

AUSTRALIAN NUFFIELD FARMING
SCHOLARS ASSOCIATION



1996 SCHOLARSHIP REPORT

By

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Re-thinking Agriculture

Topic: Sustainable systems, including farm practices,
holistic management programs

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Foreword and Introduction

I am now on a very different road to the one I was on before I left for my trip. The Nuffield scholarship provided me with major insights about the state of agriculture and has profoundly changed the way I think about Australian agriculture. I am now temporarily part of the academic and research fraternity, completing a PhD at the Institute for Sustainable Futures.

In this report I will put forward some questions which I see as important. I will also discuss from my perspective a global picture for agriculture, the Australian agricultural context, economic issues, features of my trip, holistic resource management and a brief outline of my current research. This report is very much my perspective and I am sure that some of you will disagree with much of it, but it represents what I see as important and presents an opportunity for discussion. .

The trip clearly indicated to me that current trends in agriculture (but not restricted to agriculture) are causing many problems. These include problems with distribution and ownership of resources (particularly in developing countries); the very worrying, standards-lowering trend of globalisation and the enormous social and ecological costs which are and will continue to accompany this trend; the unconscious acceptance of the western, industrial model of agriculture with its huge toll on soils, biodiversity, water-ways, and energy sources. I could go on but we are all familiar with the environmental arguments.

The questions I would like to pose include:

- What factors do we now need to consider if we are planning an agriculture for the next 100 or 1000 years?
- What can we learn from our past mistakes and from other ‘ways of thinking’ about how agriculture can better ‘fit’ this place?
- Does the expanding global market provide us with an opportunity or is it placing too greater demands on our fragile resources?

- Should our agriculture be based on fossil fuels, artificial inputs and monocultures or should we be taking notice of new ecological knowledge? This new knowledge very clearly points to the fact that ecosystems that are stable and resilient (to floods, drought, fire, exotic species, production demands) are those that are diverse and complex. To what extent is our agriculture encouraging diversity and complexity in its ecosystems?
- What industries can be sustainably developed here (my hunch is that they we could start looking at systems that are native, water efficient, deep-rooted, complex, diverse, perennial etc)?
- Should we be growing cotton and rice in the driest continent on earth?
- Should leases be continually granted on marginal land where it is becoming increasingly difficult to make a living in the conventional way? Is it in the interests of future Australians that this land is continuously mined and should we perhaps as a nation be deciding that this land ought to go out of production - with due compensation to those currently leasing that country?
- Can the knowledge or value systems of Australia's indigenous peoples shed light on the type of value systems and knowledge systems that might serve us well as we try to adapt our activities to better 'fit' or adapt to this the land?
- Should we be exporting more at lower and lower returns or should we instead be trying to pave the way to introduce the 'real' costs of food and fibre products, to maximise returns to growers?
- Should we be putting a significant proportion of our research dollars into high-input, monocultures where the goals are production and profit? Or should we be investing research dollars into agriculture that is adapted, resilient, water efficient, diverse and native?

When I applied for a Nuffield scholarship, I was working for Hassall & Associates as an agricultural consultant and studying environmental law. The proposed project theme for my Nuffield scholarship was: 'Improving the economic and environmental sustainability of Australian Farm Businesses'. This resulted in my taking a broad look at agriculture in its global context as well as looking at particular resource management methods such as Holistic Resource Management in detail. However, largely as a result of what I saw and learnt during my scholarship, I decided on returning, to change direction.

I was quite alarmed by the direction much of agriculture and society seems to be heading. It is my view that it is well and truly time, to put aside the old 'goals' of 'production' and 'profitability' and to make some significant changes to the way we do things. The state of the worlds ecosystems is sufficiently bad that I think we need to question the way we currently operate. This is particularly important for Australia which is very different to any other part of the world. To what extent does our agriculture and/or the myriad of other human activities 'fit' with our environment, or to what extent is it 'adapted' to this unique, fragile, nutrient poor, diverse, arid land. I think there is sufficient evidence to suggest that many of our activities do not fit very well and in fact are unsustainable. In the words of Dr Tim Flannery (author of *The Future Eaters*), we are a maladapted culture and like our forbears are currently in an accelerated state of 'future eating'.

I do not feel comfortable working within the existing agricultural paradigm and encouraging the goals of production and profitability at the expense of ecosystem viability and issues of social capital. I would like to make some contribution to the development of a culture that acknowledges its responsibility to developing and implementing sustainable practice. I think that partly this involves exploring our current belief systems that are perhaps suited to an outdated model of the world and an aging set of problems. I am absolutely convinced that the worlds ecosystems, including Australia's, will suffer at least some sort of collapse during my lifetime if the structure of present cultural systems and the resulting human actions are not critically reviewed and changed. It is my view that the current paradigms which includes within it the goals of: globalisation, development, production and profitability, is largely the cause of many social and ecological problems.

I think the future is full of opportunities if we can broaden our thinking to challenge traditional and ingrained, yet inappropriate, goals and methods.

Outcomes:

The following is a brief sketch of some of the global issues that I observed during my trip.

Overview - the Global context

On the one hand, we have:

- a finite planet
- with an increasing population
- increasing land degradation
- increasing water pollution and depletion of aquifers and river systems.
- increasing land and water being allocated to non-farm or urban uses
- biodiversity decreasing at a rapid rate
- increasing greenhouse gases emissions adding to climatic risks (El Nino) and unpredictable weather patterns
- an agriculture based on petroleum (10 calories of fossil energy are required per calorie of energy supplied to the average American dinner plate)
- and an increasing number of countries, particularly in Asia becoming import dependent for basic food items such as grain.

The following points aim to illustrate these trends in more detail.

We live in a world where 51 of the top 100 economies in the world are companies. General Motors is larger than Denmark, Ford is greater than Turkey and Shell is greater than Norway. The top 500 corporations now control 70% of world trade and 28% of world GDP. In 70 countries incomes are less than they were in 1980 and in 43 countries they are less than they were in 1970.

Gary Gardner from the Worldwatch Institute in Washington DC discusses the grain requirement of Asian countries in the 1997 State of the World report. Some Asian countries including Japan, Taiwan and Sth Korea now import more than 70% of all grain they consume. Japan, Sth Korea and Taiwan began to import significant levels of

grain once the grain area per person decreased to 600-750 square metres per person. This range represents the import dependency threshold. If a 600-700 square meter figure is used as today's threshold (for 20% import dependency), the club of potential Asian grain importers is on the verge of expanding dramatically. By 2020, it is estimated that seven additional countries will fall into this category - joining the six already there (Japan, Sth Korea, Taiwan, Malaysia, Sri Lanka and Nth Korea). These include Indonesia, China, Bangladesh, Philippines, Pakistan, Laos and Afghanistan. India is expected to join by 2030. By this time, more than 90% of Asians will rely on imports for 20% of their grain consumption.

Between 1994 - 1995 China shifted from being a world exporter of grain to the worlds second largest importer and now imports about 6% of its grain needs. Asia's grain imports increased from some 6 million tonnes in 1950 to more than 90 million tonnes in 1995. The EU, US, Argentina, Canada and Australia account for 4 / 5's of the worlds grain exports, with the US controlling more than half of world grain exports. Shipments from these five major grain exporting blocks have been flat in the last decade because of the slowdown in production increases. Few African nations could compete with Asian countries in a bidding war for grain.

China's Yellow River first ran dry in 1972 and now runs dry every year (except 1998!!!). The Environmental Protection Authority (EPA) in the US estimated in 1989 that as much as 40% of groundwater in the US is contaminated by toxins.

Currently in India, 600 million people make a living from the land. Industrialisation of agriculture is underway. By the time the process is complete- with massive foreign investment in machinery, seeds, fertiliser, chemicals - the work will be able to be done by only 20 million people. The indicators project that the 'displaced' 580 million will end up in the slums of India's cities. I do not question for a minute that technology and science can make peoples lives much better - but I do question the acceptance of western attitudes to this sort of trend. There must be a better way of doing it - that empowers and enriches the local people, rather than increasing further the flow of wealth to developed nations. In whose interest is it that India's agriculture is industrialised?

The Australian Context

In theory there should be opportunities for the likes of Australian farmers as demand for food should increase as well as the ability of Asian populations to purchase food. But there is amidst all of this, two major paradoxes. These include:

- malnutrition is increasing despite the fact that the world now produces more food than ever before and that two-thirds of all grain produced is fed to livestock.
- the increasing international demand for food which is conflicting with the current state of Australia's natural resources.

In many parts of the world, agribusinesses are moving into developing countries and are using the land, labour and capital to produce high value crops for export (for example, growing asparagus and /or strawberries in Latin America for European restaurants or out-of-season fruit and vegetables for US and European consumers). This is occurring whilst many in those countries are malnourished. During the 1970's childhood deaths due to malnutrition in Mexico increased by 10%, while the acreage devoted to basic food crops - corn, wheat, beans, and rice, actually declined 25%, due to multi-nationals converting land to alternative luxury crops such as asparagus geared for export.

This report is not about the problems of food distribution, but this paradox is becoming increasingly prevalent as the affluent of the world become 'hedonistic' in their relationship with food whilst many are not receiving their basic requirement. The issue of food distribution is an old one but the globalisation trend is not addressing it, instead making it much worse. Much of the agricultural land in the world is being used to grow high value luxury foods, by companies without a social or ecological conscience and bought by often ignorant consumers.

The second major paradox is that whilst the demand for food is increasing, our ability to supply increasing amounts is being steadily eroded. At the same time as Australia appears to have an increasing opportunity to supply increasingly dependent markets, the situation with our agricultural resource base is become increasingly uncomfortable.

- In an average year in Australia, about 14 billion tonnes of soil is moved by erosion. This is about 19% of the total soil moved each year globally, even though Australia is only 5% of the world's land area.
- Land and water resources are becoming increasingly degraded - the 1996 Australian State of the Environment report indicates that 15% of rangelands are seriously degraded. In addition Australian soils are suffering from structural decline, water logging and salinity, water and wind erosion, soil acidification and nutrient leaching.
- Aquifers and river systems are being depleted and over-exploited.
- Chemical and nutrient pollution are impacting on the health of major river systems, particularly the Murray-Darling basin.
- 80% of the water in the Murray-Darling Basin is extracted and 95% of this is for irrigation. This has impacts on fish and bird species, wetlands, water quality (aggravated by nutrients causing severe toxic algal blooms), salinity and erosion. This is symptomatic of major river systems in most of the developed world.
- Our agriculture is based on a finite supply of fossil fuels, the use of which adds to carbon in the atmosphere. These practices will become increasingly unacceptable.

As Wes Jackson (of the Land Institute in Kansas, USA) says - 'Soil is every bit as depletable as petroleum, and the consequences of depletion are far worse for more of the world's people. An over-populated planet can fare better without fossil energy than it can without soils to grow food'.

Wendell Berry states that - 'the fact that we have an agriculture based as much on petroleum as on soil - that we need petroleum exactly as much as we need food and must have it before we can eat - may sound absurd. It is absurd but nevertheless it is true'.

A Definition for Sustainable Agriculture:

In terms of 'sustainable agriculture' what is it exactly that we are trying to sustain? A certain human population, the planet, or an ever increasing agricultural production? I asked everyone I met with for their definition of 'sustainable agriculture' and I didn't get the same answer twice.

Dennis Avery, at the Centre for Global Food Issues, for example, talks in terms of sustaining an increasing agricultural productivity to feed the estimated 10 billion globally by 2025. Others refer to the sustainability of a particular land resource to be productive well into the future without a reliance on chemicals, fertilisers and non-renewable energy. Various other comments I received were:

- Agriculture today is based on biological capital - fossil fuels, depleting soil fertility and underground aquifers, and - synthetic chemicals and fertilisers. We are using biological capital built up over billions of years to produce a population which cannot be sustained on renewable and sustainable levels of inputs. The use of non-renewables gives us an inflated picture of the earth's capacity to support human life. We must look to making agricultural systems function more on sunlight and less on fossil fuels. For example: perennial polycultures (Wes Jackson).
- Sustainability refers to the long-term endurance of a system
- Any sustainable agriculture must endure indefinitely without depleting its ecological support base. Therefore a sustainable agriculture must be retaining and building soil.
- Sustainable systems must be designed at an ecosystem level. Plants evolved with one another and with animals, insects and microbes. All systems need the primary producers (green plants), the decomposers (microbes) and the consumers. Most of the basic links within food webs are within the soil and dependent on organic matter. Many conventional agricultural practices deplete soil organic matter.

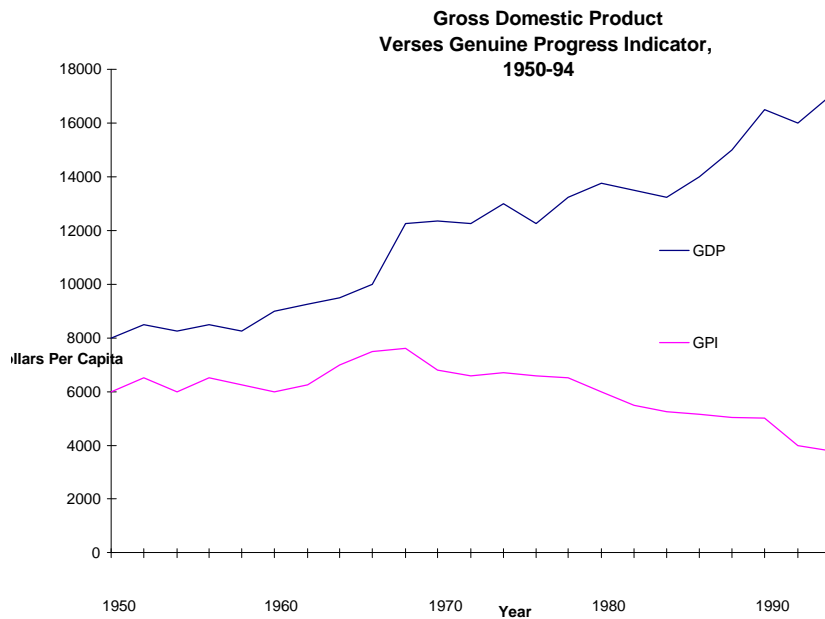
Sustainable agriculture refers to a system that is not only productive but is also 'building soil' and 'encouraging biodiversity'. If an agricultural system is not doing this, it is not sustainable in the long-term. By this definition, it is only a remote

possibility that Australia will be in a satisfactory situation to contribute to the world's growing demand for food beyond the foreseeable future. We need to put our energy and research dollars into developing systems that 'fit' their ecosystems rather than degrade them. We need to use our water efficiently and sparingly and we need to design and build an agriculture that encourages diversity and complexity and mimics original ecosystems.

Ecological Economics

I was privileged to be able to spend some time with Herman Daly, an Ecological Economist who has spent much of his working life at the World Bank. He is author of several books on 'steady state' and 'ecological economics' - Including 'Beyond Growth' and 'For the Common Good'. Because I see economics as a crucial part of the challenge of 'sustainability', I have included the main points from my discussions and readings of both Steady State and Ecological Economics below.

Ecological Economics discusses the many failings of measuring welfare through GNP. GNP - does not differentiate between income and capital, services or defensive expenditure. The depletion of our natural resources (fossil fuels, minerals, forests etc) is presently counted as income, as is expenditure on cleaning up pollution, purchasing water filters and so forth. GNP is therefore an index of throughput not welfare. The GDP makes no distinction between economic transactions that add to well-being and those which diminish it. As a result, the GDP masks the breakdown of social structure and natural habitat, and worse, it portrays this breakdown as economic gain. The GPI (Genuine Progress Indicator) has been developed to provide a more accurate indication of welfare (see graph). The following graph compares the GDP with GPI for Australia since 1950. The GPI index indicates that social breakdown, ecological degradation and social inequality have increased more than economic growth over the period.



This graph correlates well with surveys that have been conducted in Australia and other developed countries over this same period. These surveys, which aim to assess ‘quality of life’ issues illustrate that most Australians agree that the quality of life in Australia has been decreasing since the mid-1970’s. This has been occurring while GDP indicators continue to increase. The GPI which includes social and ecological costs of production is a far better indicator of well-being but is not used by the Australian government in any policy issues despite its acceptance with a growing number of economists. This further illustrates that the old methods and measures are perhaps outdated and as a society we need to find better definitions of well-being as well as methods and measures of achieving it (recent attempts to do this are discussed in ‘Measuring Progress’ 1998 edited by Richard Eckersley) .

Further points from ecological economics include:

1. Ecological Economics (E.E.) is based on the assumption that the macroeconomy is a subset of the ecosystem (a larger, finite and non-growing system) and therefore has a finite size and an optimal scale - in contrast with the conventional assumption of infinite growth.

2. Sustainable Development is development without growth. ie without throughput growth beyond the regeneration and absorption capacities of the environment.
3. Ecological Sustainability of the throughput is not guaranteed by market forces. Market prices measure the scarcity of the individual resources relative to each other, not the absolute scarcity. The market does not register the cost of its own increasing scale relative to the ecosystem.
4. EE advocates a move away from the ideology of free-trade to a more nationalistic orientation (with recourse to trade only when it is clearly more efficient). International competition is standards lowering (transnational corporations will move operations to countries with the lowest wages and the least environmental standards), making it more difficult for countries with higher wage levels and higher environmental standards (inclusion of externalities into the cost of production) to compete.
5. The effort to overcome poverty by further growth in scale of through-put is self-defeating once we have reached the point where growth increases environmental costs faster than it increases production benefits. Beyond this point, further growth makes us poorer not richer.

Holistic Resource Management:

Alan Savory is the founder of Holistic Management and is based in Albuquerque, New Mexico. Alan believes agriculture has moved beyond merely, the production of food', to the production of an export commodity. This has many repercussions.

Holistic Management (previously Holistic Resource Management) is basically a better way of making decisions for the management of resources. It is a goal based decision-making process. Comments from various extension workers were that HRM has been effective in making managers manage better and has been effective in including family, culture and social factors into management which weren't previously considered.

Holistic Management is based on the theory of holism. Simply, holism is the idea that nature only functions in wholes, rather than interconnecting parts and that nature will

never be understood by studying the parts. The philosophy acknowledges growing scientific evidence that extinction is based , not necessarily on natural disasters but rather that extinction is the result of behaviours. Since our actions (behaviour) are determined largely by our decisions, only through the way we make decisions will we truly be able to change the way we affect the world in which we live - and ensure that civilisation is sustainable in the long run.

Our ecosystem is so complex that with conventional decision-making, we cannot possibly comprehend or predict the myriad of affects each decision we make will have on the ecosystem as a whole. HRM ensures that each decision made is (simultaneously) ecologically, economically and socially sound - which is essential for long-term stability and sustainability.

Since land and /or resources cannot be managed in isolation from the humans tied to (and dependent on) these resources, HRM looks at managing “whole” situations (whole farms, whole firms, whole communities). Once this “whole” has been defined, HRM then begins by developing a single “holistic goal” that includes three components

- the quality of life desired, based on ‘values’
- the ‘production’ necessary to create this quality of life (achieve these values)
- a description of the resource base as it has to be far into the future in order to sustain what you produce.

All decisions are then tested against this holistic goal - using seven specific testing guidelines - to ensure that quality of life you seek is attained and that all decisions are truly sustainable - socially, economically and ecologically.

Further information is available in ‘Holistic Resource Management’ by Alan Savory.

Highlights of the Visit to the USA and Canada

I spent 12 weeks in the US and Canada and visited a range of individuals, organisations and farmers including:

- United States Department of Agriculture (USDA) in Washington DC
- **Frank Muller** from the Economic Policy Institute.
- **Dennis Avery** of the Hudson Institute - Centre for Global Food Issues. The Hudson Institute supports high-yield agriculture based on high inputs of chemicals and fertilisers and fossil fuels. The Institute argues that it is necessary to have an agriculture based on high-inputs and high yields to keep the total area allocated to agriculture at a minimum and therefore reduce the impact on wildlife and ecosystems. Dennis Avery admitted that this system is not built on foresight but based on non-renewable resources such as phosphate and petroleum.
- **Chuck Benbrook** who is an IPM specialist also advocates high-yield agriculture but believes technology doesn't provide all the answers. He believes in utilising the inherent productive capacity of the soil, the microbes, the natural fertility and cycles of decomposers, producers, consumers, rather than saturate the soil in chemicals and fertilisers and thereby destroy the inherent productive capacity of the soil.
- Several Holistic Management practitioners and Educators. **Dick Richardson** - teaches HRM at University level in Texas and I met with a number of his students and visited a number of project sites. **Dale Lasater** of the Lasater Ranch in Colorado is one of the longest practitioners of Holistic Management in the USA. The ranch is a wildlife preserve. Dale believes everything on the ranch has a purpose even the moles who cultivate and aerate the soil. His aim is to breed a highly adapted animal. He cites the pronghorn antelope as the example. These animals have been roaming the short-grass prairies for hundreds of thousands of years and are highly adapted. Dale puts high selection pressure on his cattle, feeds minimal supplements and uses them as a tool to create the landscape he desires. **Miles Keogh**, who is a Holistic Educator based at Grand Junction in Colorado, works with community groups in conflict. This usually means farmers, government, environmentalists, and the general public are all involved in conflict situations. Miles uses HRM to resolve conflicts by developing a goal, assigning roles and

responsibilities and looking at the design. Is the design of the system, process, resource, technology etc. appropriate to achieving the goal? I remember he quoted “The significant problems we face can never be solved at the same level of thinking we had when we created them”. I met with a farmer in Iowa, **Tom Jantzen**, who grows soybeans and corn and runs pigs and hogs. He believes we still have not solved the question of how to crop in a sustainable, enduring way. I stayed with **Don and Randee Halliday** at Rocky Mountain House in Alberta, Canada, and **Noel and Elizabeth McNaughton** at Winfield, Alberta.

- **Wes Jackson** is a director of ‘The Land Institute’ in Kansas. The Land Institute is non-profit educational research organisation devoted to the study of sustainable alternatives in agriculture, energy, waste management and shelter. Wes Jackson is a critic of the effects of industrial agriculture and he proposes various practical remedies, including the development of perennial grain crops, “herbaceous, perennial, seed-producing, polycultures”. What he proposes is a perennial mixture of plants based on the original ecosystem. The idea is to design agricultural systems that mimic the ecosystem of a particular environment. The advantages are increased productivity, reduced dependence on purchased nitrogen and a reduction in pests and disease. In other words, production based on the principles of biodiversity. The Land Institute is presently researching and breeding a number of perennial grain crops.

As well as agricultural institutions, I visited a number of other institutions which dealt with the broader issues of sustainability.

- International Institute for Sustainable Development (IISD). IISD’s mission is to promote sustainable development in decision-making internationally and within Canada.
- Natural Resources Institute - Prof Thomas Henley (Director)
- Sustainable Development Research Institute - Caroline van Bars
- Farm Folk/City Folk
- David Suzuki Foundation - Caterina Geuer.
- As well as many other farmers and researchers.

Poland

After visiting the USA and Canada, I briefly visited Poland and East Africa.

In Poland, I visited the Research Centre for Agricultural and Forest Environment of the Polish Academy of Sciences at Turew near Posnan. The research aims to use ecological services and functions by incorporating them into agricultural systems to ameliorate the negative aspects of agriculture. This includes using rotations, shelter belts, ponds, encouraging biodiversity, buffer zones etc.

The buffer zones usually composed of a variety of tree species are used to absorb leached nutrients, maintain biodiversity, control groundwater levels and pollution. The focus of research is not aimed at increasing production but is aimed at controlling the negative effects of agriculture. The main principles used are based on the energy flow of matter cycling. Studies on groundwater contamination have shown that midfield afforestation, grassland stretches and small water bodies can be used to control non-point sources of ground and surface water pollution. These are referred to as biogeochemical barriers. Studies have also shown that in a diversified landscape, parasites can more effectively reduce the number of crop pests than in uniform environments.

The Centre carries out complex investigations of the ecological processes which affect the environment under the impact of intensive agriculture. The objectives of these investigations are the recognition of changes taking place in ecosystems and agricultural landscapes under the influence of different farming activities, the recognition of threats resulting from these changes and finally, working out the principles of management aiming to minimise the threats to the environment and to natural resources.

The importance of biochemical barriers in the agricultural landscape for control of non-point sources of pollution has become apparent. These barriers may include mid-field afforestation, forest and meadow strips and swampy vegetation, mid field water ponds and other differentiators of cultivated fields. What is crucial about these barriers is the

plants ability to absorb chemicals dissolved in ground and surface waters and the accumulation in the plant biomass and in litter and soil as well as the precipitation of pollutants in the sediments of water ponds where they undergo biochemical transformation caused by living organisms.

Africa

My visit to East Africa enabled me to contrast the situation with that experienced when I visited in December 1995. At that time I was involved in a project looking at 'Combating Desertification' in rural areas of Zimbabwe and I also visited a number of tobacco, flower and horticulture farms and a number of Holistic Management Practitioners. The principles they use are similar to that used in Australia and the US although the distinct wet and dry seasons makes management of the system more predictable and similar to our Qld climate. Labour costs represent the highest cost category although this usually represents a workforce of 200-400 people on an average wage of ~ \$10 Aus / week.

CONCLUSIONS

The Australian agricultural industry faces the huge challenge of re-thinking and re-evaluating traditional and conventional systems and institutions when they are no longer capable of providing solutions to problems. The future is by no means all 'doom and gloom', but it is sufficiently challenging and complicated that careful thought and planning for the future is required now perhaps more than ever before. I believe we need to critically question a number of the fundamental assumptions upon which our social and economic systems are based.

In my travels and since it has become apparent to me that people tend to think about 'sustainability' and 'the future' in two different ways. The first group accept our present economic systems and have faith in market forces to solve all our problems. They accept the western development philosophy, globalisation, growth, free trade and do not see the increasingly visible signs of ecological deterioration as major obstacles. Their's is very much a business as usual scenario - to "manage" the environment better, improve on what we are doing, and we'll be right.

The second group see that the root cause of many of the ecological and social problems prevalent today are a direct result of the western development model, economic rationalism, market failure, a flawed confidence in neo-classical economics which fails to see its dependence on a finite, fragile ecosystem and a drive to standardise and globalise. This group see the pathway to a sustainable future is questioning at the deepest levels, the whole design of our current social structures and critiquing the value systems that presently underpin our major institutions. Are values of profit, progress, competitiveness and expansion the values present in a 'sustainable society'. Are we using the argument that it would be too costly to do anything today (which is in itself a flawed argument) as an excuse for putting more on the credit card of future generations? It is my view that we have to accept that there will be trade-offs, challenges, opportunities and new values to take on board.

Added to this individual challenge is the need for a broader vision in Australia. What will a prosperous, sustainable, healthy Australia look like in 50 years time? What is the state of our land and water resources, what crops do we grow? Are we still mining our soil? Is our agriculture still based on fossil fuels (this particular scenario is increasingly unlikely), what is the climatic situation, the energy situation, the technologies **and most importantly what are the value systems and ideologies that underpin our society?** I believe there are many possible futures. We can put our head in the sand and inherit a future that we do not want or we can think hard, ask the difficult questions, create visions and begin now to take the actions and make the decisions that will shape a sustainable future.

Are future generations and our descendants going to thank us for our visions and planning in conserving the resources they depend on; or are they going to question why we continued on with methods and processes and research directions that produced enormous problems, in full knowledge of those consequences.

As I have previously stated, this is entirely my view and one that has developed over recent years. I am still grappling with what this means and what this type of future might look like as I'm sure many of you are. I argue that we need to be critical of these old 'ways of thinking' and to seriously question just how far they go to solving our problems and in preparing Australian agriculture for a bright future. As I have previously stated, I think the future is full of opportunities if we can broaden our thinking to challenge traditional and ingrained goals and methods.

The PhD I am currently undertaking is concerned with this issue of cultural maladaptation and adaptation: - how well our cultural activities 'fit' or are adapted to the ecosystems within which they are embedded and essentially dependent upon. I am particularly interested in understanding the types of value systems that form that basis of sustainable practice, including sustainable agricultural practice.