlier. They are things that everybody wants to happen – love, equity; I don't think there are any people who don't want that, but we just don't know how to go about doing it. We are not used to sharing. From that we can work out some objectives and strategies to get there. The thing we haven't got – we, as permaculturists, know this – we haven't got case studies. So let's start using a bit of logic, then, and go through

the intellectual process and actually start documenting things and put them up as examples. We need models. Over here there are tools: there are a lot of ways we can bring about those changes. They already exist in the community; we just have to find them and use those tools. Finally, we need some sort of performance measures or indicators to see if we are actually achieving that or not.

Take supermarkets: you have this vision, shared by that supermarket. We then have to find a model to show what we can do to that supermarket. Until we can do that, the supermarket will always exist. But if you can show a supermarket that has been converted to a different approach, which fits into the community, provides healthy food grown by people in their backyards, and provides extra income incentive to those people, then we can start using it. Then the tools become available. You can actually get regulatory change, if you want to, that allows people to grow food and allows them to sell it in the supermarket. It seem like a closed door because we think regulations and policies are things of government, and not of us. But we actually make those things: they are our law. They are the things that we have passed down. It's not oral any more – it's written. A lot of the laws of our country are good laws, but we have allowed them to be interpreted by a few, rather than by our communities. So, look at your local plans, your local strategies. Seek to influence them. Get a group of people together to do it. You have probably all been through this before, I'm not telling you anything new; I'm just reminding you that you are now leaders in this regard. And if you haven't done it, then you need to link with people who have. But we need to broaden that now to include a wide range of people in the community.

These are the four key elements for northern NSW to bring about a sustainable future. They will link with all the plans produced by local government, State government agencies and by local communities that are working towards a future. It's pretty powerful – this is permaculture, to me -protecting what we have got left of our existing ecosystems, agricultural land and amenities, making the area attractive – that's that sense of place, of belonging. Repair and regeneration: there's a wealth of work done there, a lot of industries developing around that. A lot of business opportunities now exist through appropriate economic development, to repair and regenerate. Redesigning things that aren't working. Using new designs, like composting toilets, permaculture gardens rather than a monoculture.

Finally, renewal. This whole renewal process of bringing back the nature of who we are, our place. These again are policies that are going to develop. They are being developed right now for a major region of Australia which has a population of about 350,000 people. In world terms, that may not be great, but for Australia it is quite significant. There is change happening, and I feel really excited about it. And I feel positive about it. I would like you to think about how you can participate in this, if you aren't already. If you are, just keep going. Don't feel at times that you are going to burn out. There are a lot of people who can help you, but you have got to find them. And they are not going to be the people you think – they may be people you have never worked with before.

The issues given to us, the challenge, in northern NSW, were about the fact that rural residential development was sprawling out across the landscape and damaging the environment. It was splitting up communities; people weren't congregating

in villages and communities any more. So we looked at it and said, some of the hierarchies that are in Europe and the Pacific, in traditional societies, seem to work well, where people can go in their own place and feel comfortable in their own village or their own town, and the services are there that they want. So we recommended that we go with that settlement hierarchy.

The second thing that we suggested was catchment planning. When you live in a village or hamlet, you need to know that you actually link into some place in the environment, that you are a part of a sub-region, a district, or a precinct, and that your own property fits into some context. Permaculture has been focused a lot on the individual properties. What I am asking you to do is link yourselves together, and see that you have got your grand permaculture plan for the world. It's not that hard. It can be done in a region; if it's influencing regions already in Australia, I'm sure it's going to be influencing the world in more ways than one. Not just in terms of the individual property level, but in terms of major planning, national planning.

In terms of this process, in Western Australia, in the last 12 months, Balingup leads the way Balingup is a small community of 300 people; this is a major news item in a state-wide newspaper about cluster development. So it's real, it's happening. This came out of permaculture designers getting together and influencing something at a regional level.

The Cape-to-Cape strategy sets up settlement areas where determined populations will fit into those areas. What they are doing is saying that around the settlements are conservation areas, major forest ecosystems, that will be protected. Agricultural lands that are valuable that were used purely as commodities, will go back and become highly valuable to the community for manifesting products that people want.

I'm suggesting to you that by getting involved in these planning processes, using permaculture, we can actually bring about major changes and shifts in consciousness. The exciting thing to us as permaculture designers is that if this is happening at a regional level and a state level and a national level, how much easier is it to convey at a local level. So, it's about changing the world from the bottom up and the top down. Don't think it is always just grass roots. There are people at high levels that we can influence and bring that change down, and it can happen very quickly.

We are no longer inheriting the earth from our parents; we are borrowing it from our children. It's time to do a lot of work.

Peter Cuming, B. Applied Science (Hons) is the Director of Permaculture International Ltd. and a member of the Royal Australian Planning Institute. He is a renowned strategic and environmental planner developing and implementing permaculture principles in the fields of participatory planning and design, regional planning, and sustainable human settlement. Peter has been instrumental in the legislation of the new Rural Settlement Policy for the North Coast of NSW.

From Aquarius Dreaming to Nineties Reality: Nimbin's Coming of Age

Robyn Francis (Australia)

[Submitted Paper]

The village of Nimbin has been a focal point for alternative lifestyles, communities and technology since the Aquarius Festival in 1973. Two decades of new settlers and alternative lifestylers has repopulated the area to the extent that now the small village services a dispersed rural catchment of nearly 10,000 people. The 'isolationist' policy that marked much of the alternative movement in the past has created its own problems which are now being addressed through an integrative approach to the planning and design of Nimbin in recent years.

This paper looks first at the 'big picture' of Nimbin's historic and bioregional context, with a summary of the natural, servicing and social catchments of the location and its wider community. This is followed by the community-driven planning process which ushered in a new growth and development era for the village, and which, through permaculture design, has begun to realise the ideals and aspirations of the early 'alternative' movement in a cohesive and integrative way.

Historic context

The Nimbin valley holds a special place for the Bundjalung peoples with significant sacred sites, ceremonial grounds, initiation places and for the training of healers. Over a century ago things changed with European settlement. The magnificent subtropic rainforests of "The Big Scrub" were cleared for timber, dairy farming and banana plantations. Nimbin was a thriving rural village until the 1960's when England joined the Common Market and ceased importing Australian butter which devastated the dairy industry, triggering the decline of many rural communities throughout the east coast.

By the early 1970's Nimbin was a shadow of its former self until it was selected as the site for the Aquarius Festival. The influx of hippies and alternative lifestylers during and following the 1973 festival resulted in a new population growth for the village and district, and a proliferation of intentional communities in the area. The general rural settlement movement of the 1980's and 1990's has continued the repopulation of the area. Most of this settlement pattern has resulted in a widely dispersed rural population.

Catchment context

Natural catchment

Nimbin lies south of the Mount Warning caldera. The valley is surrounded by ancient volcanic ranges covered in World Heritage rainforests in the upper catchment of the Wilson's River, the major tributary of the Richmond River. These remnant forests are home to a significant and rare gene pool of subtropical rainforest species

including a rich diversity of native food, spice and medicinal plants. The fertile soils, high rainfall and subtropical climate support a wide range of crops including subtropical fruits, nuts, coffee, tea, herbs, vegetables, bushfoods, and farm forestry. Value adding cottage industry and small business are becoming a more significant part of the local economy.

Service catchment

Electricity is imported from the Hunter Valley, over 700 km away. Northern NSW Wales is at the end of the line, and the fastest growing rural region in the state, thus thresholds are approaching capacity. The issue of energy has required careful consideration, from the 'stand-alone' systems for remote rural communities and households pioneered by Rainbow Power Company, to exploring demand reduction strategies and feeding clean renewable electricity into the main grid for new village and clustered development.

Until the recent reticulated village sewage scheme, septic effluent from the village and rural communities generated serious pollution in the creeks. The heavy clay soils (0-10% permeability) are not suitable for traditional septic absorption treatment. Environmentally desirable rural treatment options have played a major part in the new village fringe developments.

In terms of community services, supply falls short of need in the village, with most major services provided in the provincial city of Lismore, 30 km from Nimbin. Private bus companies provide a limited public transport service to Lismore where major bus, rail and air connections are available. Motor vehicle dependency is a major dilemma for over 80% of the Nimbin district population and a key issue in village planning re- traffic and parking.

Social catchment

Nimbin services a dispersed rural population of around 10,000 within a 10-15 km radius of the village (see **Figures 1, 2 and 3** below). The small busy village centre provides for basic shopping needs, some professional services, health services, a small hospital, movie house, entertainment and lots of cafes. Schooling from pre-school to Year 12 is provided by State and several small alternative private schools. District sports and recreational facilities are well used and supported. What can't be found in Nimbin will be available 30km away in Lismore, a well serviced regional centre with University, TAFE and specialist training institutions, professional, retail and industry, employment and social opportunities, as well as a wide range of State and Federal Government agencies and offices.

Community planning

In 1990 following a series of village meetings the community of Nimbin approached Council to have a planning study of the village, to define new boundaries for village expansion and to establish a Development Control Plan to determine the nature of any new development. The community chose their own planner, Rob Doolan, Council agreed and the process proceeded.

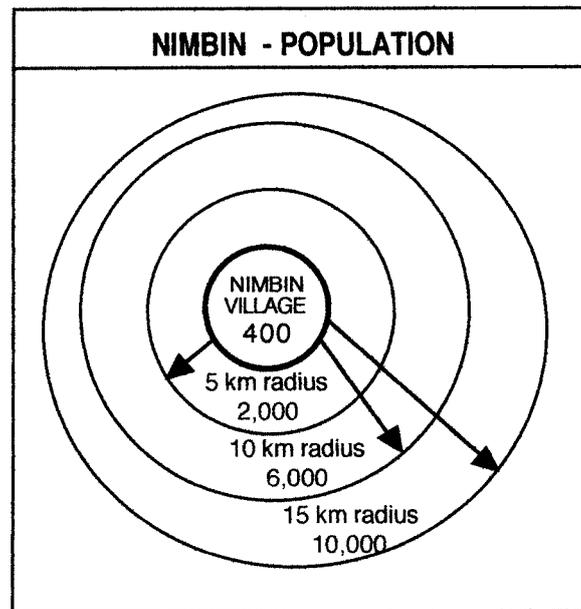


Figure 1: Nimbin population distribution

The key problem identified by the community was that the village itself had not grown proportionately to service the needs of its rural population in providing commercial premises, housing and open space recreation. The community was, and still is, concerned that any development or expansion of the village is in keeping with the character of Nimbin, the spirit of diversity, acceptance and “green” aspirations of it’s community and creative cultural expression through the arts.

Permaculture input

It was during the above planning study that I was invited to develop a permaculture concept plan to integrate the new village areas and nearby rural residential land with each other and the existing village. Following thirteen years of involvement with remote rural communities, this was the opportunity I’d been waiting for, the revitalisation of an existing village. The trend for intentional communities to settle on large remote rural properties attempting to create ‘self-reliance’ in isolation has resulted in a litany of social, economic as well as environmental problems and a widely dispersed rural population difficult to service. Yet there are so many small rural settlements in need of revitalisation, where infrastructures (school, community hall, general store etc) exist to build on, where a clustered population boost would bring needed services and business opportunities into the thresholds of viability.

Key components of new village developments

The first developments have been on rural land adjoining the village boundary. The proximity to the village provides accommodates the amenity of rural living within walking distance of village facilities.

Jarlanbah Permaculture Hamlet

This 55 acre rural residential property is a short 1.5 km from the heart of Nimbin village – a short bike ride and pleasant walking distance. As NSW’s first rural



Figure 2: Nimbin village social catchment profile

community title, it consists of 43 freehold residential lots which share 33 acres of community land.

The residential lots are 2,000 sqm (half acre) a manageable size and adequate for a generous zone 1 garden, food forest and small livestock systems. By-laws ensure the use of passive solar design, water collection and conservation, and foster responsibility towards neighbours. Solar rights are protected and use of compost toilets and grey water treatment for re-use encouraged. The internal grid electricity system, privately owned by the community, delivers a 20 amp connection ensuring the use of energy efficient appliances. A 5 amp trickle feed is available for stand-alone solar systems eliminating the need for generators.

The community land is designated for specific uses and activities. The major gully system is reserved for rainforest regeneration and has 5 dams for wildlife, recreation, aquaculture and fire fighting. There are 3 woodlots, 5 areas for sustainable agriculture, a central community centre and open space area. A network of slashed tracks provide walking trails, access for maintenance and fire breaks. The wildlife corridor and a walking track connect via Djanbung Gardens to the village.

Example of Cultural Mapping

as a tool in design these maps show people's use patterns and the issues that concern them

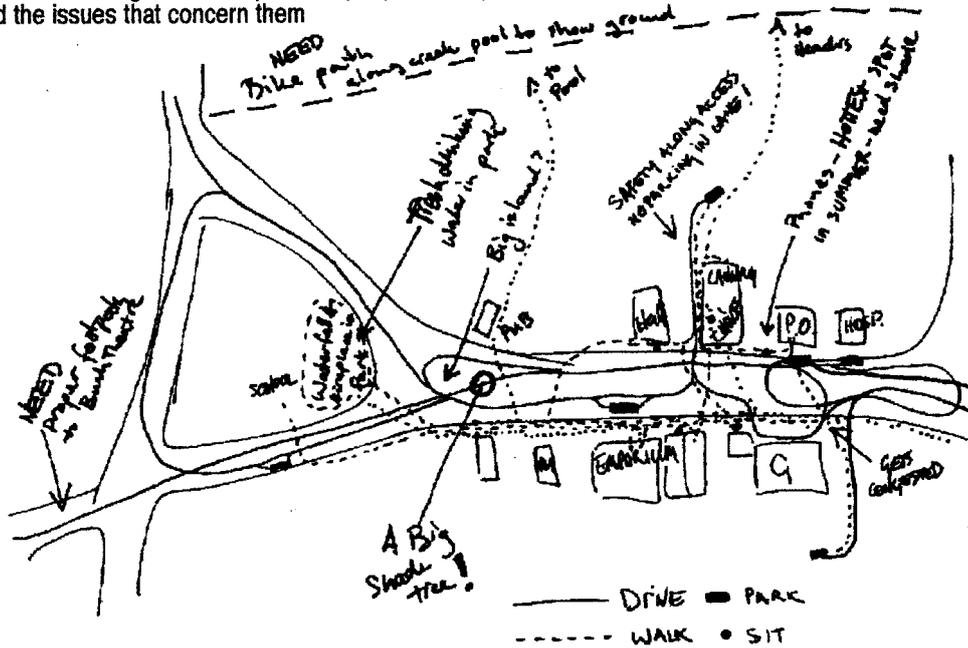
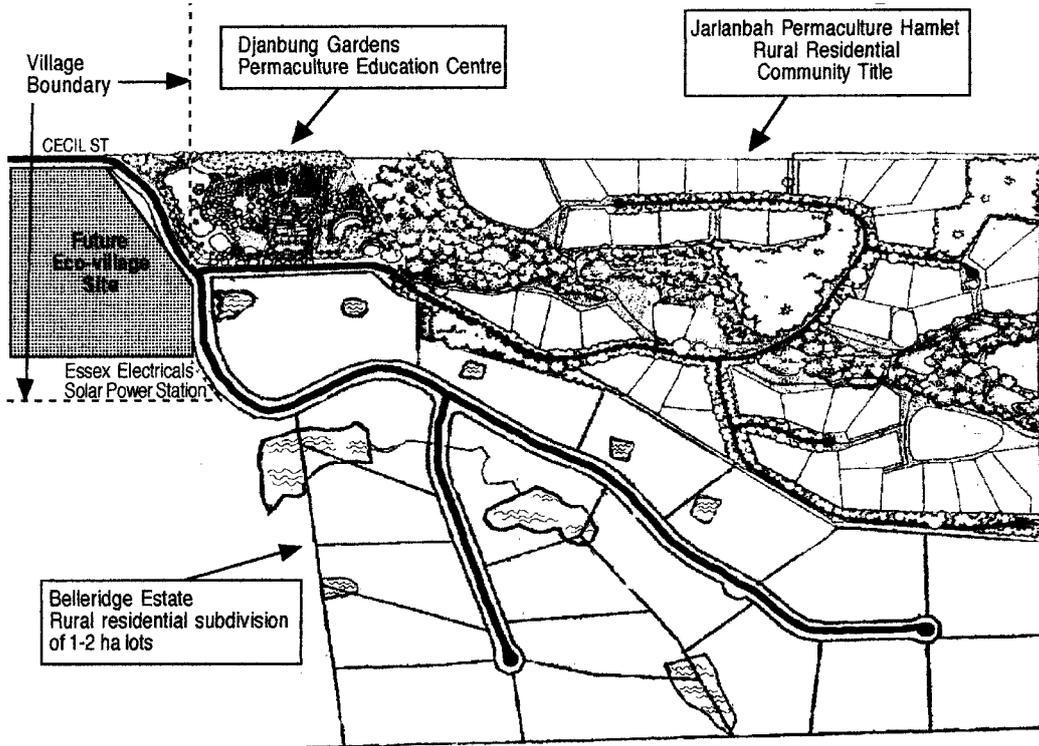


Figure 3: Nimbin cultural mapping



Nimbin Village - New Permaculture Settlements

Figure 4: Nimbin Village - new permaculture settlements

Belleridge

Adjoining Jarlanbah, and the same proximity to the village is 'Belleridge', a rural residential subdivision of 1-2 hectare freehold lots. This provides an alternative option to Jarlanbah for those who need more personal land and don't yet feel ready for 'community' life. The lots are designed so that 2-3 lots share a common dam which will necessitate communication and cooperation between neighbours. Like Jarlanbah, the purchase price includes a Permaculture design course to give residents the best possible start with sustainable design and development of their land.

The present of Jarlanbah has spilled over into local government planning policies, so many of the design principles and By-laws of Jarlanbah are now enshrined in policies and development conditions imposed by Council on new rural residential subdivisions which apply to Belleridge.

Djanbung Gardens

Djanbung Gardens Permaculture Education Centre is a 2 ha rural property at the edge of the village and neighbouring Jarlanbah and Belleridge. The demonstration farm and educational facilities provide a resource for the broader community. A permaculture education and demonstration site in or near the village was identified as a high priority at the Nimbin Eco-tourism Conference in 1992, attended by over 400 local people. By late 1997 the facilities will be completed and the centre will be fully operational. The demonstration farm is already established as a key destination for environmental tourism in Nimbin.

Eco-village

Across the road from Djanbung Gardens is an 8 acre property zoned for village residential. Purchased by a collective of people, including a Jarlanbah resident, the area will be developed as a permaculture eco-village with housing options including individual homes, townhouse cluster and expanded households. These will provide a range of living options not currently available in the village, especially for young people, the aged and rental accommodation. Eventually there will be Jarlanbah and Belleridge residents and aging 'hippies' in the hills who will be looking to retire in the village.

Other re-zoned village land provides for a Village Park with open space, active and passive recreation, small industry and commercial sites. Rainbow Power Company, a rainforest nursery and a small complex of workshop buildings are already operational in this area. These link via the gully systems with the eco-village site, Djanbung Gardens and Jarlanbah. Community plantings along the gullies are designed as interconnecting wildlife corridors.

Working with council

Since designing Jarlanbah and moving to Nimbin, our local government Lismore City Council, has become increasingly receptive to permaculture design. Through Permaculture Systems Consulting and Design, I have been engaged by Council for a number of design and implementation projects in Nimbin including a major community consultation process for the landscape of the village centre. With a team of

local permaculturists, workshops were conducted with the school (Kindergarten to Year 12), community groups, organisations and general public.

The theme was “Nimbin-Sense of Place; Designing Our Future”. Cultural mapping revealed important insights into people’s use of the village, problem areas and unmet needs. Questionnaires identified community values, priorities and aspirations as well as themes and ideas for the village landscape plan. A scale model of the village centre provided the perfect medium for interactive design workshops for the landscape, seating and traffic calming of the main street. All ideas were run through the “reality test” and the resulting design creatively addresses people’s real needs while satisfying Council’s requirements

The community consultation report documents the process and outcomes and has provided Council with a valuable guide for priorities in their decision making and works programmes. These include parking, landscaping, bicycleway and footpath routes, open space and signage.

Working with the community

Nimbin is unique, it’s community encompasses a wide range of human and cultural diversity from the conservative rural bastions of the Bowling Club and Agricultural Show Society, the middle ground of ‘normal’ folk, of professionals and business people, full spectrum of alternative lifestylers, aging hippies, young ferals, and the transient outcasts of other communities that live on the street. The amazing thing about Nimbin is the acceptance and tolerance of this human diversity. Both the diversity and the tolerance are intrinsic characteristics treasured by the community, young and old, straight and bent!

The community of Nimbin is very vocal, distrustful of governments, developers and anyone who may have ‘hidden agendas’. I have had to earn the trust and respect of the community and have now achieved this through listening and responding to their concerns, and delivering designs that acknowledge their input, genuinely reflect their aspirations and enrich Nimbin’s unique ‘sense of place’. It has meant treading a fine line between the factions, identifying the common ground and building upon that base of community consensus.

Community acceptance has flowed on with requests from community groups and organisations for assistance and advice with planning and design which I give freely as my contribution to the well-being and future of my community and neighbourhood.

Summary

Cooperation between community and local government, community consultation, designing between boundaries, retrofitting and building on what exists and augmenting it with new sustainable developments – Nimbin provides a unique example of an innovative approach to integrated eco-village design and community planning on a village and district level within the context of the wider bioregion. This is where the future of sustainable design for human settlement lies.

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Robyn Francis is highly regarded for her extensive work in Permaculture since 1984 as teacher, designer, presenter, writer, editor of the PIJ ('87-'92), founding of Permaculture International Ltd., presenter of the Mandala Garden video and the designer of Jarlanbah Permaculture Hamlet. In 1985 Robyn received the Permaculture Community Service Award and in 1995 received the ABC Rural Woman of the Year Award for NSW North Coast for her contribution to sustainable landuse planning & education. Robyn has been instrumental in the legislation of the new Rural Settlement Policy for the North Coast of NSW. Since 1994 Robyn has been based in Nimbin creating her Permaculture paradise at Djanbung Gardens and consulting for local Council, community groups & eco-developments in the village.

Permaculture in Japan: Suitable for the Natural and Cultural Conditions of Japan

Koji Itonaga, Kiyokazu Shidara, Moriyuki Konuma (Japan)

[Submitted Paper]

Introduction

Before the massive introduction of Western civilization after the World War II, Japanese rural villages had self-sustainable systems suitable for each one's physical and cultural condition and enjoyed a life style harmonious with their natural environment. But the excessively rapid economical development and capitalization once admired as miracle by both western and oriental countries lead them to the disintegration and separated them from the natural system. As its result, on one hand, the rural villages have got underpopulated and the national food self-supply rate decreased to less than fifty percent in calorie consumption base and comparing to the early 1960's about fifteen percent of once productive land has been turned to residential area or just abandoned.

On the other hand, urbanization together with overpopulation causes the physical and metaphysical pollution. Living in the artificial and materialistic environment, suffering from air, water, food and some other pollutions, and exhausted by everyday competition, city dwellers feel bodily and mentally suffocated. The fact that all the newspapers and magazines are filled with articles concerning health or healing indicates their critical situation. Permaculture reminds us the critical value and importance of social and cultural system our ancestors had constructed on the basis of deep understanding of the relationship between nature and human activities in the context of sustainable human settlement. We don't retrospect the past with nostalgia but recognize the system as a prototype with which we can construct a totally new unit of sustainable society.

What we intend to do is to identify some crucial aspects of the human eco-system of rural villages still remaining self-sustainable and report some going-on movements of reconstructing self-sustainable societies on the basis of the integration of traditional wisdom and modern ecological recognition to contribute the further development of permaculture.

Japanese rural villages, a model of self-sustainable human settlement

A Japanese traditional rural village had composed a "Human Life Ecosystem", an entity of interactive relationships between natural environment and a human's society where the latter was integrated in the former in a harmonious way as to be sustainable. In other words, a Japanese rural village developed as an universe consisting of three different spaces, such as cultivated, residential and natural.

A rural village, as the smallest unit of space where nature and human society co-exist, had been ecologically sustainable before the modernization. The import of resources from outside was minimum and the people had the life dependent on the sustainability of the regional resources such as microclimate, trees, soil and water. A regional and sustainable system had been developed on the basis of regional resources.

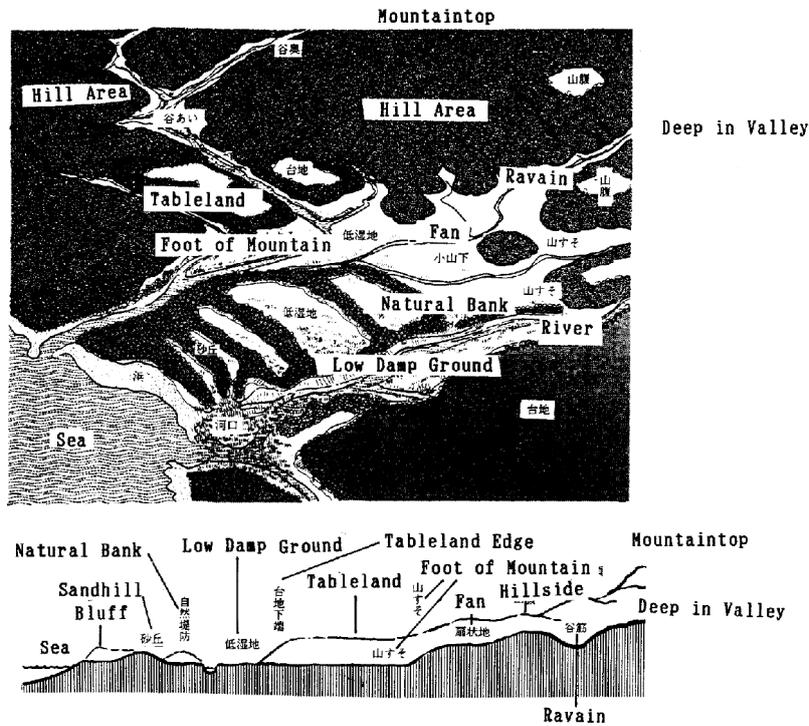


Figure 1: Traditional village location in Japan²

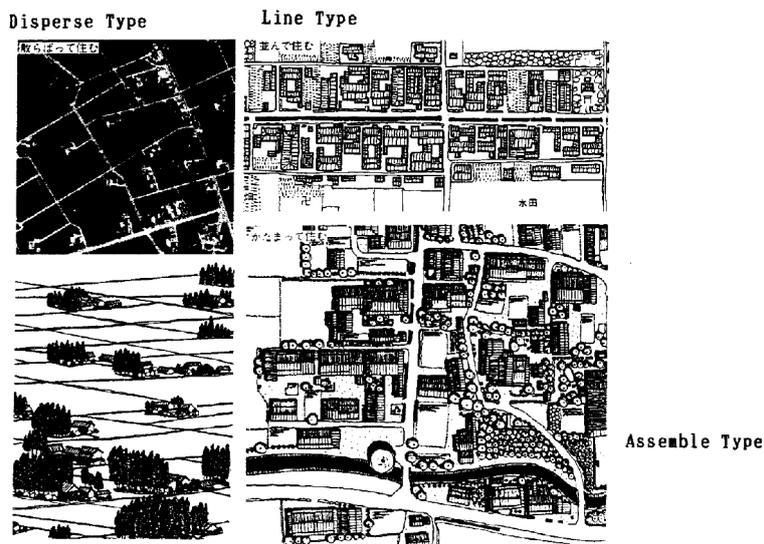


Figure 2: Traditional types of village formation in Japan²

² from Villages by Rural Planning Committee in Architectural Institute of Japan

Figure 1 shows the location of village harmonized to geographical feature. **Figure 2** shows three traditional and spatial village types. All the types have water area, natural area with small forest functioning as foodforest and windbreak, large forest, agriculture field and small agriculture field for self-supply. These systems have been maintained by many farmers for more than 300 years. The water around a village have used for both paddy field and household matter. In the small forest around a farmer's house, leaves and branches have been used as compost and firewood. In village forest, every about twenty years, trees have cut for making charcoal or building material. A large forest behind villages functions as water storage, forest-foods, and spiritual area. **Figure 3** shows these topological pattern.



Figure 3: Disperse type village landscape

The principle of Japanese rural village structure

As well as the physical factors such as site, topography and climate, social and spiritual factors have crucial importance on the structure of rural villages. Some conceptual models explaining the structure of the villages have been proposed:

- A three dimensional model composed by the functional, social and conscious space.
- A hierarchical model composed by living, productive and conserved space.
- A mountain village model composed by residential area, village mountain area and undeveloped area. The model is similar to a settlement model based of “Feng Shui”.

The principles of Japanese rural village structure can be described as:

- *Zoning* – Residential zone, production zone, spiritual zone.
- *Linear structure* – Factors are related by linear infrastructure such as roads and rivers.
- *Similarity* – Similarity of living space.
- *Composition by subsystems* – Composed by subsystems based on lineage or spatial relationship.
- *Identified border* – The borders of rural villages are well identified by symbolized space.
- *Common space* – Community roads, shrines, community forests, commonly used forests.

The aspects to be considered to reconstruct self-sustainable rural villages

Natural environment

In hilly areas, with which Japan is abound, we need to think of watershed as an important factor of the reconstruction project. Streams and rivers are the crucial factors to identify an area of ecological entity.

Landscape

Landscape is an interface of nature and human's activities where the relationships between the former and the latter are materialized. The similarity of Japanese rural villages is one of their characteristics.

Social and cultural aspects

Japanese rural societies was composed by small scale communities. There are about 140,000 rural village communities in Japan. To reconstruct Japanese rural villages as "Eco-village", the re-evaluation of the small communities as the body to control the relationships between nature and human is of necessity.

Various possibilities of "eco-village" in Japan

In urban areas

Rural village located close to cities can make use of the both advantages of urban and rural area. In other words, in the villages, agricultural resources such as fields and experiences of working with nature are the important factors to improve the urban environmental situation. The mixture of urban facilities and rural environment can provide a model of reconstructing urban villages coexistent with agriculture.

In rural areas

In rural villages the sense of value have been diversified by the urbanization and the decrease of relative importance of agriculture in the rural life. To reactivate the villages the creation of their self-sufficiency in harmony with the natural environment is crucial. It will result in rendering the villages more attractive than urban areas.

In mountainous areas

The most important problem in mountain villages is depopulation. To resolve this problem, reorganization of the village structure on the basis of more active relationships with urban cities is vital and highly required. The advantages of living in mountain villages should be more fairly recognized and made use of to attract the people from urban areas. The reconstruction of villages should be based on the integrated project of forestry, agriculture and tourism.

The trials for sustainable societies

The case of Yu-Ichi (Dream Market)

Japanese agriculture is now at the edge of destruction and so are the rural villages. But here, the success of Kanayamacho Yu-ichi group indicates one direction Japanese agriculture should follow to keep its independency and one way to reconstruct a sustainable community.

The embarkment of Yu-Ichi

Located in the north-east area of Yamagata Prefecture, Kanayama-cho has fostered forestry as its main industry and has been famous for Kanayama cedar trees. As for agriculture, rice has been its main crops for long time and they have grown vegetables in their kitchen garden for their own use.

In 1979, Yu-ichi originated on the concept of “ottai-nai (no waste in Japanese)”. A policy of cutting back the acreage under rice cultivation brought about the overproduction of vegetables for family use. JA (Japan Agriculture Association) Kanayama branch, therefore, opened a vegetable market to sell the surplus. About thirty farmers took part in the market and sold their vegetables.

As the shoppers were mostly housewives in the town, they felt ill at ease at first. They were too shy to sell their products face to face. This market was the origin of Yu-ichi named under Yu (evening in Japanese) and Ichi (market in Japanese) . As in the initial stage they sold surplus vegetables not standardized, there were some confusions of quality, quantity and price. A lot of vegetables were left unsold. In addition, the incomes earned in the market didn't deserve the labor they put there. More than half of the initial members gave up the market and just seven of them continued.

The process of development

But the concept of Yu-ichi was appreciated and it had a chance to expand outside the town. In 1982 they opened a branch of Yu-ichi in Shinjo City next to their town. At first the market was opened by Mogami Branch of Yamagata Prefectural Economic Federation of Agricultural Cooperatives with the purpose of selling the products of JA branches in the area. But other branches soon gave up because of their insufficient supply system and only Yu-ichi could stand.

Yu-ichi opens every Friday in front of JA shop and has become the shop's good attraction. In 1986 when a new branch was initiated in Yamagata City , it opened irregularly and a research was done on vegetable consumption. Its result is that the consumers valued “safety”, “freshness” and “cheapness”, which are now recognized to be important criteria to evaluate foods. The members of Yu-ichi knew that they could meet these requirements and decided to open the market regularly.

In 1990, each of the members equipped processing facilities in their own home for the wintertime production. They produced processed rice foods and secured income in winter. Their slogan has been “Keep Going”, that is the key concept of Yu-ichi's success. It seems they have constructed an efficient system in the process of keeping Yu-ichi going.

Toward sustainable agriculture

In Yu-ichi, they sell more than 200 kinds of fresh and processed foods such as vegetables, mountain vegetables, flowers, fruits, processed rice foods, pickles, all of which they grow and process by themselves. Most of the fresh products are cultivated without or little pesticide and herbicide. They process foods in a traditional way and use no chemical. In other words, they respect the earth and value traditional culture they want to pass to the next generation. This will lead to a sustainable agriculture.

Creative life creates the joy of life

Yu-ichi also provides the chances of communication between producer and consumer. At the beginning Yu-ichi was the place to sell products. But in ten years, it turned the place of heartfelt communication and of selling dreams. Both money and the joy of mutual communication produced in Yu-ichi provide the members with a joy of life.

Another benefit Yu-ichi brought to the members is the joy of creating their own life. They make the plan and schedule of Yu-ichi, produce foods and sell the products. They are proud of doing all of them by themselves in spite of their hard work. This self-sustenance saves the labor and leads to the low price of products. Consumers can enjoy safety, good taste and low price of products. The system of Yu-ichi shows a prototype of new life supported by agriculture.

Economical independence achieved by integration

The most important characteristics of Yu-ichi is the integration of production, processing, distribution, and selling. Its members deal with all the processes related to the activities mentioned above. They produce foods, process and sell them by themselves. The fact that they don't need any goods or services from outside enable their economical independence. Their income has consecutively increased last sixteen years up to between five and nine million yen per year per family (about three million yen per year per person).

One other characteristic is its flexibility. Organized by a small group, it quickly responds to the needs of the consumers. In the process of growing up, it has also developed various businesses. Food supply to the school lunch, food delivery, tour operation for the urban people to visit farms where their foods are produced are some examples. The members of Yu-ichi are active to expand their market to outside their region to achieve economical independence.

Multiple gifts

Farmers have been called Hyakusho in Japanese. This name means one hundred titles. In other words, they do anything. The member of Yu-ichi are blessed with multiple gifts and deserve this name. Under the serious situation of Japanese agriculture, they had to be multi-talented to survive as farmers.

If we think globally, the modern system, that supported the development of conventional agriculture, is now at the edge of collapse, the integrated activity of Yu-ichi seems to show a model of new agriculture.

Next dream

Yu-ichi means "dream market". Its next dream is to start a full-scale business in harmony with the life actually well organized. To make this dream come true, they try to establish an economical system where people can cooperate rather than compete. Their methodology is simple but efficient: think, select and act. New attempt will bring up new problems. But the members of Yu-ichi believe that no problem is without solutions. They have already got through some difficult situations. As long as they hold the courage to continue their activities, the dreams will come true.

The history of Yu-ichi

1979 Inauguration of Yu-ichi. 30 farmers' participation.

- 1982** Opening of Shinjo branch.
- 1986** Opening of Yamagata branch. Start of the food supply to school lunch.
- 1988** Improvement of food processing. Yu-ichi opened 81 times.
- 1990** Construction of new food processing plant.
- 1992** Contract of foods and accommodation supply for ten years with urban dwellers.
- 1993** Visit of 400 urban dwellers.
- 1994** Award of Best Agriculture in Yamagata Prefecture.

The case of Permaculture Center Japan

Being supported by a local government, a university, a company and people sharing the same vision, Permaculture Center Japan (PCCJ) was established June 1 of 1996 with the objectives of constructing the structure of Japanese permaculture on the basis of its own natural and cultural conditions. It is located in a rural town about two hours from downtown Tokyo and endowed with natural environment.

The activities include:

- *Model construction* – It actually rent one acre of farm land and an old farm house. To construct a model site with them and collecting data on it is one of its main activities. The farm slightly slopes and faces south, with two streams running at the border. As this farm had been abandoned for more than five years, this model construction is all the more important from the view point of rural revitalization. Both local traditional farming technologies and modern ones are mixed in harmonious way to get better production. The house is now under renovation and will be equipped with an earth-friendly water and waste treatment system. In the next stage whole model sight will be designed. After the close observation of the site, its climatic and cultural characteristics will be identified and a landscape design responding to the requirements of nature and people living there is to be defined.
- *Theoretical construction of Japanese permaculture* – The research on Japanese rural villages to identify the crucial factors supporting their sustainability has been done together with the collection of information of sustainable settlement and of permaculture in other countries. The study of locally cyclical economy will be undertaken.
- *Promotion of permaculture and establishment of environmentally friendly business* – Permaculture certificate courses and workshops will be organized at regular basis. Information sheets and some other publications will be issued. Some businesses such as permaculture consultancy and designing will be initiated to establish the financial basis of the Center and to give impact to the local economy.

Organization

PCCJ is a membership-based organization. The members select the committee that supervise and is responsible for the activities. The secretariat actually manages daily works.

Problems

As the Japanese rural society has very rigid structure and land is separated into small pieces owned by different owners, the activities of PCCJ get some restrictions. Realizing it almost impossible to construct a permaculture village in a vast area, its strategies is to get the people aware of the value of traditional social system and reconstruct sustainable society on the basis of the tradition.

Conclusion

Being at one of those rare points in history – a time of great change, a time when change is unpredictable as it is inevitable, we need to realize what can serve as the basis of the next stage of the world. To rely on something beyond our control or separated from what we have constructed and verified in the history is least desirable. It should be emphasized that eternal development cannot be materialized by scientific or technological renovation.

We have no intention of urging the superiority of self-sustainable system of Japanese rural villages or generalizing their principles that are locally limited and have the meaning just in the context of Japanese culture. What we want to insist is that all the cultures developed and being developed by the living people's firm intention of creating better world and love for nature have sustainability and can contribute the further development of permaculture.

Appendix

Permaculture principles

Valuations of spatial designs about Japanese traditional rural villages by permaculture principles:

- *Relative location*
 - [depth forest ~ village forest ~ windbreak ~ farmhouse lot ~ self-sufficient agriculture field ~ paddy field ~ river] a system of relative location with centre of farmhouse lot.
- *Each element performs many functions*
 - **Functions of depth forest:** afforestation, keeping water, dwelling for many animals.
 - **Functions of village forest:** afforestation, keeping water, producing mushrooms, dwelling for many birds, firewood, compost, building materials.
 - **Functions of pond in farmhouse lot:** appreciation, thawing snow, producing fishes, making microclimate, fire prevention.
 - **Windbreak:** screen from snow, firewood, compost, dwelling for many birds and insects, making microclimate, fixing soil.
- Each important function is supported by many elements
 - **Securing water:** valley water, well water, local water service, spring water, rain water.
 - **Fire prevention:** windbreak, pond in farmhouse lot, river.

- Efficient energy planning
 - Landuse planning with a centre of farmhouse lot group, [preservative ~ great productive area ~ dwelling area] securing sunshine, having good airing, controlling snow stock, locating farmhouse lot near edge of forest for securing water.
- Using biological resources
 - Bird function: bring many seeds up mountain against gravity.
 - Butterfly function: pollination.
 - Domestic animals' function: compost of faeces and urine using trees, eulalias and bamboos as building materials.
- Energy cycling
 - Compost of garbage, producing ashes for agriculture by burning refuse or soil, using water mill.
- Small-scale intensive systems
 - Small farmers land use system. [farmhouse lot ~ windbreak/channel ~ self-sufficient vegetable garden ~ vegetable field ~ copse]. A village was made by the connection of this system set.
- Accelerating succession and evolution
 - Cycle of slash-and-burn agriculture, maintenance of copse for producing woods and compost, keeping windbreak and village forest for sustainable production of forest-foods.
- Diversity
 - Producing soybeans in a footpath between rice fields, natural agriculture, collecting wild plants in the village forest, planting Chinese milk vetch before planting rice plants, various planting method.
- Edge effects
 - Locating a village on the edge of forest for looking for water.
 - Windbreak: connection area between natural ecosystem and human ecosystem.
 - Edge of a river: various wet-ecological system, using grass for feeding domestic animals on a bank, using grass as farmhouse roof material.

Patterns



Figure 4: Farmer house landscape at foot of mountain



Figure 5: Windbreak and snowbreak forest

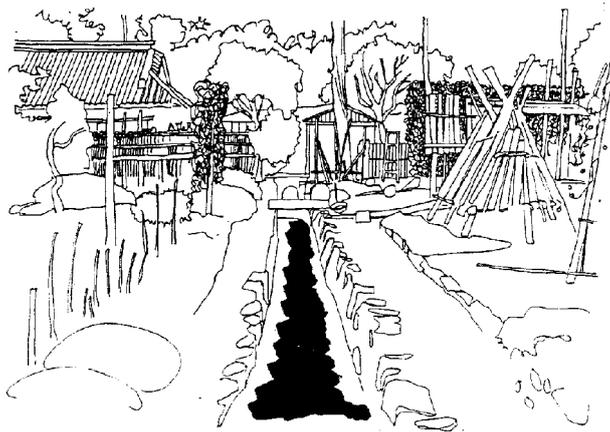


Figure 6: Farmer house lot with waterway for paddy field

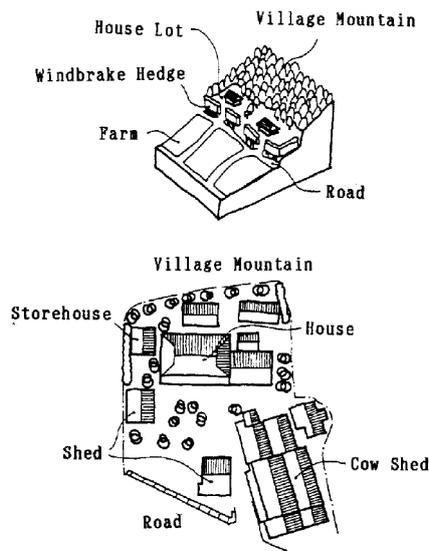


Figure 7: Farmer house landscape

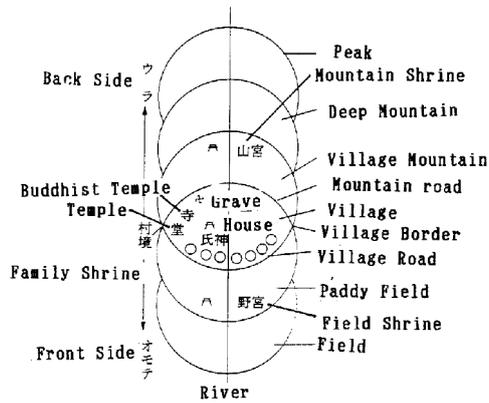


Figure 8: Primitive landscape in traditional village in Japan

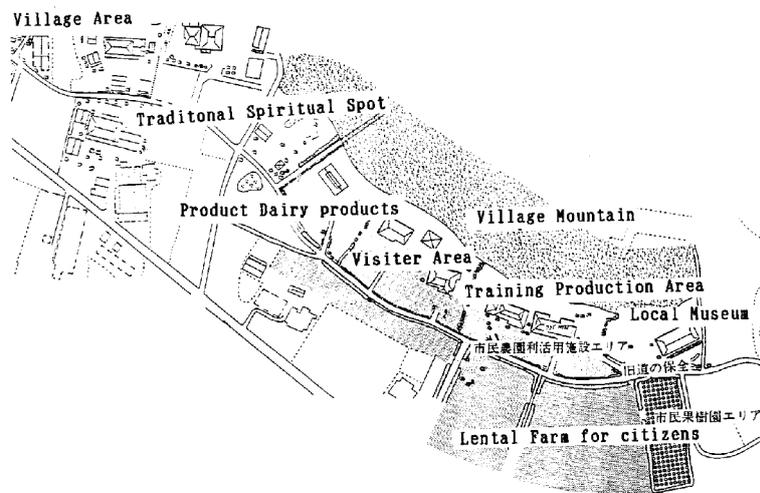


Figure 9: A reconstruction plan of a village of urbanize area in Tokyo

Crestone/Baca, Colorado

Linda Joseph (USA)

[Submitted Paper]

Crestone/Baca, Colorado in the Southwest United States, is an example of the on-going transformation of a community toward sustainability. This 25 year old, rural, mountain wilderness community, surrounded by hundreds of thousands of acres of ranch land, was originally planned as a resort/retirement development. It has grown slowly and is still in a formative stage. A large number of spiritual and environmental organizations are based in this area, and have in recent years attracted younger people with great interest in alternative and ecologically sound living. This presentation includes an overview of the diverse and unusual demographics of this locale and its residents and the great opportunities and challenges inherent in present endeavors to create sustainability: environmentally, spiritually, socially and economically.

Natural resources

Crestone/Baca is located in the vast 5,000 square mile San Luis Valley of Colorado. This valley at 8,000 feet above sea level, is surrounded by snow capped peaks of up to 14,000 feet on three sides, and sits on one of the largest fresh water aquifers in the world. Air quality is usually of very high calibre, and clear content. The mountains and valley make their own climate in this unique combination of high desert and alpine geography. The soil is a mix of sand, clay, cobble and rock. There are streams and greenbelts of aspen, ponderosas and cottonwoods, coniferous and aspen timber are thick on the mountains; pinon pine and junipers are sparsely scattered on the lower foothills to the open prairie valley floor.

There is great interest by residents in setting sound standards for environmentally friendly activities, interventions and development, identifying key natural resources, and establishing conscious programs of stewardship to preserve them, including, but not limited to – water, power and transportation conservation, sewage treatment, building materials, methods and techniques, and careful consideration of community and neighborhood design.

Wildlife

Crestone/Baca is wilderness, and is home to a variety of wildlife, including – elk, pronghorn, mule deer, mountain lion, bobcat, black bear, coyote and a variety of fish and small animals. Because bear and mountain lion live here, standard wilderness precautions apply. Feeding of game animals is strictly prohibited, and the feeding of all other wild animals is strongly discouraged. The San Luis Valley is a global flyway for waterfowl, songbirds and raptors (eagle, hawk, owl), some on the edge of extinction. Biting insects of many kinds are prevalent spring through midsummer.

Many homes and building sites are located in wildlife breeding, birthing and feeding areas. The natural habitat decreases with increasing human encroachment; encounters with bears (no longer hunted) are increasing. People are attracted to the

beauty of the mountains and their high, wild places, yet, we face the challenge of protecting the wildlife and their habitat from the negative impacts human presence can bring.

Weather and climate

The climate at 8,000 feet above sea level can be quite harsh. Natural and man-made events include extreme temperatures, intense sunlight, heavy snows, wind and dust storms, torrential rains, lightening strikes and wildfires. Annual precipitation in this semiarid valley averages 7 inches. In the foothills, precipitation is nearly double that in the Valley, and temperatures are warmer, particularly in winter. Sub-zero temperatures at night are common during the Winter months. In the coldest month (January) average high temperatures are 35°F (2°C) and average lows 9°F (-12°C). During the hottest month (July) average highs are 82°F (27°C), average lows 50°F (10°C). Average annual snowfall 69.5". The San Luis Valley averages 330 days of sunshine yearly.

Human presence and impacts

Crestone is a small town (one quarter mile square), in existence since 1880 – gold mining days – with a current population of about 60 people. The Baca Grande is a housing development adjacent to Crestone, designed in the 1970's, with 5,527 lots for homesites – 328 homes built to date – 105 miles of roads on 19.57 square miles of land, and a population of approximately 600. Manitou Foundation holds approximately 1,600 acres of land adjacent to the Baca, mainly in the foothills of the Sangre de Cristo mountain chain. Hundreds of square miles of San Luis Valley ranch land borders the Crestone/Baca community on the other three sides. Ranching is a dominant activity in this area; the first ranches were established in the mid-1800s, with many families ranching here generation after generation, with most of the land being used for cattle pasture and/or hay production.

Manitou Foundation is a Private Foundation developing a land preservation program for most of its acreage, and also offering some land grants to qualified organizations in the following categories – religious organizations and spiritual projects, ecological and environmental sustainability projects, and related educational endeavors (youth and adult). Manitou Institute is a charitable organization that fund raises and distributes funds to religious organizations and spiritual projects, ecological and environmental sustainability projects, related educational endeavors (youth and adult), and indigenous peoples projects, particularly in the San Luis Valley of Colorado, with national and international outreach and networking.

Manitou Institute and Manitou Foundation, have significantly contributed to shaping the community, supporting a wide variety of spiritual and environmental projects to locate in the area. Crestone/Baca is not a contained intentional community – anyone can choose to live there – and the diversity is remarkable: ranchers, retirees, priests, nuns, old hippies, spiritual seekers, young families striving for wholesome life styles, Tibetan lamas... and the list goes on! The predominance of spiritual centers offers opportunities for inspiration to those seeking to develop their spirituality and a spiritually sustainable life-style.

Established churches and Spiritual Centers in the area include, two churches in or near the Town of Crestone – The Crestone Baptist Church, and the tiny Little Shepherd in the Hills Episcopalian Church. A number of others, representing many of the world's great religious traditions are in various stages of getting established, such as:

- Spiritual Life Institute & Nada Hermitage Retreat Center – Carmelite Catholic Monastery;
- Crestone Mountain Zen Center, a Zen Buddhist Monastery & Retreat Center;
- Haidakhandi Universal Ashram, a spiritual center inspired by Haidakhan Babaji of India, dedicated to the Divine Mother, with devotional practices from the Hindu tradition; • San Luis Valley Tibetan Project (Kagyu lineage);
- Sri Aurobindo Learning Center;
- Samten Ling Retreat Center, a project of Mangala Shri Bhuti – a Tibetan Buddhist organization of the Nyingma tradition;

Environmental and Educational Projects based in Crestone/Baca include:

- SUBUD's Atalanta Project, an inter-disciplinary eco-center, planned as a living/working demonstration of the relationship between culture, healing and the environment, offering experiential education for people of all ages;
- BCHASA, the Baca Center for High Altitude Sustainable Agriculture;
- EDUCO, an international youth training organization providing camping retreats for youth in the development of self esteem, wilderness skills, respect of nature, healthy relationships and team work;
- Baca Institute of Ethnobotany, offering educational programs and ethnobotanical tours, on medicinal plants, plant dyeing, and the intricacies of the human-plant relationship;
- Global Action Plan for the Earth (GAP) – Household EcoTeam Program;
- Eco-village Gatherings, held once or twice monthly, for video programs, information exchange, discussion, action projects and support in living sustainably.

Many residents were attracted to move to Crestone/Baca to be near a spiritual center or environmental project that is based here. The wilderness conditions stimulate awareness of sustainable life-style practices necessary to keep from destroying the natural beauty of this area. There is a significant interest in alternative and natural building and gardening practices, and sustainable community concepts. This community, represented by Manitou Institute, was invited to participate in the Global Eco-village Network seed group, comprised of twelve communities from around the world, all aspiring and striving toward sustainability.

Social climate

The social situation in Crestone/Baca is rich and diverse – a stimulating scope of experience ranging from fulfilling to demanding, strong in groupism and individualism. In this wilderness area, the magnitude of the mountains seems to amplify personal experiences – psychologically, emotionally, physically and spiritually, providing the distinctive atmosphere for inner personal work and contemplation. Some people find that it is advantageous, or even necessary, to leave the influence of this setting periodically. Life is simple, away from the “conveniences” and activities available in more populous areas. This is particularly challenging for the children.

Major issues which have galvanized the community over recent years are – keeping the water of this Valley in the Valley versus selling and piping it to distant large cities; military flyovers in our airspace, and exploration for gold and oil by a mining company that owns significant mineral rights in this area. Such highly charged issues have provided common ground for otherwise vastly different social groups, contributing toward an attitude of respectful and cooperative – unity through diversity – and social sustainability.

Governance

Four entities of a traditional nature govern in this area – the Town of Crestone Board of Trustees, Saguache County Government, Baca Grande Water & Sanitation District and the Baca Grande Property Owners’ Association. The Baca Grande is a covenanted community, with Covenants & Restrictions created in the early 70’s, now being reviewed for changes. Present landowners have inherited the many major challenges of a massive development designed with maximum sales as the main consideration. Some lots in the development are not buildable for reasons varying from the existence of wetlands, waterway diversions, ancient trees, other significant environmental features, significant wildlife habitat and mountainous topography. Properties in this development, both vacant and improved land, range broadly in price relative to their actual assessed value. Some are being sold in the Pacific region for many times their assessed value.

Until recently there has been a notable deficit of County regulations, zoning and codes controlling land use and development. Though with growing concerns of the danger of this area becoming another suburban sprawl and spoiling the wilderness, efforts in proactive planning are in progress. The challenge here is to protect, without limiting the innovative and creative flair that has flourished in the freedom for experimentation.

Commercial enterprises and sources of local employment

There is not an abundance of jobs, nor are there many places to spend an income. Since it is still quite small, the local community lacks many of the amenities and commercial opportunities of a more mainstream community. A high level of voluntarism is required to cover community service needs such as – the property owners Board of Directors, Environmental & Architectural Committees, Library Committee, Emergency Medical Tech Association, Fire Department, Charter School, Saguache

County Search & Rescue, Crestone-Baca Community Arts and Recreational Center Association, among others.

There are only a handful of local businesses serving the community, such as – two small family owned and operated General Stores, three Restaurants/Cafes, a few gift shops, a liquor store, laundromat and small apartment complex in Crestone, a townhouse and college satellite campus complex, the Baca Grande Property Owners Association office and maintenance staff, and Water & Sanitation District staff, six privately owned Bed & Breakfasts and four real estate offices.

Self employment in the area includes – contractors, builders, carpenters, alternative building consultants, handy man and house cleaning services, small cottage industries (herbal preparations, clothing manufacture and tailoring, gift item production), organic produce growers, photographers, artists (pottery, painting, sculpting), writers, massage therapists, counsellors, child care providers, extremely limited professional services (legal, accounting, computer, and architectural). In addition, there is work provided by local ranches. Some residents commute to jobs in larger small towns approx. one hour away. The limitation in opportunities for a livelihood is an ongoing challenge to creating economic sustainability, yet, there is also the strong inclination of community members to protect the wilderness life-style and reject an influx of commercial enterprises.

The ongoing Crestone/Baca Sub-Area Master Planning process, initiated in 1994, has helped the community to identify its values and common interests, begin to establish a community vision, and identify goals and objectives to guide land use and development for the future. Plan principles that have clearly emerged include -preservation/conservation of agricultural land, protection of view corridors, open spaces and linkages between them, density reduction in the development, expansion of community services and creation of a community center, respect for and preservation of the contemplative atmosphere and wildness in nature. Other initiatives that parallel the Master Plan include, evolution of the Environmental & Architectural Guidelines and Committees with emphasis on sustainable materials and methods. Through this great variety of efforts, there is gradual, yet steady progress toward sustainability – environmentally, spiritually, socially and economically, in Crestone/Baca.

Eco-village (Re)Structuring

Declan Kennedy and Margrit Kennedy (Germany)

[Submitted Paper]

The *initial approach* and objective of our study was to unearth practical experiences gained both in the planning phases and in the architectural implementation of medium-and larger-scale eco-villages and urban renewal projects and to ascertain whether general recommendations could be derived from these experiences for the future implementation of such projects. Here I present the findings of our study, focussing on several important issues. We would like to look at village (re)structuring in a holistic context, and to trace development curves which have defined ecological architecture since its emergence in the early seventies.

Optimisation of the whole

In practice, the concept of the “eco-village” is a multi-faceted one, encompassing the qualitative improvement of open spaces, traffic limitation, new social relationships and forms of organisation, strategies of energy and water efficiency, building biology criteria, the recyclability of building materials, aesthetic qualities and new cost/benefit analyses. What unites all of these aspects, however, is that they strive for, and to varying degrees attain, *an optimisation of the whole*, rather than a maximisation of individual parts – a permaculture principle – and thus a new quality of housing, and indeed of life itself.

The projects examined here differ considerably in their objectives, approaches and the individual circumstances in which they came about. But together they show that where there’s a will, there’s a way to make concepts for urban renewal and eco-village projects a reality. This study is aimed at indicating to people wishing to construct ecologically – be they decision-makers, initiators, people involved in building or restructuring, planners, architects or the future residents – what is possible and what is of real importance by comparing various solutions.

The outcome of the study is the following *findings*, namely that:

- ecological strategies are particularly feasible in the planning of larger-scale settlements that go far beyond the scope of measures that are feasible for a single-family dwelling,
- many basic principles of traditional architecture and urban design, such as regional architecture, are ecologically beneficial and easily incorporated into planning,
- new eco-village and urban renewal projects do not have to make building more expensive; quite the contrary, that they are often the most cost-efficient solutions, both financially and in terms of the wider economy,
- nonetheless, planning processes from start to finish still require considerably more time and energy and this is generally not appropriately remunerated,

- public funding plays a crucial role where large-scale projects are concerned
- holistic approaches are generally more successful than projects focussing on a one-sided optimisation of individual ecological aims,
- good results can be achieved with a moderate application of new technologies and with new techniques, if the planning process is appropriately designed,
- the commitment, courage and persistence of everyone involved are just as necessary as a carefully worked-out, clear strategy,
- successful implementation is a social skill,
- occupant input options are desirable within a clearly defined framework,
- an international exchange of experience can be a big help in successfully overcoming difficulties in the implementation phase.

These practical experiences, in combination with other models which have been built, can yield specific recommendations for priority areas in the planning and implementation of future eco-village design projects, although it is quite clear that at the moment, almost no other field of architecture is changing as quickly as “ecological architecture”. Nearly every day, new technologies and ways of saving energy, water or materials are developed. Naturally, a talk like this one can do no more than convey the state of the art at a given period in time. Nonetheless, certain trends for future development do emerge from the brief history of “conscious” ecological architecture which roughly spans the past twenty years.

The rise in efficiency and sufficiency

Our forefathers constructed ecologically mainly because they had no other choice. Their buildings reflect the building materials available to them from the nearby area, which could be integrated back into nature without difficulty after use. Supply and disposal structures were on a human scale and organised in a way that individuals could comprehend. These are two reasons why traditions of regional architecture can hold some important lessons for contemporary ecological designs.

With the rise of industrialisation, it became possible to create chemical and synthetic building materials and construction methods which, while they had clear advantages from the standpoint of durability and cost efficiency, were generally not so easily integrated back into nature.

Hand in hand with urban expansion and the growth of the transport system came the development of large-scale linear and centralised supply and disposal systems which created a widening gap between producer and consumer, between cause and effect. The expansion of the drinking water system, for instance, and above all the sewage system, brought with it not only a decrease in the danger of epidemics and the elimination of a source of highly offensive olfactory pollution, but also a diminished awareness of water as a life element and of the impact of the individual's way of dealing with it. The same is true of the energy and food supply, and of refuse and wastewater disposal.

Over a relatively short period of a few decades in the nineteenth century, the vital processes of life in the city became completely invisible and were removed from the control and day-to-day responsibility of the individual. Public authorities and supply companies determine, procure and control who gets how much at what price.

This loss of an understanding of correlations results in growing quantities of refuse and wastewater, rocketing disposal costs and, not least, makes it increasingly difficult to find suitable locations to build disposal and waste industry plants. These are just some of the symptoms of an underlying crisis of material cycles at the core of industrialised society, which we seem prepared to accept, almost as a matter of course, as the downside of our prosperity.

One of the things industrial progress initially had to offer was a breathtaking rise in the standard of comfort. Thus, for instance, the average citizen of the world's highly-industrialised countries now enjoys a greater level of comfort than a king or emperor did just a few centuries ago, based on a comparison of the technical furnishings in their dwellings, their mobility or the range of food available to them, and no end to this development is in sight. The key question, though, is whether we can maintain this standard of living while solving the problems it presently causes, like resource consumption and the destruction of nature, or whether we have to accept that these problems can only be solved at the price of a significant drop in our high standard of living.

We could reduce our current rate of consumption to one quarter of its present level (Weizäcker-93), if we were to use the resources at our disposal more economically and efficiently, and were prepared to change our production processes and consumer habits.

The flow of materials in the rich countries could be cut back far more, to one-tenth of its present level (Friedrich Schmidt-Bleek-94). This be done not "only" by producing goods more efficiently, but above all by defining the services that they are intended to provide and then comparing the various options, including all of the material flows they involve, as well as their "environmental rucksacks". This requires a new way of thinking. Resource efficiency can be increased to seven times its present level using the example of a refrigerator which once it has been installed in a kitchen, lasts for one hundred years, instead of needing to be replaced every ten. And thinking in terms of services can be "dematerialised" even more, if we can do without building. If, for example, we were to bring in outpatient care services instead of building a new hospital, resource efficiency could be increased to one thousand times its current level, and at the same time we would be making a number of contributions to social well-being; ie. by creating new jobs, keeping patients in their home environment, reducing traffic and cutting costs to patients. This concept envisages as a matter of course that technically feasible resource productivity would have to be supplemented by "an increasingly unquestioning frugality in people's way of dealing with material things" (Schmidt-Bleek-94, 171).

The building sector, which currently consumes material at a rate of 20 tons per person per year in Germany alone, would naturally be a prime candidate for the new processes, technologies and altered consumption behaviour of the kind described above.

Overcoming the divide between nature and technology

In the wake of the Club of Rome's publication of its report on "The Limits of Growth" in 1972, and the first oil shock in 1973, many highly-industrialised countries began *rethinking* their building priorities. It would be fair to describe the decade from 1975 to 1985 as the "pioneering phase of ecological architecture", and the decade from 1985 to 1995 as the "testing phase". Since 1995, Europe has been in the early stages of the "application phase". All three phases have existed parallel to one another to varying degrees and embody problems and opportunities of their own.

The pioneering phase *contrasted drastically* to the approach that characterised the era of industrial expansion which followed on the heels of the second World War, epitomised in the concrete jungles of the 60s, 70s and 80s in their remoteness from nature and their wasteful consumption of resources. The pioneering phase was hostile to technology in many ways. This was the period when permaculture was originally conceived.

The motto of the ecological architecture of the time was "back to nature", to small-scale, interlinked, self-sufficient and decentralised systems. Bengt Warne built his celebrated "Nature House" near Stockholm, an inspiration for all who came to admire it, from Armory and Hunter Lovins to Martin Küenzeln and the Oekotop Group, the avant-garde of American and German thinkers in this field. Rudolf Doernach advocated "*bio*iversity" to replace the "*uni*versity". In Austria, Bernd Lötsch and Konrad Lorenz published a manifesto on "recreating semi-wild states", which were intended to replace sterile children's playgrounds, and did so in some places (Roland Rainer in Puchenau, Linz, Austria).

In Australia, David Holmgren and Bill Mollison published their books "Permaculture One and Two", which became bestsellers overnight, leaving a string of permaculture projects in their wake, from Hobart in Tasmania to Crystal Waters in Queensland, and enriching the green movement in North and South America, Africa and Asia, Europe, particularly in the Eastern Block countries (after the changes), and even making themselves felt in our own project: Lebensgarten, Steyerberg, in the German state of Lower Saxony (Kennedy-82, -88).

In North America, the "Rocky Mountain Institute" and the "New Alchemists" worked on models for a sustainable way of life and of work, as did the "Centre for Alternative Technology" in Wales and the "Langenbruck Eco-centre" in Switzerland.

This initial phase was characterised on one hand by endless difficult planning, permission and building processes, and on the other, by an irrepressible enthusiasm and a sense of breaking new ground shared by advocates of alternative lifestyles. It was also defined by a deeply-rooted distrust of the political and economic establishment and the established sciences.

The pioneers who built the first ecological buildings and small settlements had to weigh up every aspect from the standpoint of whether conventional supply and disposal system solutions were optimal in terms of resource consumption and had to prove time and time again that there were less wasteful alternatives. But they were also faced with the challenge of fulfilling increasing demands on the planning

process and of developing new technologies. As was to be expected, they only succeeded in negotiating these difficulties in some cases, and produced a number of plans which failed, providing the opponents of change with abundant ammunition for criticism and condemnation.

If in the pioneering phase people had still thought in terms of blatant opposites – the conventional large-scale centralised supply and disposal systems on one hand and the ecological small-scale decentralised supply and waste disposal systems on the other – it would have become clear during the “*testing phase of ecological architecture*”, which occurred roughly between 1985 and 1995, that considerably more differentiated planning approaches were involved.

As it is still impossible to replace existing large-scale centralised systems with decentralised systems in the time available to us, the aim now was supplementary or parallel use, as well as combination options and composite systems. Thus, in contrast to the pioneering phase, the testing phase from 1985-1995 was characterised by a step-by-step convergence of centralised and decentralised systems, and the integration of low-tech and high-tech, of nature and technology.

By now it had also come to light that decentralised systems designed for *single-family dwellings* alone were expensive and difficult to implement. Instead of proposing smallest-scale decentralised systems as the alternative to large-scale centralised systems, planners increasingly opted for solutions somewhere in between, that serviced an entire settlement. In other words, one spoke increasingly of “medium-sized” supply and disposal systems, or rather expanded the term “decentralised” to a new scale. These medium-sized systems include the various nature-based wastewater treatment systems which collect wastewater from an eco-village, extract the resources it contains and purify the water before returning it to the natural water cycle, as well as cogeneration facilities or large-scale solar hot water storage tanks which supply an entire residential area with heat.

Self-contained cycles, which could still be contrasted to *linear systems* relatively straightforwardly in the 80s, had now become considerably more complex, and used technical symbols with the same matter-of-factness as they accepted an optimal *combination of outside and self-generated services*.

Since the mid-1990s, one can safely speak of the “application phase” of ecological architecture. Many fundamental problems have been solved technically or organisationally, others by new legal regulations, and still others can now be circumvented without incurring too high extra costs. The solutions to these problems include improved building insulation, rainwater seepage, low-flush toilets and water-saving fixtures, planting measures, limited traffic zones, waste separation and prevention and to a certain extent the use of pollutant-free building materials. Nowadays, very little can be marketed without the prefix “eco” or “organic”, be it washing powder, cars or buildings. And as always, when a movement gains in size, it loses its contours. Different experts within the same discipline are likely to have very different definitions of what “constructing ecologically” currently entails. This is reflected in the fact that strict demarcation lines are often drawn between aspects focussed on by different architects within the field of ecological architecture. Advocates of “cost-

and space-efficient” building can be the most vocal critics of “green solar architecture”, and experts in “recycling-conscious building” do not necessarily go along with the “building biology” approach.

“Green solar architecture” has long since established itself in the area of administrative buildings – particularly bank buildings – of superior quality, extolling the integration of nature and technology (Foster’s Commerzbank building in Frankfurt is temporarily the latest epitomy of this trend), while “cost- and space-efficient building” will have to keep producing increasingly economical solutions in the public housing sector for a long time to come. As always, architecture is a perfect reflection of the money and power relations of its era (Kennedy-91).

There is a good reason why this talk examines the building materials and construction systems characteristic of three different trends: reducing resource consumption, recycling-consciousness, and healthy buildings, without being able to compare these three with one another. The reason is that the integration of these three areas is a new field for the pioneers. There is still a great deal of research and testing to be done here, in connection with the issues of energy-efficiency and ventilation, among others. Thus, the pioneering and testing phases continue on, parallel to the application phase.

If, until the mid-90s, planners were satisfied with achieving an optimal combination of outside and self-generated supply and disposal with water, energy and the necessary materials, current innovation aims higher still: zero-energy buildings are well on the way to becoming “mega-out”. What we are aiming at now are buildings that produce more energy than they consume – that is really designing for sustainability. Water-saving technologies should make way for self-contained water cycles, or failing that, wastewater-free buildings which produce compost and “industrial water”, and green spaces that produce fresh food without requiring much input – thus becoming edible parks. The emphasis is not so much on self-sufficiency as on sustainable husbandry, orienting ones production and consumption on the carrying capacity of the land.

Higher quality at a lower cost

The most advanced projects that we came upon have already attained the goal of keeping outside services to an absolute minimum to the extent that cycles are self-contained, just as Per Krusche’s original vision foresaw. If this goal also leads to a reduction in investment and running costs, as for instance in the Bielefeld-Waldquelle and Hamm-Heesen projects, these settlements can be seen as new milestones in the ecological pioneering and testing phase.

It has also become clear that the real issue is not just new technological solutions, but rather a holistic approach which reinstates the responsibility of the individual and recreates the visibility of the individual elements which our very survival depends on. In this vein, drinking-water is extracted on site and rainwater and greywater are allowed to run off into open bodies of water, or water gutters, or are purified in planted soil bed filters and water polishing ponds. Waste, or at least its organic components, are composted together with faeces. Witnessing stinking garbage

turn into aromatic humus is a very special experience. Thus, village (re)structuring manages to combine *apparent contradictions*: centralised/decentralised, hi-tech/low-tech, very high quality/very low costs – another permaculture principle.

The examples studied demonstrate that all of the issues and aspects which come with the territory of constructing ecologically, when they are implemented on a larger scale, lead to cheaper solutions for the individual and the municipality. Our findings suggest that the real obstacles are generally experts with little experience, politicians lacking courage, and administrative regulations that are too narrowly defined: not the commonly-cited occupants and costs.

We saw in the *Analysis of costs and benefits*, that the older the building, the cheaper the eco-village becomes. This is also true for ecological urban renewal projects, as the Wilhelmina (NL), Fredensgade (DK) and Aarepark (CH) projects demonstrate.

If energy, water, wastewater and refuse disposal rates continue to climb as they have over the past few years, every project which manages to lower running costs will become increasingly economically attractive in the future. “Non-ecological living” will become more expensive, be it food, cars or buildings. The motto is “using together instead of consuming individually”: the full extent of its potential has only been touched upon by the projects examined here. A real opportunity for the way ahead lies in the plummeting costs of information technology and in direct links between groups with similar goals through global communication networks. These options will allow us not only to exchange information more cheaply and quickly, but also help us locate the right car, bicycle or building at the right time, in the right place and at the right price.

Renewal instead of new construction

The biggest challenge for everyone involved in building (I can only speak for Europe but I guess it applies also all over the planet) is the ecological renewal of existing buildings, especially existing suburbs. Renewing ecologically means converting and renovating buildings with a view to a “sustainable” use of resources. This involves, for instance, procuring non-renewable materials such as copper, aluminium or iron from dismantling operations in cities and reusing them efficiently, rather than mining them from the earth. It also means allowing wastewater to flow back into the groundwater, or into rivers and lakes, in a state that is just as clean or cleaner than when we extracted it as drinking-water; keeping the air clean, so that we can once again smell the scent of plants; planning quietness and reducing noise; and providing a diversity of uses in a small area, so that living, working and leisure can be combined to reduce transport distances and improve the quality of life. In almost all our cities we are still very far away from this vision. However, the examples we studied indicate that there are ways and means of *getting closer* to these goals. What we need now are examples of ways of *attaining* these goals. And these we were unable to find.

Naturally, renewing ecologically requires greater sensitivity, patience and an openness to teamwork than developing new eco-villages. One of the differences to new building projects, which caused us a great deal of trouble in the case studies on ecological urban renewal, was that it was considerably more difficult to find ground-breaking

models and documentations of such projects, probably because ecological urban renewal projects are less spectacular. At first glance, they generally appear to differ very little from completely “normal” projects, and, with the exception of the Danish project in Kolding with its “bio- factory” – a glass pyramid, in which all the wastewater is purified – they tend toward the conventional, and are almost a little boring from the design point of view. However, a closer look at the planning processes reveals that they are far more diverse and complicated than new development projects.

As with the new settlements, the examples of renewal projects range from socially-oriented processes with a very high degree of occupant input, as in the Swiss “Aarepark” residential settlement in Solothurn, to more hierarchically organised planning processes with low occupant input, as in the Fredensgade project in Kolding, Denmark. The examples illustrate how the people living nearby a demolition project, the former Wilhelmina Hospital in Amsterdam, can work with experts to develop plans for preserving and converting a complex of this kind, and can bring about the funding and implementation of this planning with the support of clients and administrative authorities. However, they also show the extent to which authorities can block ecological planning. In Vienna, it emerged that permission to plant climbers in the street area had to pass through at least 14 different authorities. As a result, it is less time-consuming to plant climbers in planters attached to the building wall, than to plant them in the ground.

If new settlement design can lean on something resembling a model of an eco-village, this is not the case with urban renewal projects. Bearing in mind how much more important is the use of the various existing resources and potentials, both physical and social, in the urban renewal process, this is more than understandable. The upside is that the solutions in these projects are often more diverse, imaginative and better tailored to the needs of the occupants.

With both new construction and renewal, the key to success lies in winning over the support of everyone involved to goals of environmental quality, and making the planning and building process a joint success despite, or perhaps because of, the many participants, all of whom are pursuing different interests. The examples show that the quality of life and of housing gained through the juxtaposition of old and new, past and future, is well worth the effort in the present.

The eco-village vision

When an eco-village works well both technically and socially – and this concept covers both new construction and renewal projects – it is not only the highest quality product that building and conversion can offer at the present time, but also a process of development. It is a process that changes people and their relationships, as well as buildings, open spaces – and supply and disposal technology. The aim is to make this entity easier to live in, easier to love and more sustainable. In combining our old love of insisting on people’s participation in planning and our newer love of permaculture, our vision of an eco-village looks like this:

- *An eco-village of diversity*: where living and working are reconciled and long trips to work disappear; where social and cultural activities, recreation and further training, community and individuality can exist side by side.
- *An eco-village on a human scale*; with neighbourhoods to which residents can develop a direct relationship or a personal bond, but which have their own character as well. An eco-village of natural corridors, with woods, orchards, streams or wetland marches separating the individual areas and linking them to the surrounding landscape. A place where plants and animals have scope to thrive, something that has become all too rare in our civilisation. An eco-village which fits, in terms of its own bio-region, its landscape, its climate, its flora and fauna and the local culture. One where open spaces and bodies of water (typical of the area) provide biological enrichment and orientation.
- *An eco-village which uses as little space as possible*: the size and density of the settlement depends on the degree to which the area it requires for its supply and its waste disposal are really available, without being a burden on the region. Where expansion beyond this size leads to the founding of a new settlement. This creates a network, instead of the cancer-like urban sprawl typical of our times. Four- to five-storey terraced buildings or multi-family dwellings with maisonette apartments and a construction method density which yields a floor space index of between 0.6 and 0.8. Every neighbourhood has the shops, businesses, nurseries and schools it needs. Only about 20% of the surface area is built up, with the rest used for reduced traffic, leisure and recreation, water supply and wastewater treatment, energy plants and the natural corridors described above.
- *An eco-village of short distances*: The density described above leaves our eco-village not much larger than 1.5 – 2 km in diameter, meaning that everyone can walk from one end to the other in twenty minutes, or bike or drive their solarmobiles across in five minutes. Car-and minibus-sharing is available to the community for all medium distances. Public means of transport – buses and trains – are faster and cheaper alternatives for longer journeys. Efficient infrastructure planning is facilitated by service centres specialising in different aspects and located at public transport pick-up points.
- *An eco-village based on occupant responsibility*: All occupants are involved to the extent they can and wish to be in local, community self-administration, and in formulating and implementing eco-village (re)structuring. All decisions are made on the lowest level possible, based on the principle of subsidiarity. As far as possible, everyone uses the local range of services, production and trade, education, and leisure, and supports links and communication with regional, national and international groups and networks.
- *An energy-efficient eco-village*: Energy-saving options and the rational use of energy for heating purposes, and of electricity and transport cut energy consumption to less than 10% of its current level. Energy is primarily generated on a renewable basis through sun, wind, tides, geo-thermal energy and organic mass. All buildings are oriented towards the sun for optimum passive gain,

used for cooling and heating. Intelligent designs achieve a maximum annual consumption rate of 20 kwh per square metre of living space.

- *An emission-free eco-village:* Reducing energy consumption, treating wastewater in nature-based systems, limiting traffic and coppicing streets trees, all lower CO², SO², NO^x and other toxic gas emissions, as well as reducing dust particles. Sod roofs and façades covered in climbers, as well as wildlife corridors between individual neighbourhoods, improve the air and temper climate extremes.
- *A quiet eco-village:* by limiting traffic and noise pollution from production processes, which, where necessary, are surrounded by dense green belts, the settlement is a place of calm and quiet. Most sounds heard here are made by birds, playing children and the parties occupants celebrate together.
- *An eco-village which values water:* On-site rainwater seepage and the blanket ban on all toxic substances entering the groundwater allow the settlement to have its own drinking water supply. Water-saving fixtures and the separation of faeces and all other organic waste for composting and fermentation cut drinking water consumption to less than 60 litres per person per day. Gray-water from washbasins and baths, showers, washing machines and dishwashers is purified in nature-based treatment processes, and then seeps back into the groundwater. The settlement preserves natural drainage conditions. This means that wherever possible, storage rooms at ground level replace basements. Vertical and horizontal filters become just as much an integral component of open spaces in the form of constructed wetland marches, as rainwater, which is creatively allowed to come to the fore in flow forms, open gutters, streams and ponds.
- *A waste watching settlement:* Governed by the principle that “waste is resources in the wrong place”, the settlement belongs to a regional, national and international network specially devoted to this aspect of sustainable husbandry, which helps to prevent over 90 percent of the current volume of waste. Be it domestic waste, excavation soil, building materials or waste from commercial or industrial production, the little waste still produced here is sorted on-site, before entering the respective recycling, downcycling or re-use process.
- *An eco-village of healthy buildings:* Building materials and construction systems used in all buildings that are converted or constructed are healthy, save primary energy and go easy on resources in their production, use and dismantling (from cradle to cradle). They are (re)planned for multi-purpose use, easy conversion and expansion or reduction in size. Organic materials are compostable and can be returned to nature without difficulty. Electrical cables and appliances are installed and connected in accordance with the latest findings to generate as little electrosmog as possible. Before planning commences, zones of geopathological interference are detected and efforts are made to avoid building bedrooms and living spaces on top of them.
- *An eco-village full of productive plants:* Special care is placed on the selection of plant types, sizes and growth times. Thus, the settlement contains fruit-bearing bushes and trees, gardens, lean-to greenhouses, façade espaliers and

herbaceous soil coverings that meet a good proportion of the settlement's needs for fresh fruit, vegetables and salad all year round, without much extra effort – in other words, leaning towards a permaculture settlement. The district dividing corridors, streams, ponds and wetland marshes also produce edible and medicinal plants for human and animal consumption. These products are fresher and cost less in terms of embodied energy, waste and money than imports which have travelled great distances, although these can occasionally be used to ensure added variety at the table. The exchange of “surplus production” can be organised in communally-run shops or markets, which in turn creates permanent jobs.

- *An eco-village of creative conflict-solving*: conflicts are seen and dealt with as creative learning processes. This facilitates individual and collective growth. (Whenever conflicts are not settled openly, this growth stagnates or they end in hot or cold wars.) “Using together instead of consuming individually”, sharing jobs, cars, fruit-trees, playgrounds, buildings and open spaces for play, sport, leisure and communication also means going through learning processes together, leading a richer life, but also a more difficult one as well. Like most Europeans, our upbringing does not prepare us for such processes. We need to learn these skills. If we take in the gender problems and start really solving the conflicts that are basic to men and to women and their relationship, then we will be having An eco-village that contributes to *essential peace-making* (Parry & Brusseau).
- *An eco-village of human values*: historic settlements, and even restructured suburbs, can be seen as collective artworks. The individual and collective efforts of many generations lends them a special, unmistakable character. Nowadays it is possible to simulate this historical development and make various alternatives clear in quick motion. Thus the complex process of coming to a consensus on the demands of the occupants, the administrative authorities, the neighbourhood, the economy and the environment can be altered until sustainable planning can be carried out that is tailored to the combined needs of the occupants, investors and the authorities. It takes time to make this shared vision a reality, but it forms the basis of the settlement's spiritual, intellectual and technical capacity.

The Club of Rome made an appeal to humanity: *We need a vision.*

Global problems cannot be solved by market mechanisms alone.

They saw the way ahead in the thousands of small, smart decisions that reflect a new awareness, shared by millions of people, and that help ensure the survival of society and the planet. The strategy of building many rural and urban eco-villages has the advantage of not only being feasible, but also corresponding to the vision many people share of a world they would like to live in. Making the vision a reality only requires the will to take a calculable risk and shed old prejudices and patterns of behaviour. In view of the problems bombarding us from all sides, this can only be seen as a hopeful perspective.

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This paper is based on the last chapter of a new book, edited by Declan Kennedy and Margrit Kennedy, to be published in 1997, entitled *Designing Ecological Settlements*.

Professor Declan Kennedy is Irish Architect, Urban Planer, Permaculture Designer and Ecologist. He is a founding member of the Permaculture Institute of Europe. He has been teaching and practicing urban design, landscape and agricultural planning coupled with holistic implementation strategies since 1972, presently in special intensive Permaculture seminars – organised in many countries – and formerly as Professor of Urban Design and Infrastructure at the Architectural Department, Technical University of Berlin.

Crystal Waters and Other Eco-villages

Max O. Lindegger (Australia)

[Presentation Report]

Crystal Waters was never advertised until the people involved actually had something to sell. It took more than fifteen months before the land was secured, it had council support and it actually had something to sell. Large numbers of other projects get lots of early support but lots of people, too impatient, leave the project and the project collapses. There is a real need to be patient, not to build up too much hype. It is really important to keep up good communications.

Organisation of Crystal Waters

There are two organisations within Crystal Waters – the Body Corporate and the Co-op. The Body Corporate is purely legal whereas the Co-op is purely entrepreneurial. The Co-op comprises everyone who owns land as well as some friends of Crystal Waters. The Co-op is the entrepreneurial aspect of Crystal Waters. Manages the resources, the camping area and the village area. It meets every three weeks, with its directors empowered to make decisions on behalf of the entire community.

Co-ops date back to the early part of this century. They were predominantly started by farmers. The Crystal Waters co-op is used for a business which is run by a very few people. The large numbers of members pay a twenty dollar membership fee.

Legal issues and dispute resolution

The Body Corporate is a legal requirement whose members are elected once a year. It has the role of administering common land, eighty per cent for the member's benefit. The Body Corporate has sixteen by-laws. If someone is in breach of a by-law, there are firstly attempts to resolve the dispute amicably. If the dispute is not resolved it can be taken to the community "elders". These elders have total community support. They have the necessary talents and skills to help resolve conflicts within the community. If this fails to work then the Body Corporate gets involved. If this still fails to work then the dispute is taken to an arbitrator which the State Government provides. The ultimate recourse is to take the dispute to court. There has only been one instance where a dispute has reached the state arbiter.

Children

The interests of children are paramount. Some people bring children along to meetings while other people pool money to pay for child minding. There are many interest clusters within the community. The people with small children form a cluster. The people within this cluster look after each others children. As a result of these interconnected clusters, messages get around the community very fast.

Meeting places

Meeting places are very important for the transmission of information. In a Switzerland community there was a baker's oven where only women were allowed to go. All of the women in this village would use this oven. In the process lots of information was shared amongst the women. It was easy to ascertain who needed help and support. In our society all of the meeting places have been destroyed. At Crystal Waters there is no one place where everyone can meet.

Size of the community

There are approximately one hundred and seventy people living at Crystal Waters. Including visitors, there are about 200 people at Crystal Waters at any one time. Quite a lot of literature states that three hundred people is a good size for a community. It is an economically stable size for the community.

Decision making

People are able to vote from the age of sixteen. However not many of the sixteen year olds do actually participate. When Max's son was fifteen he wanted to have a bow and arrow but there was a by law which prohibited the keeping of fire arms. The young people applied to use bow and arrows. The adults making the decisions felt that they could be doing something more meaningful. and decided that the young people couldn't use bow and arrows. Decision making authority is passed on to the executive and the Body Corporate. Everyone can attend the meetings which are held every three weeks. The community holds forums when large issues are at stake. Any person can call a forum at any time. The forum doesn't have the authority to make decisions as such. However if a vote is taken then that is a strong indicator to the decision makers of the community's wishes.

Raising development funds

The project started out as a small group, developing Crystal Waters on paper. Some leaflets were distributed, describing the dream. These leaflets invited people to become part of a unique project. When people inquired about the project they were sent out a package including a deposit form. This form asked people to put their money where their mouths were, asking for \$8,500. Without these people, without such trust, the project wouldn't have been possible. The money was put in to long term deposits with an ethical investment bank. When approximately forty deposits had been made, it was possible to enter in to the necessary contracts for the development of infrastructure. If the project coordinators had gone to a bank the cost of developing the land would have been approximately twenty five per cent more expensive.

The process used to raise funds was not strictly legal but not strictly illegal either. At any given time people were able to request the return of their money plus interest earned, less one per cent management fee within three months. The people who put down money for the project were asked to become part of the management team. When the lots were sold \$330,000 profit was made which was put back in to the project. The Co-op spent the money on projects such as a business area, a bunk

house and a children's creche, projects which benefited the people who made the project possible. It is necessary to remember that any project which does not make a profit makes a loss.

Schools

There is no plan to build a Primary School. There is however space if there is the desire or need to build a school in future. Children are bussed to a nearby school. This seems to be a satisfactory arrangement for the time being.

Once you have achieved enough confidence as a designer it is really important to leave gaps in the plans. These gaps leave options open for people further down the track. Took about nine months of observation before the design was started. Knowledge of the land has increased considerably during the last eight years. It's been good to have remaining gaps to leave possibilities open.

Differences between Crystal Waters and Kookaburra Park

In the case of Crystal Waters, three of the four designers live at Crystal Waters whereas in the case of Kookaburra Park this was not the case. There had been other developments in the mean time and you learn from your mistakes and successes. At Kookaburra Park it was a developer which visited Crystal Waters. He had done developments for ten to fifteen years. The dominant development outlook was to buy a piece of land and slice it up. This developer realised that he couldn't do that any more, there had to be a better way to develop land. He still had to make a profit and that comes from a real estate agent's viewpoint. Kookaburra Park is different to Crystal Waters, not better or worse. An advantage of Kookaburra Park is that it is near to Gin Gin. It has schools within cycling distance. It has a major centre, Bundaberg, twenty five minutes away. The soils are poorer at Kookaburra Park. Both of them are using similar design principles to develop.

People buying blocks but not doing anything with them

There are a few people who have bought blocks of land but who haven't moved yet. They probably have very good reasons for not having moved. This has not been a problem really.

Beautiful San Miguel

Marcela Andre Lopez (Mexico)

[Presentation Report]

Marcela Andre Lopez, permaculture's representative from Mexico, was the first person to represent Mexico at an International Permaculture Conference. During the IPC6 Marcela showed slides of her home town, San Miguel de Allende, in the state of Guanajuato, Mexico.

San Miguel de Allende is a 500-year old community graced by beautiful carved stone buildings on cobblestone streets and an ideal climate. It is located in the high central plateau of Mexico, about four hours north of Mexico City. It is now an international artists' colony renown for its two important art schools and its rich cultural and architectural heritage.

The images presented began with a view of the city's main architectural structure, also the symbol for the city which was built by a native stone mason 200 years ago, as were the many other towers and beautifully carved buildings. Images of markets filled with colourful fruits and flowers followed, with pictures of ancient fountains splashing cooling waters within the arched courtyards of the city's original dwellings and inns, many now in use as banks, offices, museums, homes, and city administration centres as well as shops. Just outside the city are ongoing archaeological excavations unearthing pyramids alongside pottery shards more than 1,500 years old.

The city has a rich tradition in supporting the work of artisans and exports of the excellent crafts and artworks flow from San Miguel to the entire world. Artisans receive apprentices and continue traditions sometimes thousands of years old as is the tradition of ceramics and metalwork in Mexico. Music played by live musicians ensembles in ornate performance dress is part of everyday life on a stroll to the city's lively and beautiful main square. The spectacular feathered headdresses and glistening native costumes are a breathtaking and awe-inspiring sight during the frequent days of celebration when processions and parades of traditional dancers take to the city's streets.

The harsh contrast to the city's beauty and cultural richness is the degraded condition of the soils and lands surrounding the entire area, in fact throughout the state of Guanajuato and to the northern states at the USA border. Several images showing eroded areas around San Miguel showed obvious lack of organic matter in the soil, lack of vegetation, and rampant deforestation that occurred since the last 500 years.

Deforestation in Mexico was spurred by the discovery of one of the most important silver mines in the world, just an hour's drive from San Miguel de Allende. To smelt the enormous quantities of silver (one mine supplied more than a third of the world's silver years ago), much coal was needed, and with the processing of lime for many

construction projects undertaken by the Spanish colonists, the forest was decimated over several states in the central part of Mexico.

Yet the Mexican people have a spirit filled with strength, celebration, loyalty and friendship. The quality of life one enjoys is extremely satisfying, as a rich and nurturing human culture envelops one in this particular area of Mexico, all accompanied by very delicious foods. San Miguel draws many talented and interesting people, many from various parts of the world, and the lower cost of living allows people the free time to use their talents in creative or charitable pursuits. Many non-profit educational, service, medical, ecological, and historical foundations are based in San Miguel de Allende and offer many very satisfying outlets for one's talents, interests and energy.

Permaculture has found a welcome home in San Miguel de Allende, as the need for productive lands has never been greater in Mexico. The population growth has exploded, and the land productivity has plummeted simultaneously. The weather patterns have become disrupted, and the seasonal rains have not occurred on the regular and satisfactory basis of some years ago. Mexico just passed through the worst drought in the nation's history during 1995-1996, which seems to have ended with a few and very late torrential rains with hail which in turn caused more environmental problems.

Up to the recent past there was no need to store water as the groundwater and rain was always available for all the people's needs. Therefore, there is no standing tradition at this time for catching rainwater from the house roofs, and there are usually no ready containers in which to store harvested water. In the ancient culture there was a tradition of underground cisterns which stored water runoff from the many stone terraces and structures, and there once was a tradition which maintained water catchments throughout the landscape. That water-harvesting culture was lost to the Spanish colonizers who harnessed the population into a labouring workforce of servants, miners, and general labourers who by force served the Spanish to collect their booty of precious metals, cattle, wool, and timber and largely saw all Aztec gold sail away to float the European markets, saving their collapse, while Mexico lost its forest and its ancient self-sustaining cultures under foreign domination through the sword, disease, muskets, alcohol and horses with the hoofed and grazing cattle of the Spanish conquistador.

Mexico is a vibrant and exciting land, and a full-length documentary video would still need more details and images to portray the many facets of this rich part of human heritage. Mexico is the land that gave many important foods to the world: corn, tomato, beans, chillies, chocolate, vanilla, pecans, avocados, marigolds and more. There are so many nations whose economies rely on the commercialisation of these biomasses, and Mexico nurtured them for thousands of years before they were taken out as part of the loot and booty of Europeans who would later dominate the economics surrounding these foods. (See book: *Seeds Of Change*, Smithsonian Institution).

Permaculture comes as a way for this land to return to what was fine, what was a sustainable culture, what was a self-sufficient society for thousands of years. Water harvesting, food crops abounding, forested and fertile landscapes, balanced patterns of water movement in the landscape and a self-employed society independent from imports and costly manufactured agricultural equipment and chemicals.

In collaboration with the permaculture work ongoing now in San Miguel through Marcela Andre Lopez and Skye, there is an outstanding corn scientist, Ing. Ramon Aguilar in a nearby research station who is demonstrating soil recovery techniques using corn and is able to demonstrate soil productivity 14 times higher than the standard yield in corn, even while relying on seasonal rains. The soil is recovered by returning the corn stalks to the soil for five years, and the process is meticulously documented for the use of both industry and "campesino" (country people) farmers. The recovery and productivity results are even more spectacular with the help of irrigation water, increasing the production of corn within five years to 28 tonnes per hectare.

There are other outstanding permaculturists in Mexico who don't call their work "permaculture". The important project now that permaculture is so needed in Mexico is to put all the people achieving results in contact with each other in this nation. There is a shortage of journalists and communication media, even paper, throughout the nation. Therefore information is not easily available, especially if one is busy doing one's own work. Notable in this area are Alejandra Caballero and her veteran prize-winning conservationist father, Juan Carlos Caballero.

The Caballeros have demonstrated by action large-scale forestation of entire mountains, and are actively training people who would otherwise be involved in unsustainable and destructive activities within their environment. Ten years ago USA permaculturist Ianto Evans trained Alejandra in permaculture, and a dynamic, fruitful teaching practice incorporating permaculture has evolved at their family ranch/school.

Mexico is poised to apply all that permaculture has to offer and welcomes permaculture with open arms. Government agencies are receptive and requesting courses to train their management and field staff. Permaculture is a beautiful export for which Australia must be congratulated as a nation. In a time when nations export weapons and garbage, this is a life-giving and life-sustaining "product" that is a true token of peace to share among the nations of the Earth.

The slide show ended and all danced in a circle to the festive and joyous music of "mariachis" – the incomparable traditional brass and strings party music of Mexico.

It is Mexico now who welcomes the 7th International Permaculture Conference and Convergence to be held in 1999 in Guanajuato and San Miguel de Allende, state of Guanajuato, Mexico. The invitation is given by the State Water Commission and city and state government and private organizations and private individuals working to bring solutions to the drylands of the world, and many who have now been trained in permaculture are keen to share with many of their countrymen, the traditional warm hospitality, and Marcela and friends look forward to sharing knowledge and then much music that we all may dance joyously as life goes on.

Mirrunga Village

Alex Mond (Australia)

[Presentation Report]

Alex Mond came to Australia from Czechoslovakia in 1967. He has spent 20 years as an exploration Geologist, ten years in the public service as a Geologist and then as a business manager. During the last four years he has been involved in the development of eco-villages. He's had a very exciting life – the only common thread through these aspects of his life has been living on the edge. According to Alex, life on the edge is difficult but very rewarding. Australia is a very exciting place in which to live.

He has developed a special relationship to the land. His approach to development is rather different to that of most people. His project over the last twenty years has involved nine hundred hectares which are located fifty kilometres south of the ACT. It consists of three parts, the first part is a village development of about one hundred and seventy hectares. Next he would like to build up some small research or conference facilities. The community will not be based on a few individuals but rather based on university staff and students and young people. It will require a large area for the education of tourists. The site is located with the Murrumbidgee river on one side and Namaji national park on the other. It is part of the Murray-Darling Basin and is located in the upper Murrumbidgee area.

There is a very active catchment group and it has been very exciting in the last six months to see people associating within bioregions. People involved comprise not only people from the land but also people from Canberra. After many years of talking about it, all of a sudden it came together.

When he first put the project together a few years ago he didn't quite know what he was doing and everyone was quite sceptical. Robyn Francis came along with a checklist suggesting that everything fitted perfectly in his development and that indicated that he was on the right track.

Australia doesn't really have pilot projects at the current time, the only pilot project we can refer to is Crystal Waters. Many existing projects don't involve the main-stream of population. In Canberra at the present time there are more developments than in any other part of Australia. At the present time we really need some good examples. The local councils have been passing regulations without knowing what they were passing regulations about. That's why it is so important to build pilot projects all over the place, City Farms, big settlements, etc.

Catchment planning involves looking at the big picture. It is very hard for the government to make the relevant decisions because it cuts across the local government boundaries. Alex started with catchment plans and it was very exciting even at the start. Suddenly everything fell in to place. He found the perfect site and it was only owned by two people. It is not much good to identify the perfect site if it is owned

by local people. Settlement patterns had to fit in to a general strategy of the local government.

Traditionally planning hasn't talked about people's needs. A planning revolution was started by McHarg in America. This was adapted by Frederick Steiner and following this process it is quite easy to establish what should be done in a particular area.

When Alex started this project he couldn't get any permaculture designers involved, they were all too busy. He looked to national and interstate engineering firms. They all told him that there would be no way that he could get the project approved, that it would be too difficult, that there were insufficient resources. He was just about to give up when he managed to get a major utility in Canberra on side.

Very little of the area has been cleared in the past. They have identified eighteen species of birds, two hundred species of plants, ninety per cent of them native, four species of kangaroos, echidnas, platypus. This is all located within fifty kilometres of Canberra.

It is necessary to have a holistic approach, a vision of the whole. The vision or goal has to be supported by several objectives. It is really necessary to look at what is already there. By design he tried to encourage diversity of lifestyle, by creating a diversity of different sized lots.

In the last twelve months, the project has started to accumulate money and things have changed. One can't over-regulate developments. In New South Wales they have very good legislation which allows quite a lot of flexibility. Some people try to implement very strict regulations and they are called eco-fascists. People move in on the understanding that they can do this and they can't do that but after time they decide they wanted ten thousand times as much lawn as was allowed so they complain that this is too regulated. It is best to go by example and by advice. Experience shows that when people have a good example and a very good set of guidelines then they will follow it. There are always some individuals who try to do their own thing. But in communities this doesn't last long.

Very often the geology of an area is ignored in developments and very few people get recent geologies done. Usually it is lip service, they just do the minimum that is required by the Environmental Protection Agency and they don't really put serious interest in it. When Alex presented his concept to the shire he was followed by another developer who was designing some standard development. The developer commented on Alex's presentation, saying that Australians don't like this sharing and community life because that is only good for Americans. We are individuals here, rugged Australians.

Efficient servicing and self-reliance is what really gives an individual power. By controlling your power, by controlling your sewerage and garbage, that gives you freedom. You don't have to go to the council and beg. Controlling your facility, controlling your life gives you power. In this development the only things that will be controlled by the outside will be the roads and telephone. The don't have access to solar power but by being efficient and using new appliances that are coming on to the market, people are becoming more aware about how to use power. The only thing that makes it difficult is that all power is subsidised.

A lot of things can be done by designing, by identifying individual units so that people have a sense of place, a sense of belonging. You are probably aware of Crystal Waters which people complain is too spread out, there is no centre hub. As long as we learn from our mistakes.

The whole area of the eco village is four hundred acres.

Being in a steep area provides privacy and at the same time there is proximity, there is closeness. By creating diversity in the lots, they are hoping to create diversity in the community. If people have a good example and a very good set of guidelines they will follow it. It took him about ten years to actually work out what to do with the place. This place is the nicest place along the Murrumbidgee. There will be a hub: a community centre, an enterprise centre, an eating place, a meeting place. This development is about quality of life. Education takes time but it is the main tool that can be used. There are a lot of designers coming out of these colleges and there is tremendous interest. Everywhere he goes he gets tremendous support.

In Australia the tenure system varies from state to state. In New South Wales there is the Policy and Title Act, which is only about eight years old. In Queensland there is similar legislation. Alex is not trying to say that this is the best system, just that it applies to him. In some areas, common occupancy might be more suitable.

The theme is the most important part. It took him a long time but once he had decided on the theme everything fell in to place. It is important for the developer, it is important for the designer. It is important for the people, it is important for the council. When it has a name to it people can associate with it. Crystal Waters was called a permaculture village and people had certain expectations of it. People go to Crystal Waters and expect to see permaculture paradise on the earth. When he couldn't get any permaculture designers for his eco village, Alex dropped the word permaculture from its title. Participatory settlement planning is very important. After a while you establish your credibility, people know that they can trust you and the co-operation is tremendous. He met the best planners in the area who looked at his proposal and said that it wouldn't pass the council. So he put the proposal himself and got one hundred per cent approval by the council.

It is important to work with the community in the Bioregion. Government authorities are suspicious, there is always the NIMBY complex, Not In My Backyard. NIMBY is outdated, we need a holistic approach. The most important part is community resource management. There is legislation that says you can't develop within one hundred and fifty metres from the river. So he wanted to make a plan that would look so good, the authorities would look like fools if they said it couldn't be done. He got AUSLINK to map the area properly, the authorities had never done it themselves. With digital mapping there are no arguments. It is necessary to use the necessary technical tools.

The best thing that ever happened to him was having a group of students coming from Canberra University, Landscape Architects. In two hours they picked up the sense of place which had taken him two years to do. It was very exciting. He doesn't agree with all of the doom that he's been hearing about. If the people spreading the gloom were right then he would be dead by now. At the universities they went

through Malthusian theory, not Malthusian theory, now they call it something else. Young people that he knows are not scared of the future. They are ready for it, they are happy. Groucho Marx said : “why to worry about the next generation? What have they done for us?”

Alex quoted Peter Cuming , saying: “I wouldn’t be doing this if not for the youth of the next generation.”

Urban Eco-villages Group in Melbourne

Neil Simpson, Phil Gall, Sandy King, Vasko Drogriski (Australia)

[Submitted Paper]

It tends to be assumed that urban living entails having to live with urban blight: traffic choked roadways; polluted air and watercourses; suburban sprawl and alienated social environments. Less obvious is the extraordinary inefficiency of cities in dealing with energy needs, the supply of resources such as food and materials, the disposal of waste and the fact that private transport contributes significantly to greenhouse gas emissions. The Local Agenda 21 Document agreed to at the 1992 Rio Earth Summit stipulates that 'development' and the protection of the environment cannot be separated. Many financiers are no longer investing in the more dysfunctional cities, and there is now a world-wide movement seriously looking at radical solutions to the urban crisis.

An ecologically sustainable city, or eco-city, while replacing the natural environment with a built one, would in its ideal form replace what it uses, and be primarily based on renewable resources. It would also be socially as well as environmentally sustainable. Around the world there are numerous eco-village projects which are providing examples of appropriate technologies and design. However, these are sometimes dismissed as utopian and as acceptable only to small or closed communities. Indeed, attachment to commonly held expectations, such as having a car and one's own backyard, are elements limiting urban planning strategies. Suspicion of development involving increased housing density has also arisen as a result of years of flats, dual occupancy and smaller allotment policies which have been exploited for profit and have not contributed to more fully integrated planning.

In this context the Urban Villages Project of the Victorian Department of Planning and Development can be seen as offering a transitional model to a fuller eco-city plan. Designs have been submitted for retrofitting as urban villages eight sites, which are as diverse as Preston, Bayswater, North Geelong and Sandringham. The aim is to provide shops, neighbourhood services, workplaces and public transport within a walkable 400m of residential areas. The designs promote sustainability in that they aim to decrease the need for car use and provide high-density energy efficient house design. The Report recognises 1000 potential urban village sites centred on public transport nodes around Melbourne, and argues that as well as reducing greenhouse gas emissions this development strategy could absorb Melbourne's projected population increase within the existing metropolitan region until well into the next century.

The Urban Eco-village Group was formed to defend the general aims of the Urban Villages Report and to extend its sustainability criteria in the social as well as the environmental domain. We want to:

- Make contact with the residents and councils involved with the eight designs and contribute to their ongoing development and implementation.
- Help initiate designs at other sites by having meetings in neighbourhoods where we have contacts, or where there are especially suitable sites.
- Encourage more radically sustainable designs, incorporating such things as solar power generation, compost toilets, urban food production, a variety of public housing and expansion of public open space.
- Investigate how planning decisions are made and financed, with a view to maximising and extending the democratic openings.
- Build alliances.

A significant aspect of urban village planning is community involvement. In a political climate of government cutbacks and planning by decree, this provides an opportunity for people to become pro-active in decision-making which directly affects their quality of life.

Indicators of urban villages

What does it take for parts of a city to be transformed into an urban eco-village? How can the degree to which a particular area approximates, or fails to approximate, to this status be measured? Indicators of urban eco-village status include the following. As well as being used as a quantitative index, the indicators can also be directly linked to specific design considerations (as shown in italics).

Environment and land use

- Percentage of open space used for organic food production.

Possible sites for a community garden or urban food forest. The source of mulch for these and private gardens. Keyline principles to provide water and minimise maintenance costs.

- Percentage of public and private land under indigenous vegetation cover.

Sites of existing bushland and those suitable for indigenous revegetation, and the possible linking up of these areas.

- Degree of biodiversity and amount of habitat for native species.

The size of bushland needed to attract a variety of birds and small animals such as lizards. Incorporation of wetland areas.

- Levels of human/animal interaction in the community.

Site for an urban farm which includes farm animals. Waterway or dam site for the catching of fish and yabbies. Incorporation of chicken runs in garden designs. Decreased dependence on guard dogs for security and cats for companionship.

- Quantity of water both in human water supply and in waterways (eg. presence of native fish, frogs).

Find out where the street drains go and the possibility of introducing rubbish traps and wetland filters before runoff reaches waterways or beaches. Find out about the water supply and whether increased local collection would improve its quality.

- Quality of air.

Find out the main sources of air pollution in your area and how these are monitored and how they could be reduced.

Energy and resource use

- Ratio of renewable to non-renewable energy and resources in public and private use.

Look into generating electricity from the sun and wind locally.

- Degree of waste reduction and waste recycling.

Maximise the recycling of materials at your local tip, especially furniture, building and organic materials. Facilitate information sharing on the availability of excess materials. Coordinate waste collection from greengrocers and other food outlets for soil composting.

- Percentage of food grown locally.

Look into establishing a consumer- producer cooperative with any local food producers. Extend such “market garden” areas. Support individual home production, including the sharing of excess produce.

- Degree of self-sufficiency in water supply.

Collect and use rainwater from public and private buildings for drinking, aquaculture in ponds, maintaining wetlands, water recreation and garden watering. Re-use greywater.

- Average distance travelled to work.

Encourage car-pooling and look into improving the attractiveness of public transport for commuters (eg, coffee at your local train station). Develop local employment opportunities.

Transport and traffic calming

- Kilometers of designated bicycle paths.

Encourage local bicyclists to organise and propose bicycle routes, including the modification of existing roads.

- Ratio of bicycle and public transport to private vehicular transport.

Find out how public transport use could be increased in your area. Increase the density of housing and services around public transport nodes, while trading this off with the provision of increased recreation facilities in these areas.

- Average distance of place of residence from shops and public transport.

Look into how local car trips could be minimised. Should home deliveries be subsidised? Food co-ops could be facilitated.

- Percentage of essential services and facilities accessible to the aged and those with disabilities.

Assure wheelchair accessibility to all public facilities. Minimise slopes around these.

- Percentage of town centres and lengths of street pedestrianized.

Improve streetscapes to buffer pedestrians from traffic and to ensure perceived safety of pathways.

- Average traffic speed in residential areas.

Slow traffic in residential and pedestrian areas, creating traffic by-pass routes if possible.

Community and social justice

- Numbers of neighbours known by name and houses in neighbourhood visited.

Encourage street parties, joint garage sales and the sharing of shopping. Provide and maintain local noticeboards. Plan for more neighbourhood centres. Encourage the sharing of backyards.

- Degree of perceived safety of the area.

Locate and improve perceived unsafe areas, after consulting especially with the young and old, women, people of different ethnicity and those with differing sexual preference.

- Incidence of local crime.

Interview the police and local welfare workers to ascertain the nature and extent of local crime. Provide facilities such as for youth recreation, job creation and men's groups that might lessen the incidence of these offences.

- Number and scale of neighbourhood co-operative ventures organising social and cultural events and exchange of local services.

Cater for existing popular recreations such as indoor soccer, backyard rock bands, graffiti art and skate boarding as well as the more traditional ones. Community activities can include LETS schemes, food co-ops, child care, political discussion and community gardening.

- Percentage of community-based local and minority group representation on decision-making bodies.

Provision should be made for expression of the culture and opinions of people from traditions other than the mainstream Australian one. This can mean bocce courts, multicultural festivals and multilingual presentations.

- Rates of homelessness and levels of support for people at risk.

A range of housing needs to be developed to cater for those on low income, those who choose to live in shared housing, the aged and for those seeking temporary refuge.

Economy and industry

- Percentage of residents' income earned, invested and spent locally.

Incorporate non-polluting and socially useful industries near to and interspersed with the residential areas. Aim to provide a diverse range of retail outlets and services locally.

- Percentage of population below the poverty line.

Low income residents have special needs in housing, adult education, health centres, job creation and social centres.

- Proportion of affordable housing.

As well as a variety of affordable housing designs, there can be a variety of ownership and renting options, such as housing co-ops and co-housing.

- Levels of industrial pollution.

Become familiar with the pollution monitoring agencies and their powers and ensure community involvement in the process. Connect with existing watchdog groups and create networks to detect local pollution sources.

- Number of independently conducted environmental audits of businesses.

Initiate environmental audits of businesses where necessary. Create community awareness of these factors in the environment.

The above paper was presented at an impromptu workshop at the Sixth International Permaculture Conference. The workshop took the form of an open forum involving about 100 participants. It needed to be pointed out that although the Report originated from a Victorian Government department its proposals are not necessarily government policy. The Urban Eco-villages Group can be seen as promoting community input into the process.

Eco-village Networks, Activities in Denmark and Connections to Gaia Trust

Hamish Stewart (Denmark)

[Submitted Paper]

Summary text

The Global Eco-village Network, what it represents, how it functions and how people can become involved with it. The Danish communities association and its activities in relation to lobbying, informing, networking and fundraising. Gaia Trust of Denmark and its eco-village related activities, in particular Gaia Villages and Gaia Technologies.

Global Eco-village Network

The need for developing sustainable human settlements relates directly to the commitment by the world leaders at the Earth Summit in Rio (1992) to programs that will move humanity to sustainability in the 21st century (Agenda 21). To achieve the goals of sustainable human settlements, there is a need for pilot communities, and for an exchange of information between them and the mainstream.

The Global Eco-village Network (GEN) was set up to meet this need, and is now in the process of expanding. Three regional offices are located in Australia (Crystal Waters), USA (The Farm) and Germany (Lebensgarten). The offices are based in communities who have been part of the seed group which initially consisted of: The Findhorn Foundation, Scotland; Lebensgarten, Germany; Ecoville Nevo and Rysovo, Russia; GyuruSu, Hungary; Crystal Waters, Australia; The Farm, USA; The Manitou Foundation, USA; The Ladakh project, India; and the Danish Eco-village Association.

These seed projects represent eco-villages at different stages of development, the oldest established more than 25 years ago and the most recent being under establishment. Most of these projects are internationally well recognised, while the projects in Eastern and Central Europe are in the start-up phase.

Common to all of the projects is their focus on education and a desire for the integration of ecology, spirituality, and community and business development. Each of the projects functions as an eco-village training centre for their area. The range of skills that are on offer is very extensive, covering all aspects of sustainable community living.

The following programme areas are specifically being developed by the eco-village network: Establishment and development of eco-villages; Eco-village training centres and outreach programmes; Development of sustainable technologies and businesses, a prerequisite for the economic sustainability of these projects; International networking enabling eco-villages to rapidly increase their knowledge through

the sharing of information, work exchanges, training and outreach, with a special emphasis on youth training and exchange; and fund-raising.

Regional activities

A meeting of projects from Europe and Africa was held in August 1996 in Germany. Positive steps were taken towards developing the **GEN Europe / Africa** regional network and towards forming national networks of eco-settlements based on the experiences of countries like Germany and Denmark where national networks have been in existence for a number of years.

The present state of affairs is:

- Information on 1200 communities throughout Europe is being put into a database. Of these about 80 projects are identified as eco-village type.
- Existing national networks in Germany and Denmark.
- Upcoming networks in Israel / Middle East, and UK.
- Potential networkers in place in France, Turkey, Italy, Russia.
- Further contact needed to establish networks in Spain and Mediterranean islands, and countries not represented at the meeting, such as the Netherlands, Belgium, Portugal, Switzerland, Ireland, Greece and most of Eastern Europe.

Africa was represented by two persons from the Cameroons. It was decided that the next year or so would be used for information gathering so that making contacts to a potential African network would have a secure foundation.

The Eco-village network of the Americas (ENA), based at The Farm, Tennessee has been active in hosting training courses on eco-villages and permaculture, and in visiting communities in North America who could have an interest in the network. There is a close link to the Fellowship of Intentional Communities which links over 350 communities in North America. ENA has published the Design Exchange and is active in developing and updating the Eco-village Information Service on the World Wide Web (www.gaia.org).

GEN Oceania/Asia has followed up on the UN Habitat II conference held in Istanbul in June 1996, by sending information to local councils in Australia. There is an extensive correspondence with projects throughout this far flung region and there will be visits to projects in Australia and India in the coming months.

Anyone is welcome to join the regional networks, be they community, organisation, network or individual.

National network in Denmark

The Danish communities association, was started in 1993, and has now about 28 communities as members plus 150-200 individuals and other institutions. The situation in 1993 was that communities with different interests eg. ecological lifestyle, spirituality and social projects were not really communicating. The association

therefore chose a focus of connecting these groups. The secretariat was at Gaia Villages for the first three years. And has now moved to Munach, a spiritual community.

The association publishes a quarterly newsletter. Membership dues are sufficient to cover costs of producing the newsletter. (Subscription: Individuals: USD 30 and communities DKR 75). Co-housing projects have their own organisation but are being approached by the association.

The association gets funding for special projects from government agencies and it is hoped that support will be obtained for the secretariats' administration costs through a special fund for financing charitable organisations. The main activities of the network are:

- **Financing of environmentally friendly houses:** The association managed to get a state guarantee for loans to environmentally friendly houses. But it is not having the desired effect of influencing the building societies to free up their lending policies. However the spin-off has been in getting an alternative bank and pension funds to cooperate on financing houses in a couple of projects. This may be a new model for the future.
- **Lobbying:** There has been lobbying at local and national levels and getting to know politicians (MP's) through visiting the parliament etc. Support for political lobbying has been a major help in influencing public policy formulation. The association is now consulted when the government formulates programmes eg. urban ecology programmes etc. and tries to respond whenever government agencies are looking for consultative input from NGO's.
- **Agenda 21:** The association has been working for 3 years now with CIBU (the Danish NGO who has spearheaded Agenda 21), and has held conferences, published manuals etc. with them.
- **Green entrepreneurship:** Projects in the association have also been working with Gaia Technologies, a green business investment company, and a working group of the association is also working with other NGO's to stimulate green entrepreneurship.

Forming national networks is very important in bringing projects and people together and for increasing the political visibility of the eco-village movement. It has influenced the ability of projects to get loans and brought about our consultative status with the government. Belonging to an international organisation of eco-villages has also given credibility to the eco-village movement in Denmark.

Slides were shown of some of the Danish projects.

Gaia Trust

Funding for the start up of both the Danish and international eco-village networks has come from Gaia Trust of Denmark.

The main theme behind Gaia Trust's policy is the support of ecological settlements, which can demonstrate that it is possible to live in harmony with nature and each other, to a much better degree than we do to-day.

Gaia Trust has two entities which support the development of eco-villages. Gaia Villages, a non-profit division, which supports the eco-village network, and Gaia Technologies which is a "green" venture capital company that invests primarily in Danish companies. The company is on the look-out for technologies that can provide decentralized production and jobs for eco-villages.

The daughter company Gaiacorp A/S operates in the field of currency investment and consultancy. Profits from the company are the primary basis for Gaia Trust's activities.

The philosophy behind Gaia Trust's involvement in supporting the development of the eco-village network is that most of the necessary knowledge for establishing sustainable settlements already exists. What is needed now is for others to see that the vision can be realised. We still need many examples where work, culture and nature are connected. Once people can see that sustainable settlements are a real possibility, further development will happen by itself.

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Findhorn Community

John Talbott (Scotland)

[Submitted Paper]

The Findhorn Community is an example of an un-intentional community that grew out of the spiritual impulse of its three founders and which has now evolved into a demonstration of blending spirituality and ecology.

Overview

Started in 1962 by Peter & Eileen Caddy and Dorothy McClean in an aging caravan in the North of Scotland, the community has grown into a major centre of adult education with several thousand residential visitors a year. A registered charity, The Findhorn Foundation was established in 1972 as the legal structure for the educational work, which for many years was the only community structure there was.

The Foundation has two main centers, the original site, The Park, in Findhorn and Cluny Hill College, the main guest residence in the town of Forres, 5 miles away. The Park is the site of the ecological village project.

Cooperation and co-creation with Nature was a major aspect of the community's work from the early days of its founding, and became well known for its gardens. In the early 80's the community took on, as part of a new direction, the building of an ecological village as a continuation of the earlier work in the gardens. We define an 'ecological village' as a human settlement that is sustainable ecologically, economically, culturally and spiritually. This expansion of activity also initiated the purchase of The Park in 1983, which up until then had been rented. Building was begun on a larger scale in 1990 and there have been 20 new buildings erected to date.

By the late 80's the community structure began to diversify along the lines of a village and today there are some 30 different businesses and initiatives. The Foundation and the educational programs it offers occupies a less central role and in terms of people employed is reducing in size while the community continues to grow.

Values / glue

The primary glue that holds the Findhorn Community together is the commitment to a spiritual life and the transformation of human consciousness. The spiritual practice is non-religious and although Christian mystery tradition is quite strong there are many others present from Tibetan Buddhism to Native American. The stated aim of the Foundation in its trust deed is to demonstrate the validity of the underlying common principles of all major religions and spiritual traditions. There is no requirement to follow a particular path but members are encouraged to find their own practice that will allow them to lead a more fulfilled life. The one common practice that is encouraged but not required is group meditation. Meditations are

held at various times in the day in the many 'sanctuaries' or meditation rooms throughout the community.

There is a general belief in the power of working in groups and generally work departments are set up in a way that encourages personal growth and sharing of deeper issues that connect us as human beings and not just working colleagues. This way of working leads to a strong feeling of community spirit. But it has also been more difficult to maintain that as the community has grown.

Social structures / leadership / decisions

The Community's structure is in the process of change with the evolution of two main 'categories' of people in the community. The first category up until the late 80's is as a Foundation student or staff. These people are essentially working full time for the Foundation and are fed and housed in Foundation accommodations. The other category is as an Open Community member who decides on their own level of involvement or work with the Foundation and its community life. They are responsible for their own housing and finance.

The growth of the Open Community and relative reduction in size of the charitable Foundation has led to some confusion as to what are 'community' decisions and what are 'Foundation' decisions and who is or is not included in decision making. What is evolving is a structure of inclusion that is a synthesis of both categories called the 'selectorate' and which is made up of people that have been in the community a minimum length of time and completed some minimum curricula or integration process.

The Foundation's day to day business is carried out by a management committee of 6-8 people, which is subject to review and assessment by the selectorate. There is one 'Focalizer' of the community and a 'Core Group' which is more concerned with maintaining the community's social and spiritual health and which is made up of 6-8 individuals chosen by the selectorate. Major decisions are made in large community meetings using a consensus model.

Generally decisions, large or small, are made through 'attunement' or a combination of inner sensing of the 'right' thing to do combined with intuition and common sense. Whether this is always achieved can be hard to determine! And it is often a complaint that making a decision about anything is major process. There is a general feeling that we do end up in the right place most of the time.

The community also has tended to experiment and use different tools available to help with its process of governance, decision making and conflict resolution and there is a general belief that the process is as important as the outcome. This is constantly debated of course.

Plants / animals

There is still much emphasis put on Nature and the gardens, though much of that energy has been and still is spent on ornamental gardens. But with the ecological village project gaining momentum there is more being done with organic food production. A successful community supported agricultural program (CSA) was begun

in 1994 and now has over 150 shares being delivered each week, representing over 250 people.

Very little is now done with animals, though there have been experiments in keeping both sheep and chickens in past years.

Energy / water / waste

The transformation of a caravan park to an eco-village in terms of energy has been a challenge. The fuels used prior to the buying of the land in 1983 were coal, oil and electricity. Consumption was high because of the lack of insulation in caravans. Since new building was begun insulation standards have been set by the community and a concerted effort made to reduce consumption as well as the dependence on fossil fuels. Increased use of wood for space and water heating has eliminated the use of coal and where possible a shift has been made to propane instead of oil, as the less polluting option. High efficiency boilers and some small district heating schemes have also been introduced.

In 1980 a company was formed to produce solar panels and many systems are now in use for hot water use. In 1989 a 75 kw wind turbine was erected and currently provides 20% of the electricity to the site. New buildings have incorporated passive solar features and 2.5 times the insulation required by Scottish building regulations. There are plans for an additional two wind turbines. With these and with increased energy efficiency, insulation and other features it is anticipated that more than 80% of the energy will be provided by renewable sources. Currently, including the hydro component of the grid in this area the renewable component is 26%.

Transport for the Foundation is done with a fleet of buses that carry members and visitors between the two main centers 6 times per day. Some car sharing is done but the increasing presence of cars in The Park is a cause for concern. Several proposals for decreasing car population are being considered.

Drinking water for the site is provided by mains water taken from bore holes managed by the local authority in the area. We have our own well for food production and garden use as water is often restricted in summer months. Despite being in Scotland we are in the rain shadow of the highlands and have less than 22" (56cm) per year. Water conserving appliances are used in all new buildings and rainwater collection is standard practice.

After considering several options we have decided to build our own central waste water treatment facility based on the work of John Todd called the 'Living Machine' and design is underway. This will treat all domestic and commercial waste water on site and replace our use of mains sewerage, which has been connected since 1981.

The community also operates an extensive recycling program and has been instrumental in encouraging local authorities to expand the range of recycling services to the local area.

Architecture

The growth of the community in the 70's mainly living in caravans lead to some amazing creative structures. Unfortunately they were largely illegal and had to be

removed when the local council discovered them. Now the architecture for our permanent buildings has developed a common language of materials: timber, glass and local stone for walls; clay tiles, turf and/or copper for roofs. The philosophy has been to use materials as the uniting element whilst letting the forms be left to the individual's creativity. Some buildings have a conventional rectilinear style while others are round or multi-sided.

There is an internal planning committee that acts as a filter and all plans must be posted for community viewing and comment before final approval is given.

Energy and ecological standards are not completely formalized but the understanding is that the best in natural and healthy building materials will be used whenever possible. Energy standards are enforced for all buildings and are more stringent than the local standards (which are currently equivalent to Denmark's in 1935).

The construction used has been almost exclusively timber, both for structural elements and claddings. The community is using a unique 'breathing wall' construction that eliminates the need for a vapor barrier and allows the fabric of the building to interact with the indoor climate in a beneficial way. There are plans to experiment with other types of ecological construction including straw bale and rammed earth.

Economics

There are many different financial situations and means of support possible in the community but there are the two general categories: students and staff of the Foundation and Open Community. Foundation 'students' participate in a two year program and essentially pay their own costs and expenses and a fee for the program. After two years they may apply for a staff position where their costs are covered and they receive a small stipend of about US\$300 per month (spring 1995).

Open Community members are responsible for their own finances, accommodation and living situation. Some are also staff of the Foundation that have private means but most are either self-employed or work for one of the many small businesses in the community.

There are two main employers in the community: the Foundation and the Foundation's trading company New Findhorn Directions, Ltd. But there are also around 30 other small businesses and enterprises from a Steiner school to computer software company. Despite a turnover of US\$1.5 million the Foundation usually barely breaks even and large capital expenses for new building is very limited.

The current arrangement for Foundation staff is increasingly recognized as being unsustainable, despite many having been there for ten or more years. The advent of building for privately funded houses on the Foundation's land has made the economic disparities clearer. There is a concern that those who have given so many years to the Foundation will have to continue to live in caravans while those privately employed will have the means to build houses.

After many years the Foundation has decided to allow private ownership on its land in The Park to give residents the chance to obtain bank financing, which up till now has not been possible. There are quite a few conditions attached to the title

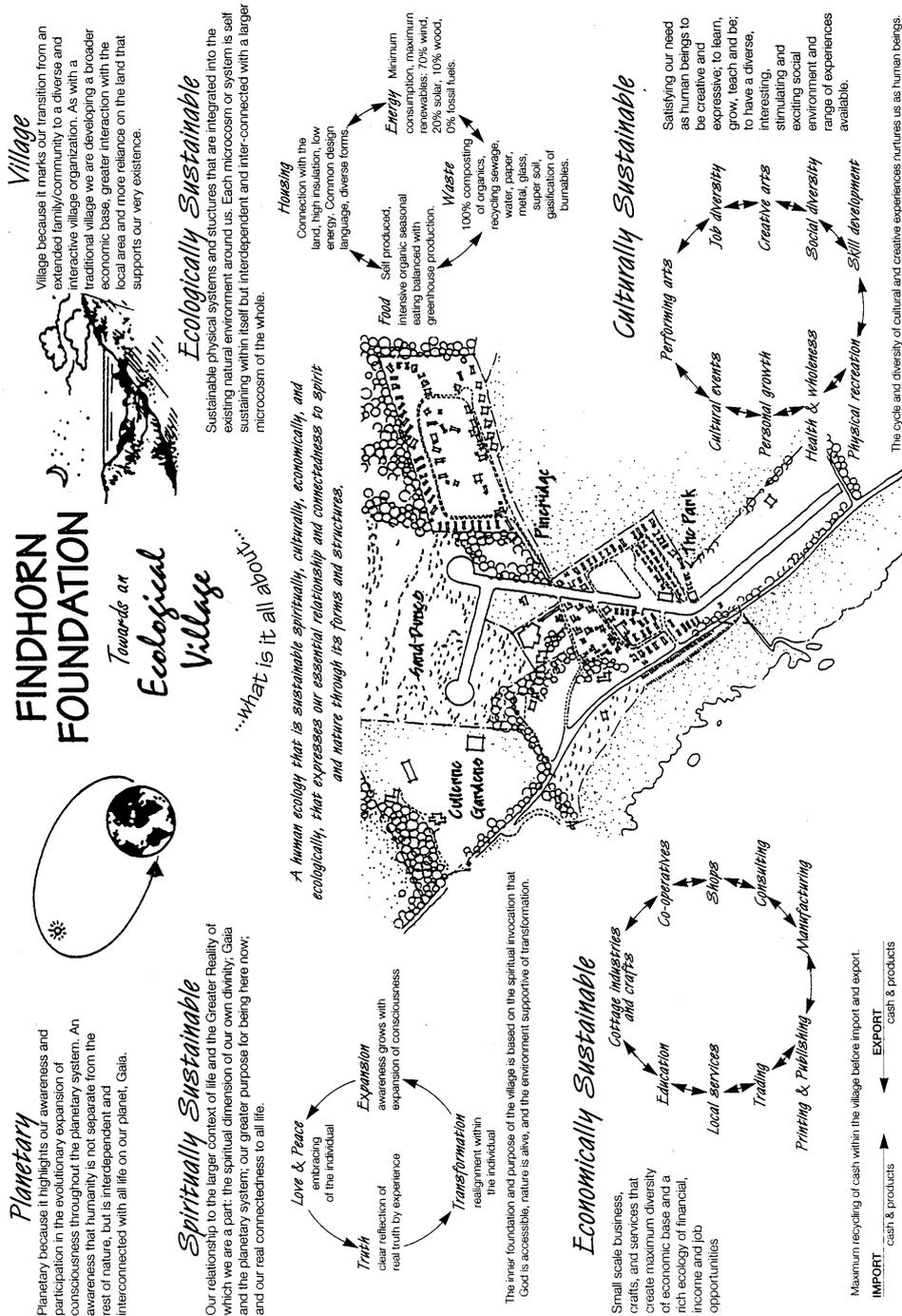


Figure 1: Findhorn Foundation

which will keep the land closely connected to the overall village development. The Foundation will also have the right of veto and/or the chance to buy back properties whenever they are offered for sale.

There is an active LETS system which has been slow to grow but which is now becoming more widely used.

Cultural activities

There is a rich diversity of social and cultural activities from the twice daily communal meals served in The Park and Cluny Hill to the various performances put on by both community artists and invited companies from many places around the world. Because of the large influx of people (10,000 per annum) there seems to be a never ending smorgasbord of offerings.

The community also hosts 2-4 international conferences a year on a wide variety of themes and also has a lecture series that brings leading alternative thinkers to Findhorn.

Community members are also encouraged to do their own creative thing and be involved in music, the arts, dance etc. as part of a balanced approach to life.

Strengths and challenges

The main and greatest strength of Findhorn is the collective spiritual orientation that allows a greater perspective and understanding to be brought into the inevitable challenges and conflicts that arise in community life. The size of the community now is also a great strength in providing a wide diversity of people and activities.

The greatest challenge now (there have been many others in the past!) is the maintaining of the close and connected community spirit that has always been a part of life at Findhorn as the community grows and continues to diversify. Providing an economically sustainable lifestyle to the Foundation's staff is also of great importance and will be receiving considerable attention in the near future.

Part 8

Technology Stream

Greywater Reuse: Some Options for Western Australia

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[Submitted Paper]

Introduction

Perth, like many Australian cities, is characterised by a Central Business District of concrete and glass towers surrounded by an ever-expanding suburban sprawl which swallows up bushland and agricultural land. This is a low density, automobile city possibly less car dependent than cities of the United States but more so than European cities (which are well endowed with public transport systems) and the low-energy Asian cities (where walking and cycling are often the norm) (Newman & Kenworthy, 1992). Australian cities are typically located on the coast, where soils are generally more fertile and rainfall more plentiful, and near mouths of major rivers for sheltered ports. Perth lies on the coastline of the Indian Ocean and at the mouth of the Swan River. This pattern of urban development has given rise to centralised wastewater treatment facilities which discharge their effluent through ocean outfalls. Marine ecology was not endangered under current pollution load but an ongoing monitoring program was called for to detect changes that may arise from the anticipated 5% per annum increase in disposal volume (Water Authority of Western Australia (WAWA), 1995). Certainly, this form of disposal represents a significant resource loss and is a major concern to the Western Australian community.

The centralised, large scale approach to water supply, sewerage and stormwater disposal has been described as “big pipes in and big pipes out” engineering from the last century (Newman, 1993) – up to 85% of costs are incurred from piping. This paradigm is inappropriate in the modern world and it may take a major catastrophe to convince the engineering community of this (Beder, 1993). Moreover, it is inappropriate to transfer this expensive, wasteful paradigm to developing countries (Niemczynowicz, 1993).

This big pipe/centralised treatment/ocean outfall approach continues with the low-density suburban expansion around modern, industrial cities requiring massive capital works, operation, maintenance and depreciation costs. Some 25% of the Perth metropolitan area was unsewered in 1994 when the State Government commenced an \$800 million sewerage reticulation of these residential properties to treatment plants. Formerly, these households used septic tanks and leach drains which deposited a considerable amount of nutrients into the groundwater and it was to prevent this and to safeguard public health that the huge expenditure on deep sewerage was justified. The fact that lawns leach a higher nutrient loading through application of fertilisers (Gerritse, 1993) went unquestioned. Many Australian cities, particularly Perth and Adelaide are in semi-arid climates yet there is a cultural tendency towards large areas of lush, green lawns around bungalow-style housing. Lawns are often over-watered and over-fertilised. Lawns consume some 40% of Perth's high quality water supply (WAWA, 1993).

While the fringes of urban Australia continue to push outwards with their associated resource-intensive water, transport and energy systems it is now understood that alternative models for development will be more sustainable. Minimum lot size has been the guiding principle to differentiate between the application of reticulated sewerage and on-site wastewater disposal systems. In Western Australia, the Department for Environmental Protection, generally specifies 2,000 square metres as a minimum lot size for on-site systems in unsewered areas (Middle, 1994). However, studies by Joliffe (1994) have shown that the performance of on-site effluent disposal systems is extremely variable with performance strongly associated with the level of maintenance applied to septic systems as well as to site characteristics such as soil permeability and slope. Joliffe proposed an alternative approach to the application of arbitrary minimum lot size. His six point strategy relies on an alternative planning approach which results in more efficient use of land through cluster housing in rural areas and this could also apply to urban renewal. Peter Cuming's new planning approach for rural settlements with cluster housing also provides a more effective pollution control framework in environmentally-sensitive areas (Sustainable Futures Planning & Design, 1995). These new planning approaches, of course, fit closely with permaculture principles.

The transformation of Australian cities to transit-oriented urban villages will lend itself to community scale, water-based, localised, sewerage systems such as Australian aerobic treatment units, eg. Aquarius, Biomax, Clearwater (for an evaluation of these and other new Australian systems see Gidiuli, Mathew & Ho, 1992). However, the transition period may be many decades and the existing, large treatment plants will have the capacity to serve a number of surrounding villages. Once population size begins to overload these plants sewer mining can divert excess to the new, smaller, village plants so that existing pipe infrastructure can be used until the end of its useful life. At each village the treated wastewater will be reused on community gardens, parks, ovals and green corridors between villages. Treated wastewater can also be returned to individual homes by separate reticulation and used in gardens. These approaches will be preferred by the regulatory authorities as they are able to retain more control.

Following similar practice with industrial wastewaters, the low volume, high strength effluent (blackwater in the domestic case) and the high volume, low strength effluent (greywater) are separated and the most cost-effective technology used for each. Thus, the optimum, low-energy, sustainable approach would be dry/composting toilets and greywater reuse. On-site greywater reuse in low-density housing areas will reduce the rate of flow increase to centralised plants in the transition period and the accelerating pace of water consumption. Low-density housing areas will be around for decades to come even if new, conventional subdivisions stopped now.

To have a significant impact on water and energy use greywater reuse needs to be coincidental with water-sensitive garden design, reduced lawn areas and growing food at home and in public open space. Greywater reuse can result in cost savings (to both the consumer and state water authority), reduced sewage flows and potable water savings of up to 38% when combined with sensible garden design (WAWA, 1993). The Wastewater 2040 community consultation process carried out by the

Water Authority of WA with the CSIRO showed that there was immense community support for reuse of wastewaters.

There will, no doubt, be social factors that prevent the widespread use of composting toilets in the near future. Hand basin flush toilets, where only water-based systems will be accepted, can result in water savings of 19% (WAWA, 1993). The blackwater could then enter a smaller diameter sewer to maintain flow velocities or the same sewer retained with increasing population densities.

Designs for greywater reuse need to be developed that do not cause environmental contamination or present a public health hazard. The purpose of this paper is to briefly review current research and development around Australia that is leading to acceptable designs while focussing on some particular case studies in Western Australia. Most detail is provided on five particular methods being trialed by the Institute for Environmental Science at Murdoch University. The trials are occurring both at the Institute's 1.7-hectare Environmental Technology Centre (a fully integrated permaculture development) and at various residences of permaculture practitioners. A scenario for the future is presented where greywater reuse is not only permitted but in many situations is compulsory.

Current regulation

Domestic greywater reuse, governed by state and local government health acts, is currently not allowed in any of the Australian states although it is acknowledged by the state authorities that 20% of householders engage in this practice in Perth (Lugg, 1994; Stone, 1994). Treated effluent from centralised plants of some country towns located in arid areas is used on municipal ovals and golf courses. More recently, in the state of New South Wales, treated effluent from centralised plants has been allowed in urban areas (New South Wales Recycled Water Coordination Committee, 1993).

In Queensland three options have been developed for possible implementation (Department of Primary Industries, 1996). These were 1) allowing greywater reuse to be continued in unsewered areas with additional monitoring by Local Government; 2) permitting and encouraging greywater reuse in both sewerred and unsewerred areas; and 3) extend option 1 to incorporate active promotion of reclaimed water (treated wastewater) through dual reticulation. This was a policy options paper and no technological options were discussed, eg. how to provide for pollution control.

National guidelines for the use of reclaimed water via dual reticulation have been prepared (National Health & Medical Research Council, 1996). Of relevance to this gathering are the criteria recommended for non-potable uses in urban residential areas, ie. garden watering, toilet flushing and car washing; agricultural food production; and aquaculture food production. The level of treatment recommended is secondary plus filtration and pathogen reduction. The filtration is required to further reduce suspended matter thereby making pathogen reduction via chlorination more effective. Pathogen reduction by disinfection (eg. chlorination) or detention (eg. lagoons) is required. It is possible that artificial wetlands can achieve all of the foregoing as a tertiary treatment method particularly if there are open water areas which will allow pathogenic die-off due to UV sterilisation.

Model guidelines for domestic greywater reuse in Australia have also been prepared (Jeppeson, 1996). These covered hand basin toilets, primary greywater systems (direct subsurface application) and secondary greywater systems (mesh, membrane or sand filtration). Procedures, criteria and components are specified for the design of individual systems.

For primary systems the guidelines have adopted the Californian approach of requiring the use of a surge tank with a screen to remove lint and hair. This is unfortunate in some ways as electrical power is therefore required for the automatic pump system and weekly inspection and clearing of the screen. The requirement for maintenance to these components by the householder resulted in some 80% of Californian systems being in an unsatisfactory condition. Several irrigation area layout designs are provided.

Secondary systems should be installed by licence only as is currently the case for all on-site disposal systems in WA including aerobic treatment units. As with the latter the owner is required to enter into a maintenance contract with the supplier. No pollution control methodologies are prescribed in either case.

System characteristics

A greywater reuse system needs to be able to receive the effluent from one or more households all year round. Where saturation of garden soils of low permeability occurs in winter rainfall, there should be facility to divert to sewer or alternative disposal. The system needs to protect public health, protect the environment, meet community aspirations and be cost-effective (Murphy, 1994).

Current on-site treatment systems have generally adopted the technology of the conventional activated sludge plant for large treatment systems. This is understandable, because the effluent standard for garden surface irrigation is a chlorinated effluent containing not more than 20/30 (BOD/SS). Differences that can be observed are the insertion of a trickling filter in the aeration chamber to cope with variable flows, and the infrequent removal of sludge. The anaerobic decomposition of sludge takes place in the first settling chamber.

If removal of nutrients are required for installation of on-site units in nutrient-sensitive catchments, P can be removed by alum dosing and N by nitrification and denitrification in separate chambers or by intermittent aeration of a modified activated sludge set-up. Hyperchlorination of ammonium in secondary effluent theoretically removes N by oxidation to nitrogen gas.

If the effluent is used for irrigation of garden plants there is the question as to why N and P should be removed. There may be an imbalance between plant requirement for the nutrients and the seasons, with a higher requirement in the warmer months than the colder months. Rather than removing the nutrients an alternative is to store the nutrients in the soil. Soils containing clay have the capacity to absorb ammonium and phosphate present in secondary effluent. Sandy soils can be amended with clay or if convenient the 'red mud', bauxite-refining residue.

Five different methods of greywater treatment and reuse under trial by the Institute for Environmental Science at Murdoch University are described below and compared

with similar projects elsewhere in Australia. Each system can be on-site for individual households or can be scaled up for cluster housing. Each has some capacity for pollution control while being cost-effective. A greywater reuse system currently under trial by the Water Corporation in Geraldton, Western Australia satisfies the model guidelines and disposal standards but does not feature any pollution control strategies and will not be reviewed here.

Options currently under research for Western Australia

Amended soil filter

Fremantle Inner City Agriculture (FINCA) developed a community garden on the Fremantle City Council's 800 square metre King William Park on Marine Terrace in South Fremantle, Western Australia and is using the greywater from two adjacent houses to irrigate it. This is part of a water-sensitive, permaculture design approach which also involves harvesting rainwater from the two houses' roofs, heavy mulching and appropriate, low water use species selection for growing food in a perennial polyculture. Design and sizing of the system was generally in accordance with Standards Australia (1994) to gain regulatory authority approvals.

Laundry and bathroom effluent from the two houses enters a collection tank in the park by gravity. The Health Department of Western Australia required the inclusion of this sullage tank prior to distribution. This was to prevent build-up of suspended solids or biological growths in the distribution system. However, the large diameter of the irrigation piping (90 mm) and outlet holes (25 mm) draining into an aggregate surround may have avoided this anyway. Particularly, with the irrigation close to the surface where there is aerobic, biological activity and the presence of earthworms is promoted. From the tank the effluent can be sent to either a duty or duty/standby field by gravity.

The duty field is modelled on the 'Ecomax' principle (Bowman, 1994) and its aim is to result in a tertiary quality effluent entering groundwater so as to avoid contamination by nutrients or pathogens. The plastic lined trench is filled with a mix of 85% red sand and 15% red mud (with 5% gypsum in the latter to neutralise its alkalinity). The red mud and sand are by-products of bauxite refining to alumina. Phosphorus is adsorbed into this clay material and nitrogen is removed from the system by intermittent drying and wetting causing nitrification-denitrification. Pathogens are filtered and die off. The duty field comprises two laterals of 20 m x 1.2 m and 25 m x 1.2 m wide providing some 70 square metres. The field is heavily vegetated with herbs, flowers and vegetables which will have significant nutrient uptake and transpiration. Thick mulch prevents any contact between greywater and foliage or vegetables.

The duty/standby field involves discharge of greywater into a heavily mulched and vegetated basin. It is expected that a considerable humus layer will form which will act as an aerobic buffer against nutrients and pathogens. The 40 m of HDPE, 90 mm diameter, perforated, flexible drainage pipe provided an irrigation area of 60 square metres.

Laboratory trials of greywater through soil columns with the red sand mix, humus and the Quindalup dune system sand from the site have been conducted to determine pollutant removal capacity. In the future soil samples from the site at various depths will be analysed.

Ross Mars has had an absorption trench design based on AS 1547 (Standards Australia, 1994) approved for his Hovea property. This design in effect relies on evapotranspiration. Discharge is into parallel pipes in a sand bed on the local clay substrate. It is assumed that nutrients will be absorbed in the clay substrate as well as being taken up by the growth banana, canna lillies, vetiver grass, sugar cane and other plants above. The system performance is currently being monitored.

Sand filtration

The Envirotech system consists of a receival tank where settling of solids occurs, a second chamber into which the effluent flows, when this is full effluent is pumped to the top of a deep bed sand filter, effluent is collected in the bottom and flows back to a third chamber of the tank, from here the treated effluent is pumped to the irrigation field. General practice is to chlorinate in this final chamber although it may not be necessary for subsurface irrigation. A system based on the Envirotech sand filtration will be installed at a permaculture residence in White Gum Valley, Western Australia with a large plot size of some 1000 square metres.

Wet composting

The Dowmus vermicomposting toilet system can be upgraded to receive wastewaters – both blackwater and greywater – and trials are currently underway. In Canberra, ACT, for example, about 12 households have had trial systems installed for monitoring by ACT Electricity and Water. With current population growth and water consumption patterns a new dam will be required and would cost in the order of \$1 billion. ACTEW have chosen to investigate the alternative, innovative path of water conservation measures.

The system utilises the Dowmus tanks modified for wet operation. Blackwater from the toilet enters a wet composting Dowmus tank and from there effluent goes to a second tank where greywater is also received. In this tank effluents are aerated around submerged volcanic rock media to achieve secondary standard treated effluent. From there the effluent goes to an irrigation storage tank in which chlorination occurs.

A wet composting research project will be established in Perth relevant to local conditions and integrated into a permaculture design.

Constructed wetlands

Glenn Marshall (1995) has conducted research into an on-site system in NSW that successfully integrates greywater, excess liquid from a composting toilet, constructed wetland planted with *Phragmites australis* (common reed), holding pond, flowforms and sub-surface drip irrigation. Long term performance data may still be required.

Tubemakers Water Treatment have recently completed construction of a combined wastewater treatment plant and constructed wetland at Mundaring, Western Australia for the Water Corporation. Mundaring has been served by septic tank systems but is in the water catchment area. A system was deemed necessary that would avoid possible contamination and at the same time allow for safe reuse of the treated wastewater.

The hybrid intermittently decanted, extended aeration (IDEA) system consists of two aerated tanks in series (Turner, Heaton & Meney, 1996). Removal of nitrogen occurs by nitrification/denitrification through control of anoxic/aerobic conditions in the first demand aeration tank and in the second intermittently aerated tank. Chemical dosing with alum allows precipitation of phosphates. Ultraviolet sterilisation provides pathogen reduction. Sludge is periodically removed to drying beds.

The free water surface wetland had to be designed within the constraints of the tender specifications and the site. The selection of plant species was based on their local occurrence in the region and proven performance in wastewater wetlands. Emergent macrophyte zones comprised *Schoenoplectus validus* and *Baumea rubiginosa* and the submergent macrophyte zones comprised *Triglochin procera* and *Potamogeton pectinatus*. The dual planting design fostered aeration in the wetland and optimal nutrient uptake across seasonal variations.

The required effluent characteristics from the wetland are BOD 5, SS 5, total N 10, total P 1 and thermotolerant coliforms 15. This is a very stringent specification and Tubemakers are confident of achieving this from a monitoring program that in future will cover seasonal variations and increasing load. Effluent from the wetland will eventually be reused on parks and gardens in Mundaring if the Council funds the pipework connection. Currently, and in future in periods of low demand, effluent is discharged to a 4 kilometre evapotranspiration trench.

Not far from the Mundaring site in Hovea, permaculture educator Ross Mars is conducting experimentation on constructed wetlands for his PhD research with the Institute for Environmental Science. The focus of the research is on the performance of the submergent wetland plant *Triglochin huegii* compared against emergent *Schoenoplectus validus*. Ross' aim is not only to verify wastewater treatment capability but, in line with permaculture principles, to use these 'bush tucker' species in a polyculture arrangement.

Modified aerobic treatment unit

At the sewerred suburb of Palmyra, Western Australia six aged-person, state housing units were chosen to be used for greywater reuse trial out of a larger urban residential redevelopment. Blackwater goes direct to sewer. All greywater from the six units goes to a single 'Aquarius' aerobic treatment unit. After treatment the effluent is pumped to storage tanks located in the roof of each unit. The effluent is then gravity fed to toilet cisterns after disinfection, and excess is used for garden irrigation either subsurface into amended soil or through large droplet sprinklers. The system was commissioned in August, 1995 and a monitoring program commenced from startup.

Of all the on-site aerobic treatment systems the Aquarius unit is clever in its engineering design and claims to remove nutrients to below 1 mg/l. Aquarius has five chambers: (1) primary sedimentation and aerobic digestion; (2) anoxic chamber for denitrification and chemical phosphorus removal; (3) aerobic biological oxidation including nitrification in subsurface biofilter and denitrification in submerged filter; (4) secondary clarifier and sludge recycle to the anoxic chamber; (5) chlorination and storage for irrigation (Mathew & Ho, 1993). As the unit was treating greywater only the first chamber was eliminated in this application so that biomass could be maximised in the subsequent treatment process.

At 15 Hamersley Street, Cottesloe, Western Australia, also a sewered suburb, a Biomax greywater reuse system was approved by the Water Corporation and Health Department and commissioned by Durrant & Waite Pty Ltd in May this year. Effluent is irrigated to the front and back yards via 'Dripmaster' subsurface tubing. Monitoring is currently underway to evaluate the performance with the reduced biomass as a result of greywater influent only.

The Institute for Environmental Science will conduct research on the use of a modified Biomax aerobic treatment unit for greywater reuse. A unit will be installed at the Environmental Technology Centre to serve the bathroom/laundry of the new climate-sensible Visitor's Centre (seminar building).

Conclusions

Some general principles can be deduced from current research.

- For the urban village, medium density development or group of houses, a greywater system utilising secondary treatment maintained by the supplier may be most appropriate. Tertiary quality effluent can be achieved biologically where necessary through the use of constructed wetlands. Reuse of treated effluent for low-maintenance garden irrigation would be subsurface up to 300 mm deep and through in-tube emitters or a pressure/drip arrangement.
- For on-site reuse at individual houses in the low-density setting (sewered or not) a primary greywater system with direct discharge into a large-diameter, subsurface irrigation system within 300 – 400 mm from the surface is most appropriate. Tanks, filters and pumps should be avoided as experience shows that these may not be maintained adequately by the owner. A surge tank can be used if retrofitting or topography will not allow gravity flow and if irrigation over a wider area is required. If pollution control for nutrients is necessary a plastic-lined clay bed along the length of the piping can be used. Once phosphorus saturation occurs the clay can be used as a soil amender elsewhere and replaced with fresh material. Phosphorus can be taken up in plants and harvested if vegetation is used on the field. A duty/standby field can be added in areas where winter saturation may occur. The field should be heavily vegetated and generally inaccessible. Seasonal biomass harvesting is recommended. Design should be region-specific taking into account soils, aquifers

and waterways but perhaps standardised within some local government areas to ease administration.

- Flushing toilets, deep sewerage and wastewater treatment plants did not replace night soil collection for economic reasons but for public health. Similarly, greywater reuse technology may not be viable now in purely economic terms. Its introduction needs to be seen in terms of its contribution to sustainable development and resource conservation without compromising public health or environmental quality.

The commencement of research into the above methods of greywater reuse will aim to achieve regulatory approval for on-site systems in WA by gathering further supporting data on the following:

- Long term effects of greywater on plants and soils and their nutrient uptake capacity;
- Long term effects of greywater on disposal area requirements;
- Low cost primary systems.

More information can be obtained from the authors at:

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Solar Dryer

David Coleman (Australia)

[Submitted Paper]

A solar powered herb dryer has been designed by David Coleman and the Rural Industries Research and Development Corporation are backing Dave and Living Waters to develop a herb industry and the experimental dryer.

To develop the industry, Living Waters is presently encouraging farmers and landowners to consider farming herbs on a large scale basis. Australia imports over \$18 million worth of herbs each year and we should be capable of reducing that considerably. A nursery is to be built to provide large quantities of herbs for farmers to get started and many varied herbs and plants will be considered for drying including fruit and vegetables.

Producing herbs as mono crops could easily be foolhardy with large potential for pests and diseases. As permaculturists we hope to encourage totally organic herb production which will not only produce a superior organically grown plant but assist in the building of suitable guilds and designed plant integrations providing natural pest and disease control. For example the growing of marigold species (*Tagetes*) in between grape vines reduces the need to spray for nematodes and adding wisterias help fix nitrogen and disguises grapes from bird attacks. Parsley, oregano, sage and camomile can provide a productive and protective ground cover in between vines, reducing the effects of grasses and weeds. Plus all are harvestable and useful. Research into suitable plants for drying is already under way at Living Waters and other interested bodies involved in the project.

The solar powered herb dryer has to have the capability to dry 500kgms of herbs per day from a 78% moisture content down to below 15% before packing or processing can take place. Half a tonne of herbs freshly picked will be brought to the dryer and be carefully dried with slowly passing warm air about 30 – 38°C.

The solar dryer will have a solar collector built in as part of the roof and cover some 120 square meters. An average of 300 watts per square meter over a 6 hour day will produce large amounts of heat that can be transferred into thermal storage accumulators similar to electricity being stored in batteries. As the energy is required it can be resourced and delivered to the drying room and through the herbs reducing their moisture content in the process.

The solar collector roof and the thermal storage units are both revolutionary in design and application. The collectors are 90% efficient compared to a black chrome hot water collector being 78%. Also it is part of the roof, saving money on roofing, and is made from non-destructive, off-the-shelf materials, ie polystyrene, polypropylene pipes and cement. An outer coating of bitumen mixed with latex is sprayed over the cement and provides not only flexible water proofing but a very good heat transfer to the cement and water pipes.

Water heated by the roof collector is pumped down to the accumulators which contain eutectic phase change material in the form of salt. Yes, hydrated salt. S04 10#20. The phase change materials (eutectic salts) are capable of storing huge amounts of latent heat, far more than any other substance known to humans. For example 10 times more heat stored than concrete of the same volume and 8.5 times that of water.

How does this work? When heat is added the salt reaches a temperature at which it will melt, and change into a liquid over a period of time absorbing Latent heat. It takes a long time to melt. The melting point can vary according to the application.

For example: Salts melt at 90°C. This is perfect for:

- Under Floor Heating: 29°C = Room Temp 25°C
- Herb Drying: 50°C = Dryer temp 30 - 40°C
- Hot Water Heating: 58°C = Water 58°C
- Desalination: 90°C = Water 90°C
- PLUS: 10% of external heating to bring to boil and crack sea water.

Horticultural propagation beds, animal housing. So many different applications, even cool ones to keep your beer cold.

Some extra spin-offs from using Eutectic heat accumulators:

- Automatic temperature control is built into the substance.
- A child cannot be scolded by hot water at 58°C. 64°C and you can feel the burn.
- All systems can be backed by a combustion stove or chip heater.
- Several different systems can be placed in series with the heat supply from the collectors or the back up supply.
- Once installed the savings far outweigh the initial cost, probably in the first year and it's all auto sun fed. Eight times less fire wood to cut. What a bonus!

A Demonstration of some of these applications will be at the Permaculture Conference and on site at Living Waters Permaculture Foundation, Denmark.

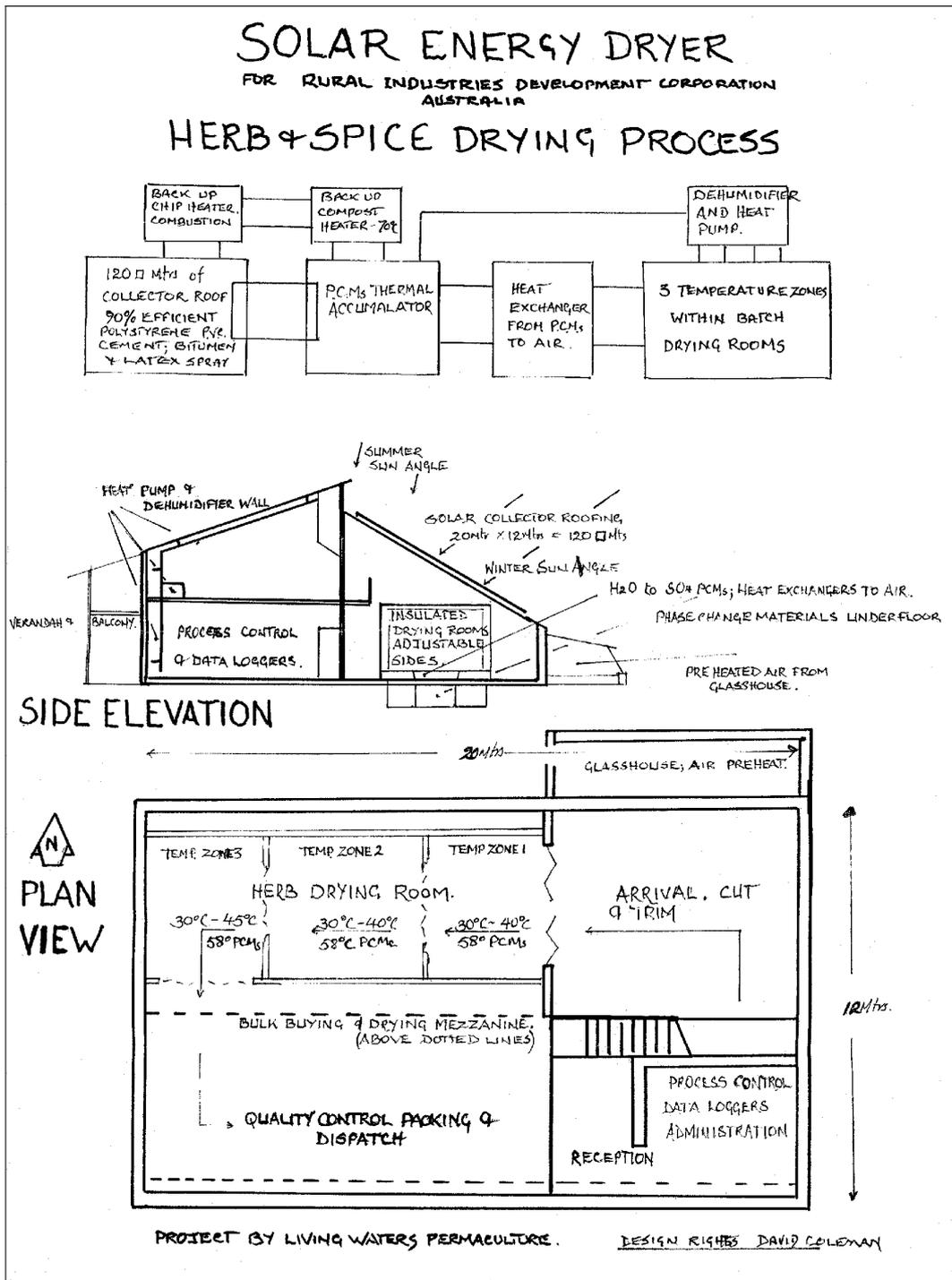


Figure 1: Solar herb dryer - process and building design.

Renewable Energy Comes of Age

Christopher Darker (Australia)

[Submitted Paper]

When one discusses natural resources, one normally considers that which lies within or upon the surface of the Earth. Today, however, I am going to talk about how you can get your share of humanity's greatest untapped resource that lies 150 million kilometres away at the centre of the Solar System. Of course, I am referring to the Sun, and the vast river of electro-magnetic energy in the form of light and heat flowing outward from it in a seemingly never-ending bounty.

The spectral distribution of solar radiation that impacts upon the Earth's surface spans a range of wavelengths between 0.3 micrometres (ultra-violet) to 1.8 micrometres (infra-red), with the visible lightwaves sandwiched in between. When we look at a beautiful rainbow, the range of visible lightwaves is clearly displayed. However, our human eyes can only see one-third of the total spectrum, as we are blind to ultra-violet and infra-red frequencies.

The amount of solar radiation reaching any given point on the Earth's surface depends on the latitude, season and time of day. However, on clear conditions around noon, the approximate energy density is 1000 watts per square metre of horizontal surface. For the production of electricity via the 'photo-voltaic' effect, we utilize the ultra-violet and visible light waves with panels realizing a conversion efficiency of between 10 to 15 percent. In other words, between 100 to 150 watts of electricity can be generated per square metre area.

There are basically three types of photo-voltaic panel currently in production for the conversion of sunlight into electricity: mono-crystal; poly crystal; and thin film. For the past twenty years, it has been the mono and poly-crystal panels that have dominated the power generation market, with the thin films relegated to a minor role in small electronic products such as watches and calculators. Now, however, the tide has turned and it is the thin film panels that are set to take centre stage, due to improvements in efficiency and long term stability that have plagued this form of construction in the past.

The two overwhelming advantages of thin film panels is their low embodied energy and the ease and speed at which they can be produced, which is in a roll-to-roll process similar to newsprint. Within three years, a thin film panel will repay its original 'energy debt' (the amount of energy embodied in its production), and the operational lifespan of the new 'UNI-SOLAR' modules is in excess of 20 years. Crystal cell solar panels, on the other hand, are far less suited to mass production, as they are made by a tedious, energy-intensive batch process that cancels out the positive environmental aspects of the first seven years of the panel's operation!

Other major advantages of thin film panels are that they can be manufactured without glass, so they are extremely durable and some are flexible; their power output

is stable irrespective of temperature variation, and the Uni-solar panels that I have here on display have a parallel cell architecture so they are shadow-tolerant.

So that you can appreciate how photo-voltaic power systems operate and to give you some conception of the scale of things, let's examine a low-cost, mini lighting kit that I have designed for a tent or single room. It consists of an 11 watt, flexible, thin film solar panel, a 12 volt 80 watt-hour heavy duty deep cycle battery, a 10 watt high efficiency quartz halogen lamp and a control unit.

Theoretically, the amount of energy stored in the 80 watt-hour battery could sustain the lamp for 8 hours from a fully-charged state, but the control unit will automatically switch the lamp off after 5 hours to preserve the battery's operational lifespan. In other words, 5 hours x 10 watts = 50 watt-hours has been discharged out of a possible 80 watt-hours, and 30 watt-hours will always remain. The control unit will also switch off the solar panel once charging is complete, to protect the battery from overcharge. The system is designed to supply several hours of lighting at night by accumulating solar energy during the day.

In this particular example, the wattage rating of the solar panel and the lamp are about equal, therefore, every hour of full strength sunlight striking the panel will provide around an hour of lamp operation at night. As well as being functional, this small system is also highly educational, expandable and a quality introduction to solar power systems.

In this presentation, I will demonstrate an 'entry level' state-of-the-art power delivery system running on solar and wind energy.

The system is designed to supply basic refrigeration, lighting, entertainment and communications services to a small residence, with an average daily energy consumption of 2000 watt-hours, and is comprised of the following components: photo-voltaic (solar) panels, mini wind generator, battery bank, sinewave inverter, logic control unit and super-efficient refrigerator/freezer. These components have been carefully matched to provide high performance at an extremely realistic price.

Photo-voltaic solar panels

The very latest triple junction amorphous (thin film) silicon solar power panels are shadow-tolerant, have a twenty-year warranty and an effective lifespan of over thirty years. Under typical Australian conditions, the 200 watt solar array will deliver an average of 1000 watt-hours of energy daily into the system.

Mini wind generator

This fine, compact machine has a twenty-year heritage, and with a propeller diameter of only 900 mm is not much bigger than a windvane. It is quiet and unobtrusive and designed for convenient roof mounting. Power output is 90 watts in a twenty-knot wind, with a peak output of 220 watts at forty knots. A daily energy production of 1000 watt-hours is easily achieved in most areas open to the prevailing winds.

Battery bank

A heavy-duty, 24 volt, 250 ampere-hour (6000 watt-hour) lead-acid battery bank is to store several day's energy in reserve to cater for cloudy, still weather conditions. These batteries are of the type used in electric vehicles and have a life of approximately 1000 charge/discharge cycles, equating to 3 to 5 years.

Inverter

The inverter transforms the large pool of low voltage direct current (DC) energy stored in the battery bank into 240 volt alternating current (AC) The output waveform is pure sinewave of a quality equal or superior to the utility mains supply. The continuous rating is 500 watts, with a maximum surge rating of 2000 watts, sufficient to operate the fridge, lighting, TV/video/computer equipment, food processor, small washing machine and hand-held power tools, etc.

A larger inverter is available, if required, to operate a microwave oven, electric iron, hair dryer, vacuum cleaner, and a wider range of higher consumption appliances up to 1200 watts continuous rating and 3600 watts surge rating.

Control unit

The 'Solar Wonderland' energy control and monitoring unit integrates the various system components, maintains the battery condition within strict operational limits and provides essential data to the users. A priority shutdown circuit automatically switches off non-essential appliances in the event of a low battery condition, effectively rendering the system foolproof.

Refrigerator/Freezer

The super-efficient 'Enviro' refrigerator/freezer has a gross storage capacity of 140 litres and an average daily energy consumption of 1000 watt-hours. This remarkable efficiency is achieved with the latest 'green freeze' compressor and heat exchanger technology based on isopropane refrigerant. It is ideal for a small family or for preserving vital medical supplies.

Unique advantages

The key features about this whole system which will endear it to a wide range of potential users are its ease of installation, versatility, expandability, negligible maintenance, and very importantly, its amazingly low price, which is currently around A\$6000. This is truly a significant price/performance breakthrough, and for many people throughout the third world and rural Australia it heralds a quality of life and amenity often denied them.

The Permaculture House: Principles and Examples of Organic Solar Architecture

Gary Dorn (Australia)

[Conference Report]

The basic ethic of Organic Solar Architecture is the integration of building energy and food systems. The process involves dialogue between the architect and the needs of the client, and development of key concepts – the process evolves holistically. If the client chooses to reflect deeply on all aspects of the project including personal needs etc., there can be great enhancement of the project, and the client's experience.

Gary suggests observation of the chosen site utilising permaculture principles. A particular building technique he favours is Straw Bale Construction; straw is easily available and environmentally ideal, fire retardant, highly insulating, aesthetically pleasing, and inexpensive. Use of recycled materials is suggested. The straw is rendered with lime and sand, or with cement, mud, etc added.

The cost of straw bale construction is approx. Aus\$300 per square metre instead of \$1000 to \$1500 per square metre for a traditional building. It can be constructed by the owner with ease, reducing costs.

There is a Straw Bale Construction Home Page on the Internet, consisting of around 1000 pages. It has been used throughout the world with success in countries such as England, France, Scandinavia, USA, Mexico, New Zealand, Mongolia; and all climates are suitable.

There has been some construction in Australia – some building authorities have had some reservations regarding approval, however these do not seem to be insurmountable.

Aspect and location are crucial, and Gary suggests using models of traditional Mediterranean and Eastern building styles to best work with our Australian climate, rather than the original British type dwellings widespread in Australia. Verandahs and clerestory windows used to channel light and heat in summer and winter placed in the appropriate direction can save energy and expense.

Now that effective solar energy equipment is accessible the building can be entirely sustainable. By building using the permaculture model, the home and user expend far less unnecessary energy.

Garry is known globally as Krakka, after his attendance at the last International Permaculture Conference in Copenhagen (IPC5). He now builds mainly Solar powered straw bale buildings and is beginning to get a reputation of being the permaculture architect. As someone who works only with permaculture clients, he is a must to see. His presentations are humorous, enlightening, full of information and reflect that he really cares about the earth, and positive sustainable living.

Greywater Re-Use: Hardware, Health, Environment and the Law

Glenn Marshall (Australia)

[Submitted Paper]

Abstract

Greywater re-use for garden irrigation should be encouraged in urban and rural households. It utilises a valuable on-site resource, conserves precious drinking water and reduces the load on wastewater disposal systems (both on-site and centralised). If applied appropriately to gardens, greywater re-use presents minimal health and environmental pollution risks.

The key to appropriate greywater re-use is user-awareness of the issues surrounding greywater. This includes hardware, health, environmental and legal aspects, which are summarised in this presentation. The presentation covers simple and complex greywater re-use systems, health risks with re-use, potential environmental degradation, minimisation of greywater pollutants and additives, and the changing attitude of water authorities in Australia to greywater re-use. With increased greywater knowledge, permaculturists can play an important role in promoting the sensible re-use of this household 'waste' water.

Introduction – what is greywater?

Greywater is the term given to all used water discharged from a house, *except* for toilet water. Greywater includes shower, bath, hand basin, kitchen sink, dishwasher, washing machine and laundry tub water. This water is called 'grey' water because it turns grey if stored for a while. It also becomes quite smelly if stored for a day or so.

Greywater is sometimes called *sullage* in Australian literature. Toilet water is generally called *blackwater* or *sewage*. In most literature, both are lumped together as *wastewater*. This convenient label is misleading because greywater is very different from blackwater, and neither should be wasted water. Both can be re-used for garden irrigation, but require different methods and levels of handling because of their fundamental differences. Greywater is far easier, safer and cheaper to re-use than blackwater, and is the focus of this paper. Houses with composting toilets have no blackwater, and should be encouraged.

Why bother to re-use greywater?

Greywater re-use for garden irrigation provides several beneficial results. It utilises a valuable on-site resource which is otherwise wasted, it conserves fresh water which can remain in natural ecosystems, and it reduces the load on wastewater disposal systems (both on-site and centralised). This last point is important as many on-site septic tank systems in Australia are failing, resulting in effluent surfacing in the leach field area. This presents a significant health and environmental pollution risk

for occupants and the local catchment. Direct greywater re-use for garden irrigation diverts much of the low-pollutant water load from a septic tank system, allowing the system to function under far less stress.

How much greywater do we create each day?

An average urban Australian house uses 820 litres of water per day for indoor and outdoor use. This encompasses toilet (140 L), greywater (340 L) and outdoor (340 L) use. Toilet water use is reducing as dual flush toilets become more widespread. Greywater is generated in the bathroom (180 L), laundry (110 L) and kitchen (55 L). Each house varies from these averages depending on appliances and habits, but the volumes indicate a lot of greywater is generated that generally disappears down the plug-hole never to be seen or re-used again.

Can we create less greywater?

Yes, and it is a positive step. Creating less greywater means we use less fresh water, which can therefore stay in rivers and lakes where it is needed by natural ecosystems. We can create less greywater in two ways – use water efficient appliances and practice a water conservation ethic. The most effective water saving devices are flow restrictor discs inserted in the shower rose, low flow shower heads, aerators on taps, low water-use dishwashers and front loading washing machines. A water conservation ethic is easily learnt – shorter showers, bath to relax, wash full loads, turn off the tap when brushing teeth – all the things local water authorities have been encouraging for years.

So what is in greywater?

Greywater contains what is washed down the drain, and so varies from house to house. For most houses it is soap, shampoo, toothpaste, shaving cream, food scraps, cooking oils, dishwashing detergents, laundry detergents, hair and lint. Normal use of these products appears to do no harm to garden soils and plants if greywater is used for garden irrigation. The most significant general pollutant of greywater is powdered laundry detergents. These are often high in salts (check for ingredients with *sodium*), many still contain phosphorus (which is known to contribute to algal blooms in Australian waterways), and are often very alkaline. Continual garden re-use of laundry water containing high salt, phosphorus-containing detergents can lead to salt accumulations in re-use areas, and stunting of native Australian plants with low phosphorus tolerance. Regions with regular rainfall may not suffer salt build-ups due to leaching of salts from soil after rain.

There are several alternatives to using powdered laundry detergents. These include liquid detergents (which are generally much lower in salt content, eg. Ark), pure soap flakes (eg. Lux soap flakes) or ceramic disks (eg. Tri-Clean laundry disks). High strength cleaners should be avoided in the home, as they are often toxic to both people and the environment. If caustic cleaners are washed down the drain, they are likely to kill beneficial treatment bacteria in septic tanks, sewage treatment plants or soils if greywater is re-used for on-site garden irrigation. Many 'green cleaners' are effective alternatives to high strength cleaners, and can be found in books such as *The Green Cleaner* by Barbara Lord (1989). An environmentally friendly option to

using bleach is to use hydrogen peroxide, which breaks down quickly to hydrogen and water in the environment. Products containing boron should be avoided as this is toxic to plants even in small amounts. Nutrient levels in greywater are generally low (except where phosphorus-bearing laundry detergents are used) and are easily utilised by vegetation in the garden.

Accessing greywater

Many slab-based houses have plumbing pipes entombed in the concrete slab, making access to greywater for re-use very difficult. Often greywater is mixed with blackwater by the time it exits the slab, making direct garden re-use inadvisable for health and environmental reasons. Housing construction regulations could be changed to make mandatory the separation of greywater and blackwater plumbing inside floor slabs so that greywater can be accessed for direct re-use if desired. Non-slab houses generally can be replumbed fairly easily to allow greywater re-use in the garden.

Greywater Re-use – is it legal or illegal?

Direct greywater re-use for garden irrigation is currently illegal in all Australian states. Greywater which has passed through a secondary treatment system (eg. reedbed or aerating package plant) may be re-used for irrigation in certain states if disinfection is provided (eg. chlorine tablets, UV or ozone). Regulations are set by conservative state health departments whose main concern is the perceived public health risks associated with greywater re-use. This fear seems to be unjustified based on greywater health risk research in Australia and America. Regulators are also concerned with high nutrient loads in greywater. Research in Australia and America shows this to be unfounded in households which do not use phosphorus-containing detergents. Local councils can choose to override state regulations, and this has occurred in some unsewered areas of Australia. A notable victory for permaculturists came with the successful struggle of Michael Wilson and Fiona Buining to be granted approval for a composting toilet and greywater reedbed system in a sewer area of Hepburn, Victoria in early 1996 (see *Permaculture International Journal* #58 and/or *Earth Garden* #95).

Encouragingly, direct greywater re-use for garden irrigation is now being examined by some Australian water authorities as an option for reducing fresh water demands in rural and urban areas. In January 1996, the Queensland Department of Primary Industries released a Policy Options Paper on the Use of Greywater, which examines the potential for regulated re-use of greywater in sewer and unsewer areas of Queensland. Regulators realise significant direct greywater re-use already occurs in Australia, and are working towards recommending specific re-use techniques that minimise health and environmental pollution risks.

How unhealthy is greywater?

Diseases are potentially present in used house water only where occupants are ill. The majority of diseases in used house water derive from enteric pathogens excreted from human intestines (eg. *Giardia* and *Cryptosporidium*). Greywater contains no faeces (except where nappies are present) and any urine from showers is generally sterile. An important study by the Los Angeles Office of Water Reclamation in 1992

monitored eight greywater re-use systems for a one year period in the City of Los Angeles. The study concluded “the use of gray water at the pilot project sites does not pose a significant risk to the users or the community”. The study found disease organisms were not present in greywater-irrigated areas, nor in stored greywater and stated “this may indicate either an entirely healthy test population (highly unlikely), or a mechanism for deactivation of pathogens”. There have been no recorded cases of people in Australia, America or Britain ever getting sick from contact with greywater re-used in the garden.

To spread disease, people must come into contact with the contaminated water. With sensible greywater management, this should never happen because greywater should only be applied beneath mulch or soil. Topsoil is alive with micro- and macro-organisms, and disease organisms struggle to survive in such a competitive environment. Households with kids in nappies can use a three-way diverter (eg. Suldi valve) on the washing machine tub to divert poo-ey water to the blackwater stream.

Basic recommendations when re-using greywater

Greywater re-use systems can vary in complexity from bucketing water out to the garden through to automatic sand filter/pump/drip irrigation systems. The choice of individual homeowners will depend upon lifestyle, size of garden, site layout, climate, available finances and other factors. Some basic parameters should be adhered to whatever system is used.

Storage of greywater should be avoided where possible. Pathogen numbers can increase rapidly in a favourable greywater environment, and stored greywater will begin to smell strongly as it becomes anaerobic (within a day or so).

It is best to apply greywater beneath mulch or soil. This stops the possibility of greywater pooling on the surface where children and pets can play in it or mosquitoes can breed. Surface spraying of greywater is not recommended, as the potential for people/greywater contact is significantly increased. Direct contact is virtually the only way for people to get sick from greywater re-use. Sub-soil or sub-mulch application of greywater also reduces the chance of water flowing overland into neighbours' properties or into gutters and waterways. The easiest way to apply greywater sub-mulch is to position greywater outlet points in swales or mulch basins then cover with mulch. Applying greywater beneath mulch means the greywater must soak through topsoil where micro-organisms and roots are most active. This biologically active soil facilitates destruction of any pathogens, breaks down organic matter and utilises nutrients in greywater. Greywater applied too deep in the soil (around six inches depending on the site) does not have contact with this most active soil horizon and will not get the same efficiency of treatment.

Both bathroom and laundry water are generally far less polluted than kitchen water, and so are easier to re-use. Kitchen water can be re-used through an independent system (eg. directed to one or two mulch basins around trees near the kitchen), or can be directed to the blackwater management system if the household greywater system cannot handle the high-pollutant load. Remember that kitchen water pollutants are mostly compost, and if applied directly to soil under mulch, should decompose quite rapidly.

A three-way diverter valve (eg. Suldi valve) plumbed under the kitchen sink and/or laundry tub allows specific greywater loads to be directed away from the greywater re-use system. This may be useful when harsh chemicals have been used (eg. bleach) or nappies are being washed.

Re-using greywater on the vegetable garden is probably not a good idea because of the (remote) possibility of transferring bacteria from greywater to food. Many permaculture practitioners will re-use greywater on vegetable gardens, and should ensure greywater is applied beneath mulch and that root crops are not watered with greywater for at least one week before harvest. Never drink greywater or re-use it for showers, washing clothes and dishwashing. If water is that scarce, then invest in water saving appliances, a water conservation ethic and a larger rainwater capture area. This will be far cheaper and safer than treating greywater back to full contact standard. An old wastewater saying holds true here – clear water is not always clean water.

Types of greywater re-use systems

Detailed explanations of greywater re-use systems are not going to be attempted here. For a comprehensive description of greywater re-use systems, I recommend the booklet *Create an Oasis with Greywater* by Art Ludwig. This American booklet is applicable to Australian conditions, and is well illustrated and explained. It is available through the *Permaculture International Journal* mail order catalogue for A\$14.

Greywater re-use can be broadly classed in two categories – untreated greywater re-use and treated greywater re-use. Untreated greywater goes straight from the house to the garden, sometimes with temporary surge storage (eg. plastic barrel) so that large flows from the bath or washing machine do not back up into the house. Untreated greywater may pass through a filter (eg. old pantyhose), but will still contain suspended particles and organic matter which can clog a drip irrigation system. Untreated greywater is therefore generally applied to the garden through larger diameter emitters (pipes or hoses). Treated greywater has passed through a treatment system (eg. reedbed, sand filter or soil filter) before application to the garden, and has few suspended particles or dissolved organic matter remaining in the water. Treated greywater is therefore appropriate for drip irrigation re-use. The use of drip irrigation increases the potential for high-efficiency greywater re-use because water can be applied in well-regulated and well-directed doses to trees, gardens or lawns. The biggest drawback with drip irrigation re-use is that water must be delivered under pressure for the drippers to function as intended. This requires either a pump or good gravity fall. Installation of a treatment system (and most likely a pump) means treated greywater re-use is generally more expensive than untreated greywater re-use.

Untreated greywater re-use systems include:

- bucketing water out to plants;
- siphoning water out of the bath/shower with a hose and directing to plants of choice;

- showering in the garden;
- connecting a (non-kinkable, large diameter) hose to the washing machine and directing water to plants of choice;
- discharging laundry/bathroom water to a surge barrel (with pantyhose filter) then gravity feeding or pumping to plants of choice;
- directly discharging kitchen sink water to a tree with mulch basin (a mulch basin is a depression dug around a bush/tree/banana circle, and excavated soil is positioned to form a wall around the basin. The basin is then backfilled with mulch. Greywater is directed to the basin, cannot escape, and cannot surface above the mulch).

These systems are generally simple to install and maintain, are inexpensive, and provide reasonably efficient re-use of greywater.

Treated greywater re-use systems include:

- constructed wetlands (reedbeds),
- intermittent sand filters,
- soil filters,
- greywater septic tanks, and
- aerated wastewater treatment systems (which use considerable quantities of electricity).

These require detailed installation and maintenance and are relatively expensive, but provide a high quality treated water which can be used in drip irrigation systems. Regulatory authorities are more inclined (at this point in time) to approve a system like this rather than an untreated greywater system. This will hopefully change as untreated greywater re-use systems are installed and successfully trialed in different areas of Australia.

Conclusion

This paper has been an introduction to greywater re-use. It has not attempted to describe re-use systems in detail, nor present a literature review of greywater research in Australia and overseas. The author intends to compile a greywater booklet which covers these issues in greater detail, and which describes greywater re-use systems suitable for Australian conditions. It is hoped the booklet will be used by homeowners, and by local and state regulators seeking more information on greywater and its potential for direct garden re-use.

More information can be obtained from:

Glenn Marshall, WaterWays Asia-Pacific, PO Box 921, Nightcliff, Northern Territory 0814, Australia.

Glenn Marshall, completed his B.Applied Science (Hons.) in 1995, entitled On-site Management of Greywater and Human Wastes. Djanbung Gardens, Nimbin, was one of the properties where Glen researched and implemented his composting toilet and

greywater wetland systems. He has recently begun documenting various greywater systems operating at many different permaculture properties around Australia and overseas, with the intention of publishing a 'How to build?' booklet. Glen has also worked as a volunteer at the Permaculture International Journal (1994-95).

Water Wheel Engineering

Ron Shannon (Australia)

[Submitted Paper]

Design decisions

Which water wheel technology best suits your situation? The answer to this question rests mainly in three parts, assuming money is no object:

- How much 'head' of water is available and what is its flow rate?
- What civil engineering works are needed to make it useful?
- What is the level of available technology?

Head of Water is a term that is characterised by the difference in height of the first availability of the water (ie where you take it under your control) and the location of the device utilising the water's potential energy to produce a useful form of energy for human consumption, like electricity, for instance. The taller the height that the water descends before you attempt to extract energy from it, the greater the effects of gravity on its acceleration from that height and the greater the available potential energy will be. Potential energy is energy in a latent or stored form. A heavy concrete block suspended from a thick rope has potential energy; it can potentially descend to provide energy that is 'kinetic', or dynamic, in nature. This energy might be used to drive a pile into the ground, for instance. The energy is potential while ever it may happen, but currently isn't. Kinetic energy is energy due to velocity. The faster the velocity, the greater the energy for any given mass that is in motion.

Head of water is potential energy; litres per second of water is kinetic energy or 'happening' energy. Water stored in an over-head tank or a hill-top dam is potential energy, waiting to be tapped for use. Water soaked into the ground is indirect potential energy. You could use it to grow trees for fuel.

What civil engineering is required?

Do you have to build a hill-top storage dam to store rain run-off, an over-head water tank, a weir across a stream, or are you so fortunate as to have a natural water-fall available to provide energy from hydro-electric water turbines? Best of all is to have a perennial stream. This requires little engineering on your part to produce pumped water or electricity.

Each of these scenarios has its own in-built problems and engineering works.

A hill-top storage dam presupposes a hill-top catchment area. You will need to have the collected water channelled into the dam and this may involve earth-works in a (for heavy machinery) sometimes dangerous location. This danger will add to the cost and difficulty of 'delving' needed drains and channels. The right location for the dam is vital, too. Read Yeomans' book "Water for Every Farm" or hire a hydrological engineer.

Water is heavy stuff (a kilolitre weighs a tonne) so dams and stands for water-tanks must be carefully engineered if they are to do their job. This means they have to be 'substantial' which is another way of saying expensive. On the other hand, a cheap dam or tank-stand is only temporary, at best.

The water from a water-fall needs to be controlled and contained before it can become useful energy. This usually, but not always, means a large tube and a cliff-top collection weir to gather the water and direct it to the turbine for conversion into rotating mechanical energy suitable for driving machinery.

What level of technology?

One of the simplest and most efficient types of water turbine for small-scale use is the Australian Michell or 'Banki' turbine. This is easy to construct in a backyard workshop with welding and plate-metal engineering facilities because of its simplicity. It is similar to the 'barrel' fan often seen in water-evaporative air conditioners and in some small 'blower-heaters' for home use.

Other types of water turbine may be purchased from specialist suppliers. There are Pelton Wheels, used in high pressure systems that have relatively low flow rates but very high 'head'; Francis-type turbines for use in higher flow rates and lower 'heads'; and Tyson turbines that are mounted on a raft for anchoring in flowing streams. This latter is another recent Australian invention and provides surprising performance at very slow flow-rates. It is most often used to pump water but can be adapted to provide electricity or both at the same time! At the bottom end of the technology scale are the water-wheels. These are proven and mature technology, albeit at a simple level, having been around for some six thousand or so years. If you work in wood, the simplest hand-tools are sufficient to build a basic water-wheel.

Water-wheels come in two basic flavours – under-shot and over-shot, with the former having two basic variants depending on the height of the water feed to the wheel. The over-shot wheel has the water being fed in to the wheel disk at the top so as to collect in buckets on the wheel causing the front of the wheel to be heavier than the rear. The weight of water causes the wheel to rotate forwards, emptying the buckets into the 'tail-water' stream which then flows on to the sea, or where-ever. High efficiency comes from full utilisation of the water flow which is directed into the wheel buckets with little or none flowing elsewhere, unlike an under-shot wheel with 'bypass' leakage below and around the wheel. Even so, there's not much in it between the two, although the over-shot wheel has fewer problems with water-borne debris. The narrow clearance below and to the sides of the over-shot wheel are an invitation to jamming by even small branches and logs if no special precautions are taken to filter them out of the feed water.

The oldest variant of the under-shot wheel is like a paddle wheel on a paddle steamer. It has its lowest extremities immersed in the flowing stream which causes the wheel to rotate backwards. It powered the English Industrial revolution in its early stages until the advent of steam-power.

A more efficient version of the under-shot wheel has the water fed into the wheel a bit less than half-way up. The water feed channel (or Flume) continues to follow the

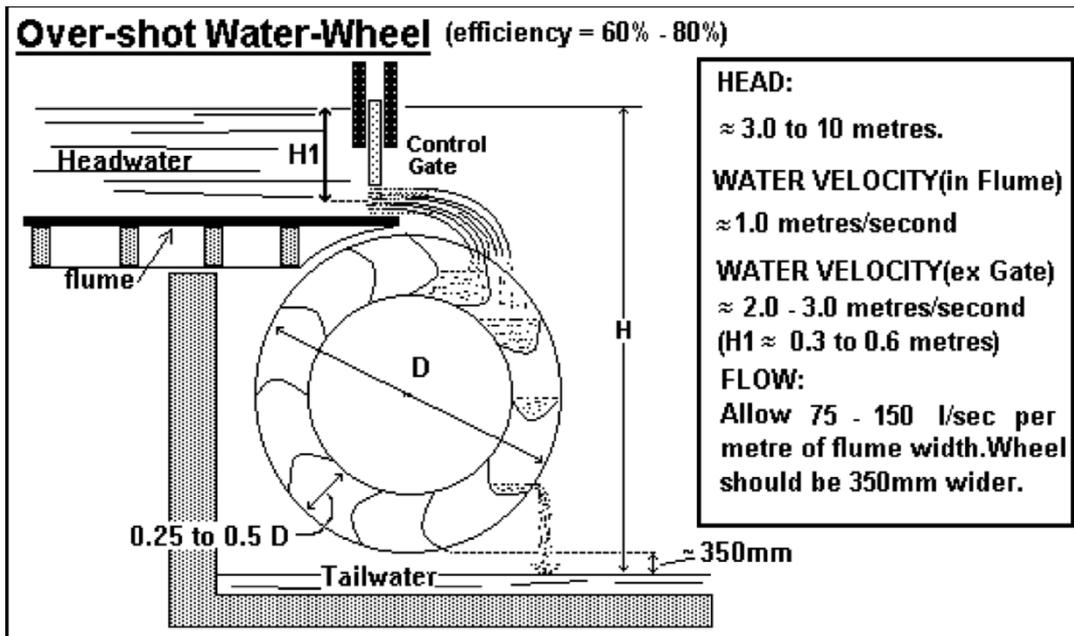


Figure 1: Over-shot water-wheel

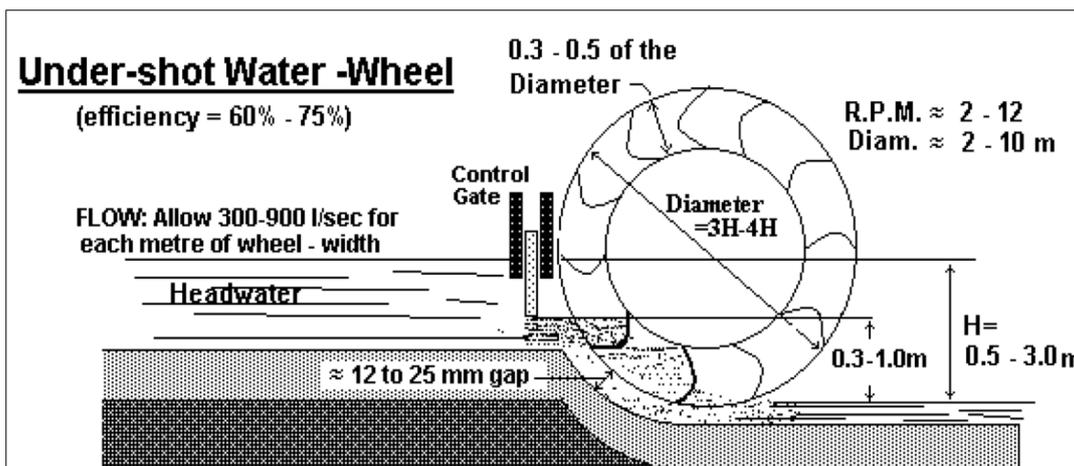


Figure 2: Under-shot water-wheel

curve of the wheel downwards to a point directly underneath the axle where it flows into the tailwater stream. This curved channel is closely fitted to the dimensions of the wheel, trapping the water in such a way as to closely couple it to the wheel structure and not allowing much 'slippage'. In some respects it combines the best of both over- and under-shot wheels. This is a type of wheel suited to home handy-man construction. The shaped flume can be built from concrete, cement-rendered brick, steel or even wood. Provision must be made to filter out all water-borne debris that is likely to cause harm to the wheel mechanism by impact or jamming. An overflow reservoir is a useful method of allowing floating debris to be bypassed around the wheel, while filter screens will be needed for other rubbish. In some situations the filter will need fairly constant attention to keep it clear and the wheel turning, so design ease-of-filter-cleaning into the system.

Whilst the design rules allow for any width of wheel, for structural strength it is wise to keep the ratio of diameter to width as near as practicable to 8 : 5. This is not a hard and fast rule, however, and D:W ratios of up to 1:2 are used. Beyond this, the strength of standard-sized timbers and steel structural members tend to be insufficient to the task and heavier construction is called for which will increase expenses dramatically. Bear in mind that torque is the product of force times leverage. This means that larger diameter, narrower wheels are preferred, consistent with flow rate. 'Work the numbers' first before you start building to see what you are up against. One or more extra reinforcing rims may be necessary across the width of the wheel.

Pelton wheels

Pelton wheels are high-speed, highly engineered devices that would be beyond the ordinary resources of a home handy-man. Someone with an industrial lathe, milling machine and a foundry could perhaps manage to build one but the design requires detailed metallurgical knowledge and experience, accurate machining and heavy-duty workshop equipment. It is not for the hobbyist. However, it is possible to purchase the difficult-to-manufacture rotor and case assembly for use in your own set-up from specialist turbine manufacturers.

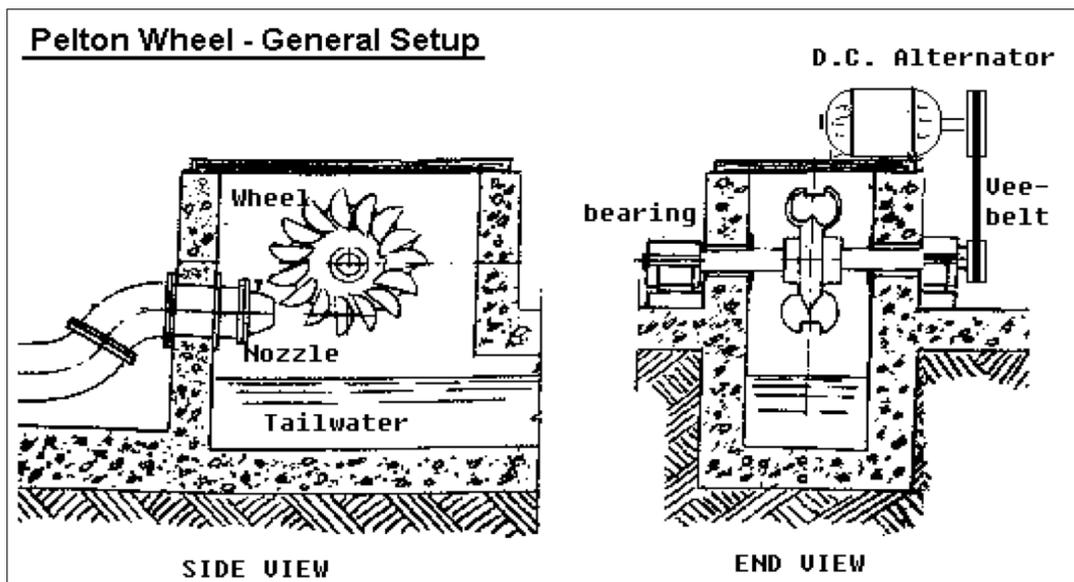


Figure 3: Pelton wheel – general setup

Figure 4 shows details of the typical pelton wheel showing the complex, stress-resistant construction. (lots of bolts!). Not a task to be taken lightly.

Pelton wheels typically have more than the one nozzle and some have 'throttleable' nozzles for power control. Another variant switches multiple nozzles on or off to achieve a similar result but without the fine control.

Control of water wheels and water turbines presents some problems in the case of electric power generation. Normal domestic electricity in Australia runs at 240 Volts and 50 cycles (or Hertz). To maintain both the voltage and the frequency within limits requires fine power control and load regulation. Now, while this is possible

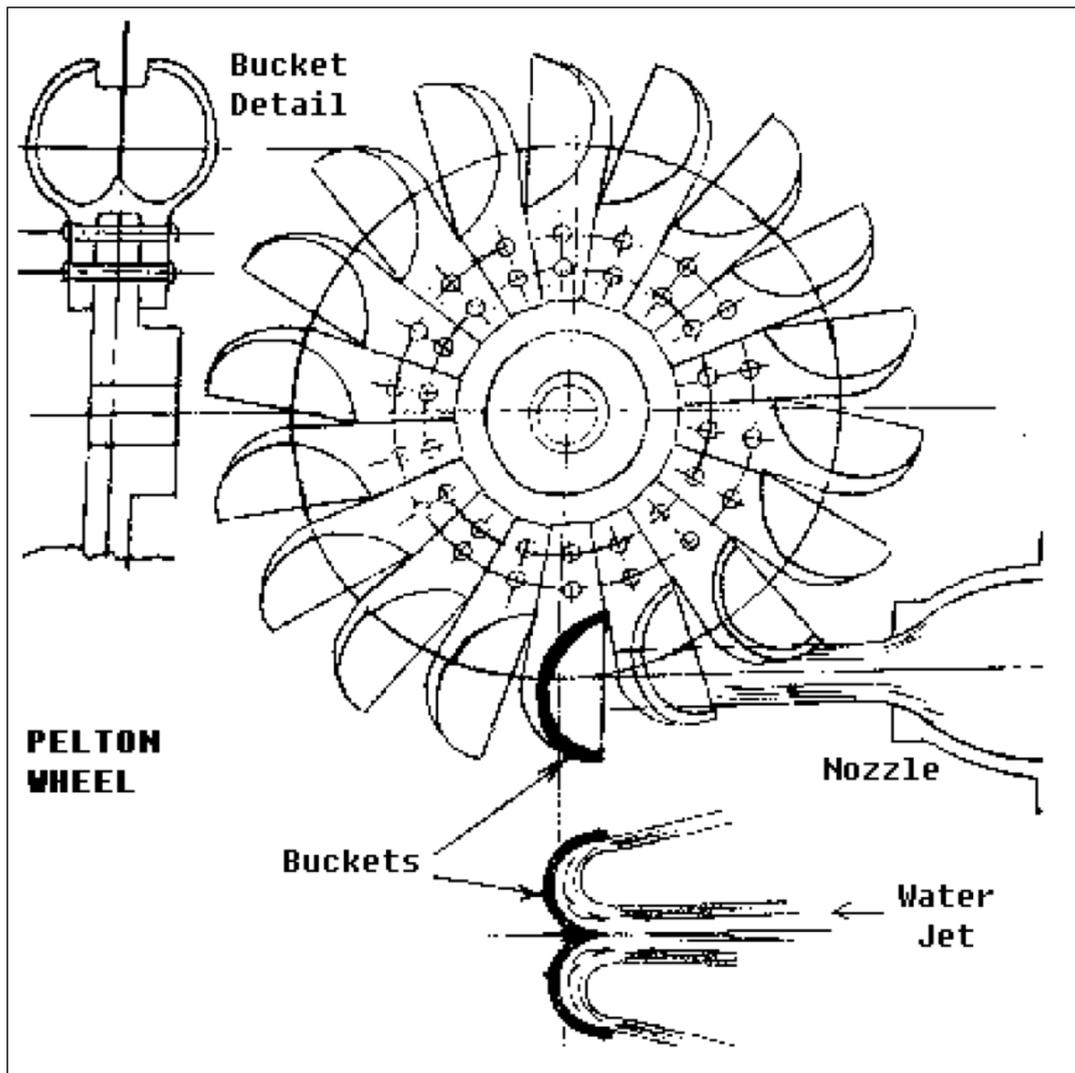


Figure 4: Pelton wheel detail

(hydroelectric power companies do it all the time), in a small scale system for a single home the control problems can be very difficult. Most people opt to generate Direct Current (DC) instead for a number of reasons:

1. DC can be stored in batteries and generated using readily and cheaply available technology, mostly from motor vehicles.
2. the batteries also provide the scope to store power from other sources such as photo-voltaic (solar) cells, wind or diesel genset for those instances when water flow is insufficient to supply power for the home. Some domestic appliances will require an 'Inverter' to provide the 240 volt, 50 cycle power normally provided in suburban homes. This is an added expense.
3. the presence of other power sources allows for pumping water when the water wheel can't.

If you have a fairly reliable and constant, high-volume flow of water then an Alternating Current (AC) supply is a possibility. The most difficult part of this type of

system is the control of water flow to the turbine to provide first; a constant alternating frequency, and second; a constant voltage with changing loads as different appliances are used then turned off again, such as the fridge. So what, I hear you say, the extra savings in not needing battery storage or charge regulators can be used to give accurate load regulation. Not necessarily.

A water wheel responds too slowly to changes in flow to allow straight-out flow-volume regulation of power parameters. That is, more load, more flow; less load, less flow. When a fridge compressor starts up it wants 240 volts, 50 cycles *right now*, not in three or four seconds time. There is the danger of burning out the motor if the voltage 'sags'. To overcome this problem of response time, it customary to have a limited capacity battery bank with a 'sine-wave' inverter to provide the extra 240 volt power temporarily while the water-wheel or turbine gets 'up to speed' to provide for the higher load. In addition you will need some fancy mechanisms to vary the turbine inlet water flow as required by the electrical load.

The Tyson turbine

The *Tyson turbine* (**Figure 5**) is mounted on a floating pontoon platform and is usually moored in mid-stream of a flowing river or creek. It is relatively light and with the turbine itself cranked out of the water the system can be towed by a light boat to a new location. Both rotating and reciprocating outputs are available from the gear-box. The latter being used to operate a positive displacement pump for water and the former being used for rotating machinery such as two alternators to provide DC power to charge batteries directly at the riverside or for conversion to AC for longer distance transmission up to five kilometres from the site.

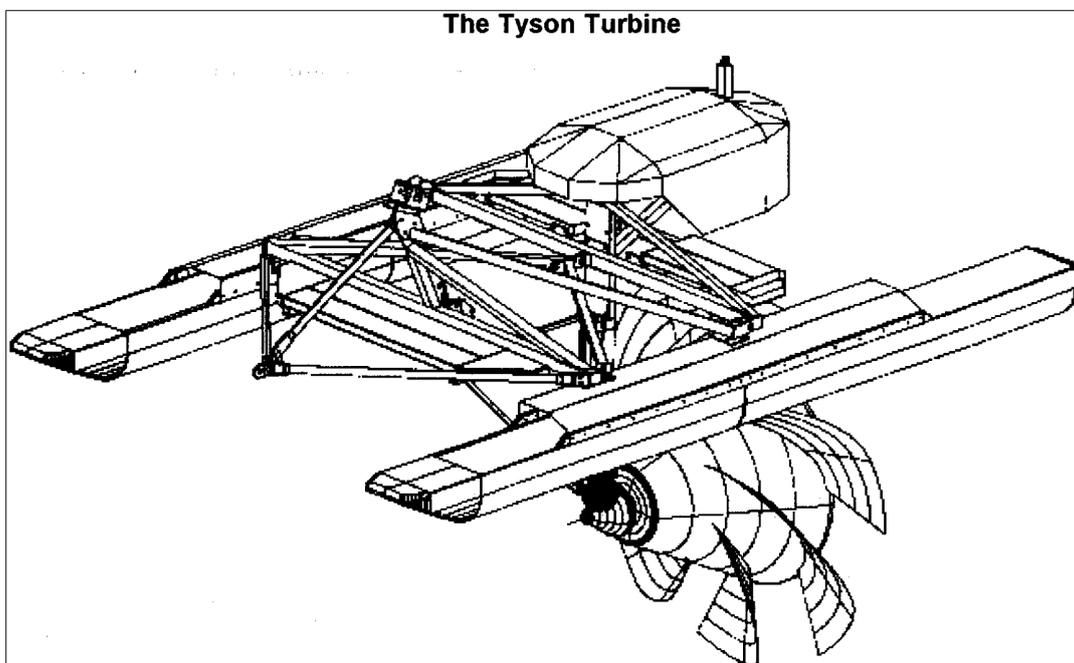


Figure 5: *Tyson turbine*

How much power will I get?

The power generated by moving water is a product of *Net Head* and *Flow Volume* (through the water wheel or device). What is Net Head? Net Head is derived from Total Head minus Head Losses. This, of course, begs the questions: what is Total Head and what are Head Losses?

Total Head is the total vertical distance that the water is falling or moving from while Head Losses are those factors that reduce the effective head such as bends in a stream, changes in stream wall and floor 'roughness', stream cross-sectional area, obstructions, etc. So a Head Loss is caused by anything that obstructs or limits the ready flow of water. How do we work this out? First we need to know the Total Gross Head (before losses are subtracted). We do this by finding the difference in height between the source water (Headwater level) and the level of the discharge water from the turbine (the tailwater level). If you can't afford a surveyor, try the method shown in **Figure 6**. With care, it can be quite accurate. Accuracy is not a real issue, however, because within +/- 10% is good enough; after all, we only want to get some idea of performance for evaluation purposes at this stage.

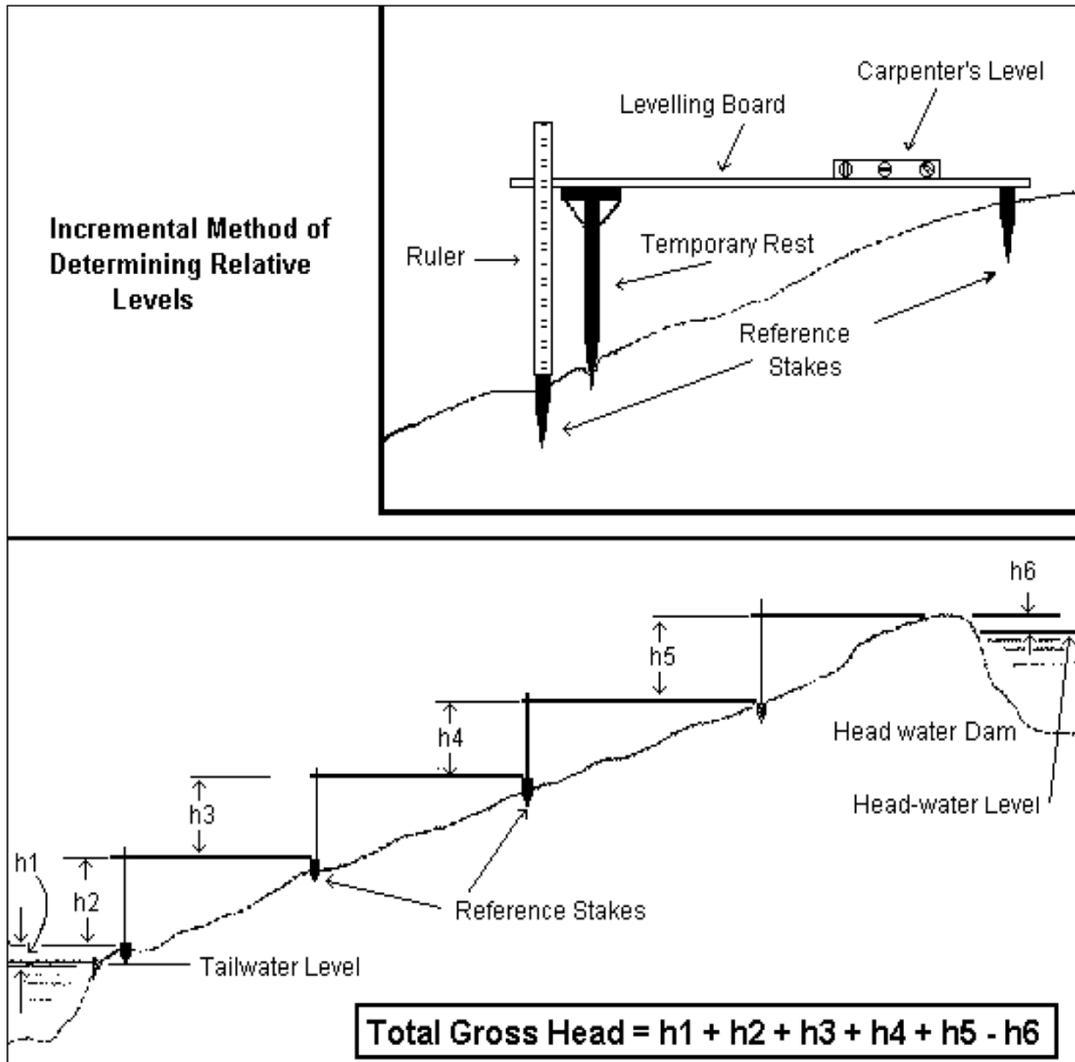


Figure 6: Determining levels

Having determined our gross head, we will now have to determine the losses in our water delivery system from the Headwater Dam to the turbine. This will vary depending on the type of system. For a pipe, the losses per linear length are fairly well documented by the pipe manufacturer, given the flow rate in cubic metres/second (or maybe cu. feet/second). Any bends, joins or other restrictions will add to the figure and the manufacturer can supply figures for these, too. For an open drain (or flume, as it's known), you will have to refer to an hydrology engineer or a good publication dealing with losses in open flumes. Such things as soil types, linings (if any), cross-sectional area and shape all affect losses. Soil type also affects the maximum water velocity you can utilise in a flume and this will, in turn, impact on your maximum flow rate and therefore power generated.

To calculate the Gross Power Available from a particular flow of water, use the following formulae:

$$GMHP = \frac{MWF \times NH}{75}$$

where:

GMHP = Gross Metric Horse Power
MWF = Minimum Water Flow (1000 m³/s)
NH = Net Head (m)

Don't forget, no machinery is perfect and will not, therefore, convert *all* energy presented to it into useful energy for your use. Assume about 80% efficiency for most turbines, in the absence of knowledge to the contrary. This means that Net Horsepower output will be 80% of the calculated Gross Horsepower.

What we need, still, but don't yet know, is how to calculate the flow rate of the water. This is pertinent to the *type* of water-wheel/turbine as well as the amount of available power. Some water-wheels or turbines work better in some situations than others because they are inherently, by design, built for particular conditions.

In Australia it is not uncommon to have 'winter creeks' that only flow for a few months of the year. In that period the flow rate may vary over a range of several hundreds down to one. Obviously a turbine that worked more efficiently at low volume flows would provide useful power for a longer period of the year than one designed for fast-flowing waters. It would be important to extract power even when the flow had slowed to a trickle and less important when the creek was in spate, especially for a home electricity generation system. This scenario would also apply to the situation of using irrigation waters from a farm dam to provide power because the water level, and therefore the Gross Head, would vary enormously. So, there are, as always, horses for courses. You will have to decide.

The Michell (or Banki) turbine

A sound choice, however, would be the Banki turbine (**Figure 8**) in situations of variable flow and volume because it is readily 'throtttable' to maintain a high conversion efficiency level, even over a 100:1 (or more) ratio of flow or head. They are also cheap and simple to build and have the endearing virtue of extracting power

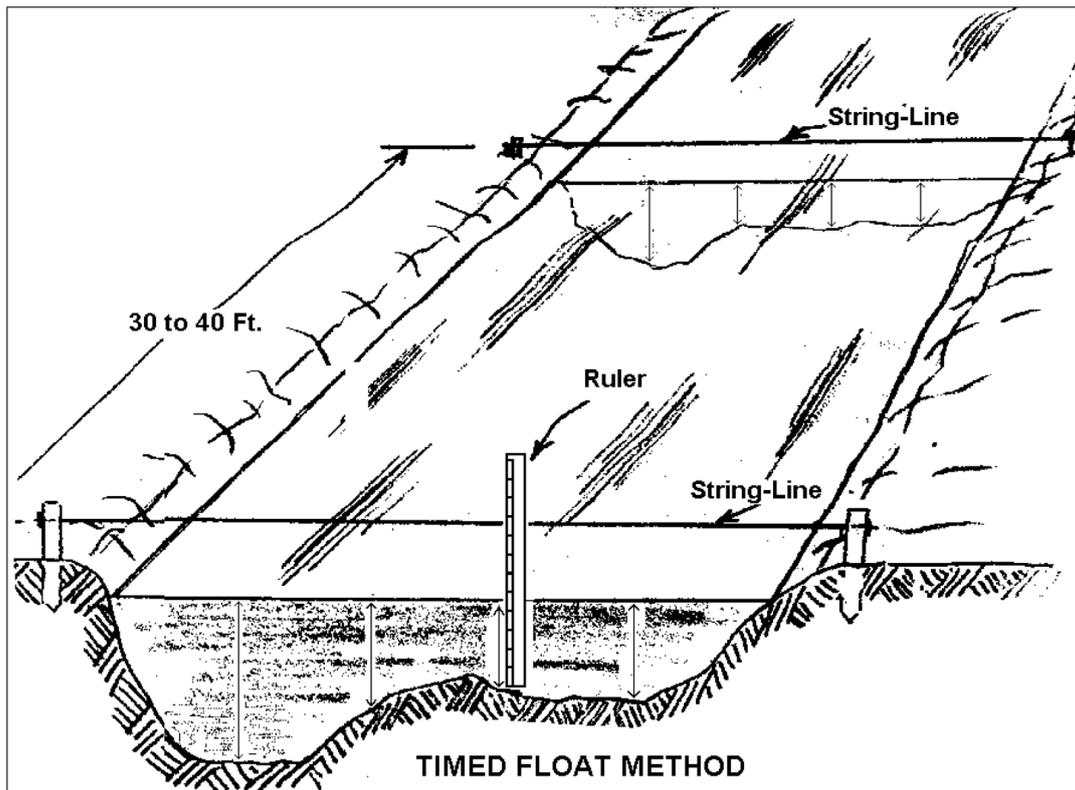


Figure 7: Determining flow rate

from the flow twice; once on entry to the wheel and once on exit from the wheel and, therefore, constitute a 'double-acting' turbine. The physical design is simple and lends itself to 'backyard' fabrication. Don't be fooled, though, these turbines mean business. For instance, a 900 mm diameter, 600 mm wide Banki turbine running from a head of 20 metres at one cubic metre per second will produce in excess of 260 shaft horsepower at about 500 RPM. This is serious power!

The Banki turbine consists of a rotor that is not unlike that in a 'Barrel' blower-fan. It has two circular endplates with the shaft running through the middle of them and curved vanes strung longitudinally between them. With the shaft horizontal, the water is let into the turbine 'runner', as the rotating bit is known, at the '9 o'clock' position (as viewed from the end) where it imparts some of it's energy to the vanes. The water then jets across the hollow interior of the runner to impart more energy to the vanes on the opposite side at about the '5 o'clock' position, hence the 'double-acting' function because the water is used twice before it is exhausted to tailwater. The Michell turbine is very amenable to power control by means of narrowing the feed-nozzle width and for fine control by means of a throttle plate in the throat of the feed-nozzle. In some designs, coarse control is accomplished by means of dividing the feed-nozzle horizontally into independent sections that can be fed, or not, with water. This allows conservation of feed water stocks and maintain output power to specification by shutting off one or more feed-nozzle sections under light loads. This is a similar tactic to that used to vary output power of multi-nozzle Pelton wheels and steam turbines.

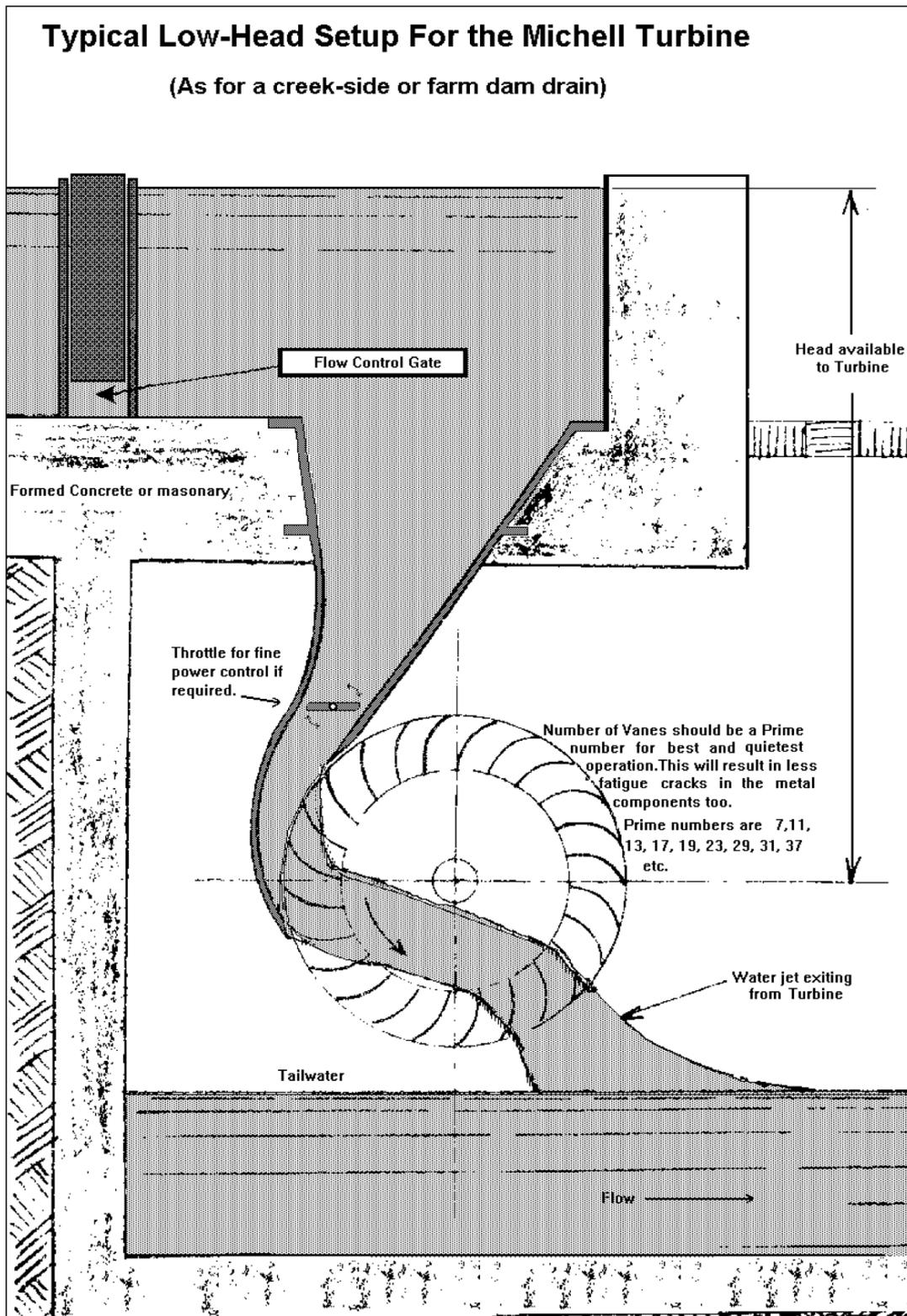


Figure 8: Michell turbine

Whilst being fairly compact in size, the construction of a Michell turbine requires substantial structures since a small runner can still produce output power comparable to a Mack truck. Bearings and their mountings need to be solidly built and

protected from water ingress while the runner, itself, needs attention to detail to ensure structural rigidity and good balance since rotational speeds of up to 600 RPM may be reached easily. An out-of-balance runner will soon destroy its bearings and support structures, as well as being noisy.

On the topic of noise, be aware that rotating machinery, no matter how well balanced, will still vibrate due to harmonic resonances if the number of vanes is an even number. To alleviate this problem, make sure that you build with a 'Prime' number of vanes. Prime numbers are those divisible only by one and themselves. The first few are seven, eleven, thirteen, seventeen, nineteen, twenty-three, twenty-nine, thirty-one, etc. So use one of these numbers of vanes. There will still be substantial noise generated by fast revving alternators or pumps and their associated drive-belts, pulleys or gearboxes which will necessitate siting the machinery away from habitation and in a reasonably sound-proof enclosure. Belt noise can be minimised by correct alignment and adjustment, but not eliminated. Make sure that vermin can't get access into the runner compartment where they could throw the rotating machinery temporarily out of balance and thereby create destructive chaos.

A 'trash-rack' will be necessary to filter out water-borne matter substantial enough to jam or catch on the rotating vanes whilst an overflow tank can be used to reject any floating debris. Get your feed-water as clean as you can to improve the longevity of the runner. Water-borne dust and grit will quickly wear away metal parts but can be mostly removed by settling out in the same pond used for rejecting the floating debris. This pond needs to be large enough for the feed-water velocity to be reduced to 2% or less of the feed flume velocity. This then dictates that the pond dimensions should be fifty or more times the width of the flume and at least one and a half to two times the depth. The pipe that feeds the feed-water to the runner flume from the settling/overflow pond is called the penstock. An ideal arrangement would be to feed the penstock from the centre of a circular pond, via suitable trash-racking, from near-surface waters and feed replenishment water into this pond tangentially at the edge so as to cause the feed waters to swirl around the edge. This has the advantage of depositing silt and grit at the edges where it is readily dredged out, as required, and forcing floating debris away from the trash-racking by centrifugal force until it has the time and the position to exit via the overflow flume. An appropriately positioned metal-strip slide on the outside of the floating rubbish exit could be arranged to filter out and deposit firewood for winter use, if sufficient were to be found in the source water.

Biogas

Ron Shannon (Australia)

[Submitted Paper]

Introduction

There are a variety of gases useful as fuel. The three most commonly used world-wide are Liquefied Petroleum Gas (LPG, propane, butane), Natural gas and Biogas. LPG is a mixture of volatile fractions from petroleum refining; principally propane, butane, propylene and butylene. This is often used as a substitute for petrol in motor vehicles because it is easily liquified, has a reasonably high fuel (or calorific) value and is readily available if you own an oil refinery. A product of oil recovery is Natural Gas which usually gushes to the surface from the oil well and is composed mainly of methane. This gas is a by-product of anaerobic decomposition of vegetable and organic matter and occurs naturally, too, as 'Marsh Gas' in swamps.

For small-scale production of fuel gas, the choice is definitely Biogas because of its relative ease of production by anaerobic digestion of animal wastes and other organic matter. The active or main flammable component of Biogas is methane which has a little-recognised attribute; although it is in itself a notorious 'Greenhouse' gas, when used as fuel it is the kindest of all because it burns to minimal carbon dioxide and water. True, carbon dioxide is also a greenhouse gas but methane gives off only half as much for a given fuel value than most. Another advantage of methane is that unlike most other fuels, it does not give off poisonous carbon monoxide when burnt, so it is safer to use in the home than other gases for cooking and heating. Biogas can be used as a fuel for gas heating, steam generation or directly as a replacement fuel in internal combustion engines. Methane has a very slow flame-propagation speed of about 430 mm per second. This means that it burns with a 'whoosh' rather than a 'bang' so it makes a very mild-mannered, tractable fuel for internal combustion engines. For the technically minded, it has good anti-detonation properties (effectively a high octane rating) and can be used to power petrol engines or as 95% of the fuel for a diesel. Since a diesel lacks spark ignition the 5% of diesel fuel is needed to ignite the gas although there are spark ignition conversions available.

Unlike commercially available Natural Gas, Biogas contains a large proportion of carbon dioxide along with water vapour, some ammonia, some hydrogen sulphide and a few traces of other gases which are insignificant for practical purposes. Because of the hydrogen sulphide and the carbon dioxide, biogas needs to be preprocessed in an operation called 'scrubbing'. The main purpose of scrubbing is to remove as much as practicable of the corrosive gases which combine with the water vapour to form acids and hence corrode all metal parts of the gas system, and to get rid of the unburnable carbon dioxide that simply 'takes up space' for no useful return.

WARNING: *Biogas forms an explosive mixture with air or oxygen. When there is unburnt Biogas in the air **do not use naked flames or any spark-producing tools or devices!** Gas concentrations of about 5% to 20% by volume in air can ignite.*

Further to the above warning, normal hand tools such as spanners, pliers and screwdrivers can cause sparks when struck against steel or iron, even hob-nailed boots! Electric hand tools like electric drills, saws, etc normally produce sparks from the motor when running. Think carefully before under-taking work in a gas-contaminated atmosphere. Better still, wait for the gas to clear first before starting work or leave it to professionals.

CAUTION: *methane can be narcotic in effect, leading to errors of judgement and reason. In high concentrations it can also asphyxiate or anaesthetise you. **Be wary of gas; it can kill!***

If you are in any doubt of your ability to handle working around gas producers, then don't! You only die once.

Having thoroughly frightened everyone into some semblance of caution, let me further warn that in some states (of Australia) it is only legal for a qualified gas fitter to work on gas installations.

Gas production, processing & storage methods

The production method we will discuss here is 'bio-digestion' which is an artificially maintained version of what goes on inside a cow. Normally this is done in a 'Digester' which is simply a large container of a size to supply the amount of gas you need. The gas is then 'scrubbed', stored, pressure regulated and piped to the appliance using it, such as the kitchen gas stove, hot water system or lounge-room gas heater.

The digester

Digesters can be as varied as the wind from a mere plastic bag to a complex piece of engineered machinery. The necessary functions of a digester are to:

- Contain the 'charge' of water and solids.
- Collect the gas for processing and storage.
- Regularly stir and mix the charge.
- Accept new quantities of charge.
- Keep the charge at operating temperature.
- Provide a means to discharge the spent contents.
- Allow access for repairs and maintenance.

These necessary functions can be varied in form depending on the basic type of digester; either 'batch' or 'continuous'. There are two 'flavours', as well; *Mesophilic* and *Thermophilic* which refer to the operating temperature ranges of particular bacterial types. Mesophilic digesters operate at around 'blood-heat' or 38°C, give or take

10°C, while the thermophilic types work at hot-water temperatures of around 60°C. Needless to say, the thermophilic digesters require extra heating which translates into extra running costs, while a mesophilic one will only need a little extra heating (for most Mediterranean climates). Thermophilic digesters have a place in industry, however, when the feedstock temperature has already been elevated by the industrial process, such as the hot water used for washing-down in abattoirs and fruit canneries.

A Batch Digester operates on a single charge until it is exhausted, producing gas via a scrubber to a storage device. At the end of the digestion cycle, the Batch Digester is emptied, cleaned, recharged and restarted for a new cycle then left until done. This cycle time may be as long as six weeks. Operating the batch digestion system requires that you have two or more digesters to be able to have a more or less continuous gas supply. Three is more practical. Batch digesters have the quality of predicability because once started they are not disturbed or interrupted.

On the other hand, Continuous-Feed Digesters have increments of charge added and subtracted on a daily basis to provide an ongoing replenishment of charge materials and water. It is obvious that the amounts withdrawn and replaced should be exactly the same or the digester may become either overloaded or underloaded. Knowledge of your feedstock, that with water makes up your digester charge, is vital. One daily increment that contains a bactericide will kill off the bacteria, necessitating a time and energy consuming cleanout of the entire digester system and a restart from 'scratch'. In the intervening two to three weeks there will be no gas production. Continuous-feed digester systems are less expensive to set up due to lower capital costs (you only need one digester, not several) but they do require close monitoring of feedstock solids. On the other hand, they are easier to automate due to their incremental nature.

What equipment is needed? You will need a large container with particular characteristics. It must not allow any metals but iron (steel), nickel and cadmium to come in contact with the digester contents or the bacteria will be poisoned and die. (Remember that steel water tanks are often galvanised with a coating of zinc which is highly toxic to the bacteria) Nickel and cadmium both aid methane production by some (probably) catalytic process although the exact mechanism is unknown and both metals can be a problem after digestion is finished since they are poisonous. The iron, too, can be a problem, but only because the hydrogen sulphide/sulphuric acid will corrode it if it is not protected by some acid-proof coating such as a bituminous paint or similar.

The digester must allow for the input of 'feedstock', the 'fuel' or 'food' for the bacteria to live on and convert to gas and, of course, for the removal of spent stock and detritus. The digester contents will have to be warmed up to the operating temperature range and preferably maintained near the optimum of 35°C for mesophilic systems. In cold climates this presupposes some form of insulation and in most climates a means of heating the feedstock and digester contents. In hotter temperate areas you may need to shade the digester in summer. The mesophilic bacteria will be killed after less than fifteen minutes at a temperature of 50°C or greater. If the heating fails, a digester will typically cool down at about 0.5°C to 1.0°C per day, depending on the prevailing 'shade' or ambient temperature of the location.

What does the well-fed digester feed upon? Typical solids consist of animal manures, vegetable scraps, food scraps, ground-up straw or grass and the odd dead rabbit, although this latter one will tend to block the pump. Ideally, all digester feed-stocks should be minced or ground up (chewed?) to a uniform size for best operation. This aspect is not absolutely vital to digestion but it will slightly increase gas production and it is vital for preventing pumps and plumbing becoming clogged. Total Solids contents over about 5.0% will cause pump problems and accelerated wear because of blockages and compaction.

Typical 'recipes' consist of about 2.0% to 12.0% of solids by weight with the rest being warm water. Above about 6%, gas quality may begin to degrade due to the digester contents becoming more 'acid' and this may require intervention to correct the pH level either by feeding back into the input side some of the spent charge or by direct chemical means such as limestone, etc. Below 2% will not provide sufficient substrate to support an active enough bacterial population and gas quantity per unit solids will decline. If pumps feature in your design, keep the Total Solids percentage down in the range of 2.0% to 4.5% and it will pay to eliminate all right angle bends from plumbing that carries the feedstock+water charge, too. If you are loading the digester directly by hand through a chute, Total Solids up to about 12% will provide greater gas production, albeit at lower quality, because there is more 'fuel' for the bacteria to feed upon but beware the 'acid stomach' syndrome!

Because the chemical reaction is to combine the carbon in the organic matter with the hydrogen from water to form methane, it follows that for the optimum gas production the ratios of the raw materials should be also be optimum. This is extremely difficult to quantify because the feedstock solids can be so variable. A handy 'rule-of-thumb' to determine feedstock efficacy is the carbon/nitrogen ratio. Bear in mind, however, that a straight chemical analysis will give a result that takes into account *all* the carbon and *all* the nitrogen. Not all may be in an available chemical form, though, so this will tend to give misleading results for the purpose of determining gas production capability. For instance, for wood shavings and straw, a lot of the carbon is bound up in lignin which normal digester bacteria cannot break-down in any reasonable time. Those feedstocks that are 'light-on' for either carbon or nitrogen will tend to give more useless carbon dioxide in the final biogas output.

Carbon is the stuff of life and without it the bacteria will tend to die off whilst a shortage of nitrogen leaves them without the means of building new cell structures to replicate their replacements. The net result is that a shortage of nitrogen results in ammonia being produced, while lack of carbon slows down the process of gas production. This is why low-carbon feedstocks require a longer 'retention time' in the digester. According to Fry, 1973 (*Methane Digesters for Fuel Gas & Fertilisers*), the lack of nitrogen results in an effluent sludge lacking in fertiliser capability compared to other effluents. For information, the effluent sludge from a properly operated digester loses none of it's fertiliser efficacy to the gas production process.

The solids may be of any organic matter although once the types of matter have been decided upon, the same types should continue to be used as feed-stock. The reason for this is to allow for the many different types of bacteria that take part in the process. Each type of 'fuel' in the charge will (usually) need specialised bacteria to break it down. In changing the feed-stock types, you may have to wait for the

correct bacterial population to establish and stabilise itself, as during start-up and, in the meantime, carbon dioxide flourishes at the expense of methane production. (indigestion?). Obviously you should avoid getting any bactericidal substances into the system such as Anti-biotics, Dettol, Pine-o-clean and others or the digestion may stop, as will the gas. The faeces from some commercial piggeries are badly contaminated by excreted, excess anti-biotics. Don't use these. Other pig manures are excellent, producing by far the best quality gas. (ie. percentage of methane)

Successful charge solids for digesters have been:

- Green vegetable matter, including weeds and grass.
- Animal manures, the best of which is from pigs; the worst, cows except as noted above.
- Stable refuse (ie straw, manure and spilt feed).
- Sewerage effluent.
- Wash water wastes and by-product wastes from abattoirs & food processing.
- Fruit cannery wastes.
- Flour mill wastes.
- Sugar mill bagasse and liquors.

Storage

To store the gas you will need a 'gasometer' or a compressor and some gas bottles. The compressed form of the gas is not as compact as would be the liquid, but is marginally useable for local vehicular travel. The liquified form would be ideal for vehicles, but to liquefy methane requires a considerable energy expenditure of about 20% to 33% of production, depending on operational scale, and needs expensive cryogenic equipment. The cost of the gas-filling and compressing equipment for compressed gas handling is not cheap, either, and requires a licence to operate in most Shires in Australia. The gasometer route is the one to take for most home use scenarios. It won't allow you to use it in your car, but it can be used for small stationary engines for various purposes such as pumping water, driving fixed machinery or generating electricity.

What is a gasometer? A gasometer is simply a variable-volume storage tank for gas, normally at a fairly low pressure suitable for the appliances that use it (see **Figure 1**). A fixed dimension container for gas suffers from a problem when delivering it's gas to the user site in that the pressure will vary from quite high when the container is full, to quite low when it is nearly empty. A gasometer combines the functions of storage, over-pressure safety valve and pressure regulation in one structure – an ideal permaculture device! This is achieved by having one gas-tight tank float upside-down in another tank of water with the gas being stored beneath the floating tank. As more gas is produced, it is stored in the gasometer and the floating tank rises to accommodate the increased volume. Conversely, as gas is consumed, the floating tank floats lower. In this way, the gas pressure is kept constant at a pressure determined by the weight of the floating tank no matter what the volume of the stored gas.

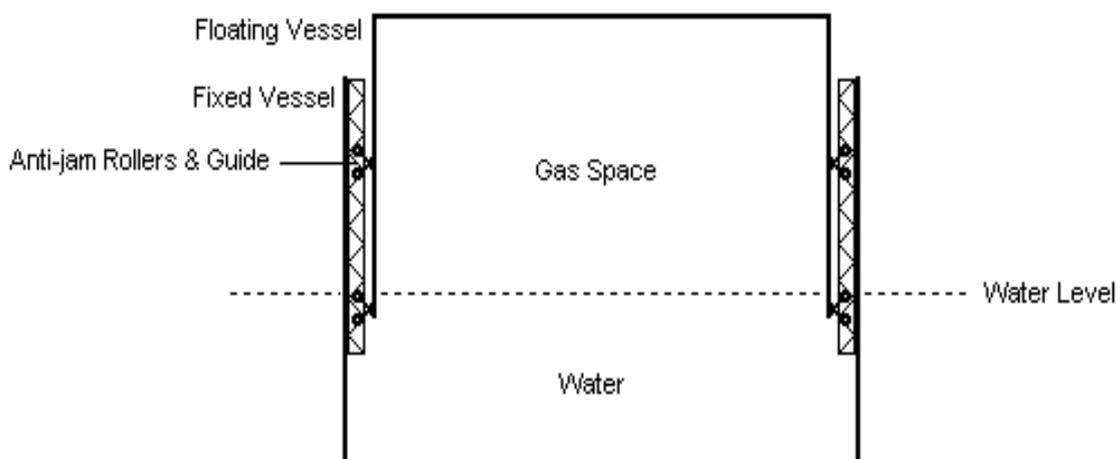


Figure 1: Typical basic gasometer

The safety function of the floating tank system works like this: if the gas volume produced is too much, the floating tank lifts up until the bottom edge is clear of the water and the excess simply blows out from under the lower lip to release over-pressure conditions and then allowing the floating tank to settle back down again in the water. A bit like a monstrous mechanical burp when it happens. It's fairly obvious that the two functions of digester and gasometer can be combined in the one device by having the floating tank float in the (mainly liquid) digester contents (see **Figure 2**). This represents a substantial saving in construction costs but it does mean that the floating tank will have to be acid-proofed both inside and out since both surfaces come into contact with the (mildly) corrosive digester contents. The disadvantage of the floating tank gasometer system is that it won't shut off the supply at low pressures. For that safety feature you will need a supply pressure regulator of the spring-loaded diaphragm type plumbed into the gas supply-line before the appliances and after the gasometer.

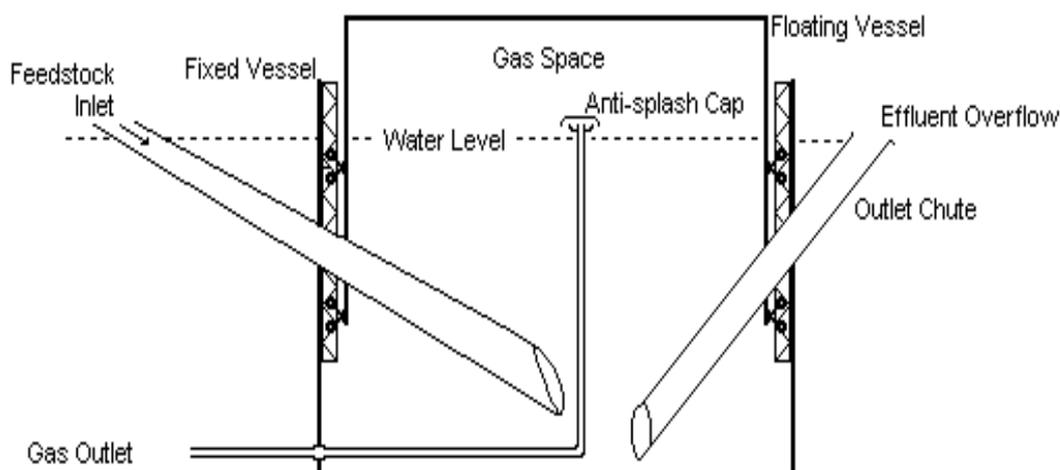


Figure 2: Basic gasometer modified for use as a digester

Note the increasing taper on the inlet chute and diverging taper on the effluent chute. This is necessary to prevent clogging. An auger might be fitted to the effluent chute to ease removal of the spent solids. This auger may be hand operated.

Regulation of the supply pressure is critical for safety and must be reliable. What is supply pressure? Pressure is the force that causes fluids to flow from one place to another. ie down a pipe. If the supply pressure was not fairly even, then sometimes your gas stove would burn fiercely while at other times it would hardly burn at all. These two states correspond to high and low supply pressures respectively. In the worst cases, the gas flame could blow itself out, filling the house with gas or it might not light at all, again filling the house with gas but more slowly.

It is a good idea to use properly designed regulators. A regulator is a device which connects into the supply line between the source (the storage device) and the destination (the gas burning device). The regulator can accept a widely varying inlet gas pressure and smooth it out to a very constant pressure at the outlet. If the outlet pressure should exceed the inlet pressure (ie you are nearly out of gas) then the regulator will shut down the supply for safety's sake. Commercially available line pressure regulators are also designed to "fail safe" (ie shut off the gas if they, themselves, break).

Scrubbing

Scrubbing is the operation that removes unwanted compounds from the biogas before it is used. Usually these compounds are those that will cause us some grief in some way. The main culprit to be scrubbed will be Hydrogen Sulphide, or 'Rotten Egg' gas, because this will combine with the moisture in the biogas to form sulphurous acids and these can corrode almost anything. The way to get rid of it is to give it something to corrode that you don't want; like some steel wool, for instance, in a wide-necked bottle or flagon. It must be of clear glass with the gas inlet pipe running down to the bottom of the container and an outlet pipe coming away near the top. Of course, the whole thing needs to be gas-tight. As you use the gas, the steel wool will corrode from the bottom upwards taking up the hydrogen sulphide by conversion to black iron sulphide which can later be reused after being oxidised to rust (ferric oxide) by exposure to air, although the process is slower than the initial scrubbing one was. When the black corrosion reaches 75% of the height of the container, or so, it's time to change the steel wool or ferric oxide for fresh, sacrificial stuff. It's probably better to run two or more similar bottles or containers connected one after the other to give some flexibility by providing some 'back-up' scrubbing capability if you are away for a period.

To get rid of the Carbon Dioxide (CO₂) requires that the digester biogas be diffused through a water (or lime-water) spray tower. This action dissolves the CO₂ in the water which is then collected at the bottom of that tower and then sprayed down a second column to release the carbon dioxide gas from the water which is then vented to atmosphere, preferably via your greenhouse to give the plants a boost. The water is then recycled back to pick up another load of carbon dioxide.

It is not absolutely necessary to eliminate Carbon Dioxide from the methane, but CO₂ has no intrinsic fuel value and can complicate the jet and air settings of user appliances. The reason is that CO₂ percentage can vary considerably from week to week of normal operation, particularly where differing feedstock constituents are used from time to time. This can vary appliance performance from 'not at all' to 'explosive', neither of which is desirable.

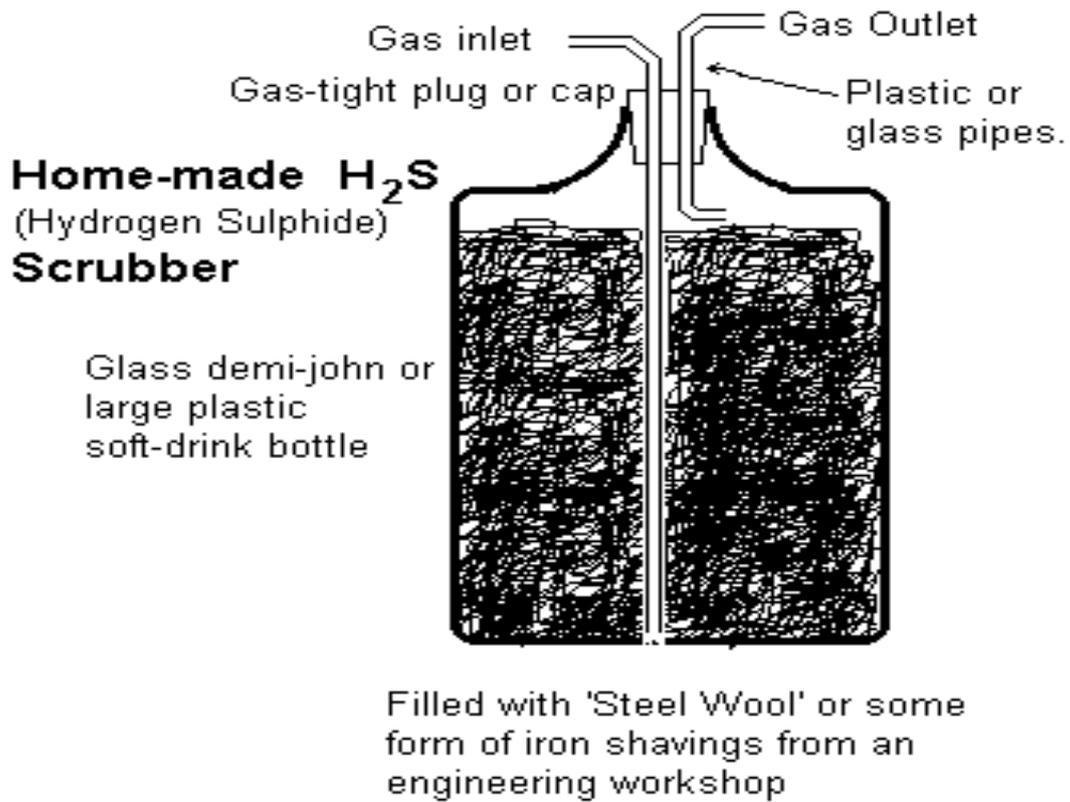


Figure 3: Hydrogen sulphide scrubber

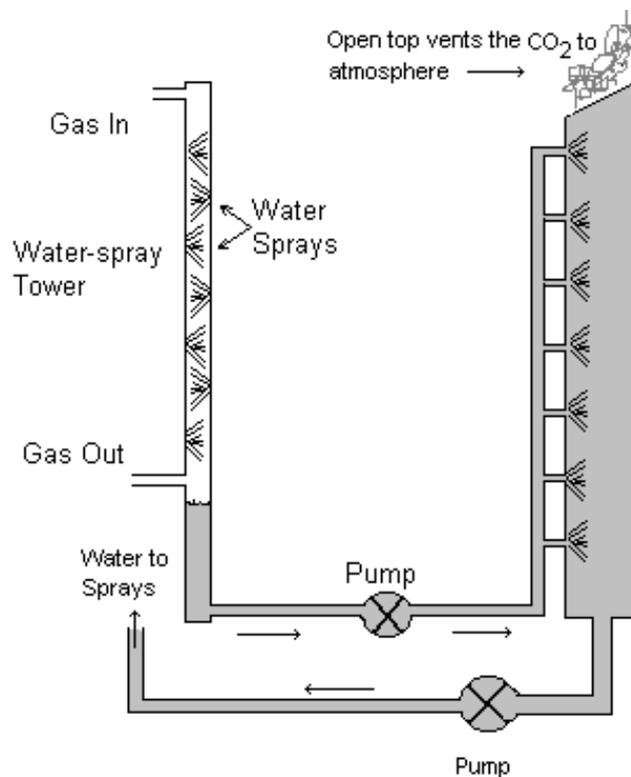


Figure 4: Carbon dioxide scrubber

In the situation where digester output quality is fairly consistent, CO₂ scrubbing may be dispensed with and the appropriate flow settings of user appliances adjusted to suit the overall lower fuel value of the combined CO₂/Methane mix. Care will have to be taken to maintain that exact CO₂/Methane balance in future, however. The only exception to this I can think of is where the digester gas is used exclusively as fuel for a methane fuel cell (electrical generator) system. These systems can be made relatively tolerant of quality-variability in fuels.

The scrubber system needs to allow a fairly free flow of gas to minimise pressure losses in the gas system since the operating pressures are so low to start with that little reduction can be tolerated before the whole thing stops flowing. Typical system pressures are around 0.5 Kp to 2.0 Kp. Since appliances usually operate at around 0.6 to 0.7 Kp, there's not much room to manoeuvre. In a system requiring Carbon Dioxide scrubbing, the low-pressure route will not work well. Instead, a series of pumps or a multi-stage pump/compressor is needed to pressurise the carbon dioxide scrubbing operation and for later methane compression for storage in high-pressure steel bottles. This more expensive storage method is usually only needed for use with vehicles to allow sufficient useful fuel to be stored or carried conveniently. A cubic metre of methane is roughly equivalent to a gallon, or 4.5 litres, of petrol, so more than one large gas bottle will be needed for a vehicle to have much range, even when compressed to twelve atmospheres.

Starting up the digester

Starting up is a process requiring patience. To get a digester going can be a problem initially although it's not unusual to get one started by simply adding feedstock at the calculated feed-rate, provided the water is warm enough. Because it can take up to several weeks for a digester to stabilise, they often need a little nursing along at first. The correct bacteria are normally already present on the feed-stock as you prepare it and time is needed to build up bacterial population numbers to full production levels, as well as to stabilise the digester pH, or 'acid balance'. The way to determine if the process is under way is to monitor gas production by means of a tube from the top of the digester to a clear bottle of water. Once a stable and continuous stream of bubbles coming from the monitor tube can be observed in the water bottle, you can assume gas production is working. It might be an idea to discard the first two weeks worth, though, because the first two weeks or so tend to produce more carbon dioxide than methane until the pH balances out at about 7.5 to 8.5.

Remember the explosive nature of methane when mixed with air!

Be absolutely satisfied that all remaining air has been purged from the gasometer storage space before you connect up the gas outlet pipe to it. In the case of the combined Digester/Gasometer, make certain that the floating gasometer tank is completely 'sunk' in the digester liquid before start-up commences to exclude all air from the storage space.

If nothing appears to be happening after a week or so, obtain the rumen (stomach) contents of a freshly killed cow and add that to the digester feedstock. This will

give the kick-start it needs, assuming all else is in order. The contents should be at a temperature above 25°C and preferably around 35°C. Don't initially overload the digester. Begin adding feedstock on a daily schedule at the calculated feed rate for the system which will depend on the digester size and gas production rate. Some authorities even recommend starting off at half the calculated feed rate until gas production rate stabilises then gradually increasing to the full rate over a period of two to three weeks. At low temperatures, excessive feed rates at start-up can cause an inhibiting scum to form on the surface of the digester contents, stifling gas production.

Operation

Feeding the digester is a matter of grinding up the feedstock to a suitable size with a chaff-cutter, an old industrial mincer or a garden shredder, mixing it with the right proportion of preferably warm water and putting it in. You must then take out an equivalent volume of spent stock from the discharge port at the bottom of the digester. That's it! It won't matter if you sometimes miss a day, either, unless it becomes a regular thing. A missed feed won't substantially affect gas production much, if at all.

Keep an eye on the scrubber to ensure that the sacrificial material is still intact and sufficient for the purpose. Replace and rejuvenate as required.

Maintaining biogas digesters consists mainly of regular cleaning and the inspection for, and replacement of, corroded metal fittings and components. Digesters operate in a warm moist environment. This is a recipe for corrosion in any one of several ways, so bear in mind that the vapour drawn off as 'Biogas' contains conspicuous amounts of corrosive sulphurous and carbonic acids with traces of various other corrosive gases

Design

Ensure there are no copper or brass fittings inside the digester tank. Most metals except iron, nickel and cadmium will poison-off the bacteria.

Heating & cooling

Heating is probably most easily provided by solar warmth in most Mediterranean climates and this is accomplished by wrapping twenty to thirty turns of 19mm black "poly" pipe, as used in trickle irrigation systems, around the outside of the steel tank used for a digester and coupling this to about the same length of 13mm poly pipe used as a solar collector. Wrap some form of thermal insulation over the outside of the digester and the 19mm heater pipe. To arrange the 13mm pipe, simply loosen the coils and spread them out on the ground or preferably on a support to keep the pipe clear of the ground by about 300 – 500mm. In either case, the 13mm pipe needs to be lower than the bottom-most coil of the 19mm pipe on the digester so as to allow for convection siphoning of the warming water from the 13mm solar collector coils to the 19mm warming coils. This should not be too hard to organise since the bottom of the tank will be mounted clear of the ground to allow gravity drainage of spent charge from the discharge cock. If it is not, then a pump may be required to circulate the warming water.

Another possible source of warmth would be an aerobic compost as this just happens to operate at the correct temperature for optimum mesophilic digester function at 37°C. This is also the optimum operating temperature of liquid piston fluid pumps, too. There's scope for a long-lasting and successful marriage of technologies in this information.

Problems may arise from the formation of a gas-tight blanket of sludge on top of the digester contents. This will inhibit gas production and will have to be broken up. How this is accomplished will depend on the feed-stocks used to form the slurry or charge in the digester. For the most recalcitrant blankets, mechanical stirrers will be needed because the upper surface of the blanket gets a tacky, dry 'skin' of dead bacteria which only a paddle can break up. This type of blanket is mainly a problem where stable wastes and animal bedding materials are used. Such things as feathers, hairs, straw and feed grains will float to the surface forming an interwoven matrix on which an impervious layer of other components can settle.

Sometimes a fairly light, flocculent layer will blanket the surface, especially where animal manures are the predominant feed-stock component. This kind of blanket, while causing much the same problems, is easily broken up by a stream of bubbles formed by pumping in the collected biogas or by an up-welling of slurry formed by pumping the slurry around. This latter idea also ensures an even temperature and bacterial distribution, which is desirable for optimum gas production and may be necessary in a Mediterranean winter if the warming coils are wrapped around the outside of the digester. This form of heating causes another nuisance, too, and that is the formation of deposits of bacteria killed by the locally elevated temperatures on the inside of the digester tank wall adjacent to the warming coils. These deposits lower the efficiency of the heat transfer from the outside to the slurry inside but pumping the nutrient liquid or slurry around the tank will help to dislodge the bacteria and spread them through the slurry for more active operation. This only becomes a major problem when the temperature of the warming fluid is above about 43°C, or so, but will also be influenced by feedstock types.

If you want to get real fancy, you can utilise an external 'heat-exchanger' mechanism and slurry-pump to more or less continuously move the sludge from the digester through the heater and back again. This provides ease of access for maintenance of those parts most easily blocked-up in normal operation but is also asking for trouble because of the necessary bends in the plumbing and restrictive flow in the heat exchanger. The digester then can go back to being a simple tank with no interior mechanisms. This is a boon in the event of a break-down because the charge and gas won't have to be emptied (usually) since the trouble-prone areas are all external to the tank. This idea is energy-intensive, however, and the maintenance costs of providing repairs and motive power for the pump need to be taken into account as well as the extra installation costs for the plumbing, pump, etc.. All in all, keep it 'bog-simple' for reliability's sake, even if you have to sacrifice a little efficiency here and there. After all, isn't this supposed to be so that you can lead the easy life? Why make it difficult for yourself?

How much gas will you need? This will depend on your gas appliances and how often you use them, but the heaviest consumer of gas will be space heating followed by water heating, followed by gas fridges and finally the gas stove. Gas barbeques

get through a lot, too, but they are not often used. A very small gas space heater, say of 26 MegaJoule rating, will consume about 1.0 m³ for each Hour of operation. For, say, two hours in the morning and six hours at night that's 8Hrs × 1.0m³ = 8.0m³ of gas each day! This would require a 24 to 30 m³ digester (4800 – 6000 gallons) volume. If you add in a gas stove (~0.5), a gas fridge (~2.0), a gas freezer (~2.5) and hot water booster (~3.0) your total maximum gas 'draw' would be about 16 m³ per day. The need for machinery to handle the daily required feedstock input (48 Kg of hen manure) is getting very close and this is getting to be a very expensive and capital intensive installation, not to mention the labour involved. The size and the cost could be halved by not using the gas heater.

Appliance	Approximate Consumption in m ³ /hour		
	Biogas	Natural Gas	LPG
Stove-top Burner (9Mj)	0.5	0.25	0.1
Oven (8.5 – 10Mj)	0.40 – 0.60	0.20 – 0.30	0.08 – 0.12
Small, two-panel heater (11Mj)	0.55	0.30	0.11
Large, flued heater (44Mj)	2.20	1.10	0.44

Table 1: Typical consumption figures – domestic appliances

Terminology

m³ Means 'cubic metres' of volume which directly translates to 1000 litres (of water), or 220 gallons Imperial.

Mj The abbreviation for "MegaJoule" (millions of Joules), a measurement unit for heat energy. Hence a '44 MJ' heater gives out 44 MegaJoules of heat per hour. A 22 MJ heater is sufficient for a small Australian house.

Total Solids The term describing the non-liquid portion of the feedstock recipe. For instance, a 5.6% Total Solids brew of hen manure contains 5.6% of hen manure and 94.4% of water by weight. Bear in mind that hen manure may not necessarily be dead dry in itself. This extra moisture content will have to be taken into account to get the recipe exact. In practice, it doesn't matter much, so long as the pump can cope without blocking up.

Turn-over Time Sometimes known as 'retention time', and is the time required for a complete change-over of solids content in a continuous feed Digester.

Convection Siphon That flow of a liquid caused by the tendency of the hotter portion of a liquid to rise and the colder portion to sink in a closed system or container.

Slurry A runny mixture of liquid and finely chopped-up solids. It can be pumped like (thick) water.

Feedstock The particular type of solids used to make up the slurry along with water.

Charge The slurry mixture of solids and water used in the digester to produce gas.

Figuring it out

The chemistry of methane production is very simple; carbon combines with the hydrogen in the water to produce methane (CH₄) while the left-over oxygen combines with the rest of the available carbon to form carbon dioxide. Note the word 'available'. For useful calculations in the real world, carbon may be present but not be available for the chemical reaction because it is 'locked up' in materials such as lignin in wood or straw. Lignin takes a long time to break down chemically; much longer than the normal digestion time of mesophilic bacterial systems. Why is this important? Because the amount of methane gas produced per unit weight of solids will depend on the amount of available carbon (and hydrogen, too)

If we are producing 0.5 m³ of gas per day from a 5.6% Total Solids brew of hen manure, we will need to add an extra 1.5 Kg of manure mixed with 30 litres of warm water per day to maintain gas production at our chosen rate (0.5 m³). If we allow about one third of the digester volume for gas collection, then our digester will have to be about 1.5 cubic metres in total volume. 0.5 m³ of gas = 1/3 of volume so total volume is 0.5 * 3 = 1.5 m³. Now, each daily charge increment added is 30 litres and two thirds of our digester's 1.5m³ is liquid feedstock which is 1.0m³ (= 1000 litres). In the liquid volume of the digester we will have 1000 / 30 = 33.3 days turn-over time. This sounds about right and produces up to 0.60m³ of gas per day in a 1500l (330 gallon) tank from 1.5Kg of hen manure which is about enough for one burner of the average Australian gas stove to burn for an hour. This does not mean we are limited to 0.60m³ of gas per day for this sized tank provided that we can store the excess over and above this amount, can keep the digester from 'going acid', keep the pumps (if any) running and prevent the formation of, or remove, any gas-suffocating surface blanket.

A timely warning: for any human engineered adaptation of natural processes, remember that natural processes have their own, in-built time-tables and capabilities. If you try to push these processes beyond their normal operating parameters they will balk, hence the need to break up surface blankets, to unblock pumps, etc. If you are prepared to put up with these inconveniences, you might get away with 'stretching the envelope' but your system will be trouble-prone, unreliable and probably short-lived. On the other hand, if you allow these natural processes their natural progression, your system will be 'low stress', low maintenance and trouble-free. Who would want to have it any other way?

Returning to our hypothetical digester giving 0.60m³ of gas per day from a volume of 1.5m³, it may be easily deduced that this is the limiting size, in a natural world, for this digester recipe. A larger volume digester will be required to process more solids than 1.5 Kg each day without trouble. Use the hypothetical 1.50m³ digester as a model and scale up from this to give the size of digester you must have for the gas amounts you need. In other words, should your needs amount to 6.0m³ of gas per day, make your digester ten times larger than our model one. Our model gave 0.60m³ of gas per day for a total volume of 1.5m³, your digester will need to be 10 * 1.50 = 15.0m³ in volume to give you your 6.0m³ of gas per day. It will also need,

daily, 15 Kg of hen manure to provide this amount of gas, along with ten times the water, too. OK, so you know the volume, but what ratio of height to width is best? The Greeks figured this one out four to five thousand years ago; it's the so-called Golden Ratio of 1.6 : 1.0 for width to height. You don't have to be exact, but get as close as practicality will allow. ie. 1.2 : 1 to 2.0 : 1 would be the limits I would use.

How much feed-stock?

The amount of gas increases with digester temperature, with retention time (up to a point) and with the percentage of total solids in the slurry. Typically, for 25°C to 44°C, 0.25 to 0.40 m³ of gas for each Kilogram of solids. Retention times approach the point of diminishing returns at around 32 to 35 days for a well-run mesophilic system. After 42 days there's virtually no gas to be had in the solids, in most cases. For Total Solids below 2% and over 6% the amount of methane will decrease. At the low end because there is insufficient 'substrate' or solids to build up an active bacterial population and at the high end because the digester slurry begins to tend towards an acid condition which increases the percentage of carbon dioxide and ammonia in the gas mixture at the expense of the methane, the active ingredient we are seeking to generate. In either case, daily methane production suffers compared to other slurry recipes in the middle of the recommended range (about 3.5 – 4.0 % Total Solids).

Pig manure is slightly different in recipe and retention times to other solids. See the recipe section below.

What recipe?

The Chook Recipe: 1.5 Kg (about 45 chooks worth/day) of fresh, runny hen manure plus 30 L of water to give a Total Solids of 5.0%. This will be difficult to pump. Gas production will be about 0.35 to 0.40 m³ of gas per Kg of Total Solids for a digester turn-over time of about 32 Days. About 0.014 m³ of gas per chook per day, maximum.

Cow Manure: bulls – 0.25 m³ of gas per Kg solids (2.0% – 4.5%), Dairy Cows – 0.15 m³ of gas per Kg. (Straw mixed into the cow brew decreases gas production.)

The Pig Recipe: for a 2% Total Solids slurry at 35°C, gas = 0.3m³/Kg at a 10-day digester turnover rate. (Faeces from pigs injected with Antibiotics kills the digester bacteria.)

From straw, alone: using oaten straw @ 35°C digester temp, 1 Kg produced 0.40 m³; wheat straw, chopped produced 0.40m³/Kg; ground-up produced 0.55m³/Kg.

From dried kelp: up to 0.40m³/Kg.

Turnover = 36days (approx) in all cases except for pigs @ 10 days.

Compressed storage

Compressed methane storage appears to be the most appropriate for farm use if the gas is to be used for vehicles. This will require a gas compressor, storage bottles,

safety storage buildings and safety areas plus a scrubber to remove unwanted gas impurities. Regular inspections by qualified gas-fitters are required by law and gas bottles and other equipment have a defined life-span. For a given-sized gas bottle, methane will provide about half the 'mileage' of the same bottle filled with LPG due to the compression limits on methane. All that aside, though, methane is, by a country mile, the best fuel for any internal combustion engine given it's fewer 'greenhouse' emissions and slow flame-propagation rate. This latter one results in vastly extended engine life and reliability due to lower operating stresses and fewer corrosive exhaust gases. Cold-start wear is reduced since gas will not flush the lubricating oil off the cylinder walls like liquid petrol will on a cold morning. This further extends engine life.

Liquid storage

For liquid storage of methane, refrigerate it to -178°C (!) For anything other than the high-tech. approach, liquid methane storage is impractical. It is the most compact form of storage, though.

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The Eco-Vehicle: A Sustainable Personal Transportation System

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[Submitted Paper]

Abstract

The automobile is one of the most popular technologies ever developed. However, automobiles are presently responsible for about 20% of global energy consumption and the effluents from internal combustion engines (ICEs) in cars pollute our air. The dominant role of the automobile in the economic development of the world's richest nations and the addictive convenience cars provide to consumers have created powerful socioeconomic momentum which will resist either shifts away from automotive transport or rapid changes in the mature technology used in modern cars. Nevertheless, substantial changes are unavoidable if cars are to become sustainable.

Electric vehicles (EVs) offer considerable promise to reduce the negative impacts of automobiles on the environment. In principle, EVs are far more efficient than ICE vehicles in converting energy into motion. Most EVs currently on the market have been converted from ICE vehicles. However, the potential benefits of using electric rather than combustion engines to drive automobiles can only be fully realized with innovative, ground-up designs which are optimized to take advantage of the unique characteristics of EVs. Since 1994, our team has worked to develop a tandem EV with innovative technologies in a ground-up design.

A safe, high performance prototype for city commuting and general use purposes has recently been completed. Design specifications predict energy efficiency of 50 km/l of crude oil, about triple that typically achieved by today's ICE automobiles. The maximum speed of our Eco-vehicle is 150 km/h. The time for acceleration from 0 to 50 km/h is 4.9 seconds. On 1 charge, this car goes about 140 km at a constant 80 km/h or about 130 km on a defined city driving schedule. We discuss some steps to further improve performance, reduce costs, win consumer acceptance and make EV technology sustainable over the long term.

Introduction

Industrialization has created unprecedented wealth, longevity, and convenience for many of the people fortunate enough to live in the industrialized countries. Unfortunately, negative impacts of this same industrialization are poisoning the air, land, and water, altering our climate, and irreversibly extinguishing substantial portions of our rich natural heritage of biodiversity. Perhaps no other product epitomizes so well addictive convenience and devastating consequences of our industrial society than the automobile.

Modern internal combustion engine (ICE) automobiles convert fossil deposits of ancient forests into CO₂, water, carbon monoxide, nitrogen oxides, sulfur dioxide, and other exhaust gases which foul the air we breath and warm the climate. People use cars for about 20% of global energy consumption. The hulks of discarded autos blemish the landscape and leach toxic materials into the environment. Fuel additives containing lead, which are still used in many countries, poison the air and soil and may be especially dangerous to the intellectual development of young children.

Despite the serious negative effects of cars on the environment, it seems unlikely that people will voluntarily forego the unparalleled convenience they provide. What would it take to make automobile manufacture and use sustainable? To answer this question, we must define the characteristics of sustainability with respect to personal transportation equipment. Sustainable development was defined by the United Nations Conference on Environment and Development as development which meets the needs of the present, without compromising the needs of future generations. To make automobile manufacture and use sustainable over the long term, automobiles must consume much less energy per distance travelled, be readily recyclable, and not emit toxic or climate altering substances in significant quantities.

We maintain that while ICE cars can be improved, they will never meet these requirements. Electric Vehicles (EVs), in contrast, have the potential to become sustainable in the near future. Even in the present case in which most electricity is generated from combustion of fossil fuels, using electricity to power a car is about 3 times more efficient, in terms of distance travelled per unit of fuel, than are typical ICE cars on the road today. Eventually, EVs can be completely powered by batteries charged by solar energy. Here we discuss the present state of the art in EVs and the requirements for EVs to be accepted in the marketplace and, eventually, to drastically reduce the negative impacts of automotive industrialization on the environment.

Convincing consumers to purchase commercial EVs will require performance similar to that available from concurrent ICE vehicles. Although environment-friendly products are popular, few buyers are willing to spend substantially greater amounts of money for inconvenient products with inferior performance. Most drivers today have the impression that EVs are expensive, slow, in both acceleration and top speed, and have very limited range. However, today's best EV technologies rival the performance of ICE vehicles in most respects. Electric vehicles can be also be expected to make rapid gains in those categories in which they lag.

Here we describe an example of the state-of-the-art in EV technology. Since 1994 the Eco Vehicle Project has been developing a tandem style EV which is small, light, and delivers high performance. The car, recently completed, was delivered to our team last week.

A state-of-the-art EV

Most electric vehicles which have been built to date have been based, to a greater or lesser extent, on conventional automotive technologies; these are termed 'converted EVs'. In some cases, for example low rolling resistance tires, such technologies are excellent for use in EVs. However, there are fundamental differences in the structural and functional requirements of cars powered by internal combustion and

those powered by electricity. Use of many ICE vehicle components can reduce the performance of EVs. For this reason, we endeavoured to create a ground up design which optimized EV performance and avoided constraints which might have been imposed by some off-the-shelf ICE vehicle components. We used many innovative technologies designed specifically for EVs.

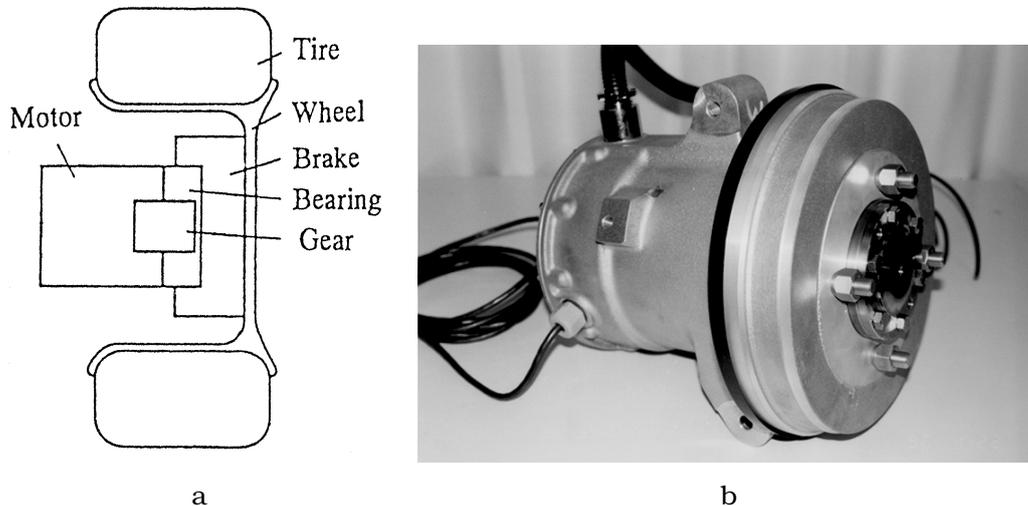


Figure 1: Conceptual drawing (a) and photograph (b) of the in-wheel drive system

The Eco Vehicle is powered by small, highly efficient, brushless DC motors built into each of the back wheels (**Figure 1**). Each of these motors can output up to 36 kW of power (48 HP). The motors are integrated with the hub bearing, drum brakes, and a reduction gear into the wheel assembly itself, which is mounted on the suspension arm. The motor achieves an energy efficiency of 92%. The brakes incorporated in the back wheels are regenerative, recapturing the kinetic energy of vehicle motion and generating electricity to store in the batteries. Under typical driving conditions, only these back regenerative brakes are used. When additional braking power is required for safety, the front mechanical brakes are engaged. The total weight of each of the power units, including the motor, gear, bearings, and brake is a remarkably light 25 kg.

In ICE vehicles, the space below the floor is required for the driveshaft, subframe, exhaust pipe, and muffler, none of which are necessary for EVs. We use this below floor space for a battery-built-in-frame (BBF) which holds the batteries, keeping the center of gravity of the Eco Vehicle low, thereby improving stability (**Figure 2**). This frame was made from extruded aluminium. Fifty-six 4V sealed lead-acid batteries, weighing a total of 269 kg, are used to supply the 224 V required by the motors. In typical serial battery systems, uneven temperatures and charge/discharge cycling greatly shortens the lifetime of some of the batteries in the series. We minimize this problem by including a heat pipe in each battery cell of the BBF and using 18 individual intelligent chargers to optimize charging for 16 groups of 3 batteries and 2 individual batteries.

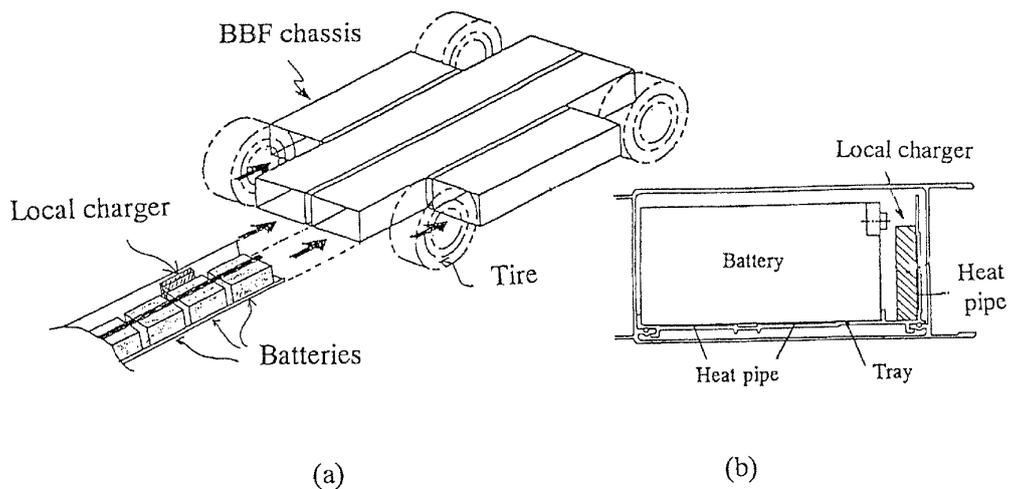


Figure 2: The Battery Built-in Frame (BBF) structure (a) and associated battery system (b)

Complete charging of the batteries from standard house current to the onboard charger takes about 4 hours. A quick recharge to 70% of capacity can be done in only 15 minutes with an external charger. The Eco Vehicle's roof and spoiler have been fitted with a total of 0.6 m² of solar panels (12% efficiency) which make a small contribution to charging the batteries during sunny weather. Under Japanese conditions (≈ 1800 hours of sunshine/year), a square meter of solar panels with energy efficiency of about 10% would recharge the batteries enough to power 1500 km/year of driving. Thus, about 5 m² of such panels would be necessary to generate the electricity to power this EV over the 7500 km which an average car in Japan is driven annually.

The Eco Vehicle's body was optimized to reduce aerodynamic resistance with iterative testing of models in a wind tunnel until an air drag coefficient of 0.25 was achieved (**Figure 3**). The final design was molded of carbon-fiberglass reinforced plastic (FRP) for strength and lightness. This body was mounted to an extruded aluminium frame built on the BBF described above.



Figure 3: Body optimised to reduce aerodynamic resistance

The only performance characteristic in which the Eco Vehicle (**Table 1**) is clearly inferior to present ICE vehicles, for practical use, is range. Lead acid batteries have a very low power density. Use of an equal weight of the newest lithium ion batteries instead of lead acid would extend the range of EVs by about a factor of 3, bringing them close to the typical range of ICE cars. Battery technology is the bottleneck to improved performance in many commercial products, and the intensive research and development efforts now underway can be expected to produce dramatic improvements in the coming years.

Attribute	Value
Length	3.3 m
Width	1.2 m
Height	1.3 m
Passenger capacity	2
Gross vehicle weight	910 kg
Range: constant 80 km/h	140 km
Range: 10.15 mode driving schedule	130 km
Acceleration: 0 to 40 km/h	3.9 s
Acceleration: 0 to 400 m	17.9 s
Maximum speed	150 km/h
Energy consumption	50 km/l crude oil

Table 1: *Eco Vehicle Specifications: Actual dimensions and computer projected performance.*

EV sustainability

A holistic evaluation of the impact of all aspects of automobile use, including not only manufacture, energy consumption and disposal, but also the associated infrastructure, suggests that complete sustainability is not feasible for the foreseeable future. For example, automobiles require paved surfaces on which to run. Paving seals the road surface, preventing infiltration of rain water which is necessary to recharge groundwater aquifers. When the proportion of paved and otherwise impermeable land surface increases to a large proportion of a region's total land area, then aquifer recharge is reduced and flooding is intensified, as is evident in large portions of Western Europe. However, despite such seemingly intractable environmental problems, there is little realistic prospect in the near future of societies voluntarily curtailing automobile usage to any great extent. On the contrary, the rapid growth of the industrializing countries is accelerating automobile production and use, a trend which seems likely to continue for the near future. Therefore, reducing the adverse environmental impacts of automobiles is urgent. Development of EVs is a promising way to accomplish this goal.

When electric vehicle technology matures, we can expect EVs to be more durable and reliable than present day conventional cars because they have fewer moving parts and are structurally simpler. Repairs also should be easier. Simpler cars should also be easier to disassemble for recycling at the end of their useful lives. This simplicity also permits wider, more comfortable passenger compartments (Fig. 4) than is possible in an ICE vehicle of comparable exterior size. Although EVs can be lighter than ICE vehicles, the side walls can be structurally reinforced to enhance safety. Perhaps the most sustainable feature of EVs is that they are ideally suited for the switch to renewable solar energy.

Any dramatic increase in the use of lead for EV batteries or any other application would be of great environmental concern due to this metal's toxicity. Several recent studies have projected that large increases in the demand for lead based batteries would require expansion of lead mining, recycling, and processing operations, and necessarily increase environmental lead release. However, these studies ignore the trend in commercially available electric vehicles to use newer battery technologies such as metal hydride and lithium ion batteries.

The dominant role of the automobile in the economic development of the world's richest nations and largest industrial corporations and the addictive convenience cars provide to consumers have created powerful socioeconomic momentum which will resist either shifts away from automotive transport or rapid changes in the mature technology used in modern cars. Nevertheless, substantial changes are unavoidable if cars are to become sustainable. EVs are far more efficient than ICE vehicles in converting energy into motion and emit virtually nothing while being driven. Given further technological development, effective marketing, and price reductions, as economies of scale reduce costs, EVs have tremendous potential to reduce the negative impacts of automobiles on the environment.

Part 9

Field Trip Reports

Broadacre Field Trip

Alanna Moore (Australia)

Forty members of the international permaculture community left the Conference on October 2nd for a three-day tour to view sustainable farming developments in the wheat belt of southern Western Australia.

Travelling to our destinations, we passed by seas of traditional wheat fields, dotted with salt scalds – 44,000 ha of land in WA has been lost to salt. There was only the odd tree, which was often dying from ‘rural pest overload.’ A depressing sight, occasionally relieved by the sight of water catchment reforestation and measures to reduce the rampant soil salinity problems of this region.

Avondale Research Station

At a brief stop at the Avondale Research Station, we saw examples of more sustainable farming systems – wheat and sheep fields with long contour banks and bush on hilltops for water harvesting and control. Acacia saligna and saltbush were being grown in strips for perennial sheep forage. Fat-tailed Awassi sheep from the Middle East were kept for milking.

Prema Organics

Our next stop was Prema Organics, an 35 ha farm run by Allan and Eileen Falkson, set up on permaculture lines. This farm’s produce enjoys A grade Demeter (biodynamic) status. It also boasts the largest private stand-alone power system in the state, with a large wind charger and solar panel bank, and 80 kW of power storage.

Once again, soil salinity has been a challenge at Prema. Salt seepage in the large dam has been somewhat ameliorated by installing a 100mm pipe below the overflow. Because salt water sinks, water pressure pushes it out – the pipe acting as a self-siphoning pump.

Many crops initially planted here were lost to salt, including 800 grapevines. Searching for a solution, the Falksons discovered a special American filtering device based on precious non-ferrous metals – the Aqualine Catalytic Water Conditioner. It cleans up chemicalized and mineralized water and converts salt so that plants won’t take it in. They found it very effective, although the initial purchase price could well be prohibitive to some – filter prices ranging from \$600 to \$28,000.

Produce is starting to come in from 2 to 3 year old fruit trees, vegetables and the 100 Isa Brown hens in their mobile hen ‘tractor.’ Compost is made in windrows with the help of an army of worms.

Some of the more esoteric methods used there included placing rose and white quartz crystals around each tree (white crystals are purported to attract moisture). A ‘Tower of Power’ has been installed to set up an harmonious subtle energy field on the farm and increase fertility-inducing paramagnetism in the soil.

Other problems encountered at Prema included marauding parrots which decimate sunflower and almond crops. Sorghum has been grown as a sacrifice crop for them.

'Curly leaf' on stone fruit has been helped by placing eucalypt branches around trees in springtime; trees without this treatment producing the worse fruit.

That night we camped at the Dryandra Forest Camp and shared our barbecue with Woylies, a small marsupial brought back from imminent extinction by a careful campaign of fox baiting.

The Woodward's farm

Our next stop was the 1200ha farm of Peter and Karen Woodward, east of Wick-e-pin, where rainfall is low – approximately 300mm a year. This family farm is now converted to organic sheep and wheat production. There are many kilometres of contour earth banks which mimic natural drainage patterns disturbed by decades of farming.

Aquaculture (yabbie ponds) and tree crops are new sidelines. Every year they have planted an Oil Mallee woodlot. This year six people in a ute planted 10,500 mallee trees over two months; while two families are being fed from the vegetable garden.

The Woodward's sell grain (much is pooled with non-organic wheat) and organic flour, milled at Corrigin. The certified A Grade organic wool is popular with the Japanese, who have strict controls on effluent from wool scouring. Some lamb is sold for the organic meat market.

Since going organic, no summer wind erosion has appeared, despite being very dry. The health of sheep and the Woodward family has been very good, too. Originally Peter's father farmed virtually organically, but problems arose when superphosphate came on the scene. Salt scalds are often full of nitrogen and phosphorus, from the aftermath of 'super.'

With the sheep, some problems have come up with the large (1500 ewe) flock size at lambing time, when they prefer to be in smaller groups. But this size flock is great for fast rotations. For ideal pasture growth they reckon the sheep would spend just one day in a 20ha paddock, whereas the Woodward's paddocks are about 40ha each.

Scouring and worms are greatly prevented by such fast rotations. Organic drenches of copper sulphate, dolomite, garlic and cider vinegar are also good for worms (although too much copper sulphate can kill sheep). Home-made mineral licks are given to provide the sulphur needed to help prevent worms and lice (as residual superphosphate has locked up sulphur in the soil). Culling the least healthy sheep also means natural health will prevail. Healthy-looking sheep have surprised them when faecal samples have shown a high worm count. Healthy sheep can obviously handle worm infestations.

Earthworks on the farm have been installed with the purpose of achieving 'water balance' in the landscape. This is because excess water pushes salt up to the surface. In winter, their wet season, much waterlogging can occur if bush has been removed and natural drainage patterns have been disturbed. The Woodward's interceptor banks are clay-sealed to hold rainfall where it falls on the slope. They have a very slight slope (1 in 1500) along the contour to send water to various ponds. Waterlogging has been greatly reduced.

Much work has also been done to intercept underground water flow, by deep soil drainage with slotted agricultural pipes over plastic sheeting, placed 5 to 7m underground. Harvested water is sent to underground bores for use.

The Watkins' farm

We travelled next to the farm of Ron Watkins, a keynote speaker at the IPC6. In 1988 he was awarded a Churchill Fellowship. In 1995 he was the WA Rural Achiever of the Year, winner of the Department of Environment 'I Can Do That' Award, the only Australian recipient of the prestigious UN Global 500 Award and a UN Environment Program award winner – one of eight people selected worldwide as a success story in combating land degradation and desertification. The Watkins farm is a showcase of holistic farm planning.

In 1908, the 552ha of land was selected from bush, and later Ron's mother was born in a mud hut. Most tree-clearing was undertaken in the 1950s, when bulldozers were available. Ron returned to the farm in 1973 and saw salinity problems starting to surface. Whereas his mother had once had a good market garden of five acres, now the orange trees were dying and the farm pond was growing salty. Visible salt expression appeared in 1976. Ron decided that water mobilising salt was the underlying problem, so he set about finding a solution.

He calculated that over the 552ha, with the average rainfall of 580mm, meant 3,000,000m³ of water was falling there annually. If 10% of this run-off could be collected, it would be enough to irrigate 30ha of land. The control and use of surface run-off water, he decided, could be a key to the sustainability of the farm.

So, in 1982 he put in the first large dam, of 30,000m³ capacity, and the locals thought that it would never fill. But it did fill, and quickly, too. Ron soon realised that gravity was an important energy to be harnessed. So he built dams high in the catchment, for irrigating downhill. Lock pipes were installed to release water for irrigation. P. A. Yeomans was invited to help design the system. Yeoman's ideas were modified by Ron, who believes they do not have totally universal application, because every situation is different.

After studying the WISALTS methods (of the Whittington Interceptor Salt Affected Land Treatment Society) he started to put in contour banks, designing them to pick up water that ran on a sub-surface clay layer and run it into his dams. Thus he prevented aquifers from recharging to stop salt movement, which manifests about thirty years after tree clearing. On the valley floors, he planted thick tree belts on top of the banks to harness deeper water movement and provide wildlife habitat and windbreaks. Bird species observed have nearly doubled since. Carob trees have been established on some banks. Nowadays, 10 to 15% of the farm is dedicated to tree belts, which are generally placed 150m apart. Another 10% of land is fenced-off waterways. There are 12km of drains, all double-fenced, and with a 1 in 400 gradient.

So Ron was able to turn water "from a problem into a resource." Whilst salinity is still around, he reckons it may take another twenty years to reverse the decline. In the meantime, he may be able to grow salt water fish in salty dams, or siphon salt out of them.

While farmers on adjacent lands have been going bankrupt, Ron has kept his head above water with his sheep and beef farming. He grows crops, generally without sprays and little fertiliser, of canola and buckwheat. He also leaves the farm to consult others on farm planning, but this is only a small part of his income.

Droughts affect him far less than his neighbours, and his fields stay greener longer than theirs. He never loses sheep when they are off-shears, because they can shelter behind windbreaks. "And you just can't put a price on that sort of peace of mind," he says.

Forest encounter

We left our Dryandra Forest camp the next day, heading for Bridgetown and the Permaculture Convergence, deciding first to make a quick detour to the tall remnant forests around Pemberton. The Gloucester Tree is a tourist attraction, which you can climb 150m up to a fire-spotting platform, from which you have fantastic views.



It just happened that it was the 50th anniversary of this fire tower and a forest festival was on. We were in for a treat. A group of local Aboriginal people arrived to put on a display of their culture. We watched with fascination as the chief of the local Aboriginal Land Council demonstrated how to make a traditional knife, called a tarp. He showed us how to make glue from the resin of the grasstree mixed with ground charcoal and kangaroo dung. The powder was then heated on the end of a specially prepared stick in layers, until it was possible to embed sharp silicate stones into it. The tarp was presented to South African delegate Tsheppo Khumbane, who was greatly touched. When it was time to leave, we sang a South African song, Tsheppo had taught us, to the Aboriginal group.

Tsheppo Khumbane with Aboriginal elder Nancy Rodgers

More information

For more information:

- Towers of Power: contact members of the Natural Resonance Study Group, c/o 38 Bellevue Terrace, Fremantle 6160, WA.
- Prema Organics: Allan Falkson, PO Box 583, Narrogin, 6312, WA.
- Land Management Society: (runs monthly tours of Watkins' Farm) PO Box 242, Como, 6152, WA.

Denmark Field Trip

Steve Payne (Australia)

A group of about 70 convergence delegates travelled on two buses for the Denmark field trip. One bus was driven by Bazza, a rising star of the tourist industry who kept everyone happy and entertained but could do nothing to prevent the slow, insidious penetration of bus exhaust fumes into the cabin. So producing this report from this motley bunch of dazed permaculturists was difficult. Nevertheless it's been done and there was of course those sitting in 'the other' bus, the poorer for being without Bazza, but the saner for fresher air.

Denmark is situated on the south coast of Western Australia amongst the majestic Karri forests, one of the world's tallest trees. Windswept beaches are also a feature of the south coast's rugged beauty, however continued logging of these old growth forests and inappropriate development of the area are creating concern for residents of Denmark. This field trip concentrated on properties and people who are offering a more sustainable, appropriate response to the area's living needs.

The MacDougall's property

The first thing that becomes evident when you visit the property of Rod and Marion MacDougall is how hard the family has worked to turn the area into a successful property. The farm incorporates a wonderful orchard with a diverse range of temperate and sub-tropical fruit and nut trees and a small commercial stand of chestnuts which provides two tonnes of chestnuts annually. Livestock also feature heavily on the property with a large flock of poultry on insect patrol in the orchard, pigs, cattle and a galah which chases parrots away from the fruit trees.

Azzolla is grown on the dams to reduce evaporation, and when harvested, provides food for the livestock. It is mixed 50-50 with grain for pig food and provides 75% of the duckling's diet. Water harvesting and intensification of the farm are among the main priorities of the MacDougalls and they are constantly looking for ways of value adding produce that leaves the farm.

Instead of clearing and burning windrows as is common practice in the area, Rod MacDougall leaves them in place, as a result he now is able to increase the stocking rate by 10% because of shelter/shade.

Five years ago, against the advice of the department of agriculture, who in the past had paid landholders to clear the land, Rod fenced off five acres and replanted the area with native vegetation. This halted *Phytophthora* damage and reduced the incidence of dieback. Ironically the government appears set to place a caveat on the regenerated forest so that it can't be used for income, even from selective logging which is all that Rod intended.

With beef returning only 50c a kilo, rabbits provide another important source of income to the MacDougalls. These are hunted using pet ferrets and a single rabbit's offspring can provide up to 90 kilograms of meat in a year. With the release of the rabbit Calicivirus this is unlikely to continue.

Living Waters Permaculture Foundation

Situated on a beautiful 23-hectare property, the Living Waters Foundation has around 50 members in the Denmark area.

Founding member Dave Coleman has been living on the land for four years. It has been owned for 11 years. Mr Coleman said three quarters of the land was forest which includes jarrah and the rare yellow tingle.

He said only timber that is already on the ground or that is going to be felled for roads in the area is milled using a mobile milling system (Lucas Mill) that uses the whole tree. Mr Coleman said \$10,000 worth of timber had been rescued and processed from a nearby clear-felled subdivision.

Last year the foundation concentrated on developing herb gardens and replanting forest. Around 7500 trees have been planted. Human waste is processed on site, and a majestic second storey compost loo with open air views is a stunning recent addition to the property!

The foundation runs permaculture design courses at the property and integrates many diverse farming and alternative energy practices. Land at the site has been set aside for the building of the Denmark Education and Innovation Centre (DEIC), plans for which are currently being considered by the Denmark Shire Council. Included in the DEIC will be a school, permaculture education centre, accommodation and a multi-functional registered kitchen. The kitchen will be designed to produce value added products from surrounding gardens as well as other local growers and will also be open to the public for appropriate purposes. Meanwhile an eco-village of 14 dwellings to surround the education centre is also proposed.

Intensive development over the last three years has already resulted in demonstration and display gardens (shown to us by Claire who lives on-site) which will further expand as the project develops. Teaching and technology demonstrations will be conducted in the passive solar buildings and working models of solar water pumping, hydraulic ram pumps, grey water treatment systems, composting toilets and worm farms will initiate the public into the world of permaculture. The highly productive garden setting will be a demonstration of appropriate land use and water management strategies. Three dams were built last Christmas.

An interesting response to temporary accommodation requirements are geodesic domes made from reticulation poly-pipe and second hand parachutes. They buy the parachutes directly from the barracks for \$50 and the domes are erected and used by people doing courses.

Solar herb dryer

One of the commercial alternative technology projects currently being developed at the Living Waters property is the solar herb dryer. It is being built under the guidance of Dave Coleman and facilitated by a grant of \$78 000. On completion it is expected to cost in the vicinity of \$160,000 and it will be capable of drying 500kg of herbs every day.

A grant of \$20,000 has also been received to develop a local herb industry, this will be used to establish a herb nursery on the property and to subsidise the cost of seedlings to growers. It is envisaged that a broad range of medicinal and culinary herbs will be grown both by local organic growers and, it is hoped, by more traditional farmers in broadacre situations. Dave Coleman intends setting up permaculture-style guilds to encourage these more traditional farmers to try organic farming and permaculture principles. According to Dave Coleman, if the technology used in the solar herb dryer is successful in a high rainfall area such as Denmark it will work anywhere further north and similar smaller versions will be built on farms to allow growers to do their own value-adding. This should offset to some degree the \$18,000,000 Australia spends importing dried herbs every year!

The Wolery



John Piercy's house (the Wolery) was built for \$4000 in 1978 (Photo: Lorraine van Raders).

The trip to the Wolery, 64ha situated beside William Bay, was hosted by John Piercy, Enid Conochie and Margaret Leslie. The Wolery is an intentional community of thirteen households incorporating low-energy passive-solar housing and household gardens. Here we looked at a number of the gardens and discussed some of the legal and social issues involved in setting up and running an intentional community. The Wolery has been established for some eighteen years. The property is owned and run through an incorporated body which means that bank finance is not available for building. This has meant that affordable imaginative solutions have been required by the residents to get their dwellings built – John Piercy's house was built for \$4000 in 1978!

Enid Conochie said that the group had to battle with local government to get approval for their community development but it had held together over the years with lots of caring and sharing.

Total Forestry

Total Forestry is an operation run by David Vann. He estimates that over the last decade he has planted over 2.2 million trees on a variety of sites including farms, developments and rehabilitation sites.

Total Forestry uses a direct seeding technique which is a method of planting native trees, shrubs and ground covers by sowing a mix of seeds directly onto the ground rather than planting nursery raised seedlings. This has the advantage of providing a great density and diversity of plants, the end result of which is a very natural looking system which can be productive both in terms of forest products such as timber and wildflowers, as well as food and fodder. While it is slower at first and requires greater initial maintenance with respect to weed and bug control, it quickly overtakes seedling plantings within a number of years. According to David Vann, the diversity incorporated into Total Forestry's plantings provide "the potential for earlier, more consistent and far greater returns."

Wildlife also finds multi-species forestry far more attractive than traditional single species cultivation as it greatly reduces pest problems. The strategy of adding wildflowers to the understorey also means more consistent returns, however, this does require an extra input of labour. The sites we visited were a roadside planting at Karri Creek, established in September 1993, and a farm plantation at Dingo Flat of the same age, both were impressive examples of the results of direct seeding.

One of the methods of pest control used by Total Forestry to deter herbivores from the young seedlings is to spray them with a mixture of a dozen eggs, one litre of acrylic paint (colour optional) diluted in 20 litres of water. Fire is kept out for as long as possible and fleshy ground covers are included to keep fuel build up to a minimum. Fertilising is not required in the first few years as it only encourages the grass to grow, and may make timber difficult to mill later on.

Heartlands Field Trip

Leonie McMahon (Australia)

General (relevant to all places visited)

Mediterranean climate – characterised by cold, wet winters and hot dry summers. Average annual rainfall is 800 mm.

Sustainable Agriculture Research Institute

Hosts: Jeff Nugent and Julia Boniface. *Location:* Nannup

The Sustainable Agriculture Research Institute, SARI, is home to two families. Jeff bought the 90 acre property in 1974 and has lived there for the past 20 years, 16 with his partner Jill. They and their two daughters live on one section of the property, Julia and Phil on another.

Only 20 acres of the property are used by the two families; the rest is bush land which was once logged for jarrah. Jeff believes the main threats now facing the natural bush land are dieback fungus and the controlled burns required by law to be carried out every 5 years.

The soil is variable, some areas are gravelly, others have a high clay content so a lot of work has been done to build them up. Julia said the main limit to expansion is water; quality, not quantity. The high salinity of the water is attributed by Jeff to agricultural practices carried out in neighbouring regions.

Solar energy is used to pump water from a bore on the lower section of the property up to the higher areas (a vertical distance of 42 m) during the summer months. The panels (a total of 21, each with a 60 Watt capacity) are fixed in a north facing position and pump approximately 2000 gallons of water per day. Solar panels are also fixed to the roofs of the houses to supply power for domestic consumption.

There are 6 dams on the property, each one supporting a different species of fish including carp, blackfish, black brim, redfin and also marron. The gardens grown by Jeff and Jill have taken on a life of their own over the years. They tumble in chaotic abundance over buildings and pathways. You never know what you will find around the next corner, an old red phone box, the solar passive home built by Jeff over the last 6 years.

The orchard is fenced off to keep emus away from the fruit. Pears, prunes, persimmons, hazelnuts and citrus are some of the fruits grown. A chicken tractor (4-5 chooks kept in a portable pen) is used in the orchard to keep grass down.

Both families use a system of rotating chooks with vegetable garden beds. Julia estimates that she and Phil grow about 80% of their own food. They breed rabbits and chooks for their own consumption. Julia uses a zoning system with salad greens such as Chinese cabbage, sorrel, New Zealand spinach, Japanese greens and herbs grown close to the house. Further out, broad beans, potatoes, peas, tomatoes and strawberries are grown. Fruits such as plums and apricots are bottled and made into wines.

The families have made a practise of collecting seeds from useful plants from Mediterranean, sub-tropical and temperate climates world-wide. Jeff said it has been a lot of work to find out which species will grow in the area. He has devised a simple and efficient way of germinating slow growing seed by planting it in barely damp coconut fibre in a plastic bag. He stores the bag in a warm place then pots the seedlings after sprouting. He uses yoghurt containers with lids on for small seed.

Small Tree Farm

Hosts: Andrew Thammo and Dr Christine Sharp. *Location:* Balingup.

Andrew and Chrissie opened their 100 acre (35 hectare) farm to the public in 1981 with the aim of providing farmers with trees that were both productive and able to be used for landcare. Over 100 different trees, exotic, rare, deciduous and native are available. Following is a small selection.

Poplars: Chrissie and Andrew promote the use of poplars on farming properties because some species are very salt tolerant and can help reverse the spread of soil salinity. Poplars are more dependent on ground water than rainfall and can make use of water courses in arid country that are often saline. They are sometimes sold as cuttings several metres tall.

Euphrates: Salt tolerant poplar with variable leaf form which can be used for erosion control and also provides suckers for livestock fodder. Sheep and cattle prefer the suckers to grass so these trees provide an economic incentive for farmers during the summer months when other feed is scarce. If unmanaged, the suckers do grow into thickets and concern was raised about the invasive nature of the species. Andrew believes this is a small risk, fairly easily avoided, and is outweighed by the great potential the species has as an economic means of controlling salinity.

Mahgreb: (native to Morocco, Tunisia, Algeria) An attractive, extremely fast growing and salt-tolerant poplar which provides good livestock fodder in the form of suckers. Andrew thinks the timber has potential as sawlogs.

Pryors: A semi-evergreen harvested for timber production at 15-16 years old; a bland hardwood used for internal mouldings and shelving.

Cottonwood: Elegant tree widely used for avenues.

New Zealand Willow: Used for erosion control.

Fat Eucalypts: The eucalypt is the most widely grown plantation tree in Australia but is very difficult to mill at a young age because it's wood holds a lot of tension. As the tree grows, the inner cells of the trunk are compressed and the outer ones are stretched so when the wood is cut the tension is released causing the cells to move and the wood to split. Rather than being used as a timber wood, eucalypts are used instead for energy production (fire and charcoal), as wood pulp and for the production of rayon.

Inspired by a New Zealand farmer who was milling 22 year old Sydney blue gum (the usual milling age is 70 years), Chrissie and Andrew set out to discover the secret of his success. The farmer believed the secret was to grow short and fat trees rather

than tall and slim ones but didn't know if the size and height was controlled by genetics or environmental factors such as wide spacing between trees.

Chrissie and Andrew started trialing 'fat eucalypts' using seeds from 46 different families of eucalypt. They planted trees out on a widely spaced grid in May 1994 and are looking for species with a specific bark characteristic; rough with an interlocking grain.

Trees which don't have these characteristics are culled. So far half have been cut out and Andrew, who originally estimated that one in five trees would be left to grow to maturity, now thinks that figure will be one in ten. He wants to develop a superior line of trees to use as a seed orchard. The planting layout was designed to increase out-pollination.

The eucalypts will undergo a rigorous pruning regime beginning at 3 years of age and continuing until they are 8. By then Andrew believes a superior log size will have been set up for milling. At 25 years of age the timber yield of the fat eucalypts should far exceed their thin counterparts.

Fat eucalypt seedlings (Sydney blue gum, spotted gum, lemon scented gum, sugar gum and red ironbark) are now available for sale at the Small Tree Farm.

Oaks: Slow growing trees which live for hundreds of years.

Cork: grown for cork production.

Willow: grows to 50m, horizontal habitat, ornamental with good autumn colour.

Californian: grows to 50m, white oak with spreading habitat and edible acorns.

Portuguese: grows very well in the South West.

Paulownia: An extremely fast growing deciduous tree from China with large flowers which come out before leaves. A very attractive tree grown for its timber.

Fire breaks

Fire retardant species include port oaks, chestnuts, *Acacia alarta* and the Mexican pepper tree.

Nanutarra

Host: John McGann. *Location:* Balingup.

John McGann bought this 33ha property in 1986 when it was a treeless, waterless, overgrazed, sandy block, "waste-deep in bracken fern". The gully running through the centre was overgrown with blackberry bushes.



*Koppula Narasiah, Tony Jansen & Adam
Tiller at Nanutarra. (Photo: Leonie McMahon.)*

John said his driving force was to restore the land and to make it a model for others to follow. He has succeeded on both counts. The small valley is now covered in well established trees. A series of dams which support marron and silver perch and water the orchard and vegetable gardens have replaced the gully.

John said he hasn't used any one single regime to develop the property. He has borrowed from organic farming, biodynamics and permaculture.

Early on, the rectangular shaped property was divided into three: the middle section is the house block and the sections on either side of it are woodlots. The first trees were planted in 1987, including tuarts and acacias as a wind break from the easterly wind but most have been grown since 1990 when John first came to live on the property with partner, Lisa.

Trees grown include Sydney blue gum, sugar gum, wandoo (grown close for good timber production), marri, tagasaste (a support species and fantastic mulch), sheoak, plus English, Mediterranean and cork oak and chestnut.

John believes good preparation of the ground is critical. The trees were planted (up to 1000 a day) along contour lines made by a bulldozer. They weren't mulched or watered. In a good season he has a high survival rate but rabbits can do enormous damage, eating up to 200 trees a week in a bad season. The major expense in tree growing becomes the cost of fencing to keep them out.

John does some alley cropping. He is trying to introduce native grasses but has not yet been successful. He has developed a love-hate relationship with the bracken fern; a phosphorous accumulator and very good humus mulch. He rips it in summer to expose the roots and uses it as a mulch, of which he said he can never have too much.

The orchard, situated on a slope, is made up of pears, nashi fruit, nectarines, apples, pistachios, macadamias, avocados, plums and citrus fruits. John said he

found terracing invaluable for growing fruit trees on sloping ground. A line of fig trees was grown along the eastern side of the orchard to act as a windbreak from hot summer easterlies. Because the figs are deciduous, they allow the winter sun in.

The orchard will eventually be fenced around its perimeter and across the top to keep geese ducks and pigeons penned in and rabbits and parrots out.

John has grown 5 species of banksia on a 0.6ha plot, pruning them to produce masses of flowers which he sells for dry flower arranging. The flowers can't be taken from the wild, only from plantation grown trees.

The vegetable and herb garden runs across the slope on either side of the chicken pen. It has artichokes, asparagus, potatoes, broad beans and blueberries, lavender, rosemary and marigolds. The beds are rotated up and down the bank and mulched using nettles and arrow-root or cereal rye and bracken fern as green manure crops.

Yarri Springs

Hosts: Peter Hicks and Wendy Wilkins. *Location:* Balingup.

Wendy and Peter bought this 3.6ha property, formerly cattle grazing country, in 1980. At the time it was infested with weed grasses including couch, kikuyu grass, blackberry and bracken fern and the creek water was too saline for stock to drink. Sixteen years later, you can't see the weeds for the trees – or the bamboo.

The couple are permaculture consultants and run permaculture tours of their property. They have established a bamboo nursery and Pete also designs waterway systems using chinampas. They are also certified Level A organic growers and members of the Biological Farmers Association. They grow stone fruit and nuts for sale.

Pete in particular has a strong interest in bamboo. He believes it is the most versatile plant on the planet but extremely under-rated. It is flexible, light and strong making it a very useful construction material. At Yarri Springs it is used as verandah railings, the framework for a large pigeon dome, an enclosure in the creek for rainbow trout, handles for tools and stakes. It has other uses as an erosion control plant, for food and shade (both human and animal) and as a windbreak. Twenty five species are available for sale from the nursery but more than 60 species are grown on the property.

Mixed in with the bamboo that flourishes along the creek at Yarri Springs are Tasmanian blackwood, walnut, kangaroo apple, rosegum, redgum and bull banksia. To stabilise the steep slope behind the house tagasaste, acacia, cork oak, chestnuts and stone pines were planted.

The couple built their passive solar designed house of rammed earth, rock, jarrah and pine on a steep southern slope overlooking the creek. There is a glass house on the northern side and verandahs the rest of the way round. Most of the windows are in the northern and eastern walls, with a few on the west and south, which is well shaded by bamboo. In summer the west and south facing windows are opened to draw cool air into the house. The 5 year old paulownias are also good air conditioners, deciduous with big summer leaves to keep the house cool.

Margaret River Field Trip

Carolyn Nuttall (Australia)

Day one

Eighteen conference participants, travelling by mini bus, departed Swanleigh on October 2, 1996. Our driver and guide was Peter Dorrington of Witchcliffe, Western Australia.

Day one was spent travelling to Glenbrook Camp School at Witchcliffe where the group was to stay for 3 nights. We travelled down Highway 1 to Bunbury, then took route 10 to our destination. Refreshment stops were at Mandurah and Busselton.

The camp school hosts, John and Betty Hindle served an excellent meal on the first evening and maintained that high standard throughout our stay. The accommodation was, in all, first rate. We enjoyed a feeling of being well looked after.

Day two

The first tour of the day was to Cloverdale sheep dairy where we met the owners, Debbie and Trevor Dennis, who produce a range of award-winning sheep milk products on site. They gave us a tour of the dairy, explaining the milking process and providing samples of their cheese for tasting. They described and demonstrated their farming focus which is to grow pasture organically using biodynamic techniques. We were impressed with the obvious success of their venture.

The second tour was to Serventy Winery. Here we saw a fully organic winery in operation. Peter Serventy, wine-maker and owner, and one of the pioneers of organic wine production, led the group on an inspection of the vineyards and his wine making operations. We had lunch and wine tasting inside Lyn and Peter's magnificent home – a touch of France with excellent wine and food to make us all feel very pampered.

Day three

Day three and we drove north to the mouth of the Margaret River to begin a tour that was to leave lasting impressions on us all. We were met by Helen O'Brien our tour guide, who spoke with such passion, knowledge and understanding of the area that we knew we were in a special place.

We paddled up the river, looking for the features identified by Helen as historical sites of the early European settlers in the area, the Bussels. We later explored a cave that this family used to store the cheese from their dairy.

We moored on an island covered in an ancient gnarled paperbark forest for a unique lunch. Helen laid out a feast of bush tucker. On a round of bread made with herbs from the local bush, we spread grass tree grub pate, ground cycad nut spread, smoked emu and kangaroo topped with a pickle of rosella like flavour and local fresh herbs. We also had quandongs and other bush fruit flavours to experience.



Helen O'Brien explaining the 'bush Tucker' (Photo: Marnie Rowe).

Helen's knowledge of, and sensitivity to the Aboriginal people who once lived in the area, together with her excellent story telling ability, made our experience on the Margaret River memorable.

(Throughout our time in the Margaret River area we were, as a group, aware that we were close to the site of the recent tragedy that had claimed nine lives in a sandfall. We knew that the locals we were meeting were grieving for lost friends and acquaintances. We also knew that they wished that the tour should proceed as planned. We were grateful for this and appreciated their courage and strength.)

Peter was keen for the group to see as much as possible and found every opportunity to fit in more visits. We stopped to see the abseillers at Bride's Cave, visited the Berry Farm for a magnificent afternoon tea and stood amongst the karris in Boranup Forest.

As well, we had time to explore the local community gardens at Margaret River.

Day four

The tour continued with a visit to the Sustainable Agriculture Research Institute (SARI) on Saturday. This is a small community in Nannup where Jeff Nugent and Julia Boniface live with their families. Jeff and Julia are the authors of *Permaculture Plants – a Selection*.

We arrived in Bridgetown mid-afternoon on Saturday 5 October to conclude an excellent tour. We were grateful to our guide Peter, his wife Jo, and all the other people who contributed to the tour's success. We had gained useful insights into other people's experiences and had learned and been inspired. Furthermore we had developed a strong sense of cohesion in the group and were saddened by the breaking up of the party. An exchange of addresses, collated by Jo Dorrington, helped ease the anxiety we felt and foreshadowed continued communication among us.