Australian Government
Rural Industries Research and Development Corporation

# Australian Organic Agriculture
## *–Prospects for Growth?*

**A report for the Rural Industries Research and Development Corporation**

By Jason Alexandra and Rod May

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***Australian Organic Agriculture – Prospects for Growth?***
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# Foreword

Demand for organic products is growing rapidly in Australia, yet there have been few systematic reviews of the opportunities and constraints to increasing production.

The project examined the prospects, impediments and R&D needs of five Australian primary industries (rice, vegetables, wine grapes and viticulture, sugar and the dairy) through consultation with those involved in the industry, holding one-day workshops, interviews and field trips. The consultative process focused on growing systems and examination of market chain relationships. Five workshops were held in four States with representatives of growers, researchers, industry and agencies, with an average attendance of about 30 people per workshop. The report is based on the authors' interpretation of the views and ideas expressed by the participants at these workshops and does not represent RIRDC's formal position.

This project was funded from RIRDC Core Funds which are provided by the Australian Government.

This report, an addition to RIRDC's diverse range of over 1000 research publications, forms part of our Organic Produce R&D program, which aims to optimise the profitability of Australian organic production in both domestic and overseas markets and to promote the utilisation of organic farming systems as a means of enhancing the sustainability of Australian agricultural systems.

Most of our publications are available for viewing, downloading or purchasing online through our website:

- downloads at www.rirdc.gov.au/reports/Index.htm
- purchases at www.rirdc.gov.au/eshop

**Simon Hearn**
Managing Director
Rural Industries Research and Development Corporation

# Acknowledgments

This report was produced with financial support from the Rural Industries Research and Development Corporation's (RIRDC) Organic Produce Program.

The project has benefited from a large number of people who have contributed time and ideas. The project was based on two years of consultation with a wide range of informants from the five industries consulted, from the organic industry generally, and from research and government agencies. We have attempted to use informed people as the primary source of information in our efforts to investigate current activities and approaches to organic agriculture in Australia.

We are grateful to the large number of people who contributed ideas and provided time, support and advice. We trust that we have captured their views and ideas in this report.

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The description of HACCP was written by John Farrer for a training program in the Tasmanian food industry. It was published in the NASAA Bulletin of February 1999. The section on the Forest Stewardship Council is from the World Wide Fund for Nature. Both are reproduced with permission of the authors.

Appendix 3 *"Saving the World with Pestilent Statistics"* from the US *PRwatch* was supplied via the Organic Federation of Australia (OFA) email newsletter.

# Abbreviations

| | |
|---|---|
| AQIS | Australian Quarantine and Inspection Service |
| BD | Biodynamic |
| BMP | Best Management Practice |
| EEC | European Economic Community |
| EMS | Environmental management system |
| ESD | Ecologically Sustainable Development |
| FAO | Food and Agriculture Organisation of the United Nations |
| FSC | Forest Stewardship Council |
| HACCP | Hazard Analysis Critical Control Point |
| ICM | Integrated Crop Management (European) |
| ICM | Integrated Catchment Management (Australia) |
| IFOAM | International Federation of Organic Agriculture Movements |
| IOAS | International Organic Accreditation Services Incorporated |
| IPM | Integrated Pest Management |
| ISO | International Organisation for Standardisation |
| MSC | Marine Stewardship Council |
| NASAA | National Association of Sustainable Agriculture in Australia |
| NGO | Non Government Organisation |
| NHT | National Heritage Trust |
| OPAC | Organic Produce Advisory Committee (Commonwealth) |
| QA | Quality Assurance |
| RAAL | Redesigning Agriculture for Australian Landscapes R&D program |
| RDC | Research and Development Corporation |
| RIRDC | Rural Industries Research and Development Corporation |
| SOE | State of the Environment (as in State of the Environment Reporting) |
| WWF | World Wide Fund for Nature |
| WTO | World Trade Organisation |

# About The Authors

**Jason Alexandra** is a consultant, researcher and farmer with 20 years practical experience in organic farming and regenerative agriculture. He is also active in water and environmental policy, R&D and agroforestry.

Jason, Margaret and the orchard staff produce organic pome and stone fruit on their farms in Gippsland and at Petty's Orchard in Templestowe in suburban Melbourne.

Petty's Orchard is one of Melbourne's oldest commercial orchards; it sits on 40 hectares in a large bend of the Yarra River within the Yarra Valley Parkland. The orchard has a heritage collection of over 250 apple varieties and a horticultural museum. The Gippsland farm is nestled into Victoria's Strzelecki Ranges, a coastal range that was once home to the world's tallest flowering trees *Eucalyptus regans* or Mountain Ash. The foothills are now dominated by intensive dairy farming.

The Gippsland property, which was once a run down dairy farm, now produces a wide range of fruit and nuts - apples, nashi pears, plums, peaches, persimmons and chestnuts. It was transformed using trees and the design principles proposed in *Permaculture 1*(Mollison and Holmgren 1978). From a "green desert" of improved pasture a decade ago, the farm today is a rich mosaic of pasture, woodlots, windbreaks and orchards. It is a haven for wildlife where native bird and frog populations have increased dramatically. A large dam is a Mecca for waterbirds, with ibis and egrets returning to roost each evening. Many insectivorous birds breed and feed in the orchards. Countless insects and spiders colonise the windbreaks and woodlots.

No chemical insecticides have ever been used on the orchards. Instead, nature's checks and balances keep pest populations low. The birds, frogs, spiders and predatory insects play a critical role in controlling insect pests. While the orchards produce the high value, commercial crops, adjoining areas are devoted to windbreaks, wetlands and wildlife habitat. These are an important part of the farming system, enhancing the pest-predator dynamics and re-establishing biological diversity in a formally simplified landscape - a practical application of symbiosis?

**Rod May** is a third generation farmer who became determined to farm organically while an exchange student in the USA in the 1970's. He decided that he would rather have given up farming then adopt the chemical intensive, high-tech systems he witnessed in the USA. Governments at the time were advising farmers ***to get big or get out***, but he decided to avoid excessive debt by staying small, staying put and adapting. He survived by innovation and a commitment to farming with nature.

The May family now grows a wide range of leaf and root vegetables, including over 10 varieties of potatoes for local restaurants, and city markets. They also produce grains, cattle, sheep, apples, nuts and wine grapes. Over 100 years of crop production has exported many of soil's nutrients off the farm. To replace these and build fertility they apply rock phosphate, lime and use long rotations of legume based pastures that improve soil structure and restore organic matter. The legumes also fix atmospheric nitrogen through symbiotic nitrogen fixing bacteria.

Rod has been active in the organic industry in Australia having been either the Chairman or Secretary of National Association for Sustainable Agriculture Australia (NASAA) for most of the past 12 years. He has also worked as an independent organic farm inspector. He now represents the certifiers on the Organic Produce Advisory Committee (OPAC) and has represented Australia at the International Federation of Organic Agriculture Movements (IFOAM) and *Codex Alimentaris* (global food standards) meetings. In the past Rod managed an early regional revegetation project - Project Branch-Out - establishing demonstration planting across the Loddon and Campaspe catchments.

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# Authors' preface

*Australian Organic Agriculture - Prospects for Growth?* is the report of a unique research project that attempted to capture and articulate the motivations, understandings, approaches and practices of people involved in organic farming.

Organic agriculture[1] is in a period of rapid expansion around the world and is experiencing unprecedented interest in Australia. This growth in interest is a relatively recent phenomenon and there is no doubt that in the past organics have been ignored or marginalised. The place and status of organic agriculture in Australia is changing. Not so long ago organics was regularly portrayed as a fringe activity. It is now increasingly seen as a field of commercial opportunity. A coalescence of factors is thrusting organics from the fringe to a more prominent position driving considerable growth and interest in organics. Escalating global demand and the growing intensity of sustainability and health concerns, including the reactions to mad cow disease, genetic engineering and declining environmental health are fuelling the interest in alternative production systems around the world.

To ensure high quality analysis it is important that we consult with those who have done things differently and who have pioneered different ways of doing agriculture or business. Funding from the RIRDC Organic Produce program has ensured that this project has been able to do this. The project was designed to let those involved in the industry identify their priorities for future R&D.

Despite, or perhaps because of the limited support received from governments in the past, there is an active spirit of cooperation and an eagerness to learn in the organic industry. The success of the project was a result of the intense and willing cooperation of hundreds of people who have contributed openly, communicated frankly and approached industry development with an ethic of open information exchange and self-reliance. This project was an important example of how R&D projects can work with the networks that exist in the organic sector.

We have no doubt that there is much to be learnt from the practitioners of organic agriculture and that many opportunities exist for designing and refining farming systems that are "applied symbiosis". We feel that this study has only begun to peel back the layers. While this project started out looking at agricultural practices used in organic production systems, it rapidly became apparent that agricultural systems are never simple because they involve people, their life choices and beliefs, and their relationships with the environment, with food and with the market. What began as fairly practical level investigations into agricultural practices and technologies rapidly evolved to question ethics, environmentalism, sustainability, health and social conscience. In short, all farming systems have people at their centre. Research into these systems therefore must include a study of people.

The project has identified the need for "scientific organics" as part of the search for ecologically sound agricultural systems. This will involve some fundamental changes to the way research is done and the way researchers and research institutions approach their role. They must increasingly look outside the current paradigms and status quo. Given the extraordinary rates of change in the late 20$^{th}$ century, it is difficult to pinpoint exactly which factors may confer the greatest competitive advantage. The future of Australia's rural industries must be built on on-going innovation. The sources and resources for innovation are diverse and at times hard to identify - large industries grow from small beginnings. They often arise from "left of field" - out of the mainstream. This is particularly the case in organics.

Organics now represents one of the commercial opportunities for many of Australia's agricultural industries. We trust that this report stimulates a greater interest from governments, investors and the research community in the challenges and opportunities of developing organic production systems that are uniquely suited to Australian conditions.

[1] "Organic agriculture" and "organics" are used throughout this report to mean production systems that are "certified and accredited". See glossary for more detail.

# Executive Summary

## The Changing Context of Organic Agriculture

Community, government and market support for organic agriculture is rising[2]. This rise in support for organic farming represents a marked change in the trajectory of modern agricultural development as increasing attention is being devoted to the sustainability and multi-functionality[3] of agricultural systems.

Therefore, organic agriculture needs to be understood not simply in terms of another production technology, but as a fundamental shift in the relationships between producers and markets; producers and technology; and producers and the environment.

There is increasing adoption of organic growing systems within Australian agriculture, partly because many people wish "to do agriculture differently" and partly due to strong and growing demand for organically produced food and fibre products, particularly in major export markets.

## Growing domestic and export demand

Throughout the world demand outstrips supply for many organically produced products. Growth in Australian organic production is estimated at 15% to 25% pa. Continuing growth is expected because of strong domestic demand and because Australia is in a good position to supply expanding markets overseas, particularly in Asia. World sales in 1997 were estimated at US$11 billion with this figure estimated to increase to US$100 million by 2006 (OFA 1999).

Recent estimates put the value of the Australian organic food industry at between $250 and $500 million, and therefore it currently constitutes a minor part of Australia's total agricultural production. About one third of Australia's organic food and fibre produce is exported. However, domestic sales rose from $100 million in 1995 to approximately $250 million in 1999 (OFA 1999).

Constraints to growth in organic production include the following factors: risk and uncertainty; insufficient expertise and skill; lack of high quality technical advice; real technical and production constraints; unclear market signals and the ambiguous policy environment.

Despite the image of independence, few farmers make decisions in isolation. They are in fact part of a complex information and value chain, so while organic production may appear attractive it will take a major shift in policies, programs and R&D to stimulate a sizeable shift to organic farming practices.

The importance of government policies is best illustrated by contrasting different European countries: Austria, Sweden and Denmark aimed to have 10 per cent of their farming organic by 2000 with substantial government support, while Britain only hoped to achieve 1 per cent.

In Australia, there has generally been an absence of government support for organic farming systems. Only recently has the Rural Industries Research and Development Corporation (RIRDC) established a dedicated R&D program to fund work which focuses on organics, and this only has a tiny fraction of the total agricultural R&D budget.

This project set out to explore the lessons the industry has learnt and the challenges facing it.

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[2] Organic agriculture was frequently referred to in the Food and Agriculture Organisation of the United Nations (FAO) electronic conferences of 1999 that explored examples of successful agricultural systems and multi-functional agriculture.

[3] Multi-functionality refers to the productive, economic, social, cultural and ecological functions of agricultural landuse. The concept hit the headlines during the World Trade Organisation (WTO) meeting in Seattle.

## The project

This is the report of the RIRDC funded project*: "Identifying organic farming practices with wider significance to science or agriculture"*. The project examined the prospects, impediments and R&D needs of five Australian industries - rice, vegetables, wine grapes and viticulture, sugar and dairy - through holding one-day workshops accompanied by interviews and field trips in 1998 and 1999.

Five workshops were held in four states with representatives of growers, researchers, industry and agencies. Attendance averaged about 30 people per workshop. Workshop reports were circulated to those who attended. Two are reproduced here as appendices to this report.

At the workshops prospects for refining farming practices in areas such as soil management, pest and disease management, sustainable production, and IPM were discussed. Research and industry development needs and/or marketing possibilities were identified.

The project readily gained the support and involvement of industry and research organisations, State agencies, growers and processors, consultants and agricultural input suppliers. The workshops provided an important forum for:

- ✓ Exchanging ideas on organic farming systems;
- ✓ Exposing organic systems to a wider audience;
- ✓ Identifying techniques worthy of adoption, adaptation or further investigation;
- ✓ Assisting communication on EPM (ecological pest management); and
- ✓ Documenting successful alternatives to chemical intensive systems.

## Project findings – constraints and opportunities

This project found that in all industries investigated there is growing activity and confidence in organic production systems and markets. In each industry, both individual producers and major agri-business entities are involved in exploring, supporting and trialling organic production methods. However, it is important to note that for each commodity investigated there are real risks and technical impediments to adopting organic production systems.

In several industries there are only minor differences between current practices and those used in organic systems, although the nature and potential significance of those differences should not be underestimated. For example, these differences include an inability to use most curative fungicides in viticulture, the need for cost effective nitrogen sources for sugar cane production, and for longer rotation times in rice.

In addition to the agronomic issues listed above, the following factors were identified as constraints to adopting organic practices:

1. An image problem - organic is perceived as fringe;
2. Uncertainty about markets and mixed market signals;
3. Risks of conversion losses and pest and disease problems;
4. Limited access to advice on agronomic practices;
5. A phobia of pest and weeds; and
6. A clean and tidy aesthetic preference that determines weed and pest management practices.

While most industries have a core of established organic farmers there is much scope for increasing production, processing and marketing capacity in order to fulfil the growing domestic and export

demand. Australia's rural industries' capacity to supply the increasing global demand for organic products could be greatly enhanced by further R&D investments. These need to be focused on both refining production systems to reduce risk and uncertainty, and to ensuring effective links along the value chain.

Several factors account for increasing interest and confidence in organic production systems:

1. Most industries reported a strong market demand for organic products, with several reporting an inability to satisfy the demand.
2. There is increasing acceptance of QA, HACCP and EMS across agriculture and this makes adoption of transparent and independently verified standards seem a far less daunting task.
3. The capacity of Australia's rural industries to innovate and adapt to new market requirements confers advantages.
4. Australia's favourable climatic conditions and abundant land resources also represent a competitive advantage to those industries wishing to expand organic production.

## Project findings - growing and certification systems

This section summarises common findings across the five industries investigated:

1. Concerns about chemicals, food safety, health, the environment, ethics and corporate agriculture tend to dominate the reasoning behind many organic practitioners' adoption of organic practices.

2. Organic agriculture involves a combination of interdependent philosophy, psychology and practice. The psychology or belief systems of many organic growers is "*independent and ecological*", while others are motivated by "a *spiritual or holistic*" belief system.

3. Markets are people - people are markets. There are growing markets for ethical products because sustainability concerns (both social and environmental) are growing around the world (New Internationalist 1999). Consumers are looking for signs of hope, wanting their purchases to be an investment in a better future. Many consumers are want to be able to purchase the "the ideal of sustainable agriculture" along with the products- they want to "vote" with their cash.

4. Organic agricultural techniques are a manifestation of 1and 2 above, but also largely aligned to conventional production practices in many respects - but "being recognisably different is also important". Much of the obvious difference is derived from accepting a cautious approach to the application of technology[4].

5. Organic Standards play a central role in defining acceptable production practices. Production within the constraints of the Standards is important in driving innovation (within the overall innovation occurring in agriculture), and maintaining the confidence of the markets.

6. The certification systems play a critical role in linking the producers to the markets. Faith in the certification systems is capable of being eroded.

7. The integrity and credibility of the certification systems and the organic standards represent important "moral capital" for the organic industry.

8. Maintaining the links between 1-6 above are probably more important than whether organic farms are demonstrating improvements in the biophysical aspects of production. Over time this system should drive continuous improvement in organic agriculture if it is as transparent as it claims.

[4] Organic certification avoids the use of a wide variety of technologies but uses a precautionary approach to determining their safety. The term "precautionary" is used in the sense of ESD principles.

9. R&D investments are needed to determine whether organic farms are "models of sustainable agriculture". A standard set of "sustainability criteria and indicators" should be applied to comparing and measuring farming systems (see chapter 5 on R&D). These should include as a minimum:

    - ✓ Pest predator relationships;
    - ✓ Impacts on biodiversity;
    - ✓ Nutrient cycling;
    - ✓ Water and energy;
    - ✓ Pollution; and
    - ✓ Social and economic impacts.

An important feature of organic farmers and organic farming organisations is that they have attempted to define the nature and characteristics of sustainability and attempted to guide farm practices accordingly. While the specifics of organic standards are both debatable and evolving, the process of applying the standards is critically important. They set an important precedent of firstly trying to define sustainability, and then requiring producers to voluntarily agree to a code or management regime. For example, NASAA certified producers in Queensland have accepted specifications that restricted further tree or scrub clearing well in advance of government controls. Other contracts specify effective contour bank and erosion control methods, crop rotation and restrictions on continuous cropping. Thus this represents an example of self-regulation in the Australian rural industry. Research is needed to gain an understanding of the motivational factors that contribute to the decision to farm organically.

An important aspect of organic agriculture is the inclusion of environmental and health issues, and sustainable land management ideals into a coherent set of principles expressed as a set of explicit standards. The standards play a key role in ensuring a precautionary approach to the application of technology[5] and in defining the relationships between the farmer, nature and the market.

Organic farmers have been at one of the vanguards of this process, pioneering not just innovative growing techniques but also ways to place limits to their actions, to articulate their values and to be contractually committed to adhere to them. In this regard organic farmers provide a strong model of industry self-regulation aimed at achieving sustainability.

## Recommendations

Consumer and market confidence in the standards and labelling system is of paramount therefore:

**Recommendation 1 -** Australian Governments are advised to:

- Protect the integrity of the terms *organic* and *biodynamic* in both export and domestic markets and to ensure clear and coherent understanding of labelling terms used to imply that a product is produced organically.

- Ensure that the standards that apply to organic exports are applied to domestic markets in Australia.

The farming systems that organic farmers apply are usually analogous to the conventional systems in a majority of features. There are powerful arguments for facilitating greater exchange in information between the organic and conventional growers, on how to improve their management and farming

[5] Organic certification allows the use of a wide variety of technologies but uses a precautionary approach to determining their safety. Precautionary is used in the sense of ESD principles.

systems. The key features distinguishing organic growers are their precautionary use of chemicals and their use of a certified quality assurance system with the necessary inspection and auditing.

**Recommendation 2 -** Relevant agricultural agencies and R&D organisations should facilitate greater exchange of information between organic and conventional growers on how to improve their management and farming systems.

Pest and disease management did not feature as a major concern for most industries - those pests and diseases which pose a problem are generally quite specific and are also usually a major problem for the conventional growers as well - for example the fungal diseases of grape vines. In some cases the organic farmers noted a marked reduction in pest and disease problems once they managed problems as part of their organic system rather than relying on curative chemical approaches, notably the virtual eradication of *botrytis* in grapes.

**Recommendation 3 -** Commodity R&D corporations need to focus R&D projects on the specific constraints or factors limiting expansion of organic production in their sector.

A range of issues that relate to the scale of centralised processing and marketing arrangements that deserve to be further investigated. These include the issues that relate to the economies of scale in modern processing facilities and whether there are alternative appropriate scale technologies that could be dedicated to organics eg medium scale dairy products plants, and the prospects of scheduling processing within existing capital intensive plants eg sugar mills.

**Recommendation 4 -** Options for generating efficient scales for processing and marketing organic produce need to be further investigated

Existing organic industry structures and networks provide important communication functions and they are an important feature of the industry. Government initiatives, which seek to accelerate the development of the organic industry, should, where possible, use these networks. They should be supported and strengthened rather than duplicated by new government programs.

**Recommendation 5 -** Any new government initiatives or programs that aim to support organic industry development should work through and strengthen existing organic industry structures rather than duplicate their efforts.

**Recommendation 6 -** A range of targeted, focused and industry specific training programs are required to support the expansion of the organic industry in Australia. Educational and training initiatives must be targeted to the nature, structure and culture of the industry sector.

Detailed R&D on organic farming systems needs to be undertaken within a specific industry context, therefore it is appropriate that the commodity RDCs get more involved. The RIRDC Organic program should focus on attracting R&D, marketing and industry organisations to invest in research and development. The RIRDC Organic program should aim towards joint projects with other RDCs or ideally towards establishing a CRC or joint venture program with a number of industry RDCs.

**Recommendation 7 -** The RIRDC Organic program should focus its efforts on attracting mainstream R&D, marketing and industry organisations to contribute to the research and development tasks via joint projects with other RDCs or through a joint venture program with a number of industry RDCs.

**Recommendation 8 -** RIRDC should commission a feasibility study or initiate a process to investigate support for a CRC or joint venture organic R&D program with RDCs and other research bodies.

While there are many agencies that could potentially be involved in organic R&D there are potential benefits that would flow from a coordinated national program.

**Recommendation 9 -** A new CRC or another National Research, Development and Demonstration Program should be established as a way of focusing the research effort on the challenges and opportunities of sustainable organic production in Australia

An ongoing process is required to design and refine any proposed research and to consider the practicality, feasibility and benefits of investing R&D funds.

**Recommendation 10 -** The RIRDC organic program should convene an R&D planning workshop with experienced researchers to consider future research investments including consideration of the questions identified in this project.

Changes in the research culture are needed that will take the focus of the R&D effort out of the labs and research farms and into a new era of collaboration with practicing farmers. Many of the benefits of such an approach are derived by the increased interchange between researchers and practitioners, with them both learning from each other. This approach corresponds with *fifth generation innovation processes* based on "systems integration and networking models" (IC 1994 p A.7) and is in direct contrast with the linear models of innovation based on technology- push (IC 1994).

**Recommendation 11 -** A greater proportion of the National primary industries research investment needs to be focused on understanding the potential of production systems developed by innovative farmers, including organic farmers.

**Recommendation 12 -** Systematic programs of research, development and extension into whole farming systems should be undertaken in cooperation with progressive organic farmers.

**Recommendation 13 -** It is recommended that each of the RDCs and other R&D agencies investigate the opportunities for establishing systematic programs, either independently or as part of a future CRC, that focus on whole farm research, development and extension to support organic agriculture. Where possible the basis of the R&D programs should be in collaboration with progressive farmers.

**Recommendation 14 -** A framework for assessing, comparing and describing farming systems using standard indicators of basic ecological processes is required. A consistent, rigorous methodology for determining the environmental impacts of farming systems should build on efforts to develop indicators of sustainable agriculture.

# 1. Introduction and Overview

## 1.1 Global context

As the profound impacts of humanity on the global ecosystem are better understood, governments, citizens and markets throughout the world are demanding that businesses of all kinds, including agricultural businesses, take greater responsibility for their environmental impacts. The majority of the world's nations have agreed to promote cleaner production and responsible business through the use of regulatory measures, economic incentives and legislation (UNCED 1992). Signatories to Agenda 21[6] have an obligation to encourage industry to report annually on their environmental record and to adopt codes of conduct promoting best environmental practice (UNCED 1992).

The United Nations has acknowledged that all businesses have major responsibilities in promoting sustainable development, in reducing resource consumption and in minimising impacts on the environment. They must recognise environmental management as one of their highest priorities. To meet the sustainability challenges, agricultural and environmental policy must be pro-active in supporting the adoption of new and innovative approaches to environmentally sound production.

Many organic producers believe they are developing models of sustainable production. Adherence to organic standards allows these farmers to explicitly recognise their responsibilities and to provide consumers with information on which to make choices. Independent certification provides assurances to consumers of the credibility of the information on the production system.

Throughout the last century the dominant directions of agriculture have been determined by:

- ✓ Technological optimism and the dominance of technological solutions;
- ✓ Increased and lower cost production;
- ✓ Cheap and abundant fossil fuels and associated technologies;
- ✓ Improvements in storage, food processing and food technologies; and
- ✓ Vertical integration and the increasing power of agribusiness corporations.

However, throughout the last decades of the 20th century popular concerns about the environmental and health impacts of industrial agriculture have increased in many affluent countries -particularly in Europe - due to factors such as mad cow disease, chemical contamination incidents and fears about biotechnology. As industrial agriculture is suffering from this "crisis in confidence" community, government and market support for organic agriculture is rising[7].

The concept of multi-functional agriculture is starting to influence the international debate on agricultural, trade and development policies (see FAO 1999). Organic systems are increasingly being portrayed as successful examples of multi-functionality, being deemed to be environmentally and socially responsible and securing increasing prominence in the market.

The rise in Government support for organic farming represents a marked change in the trajectory of modern agricultural policies. To understand this change it is necessary to try to understand organic agriculture not simply in terms of another production technology, but as a fundamental shift in the relationships between markets and producers, producers and technology and producers and the environment.

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[6] Agenda 21 is the United Nations Commission on Sustainable Development's plan of action for every area in which humans impact on the environment. It was adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, (UNCED 1992).

[7] Organic agriculture was frequently referred in the FAO electronic conferences of 1999 that explored examples of successful agricultural systems and multi functional agriculture.

## 1.2 The growing market for organic food[8]

About one third of Australia's organic food and fibre produce is exported. Domestic sales have risen from $100 million in 1995 to approximately $250 million in 1999 (OFA 1999). These figures reflect a global trend. World sales in 1997 were estimated at US$11 billion with this figure estimated to increase to US$100 million by 2006 (OFA 1999).

Throughout the world demand outstrips supply in many organically produced commodities. Growth in Australian organic production is estimated at 15% to 25% pa. Growth is expected because of strong domestic demand and because Australia is in good position to supply expanding markets overseas particularly in Asia and Europe.

Japan's organic industry grew from an estimated US$200 million in 1990, to US$1.4 billion in 1997. Northern Europe and Scandinavia are showing huge rates of growth, with demand increasing at 30% per annum and imports increasing 2000% over the past 4 years. The French market is estimated to grow from Fr4 billion in 1996 to Fr15 billion by 2000. Major retail chains and supermarkets in most European countries are committed to stocking organic products.

## 1.3 Charting new directions for agriculture

The principles of organic agriculture challenge fundamental concepts in Western thought about human interactions with natural systems. According to Vanclay and Lawrence (1995 p 47), this continues a long polarised debate "that can be viewed as a clash between the Baconian positivist, rationalist tradition which links progress with production, and the spiritual/holistic approach".

Organic agriculture can be seen as a pragmatic expression of modern ecological thought, ecological or "green" economics and what has been described as the *new romanticism* because*:*

- ✓ Much of what is happening in organics is an attempt to explore and apply principles of ecology to production systems. Ecological theory provides a sound scientific basis for a cautious approach to the use of biocides and synthetic fertilisers and provides compelling evidence of the inter-relatedness of the components within and adjacent to food production systems.
- ✓ The *new romanticism* is an expression of the desire to overcome the alienation from nature that afflicts western culture in the late 20th century. It focuses on reconnecting with nature. The food supply is a primary means of connection with nature, particularly for urban dwellers.
- ✓ Ecological or *green* economics is focused on changing the dynamics of human interactions with the natural world so that economic systems do not encourage exploitative or polluting activities.

Therefore organic agriculture is part of a manifestation of fundamentally different approaches to understanding and operating in the world. In essence, this represents a significant shift away from a mechanistic worldview to one that places greater importance on the values and functions of ecosystems and the need to support ecologically friendly activities. The following factors characterise what is occurring in organic agriculture:

- ✓ Re-enchantment rather than disenchantment;
- ✓ Re-connection rather disconnection;
- ✓ Social contracts that work through the market rather than "free market ideologies";
- ✓ Adoption of stringent standards and "regulations" that do not rely on government;
- ✓ Innovation that occurs outside the established R,D &E pathways in agriculture; and
- ✓ Ethically based and transparent standards for production.

[8] Figures here are based on presentations given by the Victorian Department of Natural Resources and Environment and the Victorian Department of State and Regional Development at an Organic Dairy Seminar, held in Gippsland in November 1998.

Organic certification systems also explicitly acknowledge the social dimensions of agriculture and the food-supply chain, recognising that agriculture is essentially a social activity. While agricultural production is an activity undertaken for people by people, in many discussions of farming systems the social dimensions of the system seems to take a second place to the technical and financial aspects of agricultural production. A fixation with production techniques or technologies may represent a kind of "blindness" to the people side of agriculture. This project aimed to provides a balance between the technical, environmental and the social aspects of organic production.

## 1.4 Chemicals, IPM and organic agriculture

Over 25 years ago, Rachel Carson warned of the dire consequences of promiscuous use of agricultural chemicals in her prophetic book "Silent Spring" (Carson 1972). The use of agricultural chemicals has been controversial ever since due to concerns about human health, wildlife and wider environmental impacts (CSIRO 1990). Health issues are very important to many organic framers. The issues of farmer and family health were frequently raised at workshops as a primary motivation for a move into organics. In some cases this was triggered by a health crisis associated with the use of chemicals (see dairy workshop report in Appendix 2).

Organic farming systems have evolved as alternatives to the use of synthetic pesticides. Interest in these systems is growing steadily. The market for organic produce is expanding here and overseas because more informed consumers are concerned about their health and the health of the environment (McCoy and Parleviliet 1998).

Environmental impacts of agrochemical use include:

- Direct pollution of both ground and surface waters. For example, fish kills occur when the common insecticide *endosulfan* exceeds concentrations of three parts per billion (CSIRO Centre for Advanced Analytical Chemistry 1991);
- Potential pollution of the entire global water cycle - one of the more disturbing aspects of agrochemical usage is the potential for atmospheric transport of pesticides. A Swiss study found Atrazine (a common cropping herbicide) in rainwater, implying that atmospheric transport may be a significant source of contamination of water bodies. The 12-month study revealed Atrazine in all lakes and rivers sampled in Switzerland (CSIRO Centre for Advanced Analytical Chemistry 1991); and
- Simplification of agro-ecosystems, including loss of soil, fungal, plant and insect biodiversity and habitats.

Concerns about the health effects of agricultural chemicals focus on:

- Consumer health issues, including increasing evidence of disruption to the human endocrine functions - many pesticides (along with industrial chemicals) are metabolised as "pseudo-oestrogens". These affect reproductive systems and are suspected to have a causal link to declining sperm counts and increasing breast and ovarian cancers (Colborn et al 1996);
- High concentrations of toxins in breast milk, for example, overseas investors have been investigating establishing an organic infant formula plant in Australia;
- Suspected behavioural and health impacts of pesticide exposure on children;
- The occupational health and safety issues; and
- Impacts on communities in agricultural areas of living near crops with high pesticides use.

Chemicals have been in the "spotlight" while many other environmental impacts of agriculture have been neglected. Chemical issues can be seen as something of a flagship issue for the certification of environmentally friendly agriculture. There are now also a range of market and policy driven initiatives, including national chemical reduction targets, and IPM programs (Rowland 1998). Whilst some industries and certainly many countries have provided more talk than action in the area of pesticide reduction, some countries are providing direct incentives for conversion to organic farming.

There are several countries - Sweden, Denmark, and the Netherlands - which have adopted legislated pesticide reduction targets (Rowland 1998). Numerous other countries and specific industries have adopted voluntary targets for the reduction in pesticide For example, the Australian Apple and Pear Growers adopted a target of 50% reduction within five years in 1990 (ACA 1990).

Numerous countries have adopted Integrated Crop Management (ICM) and Integrated Pest Management as national policies. Progress towards the aims of general strategies and defined targets is supported through research and policies that aim for the accelerated adoption of Integrated ICM or IPM (Rowland 1998). However, a range of measurement and definitional issues has arisen with IPM being called "integrated pesticide management" by critics. An alternative term "bio-intensive IPM" is used to define systems that rely predominantly on biological and cultural practices (Rowland 1998).

Australia has adopted a strategy for the "management of Agricultural and Veterinary Chemicals which aims to "minimise the risks to health, the environment and trade" (ARMCANZ 1998).

Major retailers are also increasing their influence in determining acceptable practices. Sainsbury's announced in 1996 that all fresh food products would only be stocked if they were either organic or produced using systems that comply with protocols and guidelines for ICM (RIRDC 1999a).

In Australia, several supermarket chains have demanded more rigorous QA systems that address the risks of pesticide contamination during production and handling of horticultural crops (DNRE 1997).

## 1.5 Ecolabelling - Changing consumer demand

An Agriculture WA and RIRDC study (McCoy and Parleviet 1998) found that *"consumer demand, in the highly differentiated food markets of Europe, Asia and North America, is increasing for food and agricultural products that are perceived to be healthy and have low impacts on the environment. A willingness to pay a premium for such products is apparent where products carry a verifiable assurance they are safe, nutritious and produced using systems with limited impact on the environment."*

*"Various terms are used to convey the impression that a product has the desired attributes regarding safety, health and environment. Credible verification of these attributes can be achieved by the use of independently audited quality assurance schemes"* (McCoy and Parleviet 1998).

Eco-labelling is a general term for any form of labelling which implies a product or production process is environmentally friendly, regardless of whether there has been a certification process.

Rowland (1998) claims that "*certification of organic food provides a good example of rigorous standards for production methods*" and that the environmental impact of production is likely to become as important as the quality of the end product. She links the rise in eco-labelling to rising consumer awareness and concern.

However, the rise in the number and types of eco-labelling and other environmental claims has the potential to confuse consumers and leads inevitability to the need for some kind of standard, regulation or certification system that can guarantee the validity of claims.

McCoy and Parleviliet (1998) offer 17 definitions of various terms used to describe food and food production systems. This range includes "new speak" terms like functional and pharma-foods to the various terms used to describe organic agriculture. They propose a "Clean Continuum" as a conceptual spectrum for organising the various definitions for agricultural systems used (Table 1). It proves to be a useful way of organising the confusing array of styles or types of production along a spectrum based on intensity of energy and chemical use.

McCoy and Parleviliet (1998) document a broad range of "clean food" definitions. This is in direct contrast to a definition offered by DNRE (1997) which states that "*the definition of 'clean food' used in this document means that food meets all the maximum residue limits (MRLs) and the maximum permitted concentrations (MPCs) for domestic or export markets."*

On the conceptual spectrum proposed by McCoy and Parleviliet (1998) DNRE have chosen to use one of the narrower definitions of clean food - the minimum mandated levels acceptable to Australian society, as specified in law, and thus the responsibility of all producers.

This contrast in definitions found in two recent State Government publications on "*clean food*" illustrates one of the profound and persistent problem associated with the terminology used to define foods and production systems - it is not consistently defined and many terms like *clean* or *pure* food have little real meaning.

**Figure 3.1 - A clean food continuum after McCoy and Parleviliet (1998)**

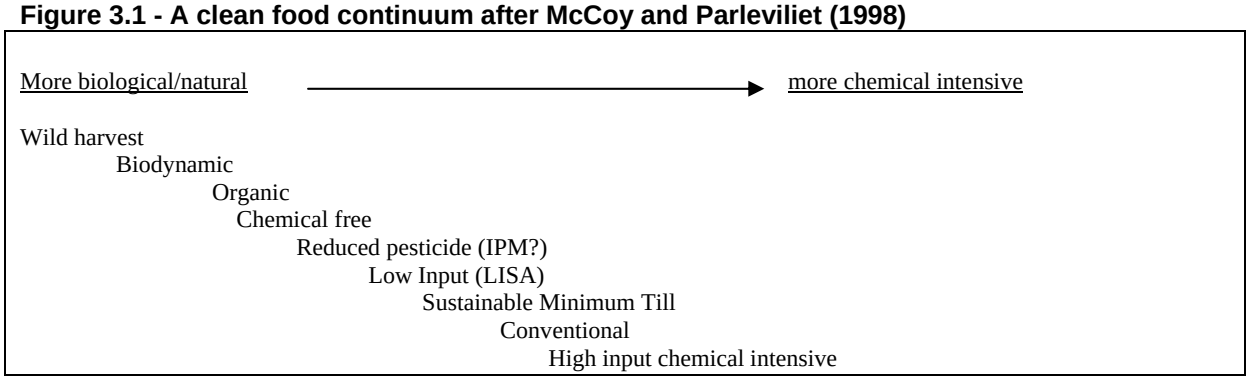


Figure 3.1 can be reorganised conceptually around the intensity of self-regulation or the reliance on governments for minimum standards, and/ or the rigour or vagueness of the claims being made to appeal to consumers.

**Table 3.1 Degrees of regulation in relation to environmental claims**

| **Intensive self regulation[9] Independently verified claims** | **Vagueness of claims Based on self assessment** | **Government set standards Eg. MRL's** |
|---|---|---|
| Biodynamic | Chemical free | Chemical intensive |
| Organic | Reduced pesticide (IPM) | High input |
| Forest Stewardship Council | Low Input (LISA) | Wild harvest |
| | Sustainable Minimum Till | General food supply |
| | Natural | |
| | Sustainable | |

**Recommendation 1 -** Australian Governments are advised to:

- Protect the integrity of the terms *organic* and *biodynamic* in both export and domestic markets and to ensure clear and coherent understanding of labelling terms used to imply that a product is produced organically.

- Ensure that the standards that apply to organic exports are applied to domestic markets in Australia.

[9] The self-regulation referred to here is supported by certification and accreditation schemes that offer consumers greater certainty that the claims are backed by practice.

## 1.6 Organic Certification in Australia

Recent estimates put the value of the Australian organic food industry at between $250 and $500 million. Demand appears to have grown because of consumer confidence in the certification system. An extensive range of producers and processors are now certified and many are receiving price premiums as a result of adhering to internationally recognised organic standards, and operating within credible systems of certification and auditing.

There are many systems of organic agricultural certification around the world. The systems accredited with the International Federation of Organic Agricultural Movements (IFOAM) standard are the most developed and recognised because they have:

- ✓ An established history of operation (over 15 years in Australia);
- ✓ Members in over 100 countries;
- ✓ Detailed and specific international standards, with regional or national refinements;
- ✓ Clear standards review procedures;
- ✓ Stringent auditing and contractual arrangements for certifying producers and of the organisations offering certification;
- ✓ Internationally recognised standards; and
- ✓ Mutual recognition amongst IFOAM accredited certifiers which facilitates trade throughout most of the world.

In Australia, there are currently seven organic certification organisations to the National Standard. Two are industry specific - wine and herbs - and five certify a wide range of producers and processors, some at only a state level: Biodynamic Research Institute, Biological Farmers of Australia and the National Association for Sustainable Agriculture Australia (NASAA), Organic Food Chain and TOP. In 2000 NASAA was the only certifying organisation accredited to the IFOAM standard that certifies a wide range of primary and secondary products.

The organic certification systems are an attempt to guarantee that consumers are buying food produced in accordance with the organic standards. The system relies on farm inspections, interviews, random audits, records and well-defined protocols on labelling and audit trails from paddock to plate. Farm certification takes from one to three years to obtain depending on the past history of the land.

NASAA certification is based on a civil contract: growers agree to operate within the standards and in exchange can use the NASAA label (NASAA 1998). Claiming to produce and sell organic produce without meeting the standards has been found by Australian Courts to be fraudulent (Ubergang case Brisbane 1991).

In Australia the Commonwealth Government established the Organic Produce Advisory Committee (OPAC) to develop and regulate export standards for organic produce. These are enforced by Australian Quarantine and Inspection Service (AQIS) and are central to the credibility of Australia's organic produce exports. However similar standards do not apply to domestic produce.

Export control orders prohibit exports of organic/biodynamic product which is not certified (OPAC 1997). To fulfil this requirement the Australian Quarantine and Inspection Service accredits industry organisations that certify producers and processors. This system only applies to exports, with no equivalent system operating to protect domestic consumers. Australian consumers need to look for evidence of certification on labels because governments are unwilling to impose any domestic labelling standards for organic produce. This includes both domestic and imported products.

The organic certification systems in Australia have evolved almost entirely without government involvement, relying primarily on contract law to provide a respected degree of assurance to growers, consumers and traders. However, the Commonwealth's export control orders are important for maintaining Australia's reputation in overseas markets and regulatory environments. They demonstrate that government involvement can be important.

It is debateable whether better informed consumers are more or less cognisant of arguments as to whether Government versus NGO (eg IFOAM) accreditation is better. However, cynics would argue that Government involvement is superfluous in the face of a unique NGO regulatory system.

## 1.7 Adapting to markets

The forces that will drive change in agriculture in the early part of the 21st century are largely already with us. Australian agriculture is subject to a large number of significant influences - environmental, economic and social - and has a proud history of adaptation.

In keeping with this willingness to adapt to market forces, the project found much willingness and openness to exploring organic production systems. While the motivational factors appear mixed, it is reasonable to generalise that this willingness to explore organics appears to be motivated by desires to farm in environmentally and socially responsible ways, and pragmatism - responding to market signals. Most industries are well aware of the growing demand and premiums paid for organic product. While there is enthusiasm for expanding production to meet this demand, the project found that there are practical or technical issues that are limiting expansion in each industry.

While most industries have a core of established organic farmers there is much scope for increasing production, processing and marketing capacity in order to fulfil growing domestic and export demand. In each industry investigated, the project found that organic production systems and marketing networks are established to varying degrees, and that there are established networks and support structures that can facilitate expansion. The project also found that there is growing activity and confidence in organic production systems and markets. In each industry, both individual producers and major agri-business entities are involved in exploring, supporting and trialling organic production methods. However, it is important to note that for each commodity investigated there are real risks and technical impediments to adopting organic production systems (these are discussed in more detail in section 5).

Organic agriculture in Australia may provide a useful model for other industries because it is based on:

- ✓ Innovation and diversity;
- ✓ Niche marketing;
- ✓ Dynamic information exchange;
- ✓ Independence from governments; and
- ✓ Certified quality assurance systems.

In summary, the growing acceptance of organic agriculture, particularly amongst large companies, R&D organisations and government agencies, is mainly due to strong and growing demand for organically produced food and fibre products, particularly in export markets. While amongst many growers, health and environmental concerns are also major motivators.

# 2. Project methods

## 2.1 Summary

This RIRDC funded project*: "Identifying organic farming practices with wider significance to science or agriculture"* examined the prospects, impediments and R&D needs of five Australian primary industries (rice, vegetable, wine grapes and viticulture, sugar and dairy) through holding one-day workshops accompanied by interviews and field trips in 1998 & 1999. Five workshops were held in four states with representatives of growers, researchers, industry and agencies. Attendance averaged about 30 people per workshop. Workshop reports were circulated to those who attended and two are reproduced in Appendix 1 (wine) and 2 (dairy) of this report as examples.

Prospects for refining farming practices in areas such as soil management, pest and disease management, sustainable production, and IPM were discussed. Research and industry development needs and/or marketing possibilities were identified.

The project readily gained the support and involvement of industry and research organisations, State agencies, growers and processors, consultants and input suppliers. The workshops provided an important forum for:

- ✓ Exchanging ideas on organic farming systems;
- ✓ Exposing organic systems to a wider audience;
- ✓ Identifying techniques worthy of adoption, adaptation or further investigation;
- ✓ Assisting communication on EPM (ecological pest management); and
- ✓ Documenting successful alternatives to chemical intensive systems.

## 2.2 Project approach

In the first stage of the project (June to December 1998) the prospects, impediments and R&D needs of five major Australian primary industries were examined through holding one-day workshops accompanied by interviews and field trips. The results are documented in chapter 5 and discussed in subsequent chapters.

In stage two (February to September 1999) interviews were undertaken with a range of people involved in various aspects of the organic industry - marketing and promotion, distribution and exporting, importing and processing of organic products and people involved in R&D relevant to organic agriculture. In November 1999 a workshop was held in Canberra to discuss the projects findings and review a draft of this report.

## 2.3 Industry workshops

Workshops were held that focused on the rice, vegetable, wine-grape, sugar and dairy industries. At the workshops successful practitioners of commercial organic production compared their farming practices with "conventional growers". Workshops were held in August, September and October 1998 at the following locations:

- Rice — Leeton, Murrumbidgee Irrigation Area
- Vegetables — Devonport, Northern Tasmania
- Dairy Industry — Warragul, Gippsland, Victoria.
- Wine grapes — Barossa Valley SA
- Sugar — Ballina Nth NSW

The locations were selected on the basis of where there is a critical mass of growers (ie where the selected industry is a major regional industry). A wide range of people active and knowledgeable about the industry were invited. Each workshop was well attended with growers, processors, researchers, consultants, and agencies staff in attendance. The industry familiarity, experience and insights of practitioners, including farmers, processors and researchers provided insight into the nature and issues of the industry.

Each workshop identified and discussed prospects for refining farming systems and specific practices in areas such as soil management, pest and disease management, sustainable production, and IPM. Participants also identified R&D opportunities, industry development and/or marketing possibilities.

Outcomes of each workshop were documented. Workshop reports and brief summaries of the findings were circulated to those who attended and others who requested copies immediately after the completion of the workshops in early November 1998. (See Appendices 1 and 2 for examples of workshop reports).

## 2.4 Workshop Objectives

The project gained the support and involvement of industry and research organisations, State agencies, growers and processors and others involved in primary production. The workshops' aims were to:

1. Identify organic farming practices which may have important applications in other farming systems, or which provide insight into future R&D possibilities;
2. Improve understanding of the organic practices with good prospects for wider adoption;
3. Document current organic farming practices;
4. Identify important R&D possibilities;
5. Assist communication between growers, researchers and industry organisations;
6. Help identify priorities for R&D.

The workshops went a long way towards meeting these objectives. In part, their success has been a result of providing an opportunity for people to explore and express their interests in organic farming and to freely and openly divulge information based on hard won experiences.

# 3. Findings and Implications

This chapter summarise the findings of the workshops. Two of the individual workshop reports are provided in the Appendix 1 (wine) and Appendix 2 (dairy). The findings of all the workshops are presented here in a summary, tabular form. Table 3.1 to 3.4 summarise the findings of workshops in relation to the project objectives. Table 3.5 compares the findings against the subjects already identified as priorities by the RIRDC organic program. Readers interested in the specifics of particular industries can obtain the full workshop reports by contacting the authors.

These tables demonstrate the many areas of common interest across the five industries consulted. There are many R&D issues that have wider relevance outside of organics. While all workshops endorsed generic industry development tasks, such as improved information access and education, each industry also identified specific constraints to expanding organic production.

The importance of these constraints should not be underestimated - for example limited options for curative fungal control pose a significant risk and therefore a major impediment to organic viticulture. Similarly, the need for high levels of nitrogen to sustain sugar cane was identified as the major agronomic issue that would have to be overcome for commercial scale organic cane.

Other significant impediments relate to the efficient and cost effective scale for processing facilities. Of course these vary between industries from moderate scale for a family winery to major capital infrastructure like sugar mills and refineries.

## 3.1 Practices suitable for wider adoption

Table 3.1 documents the practices identified that are suitable for further adoption. It can be seen that practices that relate to improved soil management and weeds are common across all industries, but that many others relate to the specifics of the industry in focus. This reinforces the need for specialist industry-focused programs and more general, widely relevant R&D. Chapter 5 expands on the HACCP, QA and EMS issues identified.

**Table 3.1 - Practices suitable for wider adoption**

| Practices suitable for wider adoption (both ways) | Rice | Veg | Wine | Sugar | Dairy |
|---|---|---|---|---|---|
| Adoption of environmental management strategies -ISO 14000 | ✓ | ✓ | | ✓ | |
| QA Models/marriage - harmonisation and mutual recognition of QA systems including SQF (HACCP) and ISO 9000 | | ✓ | | | ✓ |
| Food safety and risk minimisation | | ✓ | | | ✓ |
| Soil improvement and rejuvenation techniques, and fertility management techniques including composts, rotations, green manures, trash and sod management | ✓ | ✓ | ✓ | ✓ | ✓ |
| Understanding of weed/herb ecology and life cycle | ✓ | ✓ | ✓ | ✓ | ✓ |
| Understanding of pest and disease causality, ecology and life cycles to target interventions and control strategies | ✓ | ✓ | ✓ | ✓ | ✓ |
| Transition strategies - conversion strategies and risk minimisation strategies | ✓ | ✓ | ✓ | ✓ | ✓ |
| IPM including strategies for enhancing predator habitat | | ✓ | ✓ | | |
| Post harvest storage and handling systems | | ✓ | | | |
| System design to minimise problems eg. understanding options, implications and best practice in system design | | | ✓ | | |
| Alternatives to burning (although claimed to be limited in the cooler NSW environment) | | | | ✓ | |
| Increased soil testing and models for interpretation | | | | | ✓ |
| Improved understanding of plant nutrition | | ✓ | | ✓ | ✓ |

## 3.2 R&D priorities for organic industry development

Table 3.2 summarises the workshop findings on the priorities for organic industry development. These are differentiated from the more general R&D priorities as being those that are of commercial importance and or of importance to industry development. These have been grouped and presented in three categories:

- ✓ Marketing and information needs;
- ✓ Production and agricultural system issues; or
- ✓ Processing issues.

It is worth noting that all workshops identified the following priorities for industry development:

- ✓ Improving information flows;
- ✓ Education and training;
- ✓ Weed and disease issues; and
- ✓ Soil and fertility management.

These are aligned to priorities identified in the RIRDC Organic Program Plan (RIRDC 1998). While the above issues are generic, many of the agricultural production, system design or processing issues were of a more specific nature and relate to the specific problems priorities and conditions within the individual industry. Disease and weed management, while a general category of problem, is usually quite specific to the crop type or production system.

It is important to note that most of the issues identified are not unique to the organic industry. They represent some fairly common needs across many primary industries. For example, work done to identify the potential for contamination from recycling waste products would be valuable regardless of whether the farm using them is intending to produce for the organic market or not.

The two processing issues relate to the scale of major processing industries now operating in agriculture. These could be overcome by examination of technology options and identification of the various thresholds and efficiencies available. In dairy processing scale was not seen as an insurmountable impediment as there are already numerous farm-scale cheese and yoghurt manufacturers. For sugar, scheduling an organic production run during current down time using existing processing capacity was the proposed option, rather than construction of dedicated processing plant/s. However, even using existing capacity there is still a defined minimum scale at which this would begin to be worth while.

**Table 3.2 - R&D priorities for industry development issues of commercial importance**

| R&D priorities for industry development - issues of commercial importance | Rice | Vegie | Wine | Sugar | Dairy |
|---|---|---|---|---|---|
| ***Marketing and information*** | | | | | |
| Enhancement of market linkages along the entire value chain and improved market information and market development | ✓ | ✓ | ✓ | ✓ | ✓ |
| Enhancement of information exchange - industry networks and development of information manuals etc' | ✓ | ✓ | ✓ | ✓ | ✓ |
| Organic industry education programs eg. master tree growers or associate diplomas, TAFE courses etc | | ✓ | ✓ | ✓ | ✓ |
| Increase familiarisation with standards and certification processes | ✓ | ✓ | ✓ | ✓ | ✓ |
| HACCP control plans for all organic producers required by 1999 | ✓ | ✓ | | | ✓ |
| Analysis of farm economics and returns and further case study examination of working organic farms (eg. extension of Doug Smalls work on irrigated dairy farms in Northern Victoria) | ✓ | ✓ | | | ✓ |

| R&D priorities for industry development - issues of commercial importance | Rice | Vegie | Wine | Sugar | Dairy |
|---|---|---|---|---|---|
| ***Agriculture systems*** | | | | | |
| Weed management techniques and technologies | ✓ | ✓ | ✓ | ✓ | ✓ |
| Identification of suitable sources of nutrients including minerals, compost materials, feed supplements and nitrogen sources, including legumes | | ✓ | ✓ | ✓ | ✓ |
| Potential contamination issues from materials including bio solids and reclaimed water | | ✓ | | ✓ | |
| Selection of varieties suited to organics | ✓ | ✓ | | | |
| Alternative fungal management agents techniques and verification of the efficacy of various fungal control agents | | | ✓ | | |
| ***Processing*** | | | | | |
| Improved marketing amongst many small growers, including development of organic growers co-ops to generate processing capacity and marketing power amongst many small growers | ✓ | | ✓ | | ✓ |
| Processing logistics and scale including batch separation required in organic processing and economies of transport issues and feasibility of small and medium scale processing plants | | ✓ | | ✓ | ✓ |

## 3.3 R&D prospects - questions /issues of scientific importance

Table 3.3 summaries the issues or questions identified that may be of scientific importance. These R&D opportunities are discussed in more detail in Chapter 4.

The project has been useful in identifying those common questions or issues that those in the organic industry are keen to see further work on. However, these are relatively "raw" and a further process of refinement and definition would be required if useful research projects are to be developed based on the prospective area for R&D identified by this project.

**Table 3.3 - R&D prospects - questions /issues of scientific importance**

| R&D prospects - questions /issues of scientific importance | Rice | Vegie | Wine | Sugar | Dairy |
|---|---|---|---|---|---|
| ***Fertility and disease*** | | | | | |
| Do non specific microbial amendments work? And if so how? Include BD processes and specific use of mycorrhiza, and worm casts and teas etc? Do we need more cost effective microbial profiling? | ✓ | ✓ | ✓ | ✓ | ✓ |
| Plant nutrient and disease relationships - do different sources and quantities of nutrient influence incidence and prevalence and impacts of plant and animal diseases, including questions of plant mineral sugars and brix levels | ✓ | ✓ | ✓ | | ✓ |
| What are the critical functions and requirements of soil microbes and soil biological processes and are these measurably different on organic farms? | ✓ | ✓ | ✓ | ✓ | ✓ |
| Are comparative analyses of nutrient cycling, budgets and leaching between organic and other farms needed? What are the N&P leaching and loss factors? Are there other important pollution issues? | ✓ | ✓ | | ✓ | ✓ |
| Is it possible to enhance plant metabolism as a disease minimisation strategy? Eg. "Do foliar sprays work as "bio activated" disease control agents? Include BD preparations, compost teas, kelp, fish | | ✓ | | | ✓ |
| What are the best management strategies for balancing chemical, physical and biological aspects of soils and for triggering living soils? | | ✓ | | | ✓ |
| Are there simple design rules for IPM based on predator enhancement? | | ✓ | ✓ | | ✓ |

| R&D prospects - questions /issues of scientific importance | Rice | Vegie | Wine | Sugar | Dairy |
|---|---|---|---|---|---|
| What opportunities and constraints are there for use of waste products from other industries - eg bio solids, fish wastes etc? | | ✓ | | ✓ | ✓ |
| Do organically produced products have different nutritional and storage (or fermentation) characteristics? Is comparative analysis of these characteristics required? | ✓ | ✓ | ✓ | | ✓ |
| Are their important models of learning that are effective within organic circles eg cooperative R&D and information exchange processes such as DOORS (do our own research) or PAM (participatory action management)? | | ✓ | | | ✓ |
| How can there be independent analysis of what constitutes environmentally friendly techniques in agriculture? How can this be measured? | ✓ | | | | ✓ |
| What kind of scientific underpinning is required for the international organic standards? Is further R&D needed into specific standards on permitted or prohibited inputs and their impacts? | | ✓ | ✓ | | ✓ |
| What constitutes effective transition strategies for shifting from monocultures to diverse and complex, self-regulating agro ecosystems? Include rotation management issues. | ✓ | ✓ | ✓ | | |
| Need to develop methods for doing R&D into the whole system rather than fragments | | | ✓ | | ✓ |
| Suitable systems of inter row cover crops, or legume rotations and the use of “smother crops” to control weeds | ✓ | ✓ | ✓ | ✓ | |
| Do we need to reconsider ”traditional" nutrient budgets? | ✓ | ✓ | ✓ | ✓ | ✓ |
| Do we need to challenge to basic assumptions re maintenance of fertility - do BD sprays work to enable ongoing production without added inputs? | | | | | ✓ |
| Should alternative animal treatments including homoeopathic be tested? | | | | | ✓ |
| Paramagnetism - does it work. If so how? | | | | | ✓ |

## 3.4 Opportunities and constraints to the adoption of organic farming

Table 3.4 summarises the workshops findings on opportunities and constraints to the adoption of organic farming. Several opportunities are important to emphasise as they may generate some sizeable changes in the industry structure.

Firstly, and perhaps most importantly, most industries reported a strong market demand for organic products with several reporting an inability to satisfy the demand.

Secondly, several industries believe that there are only minor differences between current practices and those used in organic systems, although, the nature and potential significance of those difference should not be underestimated[10].

Thirdly, there is increasing acceptance of QA, HACCP and EMS across agriculture and this makes adoption of transparent and independently verified standards seem a far less daunting task.
The capacity of industries to innovate and adapt to market requirements also confers some advantages. Australia's favourable climatic conditions, relatively clean environment and abundant land resources also represent a competitive advantage to those industries wishing to expand organic production.

Constraints to adopting organics include: an image problem – organic production is perceived as a fringe activity; uncertainty about markets and mixed market signals; risks of conversion losses and pest and disease problems; limited access to advice on agronomic practices; A phobia of pest and

[10] For example, these differences include the inability to use most curative fungicides in viticulture, nitrogen fertilisers in sugar, herbicides in vegetables and need for longer rotation times in rice.

weeds and a desire for a "clean aesthetic" that determines weed and pest management thresholds and response triggers. There is also a range of industry specific issues.

The nature of farmer decision making was raised and is referred to below as a lack of experimental culture amongst farmers. What is quite clear is that very few farmers in very few industries are equipped to make decision on their own, with the absence of advice or support. Rickson, et al (1998) have found that farmers' capacities to make land management choices are increasingly constrained by contractual arrangements usually with large agribusiness interests. They have documented the influential role of agribusiness as the determinant of resource use patterns on farm. They identify reduced capacity of both farmers and public policy processes, as a result of globalised business, capital and markets. It is feasible that contracts with exporters and first stage processors could be very influential in increasing the rate of adoption of organic practices.

**Table 3.4 - Opportunities and constraints to adoption of organic farming**

| Opportunities and constraints to the adoption of organic farming | Rice | vegie | wine | sugar | dairy |
|---|---|---|---|---|---|
| ***OPPORTUNITIES*** | | | | | |
| Strong market pull with export opportunities | ✓ | ✓ | ✓ | ✓ | ✓ |
| Existing farming systems are moving closer to organic standards, eg the current emphasis on sound practices such as IPM, crop rotations and soil management. | | ✓ | ✓ | | ✓ |
| Increasing familiarity with QA systems, product identity preservation and the need for trace back and recording systems | ✓ | ✓ | ✓ | | ✓ |
| Established industry links and "cooperative" nature of industry can drive change rapidly in response to buyer requirements | ✓ | ✓ | ✓ | ✓ | ✓ |
| The market focus of the industry with its focus on quality and its capacity to niche market should enable rapid adaptation to market preferences including organics | ✓ | ✓ | ✓ | | ✓ |
| Strong industry capacity for R&D and extension and the strong "tradition of innovation" in Australian farming industries | ✓ | ✓ | ✓ | | |
| Climate and space represents an important competitive advantage over many affluent nations in Asia or Europe | | ✓ | ✓ | | ✓ |
| ***CONSTRAINTS*** | | | | | |
| Image problems - organics is portrayed as fringe or unscientific, governments agencies should adopt it as a formal policy to support leading edge organics | | ✓ | ✓ | ✓ | ✓ |
| Mixed market signals emanating from lack of demand or satisfactory premiums for organic produce currently being produced. | ✓ | ✓ | ✓ | | ✓ |
| Lack of government support eg. via R&D and agriculture departments and perceived lack of agronomic/veterinary advice | ✓ | ✓ | ✓ | | ✓ |
| Fear of "conversion losses" and diseases - commercial and agronomic risks | ✓ | ✓ | ✓ | | ✓ |
| Lack of accessible information on the certification process and on agronomic aspects of organic crop production | ✓ | ✓ | ✓ | ✓ | ✓ |
| A weed and insect phobia in modern agriculture and the "clean culture" aesthetic of pure pasture or bare ground | | ✓ | ✓ | | ✓ |
| Increased labour and machinery cost of weed control or associated problems | ✓ | ✓ | ✓ | ✓ | ✓ |
| Lack of an experimental culture amongst many farmers | ✓ | ✓ | | ✓ | ✓ |
| Shortage of certified land/farmers; | | ✓ | | ✓ | |
| Long term fertility demands especially N | | ✓ | | ✓ | |
| Threat of fungal invasion and the lack of potent curative fungal control agents | | ✓ | ✓ | | |
| Possible incompatibility of organic crops with the existing, complex rotations; | | ✓ | | | |
| Plant patenting and preferred supplier arrangements | | ✓ | | | |
| Scale of processing and transport economics | | | | ✓ | ✓ |

**Table 3.5a - Workshop findings compared against RIRDC organic program priorities**

| Education and training | Conversion processes | Systems design |
|---|---|---|
| **RICE** | | |
| Centralised - technical exchange facilitated by centralised industry structure - the rice growers cooperative | The coop provides incentives for growers in conversion. After initial reluctance to the coop is now providing subsidies to conversion | Water, drainage and salt issues common to most broad acre irrigation.<br>Rotations need to include animals.<br>Varietal issues especially short stem versus long stem varieties |
| **VEGETABLES** | | |
| Export companies with centralised agronomy and marketing services would benefit from targeted programs | Processors and export packers actively seeking to support conversions in order to met export orders | Complex rotation issues, interactions between a diverse range of crops include oil and pharmaceuticals.<br>Soil erosion and compaction common to all veg producers. |
| **GRAPES** | | |
| Dispersed and decentralised industry with many owner operators but with strong information on and commercial networks. Self learning, capable innovative. Identified need for compilation of accessible technical info into a growers manual | Minimal agronomic changes required for many growers. A case of fine tuning production. Organics offers appeal as a hedge and a niche market in an industry with well developed focus on quality and product differentiation | Long term 3-d systems with issues re trellis, sunlight, fungal, and pruning relationships;<br>Weed management issues and need for careful design due to limited capacity for change once system established. change over from cultivation to sod management also important |
| **SUGAR** | | |
| Highly centralised system with high degree of dependence on expert advisers | Minimal agronomic changes required but major scale and scheduling issues at mills. Organic could be an attractive prospect for new entrants but only possible as macro initiative or with new smaller, mobile milling and refining capacity | Regional scale design issues - Processing, harvesting scheduling etc. Economies of scale in processing and transport, harvesting technology and trash management cooperative regional management system. refine agronomy include legume rotations and N budgets, wastes, drainage, recycling and composts |
| **DAIRY** | | |
| Decentralised, strong organic sub culture. Farmer to framer exchange and mentor systems proposed. Distrust of ag departments etc. informal networks | Many existing producers with limited markets and many markets looking to increase supply. Scale and transport economies. Ideological emphasis of many growers with a holistic and personal focus | Regional scale processing and transporting issues important due to the perishable/liquid nature of product. Value adding and processing issues. Organic growers' coops?<br>few on farm issues not well covered within conventional systems |

**Table 3.5b - Workshop findings compared against RIRDC organic program priorities**

| Soils | Pest and diseases | Plant and animal nutrition | Market development |
|---|---|---|---|
| **RICE** | | | |
| Minimal soils issues. very similar to conventional systems,<br>Soil -water relationships critical for irrigation<br>Requires longer rotation | ducks<br>wild millet<br>storage losses | Alternative phosphorus sources | Mature system with no market development problems<br><br>well developed capacity to meet demand |
| **VEGETABLES** | | | |
| Erosion, compaction, maintenance of organic matter % etc. key issues for organics: nutrient replacement and intensity of rotations | weeds<br>some fungal and insect<br>more IPM needed | alternative nutrient sources/ composts | Development will be driven by packers attempting to meet export demand. Strong market pull. Large growers could use bonus contracts to entice growers into organics |
| **GRAPES** | | | |
| Sod management, mowing systems. soil rejuvenation in old vineyards and mowing systems suitable to young vines in new ones | **Insects -** Organic systems reduce insect problems eg light brown apple moth and mites.<br>**Fungi** - powdery and downy mildew Potential loss of copper and sulphur due to EU a major issue, alternative & curative fungicides a high priority<br>**Weeds** management primarily an engineering problem | N from sod and N for ferment major issues to be clarified | Mature component of wine sector. Established networks. Well developed capacity to service niche markets with defined product definition. Some confusing market signals eg. All Southcorp organic fruit is not going into organic wine? |
| **SUGAR** | | | |
| Waterlogging, compaction and machinery transits. Cultivation versus herbicides has big implications for soils load bearing capacity for heavy harvesting gear. Compost, wastes and trash , management | No major insect problems<br>Cultivation for weeds can create transit problems | N budgets<br>Sources of N that are cost effective recycling of mill waste and potential for large scale composts - ash, mill mud, trash, bagasse etc | Highly centralised and capital intensive processing requires matching growers to processing scale or finding alternative processing capacity eg. Mobile small scale refinery.<br>What scales are the markets for organic product? |
| **DAIRY** | | | |
| Intensive focus on improving soils as it relates directly to production and animal health. Trigger mechanisms for firing up soil life include biological, chemical, and physical elements. Living soil regarded as key to health pastures / livestock | Major focus on animal health linked to soil and health and nutrition. Naturopathy and homoeopathy for cows developing<br>Understanding of weed cycles and links to soil/pasture processes. | Balancing of mineral and microbial soil life. Pasture rotations. Use of minerals in accordance with the Albrecht theory. Biodynamic non-material soil improvements. Use of specific supplements eg cider vinegar, yeast etc | Intermediate scale processing required to shift for domestic niche to export commodity. Unutilised existing production also leads to confusing market signals. |

## 3.5 Conclusions arising from the workshops

Based on the advice gained at the workshops we have arrived at the following conclusions and recommendations:

The farming systems that organic farmers apply are usually analogous to the conventional systems in a majority of features. There are powerful arguments for facilitating greater exchange in information between the organic and conventional growers, on how to improve their managements and farming systems. The key features that distinguish organic growers in practice are their choice of non-chemical fertilisers and pest management agents and their use of a certified quality assurance system with the necessary inspection and auditing. However, it is also important that the influence of organic philosophies or principles is not ignored as these may be more important in the successful management than specific individual practices.

**Recommendation 2 -** Relevant agricultural agencies and R&D organisations should facilitate greater exchange of information between organic and conventional growers on how to improve their management and farming systems.

Pest and disease management did not feature as a major concern for most industries - those pests and diseases which pose a problem are generally quite specific and are also usually a major problem for the conventional growers as well - for example the fungal diseases of grape vines. In some cases the organic farmers noted a marked reduction in pest and disease problems once they managed problems as part of their organic system rather than relying on curative chemical approaches, notably botrytis in grapes. This may have important implications for many agricultural industries.

**Recommendation 3 -** Commodity R&D corporations need to focus R&D projects on the specific constraints or factors limiting expansion of organic production in their sector.

There are a range of issues which relate to the scale of centralised processing and marketing arrangements that deserve to be further investigated. These include the issues that relate to the economies of scale in modern processing facilities and whether there are alternative appropriate scale technologies that could be dedicated to organics eg medium scale dairy products plants, and the prospects of scheduling processing within existing capital intensive plants eg sugar mills.

**Recommendation 4 -** Options for generating efficient scales for processing and marketing organic produce need to be further investigated.

Existing organic industry structures and networks provide important communication functions and they are an important feature of the industry. Government initiatives, which seek to accelerate the development of the organic industry, should where possible use these networks. They should be supported and strengthened rather than duplicated by new government programs.

**Recommendation 5 -** Any new government initiatives or programs that aim to support organic industry development should work through and strengthen existing organic industry structures rather than duplicate their efforts.

**Recommendation 6 -** A range of targeted, focused and industry specific training programs are required to support the expansion of the organic industry in Australia. Any educational and training initiatives must be targeted to the nature, structure and culture of the industry sector.

Much of the meaningful work on organic farming systems needs to be undertaken within the context of a specific industry and therefore it is appropriate that the commodity RDC's get more involved. The RIRDC Organic program should focus it efforts on attracting mainstream R&D, marketing and industry organisations to contribute to the development task. Because of the important market prospects and the leading edge nature of much of the potential research the RIRDC Organic program

should aim towards joint projects with other RDC or ideally towards establishing a joint venture program with a number of industry RDCs.

**Recommendation 7 -** The RIRDC Organic program should focus its efforts on attracting mainstream R&D, marketing and industry organisations to contribute to the research and development tasks via joint projects with other RDCs or through a joint venture program with a number of industry RDCs.

In light of the above it would be worthwhile commissioning a feasibility study into the prospects of establishing a joint venture program or joint projects with as many of the RDCs as possible and with other research bodies such as CRCs or state agencies. Industries RDC worth considering include Grains, Horticulture, Wine and Grape, Cotton, Dairy, Sugar etc. The pull of high export demand and the potential public attractiveness of organic R&D could be presented as powerful lures for these organisations to engage in joint projects or long standing commitments to a joint program.

**Recommendation 8 -** RIRDC should commission a feasibility study or initiate a process to investigate support for a CRC or joint venture organic R&D program with RDCs and other research bodies.

**Recommendation 9 -** A new CRC or another National Research, Development and Demonstration Program should be established as a way of focusing the research effort on the challenges and opportunities of sustainable organic production in Australia.

# 4. A Policy and Research Agenda

## 4.1 Future policy directions for Organic Farming

It is worth asking the following question: If organic agricultural products have such strong market prospects, improved environmental performance and good scientific credentials why aren't organic methods being adopted on a rapidly increasing number of Australian farms?

The answer is probably a combination of the following factors: risk and uncertainty; expertise and skill; decision making processes; real technical and production constraints; unclear market signals and the policy environment.

Despite the image of independence, few farmers make decisions in isolation. They are in fact part of a complex information and value chain, so while organic may appear attractive it will take a major shift in policies, programs and R&D to stimulate a sizeable shift to organic or minimal chemical farming practices. The importance of government policies is best illustrated by contrasting different European countries: Austria, Sweden and Denmark aimed to have 10 per cent of their farming organic by 2000 due to active government support, while Britain could only hope to achieve 1 per cent.

In Australia, there has generally been an absence of government support or encouragement of organic farming systems. Only recently has the Rural Industries Research and Development Corporation (RIRDC) established a dedicated R&D program to fund work which focuses on organics, and this only has a tiny fraction of the total agricultural R&D budget.

Despite the limited R&D to date there are growing numbers of Australian farmers practising organic agriculture. While these practitioners and their techniques have been derided from the agri-chemical/food sector[11] and have received little official recognition they are finding growing recognition from appreciative and informed consumers - "the market is speaking".

## 4.2 History and background

Cameron and Elix (1991) undertook several regional case studies of agricultural systems. The farming systems of organic and biodynamic farmers operating in the study areas were compared with conventional farmers systems, and the social, economic and environmental costs and benefits identified. Cameron concluded, *"the barriers to adoption of low input farming must be overcome. The traditional bias against research into low input methods must be reversed and more effort must be put into marketing and consumer information. Equally importantly, those farmers who wish to convert to low input farming should be assisted by government, both technically and financially*" (Cameron and Elix 1991).

In 1992 the Australian Conservation Foundation reported to the Commonwealth Department of Primary Industries and Energy (DPIE) that *"There is a need for real support from Governments via further research and development into growing and processing of organic produce, extension and advice to growers on techniques and programs which support innovative changes. Central to realising all the above is the need for extensive "cultural changes" within State and Federal agricultural agencies and statutory marketing authorities. The basis of this cultural change would start with recognition of the importance of organic farming systems both in their own right and as a model to other growers, and their importance as experimental and innovative management systems.*

*The importance of organic agriculture has been recognised by the Scandinavian countries that are now financially supporting farmers to change to organic farming. While it is understood that*

[11] See appendix 3 for details on how this is done

*Australia is unlikely to subsidise organic production, it is important that Governments remove the impediments to its adoption where they are in a position to influence this."* (ACF 1992)

In recognition of the Australian Governments commitments to free trade the ACF (1992) went on to state "*Direct subsidies for conversion to organic farming are neither desirable nor likely within the current policy framework. However, a deliberate commitment from governments to support organic agriculture via the usual methods of government support for agriculture - research, development and extension are required".*

## 4.3 Policy, perceptions and PR?

Synthetic pesticides are only one option for controlling pests, as are chemical fertilisers for "building" soil fertility - a recent addition to our 10,000 year old agricultural traditions, however within a couple of generations they have seized a dominant position in the minds of many agricultural scientists and policy makers.

It is of fundamental importance to the future of agriculture to questions whether other options for controlling pest, weeds and fertility have been seriously investigated, assessed and/or promoted using modern research methods.

Organic agricultural systems have had a tiny fraction of the billions of dollars spent on agricultural research in the last century. Much agricultural R&D still focuses on high-tech production, like biotechnology, even though market resistance may reduce the commercial potential of GMO product significantly.

The workshops identified the fringe image of organic agriculture as an impediment to conversion. This is not surprising as organic systems are still frequently denigrated. They are lampooned as unscientific, based on "muck and magic" or alternatively they are portrayed as elite, merely pandering to the tastes of the rich and trendy while the "real challenge of feeding the worlds masses are being met by chemicals". Appendix 3 contains a damning exposé of the methods used to denigrate organic agriculture.

Most of the "arguments" are public relations propaganda used to counter the findings of the few thorough investigations[12] like the US National Research Council's (1989) report "Alternative Agriculture". This comprehensive study provides a clear endorsement of organic farming techniques, offering extensive evidence of the viability, profitability and productivity of numerous "alternative" farming systems.

The US National Research Council (US National Research Council, 1989) found that:

- "Alternative agriculture" had significant environmental benefits.
- The extensive use of pesticides has resulted in increased population of pests due to the reduction in predators.
- The inappropriate use of soluble fertiliser results in inadequate plant nutrition and renders crops more prone to pest infestation and diseases.
- Crops can be grown with comparable yields, lower costs and significantly reduced environmental impacts through the application of "alternative methods"; and
- Governments need to adopt policies which actively support "alternative agriculture".

Recent work published in the prestigious journal Nature (Trewavas, 1999) confirms these findings. The article describes a seventeen year experiment in the US which demonstrates that cropping systems

[12] See New Internationalist June 1999 for an expose of the way PR and paid think tanks are used to counter proposed restriction on polluting industries including the agri-chemical industry. It is also used to create "smoke screens of scientific debate and discredit scientists who speak out publicly for environmental reform.

based on organic fertilisers maintained equivalent yields to conventional systems, while increasing soil organic matter (carbon) and significantly reducing nitrogen pollution to ground water.

Adoption of similar practices in the corn/soybean regions of the USA would sequester an estimated amount of carbon equivalent to 1-2% of the carbon released into the atmosphere annually from fossil fuel combustion in the USA. If cropping soils across the world could build soil organic matter levels these soils would become a significant sink for carbon dioxide in the atmosphere.

## 4.4 Research questions identified at the workshops

The workshop process identified the following issues as being worthy of further investigation because of a belief in their potential relevance to agriculture. Questions 1 to 16 were identified in two or more workshop while questions 17 to 20 were identified only at the dairy workshop.

The project consulted with a wide range of practitioners, but only had limited representation from researchers, so that it reasonable to presume that there was not full familiarity with the full range of R&D either completed or currently being undertaken. A further process is required to design and refine any proposed research and to consider the practicality, feasibility and benefits of investing R&D funds into trying to answer these questions. The questions identified may form a useful starting point for a workshop with experienced researchers and R&D managers where the questions of what is currently known and how these questions might be researched are explored.

1. Do bacterial inoculants work? And if so how? Include BD processes and specific use of mycorrhiza, and worm casts and teas etc? Do we need more cost-effective microbial profiling -eg gene finger printing?
2. Plant nutrient and disease relationships - do different sources of nutrient influence incidence and prevalence and impacts of plant and animal diseases, including questions of plant mineral sugars and brix levels?
3. What are the critical roles of soil microbes and soil biological processes and are these measurably different on organic farms?
4. Comparative analysis of organic and other farms in terms of nutrient cycling, nutrient budgets and nutrient run off and leaching.
5. What are the nitrogen and phosphorus leaching and loss factors? Are there other important pollution issues e.g. pesticides?
6. Is it possible to enhance plant metabolism as a disease minimisation strategy? Eg. "Do foliar sprays work as "bio activated" disease control agents? Include BD preparations, compost teas, kelp, fish
7. What are the best management strategies for balancing chemical, physical and biological aspects of soils and for triggering living soils? What are the most cost-effective ways of triggering or stimulating soil rejuvenation?
8. Are there simple design rules for IPM based on predator and predator habitat enhancement?
9. What opportunities and constraints are there for use of waste products from other industries - eg bio-solids, fish wastes etc?
10. Do organically produced products have different nutritional and storage (or fermentation) characteristics? What would comparative analysis of these characteristics tell us? Are there important implications for taste, health or storage?
11. Are there important models of learning and innovation that are effective within organic circles eg cooperative R&D and information exchange processes such as DOORS (do our own research) or PAM (participatory action management)?

12. How can there be independent analysis of what constitutes environmentally friendly techniques in agriculture? How can this be measured?
13. What kind of scientific underpinning is required for the international organic standards? Is further R&D needed into specific standards on permitted or prohibited inputs and their impacts?
14. What constitutes effective transition strategies for shifting from monocultures to diverse and complex, self-regulating agro-ecosystems?
15. How can the need to develop methods for doing R&D into the whole system, rather than fragments, be addressed?
16. Development of suitable systems of interrow cover crops, or legume rotations and the use of "smother crops" to control weeds.
17. Do we need to reconsider "traditional" nutrient budgets? Can we test claims of generating massive pH change by applying minimal liming materials but adhering to mineralisation proportions prescribed by Albrecht?
18. Do we need to challenge the basic assumptions regarding maintenance of fertility? Do BD sprays work to enable ongoing production without added inputs?
19. Should alternative animal treatments, including homoeopathic ones, be tested?
20. Paramagnetism - does it work and if so how?

**Recommendation 10 -** The RIRDC organic program should convene an R&D planning workshop with experienced researchers to consider future research investments including consideration of the questions identified in this project.

## 4.5 Australia's agricultural R&D - innovation and innovators

R&D investment is recognised as critical to the innovation process and is important for Australia's international competitiveness (Industry Commission, 1994). Furthermore R&D is important in order to operate efficiently under what are increasingly recognised as Australia's unique environmental condition (LWWRDC 1998, Cullen 1997 & 1998).

Australia spends over a billion dollars[13] on rural research per annum (Industry Commission 1994), yet only a tiny fraction is focused on organic systems[14]. This is in stark contrast to many tens of millions of dollars of public funds invested in biotechnology R&D, which in light of recent embargoes may be of little commercial value.

More of the national research investment needs to be focused on understanding the potential of production systems developed by innovative farmers, including organic farmers.

Identifying and understanding whole farming systems, including basic ecological processes at work on operating organic farms, was identified at several workshops as an opportunity worthy of further R&D investment. The focus on whole systems was regarded as a necessary step in order to overcome the "poverty of reductionism". Characteristics of functioning organic farms need to be investigated and contrasted with comparable chemical intensive systems.

[13] 1990-91 total for primary industry's R&D was $608 million, including university, Government agencies and the expenditure of the RDC's. A further amount is invested in the natural sciences and the environmental impacts of development (Industry Commission 1994).
[14] The RIRDC organic produce program invests approx $250,000 per annum.

A systematic program of research, development and extension into whole farming systems undertaken by and in cooperation with progressive farmers is recommended[15].

Accelerating the development of sustainable farming systems by understanding and supporting those farmers who are pioneering innovative systems is proposed. A process for identifying and renumerating innovative farmers actively involved in R&D would be an essential component of the proposal.

Farmer researcher collaboration will be central to the effectiveness of this R&D because it is unlikely that R&D agencies are capable of this innovation, or of understanding innovation or the innovation process in isolation from the innovators.

Integration of the national research effort in agriculture with the advances being made by innovative farmers will require a deliberate shift on the part of research agencies. There is also a strong probability that the way Australia's agricultural R&D corporations, agencies and programs are structured, biases R&D investment into the established industries and support for the status quo.

Changes in the research culture are needed that will result in the R&D effort being taken out of the laboratories and research farms and into a new era of collaboration with practicing farmers.

Many of the benefits of such an approach are derived by the increased interchange between researchers and practitioners, with them both learning from each other. This approach corresponds with *fifth generation innovation processes* based on "systems integration and networking models" (Industry Commission, 1994). It is in direct contrast with the linear models of innovation that are based on technology push.

**Recommendation 11 -** A greater proportion of the national primary industries research investment needs to be focused on understanding the potential of production systems developed by innovative farmers, including organic farmers.

**Recommendation 12 -** Systematic programs of research, development and extension into whole farming systems should be undertaken in cooperation with progressive organic farmers.

## 4.6 Are Organic Farming Systems Models?

There are successful, innovative organic farmers around Australia in a diverse range of industries and bio climatic regions. The five industries investigated in this project demonstrated that there are organic farmers operating in many different industries, usually in advance of any formal R&D programs that aimed to support commercial organic systems.

The people who have developed innovative, organic farming systems are not homogeneous but have some important characteristics in common, including:

- ✓ Refinement of organic farming systems in parallel with "official" farm management advice especially in relation to pest control and fertility management;
- ✓ A willingness to adhere to published standards and be subjected to inspection etc;
- ✓ Minimal and cautious use of synthetic pest control compounds and fertilisers; and
- ✓ Explicit recognition and inclusion of environmental values in their farm management practices.

[15] The authors recognise the worth of much research that is undertaken including that already done in cooperation with farmers. The proposal put forward is not intended to belittle this effort.

While this project began the process, more benefits could be realised from systematically trying to understand the systems pioneered by innovators in organic agriculture. Understanding their systems may lead to farming practices or models that are cost effective, sustainable and more widely applicable. Organic farms and farmers in Australia could be seen as "dispersed experiments" that have never been adequately measured or written up.

Many organic farmers have developed innovative low input farming systems adapted to specific crops and conditions. Measuring, analysing and describing in detail agro-ecological processes occurring on these farms and identifying how Australian agriculture can benefit from them represents a significant and worthwhile challenge. More detailed measurement may quantify claims about environmental friendliness, soil or fertility management etc. A systematic program of whole farm research, development and extension undertaken in cooperation with progressive organic farmers is required.

There are a number of reasons why these farms and farmers may be an important focus for R&D investments, including:

- ✓ Agricultural research has generally ignored the innovations occurring on organic farms[16];
- ✓ Existing Australian organic farmers have generally pioneered their farming systems with little support from governments and agribusiness,
- ✓ Future export market are increasingly likely to be based on Australia's competitive advantages - our relatively unpolluted environment and an environmentally aware farming population,
- ✓ Unlike many industrialised countries, most Australian agro-ecosystems retain remnants of former natural ecosystems and complex natural checks and balances which can be deliberately enhanced,
- ✓ That most farmers do not make decisions in isolation and that changing agricultural systems requires an ongoing commitment of research and development expenditure;
- ✓ Many Australian farmers already use relatively low input farming systems, and these could be enhanced by improved agro-ecological knowledge ;
- ✓ Any attempt to understand and use organic farming systems as models must recognise that apart from agronomic processes worthy of investigation, many farmers have cultural, economic and environmental values as an integral component of their farming systems and these cultural relationships are worthy of R&D (see below);
- ✓ Agricultural extension and adoption may be successfully facilitated by supporting farmer to farmer technology and information transfer;
- ✓ Farm-based research and demonstration can be very cost effective and can successfully utilise keen observation skills of farmer and researchers;
- ✓ Refocussing some of the research effort in this way is consistent with the landcare principles of Government facilitation of community empowerment, self-reliance and innovation for sustainability.

**Recommendation 13 -** It is recommended that each of the RDCs and other R&D agencies investigate the opportunities for establishing systematic programs, either independently or as part of a future CRC, that focus on whole farm research, development and extension to support organic agriculture. Where possible the basis of the R&D programs should be in collaboration with progressive farmers.

[16] There several researchers that have undertaken research in Australia, including P. Dann, J. Derrick, D. Dumaresq, D. Small and M. Ryan. Megan Ryan (CSIRO Division of Soils) has undertaken a review of Australian organic research and prepared a list of recent Australian research.

### 4.6.1 A well funded National Organic R&D program?

While the many agencies involved in agricultural R&D should investigate these opportunities, a more coordinated national program may be advantageous. There are potential benefits that would flow from a coordinated national program.

A strong policy commitment is required to signal to R&D agencies that organics are a recognised priority area for R&D investments. This could be done by the Commonwealth through a dedicated R&D funding program, or via advice to the R&D Corporations (which are already funded approximately 50% by the Government). Effective implementation of the program would require a change in agricultural research priorities and a cultural change on the part of the agricultural research community who so far have generally ignored the potential models offered by existing practitioners of low input and organic farming.

### 4.6.2 A National R & D program for ecological farming systems

It is widely recognised that Australian agriculture needs to focus on the development of innovative solutions to economic, social and ecological problems (Lawrence and Vanclay 1995; Reports on the Rural Summit Weekly Time 1999; LWRRDC - RAAL Program Plan 1999).

To develop solutions there is a need to integrate the understanding of agronomic and ecosystem processes (LWRRDC- RAAL 1999). If we are to understand the potential models offered by innovative farmers, radical departures from the existing R&D approaches are needed. Multi-disciplinary programs of research, development and extension are required.

Knowledge of social, economic and ecological complexities of sustainable agricultural systems will be furthered by cooperation between farmers and researchers. Together they bring different skills to the challenge of documenting existing processes and systems, and in comparing the nature and impacts of various farming systems and techniques. This needs to be undertaken in conjunction with those practicing farmers who have personally developed, adopted and adapted systems to suit their circumstances.

A comprehensive "whole systems" approach permits identification and development of solutions that have arisen from within *"the innovation process,"* while the formal R&D investments can stimulate further evolution. Better integration of the theoretical and practical knowledge will be an intrinsic outcome of the program.

As stated in the section above, the program should work in conjunction with existing innovative farmers offering them the opportunity to be engaged in a paid capacity to assist scientific staff measure, document, define and demonstrate the characteristic of their farming systems.

The opportunities for participation should be sufficiently flexible and adequately renumerated to permit farmers and members of farming families to actively take part in the program without adding an additional unpaid workload[17].

Putting existing farming practices/systems under a spotlight to determine their relative environmental impacts and their ecological sustainability would be extremely useful. In order to determine the processes and characteristics of sustainable farming systems, this program would subject practicing farming systems to scientific scrutiny.

The program should have the capacity to explore various, representative or regionally important farming systems in detail. It would need to measure and compare on-farm ecological processes, such as pest predator relationships, soil and crop processes, nutrient and disease relationships, energy and carbon budgets. These factors are detailed below.

[17] Unpaid farmer contribution to the national sustainability challenge has been a ubiquitous characteristic of the NHT and various "landcare programs".

### 4.6.3 Key biophysical factors, as indicators of sustainability

Landcare and the related initiatives[18] of the last decade have aimed to achieve sustainable landuse through better integration of commercial and environmental concerns. Measurement of the extent to which this has been achieved has been constrained by lack of consistent approaches to monitoring and recording data (ARMCANZ 1998). More significantly, despite the hundreds of millions of dollars, there are few objective measures of progress in improving the physical environment as a result of these programs (ANAO 1997).

Perhaps, after this decade of publicly funded education and promotion of sustainable landuse we are seeing a renewed focus[19] on embedding environmental responsibility in commercial processes, and on developing reliable methods of measuring performance.

Reducing the environmental impact and increasing the ecological sustainability of farming systems, depends on applying a practical understanding of at least five fundamental and interrelated ecological processes, geology and soils, biology and biodiversity, nutrient cycles and budgets, water cycling and energy flows.

These are critical components at a paddock scale. Aggregated they become critical to regional ecological processes. For example, failure to manage nutrient and water cycling results in salinity and/or eutrophication (RAAL program plan 1999, SoE report 1996). Similarly failure to understand and manage biodiversity results in simplification of ecosystems, species loss and ultimately loss of ecosystem function and integrity. For example, recent research indicates that up to 50% of the woodland birds of South Eastern Australia are in decline and may be threatened with extinction (Reid 1999).

Clearly there are suites of complex interrelationships and trade-offs within agricultural systems. For example, soil compaction can require increased fossil fuel (energy) inputs to maintain a cropping regime. Compaction also changes water run-off and absorption characteristics, and the populations of soil organisms.

It should be possible to describe farming systems using standard indicators of basic ecological processes. While considerable effort has been devoted to develop indicators of sustainable agriculture in recent years (SCARM 1998; Hamblin 1997), the authors are unaware of any systematic attempts to use standard descriptors for comparison of farming systems. A consistent, rigorous methodology for determining the environmental impacts of farming systems is needed. This methodology would have far wider application being useful in the process of developing and refining effective environmental indicators for agriculture and therefore also useful in state of the environment reporting (SCARM 1998; Hamblin 1997).

Ultimately, a better understanding of how agro-ecosystems function and how we can improve management of critical interactive components should result. Identification of opportunities to adapt landuse systems in line with ecological understanding is needed.

**Recommendation 14 -** A framework for assessing, comparing and describing farming systems using standard indicators of basic ecological processes is required. A consistent, rigorous methodology for determining the environmental impacts of farming systems should build on efforts to develop indicators of sustainable agriculture.

[18] "Landcare" is used as an umbrella term as there have been a range of government funded programs aimed at sustainable landuse or sustainable landscapes, such as those funded by the Natural Heritage Trust.

[19] A "renewed focus" because in earlier decades OECD countries agreed to apply the principles of polluter pays and user pays as a means of embedding environmental responsibility in commercial processes.

### 4.6.4 Cultural and social factors

In addition to monitoring biophysical processes, indicators of sustainability of human and community processes should be included. Social indicators of sustainability such as pride of work and self-respect and critical social processes that support community viability should also be included in the program. Currently one of the key social processes that defines sustainability is the commitment of the practitioner, yet clearly there is a need for a more empirical measurement of social process in rural communities. Understanding of social, economic and physical factors are critical to the adoption of change in land management systems. Further work is required to understand the market and policy drivers of social and biophysical outcomes in agricultural landscapes (Rickson et al 1998).

An important feature of organic farmers and organic farming organisation is that they have attempted to define the nature and characteristics of sustainability and attempted to guide farm practices accordingly. While the specifics of organic standards are both debatable and evolving, the process of applying the standards is critically important. They set an important precedent of firstly trying to define sustainability, and then for producers to voluntarily agree to an agreed code or management regime. For example, NASAA producers in Queensland accepted specifications that restricted further tree or scrub clearing well in advance of government controls. Other contracts specify effective contour bank and erosion control methods, crop rotation and restrictions on continuous cropping.

Thus this represents an example of self-regulation in Australian rural industry. Research is needed to gain an understanding of the motivational factors that contribute to decisions to farm organically.

An important aspect of organic agriculture is the inclusion of environmental and health issues, and sustainable land management ideals into a coherent set of principles expressed as a set of explicit standards.

Just as individuals, institutions and society in general needs processes for reflection and time to define and redefine "purpose" and "identity" so too "agriculture" needs to reflect, refine and define itself. Organic farmers have been at one of the vanguards of this process, pioneering not just innovative growing techniques but also a sense of the need to define the purpose and limits to their actions, to articulate their values, and to be contractually committed to adhere to them.

It is possibly in this regard that the organic farmers provide the strongest model. While organics has no moral copyright on "sustainability", it does offer a strong model of industry self-regulation aimed at achieving sustainability.

The Standards play a key role in ensuring a cautious approach to the application of technology[20] and in defining the relationships between the farmer, nature and the market.

Organic Standards play a central role in defining acceptable practice. Production within the constraints of the Standards is important in driving innovation (within the overall innovation occurring in agriculture), limiting environmental degradation and maintaining the confidence of the markets.

The certification systems play a critical role in linking the producers to the markets and in maintaining the consumers' confidence. The integrity and credibility of the certification systems and the organic standards represent an important component of the "moral capital" of the organic industry. Faith in the certification systems is capable of being eroded like the landscapes or productive capacity of ecosystems.

[20] Organic certification allows the use of a wide variety of technologies but uses a cautious approach to determining their safety. Precautionary is used in the sense of the precautionary principle.

## 4.7 Integrated pest management

Not surprisingly, soil fertility and pest management were raised at the workshops as areas for further R&D. Many organic producers believe that there are causal links between soluble fertilisers, especially nitrogen and incidence of pest and disease problems.

Stirzacker (in publication) demonstrates that in most Australian horticultural crops luxurious levels of nutrients are routinely applied as "insurance". Further R&D into links between fertiliser use and crop disease may prove valuable.

Most workshops identified the opportunity to enhance predator habitat as an important IPM strategy. While most industries believed that they had minimal chemical use, reductions were seen as possible through improved understanding pest life-cycles and through the testing of alternative control compounds or systems

With targeted research and industry cooperation we could move to minimal pesticide use, but dramatic changes are needed. Farms would look and function differently. New skills, knowledge and approaches will be required to accelerate the evolution to ecological farming. Increased R&D is needed to support the challenge of creating regenerative or ecological agriculture systems - ones that are not dependent on routine use of synthetic pesticides but instead uses sophisticated understanding to create productive agricultural ecosystems.

The potential for Australian agriculture to benefit from more environmental friendly pest and weed management compounds/ systems/ knowledge is yet another potential benefit from intensive research into organic farming systems.

# 5. Certification

## 5.1 Certification issues

There are many issues raised throughout the project associated with organic product certification. The following list provides a summary of these issues.

1. Eco-labelling and claims of environmentally friendly products are proliferating and are often unsubstantiated. As a result there is increasing emphasis on systems which provide verification or independent certification. Organic systems are likely to come under increased competition from a range of systems or labels that claim to be "environmentally friendly".

2. Certification systems are already providing benefits to farmers with the rapid growth in organic food and fibre production in Australia resulting from domestic and international confidence in the certifications systems used. Maintaining confidence in organic certification systems must remain a high priority.

3. There has also been rapid adoption of quality assurance and food safety risk minimisation systems in Australia that aim to ensure safe, quality products. While these systems are effective at minimising risks of contamination, they do not address wider issues of how the production systems affect the environment, unless aspects of production process are also an attribute of product quality. Agricultural chemicals are one such attribute. As a result, chemical safety and management are a "flagship issue" that has led to market recognition of organics. In the future organic producers must ensure that all aspects of food safety are addressed by their systems (see John Farrer on HACCP in Section 7.9).

4. Concerns about agricultural chemicals have motivated the adoption of stringent standards within the organic industry, but many other issues have not generated the same detailed responses. Australian organic production should be pro-active addressing other issues that will become increasingly important in the future - energy and greenhouse, water use and quality, and bio-diversity. These issues are of increasing importance and could rapidly escalate up the international agenda, as has recently happened with biotechnology.

5. Consumer concerns have had direct and significant influence on major retailers' policies on genetic modified organisms (GMOs) this year. It will only be a matter of time before this influences science policy and farm practice.

6. Affluent markets are demanding products produced from environmentally friendly or sustainable systems. There are likely to be long term economic advantages from developing the capacity to assure increasingly demanding markets that products and production processes are consistent with Ecologically Sustainable Development (ESD) principles. This capacity should be developed whether these requirements are institutionalised or not. Even if global trade rule remain focused on free trade these assurance may become standard components of supply contracts. Preparation seems a prudent strategy. **Appendix 4** provides two scenarios of how commercial, policy and trading regimes could rapidly demand an EMS, or other evidence of policy and regulatory regimes that support good environmental practice or sustainability. Regardless of whether change is driven by multi-lateral agreements, domestic policy or the private sector, evidence of environmental responsibility could become a necessary component of business management in the twenty first century.

7. Certification systems and standards must continue to evolve - Organic certifiers have pioneered credible systems for setting targets, and applying meaningful standards for use in Australia's diverse agricultural systems. Ongoing work is required on refining standards and on ways of measuring and reporting on environmental change. Thus, the importance of establishing good links between commercial operators and research organisations cannot be over emphasised.

## 5.2 Defining quality

In the late twentieth century, industrial agriculture has taken the affluent world from food scarcity to over supply. Australian agriculture can not expect a vast, under satisfied world market desperate to buy agricultural commodities[21].

Affluent markets increasingly demand quality, consistency and reliability from suppliers of goods and services. They are also demanding assurance or certainty of quality. As a result, quality products and processes, and quality assurance systems (QA) are becoming an increasingly important part of agricultural business. Not only must the end product appear be of good quality but suppliers must also have the capacity to guarantee quality and reassure wary consumers.

Farmers are like all other businesses in that they must be responsive to market requirements. Most Australian livestock producers are familiar with an "audit trail" or system of verification that aims to address the specific quality concerns of a major market. In 1993 Australia introduced an individual livestock identification system to satisfy the European Union requirement to identify all cattle treated with hormonal growth promotant (NFF 1994) so these animals (and all derived products) could be excluded from EU export orders. Cattle must be marketed with an individual identification (usually a pink tail tag) and more recently grower declarations.

Quality assurance, quality systems and audit trails are becoming increasingly important in the marketing of agricultural produce. But quality has many facets, and is defined in many different ways by different people, markets and cultures.

Broadly speaking, common components of food quality can be defined as:

- ✓ Healthy - fresh, nutritious etc;
- ✓ Food safety - freedom from microbiological or chemical contamination, etc;
- ✓ Environmentally friendly - sustainable production, acceptable environmental effects;
- ✓ Ethical - animal rights, fair trade, human rights eg. No child-labour or free from genetic manipulation; and
- ✓ Religious - produced in ways consistent with religious beliefs, eg. Halal or kosher.

How production effects the environment is becoming an important component of an overall assessment of quality.

## 5.3 Market demands

European supermarkets are imposing increasingly serious production standards or "Environmental QA" on their suppliers. Sainsbury's fresh produce section purchases over 12 billion pounds (Stirling) of fresh produce per year from over 40 countries (RIRDC 1999a). They only accept two standards - certified organic or produce which meets Integrated Crop Management protocols. Sainsbury's has assisted in the development of ICM protocols for 99% of the crops they stock (RIRDC 1999a). Not only are there ICM protocols but their application is routinely audited.

This approach is becoming common practice for European retailers. Another major British retailer sent a buyer to check the QA system used in an export operation. The pack-house was found to be acceptable, but the inspector also asked to see a few of the farms supplying produce. A slack approach to the storage of farm chemicals resulted in the importer rejecting all produce from one farm.

[21] There was a relatively brief period following the Second World War when Australia's agricultural commodity exports boomed. However, for most of the latter part of the 20th century Australia's markets for food commodity exports, especially grains have been determined by the trade and foreign policy concerns of world powers. See "The Food Question" IIED (1990) for more discussion on the food trade, aid and international politics.

This sends a powerful message to the company (and other exporters) and its suppliers about how serious the importers are about ensuring that all stages of the value chain address environmental management.

## 5.4 Environmental issues

It is understandable that consumers have strong concerns about those aspects of the production process that could result in contamination of the final product - chemical residues, "genetic pollution", microbial contamination. However, consumer concerns extend well beyond concerns for product quality to include concern for the quality of the production process and how this affects all aspects of the environment.

QA systems that address the wider environmental effects of agriculture are not as well developed as those systems that have a focus on product quality. This reflects a longer historical focus on food safety within the food industries, and the inherent complexity of environmental management.

Organic certification provides an important working model of certification and labelling of agricultural products. An extensive range of Australian organic producers and processors are now certified. Many are receiving price premiums as a result of adhering to internationally recognised organic standards, and operating within credible systems of verification and auditing. However, the organic standards are far from comprehensive and various aspects of environmental management are only dealt with marginally. These include:

- ✓ **Energy and greenhouse issues** - for example the issue of food miles is increasingly raised (often organic produce ends up travelling tens of thousand food miles to markets that pay for premiums),
- ✓ **Bio-diversity conservation** - while usually no worse than many of there counterparts few organic systems demonstrate excellence in bio diversity conservation and this expectation is not made explicit in the standards,
- ✓ **Water use efficiency** and some of the regional hydrological linkages. For example an organic farm may have equally high rates of ground-water recharge that impact on regional groundwater systems.

## 5.5 Environmental certification for agriculture

The authors believe that it will only be a matter of time until other agricultural systems are certified against other measures or standards for sustainability. Many questions will arise when there are attempts to certify other forms of farming as environmentally friendly. Firstly, in the absence of some clearly defined standards it is extremely difficult to define what constitutes an environmentally friendly agricultural system, and how to measure progress towards this goal. At present, there is interest in applying many other systems such as ISO 14000 and for extending the concept of certification beyond the organic farming sector with its long history of standards, its coherent philosophy, and its core focus on permitted and non-permitted inputs.

It should be no harder to arrive at certification systems with well defined standards, criteria and indicators for sustainability and environmental performance in agriculture, than in other major natural resources sectors such as forestry (see www.fsc.org) and fisheries (see below). Hamblin (1997) proposes a range of useful indicators selected for this purpose at a national scale but the challenge remains to convert these to auditable or certifiable set of standards.

## 5.6 Forestry and fisheries certification

Efforts to develop certification systems in agriculture need to be informed by the related initiatives in fisheries and forestry. International certification of wood products is progressing rapidly and provides an important precedent to agricultural industries. Important lessons could be learnt from the experience of establishing the Marine Stewardship Council (MSC) and the Forest Stewardship Council (see www.fsc.org).

Both the MSC and the FSC attempt to provide a system for certifying forest or fisheries products that claim to have been produced using sustainable production systems. They aim to allow consumers to differentiate between products derived from the exploitation of natural resources, and those produced in accordance with sustainable yield principles and sound environmental management.

Markets will be seeking increasing assurance and verification of quality claims including claims regarding environmental impacts of production. Verification systems will require "chain of custody" or audit trails from paddock to plate to be credible, as well as rigorous and detailed systems for measuring environmental effects. Building and maintaining credible systems of verification, chain of custody, and environmental measurement will be central to continuing growth in the organic industry.

## 5.7 Food safety and organics

Fears of an unsafe food supply system have been fuelled by a series of high profile food contamination events in the last decade that have had tragic and costly consequences - severe food poisoning, death, compensation claims, product recalls etc. This has resulted in increased commercial, legal and public pressure to more effectively address food safety issues.

Consumer perceptions are governed by impression and information gained in the media which supports fears of an increasingly "unsafe" and "unnatural" food supply. Consumer concerns include issues of food safety - such as chemical, genetic pollution[22] (from biotechnology) and microbial contamination - as well as the fate of the wider environment, and how it fares as result of agriculture practices. Public perceptions and buying power are important factors in the marketing of food products. Commenting in 1999 on a 57,000 tonne shipment of canola valued at $A26 million (US$16.53 million) Graham Lawrence, managing director of the NSW Grains Board said the cargo is bound for oilseed crushing plants in Europe. "Europe has moved to become a major buyer this year because Australia is the only country to guarantee non-genetically modified Canola," he said. This led to a record shipping program of canola for 1998.

The desire to avoid any potential negative impacts of biotechnology permeates the entire food chain, particularly as major northern hemisphere supermarkets placed embargoes on products derived form genetic modification. The precautionary buying policies of these companies have a huge bearing on market demand. For example, Sainsbury's supermarkets buy more fresh produce than the total value of the Australian agriculture. They have two standards - certified organic and certified to comply with Sainsbury's own stringent IPM standards.

The news item (boxed below) demonstrates that some buyers of farm products (especially EU supermarkets) are serious about having processes that allow them to track food through the entire production process.

[22] Biotechnology now appears to be the next major frontier of the food safety debate with increasing controversy and media attention focusing on the various claims and counter claims. The debate itself demonstrates a healthy scepticism on the part of the public about claims made by the scientific experts and the major agribusiness corporations. Commerce has its own way of dealing with the controversy - European retailers are now guaranteeing that they are stocking GE free products and Australian canola exports have received an unexpected boost due to their GM free status. (see boxes below).

## Box Text: Biotechnology - the changing story

**European food retail chains eliminate genetically modified (GM) ingredients from their-brand**
LONDON, UK, March 22, 1999 (ENS) - European food retail chains have moved to eliminate genetically modified (GM) ingredients and additives from their own-brand food products. The European Union (EU) supermarket association Eurocommerce claimed that this is of "major significance". Fernanda Fau of Eurocommerce was speaking after last week's announcement by seven supermarket chains that they are launching a consortium to jointly source non-GM foodstuffs.

"Things are changing very fast," Fau said. "The debate on GM foods has achieved a high profile across the continent within a space of weeks. Moreover, the principle that segregation of GM ingredients is possible has now finally been accepted. We first lobbied for this two years ago and were told it was impossible."

Headed by Sainsbury of the UK, the consortium comprises retailers from six countries. "Many of our customers clearly want the possibility of choosing GM-free food," a Sainsbury spokesperson said. "We decided we could only be sure of eliminating GM derivatives by tracking some ingredients all the way from the farmer's field to the supermarket shelf and we would only get the buying power to do this by working together with supermarket chains in other European countries."

Sainsbury's environmental manager Alison Austin said the agreement would enable the supermarkets to take out direct, long-term agreements with farmers guaranteeing non-GM crops, and track them right through the production process.

Over the past 18 months, Sainsbury has reduced the number of its products with GM ingredients. It will now direct its attention to foods containing soya oil and lecithin, neither of which yield to scientific testing for the presence of GM material. The firm says it will abandon product lines containing them if it cannot either establish firmly that they are GM-free or find alternatives. It says it is also aiming to ensure that its milk and meat products are produced from animals fed on non-GM food.

Sainsbury's partners in the scheme are Marks and Spencer, also of the UK, Carrefour of France, Italy's Effelunga, Migros of Switzerland, Belgium's Delhaize and Superquinn of Ireland.

Environmental groups in the Netherlands and Germany have urged supermarkets in their countries to join the consortium or establish similar initiatives.

Meanwhile, British food retailer Iceland is achieving rising sales after its move to ban GM foods from its own-brand range according to a UK press report. The Observer newspaper reported yesterday that the company would report a nine percent sales increase this week, in part due to public enthusiasm for its stance on GM foods.

{Published in cooperation with ENDS Environment Daily, Europe's choice for environmental news. Environmental Data Services Ltd, London. http://www.ends.co.uk; Email: envdaily@ends.co.uk}



Much progress has already been made on quality systems that focus on food safety. With the exception of biotechnology, food safety concerns are being addressed by a range of QA and HACCP systems. These systems focus directly on product quality control, food safety and risk minimisation (Vic NRE 1997b; HRDC undated).

Implementation of QA and HACCP systems is now widespread and increasingly commonplace in food production and processing enterprises throughout Australia. The adoption of QA has been accelerated by pressure from regulators and major produce buyers - primarily the major supermarkets.[23]

There is an expectation that organic producers adopt a HACCP program because while many feel confident that they have fewer risks from chemical contaminants there are a range of other risks that must be managed. Technically, within the framework of organic certification, HACCP principles relate to the management of the organic "quality" system and not to food safety per se.

## 5.8 HACCP defined

HACCP is an abbreviation for **H**azard **A**nalysis **C**ritical **C**ontrol **P**oint and has become a buzzword in recent times, in particular with the pending food safety related introduction of new Food Standards Codes and Legislation in each State.

HACCP was first developed as a food safety system in the 1960's as part of NASA's (National Aeronautics and Space Administration) program to ensure that food was safe for astronauts.

The concept of HACCP was first introduced to the United States food industry in 1971, and a number of major companies introduced it as part of their general manufacturing practice in 1974. It was not until the mid 1980's that Australian manufacturing industries took it up.

It is now widely accepted as appropriate to all food manufacturing and processing, and indeed to pre-manufacturing stages, and as such can provide a more efficient and cost effective control over food quality and food safety factors than more traditional procedures such as those based only on final preparation systems.

The application of HACCP to food preparation systems for industries such as in-flight catering in airlines also became part of the Australian industry in the 1980's. The extension of this to retail outlets will be a feature of new food standards codes and legislation in each State.

**What does it mean for a small business proprietor who produces, processes, manufactures, distributes or prepares food?**
Essentially it means adopting measures that will ensure food safety based on the development of a food safety plan that embodies the seven HACCP principles.

That is:

- **Analyse hazards.** Potential hazards associated with a food, and measures to control those hazards, are identified. The hazard could be biological, such as a microbe; chemical, such as a pesticide; or physical, such as ground glass or metal fragments.
- **Identify critical control points.** These are points in a food's production – from its raw state through processing and shipping to consumption by the consumer – at which the potential hazard can be controlled or eliminated. Examples are cooking, cooling, packaging and metal detection.
- **Establish preventative measures with critical limits for each control point.** For a cooked food, for example, this might include setting the minimum cooking temperature and time required to ensure the elimination of any microbes.
- **Establish procedures to monitor the critical control points.** Such procedures might include determining how, and by whom, cooking time and temperature should be monitored.
- **Establish corrective actions to be taken when monitoring shows that a critical limit has not been met** - - for example, reprocessing or disposing of food if the minimum cooking temperature is not met.
- **Establish procedures to verify that the system is working properly** - for example, testing time– and– temperature recording devices to verify that a cooking unit is working properly.
- **Establish effective record keeping to document the HACCP system.** This would include

[23] This paper does not attempt to review the QA and HACCP based systems but refers to them when they also address wider environmental issues or are useful examples.

records of hazards and their control methods, the monitoring of safety requirements and action taken to correct potential problems.

Each of these principles would have to be backed by scientific knowledge: for example published microbiological studies.

**Need for HACCP** New challenges to the Australian food supply have prompted ANZFA (Australian New Zealand Food Authority) to consider adopting a HACCP based food safety system. One of the most important challenges is the increasing number of new food pathogens. For example, between 1973 and 1988, bacteria not previously recognised as important causes of food-borne illnesses - such as Escherichia coli 0157:H7 and Salmonella enteritidis – became more widespread.
There is also increasing public health concern about chemical contamination of food: for example, the effects of lead on the nervous system. Another important factor is that the size of the food industry and the diversity of products and processes have grown tremendously – in the amount of domestic food manufactured and the number and kinds of food imported. At the same time, the Australia and New Zealand Food Authority (ANZFA), State and local agencies have the same limited level of resources to ensure food safety.

**Advantages**

HACCP offers a number of advantages over the current systems. Most importantly HACCP:
Focuses on identifying and preventing hazards from contaminating food.
Is based on sound science.
Permits more efficient and effective government oversight, primarily because the record keeping allows auditors to see how well a firm is complying with food safety laws over a period of time rather than how well it is doing on a given day.
Places responsibility for ensuring food safety appropriately on the food manufacturer or distributor.
Helps food companies compete more effectively in the world market.

Source: John Farrar (NASAA Magazine Feb.1999) - reprinted with permission from the author

## 5.9 Comparing ISO 14000 and organic certification[24]

### 5.9.1 ISO 14000 EMS

The ISO 14000 series of EMS are intended to provide organisations with the elements of an effective environmental management system. They have been designed to be applicable to all types of organisations, in a wide range of geographical and cultural environments. The standard focuses on the management process not the environmental performance.

ISO 14000 recommends the use of a fairly standard management approach - policy and objective setting; planning; acting; reviewing and revising - that aims to leads to continuous improvement. It is a generic, systems-based management "shell" that an organisation can adopt in a manner that suits its operations, purpose and context.

The key elements of the ISO 14000 EMS (AS/NZS ISO 14001:1996) are organised around the following themes or clusters of activity:

- ✓ **Environmental policy** - appropriate, environmental policy that has the backing of the organisation's top management. In one of the rare examples of the standard being prescriptive it does prescribe that policy includes commitments to continuous improvement and to compliance with relevant legislation. The policy must be documented, and communicated to employees, and available to the public.

[24] This appendix is based on work undertaken for the RIRDC Resilient Agricultural Systems program. It is included here because of the relevance to organic standards and certification.

- ✓ **Planning -** includes establishing procedures to identify environmental impacts; to set targets and objectives; to implement programs of activity designed to achieve these targets and objectives and to specify time frames for their achievement.
- ✓ **Implementation and operation** - involves defining roles, responsibilities and authorities; defining training needs; establishing communication procedures and relevant documentation systems;
- ✓ **Checking and corrective action -** involves formalising monitoring, record keeping and measuring systems; and periodic evaluation of compliance with relevant legislation; and the establishment of EMS audits whereby the system is audited.
- ✓ **Management review** leading to revision of the of the other elements; and therefore
- ✓ **Continual improvement**.

The ISO series makes an important distinction between developing an EMS for guidance only, or to meet the requirements necessary for certification. ISO 14004 is a general guide for developing an EMS while ISO 14001 describes the specification necessary for certification.

ISO 14001 focuses on elements that can be objectively audited. Significantly, the standard notes that it is the system that is audited not the environmental performance or outcomes. ISO 14001 does not specify anything other than commitment to an environment policy that is publicly available, documentation and record keeping, compliance with relevant legislation and regulation, commitment to pollution prevention and continuous improvement. The Australian and New Zealand Standard (AS/NZS ISO 14001:1996) states bluntly that "adoption of the International Standard will not in itself guarantee optimal environmental outcomes."

ISO 14001 shares many similarities with ISO 9000 series of quality management. The ISO 9000 management systems can be used as the basis of ISO 14000 systems (AS/NZS ISO 14001:1996). A key difference is that quality management systems address the needs of the customer or client, while environmental management systems must address the needs and interest of a wider "range of interested parties and the evolving needs of society for environmental protection" (AS/NZS ISO 14001:1996). This last point is very important because it mandates an involvement with "interested parties and recognises the evolving nature of environment protection.

### 5.9.2 A COMPARSION BETWEEN ISO 14000 AND ORGANIC CERTIFICATION

The ISO 14000 outlined above and organic certification systems have very different origins and modes of operation. The contrast between them can appear quite extreme on the surface yet they in fact share many common elements. For example, organic certification and ISO 14001 are very different in terms of what they specify, yet in operation they both rely on principles of third party auditing, certification and accreditation of organisation capable of certifying.

The fundamental difference between the systems described is that some are process based models like ISO 14000, while others are standards based system which specify a set of standards which must be complied with such as those necessary to meet organic certification.

It is useful to separate comparisons of "process based systems", and "standards based systems". While standards based system require effective process, and process-based systems require standards, criteria and targets to operate in a meaningful way, each group fulfils quite different purposes and relies on different processes to establish and refine their standards and targets. As such we can only apply organic standards to agriculture and the Forest Stewardship Council's timber certification system to forestry. In contrast the ISO systems can be applied to a wide range of enterprises and activities including agriculture and forestry.

The Forest Stewardship Council, the ISO system and the IFOAM System all demonstrate that it is possible to have a core set of operating principles and a minimum set of standards that can be applied to a diversity of national, cultural and commercial situations.

Tables 2 and 3, below are an attempt to compare the various systems

**Table 2 - A comparison of the various "standards-based" accreditation systems**

| KEY ISSUES | NASAA | IFOAM | FSC | MSC |
|---|---|---|---|---|
| Forestry | | | ✓ | |
| Fisheries | | | | ✓ |
| Agriculture | ✓ | ✓ | | |
| Sustainability | ✓ | ✓ | ✓ | ✓ |
| Culturally appropriate | ✓ | ✓ | ✓ | ✓ |
| Food safety | ✓ | ✓ | | ✓ |
| OHS | | | ✓ | ✓ |
| HACCP model | ✓ | | | |
| Chemical use | ✓ | ✓ | ✓ | ✓ |
| Genetic engineering | ✓ | ✓ | ✓ | |
| On farm environment | ✓ | ✓ | | |
| Water impacts | * | * | ✓ | ✓ |
| Biodiversity | * | * | ✓ | ✓ |
| Soil erosion and land protection | ✓ | ✓ | ✓ | |
| Energy/CO2 | * | * | ✓ | ✓ |
| Human rights | ✓ | ✓ | ✓ | |
| Animal rights | * | * | | |
| External accreditation of certification agency | ✓ | ✓ | ✓ | ✓ |
| Independent inspection and auditing | ✓ | ✓ | ✓ | ✓ |
| Local interpretation of standards | | ✓ | ✓ | ✓ |
| Sustainable yield focus | ✓ | ✓ | ✓ | ✓ |
| Internationally recognised | ✓ | ✓ | ✓ | ✓ |
| Clearly specified input and operating standards | ✓ | ✓ | ✓ | ✓ |

* = Minor or optional focus

✓ = core focus

**Table 3 - A comparison of the systems-based approaches**

| System component or process | NASAA | IFOAM | ISO 9000 | ISO 14001 | SQF 2000 | HACCP | FSC |
|---|---|---|---|---|---|---|---|
| Must comply with legislation or regulation | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| External accreditation of certification process | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Independent inspection and auditing | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Auditing and certification of the management system | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Recognisable label | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Contractual compliance to operate within a set of defined environmental or input standards other than government standards | ✓ | ✓ | | | | | ✓ |
| External review of regional standards | ✓ | ✓ | | | | | ✓ |
| Stakeholder consultation | | | | ✓ | | | ✓ |
| Internationally recognised | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Clearly specified management system | | | ✓ | ✓ | ✓ | ✓ | ✓ |

# Appendix 1 - Report on the Winegrape Workshop

**"Application of Organic Farming Techniques to Winegrape Production" September 1998**

## Introduction

The workshop was held at Kaesler Estate, a winery and vineyard in the Barossa Valley. Approximately 40 people attended with representatives from most wine grape growing regions of South Australia and Victoria. It proved to be an important opportunity for grape growers, wine makers and researchers to explore:

- The experience of organic growers;
- Emerging techniques for pest, disease and weed management;
- Alternatives to chemicals which may become increasingly vulnerable to environmental regulatory and market pressures, especially copper and sulphur based sprays;
- Integrated pest management practices;
- Certification and accreditation systems; and
- Opportunities and constraints to conversion to organic practices.

## The speakers

1. **Jason Alexandra** introduced the day providing a brief overview of the project.

2. **Rod May** gave a profile of the organic industry covering

- The current diversity of products and production systems;
- The shortage of organic product in international markets, and buyer enthusiasm;
- The conversion process;
- The certification system; and
- An overview of pest and weed management, packaging and record keeping requirements.

Rod also emphasised that organic farming systems:

- Aim to enhance soil life and attempt to generate self regulating, diverse systems through promoting beneficial insects and crop/plant diversity;
- Allow for strategic interventions of some bio controls that are generally based on botanical or mineral compounds eg. use of copper or sulphur to control fungi;
- Use no herbicides and rely on other strategies such as mowing, cultivation or flame weeding. Weeds are therefore often regarded as the biggest challenge; and
- Must still be compliant with food laws.

3. **Leigh Verrall** - chairman of the Organic Vignerons Association (OVA)

Leigh provided a brief history of the OVA. It started in 1992 and has grown from 6 members to 80 members today. Most members are organic grape growers or are interested in organic wine grape production. OVA is accredited by AQIS. OVA can prove the process of production, uses statutory declarations from growers clearly defined audit trails and competent inspectors.

**Comparison with conventional production** - Many wine grape growers are not far off organic production. The main problems for organic production are weeds and powdery mildew.

**Weeds** - the ease of using herbicides leaves a lot of growers out of organics. The only alternatives are mulching or mowing.

**Fungi -** organic growers rely on sulphur and canola oil for powdery mildew. The oil appears to work as a preventative. Copper is used in spring to control downy mildew. Conventional growers use phosphoric acid as a curative fungicide. IFOAM has rejected the use of phosphoric acid even after a review requested by Australian growers.

Copper and sulphur may be phased out due to EU regulations and this represents a real problem for organic producers.

Healthier plants results in less mildew. Use of N fertiliser promotes fungal attacks. N fertilisation produces large cells with thin walls leaving the plant prone to attack. Legumes supply more than adequate N for the vines needs.

**Markets** - Wine grapes are priced on flavour not appearance and this suits organic production. Premiums are paid on the quality of the product.

Overseas demand is very strong. There is an on going problem of lack of supply with all available supply contracted. Demand is strong in Europe, Asia and America.

20% of German wine production is organic and Australia lags behind. There is no reason to not become organic as Australian growers enjoy the benefits of very favourable climate.

OVA maintains a national registrar of organic product to link OS buyers with producers.

Organic is also seen as a hedge against a down turn in the industry or over supply of fruit [as is predicted by some commentators]

**Establishment -** key criteria for site selection include:

- Good air movement
- Plenty of sunshine on fruit and leaves
- Good weed control before becoming organic eg. use of herbicides to eradicate couch grass before planting vines

OVA recommends the use of herbicides in the year prior to planting and even in the first year of establishment as a way of getting vines off to a good start. It is also important to build up phosphorous levels for the young vines. It is then relatively easy to maintain for 3 years organic before first major crop.

4. **David Bruer -** Temple Bruer Wines/ OVA research director

David introduced three main problems

1. Lack of supply - not really a problem but an opportunity.
2. Weeds
3. Fungi

**Weeds**

Weeds are not a problem in old vines. David uses a modified mulcher mower. The first year after he stoped cultivation he recorded a 20% drop in yield, but in subsequent years the yields returned to their former levels.

Weeds are a bigger problem in their new vineyard - 12 hectares. They have use a Smart Dyson trellis mainly to control fungal disease as it uses a thin canopy with all leaves in bright sunlight. Mowers and brush cutters and mulches are used to control weeds in the under-vine strip. These are conventionally controlled by herbicides - the alternatives are proving to be more expensive. Dodging mowers [offset wheel mowers] are good in old vines.

David emphasised the problems associated with cultivation - loss of soil structure and organic carbon, inhibition of earth worms - and stated that cultivation should be avoided where possible.

The main problem with mowing is the additional costs.

**Fungal diseases -** "need to approach it as a design issue"
Canopy density - tall thin canopies also intercept more light and reduce the vigour of weeds.

**Downy Mildew** - easy to control with copper but David would like to be able to use phosphorite (phosphoric acid) and has (is) appealing for a review of its use by IFOAM, in particular the use of phosphoric acid in the event of serious infestation.

EC Regulation 2029/92 will prohibit the use of copper and sulphur in organic systems. These are the key elements in defence against odium eg. the use of vegetable oil and sulphur sprays and early season copper sprays.

It is vital that fruit is not infected for wine making as fungal infected fruit is not an option.

Powdery mildew - growers currently rely on copper, but because this suppresses soil life the EC regulation calls for its total phase out. A modification preferred would be to introduce a step wise reduction in use of both copper and sulphur.

[Authors' note: this raises interesting issues re the scientific basis of organic standards if IFOAM reject phosphoric acid and yet organic production relies on two environmentally potent fungicides that are being rejected by the EC]

David stated the need for alternatives fungal control agents and noted some interesting research into the potential use of cultures to control these two fungi.

**Botrytis -** since becoming organic David has no problem with Botrytis and links this to a reduction in the population of light brown apple moth. This is problem for the production of botrytis riesling but good for the rest of the vineyard.

John Matts - Vineyard Manager, Penfolds Clare Estates (Southcorp)

John gave a presentation which focused on the experience of managing Southcorp's organic vineyard in the Clare Valley.

Clare Estate has 180 hectares of vineyard of which 52 hectares are organic and 27 in conversion. John emphasised that organic viticulture is not new and many commercial vineyards practice "near organic" except for their herbicide use.

Much of the production from the organic vineyards goes to produce the "Organic Red" and the "Organic White" which are mostly marketed in the UK and Europe, however in accordance with the Southcorp policy grapes go to the highest value product. As a result of this policy quite a quantity of the organic grapes are used for other products including the Bin 28 which John referred to as "poor man's grange"

Other subjects covered on the day were:
Dr Eileen Scott - University of South Australia - spoke on fungal management and R&D
Deanne Glen - Victorian DNRE - spoke on IPM

## RIRDC Project - Key questions.

| | |
|---|---|
| **1. Practices suitable for wider adoption (both ways)** | • IPM including strategies for enhancing predator habitat<br>• Soil improvement and rejuvenation techniques<br>• Fertility management techniques including composts and sod management<br>• Transition strategies - conversion strategies and risk minimisation strategies<br>• System design to minimise problems eg. trellis design |
| **2. R&D priorities for industry development - issues of commercial importance** | • A manual of sustainable/organic wine grape production based on existing work into an accessible text.<br>• Enhancement of information exchange - industry networks etc<br>• Organic industry training programs eg. TAFE, university courses<br>• Unified marketing amongst many small growers<br>• Nutrient budgeting and the role of N in quality ferments<br>• Alternative fungal management agents techniques<br>• Verification of the efficacy of various fungal control agents<br>• Weed management techniques - flame weeders, hot water, alcohol based foam weeders. |
| **3. R&D prospects - questions /issues of scientific importance** | • Transition strategies for shifting from monoculture to diverse and complex, self regulating agro ecosystems.<br>• need to do R&D into the whole system rather than fragments<br>• Do bacterial inoculants work? If so, how? Include assessment of specific proprietary products such as "Nutria life 320", BD processes. and specific use of mycorrhiza<br>• Plant nutrient and disease relationships - do different sources of nutrient (eg composts versus fertilisers) influence incidence and prevalence and impacts of plant diseases, including questions of plant mineral sugars and brix levels<br>• Roles of soil microbes and soil biological processes?<br>• Comparative analysis of nutrient cycling, budgets and leaching N&P leaching under different management systems.<br>• Enhancement of plant metabolism as a disease minimisation strategy eg. "do foliar sprays work as "bio activated" disease control agents? Include BD preparations, compost teas, kelp and fish.<br>• IPM and predator enhancement<br>• Independent analysis of what constitutes environmentally. Friendly techniques in agriculture particularly in relation to fungal control agents.<br>• Science underpinning the international organic standards - R&D into specific standards, permitted inputs and their impacts |

| | |
|---|---|
| **4. Opportunities and constraints to the adoption of organic farming** | Opportunities<br>• Strong market pull with export opportunities<br>• Existing practice of many conventional growers may parallel many of the practices required by organic standards eg existing emphasis on sound practices such as IPM, cover crops and soil management<br>• Familiarity with the QA system and the need for trace back and recording systems<br>• The market focus of the industry with its focus on quality and its capacity to niche market should enable rapid adaptation to market preferences<br>• Climate and space represents a competitive advantage<br>• Strong "tradition of innovation" in Australian wine industry<br>Constraints<br>• Image problems - organics is portrayed as fringe or unscientific, governments agencies should adopt it as a formal policy to support leading edge organics<br>• Mixed market signals emanating from Penfolds not selling there whole organic crop as organic;<br>• Lack of strong government support eg. agricultural departments;<br>• Threat of fungal invasion and the lack of potent curative fungal control agents<br>• Lack of accessible information on the certification process and on the agronomic aspects of organic crop production<br>• Increased cost of weed control<br>• "Clean culture" aesthetic of cultivated vineyard floor<br>• Perceived lack of agronomic/ entomological and biological advice |

# Appendix 2 - Report on the Dairy Workshop

## 1. Introduction

The workshop was held at the McMillan Campus (Warragul) of the University of Melbourne's Institute of Food and Agricultural Resources.

Approximately 40 people attended including 10 dairy apprentices. It proved to be an important opportunity for dairy farmers, researchers and others to explore:

- The experience of organic and biodynamic dairy farmers;
- Emerging opportunities in markets for organic dairy products;
- Techniques for animal nutrition and disease management;
- Views on land and pasture management;
- Certification and accreditation systems; and
- Opportunities and constraints to conversion to organic practices.

To start the discussion a number of experienced organic dairy farmers were invited to "tell their story." These notes are based on the speakers and the general discussions. A table summarises the findings.

## 2. The speakers

**Liz Clay** chaired the meeting and introduced the event and Jason Alexandra and Rod May.

**Jason Alexandra** introduced the project, outlining its purpose and pointing out that it is not an evangelical tour to promote organics but an R&D project that was based on recognition - "dragging a coarse net" through experience of the five industries consulted. He also described the RIRDC Organic R&D program and the elements of the research strategy.

**Rod May** spoke on organic certification and the certifying bodies. He gave a profile of the organic industry covering:

- The current diversity of products and production systems;
- The shortage of organic product in international markets, and buyer enthusiasm;
- The conversion process;
- The certification system; and
- An overview of pest and weed management, packaging and record keeping requirements.

Rod also emphasised that organic farming systems:

- Aim to enhance soil life and plant and animal health
- Attempt to generate self regulating, diverse systems through promoting beneficial insects and crop/plant diversity
- Use no herbicides and rely on other strategies such as mowing, cultivation or flame weeding. Weeds are therefore often regarded as the biggest challenge although this is less of an problem for the grazing based industries; and
- Organics must still be compliant with food laws.

Frances Porter pointed out that the Biodynamic Research Institute does the certification of BD farms.

### 2.1 The dairy farmers' stories

**Biodynamic Farmer 1** - Farmer and her husband are BD dairy farmers Gippsland They farm 420 acres, milking 100 cows plus beef and sheep. Farmer mentioned the very personal motivation of choosing to farm biodynamically.

16 years ago farmer and her husband moved from a high pressure business and a part time sheep farm in WA to the present farm in Gippsland. They liked the farming lifestyle but knew little of what to do. They started with beef cattle. To find out how to become a "good farmer" they attended McMillan courses and went to Department of Ag. They attempted to farm conventionally based on this advice.

Why do you add fertiliser? Because it is a convention. Plenty of vet bills in the first years. Why are we giving the cows so much medication? Something was wrong. This led to a questioning that led to biodynamics. Now they use no sprays and no fertilisers and no detergents. Now they are BD they have no problems, no vets used any more. Their vet is a "stranger" and hard to recognise because they haven't seen him in years. BD farming is not popular with the supply companies.

BD means life force - the life force in plants, animals and soils

You cannot be told how to be a BD farmer. It is a journey of self discovery. If you don't ask questions you will be owned. BD is about self sufficient system - farms are self sufficient ecosystems. The moment you add outside products you have "lost your soul" and you will be kept in debt - companies own farmers through debt. BD tries to cut costs. Production costs are minimal. Still own and operate a viable farm. Don't get caught.

Clean milk is defined by industry that which has a low cell count. Low cell count is not clean milk. We do not pollute. Health is the main reason for BD farming. Many of the cancers and diseases are endemic in our generation. Our parents are OK, and our children need to be protected from chemical farming, (as taught by McMillan). McMillan and sort of farming it is promoting is the problem.

The mothers of today feed the children of tomorrow. Clean milk is chemical free!

If a person's motivation is for monetary gain, you will fail. If not for your own health, it will fail. A deep commitment is required. You must believe! Peer pressure is a powerful factor against the BD farmer. They have suffered lots of jeers from chemical farmers.

**Questions and answers**
Q. How do you control mastitis? No problem therefore no treatment required. Nil
How do you control milk fever. No problem therefore no treatment required. Nil
Do you own your farm. Yes

**Biodynamic Farmer 2 (BFA)** - No help has been forthcoming from anyone - such as Departments of Agriculture - over the years. (farmer supplies Burra Foods).

He used to have sheep and cattle when a kid. No super then, only lime that was spread regularly. Then super/moly arrived. They spread super/moly in the shape of and M. on the side of a hill and the "M" turned a clearly visible darker green. They put out a bag to the acre of super/moly and then spread some lime and it went green also. The sheep got sick, the wool went green and broke. The meat was crook. They found out that lime induces/releases moly so that this created an "overdose". There was a too much moly and a toxic presence.

Started dairying using conventional dairying techniques - used dry cow and other antibiotics, super and potash. The animal health problems just seemed to keep increasing, they started using packs of 30 milk fever bottles and suffered from lots of grass tetany. Decided to use a seaweed spray instead of super/potash but still not happy. Went onto mineral fertilisers after a soil test. With a pH of 4.1, decided on micronutrients. P was tied up in the low Ph, high iron soils. He started using lime and dolomite but he didn't have enough money in the bank to put out what was recommended, so he put out half the rate on the steep, long, narrow farm. Half of the farm is too steep for a tractor so fertilisers must be spread by air. He now takes soil tests every two years now. pH is now at 5.6-5.8.

Animal health has greatly improved. No milk fever for yonks. A few bags of Causmag are still in the shed and gone rock hard like cement. They started to sneak up to now close to 250kg/fat . Production has increased dramatically from 12 litres per day to 24 litres per day. Used homoeopathic to replace antibiotics. "It works". 350 acres milking 140 cows. Buy in organic grain. For full annual production. Up to 3.5kg/head per day in bail in winter.

**Q&A** - What is the product worth? Price is about the same as conventional.
4c/litre for manufacturing bonus. 24 litres per cow. Around 3000l/day? now dropping to 1000 l /day?. The breed is one Friesian type adapted to harsh conditions.

**Organic Farmer 3** introduced with a simple experiment to demonstrate that we only see part of the picture. farmer showed pictures.

Farmers farm 200 acres with 100 cows. Leased it for $33/acre for a start. Now they are the owners practically. Never milked more than 100 cows. Farmer used to be a bad asthmatic and with organic farming is now free of medication and asthma.

Linked the health of soil to the health of the blood. The farm is a family one. All the 11 kids help. Cows all calve in February, March and April. About 180-190k protein. Not a slave to the farm. Plenty of leisure time. Planted 4000 trees.

Farmer used to be an asthmatic and his condition was aggravated by super. So he stopped using super. Put out lime and dolomite instead but got a limited response. Went back to super. Got sick. Stopped super. Looked further at soil balance, started studying, asking why - why do animals get sick? Most BD and organic farmers recognise that unbalanced soils and nutrients result in sick plants and animals. Low mineral sugar content of plants attracts insects. Mineral sugar must not fall below 4% mineral sugars. As the plant drops in sugar the insects hone in and attack. Last year rich spring pasture ready for silage making was not eaten on the farm when all neighbours lost theirs to lucerne flea. Farmer has measured 10kg mineral sugar per 100kg dry matter. Diahorrea of insects sets in when mineral sugars are high. He also has no bloat on the farm. Minerals in the ground the key. White sponge should be in the centre of the grass stalk- not hollow. No lodging when brix is right. Strong bones/strong bodies.

Healthy soil = health plants = healthy cows - 2 years since last mastitis. Milk samples have been chromatographed. 10 times the enzymes and amino acids of normal milk. Silastic or was this [Lactic acid] which determines the keeping quality is usually under 4.95 most of the time but farmers has gone to over 5.6. Unpasturised milk good to drink for weeks.
The interaction of chemicals occurs throughout the food chain right up to people.

**Questions and answers:**
How do you control weeds. ? Excess K causes thistles and docks. Soil balance is critical. farmer uses atomic extraction soil test done in US annually. Balance of soil minerals is critical. Soils have changed from pH of 4.1 to 6.5. but most of the district remains very acid.. Soil life is the critical factor - there are 4-5 billion living cells in a gram of soil. Has the change in Ph been a result of tonnes of lime over the years? No more a result of using the right balance of mineral nutrients Ron warns of the need to be careful and not to use too much dolomite. Soil should be balanced. [A bit vague on the reply! but worth further investigation - editor] .
Apple cider vinegar is used as general tonic and to promote ease of calving. It decalcifies the bones and permits greater flexibility in calf and cow.

**MARKETING - Peter Hansford**
(Peter is "the enemy" in his own words because he works for DNRE) Phone 039637 8503.
Peter aimed to give a picture of the export opportunities. Peter stated his personal commitment to organic foods (he feeds his own kids organic food out of preference).

Peter is the manager for North Asia market development program. It is part of the Victorian Agribusiness Initiative which aims to support a $6 billion export target (This has now been increased to a target of $12 billion). Looking primarily at north Asia.

The programs strategic priorities are
- Market information,
- New industry development.
- Business matching.

Recently Victoria had a visit of Korean dairy processors. The Japanese are also wanting to set up an organic infant milk plant in Australia. The plant would produce infant formula to replace conventional cows and breast milk because of concerns about pollution of cows and human milk with toxins.

Organic dairying has to become more market driven. Organic dairy products are a major opportunity in many North and South Asian Markets, eg. Singapore coming is coming on line as a market, also growing markets for organic product in Japan and Korea.

The opportunity arises due to concerns about exposure to agricultural chemicals, for example, 90% of kids in the US now showing records of exposure to harmful levels of OrganoPhosphate insecticides.

Australian organic industry is estimated to be worth $150 million pa. Japan organic industry has grown from an estimated $200 million (US) in 1990, to 1.4 billion $ (US) in 1997. Still opportunity for domestic expansion.

Victoria produces 62% of Australia's milk, 75% of the total amount of processed dairy products and 85% of Australia's exports.

There is not currently any large scale processing of organic dairy products. Japanese are interested in investing in organics in Victoria. 18% of dairy products from Victoria go to Japan.

Currently 20% of the volume of agri-exports accounts for 50% of the returns. We must increase the value added component of our exports . Products such as tea fruit juice, dairy products, juices, wine, poultry and beef offer lots of potential.

While the emphasis has been on fruit and veg production organic dairying represents a major opportunity for export.

Organics appeal to the health conscious, those with environmental concerns and the affluent.

**Questions and answers**: Concerned about Coles (BD grower)? You could lose your local market and have your price dictated by Coles.
Why should we export? Too much cost. Jason explained the different scales encountered between domestic and export. How do you grow?
Q. Is there any DNRE involvement in domestic marketing?. Alex Podilinsky pointed out that BD pioneered export marketing of BD 20 years ago. Total world production is limited by environmental factors and we can capitalise on our potential to produce high quality product. Farms are deteriorating at the same time and special expertise needs to be available and this will not and has not flowed from DNRE. Peter agreed that there has been limited attention to this, but it is slowly changing.

**Anne McDonald.** Business Victoria, (service delivery arm of Dept of State Development). Anne is responsible for the Dairy Industry, Horticulture and agribusiness. Departmental brief is to increase economic growth in the state - an investment attraction task force. Business Victoria deals directly with businesses in Vic. Some programs are available to assist with funding of networks, feasibility studies, strategic training facilities, especially to support groups or associations.

The domestic market for organics is estimated at between $A 100 and $A 150m. 30m to 50m export. Estimated growth at 15% to 25% pa. Coles now have around 200 lines of organic dry goods. 2-3 supermarkets with fresh goods only.

Anne presented a brief overview of what is happening in the organic market through Northern Europe and Scandinavia and illustrated the rate of growth with the following examples. France Fr4 billion in 1996 - estimated to grow to Fr15 billion by 2000. Demand increasing at 30% per annum. Imports increased 20 fold over the past 4 years. 2 major retail chains in France are totally committed to organic production. Sainsbury - an English retail chain - like we did last year. The French government doesn't like agricultural imports so it has started subsidising conversion to organic production. Biological or ecological certification in the Netherlands is government supported. Major supermarkets there are committed to organics.

Asia, Taiwan, Hong Kong, Malaysia, Singapore, Japan are also major markets. Problems with certification system in Japan are a result of an absence of national standards - certification occurs regionally and much imported product claims to be clean or chemical free. The Japanese Ministry of Agriculture, forests and fisheries is developing a national system and this they claim will be in place by 2000. IFOAM accreditation important for access to Japan. Many exporters don't want to touch the Japanese market because of the size of the market.

The Malaysian organic market is holding up against conventional products despite recent economic problems. There is a nexus between supply and demand of processed product. Many processors are interested but they need to find reliable supplies - a push pull situation - until a market exists growers won't convert but without suppliers a processor cannot scale up production.

Three important issues emerge.
1. Critical mass required of both growers and processors.
2. Logistics (eg transport and consolidation) BV? can help here.
3. The effect of organic on conventional systems. Very positive example of implementing a QA system.

**Discussion on business growth**
We need support for small operators to grow to larger business through natural increase. Govt wants the biggest bang for the buck and processors are the key here. Talks with Dairy Corp next week may reveal support for small producers and processors.

Jason said that large businesses grow out of small and that new co-op arrangement could be put in place. Government could help business growth if possible.

The Economic Development officer with the Baw Baw shire explained his role and offered to support and assist the development of local economy including agriculture. Will support, facilitate and assist. Have some useful connection, and contacts into organisations. He provided a networking form for those interested in establishing an organic dairying network.

**Notes on the workshop discussions**

**1. Mineralisation versus low input BD farming**
RON SMITH
Showed us his fertiliser recipe for this year based on mineral analysis:
- 20 tonne dolomite @12% on 200 acres
- 10 tonne RPR
- tonne $KSO_4$
- Ml So4 1.6?
- MlO2 1.6?

- Borax 320kg
- $CuSO_4$ 200k
- I kg cobalt
- 20 tonne lime

A BD farmer reported that after 25 years without mineral input, that everything was OK.
Nutrient budgets (input must equal outputs) processes are not used for nutrients. Manure is regarded as more valuable than the milk.

It depends on how much money is in the bank or nutrient in soils that can be withdrawn, thus not all soils are equal. 35 years only a small time trial in the geological time scales involved.

Reports about how soils change with use of BD sprays. It is worth challenging basic assumptions on how soils work and to understand that soils are built through microbial processes. Research projects which focus on the soils chemical and physical properties on farms which have mineral and/or BD inputs would be useful.

**2. Rock Powders and paramagnetism: Magnetic fields.**

This raised many issues about force and substance.
We are all farming energy. The earth is a giant alternator. Other forces are attracted by mineralisation which includes magnetism. Variations in paramagnetic forces between different kinds of rocks were described eg. Basalts compared to granites dust.
Further investigations of rock dusts and paramagnetism warranted.

**3. How do BD sprays work?**

Some claimed that this could not be answered by conventional scientific examination.
The way to progress in BD is through the mentor process and seeing the results. The scientific approach is too fragmented and not integrated. Too many factors.

There are a variety of ways to achieve the same result. With only 50 years of chemical farming, farms are still dying. Can the BD people articulate why the processes work.
Scientific knowledge is limiting.

**4. Creating living soil**

Various triggering mechanisms used to create a living soil - one which has a balance between biological, physical, and the chemical aspects of the soils. These triggering mechanisms include re mineralisation and BD sprays. Those with a track recorded were nominated as;

- mineralisation,
- grazing, as a way to activate soils and improve structure through promoting greater depth of root growth,
- diversity of plants in a pasture (up to 96 species in an Italian pasture),
- BD sprays,
- paramagnetism.

The process which stress living soils were listed as:

- use of Nitrogen fertilisers -N knocks out humus
- compaction and over grazing,
- method of applying fertiliser.
- Cell grazing, soil structure,

**5. Weeds and pests - Ceasing of herbicides and pesticides.**

Pests not really regarded as an issue for organic dairying. Red legged earth mite are not considered a problem if soil is balanced. Mineral sugars issues as noted.

Weeds are not a problem. Fear of weeds is due to a weed phobia and that they do spread on sick soils. Understanding the life cycles and relationships to soils all important for managing weeds

**6. Education and knowledge**

Questions were raised as to the value of any scientific research "Why do scientific research?" "It has been done". The communication and education needs
to be carried out. A view was expressed that the scientific paradigm is not useful for research into the dairy farming. Holism rather reductionism is required to understand the agro ecosystem.

Education was regarded as critical and the following points made about the kind and direction of education:

- biggest issue is that of education. Education, Education.(But be careful
- of the definition of education);
- why do we have so many problems in conventional agriculture with all the magic; bullets that are available - a de briefing is required to unlearn all the chemical farming dependencies;
- mentoring rather than schooling (through institutions through Mc McMillan etc) would work for those who wish to learn organic dairying - one on one mentoring is critical to change peoples attitude.
- there is a need to unlearn chemical farming concepts - unlearn what we know.

It was noted that with the sheer number of operators with an interest in organic farming a mentor system of education may not be capable of meeting the demands and that other processes may be required for transferring the knowledge of how to farm organically.

**7. Animal Health**

Prevention of problems is based on good quality pastures and not stressing animals through over grazing or over stocking. All treatments need to work with cows own immune system.

Ron Smith provided a list of home remedies and supplements. These included:

- pick up drench based on apple cider vinegar, dolomite, yeast etc,;
- homoeopathic;
- vitamin C;

These supplements must be combined with good healthy pasture. Many products are available. Not everything works for everyone. Confidence in your own ability to fix problems is important. Some vets are now using natural treatments. [Editors note: one of the local vets attended the workshop]

## 4. RIRDC Project - Key questions dairy workshop.

| | |
|---|---|
| **1. Practices suitable for wider adoption (both ways)** | • soil testing and interpretation (Albrecht etc)<br>• soil improvement and rejuvenation techniques - nurturing of soil life - triggers for firing up soil life<br>• fertility management techniques including liming, mineralisation and composts<br>• understanding of dairy cow nutrition (quality of feed issues) and sod management<br>• understanding of weed/herb ecology. life cycles and relationship to fertility<br>• system auditing and quality control<br>• use of homoeopathics and supplements like apple cider vinegar (Ron's pick up drench) |
| **2. R&D priorities for industry development - issues of commercial importance** | • case study examination of successful organic farms (extension of Doug Small's work)<br>• enhancement of information exchange - industry networks, mentor systems, etc'<br>• organic industry focus inserted with training programs eg. TAFE, uni courses<br>• overcoming scale of supply/processor demand and economies of transport issues<br>• development of organic growers co-ops to generate marketing power amongst many small growers<br>• feasibility of small and medium scale processing plants<br>• post regulation (deregulation) issues and opportunities<br>• market development - esp. exports<br>• value adding and processing/<br>• defining quality using objective measures.<br>• HACCP control plans for all organic producers required by 1999 |

| | |
|---|---|
| **3. R&D prospects - questions /issues of scientific importance** | • degrees of liming required to generate massive pH change (Ron Smith mineralisation using Albrechtian proportions)<br>• How to meet the need to do research into the whole system rather than fragments (the poverty of reductionism)<br>• Do bacterial inoculants work? and if so how? Include assessment of specific proprietary products such as "Nutria life 320", BD processes. and specific use of mycorrhiza<br>• Plant nutritional status concurs insect resistance (Ron Smith high brix levels = low insect predation - no lucerne flea problems) including questions of plant mineral sugars and brix levels<br>• relationship between fertiliser and animal disease - do different sources of nutrient (eg composts versus fertilisers) influence incidence and prevalence and impacts of dairy cow diseases,<br>• roles of soil microbes and soil biological processes?<br>• comparative analysis of production and levels of nutrient runoff and leaching (nutrient cycling, budgets and N&P leaching or runoff) under different management systems.<br>• challenges to basic assumptions re maintenance of fertility - do BD sprays work to enable ongoing production without added inputs?<br>• challenges to basic assumptions re fertility - Albrecht proportions for interpretation<br>• alternative animal treatments including homoeopathic<br>• Independent analysis of what constitutes environmentally. friendly techniques in agriculture particulary in relation to PK and pesticide runoff.<br>• paramagnetism - does it work if so how?<br>• objective analysis of the keeping qualities and nutritional qualities of organically produced milk - is it qualitatively different and if so why? |

| | |
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| **4. Opportunities and constraints to the adoption of organic farming** | Opportunities<br>• strong market pull with export opportunities and need for critical mass of producers within cartage distance of processing plants<br>• existing practice on many dairy farms may be close to the practices required by organic standards eg minimal changes required to become certified organic<br>• familiarity with the QA system and the need for trace back and recording systems<br>• the increasingly market focus of the industry and the increasing capacity of processors to niche market should enable rapid adaptation to market preferences<br>• climate and space (acreage) represents a competitive advantage<br>• strong "tradition of innovation" in Australian dairy industry<br>Constraints<br>• organic image problems - organics is portrayed as fringe or unscientific, governments agencies should adopt it as a formal policy to support leading edge organics<br>• mixed market signals emanating from lack of specific demand for organic and biodynamic produce currently being produced. Many farmers currently selling to nearest processor;<br>• lack of government support eg. ag departments;<br>• fear of "conversion losses"<br>• lack of accessible information on the certification process and on the agronomic aspects of organic crop production<br>• increased labour cost of weed control<br>• a weed and insect phobia and the "clean culture" aesthetic of pure pasture<br>• perceived lack of agronomic/veterinary advice |

# Appendix 3 - PR, Policy and Pesticides

Despite good press in some scientific journals organics continues to be consistently put down, however it seems that much of the "information" may be deliberate misinformation. The article below from PR Watch provides a useful insight into the methods used to sway public opinion.

In a Nature article on global food supply Trewavas (1999) quotes Dennis Avery[25] in reference to organic agriculture, making repeated claims of substantial problems. These include:

*"Going organic worldwide, as Greenpeace wants, would destroy even more wilderness, much of it of marginal agricultural quality."*

*"Mycotoxin contamination, and infection from the potentially lethal Escherichia coli O157, are additional problems."*

*"average crop yields [for organics] on a variety of soils are about half those of intensive farming"*

The validity of these claims and of Avery's methods is brought into question by Charman (1999). She describes consistent misrepresentation of scientific findings in what appears to be an organised campaign to capture public opinion. Due to the significance of this campaign in proliferating misconceptions the following article *"Saving the Planet with Pestilent Statistics"* by Karen Charman is reproduced below. This article was distributed electronically by OFA. It was first published in PR Watch at http://www.prwatch.org/, a Publication of the Center for Media & Democracy Vol. 6, No. 4 / Fourth Quarter 1999: Engineering Opinions on Engineered Foods.

> ***"Saving the Planet with Pestilent Statistics"*** **by Karen Charman**
> Dennis T. Avery, author of the tract "Saving the Planet with Pesticides and Plastic," proudly describes himself as a missionary. His mission: to protect and promote "high-yield farming to save wildlife."
>
> Besides writing a nationally syndicated weekly column for the financial newswire Bridge News, Avery is also the director of the Hudson Institute's Center for Global Food Issues. He travels the country and the world preaching his gospel of biotechnology, pesticides, irradiation, factory farming and free trade.
>
> According to Avery, it is the greenies and "organic frenzies" who threaten the world with famine and loss of habitat for their sacred wildlife. Why? Because farming without synthetic pesticides, petrochemical fertilizers and biotechnology would require too much land.
>
> Avery sees no problem with agricultural pollution, be it groundwater contamination, pesticide and fertilizer runoff, or even the mountains of stinking manure produced by the huge cattle, chicken and hog operations that plague increasing numbers of rural communities. He denies that there is any link between pesticides and cancer or other illnesses. In fact, he says, organic food is what will kill you.
>
> Last Fall Avery began claiming that "people who eat organic and 'natural' foods are eight times as likely as the rest of the population to be attacked by a deadly new strain of E. coli bacteria (0157:H7)." This happens, he says, because organic food is grown in animal manure, a known carrier of this nasty microbe. He says his data comes from Dr. Paul Mead, an epidemiologist at the U.S. Centers for Disease Control (CDC), the federal agency that tracks outbreaks of foodborne illness.

[25] Avery, D. in Fearing Food. Risk, Health and Environment (eds Morris, J. & Bate, R.) 3-18 (Butterworth-Heinemann, Oxford, 1999).

Avery continues delivering this message with op-eds that bear titles such as "The Silent Killer in Organic Foods" and "Wallace Institute Got it Wrong: CDC Data Does Indicate Higher Risk From Organic and Natural Foods." These editorials are diseminated by Bridge News to between 300 and 400 newspapers throughout the country and approximately 500,000 other subscribers here and abroad including government departments, central banks and businesses.

I heard Avery's sermon live in June 1999 at the National Agricultural Biotechnology Council meeting in Lincoln, Nebraska. After his talk I asked him why he quoted the CDC as the source of his information when they deny having data attributing E. coli 0157:H7 outbreaks to organic food. He accused CDC of engaging in a "cover-up" due to pressure from environmentalists.

Back home I noticed more than a couple of similar stories popping up in various venues. One particularly sloppy story, titled "Organic Food Creates Higher Risk for Food Poisoning," was posted on August 25, 1999 on USDA's National Food Safety Database by US Newswire, a service that electronically disseminates news releases. Though this story doesn't quote Avery, it quotes the CDC's Foodborne and Diarrheal Diseases Branch chief, Dr. Robert Tauxe, saying, "Organic food means a food was grown in animal manure."

Tauxe denies ever making that statement and says he believes the rumor originated with Dennis Avery. After fielding numerous media queries on the subject, CDC took the unusual step on January 14, 1999 of issuing a press release stating, "The Centers for Disease Control and Prevention has not conducted any study that compares or quantitates the specific risk for infection with E. coli 0157:H7 and eating either conventionally grown or organic/natural foods." In addition, Tauxe says he called Avery to tell him to stop claiming that the CDC was the source of this allegation. Avery responded by telling Tauxe, "That's your interpretation, and I have mine."

Avery's newest version of what happened with the CDC is that Dr. Paul Mead, an epidemiologist who works in Tauxe's division, gave him the information. Absolute bunk, says Mead. "What happened is that he called me up and announced that eight percent of the outbreaks of foodborne illness were from organic food. I took some exception to that and said I didn't know him and what his purpose was, but our data don't support that." Mead was chagrined to hear that a year after this conversation took place, Avery is still sourcing this phantom data back to him.

Contrary to Avery's claim, E. coli 0157:H7 contamination from manure is less likely to occur on organic farms than in the factory farming system that Avery supports. Fred Kirschenmann is an organic farmer and board chairman of the private organic certification company Farm Verified Organic. He points out that a single cow produces approximately 10 times as much fecal matter as a human being. This means that a feedlot of, say, 5,000 head of cattle would produce the same amount of manure as 50,000 people. Yet modern conventional agriculture does not regulate the use of raw manure in food crops, Kirschenmann says, and farmers are spreading increasing amounts of it on their fields because it is too expensive to truck away and they don't have anywhere else to put it.

Kirschenmann serves on the National Organic Standards Board which was charged by Congress to advise the USDA in formulating its legal standards defining organic food. "In organic systems, most animals have to have access to pasture, so they can't be concentrated in huge feedlots," he says, adding that Avery's charge that organic food is grown in manure is misleading, at best. "Organic farmers use manure, but virtually every certification organization I know of doesn't allow raw manure. Raw manure must either be composted or applied long enough in advance that the bacteria is no longer active," he said, adding that this requirement is being written into USDA's proposed rules.

Dr. Robert Elder, a research microbiologist at the USDA's Meat Animal Research Center in Clay Center, Nebraska, specializes in measuring E. coli 0157:H7 in cattle. He says this deadly bacteria could be prevented from contaminating meat carcasses before they are ground into hamburger. "If you took meticulous time with every single carcass to vigorously clean it, scrub it, and wash it down, you could probably eliminate it," he said. But, Elder added, considering that the bigger plants are processing 3,000 to 4,000 animals a day--about 300 an hour--adequate cleaning is impossible. And that is a huge problem for the public. Elder's soon-to-be published research shows that in the summertime, when E. coli 0157:H7 levels peak, 80 to 100 percent of the feedlot cattle he tested carried the deadly 0157:H7 strain.

Despite a public debunking of Avery's statements in the New York Times last February, his bogus claims continue to spread and appear to be gaining momentum. U.S. newspapers like the Las Vegas Review-Journal, Investor's Business Daily, and the Journal of Commerce have run stories about killer organic food. The story has also made its way to Canada and Europe, under headlines such as, "Organic just means it's dirtier, more expensive," "Organic food--'It's eight times more likely to kill you'" and "Organic food link to E. coli deaths."

Even E. coli expert Rob Elder said he wouldn't eat organic food or feed it to his family because it was more pathogenic. When I asked where he got that information, he sent me a copy of an Avery piece, "Organic food? No thanks!" that appeared in the Wall Street Journal last December. Upon further questioning, Elder said a colleague had given it to him and said that Avery worked for the CDC, so he thought it was a credible source.

I asked Sally Heinemann, the editorial director of Bridge News, if its syndicated columnists had to meet any particular criteria and whether Bridge checked the accuracy of Avery's columns. Instead of answering, she began shouting, "Who are you? Who do you represent? What do you really want to know? Go find it on the web!" before slamming the phone down.

Avery says he can pretty much say what he likes, because he works for himself as an economic forecaster to farming organizations and doesn't have to worry about anybody firing him. Referring to his past employment with the US State Department and USDA, he adds: "I have full federal retirement, and I already own the prettiest small farm in America." He considers the $35,000 a year he gets from the Hudson Institute to be very little, and says he only needs money "to carry on the mission."

Avery acknowledges that Hudson is corporate-funded. Looking over the roster of companies that have supported its work--agrichemical heavyweights like Monsanto, Du Pont, DowElanco, Sandoz and Ciba-Geigy and agribusiness giants ConAgra, Cargill, Procter & Gamble, among many others--Avery likely has no reason to fear the axe. His mission is their mission.

[for more on such attacks on organics go to http://members.tripod.com/~ngin/pb.htm or http://members.tripod.com/~ngin/organic.htm]

# Appendix 4 - The Global future of organic agriculture

## Free trade or fair-trade - Which way for the WTO?

The protests opposing “free trade” in Seattle in 2000 and Melbourne in 2001 demonstrated the controversial nature of globalisation and global trade rules. Governments of rich and poor countries, industry and other lobby groups hold different positions about what is desirable and useful in the reform of the World's trade rules.

While Seattle was inconclusive it is clear that more of the global community is learning what Australia's farmers have known for decades - trade and trade rules are central to international relationships. Whether we like it or not the rules have a bearing on the lives of billions of people, and a huge impact on the profitability and viability of export orientated primary industries.

The effects of subsidised agricultural production or of restrictive trade policies are well documented. Currently Australian agricultural exports try to compete in a range of protected markets or against directly subsidised agricultural production. In an effort to counter this Australia has led the Cairns Group in advocating liberalisation of agricultural trade. But as the US lamb dispute graphically illustrated free trade rhetoric is often over ridden by domestic politics. Many countries see subsidises for agriculture as justifiable in terms of domestic food security or for protecting rural cultures and communities.

Predicably, these different positions clashed at Seattle. To understand what happened we must also try to understand the non-government agendas - many of the protestors and lobbyists in Seattle want labour standards, human rights and environmental standards respected and incorporated into the World trade rules. Therefore Seattle may mark the beginning of much bigger debate and even a turning point - the *free trade agenda* may be swept aside by a larger agenda of "*fair trade"*.

The critics of free trade claim that it will result in the erosion of national standards in all countries as they scramble to compete against the countries with the lowest standards. Throughout the world people are asking "Do we want free trade if it means having to compete against countries with lower labour, human rights and environmental standards? Is there another way?"

**Is multi-functional agriculture another name for landcare?**

Western Europe has some of the most heavily subsidised and regulated agriculture in the world, yet, public confidence in agricultural industries and science is at all time low due to mad cow disease, the recent dioxin contamination and escalating fears about biotechnology. Growing concerns about environmental impacts and relationships have focused community and government attention on increasing efforts to protect the environmental and cultural aspects of agriculture as well as ensuring safe and high quality food.

The Europeans are now advocating that the concept of multi-functional agriculture should be a central plank of agricultural and trade policy. The policy of multi-functionality is in recognition that agriculture is not like a big factory and there is more to it than simply the efficient production of food and fibre. They argue that agriculture and farming communities have important roles in managing landscapes, maintaining cultures and in delivering environmental services - like clean water, carbon sequestration and biodiversity protection.

Multi-functionality is a concept we should not have too much trouble in accepting in Australia. While the terms used by the Europeans are different they sound surprisingly like landcare.

For the past decade, Australian land management policies have been innovative and progressive. Landcare policies and programs have evolved from an early focus on soil erosion and sustainable agriculture to a broader focus on biodiversity, water and rural communities. These policies have been

widely acclaimed and there is now widespread talk that we should be exporting our landcare know-how - a global framework of multi-functionality may be the platform for this.

In effect, Australian governments and farm and environment organisations have recognised the multi-functional nature of agriculture for years and we should welcome the European Union's adoption of this ideal.

In international trade forums shouldn't Australia welcome the concept of multi-functionality and then be trying to determine what kinds of mechanisms are useful to support it? Obviously we would continue to argue against direct price support for agricultural production.

While some claim that "multi-functionality" is simply another excuse for subsidising production in Europe it probably represents an important change in direction to the trajectory of 20th century agricultural development and trade policy. The concept of multi-functional agriculture is gaining wider currency and starting to influence international debate on agricultural, trade and development policies (see FAO http://www.fao.org/mfcal). Should we prepare for it being a central part of the next WTO round?

**Is Australian agriculture really free of subsidies?**

Lets consider what might happen if the multi-functional agenda gets up. Instead of focusing on price subsidies governments might need to look more closely at the wider issues of how agricultural systems interact with rural communities and the environment.

What will be the trade implications of natural resource policies or environmental subsidies and standards being placed on the WTO agenda?

The debate to date about agricultural subsidies has focused on price support or market subsidies and ignored input subsidies including price and access to environmental or natural resources and pollution standards despite these being recognised as determinants of both trade competitiveness and environmental degradation.

Could Australia's claim of being free of agricultural subsidies be contested at the WTO if environmental standards or access to natural resources were included in the equation? What effect would this have to our capacity to access export markets?

Is the right to exploit the environment an agricultural subsidy? If so how can it be measured and how can it be proven that one country exploits its environment more or less than another does, or beyond some acceptable standard?

If Australia's claimed lack of agricultural subsidies is successfully contested, various industries may face loss of major markets or rapid adjustment in order to retain them. For example, the EU has recently expressed interest in the level of subsidies provided to Australia's irrigation industries and is presumably keenly watching over the water reform process.

In recently published work on "the Sustainability of Irrigation" Dr Terry Heiler [26](1998) categorically states that "continued access to important global agricultural export markets may depend upon an ability of agricultural exporting countries to demonstrate that water resources are being used sustainably in agricultural production systems"

He also emphasised that the EU is actively examining the environmental, policy and legal standards that operate in its main competitor countries and states that "irrigated agriculture is a prime candidate for EU attention, especially in the Australian environment. The ability to demonstrate acceptable

[26] Terry Heiler is a Director of Landcare Research NZ

actions in regard to sustainable irrigated systems will be essential in any international debate. Prudence would suggest that a pro-active national strategy should be developed..."

Finally he concludes by warning that " agricultural exporters need to be alert to EU initiatives to link trade access to compliance with sustainability standards..."

Water is not the only resource that could be the focus of international attention. Analysis undertaken for Environment Australia (1996) by the National Institute of Economic and Industry Research estimated that the value of environmental and natural resource subsidies across a range of industries, including agriculture was approximately $13 billion. This is equal to an estimated at 3.2 to 3.5 % of GDP (Environment Australia 1996).

What about indirect subsidies? While Australia farmers are not subsidised by way of government price support, there are generous tax provisions such as accelerated depreciation and landcare tax rebates, grants programs and so on.

There are still large direct budgetary outlays (as well as income forgone) used to support agriculture. About $5 billion has been spent on landcare type program in the last decade and about $7.5 billion on agricultural R&D. The Industry Commission Report into State Assistance (1996 page 115) found that State Government assistance to agriculture in 1995-95 "was equivalent to 3% of farm-gate value of agricultural output". The level of support almost doubles to approximately 6% when the Commonwealth (1993-94) expenditure of over $500 million is added (IC 1996 page 10). This is approximately 6% of the value of farm gate output and therefore an equivalent to a significant percentage of profit.

Effective assistance (outlays and income forgone) to agriculture now exceeds manufacturing (IC 1996 page 9). "State and territory budgetary assistance to agriculture is directed primarily at lowering the costs of many of the inputs to agriculture" but "outlays provide little assistance which directly increases returns from farm outputs. Hence they have little influence on the measured output assistance - the nominal rate of assistance to agriculture" (IC State Assistance Inquiry 1996). In other words there is little of the conspicuous price support so decried by proponents of free trade, but combining State and Commonwealth assistance brought "the total effective rate of assistance to agriculture in that year [1993 - 94] to 19%."

While the above figures reflect outlays and income forgone they do not attempt to take into account of any environmental subsidies or a wide range of environmental values affected by agriculture.

Australian agricultural industries appear to be in receipt of sizeable government assistance, including environmental and natural resources subsidies. As a result, they may be particularly vulnerable if these kinds of subsidies are successfully contested through WTO, or if environmental or resource subsidies are placed on the agenda.

It would appear prudent to start identifying strategies and options that will prepare industry and governments for the eventual inclusion of environmental subsidies into the WTO agreements.

Analysis is required of the kinds of risks and challenges that could confront industries due to the environmental and trade policy contexts that they operate within. It would be a good idea to put these issues on the research, policy and industry agendas in a precautionary, neutral and non-confrontational manner, prior to the trade issues reaching "fever pitch".

## Two scenarios

Several important policy issues were raised at the workshops.

National and international policy issues have huge and direct relevance to the expansion of organic agriculture in Australia. Therefore this paper cannot focus only on the technical issues of organic

production without also examining some of the policy issues which will set the overall operating context. Just as markets are made up of people, policies (and policy processes) are made by people.

Government policy affects private sector investments in agriculture. While it may be tempting to think that the relationships between government and the private sector will continue in much the same manner as today, transformative social and technological processes can and do occur rapidly - witness the recent debate about GMOs.

Taking into account the dynamic nature of international market relationships and the complexities of international trade negotiations two contrasting scenarios to illustrate entirely different operating contexts for organic agriculture have been prepared.

## Scenario 1 - leave it all up to business

In this scenario the role of the nation states continues to diminish to the point of irrelevance to the globalised markets serviced by competitive merchant traders.

Organic standards for agriculture become the accepted production standards for the environmentally aware markets in the affluent north[27] - especially Europe - and the wealthier inner city and coastal suburbs of Australia.

Pressure to comply with environmental standards is almost entirely driven through market chains. Government policies are regarded as little more than irrelevant, political window dressing prior to elections. The traders' main expectation of governments is that they ensure the operation of contract law.

Sophisticated commercial networks ensure the integrity of audit trails. Electronic communications are used to assist in the auditing and verification of product and their sources. The *Emailing* of digital images and the use of bar coding on product and product labels are common place.

Corporate image and reputation are regarded as the paramount assets of the new trading cooperatives and conglomerates. They never put their reputations at risk by sourcing goods or services from suppliers who are not completely transparent about their ethical obligations - both social and environmental.

Human and animal rights groups and the environment movement have waged powerful global campaigns aimed at getting companies to clean up their act.

In perfect hindsight the stock broking fraternity refers to the Ok Tedi incident as the beginning of the new era of awareness.

EMS and corporate environmental reports are now scrutinised more diligently than company balance sheets after the value of numerous blue chip companies plummeted due to embarrassing environmental liabilities.

Several landmark court cases found companies responsible for the ethical performances of their suppliers. This fundamentally changed the nature of the way business was done and increased what became known as *commercial transparency obligations*. Daily updates of EMS reports are regularly scrutinised on the worldwide web by a new breed of investment analyst[28].

Government barely imposes any regulation on business but the powerful corporate sector has successfully demanded stringent truth in labelling laws and the streamlining of the legal system in

[27] North is used here as in the international development literature to refer to the nations of the Northern hemisphere - not the north of Australia.

[28] Tomorrow magazine already publishes EMS report cards on trans-national businesses.

order to expedite the settlement of numerous commercial disputes about product quality, contractual obligations and environmental performance.

A new global Environmental Standards Review Tribunal has wide-ranging powers in relation to establishing baseline standards for environmental performance. It also commissions extensive research in an effort to have science-based standards for production.

Powerful agribusiness corporations dominate the primary industries. Farmers have difficulty gaining access to markets for their products unless they have satisfactory environmental management systems in place, or they are certified to IFOAM standards by a credible certifying organisation.

In Australia, in line with the small government ethos of the late 1990s most industry development and advisory functions of government agencies have been abolished. In fact, most departments that had an industry focus have been abolished at the behest of the private sector.

Many redundant staff from the disbanded Primary Industries and/or Agriculture Departments now either work for the international corporations or work as independent auditors and environmental advisers.

Some work as advocates before the Environmental Standards Review Tribunal. Many fondly remember the days in the 1990s when they were paid to encourage the voluntary uptake of Landcare practices - singing over their beer *"those were the days to be on a government payroll"*.

## Scenario 2 - The GATT Agreement of the new Millennium

Update The 2001 joint sitting of the WTO, the IMF, FAO, and the UN Security Council and UNESCO reaches a historical agreement to introduce an entirely new regime of trade and environment rules aimed to guide the global community out of escalating environmental and economic chaos.

Unprecedented global cooperation on the need for radical reforms arose following the Asian and South American financial crisis of the late 1990's. The impact of the crisis was exacerbated by an extended period of economic turmoil and climatic chaos attributed to the greenhouse effect.

Successive international reviews provided the foundation for the new integrated regime of commercial and environmental trading rules that set the policy agenda for the new Millennium.

These reviews found that the unintended impacts of the GATT and WTO agreements of the 1990's were totally unacceptable and strongly recommended a major shift away from free trade to the concept of fair and directed trade.

The abysmally slow progress of the international environment agreements of the late 20th century also added weight to the reform agenda.

Various strategies and treaties had proven to be little more than well-intentioned wish lists. Reviews of Agenda 21, the Global Greenhouse Convention, the Desertification Strategy and the Convention on Biodiversity demonstrated beyond doubt that unless international conventions and treaties are backed by supportive trade rules they have little real capacity. The demise of Iraq, Pakistan and Indonesia ??? demonstrated the awesome power of trade embargoes in the globalised world economy.

New trading rules were deliberately designed to introduce a regime of global earth-care and conservative development after the failure of now disreputable compromise policies of the era of "*sustainable development*" (Sachs 1992).

Stringent targets and tight time lines for phasing in the new rules caught many countries off guard and resulted in considerable domestic upheaval as natural resource, pollution and environmental protection policies were hastily upgraded in order to avoid trade sanctions.

Despite a vocal corporate sector calling for governments to introduce prompt and comprehensive reforms many companies suffered enormous commercial penalty merely as a result of their nominal country of location. They pleaded to be granted "*flag of convenience"* status but were caught completely off guard by the new trading rules.

For the first time in decades, Governments were seen as having important roles in accelerating the adoption of best practice in environmental restoration.

With the backing of the powerful international financial, trade and environment organisations the ailing Australian public sector became reinvigorated. It had a clear sense of purpose. The political masters supported the introduction of stringent environmental regulation (They had little choice when faced with the threat of trade sanctions). All commercial activities that effected the environment were regulated ruthlessly but fairly and equally with no special arrangements for different sectors - petty officials sprouted the official line "*pollution is pollution so it doesn't matter what you do, if you make a mess its your responsibility"*

Inter-locking environmental management strategies (public sector) and private sector environmental standards created consistent operating frameworks.

Private sector standards linked into regional and national plans and policies. Wide-ranging incentives and tradeable rights systems were used to induce rapid change.

Specialised trading houses were established to trade CO2, and pollution licences under stringent government guidelines that mandated rapid total reductions in emissions. Companies that failed to meet environmental standards lost their operating licences to those waiting in line to gain access to the privileged markets for pollution.

Global finance, mining, energy and transport companies became the major investors in Australian land, financing revegetation on a scale that made the National Heritage Trust (sale of Telstra mark 1) look like a picnic race meeting, through leveraging modest income derived from carbon credits.

The pre 2005 scramble to purchase enough carbon credits sent the value of $CO_2$-sink companies booming in markets reminiscent of the Internet stocks during 1999.

Bio-diversity conservation became another rapid growth area on global share markets. Tourism, water and fishing industries buy up large areas of coastal catchments and vast amounts of tradeable water rights in order to give their business a competitive advantage and enhance their environmental credentials.

$CO_2$ traders and biodiversity speculators pay large bonuses to organic farming syndicates that now control most areas of extensive agricultural production in Australia.

A few areas of chemical intensive agricultural production are permitted within the stringent planning and landuse zoning systems that are now in place. These are regraded as toxic sites and few people visit them. They have limited access to world markets and are regarded as toxic no go zones.

Few people wish to visit these *toxic sites.* However, several universities have longitudinal studies under way to determine if the prevailing "myths" about these regions are accurate. The popular press continues to report that these regions are intense cancer clusters that are also prone to high rates of genetic defects due to the influence of pseudo estrogens, but well paid (private) medical researchers continue to argue that there is no evidence to support these claims. Advanced social research

demonstrates that the majority of people believe that this debate a "modern" example of the nicotine /cancer denial that continued for 30 years in the previous century and get on with their (healthy) life.

*Scenario conclusions: Regardless of whether environmental responsibility is driven by public policy processes or markets, the change is coming and could come quickly.*

# Glossary of Terms

**Accreditation (organic, FSC, ISO) -** The successful outcome of compliance checks or audits of an organisation undertaking certifications. Thus the organisation is competent to perform the task of certifying enterprises. For example, organisation X is accredited by government, JAS-ANZ, IOAS, etc as competent to undertake the processes necessary to certifying compliance with a particular standard.

**Adaptive management** - A management approach that selects actions most likely to succeed in improving an environmental system and modifies the approach based on monitoring the system, the outcomes and resultant change in understanding.

**Baseline** - Reference point or standard against which processes and activities are assessed.

**Benchmark** - A reference or standard as for baseline - except that a benchmark sometimes refers to a goal or a target, for example, optimum water levels in a wetland.

**Biodynamics** - Biodynamic farmers apply the philosophy of Rudolf Steiner to enhance an organic production system.

**Certification** - In organic standards, FSC or ISO, certification refers to a business, organisation, producer or processor that is certified to be operating in conformity with a particular standard and therefore to use a particular label. Certification is granted by an accredited certification organisation (see above).

**Certification Agency -** An organisation with the capacity or right to certify (as above)

**Eco-labelling -** A general term for any form of labelling which implies a product or production process is environmentally friendly, regardless of whether there has been a certification process.

**Ecosystem** - The combination of all biotic (living) and abiotic (non-living) components of a system, and their interrelationships, including human activities. It is possible to refer to local ecosystem eg a wetland, a regional ecosystem or the global ecosystem.

**Ecosystem health** - The capacity of an ecosystem to function in a healthy fashion, usually an aggregate measure of a range of functions such as water use and nutrient cycling.

**Ecosystem integrity -** The capacity of a system to continue to function in an integral and robust fashion, maintaining resilience and internal checks and balances.

**Environmental management -** A broad term covering all aspects of management that has a focus on the environment and environmental outcomes. In Australia this tends to be arbitrarily separated from natural resources management. However, much international literature recognises natural resources as those components of ecosystems that have direct value to humans, and that can be re-sourced or sourced from the environment on a renewable basis if certain limits or thresholds are adhered to. Thus resources and ecosystems are related but different. For example an estuary provides a range of ecosystem services by virtue of its dynamic processes such as nutrient recycling, waste assimilation, climate modification etc and as part of the resultant biological processes a renewable resource (fish stocks) are available for harvest.

**Environmental audit -** The systematic examination of an organisation, facility or site, to determine to what extent it conforms to specified environmental criteria based on local or national or international standards, laws or regulations. An audit can be undertaken independent or by affiliated persons, but for organic certification purposes an independent or third party auditor or inspector is required.

**Environmental Management System -** Environmental management systems or EMS are used as a generic term to describe any systematic management approach used by an enterprise or organisation to manage the environment.

**Environmental Management System Audit -** The audit of an EMS by a third party to ensure that processes used within the system comply with the stated standard.

**ESD -** Ecologically sustainable development as defined in Agenda 21 (UN 1992) or the National Strategy for Ecologically Sustainable Development (C'wealth 1992).

**Indicator -** Something observed or measured to reflect the status of a system, like an oil pressure gauge on an engine. Indicators are central to monitoring and reporting on the state of the environment (as per SOE). OECD countries have agreed to use pressure, state and response (PSR) indicators for SOE reporting.

**Monitoring -** Repeated observation and recording of *findings* over time.

**Natural resource management** - A term commonly used in Australia to means land and water management and therefore a large subset of "environmental management. It is also used widely overseas where it generally includes other resources such as fisheries, forestry and minerals.

**Organics and Organic Agriculture** - In this document refers to all systems of organic agriculture that are certified including biodynamic systems

**Standards or organic standards -** The standards used by certifying bodies that specify certain production or processing standards.

**Targets -** Targets specify measurable outcomes to be achieved within specified time frames. Targets permit managers to evaluate whether an agreed action has been carried out and its effectiveness in improving environmental conditions.

**Threshold -** A point at which a system changes discernibly, often referring to the point at which a stimulus is strong enough to produce a response, or a border or limit at which effects are produced.

**Trigger** - A unique form of target that triggers action to address a problem, or a change in management direction.

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