Australian Government
Rural Industries Research and Development Corporation

The Olive Industry–
An environmental management systems framework

A report for the Rural Industries Research and Development Corporation

by Nelson Quinn

October 2004

RIRDC Publication No 04/057
RIRDC Project No R03/350 NEL-1A

ISBN 0 642 58767 1
ISSN 1440-6845

An Environmental Management Systems Framework for the Olive Industry
Publication No. 04/057
Project No R03/350 NEL-1A

Researcher Contact Details

Nelson Quinn
109 Holmwood Road
Wallaroo via Hall 2618

Phone: (02) 62 302 372
Fax: (02) 62 302 940
Email: aranmohr@austarmetro.com.au

In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

RIRDC Contact Details

Rural Industries Research and Development Corporation
Level 1, AMA House
42 Macquarie Street
BARTON ACT 2600
PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4819
Fax: 02 6272 5877
Email: rirdc@rirdc.gov.au.
Website: http://www.rirdc.gov.au

Published in October 2004
Printed on environmentally friendly paper by Canprint

Foreword

Those involved in the rapidly growing olive industry in Australia are conscious of the need to identify, analyse and elaborate the critical factors for continuing success.

Along with other rural based industries, the impact on the environment is one of the factors under increasing scrutiny from the general public and governments at all levels. There is an international dimension because of trade and the growing number of international agreements relating to environmental issues.

This report includes proposals for more detailed development of practices beneficial for the industry and the environment from nursery to consumer.

This project was funded from RIRDC Core Funds which are provided by the Australian Government and is an addition to RIRDC's diverse range of over 1000 research publications. It forms part of our New Plant Products R&D program, which aims to facilitate the development of new industries based on plants or plant products that have commercial potential for Australia.

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

- downloads at www.rirdc.gov.au/fullreports/index.html
- purchases at www.rirdc.gov.au/eshop

Simon Hearn
Managing Director
Rural Industries Research and Development Corporation

Acknowledgements

Many people from the olive industry, government agencies, industry associations, and research organisations have contributed to this report. They have provided information and ideas, and have been a sounding board for thoughts on the way ahead, although naturally I take responsibility for the conclusions and proposals. I also put on record that as well as being an olive grower and Director of a processing company I am an active member of olive industry associations and the Landcare movement, and I am a Director of Austalian Landcare Management System Ltd, the not-for-profit company established to support development of the Australian Landcare Management System as an approach to region or catchment based local environmental management systems.

Nelson Quinn

Contents

Executive Summary

This report seeks to provide a basic description of environmental management systems, the international standard for them, their potential benefit for all levels of the industry, to identify issues relevant to their acceptance and implementation, and to propose positive action to establish an environmentally responsible olive industry and successful adoption of continual improvement processes. The proposals involve:

- embracing a culture of ecological sustainability and continual improvement
- industry association leadership at national State and regional levels
- developing systems to suit the needs of all sectors and scales of the industry
- lobbying for changes in government policies to improve the chances of success
- increased research, and
- an increased rate of industry association membership and of network development.

The report includes descriptions of environmental management systems, including that based on the international standard (ISO 14001) and various possibilities developed by industries using its core principles. A fundamental conclusion is that the best course for the olive industry is to base its environmental management practices on ISO 14001.

There are many benefits from using environmental management systems, such as some cost reductions, an integrated planning and management approach, long-term sustainability, public acceptability and improved health and safety.

There are many risks for the industry that can be reduced or managed by improved environmental practices, thereby reducing the level of uncertainty traditionally besetting rural based industries in Australia, such as climate variability and the vagaries of international trade. These risks include declining terms of trade, climate variability and global warming,, local, national and international regulatory pressures, changing consumer expectations, availability of water, the potential of olives to become weeds in some places and circumstances, chemical use and waste generation by all sections of the industry and consumers.

The environmental impacts of the industry are fairly easily identifiable, as its various elements parallel many other rural, food processing, wholesale, distribution and retail activities.

They include impacts on natural resources, the effects of artificial and other concentrated chemical use and energy use, greenhouse gas generation and generation of waste.

The report suggests that some broadly based concepts should underlie the development of environmental policies, practices and management systems for the industry. These include comprehensive business and property planning, effective change mechanisms to overcome resistance to new approaches, sustainability, positive application of the precautionary principle, resilience, life cycle analysis, zero waste and quality assurance. These principles can provide a basis for a highly adaptive approach that will stand the test of time and deliver continual improvement.

There are several practical problems to be overcome. There is a need to ensure that all involved in the industry understand the relationships among their enterprises, the natural environment, community expectations, regulatory systems and market needs. The impact on biodiversity can be used to define and illustrate many of these relationships.

Many people may need convincing that the effort is worth it, and that new systems are just not yet more cost and paperwork impositions.

There must be adequate support systems – training, extension services, useful research outcomes, facilitators and co-ordinators and supporting material.

There is a strong case for using existing networks, such as industry and Landcare groups, to facilitate changes and avoid isolation.

It is preferable that enterprises do not rely on simpler systems, as they are often not comprehensive and risk falling behind community expectations.

There is a case for several institutional changes, such as public reporting of enterprise environmental management activities, integration of industry environmental systems with regional and catchment planning and overcoming the emphasis on a production paradigm that inhibits development of systems to incorporate a value for the externalities of food production in the prices consumers pay, or to provide equivalent compensation to producers.

There are already many support systems available that the industry can use. These include national and State or Territory programs fostering environmental management systems, improved environmental performance and industry innovation.

Several industry groups have developed relevant processes and guides.

Holistic planning that treats humans, their economies and the environment as inseparable is one basis for developing environmental management systems. Quality management systems can be used in a similar way, particularly any based on the work of Dr W Edwards Deming.

There is a growing sustainable agricultural movement supported internationally and locally by interest groups, governments, research institutions and the Landcare movement.

The olive industry is already developing relevant arrangements, such as the Olive Care course and HACCP arrangements tailored to industry needs. The Australian Olive Association and NSW Agriculture have produced a publication on organic olive management.

Some industry models, such as those for forestry, civil construction, and fruit and vegetable growing in Queensland, have features useful for the olive industry. They illustrate how environmental improvements can be made, while accommodating different levels of interest, knowledge, commitment and resources.

The Australian Landcare Management System is a farmer-developed model for applying an internationally recognised and audited management system, establishing mutually beneficial links with catchment or regional priorities and strategies and requiring continuous support for biodiversity conservation, perhaps the major touchstone for measuring environmental well-being in Australia.

Broad elements for training courses are included, as well as recommendations for further industry and individual enterprise action.

1. Introduction

The olive industry is a part of our natural environment. Nurseries, farms, processing and distribution, sales and consumption all contribute to changes to that environment, as these elements rely directly or indirectly on natural processes. Olives can be weeds and all parts of the industry generate waste. Industry and government programs, trade relations and local, State and Territory or Commonwealth laws are all influenced by the community's desire for good environmental management, safe, quality food, avoidance of health problems and provision of a safe working environment.

It is therefore not feasible for any industry, including the olive industry, to be developed and maintained without regard to its impact on the surrounding environment. Nurseries and olive groves also benefit directly from thriving, life-supporting ecosystems.

Olive industry development in recent years has involved a great deal of planning, including for effective management systems, by many enterprises from the smallest to the biggest. How environmental issues are dealt with affects financial returns. Positive action can lead to a reduction in costs. If these issues are ignored costs can rise, for example, through energy wastage.

One way to meet both environmental and management needs is to use environmental management systems. These involve a comprehensive, planned and systematic approach to managing environmental issues. As all aspects of the olive industry are inextricably entwined with environmental issues, these systems complement and support other business planning and management systems.

This report seeks to provide a basic description of environmental management systems, the international standard for them, their potential benefit for all levels of the industry, to identify issues relevant to their acceptance and implementation, and to propose positive action to establish an environmentally responsible olive industry and successful adoption of continual improvement processes. The proposals involve:

- embracing a culture of ecological sustainability and continual improvement
- industry association leadership at national State and regional levels
- developing systems to suit the needs of all sectors and scales of the industry
- lobbying for changes in government policies to improve the chances of success
- increased research, and
- an increased rate of industry association membership and of network development.

The olive growing industry is spread across all States and the Australian Capital Territory. Many of the issues relating to the environment are common to all, even if the emphasis changes from place to place. Because of this background this report has been prepared from a primarily national perspective. Acceptance of the way forward suggested in it will require action at national, State or Territory, and local level.

It is commonly said that it is hard for an enterprise in the red to be green. Although not directly the subject of this report, the profitability of an industry can be one of the important determinants of how environmentally sensitive an industry becomes. This reinforces the need for the industry to give simultaneous priority to profitability, quality and environmental issues.

2. Environmental management systems

An environmental management system is a process for identifying and managing the environmental impacts, risks and opportunities arising from an activity.

These systems can be quite simple in scope and operation if applied to a single, or few, items. They become increasingly complex as they cover more and more elements of a complex operation.

A primary motive for use of these systems is to achieve reduction of adverse impacts on the environment. Regardless of the level of intensity or range of a system, the process needs to include:

- an environmental policy backed by a commitment to work towards its goals
- a plan to work towards the goals, including implementation action, which may require attention to resources, new skills and knowledge and clear delineation of responsibilities
- systematic recording, to enable measurement, evaluation and review, and
- a review process, with revision of plans as necessary.

The end result will be a continuous improvement approach.

Since 1996 there has been an internationally accepted standard for environmental management systems, subscribed to by Australia and New Zealand (ISO 14001). As it is comprehensive in scope, and as there are obvious benefits in aligning practices here with those in use in trading partners and competing industries and countries, it provides the best foundation for developing systems in Australia. The full ISO 14001 approach leads to certified and audited systems. Even if enterprises do not want to go that far, its elements are relevant to all. These elements are:

1. ***Environmental policy:*** This is a statement of intention about overall environmental performance, with targets and goals.
2. ***Planning:*** This involves ascertaining the environmental impacts of the enterprise, identifying laws and industry codes that apply to the industry, establishing long-term goals and shorter term targets to meet the environmental policy and developing programs to achieve the goals and targets.
3. ***Implementation and Operation:*** This requires establishing roles and responsibilities, providing training and skills enhancement as necessary, establishing effective internal and external communication arrangements, effective document management, operating procedures and ensuring emergency preparedness and response.
4. ***Checking and corrective action:*** Monitoring and measurement are important for review and revision. A corrective and preventive action procedure is needed. Record keeping is required. Auditing of the system is needed.
5. ***Management review***: This is done to ensure the continuing suitability, adequacy and effectiveness of the system, and to provide a basis for revision as necessary of the environmental policy.

All of this may seem daunting, but it is simply a comprehensive way of setting out a relatively simple formula underlying many management improvement systems:

- plan – say what you will do
- act – do what you have said you will do
- check – record what you are doing
- review – change what is needed to keep on the continual improvement pathway.

ISO 14004, *Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques*, elaborates on what is needed for an effective process:

- recognising that environmental management is among the highest business priorities
- establishing and maintaining communications with external and internal interested parties
- determining the legislative requirements and environmental aspects associated with the enterprise's activities, products or services
- developing management and employee commitment to the protection of the environment, with clear assignment of accountability and responsibility
- encouraging environmental planning throughout the product or process life cycle
- establishing a process for achieving targeted performance levels
- providing appropriate and sufficient resources, including training, to achieve targeted performance levels on a continuing basis
- evaluating environmental performance against the enterprise's environmental policy, objectives and targets and seeking improvement where appropriate
- establishing a management process to audit and review the environmental management system and to identify opportunities for improvement of the system and resulting environmental performance
- encouraging contractors and suppliers to establish environmental management systems.

A critical feature of the ISO 14001 approach is that it does not require any specific type of environmental goal – this is for the enterprise to determine. This is because ISO 14001 is about establishing and maintaining a management system. It says nothing about the enterprise's actual environmental performance. This means that merely having an ISO 14001 compliant or certified system is not a guarantee of environmental excellence. Excellence or a 'clean, green' image are outcomes of appropriate goals and systems.

It is possible to tailor the ISO 14001 approach to many different situations, so that it is implemented and maintained in such a way that achievement of environmental goals best suited to the type and scale of activity is promoted inherently, with minimal or no additional resource requirements. This is particularly important for the olive industry, as there are great differences in scale from very small to very large in the case of growers and processors.

Guides to managing the environmental impacts of enterprises similar to many parts of the olive industry have been developed, or are under development.

The nursery industry has completed an audit of environmental legislation affecting the industry, and has decided that the best way to ensure environmental compliance by members is to add a chapter to the current Nursery Industry Accreditation Scheme Australia Best Practice Guidelines. These Guidelines are based on best practice protocols rather than continuous improvement. They are audited by Industry Development Officers.
Horticulture Australia Ltd with industry partners is undertaking a project on *Environmental Assurance in the Australian Horticulture Sector* involving environmental management systems to build on the work already done in the sector and provide resource materials specific to the sector. More details are in Chapter 9.

The Murrumbidgee Horticulture Council has produced a comprehensive guide to managing the environment for perennial horticulture in the Murrumbidgee Irrigation Area. It provides information necessary to meet current community and industry expectations and, where an enterprise so decides, to achieve certification under ISO 14001.

Any tree growing industry, including olives, has many practices and issues similar to those of tree growing for wood rather than fruit production, such as chemical application, soil, water and ecosystem management, machinery use, cultural or heritage sites and weed problems. In some cases, an olive enterprise may include wood production at the end of productive fruiting.

The Australian Forestry Standard, finalised in 2002, provides a basis for voluntary, independent third party certification against auditable forestry management performance criteria that support sustainable management of forests for wood production. It is intended that the Standard provide a basis for complying with ISO 14001 requirements. The Standard embodies forest management performance criteria that support continuous improvement in sustainability of forestry, based on the following:

1. conservation of biological diversity
2. maintenance of productive capacity of forest ecosystems
3. maintenance of ecosystem health and vitality
4. conservation and maintenance of soil and water resources
5. maintenance of forest contribution to global carbon cycles
6. maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies
7. legal, institutional and economic framework for forest conservation and sustainable management.

An olive growing enterprise based in part on eventual wood production would be eligible to join the Standard.

The Australian Food and Grocery Council helps its members in the food processing industry with advice on implementing environmental management systems, using Craddock and Cummings', *How to Implement an EMS*, a 1996 Hallmark publication. The Council has also produced guides to help its members achieve sustainability and eco-efficiency, including on how to provide advice about these issues to their suppliers.

3. The mechanics of environmental management systems

The natural starting point for an environmental management system is to conduct an initial environmental review. This involves:

a) Identifying the environmental impacts of the activities of the enterprise.

This requires listing all the activities and setting out all of the environmental impacts that can be identified. There is an increasing amount of assistance available for this. Examples include:

- the nursery industry guidelines (still in production)
- *Horticultural Productivity and Sustainability* (published by the Horticultural Research & Development Corporation and the National Land & Water Resources Audit)
- *The Green Book* – a guide to managing the environment for perennial horticulture in the MIA (published by Murrumbidgee Horticulture Council Inc)
- Australian Forestry Standard publications
- Australian Food and Grocery Council publications
- Australian Greenhouse Office publications
- *Environmental Factors affecting Australia's Livestock Industries* (published by Bureau of Rural Sciences)
- *Introduction to Environmental Management Systems in Agriculture* (Commonwealth of Australia publication).

b) Identifying legislative and regulatory requirements and codes of practice.

Commonwealth, State or Territory and local government laws may all apply to an enterprise. In some cases international laws or arrangements will apply. For example, the product standards applying to exporters will come from Codex Alimentarius, the international food standard agreement.

In many cases these laws will have direct and obvious application, for example, local rules on waste water management. In others, the relationship with the enterprise will be less obvious, for example, on management of native vegetation.

There is an increasing range of codes of practice that may apply.

Legislation affecting employment and training, business arrangements, vehicles and firearms may also be relevant to environmental management systems.

There is an important role for industry associations in providing guidance on finding and explaining relevant laws and codes of practice, and one generating lists of information and advisory sources.

c) Evaluating performance against enterprise criteria.

This is a self-assessment process that provides a basis for subsequent planning and action. It will help identify the enterprise's existing environmental management practices. Evaluation of these should uncover any obvious gaps.

d) Investigating any previous incidents with negative environmental consequences.

This process can involve tracing the chain of events leading to a negative consequence, analysis of any known regulatory failure and consideration of the local state of the environment.

With this knowledge, the following steps consistent with ISO 14001 can be taken. Even if there is no intention to go as far as a certified, audited system, adhering to these steps as they relate to the enterprise will bring enterprise and environmental benefits.

PLAN

Environmental policy:

This is a broad overall statement of the enterprise's intentions about continuous improvement of its environmental management. If this statement is combined with other elements of an enterprise's mission or goals the likelihood of effective integration and success should be greater.

Identify and determine significance of environmental impacts:

These will emerge from the initial environmental review described above. The significance of the impacts should be ranked, or at least the most significant identified. This is a self-determination exercise, subject to having regard to legal requirements and special local needs – for example, as in the Sydney water supply catchment area.

Identify legal and code of practice requirements:

See again the suggestions on environmental review.

Objectives and targets:

These can be as few or as many as an enterprise wishes. They relate to improvement, for example, better compliance with regulatory requirements, and should be consistent with the environmental policy. The views of interested parties should be taken into account. They need not relate to every impact.

Environmental management program:

This is the action plan to achieve the objectives and targets.

ACT

Roles and resources:

Responsibilities for the action plan, including monitoring of progress, need to be assigned, and the resources for it identified and provided.

Training and awareness:

All those involved with the action plan should have, or acquire, the necessary training and skills, and awareness of the plan.

Communication:

Arrangements are needed to ensure those within the enterprise are familiar with the action plan, and to inform any outside parties with an interest.

Document control:

The whole system needs to be supported by adequate document control.

Operational control:

The aim is to ensure that all relevant procedures are consistent with the action plan requirements. This may include procedures for selecting suppliers of goods and services in accordance with their environmental impacts.

Emergency preparedness:

Potential emergencies should be identified and prevention and response procedures established, including for the mitigation of any negative environmental impacts.

CHECK

Monitoring and measurement:

This will enable performance against the objectives and targets to be evaluated, and overall environmental impact to be assessed. Compliance with any legislative or code of practice requirements should be included.

Corrective and preventive action:

Problems should be identified, and corrective and preventive action set in train. This may require changes to operational procedures.

Records:

Quality records should be kept.

Audit:

An audit program should be established as a check on overall performance.

REVIEW

Review:

Enterprise management needs to review the system periodically to test its continuing suitability, adequacy and effectiveness, and to enable any necessary changes to be made to ensure that the commitment to continual improvement is met.

Several support systems for those taking up environmental management systems have already been mentioned. Another example is the Australian EMS Manual. It was prepared following a meeting in June 2003 of representatives from several organisations then involved in environmental management systems work around Australia, who evaluated existing documents to consider their best features. The Manual is directed at land managers.

Introduction to Environmental Management Systems in Agriculture is a publication sponsored by the Commonwealth Government available from the CB Alexander Agricultural College at Tocal, New South Wales.

The number of people trained as facilitators and auditors for environmental management systems is increasing. Many others are gaining practical experience through pilot programs.

Environmental management systems overlap several other systems relevant to the olive industry. These include HACCP, Olive Care, occupational health and safety requirements, chemical management requirements, land and water management frameworks promulgated by catchment management authorities, and quality management standards based on ISO 9001.

There will also be overlap with commercial schemes initiated or maintained by retailers in Australia and overseas. For example, the Australian Food and Grocery Council is working with its members on developing advisory systems for suppliers so that they adopt environmentally sound practices and meet appropriate standards. Businesses increasingly seek to conform with EUREPGAP, a European standard for agricultural production that emphasises minimisation of agrochemical inputs. The Commonwealth Government has recently published *Guidelines for implementing EUREPGAP for Australian fresh fruit and vegetable producers*, prepared for a joint industry-government working group.

This means that an environmental management system need not be developed as a stand-alone arrangement, and reinforces the proposition that an environmental policy is usefully developed as part of a wider enterprise mission statement or goal.

4. Benefits

The major purpose of environmental management systems is to improve environmental management. Achieving this brings with it several other benefits.

4.1 Commercial

Good environmental practices should reduce costs for inputs such as energy, machinery, fertilizers, and other chemicals, water and packaging. If the most up-to-date operational systems are used, there may also be labour savings.

Horticultural field trials have demonstrated that applying recycled organic material can result in water savings in excess of 25%, reduced chemical and fertiliser inputs, reduced run-off and consequent soil erosion and waterway pollution, as well as increased plant vitality, initiation of a cycle of soil carbon regeneration and reduced greenhouse emissions. It has been demonstrated that in some areas every dollar spent on applying recycled organic material can recoup up to $8.85.

In some cases there will be additional income streams from transforming waste into saleable products.

For some there will be marketing advantages from greater credibility with the public here and overseas about ‘clean, green’ products. The relative share of organic produce appears to be increasing because of its association with absence of artificial chemical substances.

These factors taken together are also a defence against declining terms of trade and competition from other industries.

4.2 Whole enterprise approach

Because of the direct links between elements of environmental managements systems and many other facets of an enterprise, their use can form the basis for a holistic approach to enterprise planning and management. This is particularly the case for olive growing and many nurseries, as they are dependent directly on natural systems and often set in a wider landscape. It therefore becomes easier to understand the links between an enterprise and the natural systems that support it, thus reducing the risk of counter-productive approaches to management.

Approaching the enterprise in this way is also likely to lead to more effective combination of personal, social, financial and environmental goals.

Experience so far with environmental management systems is that they lead to establishment of new and useful partnerships and relationships within an industry and with other interested parties, including regulators and managers of government support programs.

4.3 Industry sustainability

The most effective use of environmental management systems avoids resort to reactive approaches and encourages the adoption of the most progressive approaches, thus keeping ahead of regulatory pressures and at least some consumer preference changes.

This progressive approach can be used to help develop regulatory frameworks, make their administration sensitive to the industry, establish useful partnerships with other industries and government agencies, and influence wholesaler and retailer codes and research programs. It provides a greater prospect of introducing beneficial new practices more in harmony with natural systems or that reduce environmental impact.

These factors together should increase the resilience of all elements of the industry as the many circumstances affecting it change, and increase its capacity to adapt to pressures with potentially negative impacts, eg, paperwork supporting new regulatory systems, the demands arising from urban spread into rural areas and reduced or more costly access to resources such as water.

4.4 Health and safety

ISO 14001 defines the environment as including humans. An environmental management system based on the standard can therefore be the vehicle for ensuring compliance with occupational health and safety requirements.

Farmers, and presumably some other business people, are said to be prone to stress because of limited, or even no, control over big issues affecting them, for example, climate and foreign exchange variations. Use of environmental management systems increases the degree of control over an enterprise, thus reducing some of the stressors on owners and managers.

5. Industry risks and environmental issues

Environmental management systems have elements in common with quality assurance (eg, chemical residues), productivity (eg, lower energy and other input costs), food safety (eg, absence of contaminants) and occupational health and workplace safety (eg, absence of pollution). All of these have a place in overall enterprise planning and management.

Systematic and continuous attention to environmental management and the overlapping quality and safety issues can also contribute to better handling of the several risks inherent in the industry.

The industry will have a greater chance of long-lasting success if it identifies and deals with several risks. Several issues involve major risks for the industry, particularly its farming sector.

5.1 Declining terms of trade

There has been a continuing decline in the terms of trade in agriculture generally, whereby the costs of production tend to continue to rise while prices for the raw products fall. One outcome of this is the continual bearing of all environmental costs arising from an enterprise by its owners, even if there is a common good element to them. This suggests a need to increase the profitability of the enterprise, either by including all the costs in product prices or by otherwise rewarding the enterprise owners, for example, by payments for agreed standards of landscape management and for the ecosystem services delivered by the land.

Dealing with these issues in a direct way is particularly difficult in Australia because of the exaggerated importance placed on agricultural production, rather than on the multi-functionality of land management. There is also the problem that most wealth in Australia is in the cities, while responsibility for management of the life supporting environment is visited on the minority who own, manage or live and work on rural land.

It is also true that in a democratic society the values underpinning action everywhere will be those held by a majority of the people. In Australia, for well over a hundred years, this majority has been in the cities and large urban centres. The need for understanding of the sources of urban well-being has perhaps never been greater.

Because of the now entrenched 'consumers rule' paradigm in Australia, unbalanced market power in food distribution and sales, a corrupted international trading regime, and inadequate international trade agreements, producers of olive products as well as olive growers face the likelihood of declining terms of trade.

5.2 Climate variability and global warming

Australia has one of the most naturally variable and volatile climates on Earth – a country of flooding rains and long droughts. The climate has also been changing. Average surface temperature increased by 0.76^{o}C from 1910 to 2000. Since 1900 there has been a 10% increase in the number of days of rain, and extreme rainfall events have become more common. These variations are largely unpredictable beyond very short periods, although there has been a rapid increase in capacity to predict El Nino events, which have greatest effect in northern and eastern Australia.

Global warming is attributable in large measure to changes in atmospheric composition arising from human activities, particularly energy use. Agriculture and associated land clearing are major contributors in Australia, accounting for about one third of total emissions. Most agricultural emissions are from livestock production, but all the other agricultural sectors contribute.

Global warming will have impacts on our climate and our weather. Current indications are that rainfall will decrease in some areas, for example, south-west Western Australia and much of the Murray Darling basin, and that winters will be warmer in some areas. The pattern of rainfall may continue to change.

As olives are sensitive to temperature and water availability, the boundaries of their extensive range in Australia, the characteristics of products from different places and yields are bound to change.

5.3 Pests and diseases

All agricultural products are subject to pest and disease problems, which can become overwhelming. Continuing imports of plant material and other goods, and trends in world trade rules, mean the risk of new or increased problems is ever present. Climate change can alter the range of some pests and diseases, extending them in some cases.

5.4 Local, national and international regulatory pressures

These are perhaps best symbolised by developments in the Sydney water supply catchment area aimed at guaranteeing a safe water supply for the Sydney urban population. New developments and activities are not to be approved unless the proposals will have a neutral or beneficial effect on water quality. This approach is more likely to be copied than spurned in other jurisdictions. It should be assumed that laws will increase at all levels of government supporting improved environmental management, including waste management.

International environment treaties also have their impacts, even though major English speaking democracies, including Australia, continue to give much higher priority to so-called free trade arrangements. The broader-based approaches taken by most countries are likely to tip the balance in favour of ecological sustainability over time. As the olive industry becomes more export oriented, it will become more influenced by these international trends.

5.5 Consumer expectations

Consumers in Australia and overseas place a high priority on food safety and product quality. A relatively isolated incident may have a major general effect – recovering from it can be costly and lengthy and consumers can be fickle in their demands. Many consumers continue to expect that the products they buy and use have minimal or no environmental impact, and that producers respect the environment. The grocery and food industries and regulatory authorities have become very sensitive to these pressures.

All of these risks can be managed better if enterprise management includes environmental management systems. They facilitate greater predictability about key elements affecting the enterprise, generate better understanding of all the issues affecting the enterprise and reduce costs, including the costs and impacts of local and externally generated emergencies and crises. They are one means of integrating social, environmental and financial elements of a business when used as part of a whole business planning system.

These systems can also contribute to overcoming several other risks for the olive industry, including:

- inadequate enterprise planning and management
- the cost of insurance
- the many demands of wholesalers and retailers
- energy use, and
- international competition.

There are also major environmental issues arising from the industry.

5.6 Water use

Most analyses of olive growing suggest that a major key to financial success is availability of water at the right times and in the right quantities. The nursery industry is dependent on water availability. Processing uses water and produces polluted water. Water is used throughout the packaging and marketing chain.

Therefore, the maintenance and expansion of the industry adds to the demands for water in Australia. Agricultural uses account for about 70% of total water consumption in Australia. This water is being used primarily to support urban settlements and earn export income, even though in public debate it seems often to be described as just a self-indulgence by farmers.

There are no specific figures available for olive production water consumption, but the production of fruit uses over 700 litres per kilo of product and there is no reason to assume that olives would be very different. Water usage for grapes and fruit production is modest compared with that for several grains, soybeans, oilseeds, chickens and beef cattle. Most food processing industries use about 8 litres of water per kilo of product.

There is a recent paper on using limited water supplies for irrigating olives in Appendix 1.

5.7 Olives as a weed

The spread of olive trees in some places, for example, in the Adelaide hills, shows that olives can spread into the native Australian environment. Some researchers have concluded that olives may become a major woody weed problem that could spread across large areas of southern Australia. Equally, in some parts of Australia where there have been olives since at least the 1820s no weed problem has developed. Nevertheless, the industry needs to base its environmental policies on the following conclusions of Spenneman and Allen in 2000:

> "The spread of the Australian olive industry in the 1990s poses a potential major weed threat. The South Australian experience has shown that olives will become a major woody weed if left uncontrolled in areas with a suitable climate. The containment of this problem should not be left to the various public agencies and landcare groups drawing on increasingly limited public funds.
>
> Strategies to prevent the escape of crop species into the surrounding environment need to be part of the overall planning exercise along with plant propagation, production logistics and financial management considerations, when a species is to be grown commercially.
>
> The European history of Australia is littered with examples of well-intentioned introductions and naturalisations gone wrong. Given that the environment is fragile,

> we cannot afford to continue this trend. There is a clear obligation to avoid further degradation of Australian remnant bushland with weeds. Given the diversity of growers, self-regulation is not likely to be an effective mechanism and some level of state or local government regulatory control needs to be developed. Environmental regulation of the olive and other horticultural industries would be an appropriate measure to commence the new millennium."

A survey published in 2003 categorised 2700 exotic plant species known to be naturalised in Australia as major or minor threats to natural ecosystems or agriculture. The survey indicates that olives have naturalised in New South Wales, Victoria, South Australia and Western Australia, and are considered to be a problem in South Australia, the only State that has taken formal action on control or determination as a noxious plant.

Because of the superficial similarity between cultivated olives (*olea europea*) and other olives such as the African olive (*olea cuspidata*), which have also become naturalised in Queensland and New South Wales, it may well be in the industry's interest to play a role in control of this olive variety.

5.8 Use of chemicals

A core feature of most quality assurance systems for food is the need for absence of chemical residue. Catchment management programs increasingly emphasise the need to prevent contamination of soil, water and air. There are strict rules under government permit systems for the management and use of chemicals to safeguard the environment, food quality, worker safety and human health. Many chemicals are expensive and an array of equipment may be needed to use them. There is continuing uncertainty about the long-term effects of some chemicals, whether they are artificial or concentrations of naturally occurring substances.

Increasing attention is being paid to potential health consequences from many chemicals, including pesticides and fertilisers. It is claimed that these include DNA changes with multi-generational effects.

The issue is relevant to all elements of the olive industry.

5.9 Waste generation

This is another issue relevant to all elements of the industry. For example, in processing of olive oil there is a potential 80% waste rate. The larger the enterprise, the greater the problem as this proportion does not change. The problem will grow quickly as olive production increases rapidly.

Raw processing waste is considered harmful to the environment. Only limited progress has been made in dealing with it in traditional olive producing countries. Its potential as a source of by-products, alone or in combination with other material, is largely untested.

At the same time, there is increasing pressure to eliminate waste simply going to disposal. This is a recognition that humans are unique in the living world in our capacity to transform natural resources into useless and harmful waste products.

A paper outlining several issues relevant to processing waste is at Appendix 2. It was prepared by the author for a workshop on processing waste in Victoria in 2004, organised by the Strathbogie-Goulburn Olive Growers Association..

6. The industry and its impacts

Each element of the olive industry has environmental impacts. The following list of impact generating activities and impacts is indicative only, as many enterprises may have features that generate other impacts.

6.1 Nurseries

- Use of water, chemicals, fertilisers, energy, machinery and potting mixes.
- Infrastructure, eg, roads and tracks, buildings, pots and tools.
- Transport and packaging.
- Impact of climate.
- Generation of waste.
- Pest and disease issues.
- Weed potential (including olives).
- Potential air, noise and dust pollution.

6.2 Farms

As for nurseries, plus

- Soil condition, erosion, compaction and salinity.
- Impact on landscape and biodiversity.
- Fuel management.

6.3 Oil and table olive processing

- Use of water, chemicals, energy and machinery.
- Infrastructure, eg, buildings, containers and tools.
- Transport and storage.
- Waste generation (eg, pomace, black water, caustic water, saline water, containers).
- Packaging, and raw material extraction.

6.4 Distribution and sales

- Use of energy.
- Transport and storage.
- Generation of waste.
- Advertising and marketing.

6.5 Consumers

- Generation of waste.

In many cases, the olive enterprise will be combined with other enterprises. Olives planted as part of a diversification program would be a typical example. Nurseries often have retail outlets, processing can be carried on along with other food preparation and olive products are typically only one product line sold by wholesalers, traders and retailers. Therefore there will often be a need to consider a wider range of potential environmental impacts, for example, from pastoral and cropping activities or refrigeration.

7. Key concepts

Application of the following key concepts can underpin determination of enterprise goals, planning for consistent quality products with minimal environmental impacts and risk analysis. They assist in establishing an effective continuous improvement approach, in increasing the benefits and accelerating the spread of systems, and in achieving maximum value from time and investment.

Consistent with the principles underlying ISO 14001, the pathway to sustainability involves continuous improvement in the way we do things, and restoration of degraded environments. Using these propositions as guidelines should ensure that sustainability indicators will be favourable, even if precise measurement is not possible.

7.1 Planning and management

There are many guides to business planning and to property planning. In all cases, they will complement development of environmental management systems. A comprehensive approach to business or property planning involves:

- personal, family and business goal setting
- resource stocktakes (including natural resources where applicable) and alignment of enterprise practices with resource capabilities
- human resource stocktakes and skill development needs analysis
- business structure (including succession planning)
- quality assurance
- marketing
- production systems planning and management
- enterprise evaluation, planning and performance monitoring
- risk management, including the impact of natural events
- financial planning, budgeting and control
- record keeping and information management
- a business plan integrating all the enterprise elements, and
- linkage of management planning to broader issues affecting the industry, including, in the case of farming, catchment and regional natural resource management issues.

This is a long list, but analysis of most businesses will show that all, or most of, these points have been considered, even if not very consciously.

Many olive groves are established as part of a diversified farming enterprise. Even where the grove is the only land use on the enterprise area, it will in turn be part of a wider landscape. The concept of whole farm planning requires considering all of the farm physical and other assets, using long time perspectives and accommodating all the social, personal, financial and production aspirations of those involved. The result should be a blending of ecological and production considerations with the intention that the latter continue successfully without detriment to the former.

There are also various approaches to farming and nursery management that can contribute to a strong foundation for environmental management systems, including low input, natural sequence, organic, biodynamic and permaculture systems. In every case, they need examination to test their sustainability value.

Cleaner production and related approaches to manufacturing industries apply in similar ways to processing and in the rest of the supply chain to the consumer.

A common response to complex issues is that it is all too hard – where to begin? Determining a goal or vision for an enterprise is a good starting point. This may vary from relatively narrowly conceived goals for businesses established for commercial purposes only to highly personal lifestyle goals where the olive enterprise is only a means to that end. In all cases, later frustration and disappointment can be avoided if the vision or goal has regard to all the personal background, financial and ecological circumstances affecting it.

With a well thought out goal or vision it is then possible to develop a plan that:

- sets out what can be done with the resources already available (eg, financial, human knowledge, labour)
- identifies impediments to progress, such as knowledge gaps or lack of resources
- includes a strategy to define well and deal with the impediments, and
- sets out immediate action.

7.2 Change mechanisms

Undertaking such a planning process will also provide a considered basis for reviewing the vision or goal to make sure it is realistic.

Partly in response to enterprise planning and partly in response to external factors such as market or climate changes, change in an enterprise will occur. There seems to be a natural tendency to resist change for all sorts of reasons.

Introduction of environmental managements systems will often involve changes small to great. Change is easier if:

- all concerned agree with the need
- the proponents of change are willing to invest in it, and
- those who make the change clearly share in the benefits.

As an example, wholesalers and retailers who impose environmental codes or standards on their suppliers should be willing to provide technical and financial assistance to those expected to comply with the codes or standards.

7.3 Sustainability

There is no universally agreed definition of sustainability, perhaps only an understanding that it imports a sense that the resources available today should not be depleted to the manifest disadvantage of future generations. The Commonwealth's *National Strategy for Ecologically Sustainable Development* of December 1992 suggested that ecologically sustainable development is:

> "using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased."

The United Nations Environment Programme has used a similar definition:

> "Sustainable development is . . . improving the quality of human life while living within the carrying capacity of the supporting ecosystems."

The problem with these kinds of definitions is that they are anthropocentric and do not provide much help in planning or day-to-day operation of an enterprise. It is therefore necessary to look in a more detailed way at some concepts that, if adopted, should lead to more rather than less sustainable outcomes.

The anthropocentric way that sustainability is usually expressed, as in the above examples, obscures the extent to which human society evolved within the planet's ecosystems and continues to depend on them for food, water, air and other life supporting systems. The human species is the only species able to control the environment (even if often only for a short period), and the only one that transforms natural resources into useless and often harmful waste, and directly contributes to large scale and long-lasting environmental change, for example, global warming, desertification and biodiversity loss.

A good starting point for an industry is to recognise that its products should be the by-product of good land air and water management and that a zero waste paradigm should prevail through the whole product chain. This way there is a greater chance that the industry will be more rather than less in harmony with nature, and that it will last so long as there is a market for its products.

Use of environmental or sustainability indicators is one way of checking impact on the environment. If sustainability is the main goal then the following are basic indicators:

- no net loss of soil, soil condition and health, and biodiversity as a result of human activity,
- maintenance of atmospheric stability,
- maintenance of inter-generational equity, meaning that future generations should have access to at least the same or equivalent level of resources and amenity as we enjoy now, and
- restoration of degraded environments or, at least, reversing of causes of degradation within a generation, say, about forty years.

The outcomes on this basis would maintain dynamically balanced ecosystems while recognising that the way in which this occurs will change over time.

In practice, it is usual to develop more detailed locally specific indicators. To be useful, their relationship with the broader universal indicators needs to be clear.

7.4 Precautionary principle

The precautionary principle is often called in aid to support sustainability processes. It is particularly relevant to environmental management systems, as in one form or another it has been incorporated in international agreements and in Australian laws. It is often generally stated as requiring that:

- careful evaluation should always be undertaken to avoid serious or irreversible damage to the environment, and
- an assessment of the risk weighted consequences of various options should be undertaken in formulating a proposal.

The Rio Declaration at the UN Conference on Environment and Development in 1992, signed by Australia, included:

> "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The precautionary principle is of practical importance for exporters to Europe, as it is part of European law. The European Commission has indicated that:

> "Although the precautionary principle is not explicitly mentioned in the Treaty except in the environmental field, its scope is far wider and covers those specific circumstances where scientific evidence is insufficient, inconclusive or uncertain and there are indications through preliminary objective scientific evaluation that there are reasonable grounds for concern that the potentially dangerous effect on the environment, human, animal or plant health may be inconsistent with the chosen level of protection."

These formulations are often criticised as negative and placing an undue emphasis on risk avoidance. They provide no guidance for day-to-day action.

The principle can, however, be couched positively in propositions that, if used in enterprises, support good environmental management. These include:

- basing decisions on preferred futures,
- seeking the least risk pathways to the preferred futures,
- consciously considering the potential environmental impact of the options available to achieve the preferred futures, and
- accepting responsibility for any unforeseen outcomes.

Ideally this positive supportive action would be backed by laws and development approval processes that clearly place responsibility for the outcomes, including any environmental degradation, on the proponents.

The European Commission has pointed out that the precautionary principle supports a structured approach to risk analysis and the management of risk.

One effect of using the precautionary principle as suggested should be an increase in predictability about many of the enterprise's operations.

7.5 Resilience

The concept of resilience is another support for a sustainable approach. A resilient system is one that can absorb shocks without changing its essential structure and functions. This requires that an enterprise needs to be able to cope with novel situations without losing options for successful continuation. This requires highly adaptive capacity so that changes can be made without significant decline in production, good environmental consequences, social relationships and financial well-being.

7.6 Life cycle analysis

Life cycle analysis of products is another technique to help understand, identify and quantify all of the potential environmental consequences of a product or service throughout its life, from the acquisition of raw materials to final disposal.

7.7 Zero waste

A zero waste goal is met if the by-products of a process leave the site only because

- they have been returned to a benign condition (eg, treated water),
- they are re-used or recycled,
- they are a new product of value (eg, compost from olive waste) or
- the law requires their removal (eg, defined hazardous substances).

Applying this concept can be particularly difficult in the case of some greenhouse gas emissions and energy, such as heat generated in a processing or refrigeration situation. Continuing reduction or re-use is, however, consistent with a zero waste goal.

7.8 Quality Assurance

This is a process for ascertaining that a product properly meets any specifications set for it. This is particularly important for food products, which need to comply with food safety laws and satisfy consumers about their expected characteristics – consistency, predictability and safety. The need for quality assurance has led to development of systems to support it. ISO 9001 is a quality management standard that parallels ISO 14001. Not surprisingly, there is a high level of correspondence between the provisions of the two standards.

HACCP (Hazard Analysis Critical Control Point) is a risk management tool for identifying points in a production process where contamination or other problems can occur, to avoid food safety problems. It has been endorsed by the Codex Alimentarius Commission (the international body that sets standards for food, including olive products). HACCP was pioneered in the 1960s to provide a 'zero defect' program to guarantee safety in the foods that astronauts would be consuming in space. It relies on control and monitoring in the preparation of the product, rather than on finished product sampling and testing. The process involves seven principles:

- analysis of hazards
- identification of critical control points at which a hazard can be controlled or eliminated
- establishment of preventive measures with critical limits for each control point
- establishment of procedures to monitor the critical control points
- establishment of corrective actions to be taken when monitoring shows that a critical limit has not been met
- establishment of procedures to verify that the system is working properly
- establishment of effective record-keeping to document the HACCP system.

These principles can be applied in many situations, including environmental management.

8. Practical issues

Several implementation issues for environmental management systems in Australia have emerged from the experience so far.

One is the level of understanding of enterprise managers of the relationships among the enterprise, the natural environment, community expectations, regulatory systems and market needs. Biodiversity is a good example. At its simplest, it is the plurality of living things and their habitats. It has a profound effect on everything humans do. Australia is in a very special position as one of the very few mega-biodiverse countries.

Biodiversity is fundamental to:

- crop and natural vegetation pollination,
- agricultural pest control,
- dispersal of seeds and nutrients,
- protection from ultraviolet rays,
- regulation of climate,
- moderation of temperature extremes,
- air and water purification,
- flood and drought mitigation,
- waste detoxification and decomposition, and
- generation and renewal of soil and fertility.

Biodiversity is therefore the foundation of productive agriculture and significant for the rest of the supply chain. Other Australian industries rely to some extent on biodiversity, for example, tourism and art.

The problem is that biodiversity, which is fundamental to human activities, is constantly at risk from these activities. Loss of biodiversity arises from habitat destruction, the impact of pest plants and animals, the impact of pollution – including by carbon dioxide, methane, ozone layer depleting substances and energy – and from hunting. The olive industry can involve all of these.

This background reinforces the need to understand the role of biodiversity in an enterprise (for example olive growing and any associated farming and tourism activities), and to avoid adverse impacts on biodiversity (for example, in processing, packaging and waste disposal), thus increasing the likelihood of a sustainable enterprise with public acceptance and personal satisfaction.

In a comprehensive literature review for Land and Water Australia the criteria for evaluating mechanisms to integrate biodiversity conservation into natural resource management planning and practice in Appendix 3 were proposed. They are adaptable to the enterprise level. Criteria of this kind will become more significant as stronger links are drawn between individual enterprises and the settings of which they are a part, whether urban or rural.

In some cases take-up of environmental management systems may not easily occur without prior training or education about all of these issues. The evidence so far is that this would be less of a need

for many large organisations, those heavily involved in the landcare movement, and many smaller enterprises geared towards lifestyle outcomes.

One element in this is the level of understanding of the relationship of the enterprise to prevailing catchment or regional planning and management. This is an issue for all parts of the industry because of water use or impacts, as well as other impacts in particular cases. As with the Sydney catchment example, catchment programs and attendant regulations are likely to have a direct impact on how an operation is managed to achieve particular environmental outcomes. These developments mean that in many places the challenge about enterprise-environment knowledge will increase, thus providing a more widespread recognition of the value of environmental management systems.

There can also be perceptions of a lack of relevance of such systems, as being unnecessary, time consuming and unrelated to income, or even conflict with business plans. Continuing education is one way to overcome these perceptions. Another is to ensure systems and supporting structures and materials are developed to fit as easily as possible with the way that enterprises operate, and that they respect the priorities of the enterprise, such as staying in business.

There are often concerns about paperwork and costs, particularly with fully certified and audited systems. This reinforces the need to tailor systems to enterprise operational realities, and to provide a range of options that involve continuous improvement, reduction in environmental impacts, consistency with ISO 14001 and simplified paperwork. Some examples are in the next Chapter.

Adequate support systems – training, extension services, useful research outcomes, facilitators and co-ordinators and supporting material – can accelerate the spread and acceptance of these systems. The landcare movement and several industry associations have shown how professional and continuing support makes a difference. There may be difficulties in gaining access to the wide array of public and private organisations with useful knowledge about natural resource use and environmentally sensitive business operations. These can be overcome.

Persistence with traditional ways of doing business can also hamper attempts to make beneficial changes. As indicated in Chapter 7, positive change mechanisms need to be considered. There are also examples of relevant successful innovative practices, but the mechanisms for extending their use still seem to be inadequate, as indicated in the Land & Water Australia's 2003 *Review of farmer initiated innovative farming systems.* It would be equally true that cleaner production processes are not yet universal in the processing and sales and distribution parts of the product chain.

Enterprise isolation or an absence of networks can also be a handicap, reinforcing the desirability of working through existing structures such as landcare networks and industry associations.

In some cases participants have found the process too rushed, reinforcing again the need to tailor introduction of processes to the needs, style, interests and level of knowledge of the prospective audience.

In some cases there has been a view that environmental management systems are not sufficiently different from some other approaches to dealing with environment issues to justify taking them up. Although the landcare movement has been a useful vehicle for generating interest in environmental management systems, in some cases some think that they can do enough within landcare. Others with a more direct commercial perspective may choose instead to base their systems on a commercially-driven arrangement, such as EUREPGAP. In Australia these systems will often not provide as extensive a coverage as would occur with an ISO 14001 based system, as they tend to relate to performance standards rather than continual improvement and may not emphasise sufficiently issues that are important here, such as biodiversity.

Because of the intense debates in many parts of Australia about the consequences of finding threatened species, some landowners are wary of any schemes that may lead to publicising information about threatened species locations. This is linked with the failure of the community to pay landowners for eco-system services or to compensate them for restricting their commercial activities in support of an environmental objective.

Public reporting of an enterprise's environmental management activities and of the extent to which it is meeting its targets or goals is a mechanism strengthening the credibility and usefulness of environmental management systems. There is also value in information generated by these systems having wider use, for example, in catchment planning. To do so would require great care in some cases in devising systems that respect privacy.

There is a continuing search for systems to capture value for the enterprise because of its use of environmental management systems. In Australia the emphasis on a production paradigm has inhibited development of systems to incorporate a value for the externalities of food production in the prices consumers pay, or to provide equivalent compensation to producers. This in turn has hampered debate about the values that should underpin land use in rural Australia and management practices in urban Australia.

9. Support systems

There are several existing arrangements, information sources and organisations supporting the introduction and implementation of environmental management systems.

9.1 Government

a) National Framework

The Commonwealth Government has led the development of a National Framework for Environmental Management Systems in Agriculture.

The Framework provides a set of principles that describe the broad parameters needed to achieve consistency and acceptance across the agricultural sector. It seeks to describe the relationships and roles of the range of participants in environmental management in agriculture, including landholders, industry groups, community groups, and local, State and Territory and national government. The Framework emphasises the voluntary adoption of environmental management systems and asserts a role for industry leadership. The Commonwealth has supported the spread of environmental management systems through several programs:

- ***Incentives program*** **–** this provides up to $3,000 reimbursement for activities associated with the development and management of an environmental management system for a range of primary producers who meet fairly restrictive criteria..
- ***National Pilot program*** **–** $85 million is being invested in fifteen environmental management system pilot projects across Australia. The aim is to test and enhance the potential of different systems as a business management tool for primary production, and to understand and address any limitations.
- ***Pathways to Industry EMS Program*** **–** this program has funds for assisting industry groups to develop and implement environmental management systems and other environmental quality approaches to achieve adoption of profitable and sustainable farming practices, improved natural resource management and environmental outcomes, and demonstrate environmental stewardship to domestic and international markets.

The *Pathways* program involves only the large industry groups. The olive growing industry is still much too small to qualify in its own right. It is considered to be simply a part of a 'horticulture' industry. Horticulture Australia Ltd and the Horticulture Australia Council were granted $926,000 to develop and implement a *Pathways to Environmental Assurance in the Australian Horticultural Sector* plan. Horticulture Australia Ltd describes the project now called 'Horticulture for Tomorrow' as follows:

> "This funding will ensure horticultural growers have a one-stop shop for information about EMS and tools that integrate with existing farm management systems.
>
> The 'Pathways to Environmental Assurance in the Australian Horticulture Sector' plan will build on the codes of practice already developed in many horticultural sectors including nursery, turf and vegetables. It will increase awareness of environmental assurance in horticulture and enable horticultural growers to make informed decisions about the systems they implement in their businesses.

A component of this will be the development of resource materials including a 'Beginners' Guide to Environmental Assurance in Horticulture' and a check list for compliance. The materials will be developed with input from a technical steering committee and will provide a simple, user-friendly mechanism for growers to implement good agricultural practice (GAP) on farm. These will be trialled with growers to make sure they are realistic and easy to implement."

b) Related Programs

There is no directly equivalent Commonwealth program supporting environmental management systems outside agriculture. There are, however, other programs that seek to improve environmental outcomes from business activities, and which can be useful components of environmental management systems.

c) Eco-Efficiency Agreements

Eco-Efficiency Agreements between a peak industry body and the Commonwealth involve working together to promote Eco-Efficiency to the body's members. The body agrees to commit publicly to Eco-Efficiency, and develop an action plan for three years. An action plan may include trialling or developing environmental management systems. Subject to the approval of the Minister for Environment and Heritage, funding may be provided to assist with activities that go beyond 'standard' practice, that are in addition to the industry body's existing activities, and are matched by the industry in cash or kind.

Existing Agreements relevant to the olive industry are with the Australian Food and Grocery Council and with the South Australian Wine and Brandy Industry Association and the Winemakers' Federation of Australia.

The Australian Food and Grocery Council has produced an 'Environment Toolkit' for members to provide practical information on how to incorporate environmental issues into every day business decisions. The Council also produces public environment reports. The Commonwealth believes that public environment reporting is an important mechanism for improving corporate environmental performance, and may be relevant to individual organisations through the supply chain as well as the sector as a whole. It asserts that reporting can help generate business value through the measurement and management of environmental risks and opportunities, and respond to the growing expectations of customers, business partners, investors and the wider community.

The wine groups have undertaken significant extensions of the work already underway. The latter has included an Environmental Code of Practice (waste, noise and odour), development of an environmental strategy, facilitation of a national greenhouse gas abatement program and biannual National Wine Industry Environment Conferences and Exhibitions.

d) Packaging and waste

The National Packaging Covenant is the leading instrument for managing packaging waste in Australia. It is a co-regulatory agreement involving industries in the packaging chain and all levels of government, covering the supply chain from raw materials suppliers to retailers. The Covenant objectives are:

1. To establish a framework based on the principle of shared responsibility for the lifecycle management of packaging and paper products including their recovery and utilisation.

2. To establish a collaborative approach to ensure that the management of packaging and paper throughout its life cycle and the implementation of collection systems –

including kerbside recycling schemes – produce real and sustainable environmental benefits in a cost effective manner.

3. To establish a forum for regular consultation and discussion of issues and problems affecting the recovery, utilisation and disposal of used packaging and paper, including costs.

The Australian Food and Grocery Council is a signatory to the Covenant, as are seventy-five of the Council's member companies. Most have reported environmental improvement as a result of their Covenant activities. The Covenant arrangements have recently been evaluated and a consultation paper with suggestions for strengthening the system is being issued.

The Commonwealth, through the Natural Heritage Trust, has also worked with the organics industry to achieve more efficient flows and uses of materials including green waste, water and energy.

e) Greenhouse and energy

The Greenhouse Challenge is an Australian Greenhouse Office program for co-operation with industry to reduce greenhouse gas emissions. Members receive technical advice, including a workbook, access to workshops and seminars and newsletters and reports.

From 1998 to 2003 the Commonwealth maintained the Energy Efficiency Best Practice program involving, among others, companies in the packaging, supermarket and wine industry sectors. An internet based resource kit is being prepared to provide general access to the lessons learned from this program.

f) Other programs

The Commonwealth has continued funding for several programs that can support environmental activities by landholders directly or indirectly through regional catchment authorities, symbolised by the National Landcare Program. The FarmBis program is also to continue. This program subsidises training and education related to business management for primary producers. In several States it has been used to support olive industry training.

The Commonwealth supported National Food Industry Strategy Ltd has commissioned a project on environmental sustainability in the food industry. The outcomes are to include advice on opportunities for enhancing the adoption of sustainable practices in food production by government or through better market signals.

The Commonwealth's Commercial Ready Program supports industry investment in research and development, proof of concept, technology diffusion and commercialisation activities. The intention is to encourage collaboration between Australian businesses and public research providers to develop competitive new products and processes with strong commercial potential. This program would be relevant to developments in the olive industry aimed at overcoming long-standing problems, such as processing waste management.

g) Other levels of government

State and Territory governments are involved in development and administration of several of these national programs, for example, landcare, catchment management, FarmBis and waste management. Many local governments are active in elements of these activities, for example, waste management.

The States also have staff whose responsibilities include working with the olive industry in various ways.

In most jurisdictions, often including local government, there will be regional development or industry support programs that may be available to support some environment related activities. For example, in 2001 the Western Australian Department of Agriculture released the publication, *Developing an environmental management system: a practical guidebook for agricultural businesses.*

State agencies may also develop resources providing detailed information on particular issues, such as the native biodiversity resource kit *Environmental Management in Agriculture* in Victoria. It was developed in consultation with farmers.

9.2 Industry

As already mentioned, the Murrumbidgee Irrigation Council, the Australian forestry industry, and the viticulture industry have already produced documentation to support better environmental outcomes and environmental management systems, and the nursery industry has a similar project underway. The *Pathways to EMS* project being undertaken by Horticulture Australia and the Australian Horticulture Council should also lead to relevant support systems.

For those who combine pastoral activities with olive growing, Meat and Livestock Australia has been producing a steady stream of material supporting environmental improvement and related productivity activity. Much of the advice in its publication *Towards Sustainable Grazing* is relevant to any enterprise based on land and water.

A guide to environmental management system development for grain farmers is also available. Its preparation was funded by the Grains Research & Development Corporation and Land & Water Australia.

9.3 Cleaner production

The United Nations Environment Program has a Working Group for Cleaner Production in the Food Industry. Established in 1996, it is supported by, and located at, the University of Queensland. Cleaner production is defined as the continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment.

The University of Queensland group has developed an eco-efficiency toolkit that includes:

- a manual comprising a self-assessment guide detailing water, energy, chemical and waste minimisation opportunities that are specific to the food industry, and
- a CD-ROM containing a generic training package for staff training and a calculator for identifying true water costs, trade waste costs, compressed air costs and greenhouse emissions.

Fruit and vegetable processing has been included, along with several other food industries.

The Commonwealth Department of Agriculture, Fisheries and Forestry organised a series of workshops, with the assistance of State agencies, across Australia as a follow up to the Queensland project. The purpose of the workshops was to:

- describe the Queensland project
- describe how an eco-efficiency assessment is undertaken, including use of the toolkit, and
- discuss if a national approach to eco-efficiency would be beneficial to the industry.

9.4 Farm planning and management

There is a considerable amount of material now available to support whole farm planning, which is essentially planning a farming operation to fit in as much as possible with the local landscape and ecology and with regional environmental needs. There have been several Commonwealth, State and Territory programs to foster this approach, and to provide the tools and training to carry it out.

There are specialised variations of farming and enterprise planning that incorporate human factors, such as personal lifestyle goals and people management, as a central feature. One example is the holistic management approach espoused by Allan Savory, the founder of the Center for Holistic Management. Holistic management treats humans, their economies and the environment as inseparable, and therefore emphasises the need to consider all the interactions between people, business and the environment in decision-making about any of them. He has developed a testing process to enable people to make decisions simultaneously concerned with short and long term economic, social and environmental realities. The aim is to make decisions that satisfy immediate needs without jeopardising their future well-being or the well-being of future generations. It provides a basis for taking advantage of the vast accumulation of knowledge now available to support decision-making.

In many enterprises success depends in large measure on the commitment and knowledge of staff to produce high quality goods and services, which is in turn a function of how they are managed.

The management method developed by Dr W. Edwards Deming is credited with establishing the statistical quality control and the principles of management that led to Japanese post-war economic success and the reputation of many Japanese goods and services for high quality. The people management elements are:

1. learn what quality actually is, teach it to all who work in the organisation, and then listen carefully to any worker who has an idea of how it may be further improved, and
2. manage everyone in the organisation so that it is obvious to all workers that it is to their benefit to settle for nothing less than quality work.

This proven formula, based on ‘leading’ rather than ‘bossing’ staff, is clearly consistent with a continual improvement approach.

9.5 Farming innovation

There is a growing sustainable agriculture movement supported internationally and locally, with research to underpin it. Research publications from many organisations, for example, CSIRO and Land & Water Australia, as well as universities, government agencies, and industry groups, provide pointers to more ecologically sound farming practices.

Some of the research highlights the extent to which the spread and take-up of worthwhile innovative processes is much less than it could be.

There are many opportunities to establish better communication and partnerships involving innovative farmers, researchers, other resource managers and all levels of government.

9.6 Landcare

Community landcare is the most widespread volunteer natural resource management movement in Australia, operating in urban as well as rural areas. It has been responsible for considerable knowledge gains by members and supporters about sustainable natural resource management, for innovative practices and for restoration of degraded environments. In many parts of Australia its members are active in development of the catchment management organisations that will become more influential in what industries do and how and where they do it. In many localities the landcare movement provides a solid basis for agricultural and downstream activities that are more rather than less harmonious with natural processes.

Environmental management systems do not help establish the capacity of land to support a particular industry, as they are internal to management. A patchwork quilt of environmental management systems at the enterprise level will not guarantee region or catchment-wide gains, thereby potentially reducing the value for the enterprises involved as well as for the wider community.

In some situations, such as the Sydney catchment, a starting point for developing an environmental plan will be the avoidance of known significant impacts. The Queensland Fruit and Vegetable Growers had to deal with this in developing an approach to environmental management systems for farming in the wet tropics where meeting regional criteria has to be a high priority. The model used identifies the environmental impacts of farm activities relevant to identified significant regional impacts to be avoided, for example, pollution of the Great Barrier Reef from sediments and nutrients. Individual enterprise plans then address these issues, as well as any others they believe to be significant in their case. The aim is to entrench this approach by formalising links with the regional natural resource management processes.

The same approach could be applied in any sensitive area, applying to nurseries and processing just as easily as to agriculture.

As a result of initiatives by some landcare groups and government agencies in Queensland, and Meat and Livestock Australia, the Australian Landcare Management System (ALMS) has been developed. It is an ISO14001 based system involving:

- consideration of catchment level priorities and strategies
- continuous support for bio-diversity conservation
- information exchange between farm catchment and region, and
- public sector, community and market place recognition and appreciation of the commitment to continuous improvement in environmental management.

An ALMS pilot trial under the Commonwealth National Pilot Program is under way with activities in South Australia and Victoria. Concurrently there are groups implementing ALMS in Queensland. A supporting organisation, Australian Landcare Management System Ltd, a non-profit company, has been established.

9.7 Olive industry initiatives

There are initiatives in the Australian olive industry that support environmental management systems. The Queensland Department of Primary Industries, on behalf of the industry, organises several courses.

The Olive Care Approved Supplier Training Program is for olive growers and harvesters who supply olive processing plants. It is based on the principles in the Codex Alimentarius,

thereby combining local environmental and food safety considerations with internationally accepted standards. This course is supported by an Olive Care Auditor course, thus providing a mechanism for ensuring compliance with the Olive Care requirements.

The Queensland Department has also initiated a HACCP course designed specifically for the olive industry.

The most recent development by the Department is an Environmental Management Course covering:

- environmental issues in horticulture
- environmental legislation
- management systems
- environmental terms and definitions
- introduction to environmental risk management
- identifying and managing environmental risks.

These are all short courses.

It is intended that a National Code of Practice be developed, covering:

- environmental issues
- oil and table olive quality standards, and
- food safety practices.

The Australian Olive Association has established a Processors' Group, and this group has established subsidiary groups examining labelling, quality assurance, waste management, a code of practice, traceability and storage. The outcomes from these groups will all assist in the development of effective environmental programs and systems.

The Australian Olive Association has produced a publication, *Organic Olive Management – a guide for Australian Olive Growers.* Organic and bio-dynamic practices emphasise the use of renewable resources, conservation of energy, soil and water, recognition of livestock welfare needs, and environmental maintenance and enhancement, while producing optimum quantities of produce without the use of artificial fertiliser or synthetic chemicals. These practices may therefore provide a good foundation for environmental improvement and environmental management systems.
The outcomes of the Processing Waste workshop referred to in Chapter 5 were agreement that the industry should adopt a zero waste approach, and that a working group should be established with olive industry, local and State government and expert representation to take the issues forward.

10. Alternative environmental management system pathways

It is in the interests of all participants in the olive industry that their operations be as environmentally sound as possible.

It is unlikely, however, that all will want to establish and maintain a full certified, audited ISO14001 compliant system. Availability of time, information, resources and personal inclination will all affect individual enterprise decisions.

There are several models already to guide further developments in the olive industry so that different levels of interest, knowledge, commitment and resources can be accommodated.

10.1 Forestry

The Australian Forestry Standard has a basic policy approach intended to provide for continual improvement in management, with enterprises developing their policies commensurate with the nature and scale of their businesses. It is structured to be consistent with ISO 14001, so an enterprise can move towards full compliance if it wishes.

Australian Forestry Standard Ltd has been formed to manage the implementation of the whole Australian Forestry Standard, thus providing continuity, stability and a structure for continuing review of the Standard.

10.2 Civil construction

In the civil construction industry it is common for contractors to have to meet a minimum set of standards for quality management, occupational health and safety and environmental management in order to undertake work for many clients.

To simplify and reduce costs for smaller size contractors, the Civil Contractors Federation has developed a National Prequalification Program. It is based on ISO 14001 (and other relevant standards). The Federation has developed the Integrated Management System as a tool to assist contractors. It includes a guide system manual, information on procedures, verification forms and generic documentation that can be easily adapted. Training and auditing is also arranged.

10.3 Queensland Fruit and Vegetable Growers

The approach taken by the Queensland Fruit and Vegetable Growers also recognises that many growers would prefer a system less complex and administratively demanding than the full ISO 14001 requirements. The Association is now developing a Farm Management System as a simpler approach, but still based on the elements of ISO 14001. As this approach would not involve formal certification, and because of the significance of regional environmental impacts in the wet tropics, a different endorsement model is being explored.

10.4 Australian Landcare Management System Ltd

The Australian Landcare Management System recognises that different land managers will have different aspirations and capabilities and that people beginning to undertake

environmental management systems will have different requirements as compared with those who have an established cycle of continuous improvement. Hence the categories of membership are differentiated primarily on the basis of whether the land manager is still developing his or her environmental system or whether a developed system is being refined and is being subjected to a more rigorous audit. Consequently these categories are not hierarchical but are designed to meet the varying environment management systems needs of land managers. There is some more detail about these levels of involvement in Appendix 4

11. Establishing environmental management systems in the Australian olive industry

11.1 For the future

Establishing an environmental improvement culture in the olive industry will require concerted action by olive industry organisations, active participation by all enterprises in the industry and continuing research.

Success with environmental management systems should be greater where there is a high level of understanding of environmental issues, where there is acceptance of key concepts, where there is a clear link with industry operational realities and other quality or continuing improvement activities, where there is ready access to information and where there are effective support systems and networks.

The industry at national, State and regional levels needs to commit to an ecologically sustainable industry, involving the following principles:

- least impact on the natural environment
- a culture of continuing improvement in all facets of the industry, including environmental management
- restoration of degraded environments, and reversal of environmentally harmful practices
- avoidance of practices that have unknown consequences or may pose a threat to the environment
- production as an outcome of good land and water management, whether in nurseries, on farms, or in other production such as packaging, and
- zero waste.

There are several steps the Australian Olive Association can take. These include:

- entering into an Eco-efficiency Agreement with the Commonwealth
- joining the Greenhouse Challenge
- seeking involvement in the Pathways to Environmental Assurance in the Australian Horticultural Sector activity being undertaken by Horticulture Australia Ltd and the Horticulture Australia Council
- becoming involved in the work of the local Working Group for Cleaner Production
- commissioning the development of environmental management systems arrangements appropriate to all parts of the industry including:
    - systems suitable for smaller enterprises, based on those being developed by Australian Landcare Management System Ltd, the Queensland Fruit and Vegetable Growers and the Civil Contractors Federation

  - development of risk profiles for all sectors of the industry
  - a legal and regulatory updating service
  - a directory of suppliers preferred because of their environmental credentials
  - continuing communications, including newsletters, and
  - endorsement and rewards systems
- promulgating success stories about innovative and environmentally friendly practices in the industry
- developing a training program and accreditation system encompassing olive industry needs for facilitators and auditors (see Appendix 5 on Training)
- continuing development of short course training programs on environmental management and quality control
- organising olive industry environmental trade fairs and conferences in concert with State and regional associations and other organisations,
- establishing partnerships with other industry, community, research and government organisations,
- establishing a Sustainability Committee from Australian Olive Association membership, supported by a technical advisory committee drawn from research, industry, government and community interest groups,
- continuing to pursue the introduction of a compulsory levy system to support research and development, and
- develop policies and practices to avoid an 'olives as weeds' problem.

To help overcome impediments from beyond the olive industry, the Association can lobby governments and other industry groups to:

- accept the multi-functionality of land management as a foundation of national policies on industry development, international trade and environmental protection,
- inform urban communities about the relationship between their lifestyles and rural enterprises and management,
- ease the criteria for the Commonwealth's environmental management systems incentives program so that many more enterprises may benefit,
- maintain the FarmBis program,
- increase programs and funding for targeted public good research of mutual benefit to the industry and the community at large, and
- remove any identified disincentives to the take-up and spread of environmental management systems.

State and regional olive associations can consider related action within their own jurisdictions, particularly in relation to regulatory and planning systems, regional catchment management and extension services. They should establish close links with regional and catchment management systems, and set in train processes for informing olive industry participants of significant environmental issues in their localities.

Environmental management should continue to be prominent in the industry's research and development strategy, with particular emphasis on:

- olives as weeds,
- water use in the industry,
- integrated pest management,
- the impact of olive growing on local ecosystems,
- harmonising olive growing with natural processes and with achievement of regional natural resource management goals, and
- zero waste options.

Individual enterprises can join regional and State olive industry associations and the Australian Olive Association and other relevant groups such as landcare and cleaner production groups. Many larger enterprises can join relevant national industry bodies such as the Australian Food and Grocery Council.

11.2 Now

There are many things an enterprise can do immediately. Here are some examples.

- Become knowledgeable about the local environment.
- Start restoring degraded environments.
- Join – regional, State and national industry bodies, Landcare and farm improvement groups, catchment groups, cleaner production groups or equivalents.
- Re-use or recycle waste wherever possible.
- Use least impact packaging, marketing and sales techniques.
- Start reducing water, chemical, energy and machinery use where practicable.
- Avoid unrelieved large-scale monocultures on farms.
- Avoid 'olives as weeds' problems.
- Involve the staff in considering and managing quality issues.

Appendix 1: Water issues

Paper reprinted with permission of the authors.

Irrigating oil olives with limited water supplies

Damian Conlan, Clarrie Beckingham, Mike Robbins, Dr Rod Mailer and Jamie Ayton. NSWDPI

Introduction

Throughout the prevailing drought conditions of the past three seasons in much of NSW the subject of irrigation continues to grow in importance. Olive trees have traditionally been grown in less fertile harsher environments because the trees are hardy and can be reasonably productive even under very dry summer conditions. These traditional methods utilise the landscape with terraces and contours and wide tree spacings (60-80 trees per ha) to maximise water harvesting by the trees. In Australia's recent olive industry development the minimum density is about 250 trees per hectare. We have planted our trees on the assumption that they will be irrigated but for many small growers the last three years of drought has severely restricted the water available for irrigation, which has slowed the development of trees and halted or reduced productivity over this time.

We can reasonably expect that water will continue to be a precious commodity, and for many growers a limiting one, so using it wisely will have a major impact on the profitability of their olive growing.

This paper will describe some of the effects of water deficit on olive productivity at different times of the year and for growers with limited irrigation water, a strategy for efficient water use based on fruit development stages is put forward. Regulated deficit irrigation in olives is also discussed in relation to how and when this can be used to maintain productivity and provide quality improvements.

Water stress and olive production

The reproductive cycle of the olive tree starts about 11 months before flowering with flower bud induction in early summer. This takes place on the new shoots produced in spring and early summer where 30-50 centimetres of shoot extension is necessary to ensure sufficient shoot length to carry a good crop the following season. At the same time the tree is starting to produce a crop which is competing with vegetative structures for nutrients and water. Adequate water through this spring early summer period is essential for both the current and next season's crop.

In late summer - early autumn, flower bud initiation takes place and flower buds begin to develop. This is followed by flower bud differentiation in late winter when the flower bud begins to develop into the inflorescence. This is followed by bloom in the spring, which in turn is followed by fruit set.

Maintaining adequate soil moisture through all these key events is important for maximising productivity. Water stress at differentiation and inflorescence development can increase the proportion of imperfect (infertile) flowers and stress at anytime during bloom, pollination and fruit set can dramatically reduce the crop.

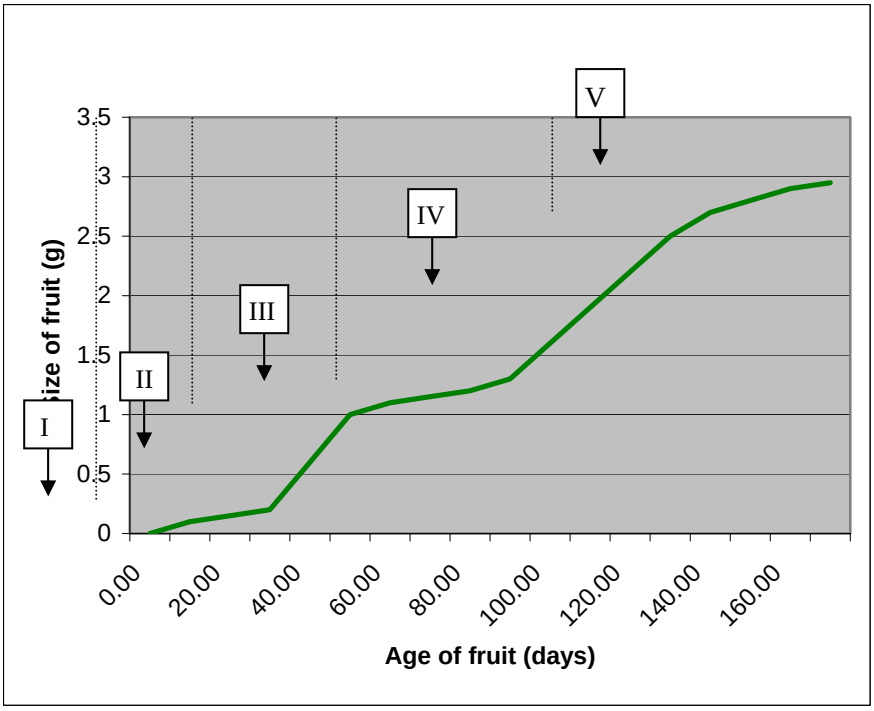
The fruit development period (November – May) encompasses the period when crop water use is highest and an understanding of how the olive tree responds to droughting combined with knowledge of fruit development can help us use our irrigation water in the most productive and efficient way.

Olive fruit development

Olive fruit development follows a double sigmoidal pattern of fruit growth that can be divided into five stages. In this description the times and durations of the stages are examples based on early

November flowering in southern inland NSW. Duration and timing of the stages will vary according to variety, environment and crop size.

Figure 1. Olive fruit growth and stages of fruit development



I. *Fertilization and fruit set*. Rapid early cell division involves growth of the embryo, enlargement of the new fruits becomes noticeable after about two weeks. A large number of fruits and flower parts are dropped in this stage, and any stress imposed on the tree will increase the level of abscission and reduce the crop potential. When flowering starts in early November this period will last until late November, early December.

II. *Seed (endocarp) development*. With early Nov flowering stage II often runs from end Nov to early Jan. Stage II is a period of rapid fruit growth due to both cell division and enlargement that mainly involves the growth and development of the endocarp (seed/pit). There is little development of the flesh (mesocarp), nor is there significant oil production in the fruit at this time. Lavee (1996) suggests that imposing moisture stress on the crop in the latter part of stage two can reduce seed size and improve the flesh-pit ratio in table olives. Where irrigation water is limited some water stress late in this period can also reduce vegetative vigour and reduce competition for the developing crop. Moderate moisture stress is also thought to not impact on oil production potential however limiting cell division can potentially limit eventual fruit size and severe stress is not advisable.

III. *Seed/pit hardening (endocarp sclerification)*. Fruit growth slows during stage III as the fruit undergoes a hardening of the endocarp. This process can last 4-5 weeks running into early to mid Feb. There is little growth of the fruit and little oil synthesis during this period. The crop can tolerate reasonable moisture stress during this period and it is a time when fruit respiration is low. The tolerance of dry conditions also applies to the vegetative parts of the tree and vegetative growth will also slow or stop when stomata close up and transpiration slows in the hot conditions.

IV. *Mesocarp (fruit flesh) development (cell enlargement oil synthesis)*. Beginning in late January early February stage IV is the second period of rapid fruit growth. This growth is

due to development of the mesocarp or flesh of the fruit and mainly involves cell enlargement. This is also the main period of oil synthesis with oil accumulation in the fruit being directly correlated with fruit growth (dry matter increase) during this period. Severe moisture stress can restrict growth of the fruit and oil production potential. Lavee (1996) reports that where irrigation water is limiting the most benefit to productivity is gained by using it in this period. Research in Europe has shown that irrigating to 50% of crop evapotranspiration (ETc) in this period will produce a crop that is very close to yields that can be achieved with full irrigation. But, severe stress in this period will reduce fruit growth and oil yield potential. We observed in the field this year that as stage IV progresses the fruit becomes increasingly susceptible to moisture stress and desiccation. This may be related to the progressive increase in fruit respiration rate (Ranalli et al 1998) and the increasing mass of soft tissue in the fruit as stage IV progresses. Where irrigation water supply is limited it maybe possible to impose a more severe deficit at the beginning of this period and increase water inputs as fruit growth progresses.

V. *Ripening*. Ripening commences with green maturation. This is described as the change from dark lime green to lighter green but it can be determined more accurately in the field by observing the onset of fruit softening. This change in fruit texture takes place quite dramatically over a period of one to two weeks and can be observed as a change from hard (Granny Smith apple texture) where the fruit is difficult to squash between thumb and index finger to softer texture wherein the fruit is easily squashed and milky juice is released. As the fruit ripens dry matter continues to increase along with oil synthesis, although at a slower rate than in stage IV. As with stage three the respiratory demand from the fruit lessens and with the weather cooling ETc drops off. Crop water management in stage V can have a dramatic impact on yield and quality characteristics. Fruit moisture content tends to drop off as ripening commences and imposing a water deficit on the trees can reduce fruit moisture further. It is possible that imposing water stress combined with the onset of colder weather can reduce metabolic activity in the fruit leading to reduced utilization and greater retention of phenolic compounds in the ripening fruit. In addition low fruit moisture at oil extraction time can increase the proportion of phenols in the oil due to reduced loss in the aqueous phase. Monitoring fruit moisture levels in the ripening period can provide a useful guide to crop water management to ensure that the required fruit moisture levels are attained at harvest time. Varieties will vary substantially in their response to water deficits and different irrigation management may be necessary for different varieties.

Because the duration and timing of the stages described above can vary substantially between varieties, locations and crop load, field monitoring of fruit is necessary when fruit development stage is used as the basis of any grove management activity.

Irrigation management

Figure 2 below illustrates a suggested moderate deficit regime based on fruit development stage, where crop water inputs are expressed as % of ETc.

This is presented again in table 1 with the addition of a full irrigation and two more deficit irrigation strategies, severe and extreme, showing water use per tree per day and megalitres per month.

This information is presented as a strategy rather than a guide and the application of deficit irrigation regimes should be based on good irrigation management that is based on monitoring soil moisture, plant condition and crop growth stage and weather conditions. In addition irrigators should have a good understanding of their irrigation system and soil characteristics system in relation to uniformity and rate of delivery and soil water holding and drainage properties.

NSW DPI will be conducting trials that apply similar irrigations regimes to that described here in the coming summer and more tangible data will become available at this workshop next year.

Figure 2. Olive fruit growth and crop water inputs under deficit irrigation conditions expressed as a percentage of ETc

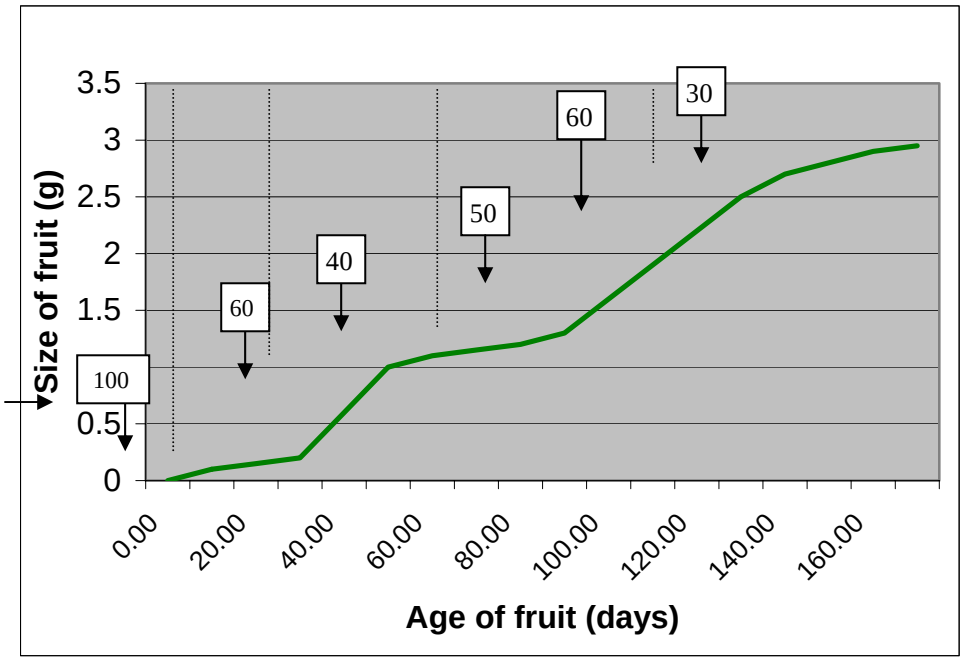


Table 1.
Crop water use estimates for mature olive trees grown in Wagga Wagga through the flowering and fruit development period for full irrigation, moderate, severe and extreme deficit irrigation.

	Fruit	Full irrigation			Moderate deficit			Severe deficit			Extreme deficit		
Month	Stage	%ETc	l/tree/day	Ml/month	%ETc	l/tree/day	Ml/month	%ETc	l/tree/day	Ml/month	%ETc	l/tree/day	Ml/month
Oct	O	100	79	0.89	100	79	0.72	100	79	0.72	100	79	0.72
Nov	I	100	105	1.14	100	105	0.92	70	73	0.65	50	52	0.46
Dec	II	100	111	1.25	60	66	0.61	40	33	0.30	0	0	0
Jan	III	100	133	1.50	40	53	0.48	25	33	0.30	0	0	0
Feb	IV	100	108	1.10	50	54	0.44	30	32	0.27	25	27	0.22
Mar	IV	100	90	1.02	60	54	0.57	50	45	0.41	25	22	0.21
Apr	V	50	23	0.25	30	14	0.12	25	12	0.10	0	0	0
May	V	0	0	0	0	0	0	0	0	0	0	0	0
Total water inputs (Ml/ha)				7.16			3.87			2.75			1.61

Notes to table 1.
The data above is based on crop water use calculations for a mature olive grove with an average fruit load of 10 tonnes. The potential total crop water use for 12 months based on these calculations is 9.1 Megalitres per hectare (Note that table 1. covers 8 months only). The calculations are derived from average evaporation data multiplied by crop factors developed by Norm Cross, NSWDPI Irrigation officer. The table presents hypothetical irrigation figures that assume extreme drought and in most years the irrigation amount will be reduced by effective rainfall events (events of more than 5mm). In Wagga Wagga average effective rainfall in this period is 213 mm or 2.1 megalitres per ha. Just how effective it is will depend on when it falls in relation to fruit development stage.

- %ETc is the amount of irrigation water applied expressed as a percentage of crop evapotranspiration, hence full irrigation is supplying 100% of ETc.
- L/tree/day is crop water inputs expressed as litres per tree per day.
- Ml/month is crop water inputs in megalitres per hectare per month.

The table presents a possible irrigation strategy for growers with limited water supplies for irrigation. It is based on a review of the literature but we do not have yield or tree health data from trial work done in Australia. In particular we do not have long term data on the effect of severe deficit irrigation on subsequent cropping potential and tree development.

The extreme deficit irrigation regime depicted above presents a strategy for best use of a small amount of available supplementary irrigation water. In general this irrigation supply should be considered inadequate for intensive olive growing and restriction of water inputs to this extent would entail yield reduction as well as reduced vigour and growth.

Table 2. Crop factors for oil olives. (Norm Cross NSWDPI)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crop factor	0.42	0.38	0.41	0.36	0.36	0.36	0.38	0.50	0.56	0.52	0.47	0.35

Open pan evaporation (Epan) data is often used to calculate potential crop water use. Crop water use will be different to evaporation from the open pan and a Crop Factor (Cf) is used to relate crop water use to the Epan data. Crop Evapotranspiration, ETc = Epan X Cf. Epan data is available from research stations and Bureau of Meteorology stations and in most irrigation districts Epan or reference crop (ETo) water use figures are provided daily through the peak irrigation season. These calculations are useful for estimating potential crop water use, but they are only an estimate and they do not replace field monitoring of soil moisture and crop condition.

Where the evapotranspiration of a reference crop (ETo) (a well watered grass sward) is supplied to irrigators rather than pan evaporation, we use a crop coefficient (Kc) to relate the ETo to that of our crop (ETc). In which case ETc = ETo X Kc. ETo is usually less then Epan, and crop coefficients are usually higher than crop factors. In the case of olives crop coefficients range between 0.4 and 0.7 depending on the time of year and the sources of the data.

Regulated Deficit Irrigation

Regulated deficit irrigation is a refinement of irrigation scheduling where water deficits are imposed on the crop at particular stages of fruit development to affect quality and/or yield characteristics. Additional benefits from RDI include reduced water use and costs and improved environmental management.

The increasing demand and rising cost of water has increased the need to focus irrigation research on low water use strategies for olives. Goldhamer (1999) studied the effect of deficit irrigation on Californian table olives and found that commercial yield of table fruit was reduced by severe deficit treatments due to reduced fruit size and weight. However the oil content of fruit was higher and the oil yield per acre was not significantly reduced. Motilva et al 1999 observed in Lleida, Spain, that deficit irrigation treatments advanced fruit ripening and increased the polyphenol concentration and the stability of olive oils without reductions in oil yield. D'Andria et al (1999) made similar observations from research carried out in southern Italy. These studies indicate that the use of regulated deficit irrigation in intensive olive orchards can reduce water use and improve oil quality without reductions in yield across a number of varieties and growing environments. In another study Tovar (2001) applied 7 different irrigation regimes through the summer -early autumn period. He describes significantly higher polyphenol and chlorophyl levels and stability of RDI oils than in fully irrigated trees. Perhaps

even more interesting was the difference in organoleptic character of the oils from different treatments.

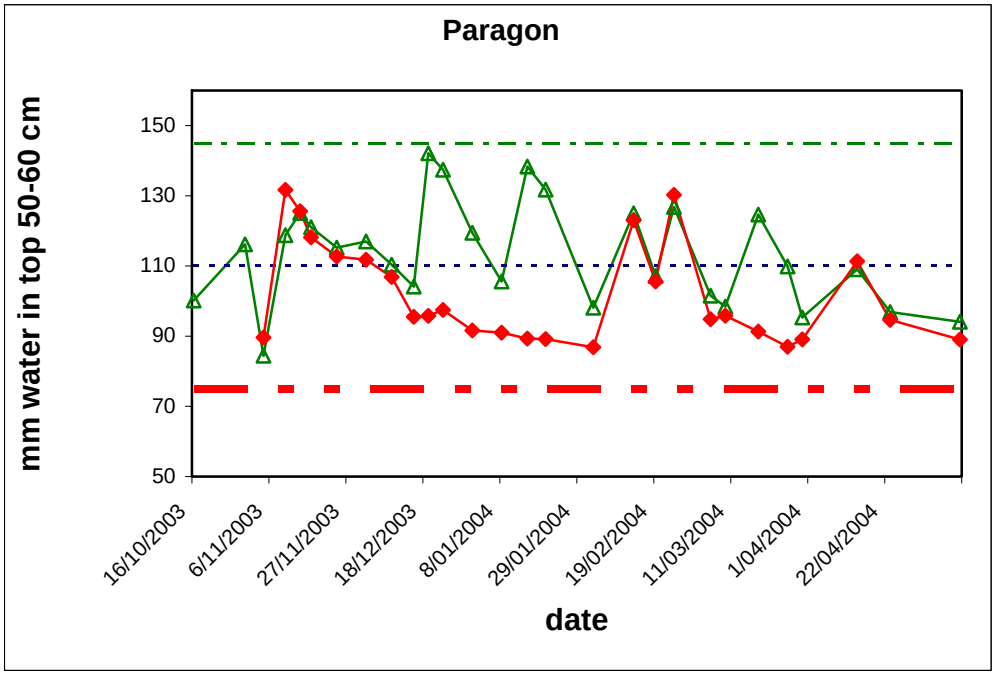
Bitter and pungency attributes were found to decrease linearly with increased irrigation water. Intense fruit flavours attributed to polyphenols were higher in the most severe deficit treatment and clear differences in organoleptic style were observed. While all the oils showed positive organoleptic characters such as green almond, anise and green banana only the high irrigation level oils were sweeter and displayed tomato and walnut attributes, while low irrigation oils had green tomato attribute.

NSW Agriculture Trials

In 2003-2004 we applied severe and moderate deficit irrigation regimes to several oil varieties in the Riverina. The trial was based in a large commercial grove which is furrow irrigated.

Under drought conditions the highest irrigation regime equated to about 60% of ETc while in the severe deficit treatment water was withheld from early in stage II (early December) until the onset of stage IV (early February) and then supplied with two waterings in February and no further water inputs until a rainfall event of 15mm in mid April and then another rainfall event of 25 mm in Late May. Due to the furrow irrigation and the limitations on water availability, control over the treatments was limited, but despite this we were able to make a number of interesting observations on yield and quality characteristics. The severe deficit treatments reduced fruit yield by about 25 % but oil yield was slightly higher and total oil yield was reduced by about 20%. This changed as the harvest period progressed with the deficit treated trees appearing to catch up to some extent as fruit continued to grow and produce oil as ripening progressed. Crop water inputs are depicted below in Figure 3.

Figure 3. Soil moisture measurements in Paragon olives irrigated with moderate and severe deficit irrigation regimes from mid October 2003 to Mid February 2004.



More data on the methods used, the yields and quality characteristics of oils produced in these trials will become available later this year when it has been compiled and analysed and a report completed for RIRDC.

NSW Department of Primary Industries irrigation support services

Within the NSW Department of Primary Industries, there are two main avenues for accessing irrigation related advice and training.

Under the banner of WaterWise on the Farm, the Department offers a range of courses from general to highly specific, starting with their Introduction to Irrigation Management. This course comprises four half day workshops covering soils, systems, scheduling and soil moisture monitoring, with the final session covering irrigation, drainage and management planning. Each workshop comprises of both lecture and practical field sessions and are usually tailored to specific crops or irrigation systems depending on the group involved.

Other courses available cover such topics as Water Security and Irrigation Pumping. Details about the courses can be obtained from the WaterWise on the Farm Facilitators. Irrigation extension and technical advice is available through the Department's Irrigation Officers who are based various locations throughout the state. Details of their locations are at: www.agric.nsw.gov.au/irrigation

The web site also has articles and other information related to irrigation subjects, WaterWise on the Farm initiatives and assistance available through the Department.

References

1. d'Andria, Morelli G, Giorio P, Patumi M, Vergari G and Fontanazza G (1999) Yield and oil quality of young olive trees grown under different irrigation regimes. Proceedings of the third international symposium on olive growing. *Acta Horticulturae* ,474, 185-188.

2. Fernandez JE, Moreno F (1999) Water Use by the Olive Tree. *Journal of Crop Production* Vol 2, No2(#4), 101-162.

3. Goldhamer DA (1999). Regulated deficit irrigation for California canning olives. Proceedings of the third international symposium on olive growing. *Acta Horticulturae*, 474, pp369-372.

4. Lavee (1996) World Olive Encyclopedia, Chapter 2, Biology and physiology of the olive. International Olive Oil Council.

5. Michelakis N (1990) Yield response of table and oil olive varieties to different water use levels under drip irrigation. *Acta Horticulturae* 286, 271-274.

6. Motilva MJ, Romero MP, Alegre S, Girona J (1999) Effect of regulated deficit irrigation in olive oil production and quality. *Acta Horticulturae*, 474, 377-380.

7. Ranalli A, Tombesi A, Ferrante ML, De Mattia G (1998) Respiratory rate of olive drupes during their ripening cycle and quality of oil extracted. *Journal of Science and Food in Agriculture 77, 359-367.*

8. Tovar MJ, Motilva MJ, Luna M, Girona J, Romero MP (2001) Analytical Characteristics of Virgin Olive Oil from Young Trees (Arbequina cultivar) Growing Under Linear Irrigation Strategies. *Journal of the American Oil Chemists Society* 78,8 843-849.

Appendix 2: Processing waste

This is a paper prepared for a workshop on Effective Waste Utilisation from Processing organised by the Goulburn-Strathbogie Olive Growers Association at Alexandra, Victoria on 5 May 2004.

A National Approach to Olive Processing Waste

Nelson Quinn, Convenor, AOA Processor Group Waste Management Committee

Dealing with waste from olive processing is a major unresolved issue – to quote the Research Institute for Water and Waste Management in Aachen, Germany:

> "The practice of treating the waste from olive mills is generally appalling."

This conclusion refers to practice in Europe. We need to avoid the same outcome in Australia, and in New Zealand, building on the close relationship already existing between the olive industries in the two countries.

The need to act

There are several reasons to act quickly and positively on the issue.

Be first:

There is research underway in Europe, but there is no reason for Australia and New Zealand not to strive to be first to achieve true sustainability in the industry.

Leap ahead in markets:

It is obvious enough that the industry has to meet the standards imposed by the buyers of its products, eg, retail grocery chains. There are advantages in keeping well ahead of any such standards so that the products already meet them as they change.

Generate by-products:

One objective for dealing with waste is to transform it into other commercial products.

Meet community expectations:

Consumers expect clean, safe food. There is increasing attention to the processes used to produce it. Community expectations are also expressed in other ways, eg, the standards developed by the Sydney Catchment Authority to guarantee safe, clean drinking water for the urban masses of greater Sydney. In the quite large catchment area for Sydney water, development proposals, including for olive processing, will need to demonstrate a neutral or beneficial effect on water quality. We should act on the assumption that this approach will be copied rather than spurned in other jurisdictions.

Help regulators:

It is best to work with regulators, planners and policy makers so that the outcomes reached are grounded in a realistic appreciation of the industry and to raise issues with them rather than wait for others to do it. It is also much easier for regulators if they are presented with potential solutions rather than just problems. We need to avoid decisions that are hard to apply in practice, or unduly harsh default decisions.

Action underway

There is already considerable action underway to overcome the waste problems. There is research in Europe that may not be readily accessible in English, being mainly in Spain, Italy and Germany. Pressures from the European Union for higher standards will no doubt ensure continuation of this.

As well as the local Alexandra composting example, there are other research activities underway in Australia. For example, two featured at the 2003 National Olive Conference. Dr Tan Nair from the University of Western Sydney wants to examine an innovative method of bio-remediation to accelerate the decomposition and detoxification of solid olive waste to produce organic mulch and a substrate for mushroom cultivation. Brigita Pty Ltd from Adelaide is developing a waste water retrieval system to lower environmental impact and recover resources present in waste water from olive oil processing. The company has recently received a $97,000 grant from the Commonwealth Government's New Industries Development Program to help build and install a full-scale version of its system.

These different approaches illustrate several strands of activity – to reduce environmental impact, to neutralize the waste, or to transform the waste into commercial products.

The AOA has supported the establishment of a Processors' Group, which in turn has established a Waste Management Group to explore options for overcoming the waste problem.

It is still early days for the group, but it looks like settling on the following tasks:

1. determine what the waste materials are
2. determine the effects these have on the local and wider environment
3. ascertain if there are ways the waste can either be used with beneficial results for the environment, or disposed of so that there is zero impact, and
4. influence and work with regulatory agencies.

The group has a dozen members spread across Australia.

There is a consultation paper out on a possible research and development levy process for the olive growing industry. If growers vote in favour of this there will be Commonwealth government funds to match industry funds to apply to priority research. This can include waste management at all points in the industry.

With the benefit of a grant from the Rural Industries Research and Development Corporation, I am preparing a report on establishing a framework for environmental management systems in the olive industry, from nurseries to consumers. The intention is to set out convincingly why such systems are desirable, emphasise the potential environmental impact of all levels of olive industry and consumption activities, and provide a basis for developing the more detailed guidelines that are needed, or in some cases, review and, if necessary, adaptation of existing work, eg, for nurseries.

Some concepts

There are some basic concepts that should underpin action on waste management if we are to achieve long lasting results relatively quickly and economically.

Life cycle analysis:

An increasingly popular approach is analysing the total impact of a product from the initial inputs to final disposal. Doing this ensures that the total impact is known and can be acted on, and there is less chance that a problem is simply transferred, eg, the outcome of past practices of simply letting waste water from industry drain away.

Precautionary principle:

This is often described in most confusing terms, leading to counter-productive argument. In practice, the principle requires identifying preferred futures (eg, a clean, green industry) and seeking least risk pathways to achieving them. This is a confident and positive approach.

Zero waste:

This is the only realistic goal. There is now so much work going on around the world on achieving zero waste outcomes from human activities that is has to be seen as an achievable goal. This goal also avoids the pitfalls of 'best practice' and similar approaches. With these you only stay level with your competitors, may end up being stuck with dead end technology, and are ill-prepared for sudden or dramatic changes in regulatory systems and consumer preferences.

Holistic land and water management:

There are several approaches to planning and management based on whole system perspectives, often with particular attention to the relationships among social, economic and environmental issues. Where land, water and biodiversity condition goals are included in these processes, the outcomes will be positive for continual improvement in all aspects of an enterprise, including waste management and financial viability.

Good planning:

Often people worry too much about the enormous size of a task, or about the perceived huge gap between the current position and achieving the goal. These concerns can be overcome by planning processes involving as many parties as can be found to take an interest, and producing a plan involving:

- what we can do now with current knowledge, mechanisms and resources
- processes to identify knowledge and other gaps impeding further progress,
- a strategy to overcome the gaps, and
- processes to ensure an immediate start to implementation of readily agreed items.

Change mechanisms:

Inertia against change often has to be overcome. Key steps in introducing change effectively include:

- convincing all the relevant parties of the desirability of the change
- a willingness by those who want the change to invest in achieving it, and
- a clear sharing in the benefits by those expected to make the change.

For example, there is often resistance to regulatory changes because one party is expected to bear all the cost and do all the work with the benefit for others. In Australia we still have the

problem that primary producers and food processors are routinely expected to bear the cost of public good elements of improved environmental outcomes or reduced food safety risks.

Incentives and support

A good incentives framework and strong support from interested parties can accelerate action.

Government leadership:

This can take many forms, including simply advocating progressive waste management goals, positive recognition of the industry, eg, through the levy process, and tax and grant systems supporting sustainable production systems. All levels of government are important for this.

Links with other activities:

Regulatory and planning systems, quality assurance programs and workplace safety requirements and environmental management systems have overlaps, so there can be advantages in encouraging all in the industry to embrace them all positively. Participation in landcare or similar activities has similar advantages.

Regulatory arrangements:

There are several relevant to the industry administered by all levels of government. As already mentioned, it is desirable that the industry be involved in developing these. The more compatible they are with typical industry practices, the more likely they are to be willingly implemented. It is also not often realized that in a market economy regulatory standards are an important source of information, eg, if the water quality standard has been met, the waste water can safely be used in the market garden.

Other groups

There are many other groups whose aspirations are consistent with responsible waste management, or whose members are potential customers for new olive industry by-products. These would include the organic farming movement, landcare and catchment management groups, holistic management groups and aboriginal and conservation groups. All of these can provide support for individual enterprise activities, and for development of progressive government policies, programs and regulatory systems.

Roles

Quicker and better results require all parties to play a positive role.

Growers:

As well as ensuring they have good waste management operations they need to maintain pressure on processors, industry associations and all levels of government to develop and implement effective waste management programs. They should support research and development programs and join relevant organizations, especially their olive industry associations. Larger scale operators can join various government initiatives, eg, the National Packaging Covenant.

Processors:

They can participate individually and collectively in all waste issues, depending on scale, location, interests and priorities. They can adopt environmental management and quality assurance systems, which is easier for processing than farming. In many cases in Australia processing is part of a bigger farming operation. Those involved in this way can research and adopt sustainable land use or landcare farming practices, integrating the processing operation with broader landscape management.

Industry associations:

They can make waste management a priority, foster the development and spread of environmental management and cleaner production systems, encourage related research, showcase and publicise new developments and join relevant government programs, eg, an Eco-efficiency Agreement at the national level.

Governments:

There is a major role for governments at all levels, even where they espouse the currently fashionable non-interventionist approach. They are responsible for planning and regulatory systems, tax systems, and environmental, industry support, regional development and trade programs, all of which have impacts on the olive industry. Olive industry standards are also subject to international agreements because of the roles of the International Olive Oil Council, the European Union and Codex Alimentarius. It is best to have standards that we can meet easily, that competitors struggle with and that are reliable and regularly monitored and enforced. The Commonwealth government needs to remain strongly involved in these international processes.

The initiative of the Goulburn Strathbogie Olive Growers Association and its local and State government supporters is a big step forward.

Appendix 3: Biodiversity

Criteria for evaluating mechanisms to integrate biodiversity conservation into NRM planning and practice.

This review concludes that the effectiveness of integrating biodiversity conservation into NRM plans can be assessed using the following criteria:

Information

The plan should increase the prospects for:

- understanding of ecological processes and their relationship to human needs, eg, agriculture, amenity and life support services, and associated changes in human values, attitude and behaviour towards the rest of the natural world,
- understanding and acting on the links between local, regional, national and global biodiversity scales,
- use of mechanisms for developing skills in using these data and information sources,
- understanding and use of processes that should improve environmental outcomes generally, eg, holistic management, some organic agriculture practices, environmental management systems, 'no waste' urban management systems, and other processes that tend to
- harmonise human activities with natural processes,
- increased research, including funded by governments on public good tests,
- continuing public education, beginning at primary school level.

Incentives

The plan should provide mechanisms for:

- identifying the legal, social and economic factors militating against effective action, eg, market failure issues, and for overcoming them
- aligning action favourable to biodiversity with other action common or desirable for achieving social and economic goals, eg, in agriculture, urban management and production and consumption patterns
- paying landholders for public good services
- developing well informed peer pressure by the whole community on all urban and rural landowners, managers and workers
- increasing government investment in relevant public good activities
- overcoming market failure problems relating to externalities for primary producers and other non urban landholders
- payments to landholders for ecosystem services arising from their land
- legal and regulatory frameworks encouraging good environmental practices
- landholders having first opportunity to undertake paid work for biodiversity on their land
- increasing efficiency in all human activities.

Institutions and Values

A good plan needs to:

- provide a basis for overcoming fragmentation, needless overlap and lack of co-ordination in government at all levels
- facilitate priority for conservation tests in local government planning and development (sic) approval systems
- identify relevant positive community values and build action plans around them
- identify relevant negative community values and potential means for overcoming them
- increase thinking about landscapes and their attributes and values
- and how humans interact with them, particularly in respect of
- securing conservation values before exploitation occurs
- propose appropriate legislative changes and means to achieve them.

Planning Process

A good planning process:

- involves as many parties as can be found to take an interest right from the start of the process
- produces a plan involving:
- what we can do now with current knowledge, mechanisms and resources
- processes to identify gaps (knowledge, mechanisms, resources, etc)
- mechanisms to ensure implementation of readily agreed items
- begins immediately
- includes simple sustainability tests based on soil loss and health, biodiversity and inter-generational equity
- includes continuous restoration activities
- uses precautionary principles, ie, identifies preferred futures maximising biodiversity values and seeks least risk pathways to achieving them.

Appendix 4: ALM membership

The requirements of each of these categories of ALM membership are as follows and are summarised in the following table.

***Subscriber**:* Interested in ALM and registered as an ALM Subscriber. Want to access information about ALM and prepared to help ALMS Ltd in some way.

Associate: Want to implement ALMS and registered as an ALM Associate. Using the EMS Manual and Workbook or an equivalent such as the software, MyEMS, and progressing to develop a continuous improvement system that meets ALMS requirements.

Eucalyptus: Participated in an ALMS workshop series, or similar EMS development process; and taken into account local or regional catchment priorities or strategies. Demonstrated a commitment to continuous improvement of support for biodiversity conservation; completed all sections of the Australian EMS Workbook; passed an ALM Eucalyptus audit and having paid the ALM Eucalyptus membership fee.

Banksia: Met all the system requirements applying to ALM Eucalyptus membership plus is exchanging information with the catchment authority in the region. Passed an ALM Banksia audit and paid the ALM Banksia membership fee.

Grevillea: Met all the system requirements applying to ALM Banksia membership and is ISO 14001 certified. Paid the ALM Grevillea membership fee.

ALM MEMBERSHIP BENEFITS AND REQUIREMENTS

Aspect	ALM Subscriber	Associate Member	ALM Eucalyptus	ALM Banksia	ALM Grevillea
Required to complete application form	✓	✓	✓	✓	✓
Receive newsletters, papers and notifications of events	✓	✓	✓	✓	✓
Access to the ALM web portal and online ALM groups	Restricted	Restricted	Open	Open	Open
Eligible to display ALM membership sign	-	-	✓	✓	✓
Commence/continue eligibility period for discounted ALM membership	-	-	✓	✓	✓
Receive ALM membership guide with Australian EMS manual and workbook	-	✓[1]	✓	✓	✓
Eligible to participate in ALM supported workshop	-	✓	✓	✓	✓
Documented ISO 14001 compliant environment management system	-	-	✓	✓	✓
Have taken account of natural resource management catchment priorities and strategies[2]	-	-	✓	✓	✓
Provide continuous improvement for biodiversity conservation[3]	-		✓	✓	✓
Exchange information via the ALM processes with catchment authority	-	-	-	✓[4]	✓
Auditing	-	-	ALM Eucalytpus accredited auditor [5]	ALM Banksia accredited auditor[6]	ISO 14001 accredited auditor[7]
Eligible to represent products as arising from an ALMS certified farm	-	-	-	✓	✓

Aspect	ALM Subscriber	Associate Member	ALM Eucalyptus	ALM Banksia	ALM Grevillea
Eligible to represent farm products as arising from an ALMS ISO 14001 certified farm	-	-	-	-	✓
Fees/cost *All fees and costs are GST inclusive	Annual ALM Subscriber contribution • Concession $22 (student, pensioner) • Individual $55 • Corporate $550 (minimum)[8]	Annual Registration fee ($55) plus cost of Australian EMS workbook and manual and of workshop attendance (variable)	Annual Registration fee ($110) plus cost of auditing (variable)	Annual Registration fee ($110) plus cost of auditing (variable)	Annual Registration fee ($110) plus cost of auditing (variable)

Footnotes

[1] The intention is that Associate Members will be in a position to apply for ALM EUCALYPT Membership within two years of undertaking their first ALMS workshop or an equivalent activity. In the event of this not happening then an ALMS Facilitator will be requested to construct an appropriate course of action with the Associate Member. An 'equivalent' activity might be a landholder seeking ALM EUCALYPT membership having developed an EMS using the software program, MyEMS but without having participated in an ALMS workshop. Alternatively a landholder may have an EMS in place from another EMS program and now be seeking ALM certification and membership.

[2] Taking account of catchment priorities means just that. It does not mean that the catchment priorities necessarily take priority over those of the landholder. The landholder makes the final judgement using the mechanisms for prioritisation within the ISO 14001 management process.

[3] Providing continuous improvement in support for biodiversity will require monitoring of that support but not of biodiversity itself.

[4] The ALM information exchange processes will ensure that the source of the information will remain confidential unless written permission is provided for the information to be attributed.

[5] The first level of audit – that to enable entry into ALM Eucalyptus Membership – is termed the ALM Eucalyptus Member's Audit and this done by an "ALM Eucalyptus accredited auditor". An ALM Eucalyptus accredited auditor will have a certificate indicating successful completion of an environmental auditors workshop, will have signed a form indicating they have read and understood requirements for ALM Membership and they will not be part of the business unit for which the ALM Eucalyptus certification applies. However they will not necessarily be independent of that business unit. For instance a person purchasing product from a property or advising on how to move to a Eucalyptus Membership could undertake a eucalyptus audit.

[6] An ALM Banksia accredited auditor will need to meet the provisions applying to an ALM Ecalyptus accredited auditor, have undertaken at least 10 ALM Eucalyptus audits or equivalent and be independent of the business unit and related units, for instance along the product chain, to which the certification applies.

[7] ALM Grevillea Members will need to be audited by an ISO 14001 accredited auditor and be able to demonstrate that they meet the requirements applying to ALM Banksia Members.

[8] Fees include a link from the ALM site to your corporate web address as well as ALM endorsed advertising during seminars, workshops and through the ALM web-site. Voluntary corporate contributions in excess over $550 are welcomed.

Appendix 5: Training

Experience in Australia and elsewhere suggests that a comprehensive approach is needed to the provision of information and training opportunities if the introduction of environmental management systems is to be successful and wide spread. The experience, knowledge, interest and available time will vary considerably among those who may be interested. Therefore, the following suggested training elements would not be needed in all cases.

1. Understanding of the industry

- key elements of (olive growing) (olive processing) and relationship to natural resources
- outline of whole of industry chain (from suppliers to consumers)

2. Understanding of background issues driving environmental management demands

- local, State, national and international regulations and agreements
- industry codes of practice
- market forces
- regional and catchment management of natural resources

3. Ecology and the olive industry

- natural systems and olive growing
- waste issues

4. Elements of environmental management systems

- responsible environmental management
- continuous improvement concept
- other useful concepts
- formal EMS requirements
- relationship to enterprise planning and management, staff management, occupational health and safety and quality control

5. Levels of environmental management system participation

- full certification and auditing
- staged approach consistent with ISO 14001

6. Support systems

- government programs
- industry programs
- materials available
- sources of information and advice.

The foregoing is based on a need for environment-based training. In practice, the greatest and most immediate demand is for training to deal with immediate management and profit issues, for example, maximising olive production or successful marketing of olive products.

One way forward, based on successful experience in the pastoral industries, is to ensure that production, processing and marketing training includes explicit links with environmental issues, for example, energy and machinery use in most cases, dependence on natural systems for production, and waste issues for processing and marketing. The continuing improvement, and related risk management and precautionary approaches, are applicable in all cases.

Such an approach can prepare the way for more explicitly environmentally oriented courses and materials. In the pastoral industries, Prograze and similar courses on production systems have led naturally and easily to the Meat and Livestock guide *Towards Sustainable Grazing*, which is based explicitly on environmental concepts.

References

www.daff.gov.au This Commonwealth Government website provides access to information on environmental management systems, covering:

EMS Navigator
New EMS Directions
Pathways to Industry EMS Program
Australia's National Framework for Environmental Management Systems in Agriculture
Environmental Management Systems – Biodiversity Resource Guide
Environmental Management Systems – National Implementation Plan
Environmental Management Systems – National Pilot Program
Environmental Management Systems – Training Information
Environmental Management Systems – Contact Officer
Environmental Management Systems & Production Certification
Environmental management Systems Incentives Program
Factsheet – Environmental Management Systems in Australian Agriculture
Envronmental Management Systems Working Group
EMS Navigator: Definitions

VEMAS Voluntary Environmental Management Arrangements: T Mech and MD Young, Rural Industries Research and Development Corporation 2001

www.agric.nse.gov.au/reader/11441 This New South Wales Government website has extensive information on environmental management systems and on the related topics of natural resources and climate.

Media Release – Horticulture Secures EMS Funding: Horticulture Australia Ltd, 2004

www.horticulturefortomorrow.com.au This is the website for the Horticulture Australia project on Environmental Assurance in the Australian Horticulture Sector

Nursery & Garden Industry Australia – Environmental Legislation Investigation: Storm Consulting Pty Ltd, 2003

Environmental Management Systems – Specification with Guidance for Use (ISO 14001:1966): Standards Australia and Standards New Zealand

The Greenbook: A guide to managing the environment for perennial horticulture in the MIA: Murrumbidgee Horticulture Council Inc., 2004

AS 4708 (Int) – 2003 The Australian Forestry Standard: Australian Forestry Standard Ltd, 2003

Horticulture Productivity & Sustainability: Horticultural Research and Development Corporation and National Land Water Resources Audit, 2001

Australian Food and Grocery Council 2003 Environment Report: Australian Food and Grocery Council 2003

Property: Rights and Responsibilities: ed. C Mobbs & K Moore, Land & Water Australia, 2002

The Air Up There – Greenhouse and Agriculture: Department of Agriculture, Fisheries and Forestry, 2002

Greenhouse and Agriculture Workshop Series Final Report: Department of Agriculture, Fisheries and Forestry, 2001

Guidelines for implementing EUREPGAP for Australian fresh fruit and vegetable producers: Department of Agriculture, Fisheries and Forestry, 2004

Greenhouse Gas Emissions from the Australian Livestock Sector: Australian Greenhouse Office, 2001

Environmental Factors affecting Australia's Livestock Industries: Department of Agriculture, Fisheries and Forestry, 2001

Introduction to Environmental Management Systems in Agriculture: Department of Agriculture, Fisheries and Forestry, 2003

Activity-based Cost and Environmental Management: Jan Emblemsvag and Bert Bras, Kluwer Academic Publishers, 2001

Development of a regional pilot to facilitate industry and landholder implementation of on-farm Environment Management Systems: D Hine and I Muller, Queensland Fruit and Vegetable Growers, 2003

The Australian EMS Manual: The Australian EMS Manual Committee, 2003

Take Your Pick – The Seafood EMS Chooser: Seafood Services Australia Ltd and Ocean Watch, 2002

Environmental Management Systems Business and Property Planning Workshop Series: New South Wales Agriculture

Developing your own EMS – a grain farming example: New South Wales Agriculture 2002

Riverina Environmental Management System (EMS) Package: Department of Natural Resources and Environment, Victoria

Developing an environmental management system: a practical guidebook for agricultural businesses: Department of Agriculture, Western Australia, 2001

Farmers Assessing their Resource Management: NSW Farmers' Association

Sustaining the Catchments (Draft): Department of Infrastructure, Planning and Natural Resources, New South Wales, 2004

www.deh.gov.au This Commonwealth Government website has extensive material on natural resource management, waste issues, sustainable industries and supportive programs such as Eco-Efficiency Agreements.

Pilot Project Summaries – The 2004 EMS National Pilot Program Annual Forum: Department of Agriculture, Fisheries and Forestry, 2004

Climate Change Impacts for Australia: CSIRO, www.marine.csiro.au/iawg/impacts2001 pdf

Climate Change: Impacts, Adaptation and Vulnerability – Summary for Policymakers: Intergovernmental Panel on Climate Change, www.unep.ch/ipcc

Planetary Overload: A J McMichael, Cambridge University Press, 1995

Observed Changes in Australian Climate: R Suppish, D Collins & P Della-Marta, CSIRO Atmospheric Research and Bureau of Meteorology, National Climate Centre

Climate Change: G I Pearman, In Search of Sustainability Online Conference, www.isoconferece.org.au

Business, Trade and the Environment: Prospects for a Steady Playing Field: P Ekins, presentation at the 1997 Open Meeting of the Human Dimensions of Global Environmental Change Research Community, Laxenburg, Austria.

Australian Olives – A guide for growers and producers of virgin oils: M Burr, 2nd Edition, 1997

Olive Production Manual: ed. G S Sibbett & G C Martin, University of California, Division of Agriculture and Natural Resources, 1994

Yield response of table and oil olive varieties to different water use levels under drip irrigation: N Michelakis, *Acta Horticulturae, 286*, 1990

Regulated deficit irrigation in olive trees: S Alegre, J Girona, J Marsal, A Arbones, M Mata, D Montagui, F Teixiedo, M J Motilva & M P Romero, Proceedings 3rd International ISHS Symposium on Olive Growing, *Acta Horticulturae, 474,* 1999

Analytical characteristics of virgin olive oil from young trees (Arbequina cultivar) growing under linear irrigation strategies: M J Tovar, M J Motilva, M Luna, J Girona & M P Romero, *JAOCS*, Vol 78, no. 8 (2001)

Olive oil quality and strategic irrigation: D Conlan, New South Wales Agriculture

Weed Categories for Natural and Agricultural Ecosystem Management: Convenor – R H Groves, Department of Agriculture, Fisheries and Forestry, 2003

The Avian Dispersal of Olives Olea Europaea: Implications for Australia: D H R Spennemann & L R Allen, *Emu,* Vol 100, 2000

Feral Olives (Olea Europaea) as future woody weeds in Australia: D H R Spennemann & L R Allen, *Australian Journal of Experimental Agriculture*, Vol 40, 2000

Olive Position Paper: Weed Management Society of South Australia Inc., 2001

Shonky sperm not up to the job, scientists warn: A report of remarks by Professor John Aitken and others on the impacts of toxic chemicals on male sperm. *The Canberra Times*, 29 May 2004

Fertilisers 'destructive': A report of comments by Dr A Rovira on the adverse impacts of chemical fertiliser usage and conventional cultivation. *The Weekly Times*, 11 February 2004

Waste Management – Olive Oil Production: C Earnshaw, paper at Wagga Wagga Oilive Oil Workshop, May 1999

Managing for the Future: Commonwealth of Australia, 1995

Planning for Sustainable Farming: Andrew Campbell, Lothian Books, 1991

The Business of Farming: Eric Smith, ABC Enterprises, 1991

Group Farming: R Powell, M Bartholomaeus, R Gasson & D Blesing, Australian Rural Adjustment Unit, Publication No 129

Sustainable Agriculture: J Mason, Kangaroo Press, 1997

Preparing the Ground: Social Research for the Facilitation of Sustainable Agriculture: A Brown, Charles Sturt University

Landcare Farming: P Cullen, J Williams & A Curtis, Landcare Australia, 2003

Land use and natural ecosystems: A revolution in land use is the key to a sustainable landscape: J Williams & D A Saunders, CSIRO

Sustainability Issues for Agriculture in Western Australia: A Bennett, R Kingwell & R George, WA Department of Agriculture, 2003

www.sare.org This the website for the Sustainable Agriculture Research and Education program of the US Department of Agriculture

A Revolution in Land Use: Emerging Land Use Systems for Managing Dryland Salinity: R Stirzaker, T Lefroy, B Keating & J Williams, CSIRO Land & Water, 2000

Achieving Sustainable Relationships between Australian landholders and landscapes: D Mitchell, 2002 Fenner Conference on the Environment

Sustainability Indicators for Agriculture: An Introductory Guide to Regional, National and On-farm Indicators: J Dore, Rural Industries Research & Development Corporation, 1997

Emerging Challenges for Farming Systems – Lessons from Australian and Dutch Agriculture: ed. K Rickert, Rural Industries Research & Development Corporation, 2003

Sustaining the Land: Case Studies of Farmers Working for our Future: B McNeill, NSW Farmers' Association

National Strategy for Ecologically Sustainable Development: Commonwealth of Australia, 1992

Sustainability – the Principle, its Implementation and its Enforcement: D E Fisher, *Environmental and Planning Law Journal*, Vol 18, No. 4, August 2001

Acceptance of the Precautionary Principle – Australian v. International Decision-makers: L Wyman, *Environmental and Planning Law Journal*, Vol 18, No. 4, August 2001

Communication from the Commission on the precautionary principle: Commission of the European Communities, COM (2000)1

www.resalliance.org This is the website for the Resilience Alliance.

International Human Dimensions Programme on Global Environmental Change: IHDP Update 02/2003, Focus: Resilience

www.cfsan.fda.gov, ***www.inspectiongc.can*** These are two websites providing descriptions of the history of the system known as HACCP (Hazard Analysis and Critical Control Point) and of its content.

The Environmental Imperative – Eco-Social Concerns for Australian Agriculture: F Vanclay & G Lawrence, Central Queensland University Press, 1995

Understanding Landholders' Capacity to Change to Sustainable Practices: J Cary, T Webb & N Barr, Department of Agriculture, Fisheries and Forestry, 2002

Environmental Management in Agriculture – Native Biodiversity Resource Kit: Department of Sustainability and Environment, Victoria, 2003 (available on www.dse.vic.gov.au)

Review of farmer-initiated innovative farming systems: I Perkins, T Gleeson & B Keating, Land & Water Australia, 2003

Nature Conservation on Farms: NSW Agriculture, 1996

Environmental Partnerships: N Gunningham & D Sinclair, Rural Industries Research & Development Corporation, 2002

EMS and Land Valuation: C Nind, Rural Industries Research & Development Corporation, 2002

Rights, Institutions and Sustainability: How can we make it work?: P Martin & M Verbeek, 2002 Fenner Conference on the Environment

For the Common Good: H E Daly & J B Cobb Jr, Beacon Press, 1989

Australian Weed Management Systems: ed. B M Sindel, RG & FJ Richardson, 2000

Balancing Conservation and Production: CSIRP Tropical Agriculture

Tools to assist Environmental Management in Vineyards: A M Boland, D Baker, G Greiger & G Hogan, Second National Wine Industry Environment Conference and Exhibition, 2002

Towards Sustainable Grazing: ed. W Mason, L Warn & G Cahill, Meat & Livestock Australia Ltd, 2003

Tocal Code of Land Use Practice: A C Archer, NSW Agriculture, 1997

A Biodiversity Strategy and Plan for the Australian Rice Industry: D Freudenberger & J Stol, CSIRO Sustainable Ecosystems, 2002

Pathways for Biodiversity Conservation: Synapse Research & Consulting & Associates, Land & Water Australia, 2003

www.civilcontractors.com This the website for the Civil Contractors' Federation.

Holistic Management - A New Framework for Decision Making: A Savory with J Butterfield, Island Press, 1999

The Deming Management Method: M Walton, W H Allen & Co Plc, 1989

The Control Theory Manager: W Glasser, Harper Collins Publishers, 1994

Managing a Better Environment: Opportunities and Obstacles for ISO 14001 in Public Policy and Commerce: J Morrison, K K Cushing, Z Day & J Speir, Pacific Institute for Studies in Development, Environment and Security, 2000

Review of the National Landcare Program: Department of Agriculture, Fisheries and Forestry, 2003

Guide to Australian Landcare Management: T Gleeson, P Crawford & J Douglas, Australian Landcare Management System Ltd, 2004

Organic Olive Management – a guide for Australian Olive Growers: Australian Olive Association Ltd & NSW Agriculture, 2003