Department of Agriculture
Government of Western Australia

DEPARTMENT OF AGRICULTURE

SUBMISSION TO

THE STATE SUSTAINABILITY STRATEGY

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EXECUTIVE SUMMARY

The following report was written in response to the *Focus on the Future*, a consultation paper for the State Sustainability Strategy for Western Australia.

The report discusses:

- recommendations for the Sustainability Policy Unit to consider when developing the State Sustainability Strategy.
- defining sustainability and the implications for agriculture;
- opportunities for moving towards a sustainable industry;
- trends and challenges faced by agriculture; and
- some case studies of how the agricultural sector is currently developing and implementing sustainable agricultural practices.

Agriculture has been and will continue to be a major driver for economic development in most regions. Sustainability is an important issue for agriculture and poses a number of opportunities and challenges for the industry. Much has been done, particularly through the landcare and bio-security programs to raise awareness and empower community and industry groups to take increased responsibility, and work needs to continue to build on this increased capacity.

The role of the Department of Agriculture is to assist the agriculture industries in Western Australia achieve sustainable growth, which will in turn contribute to the social and economic well being of Western Australia.

In order to achieve sustainable growth, agriculture must:

- ensure that the resource base used by agriculture is maintained or enhanced;
- minimise the impact of agriculture on the surrounding environment;
- meet community and political expectations with regard to biodiversity, animal welfare, and food safety; and
- maintain or enhance international competitiveness

These requirements must all be met if sustainable growth is to be achieved. For example, given that 80 per cent of agricultural production in Western Australia is exported, high performance in biodiversity maintenance will not provide sustainability if international competitiveness is reduced. The reverse is also true, international competitiveness in terms of cost of production will not provide sustainability if products are excluded from markets because the production system is causing damage to ecosystems.

Agriculture faces significant challenges given global economic, market and trade related trends and state/ national issues related to:

- land and water degradation;
- biodiversity loss and weed, pest and disease invasion;
- climate change and Greenhouse;
- access to water supplies - a key for future agriculture based development; and
- rural area depopulation and loss of services.

These are discussed further in Sections 6 and 7.

Six key areas are highlighted for consideration in the Strategy and these are discussed more fully in Section 1.

1. The need for greater government sector coordination to achieve sustainability

Under current governance arrangements no whole of government framework exists that enables issues of sustainability to be considered across sectors and institutions. For example decisions about economic development and natural resource management are often made in isolation from one another and at worst can be conflicting.

To improve the connectiveness amongst sectors as well as to give guidance on the strategies the State needs to pursue for sustainability, it is suggested the Sustainability Strategy considers the considers the initiation of whole of government strategic planning (e.g. scenario planning) at a State and/or regional level. This would give a long term perspective, establish a preferred sustainable future scenario for WA and each region, and establish common outcomes and success measures for sustainability. These could in turn underpin the integration of effort, define the necessary alliances and enable the examination of institutional roles and responsibilities in the light an agreed future.

2. Targets for sustainability

Compatibility in policy and decision making is essential across the different scales (national/ State, regional and farm) and sectors (economic, social and environmental).

Clear NRM targets will provide consistent messages about sustainable land management across State, regional and local/farm scales. For example, best practices to be implemented at a local/farm level, need to be linked to the outcomes being pursued at regional and state levels of governance. These outcomes will also need to align with national policy/goals, in relation to say funding, and to global requirements in relation to trade.

This approach has a clear linkage with the National Action Plan for Salinity and Water Quality, the Commonwealth Government's approach to addressing dryland salinity and deteriorating water quality in key catchments and regions across Australia. The current regional NRM groups in the agricultural areas have made considerable progress towards developing regional NRM plans. The Department is currently working with these groups to support accreditation of these plans, to develop a process for target setting and to establish interim targets. Appendix 1 provides further details of this work.

3. Risk management and adoption of best management practice

Processes based on risk management (e.g. quality assurance or environmental management systems) can be applied at a variety of levels including State, regional, individual/enterprise scales. Such risk management approaches are used both widely and successfully in relation to market, financial, seasonal and biosecurity risks, and can be successfully adapted to management of environmental risks.

At a regional/catchment scale a transparent framework for environmental management is required, which:

- defines performance standards and related industry best practices based on the key environmental risks within a certain zone; and
- allows for on-going improvement in performance through monitoring and evaluation.

At an institutional level, EMS/QA based methods can provide an integrating framework by defining criteria for evaluating an institution's capacity to support industry achieve set objectives for sustainability.

The governance framework for natural resource management agreed to at COAG and recently endorsed by the NRM Ministerial Council will drive this change nationally through linkages with the NAP and NHT funding programs.

These aspects are further discussed in Section 5 and Appendix 1.

4. Increased attention to incentives and structural adjustment

A combination of policy tools needs to be considered when dealing with the challenges for sustainable agriculture.

Economic incentives or the use of market based mechanisms [1] are a way of encouraging sustainable practices. Economic incentives can be provided by the government (or in some cases private industry) to encourage primary producers to adopt sustainable practices. Examples include providing incentives for the provision of environmental services such as remnant vegetation protection, C sequestration or catchment protection for water quality improvement. Stewardship payments or land purchase could be part of structural adjustment packages designed to drive landscape scale change in use and practice.

Application of these mechanisms within a framework that has clear objectives and targets can result in greater efficiency in expenditure of public funds.

5. Research and development

Continued innovation will be a vital strategy for sustainability and this needs to be strongly supported by effective and relevant (to sustainability goals) research and development. Much of the agricultural research to date has had a focus on industry production efficiency, and insufficient consideration for the broader environmental and social aspects of sustainability. It is suggested future research and development in agriculture will need to consider together the economic and environmental aspects and possibly social implications. Considerable further discussion on research and development is provided in Sections 5 and 9.

6. Information and education

The quest for sustainability is likely to require significant changes to values, attitudes and behavior - human qualities that are very hard to modify. Future communication strategies need to recognise this and perhaps be informed more by the techniques of the marketers than the educators.

As well an effective flow of information and new knowledge to and through farmer networks on risks and improved practice will be required.

1. RECOMMENDATIONS

The report has highlighted the trends impacting on the agricultural sector and the opportunities and challenges facing the sector in relation to sustainability. These need to be considered in the formulation of the State Sustainability Strategy.

Below are some specific aspects that the Department regards as important for inclusion in the Strategy.

1.1 Government sector coordination

Under current governance arrangements no whole of government framework exists that enables issues of sustainability to be considered across sectors and institutions. Each sector has a commitment to sustainability and typically works within its sector towards it's view of sustainability. The response and actions are a product of the particular institution's client relationships, knowledge, skills and attitudes. Often networks across the sectors are poorly developed and this together with cultural differences can result in different objectives and inevitably lead to uncoordinated or even conflicting actions. For example decisions about economic development and natural resource management are often made in isolation from one another. Moreover the linkages between Treasury funding allocations and the magnitude of the sustainability challenges faced by different sectors do not appear to be clear or well established.

Coordination requires leadership and common objectives underpinned by good relationships between the different players. The Department does not believe that structural or legislative change is necessary to achieve this.

To improve the connectiveness amongst sectors and give guidance on the strategies the State needs to pursue for sustainability, it is suggested the Sustainability Strategy considers the initiation of whole of government strategic planning (e.g. scenario planning) at a State and/or regional level. This would give a long term perspective, establish a preferred sustainable future scenario for WA and each region, and establish common outcomes and success measures for sustainability. These could in turn underpin the integration of effort, define the necessary alliances and enable the examination of institutional roles and responsibilities in the light an agreed future.

The institutions responsible for the different sectors would be required to provide expert input and analysis to ensure rigour. For example, Section 5 of this document outlines a number of challenges the agricultural sector will face, with the most notable being: a limited capacity for change; climate change that may require a shift in the nature and type agricultural industries in Western Australia; and the current dilemma of increased efficiency conflicting with perceptions about social sustainability.

Separate to, or as part of the above, the Strategy may establish an active process to improve networking across the government sectors. Key staff from disparate departments would meet on a regular (but infrequent) basis as action learning groups to discuss sustainability issues in their sector, to present case studies and discuss successes and failures. Initially, this may require some expert facilitation.

1.2 Targets for sustainability

Sustainability is a desirable goal, but the drive for short-term gain often pushes that goal to the background. To become more than rhetoric, sustainability needs targets and standards which are agreed across the board and provide measures of the outcomes required. This will potentially allow greater economic efficiency by clarifying priorities and guiding trade-offs between condition and use. Targets will guide innovation and reduce the dependence on process based measures for management, the impacts of which are often poorly targeted and of uncertain consequence.

Ideally, targets would be agreed by the EPA and comprise part of the Governments "true measures of progress" initiative.

Targets for natural resource management outcomes are best set at a regional/catchment level and nested under broad goals at a national and state level. These should be based on hard data on the current state and likely future state of natural, economic and social systems. Targets may be redefined as knowledge grows, but they give all industries (agricultural and other) something to aim for, and a basis for the community and government to assess the effectiveness and efficiency of investment in remedial or regulatory action. Effective monitoring and evaluation to assess expected versus actual impacts of management interventions will be a vital component of successful management.

Compatibility in policy and decision making is essential across the different scales and sectors: economic development, social and environmental. Clear NRM targets will provide consistent messages about sustainable land management across State, Regional and local/ farm scales. For example: best practices to be implemented at a local/farm level, need to be linked to the outcomes being pursued at regional and State levels of governance. These outcomes will also need to align with national policy/goals, in relation to say funding, and to global requirements in relation to trade.

Targets will also be the basis for assessing the need for and targeting of structural adjustment packages. See Section 5.4.

This approach has a clear linkage with the National Action Plan for Salinity and Water Quality, the Commonwealth Government's approach to addressing dryland salinity and deteriorating water quality in key catchments and regions across Australia.

It outlines a number of actions including:

- targets and standards for natural resource management;
- regional/ catchment natural resource management plans;
- monitoring and evaluation to measure changes in behaviour and impacts on natural resource condition; and
- an improved governance framework.

The current regional NRM groups in the agricultural areas have made considerable progress towards developing regional NRM plans. The Department is currently working with these groups to support accreditation of these plans, to develop a process for target setting and to establish interim targets. Appendix 1 provides further details of this work.

1.3 Risk management and adoption of Best Management Practice

The above targets should be used by all government agencies working in the region, and standards for industry and agency practices related to these can developed in partnership with industry by agencies in their areas of expertise. These standards will be the basis for best practice and a prime means of achieving targets through voluntary adoption or through regulatory means.

An important role for the Department is to help farmers profitably manage the environmental risks of agricultural land use. This will be assisted by transparent framework for environmental management, which sets performance standards for industry and the department and allows for on-going improvement in performance (see Appendix 1).

This framework will be based on:

- engagement of relevant producer groups;
- spatial zones that recognise biophysical and land use factors, and processes that influence NRM outcomes;
- assessment of key environmental risks and indicators related to these;
- related benchmarks or criteria defining environmental sustainability;
- BMPs underpinned by these criteria which allow profitable agriculture and address the key environmental indicators;
- sign off and reporting to a third party on compliance with BMPs - probably EPA; and
- monitoring and reporting on trends in adoption and, in the longer term, resource condition trends against targets.

Such risk management approaches are used both widely and successfully in relation to market, financial, seasonal and biosecurity risks, and can be successfully adapted to management of environmental risks.

Best Management Practice is a tool being adopted world wide to encourage adoption of and educate primary producers about sustainable agricultural practices. In supporting BMP's the Department of Agriculture is providing an opportunity for primary producers to meet world market requirements.

At an institutional level, EMS/QA based methods can provide an integrating framework by defining criteria for evaluating an institutions capacity to support industry achieve set objectives for sustainability.

1.4 Use of market mechanisms or economic incentives

Economic incentives or the use of market based mechanisms [2] are currently an under utilised policy mechanism for achieving an improvement in the natural resource base. In principle these recognise the public good value in an improved environment and attempt to apply public funds in a way that ensures economic efficiency. Examples include auctioning or tendering for the provision of 'environmental services' such as remnant vegetation protection, tradeable permits, and land stewardship payments.

Research and development into the use of workable mechanisms is warranted and is being pursued through a $10m national program as part of the National Action Plan.

Adjustment schemes, such as that outlined in Section 5.4, are another policy approach that falls under this category. These could be used where high value public assets are at stake, irreversible damage is likely and required land use change is improbable because of high private (landholder) costs.

1.5 Research and development

Continued innovation will be a vital strategy for sustainability and this needs to be strongly supported by effective and relevant (to sustainability goals) research and development.

Research and development for sustainable outcomes will differ in its focus to traditional research and development. Where traditional research and development was industry driven and usually with an economic focus, future research will need to be undertaken that fills the knowledge gap for sustainability, e.g. what conditions will make farmers (or others) willing to make the enterprise more sustainable? The approach needs to be more whole of eco-system rather than one simply related to industry practice.

1.6 Information, education and persuasion

Awareness raising, education and extension are much used tools for attempting to create voluntary change. As outlined in Section 7, there are a number of constraints in broadacre farming systems for the adoption of natural resource management practices.

The quest for sustainability is likely to require significant changes to values, attitudes and behavior - human qualities that are very hard to modify. Future communication strategies need to recognise this and perhaps be informed more by the techniques of the marketers than the educators.

As well an effective flow of information and new knowledge, to and through farmer networks, on risks and improved practice will be required.

1.7 Social sustainability

Vibrant rural communities, the role of the Department of Agriculture

Rural communities have been dependent on agriculture to remain viable, however due to technological and structural changes, an internationally competitive agricultural sector can no longer provide these communities with the spread of wealth and the regional employment it once did. The Department of Agriculture's core business is to develop sustainable agricultural systems that ensure an internationally competitive industry. The revitalisation of rural communities falls beyond its scope.

Intensification of agriculture where resources are favourable, especially if some downstream processing is involved, may provide increased employment and other benefits. Again these will need to export focussed and able to remain internationally competitive to provide long term community revitalisation.

Vibrant rural communities, the role of Government

Maintaining and developing vibrant rural communities will be the responsibility of a number of different departments and the communities themselves. Rural policy development needs to focus on developing a sense of place, focusing on the strengths of each community.

2. INTRODUCTION

To meet today's community values related to sustainability, agriculture faces some significant challenges. The traditional practices that are the current focus of much of the agricultural sector, may have to change over significant areas to meet future sustainability goals.

Changes to the landscape from agricultural practices (including farming, pastoralism, horticulture and intensive industries) have resulted in a number of environmental problems. The push for continual efficiency improvements, driven by declining terms of trade and technological advances, has contributed to depopulation of rural areas dependent on agriculture. None-the-less, agriculture remains a prime economic driver in the regions and primary producers are responding to the challenge of developing and adopting sustainable practices. With continued support from government and society this trend will continue.

The role of the Department of Agriculture is to assist the agriculture industries in Western Australia achieve sustainable growth which will in turn contribute to the social and economic well being of Western Australia.

In order to achieve sustainable growth, agriculture must:

- ensure that the resource base used by agriculture is maintained or enhanced;
- minimise the impact of agriculture on the surrounding environment;
- meet community and political expectations with regard to biodiversity, animal welfare, and food safety; and
- maintain or enhance international competitiveness.

These requirements must all be met if sustainable growth is to be achieved. For example, given that 80 per cent of agricultural production in Western Australia is exported, high performance in biodiversity maintenance will not provide sustainability if international competitiveness is reduced. The reverse is also true, international competitiveness in terms of cost of production will not provide sustainability if products are excluded from markets because the production system is causing damage to ecosystems.

A strategic response from Government and industry will be required to ensure consistent and favourable outcomes for the industry, the environment and society when meeting the challenge of sustainability. How the state manages this process will be a major determinant of sustainability outcomes. External drivers and the responses we make to these will have a major influence on outcomes. Examples of external drivers include:

- Technology advances in a wide range of areas such as telecommunications, bioengineering, precision mechanisation and transport.
- Downward trends in world prices for agricultural commodities.

- Changing consumer tastes.
- Changes in lifestyle choices and migration to coastal areas.
- Regulation to protect the environment (including global recognition of the need and role of regulation).

The purpose of the paper is to give an outline of many of the issues in the area of sustainable agriculture and make recommendations for input into the State Strategy. The Department would welcome the opportunity to continue its involvement in this process and is interested in providing more detailed information in the further development of the Strategy.

3. DEFINITION OF SUSTAINABILITY

Pannell and Schilizzi (2001)[3] describe the definition of sustainability as clouded due to its ambiguity and multiplicity of definitions in use. The World Business Council for Sustainable Development supports this view and adds that the subject evokes an emotional response in many people, although these people may not be able to define it.[4] Therefore to give meaning to the discussion, this section will add further clarity to the definition presented below of sustainability given in the *Focus on the Future* consultation paper.

> *"Sustainability is the simultaneous achievement of environmental, economic and social goals."*[5]

This definition, like most defining sustainability, embodies the idea of triple bottom line accounting and consequently identifies three key areas of sustainability: environmental, economic and social. The exact definition of these goals is the main contributing factor to the ambiguity associated with the term sustainability. The Premier's speech delivered at the launch of the Sustainability Exhibition 8 February 2002 adds clarity to the goals referred to in the consultation paper. In his speech the Premier stated:

> *"…our long term well-being depends as much on the promotion of a strong vibrant society and the conservation of our environment as it does on economic development".*

and that:

> *"Social and environmental considerations should be integrated into all decisions at the beginning of the process, not bolted on afterwards."*

The Premier emphasised conservation of the environment and developing a strong vibrant society and their integration with economic development. Interpretation of the Strategy's definition using the Premier's speech gives the goal as ensuring that any economic objective pursued incorporates conservation of the environment[*] and does not marginalise communities or individuals, but rather builds stronger more vibrant communities.

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[*] ***conservation/noun*** *1. the preservation of areas which are significant, culturally or scientifically, in their natural state. 2. the management of the natural environment to ensure that it is not destroyed in the process of development. 3. the preservation or conserving of natural resources, as water, coal, etc. [Latin]* - Definition from the Macquarie Dictionary 2000.

In the second quote from the Premier, he outlines the expectation that all future processes will need to incorporate all three components of the sustainability equation; that each component is equally important. This assigns responsibility to each State Government Department to ensure all new processes and decisions incorporate this sustainability ethos.

The Department of Agriculture supports the State Government's broad definition of sustainability, but its application to an agricultural industry facing significant land degradation problems is likely to involve trade-offs. This is explained further in Section 4.

4. AGRICULTURE AND SUSTAINABILITY

The previous section gave a definition of sustainability from the State perspective. This section will apply the definition to agriculture and follow this with a discussion of how agricultural practices in the past, future and present compare to this definition.

Trends in agricultural performance (discussed in Section 6) reflect how the agricultural sector has directly contributed to state wealth, but at the same time lead to degradation of the natural resource base. These trends also indicate agriculture's declining capacity to contribute to the revitalisation of rural communities.

Standing Committee on Agricultural Resource Management (now replaced by the Natural Resource Management Standing Committee), recognise the limitation of agriculture to contribute to the social aspect of sustainability in their definition of sustainable agriculture as:

> *"… the use of farming practices and systems which maintain or enhance*
>
> - *the economic viability of agricultural production*
> - *the natural resource base*
> - *other ecosystems which are influenced by agricultural activities"*[6]

However the Department recognises that agriculture can indirectly contribute to the sustainability of rural communities.

Accordingly the definition for sustainable agriculture can be given as:

> *"Ensuring profitable agricultural systems that conserve our environment whilst contributing to the economic and social well being of rural Western Australia."*

The above definition for sustainable agriculture is ambiguous due to the value laden nature of the terms 'well being', 'profitable agricultural systems' and 'conserve our environment'. However, Pannell and Schilizzi[7] argue that despite the ambiguous nature of the definition of sustainable agriculture, the term is useful as a guide or 'emblem' for developing strategies that encompass the main elements of the term 'sustainable agriculture'.

Strategies for achieving sustainable agriculture will have clearly defined objectives and indicators; qualities that are hard to clearly define for sustainable agriculture. By taking sustainable agriculture and breaking it into key strategies for particular areas; the concept of sustainability can be more easily defined and focused. It is the strategies that should be used for policy decisions and planning rather than the broad goal of 'sustainable agriculture'.

This concept is demonstrated in Figure 1, with the components of sustainable agriculture placed above the line as outcomes (as outlined in the definition of sustainability), and the more specific strategies (below the line) being the means for achieving these outcomes. Figure 1 is illustrative and by no means inclusive of all possible strategies encompassed in sustainable agriculture.

Strategies developed for achieving sustainability will need to be linked across a range of scales; state, regional and local. Much time has been given to defining sustainability and sustainable agriculture at the broader state, national and global scales; however to ensure sustainable agriculture is pursued, regional and local scale definitions and consequently strategies will need to be consistent with the state approach. Pannell and Schillizzi (2001) reveal the importance of consistency by stating:

> *"the definitions employed in actual decision making for agricultural policies or research are often extremely small scale, such as individual paddock."*

Currently consistency does not appear to be present between scales. However consistency does not imply that each sub-component of the whole needs to meet each component of sustainability.[8] Pursuit of sustainable agriculture needs to be considered as a whole, with strategies working in unison as components for achieving the outcome.

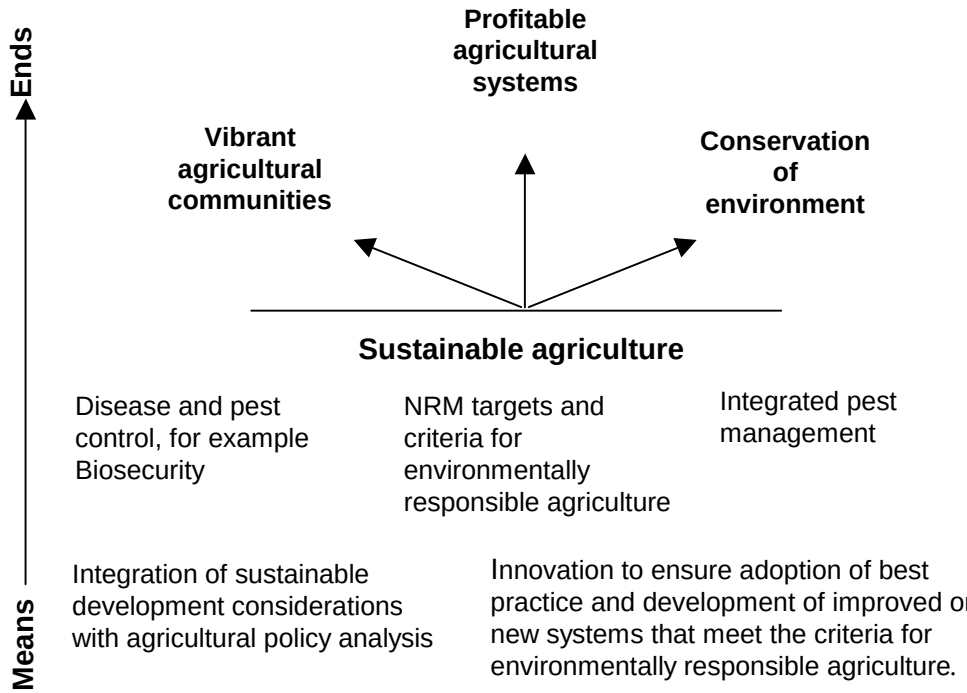

Figure 1. A pictorial representation of example strategies that encompass the main elements of sustainable agriculture.

Agriculture has made a strong contribution to the economic development of the state and nation. Community goals and values have, however, altered considerably since agriculture was established as an industry in Western Australia. Consequently many enterprises and practices that exist do not meet current societal expectations of sustainability. The historical focus of agriculture was towards economic development with little thought given to the

natural resource consequences. Today agriculture industries have, for many reasons such as market, regulatory or altruistic drivers, shifted their focus towards achieving and demonstrating their commitment to pursuing sustainability.

Historically there has been a trade-off between environmental condition and agricultural profits and production. The results of this can be best seen in consequences such as salinity and erosion. It would be unrealistic to think that trade offs are not going to exist into the future. It will be very difficult to achieve all three goals of sustainable agriculture simultaneously, particularly when it comes to undoing environmental damage as a consequence of past production practices, or 'retro fitting' current agricultural practices.

For example the recent decision to reduce logging of old growth forest created 'winners' and 'losers'. In this case, the pursuit of sustainability resulted in a trade-off; environmental goals (or rights) of the broader community took precedence over the goals (or rights) of the affected local community. In instances such as this it is usually regarded as fair and just that compensation or structural adjustment packages are paid to affected individuals and communities. Situations such as this may become more common place as agriculture is forced to adopt sustainable practices to meet community expectations.

However by aspiring to all three components of sustainability (social, environmental and economic) provides the basis for disparate groups to engage in discussion and think about opportunities and ways to work together. Partnerships and perhaps compromise are the key to this approach to sustainable agriculture, but it is important to set up the mechanisms for the development and operation of these partnerships. Governments should assume a mediation role and establish the process and criteria for negotiation and compromise.[9]

The Department of Agriculture supports that the pursuit of sustainability of agriculture is vitally important. To ensure that this is done, the best available information needs to be provided for decisions regarding the strategies implemented by government, industry and community to ensure that sustainability is achieved. The challenge will be about how resources are used, ensuring the right information is available for input into policy and prioritisation processes, and ensuring that research and development pursuits are working towards defined targets for sustainable development.

4.1 NRM Targets for sustainability

To become more than rhetoric, sustainability needs targets and standards which are agreed across the board and provide measures of the outcomes required. This will potentially allow greater economic efficiency by clarifying priorities and guiding trade-offs between condition and use. Targets will guide innovation and reduce the dependence on process based measures for management, the impacts of which are often poorly targeted and of uncertain consequence.

Ideally, targets would be agreed by the EPA and comprise part of the Governments "true measures of progress" initiative.

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5. OPPORTUNITIES TO PURSUE SUSTAINABILITY

A range of these opportunities is discussed below under five category headings[10]: environmental excellence with growth in best management practices and industries; research and development; business as usual with some adjustments; forced adjustment; and global and national considerations.

5.1 Environmental excellence, with growth in Best Management Practices and industries

With future markets expected to place greater emphasis on quality assurance, production certification, identity preservation, environmental amenity, supply chain management and food safety, the opportunity currently exists to develop best management practices and industries to place primary production in a strong position for the future.

The National Action Plan for Salinity and Water Quality (NAP) provides a significant opportunity for the state in this regard. The Natural Resource Management Ministerial Council recently endorsed a far reaching national framework for NRM. It is essentially a performance based, adaptive management approach based on key assumptions related to the need for transparency of performance and reporting, the need to learn by doing and reviewing and the need to be able to adapt management in the light of the impacts of current policy and management on measurable objectives.

The governance framework has as its key components:

- catchment / regional plan accreditation criteria and guidelines for access to NAP/ NHT funds;
- national framework for NRM standards which requires regional targets for incorporation in regional plans;
- monitoring and evaluation of performance in relation to a number of key indicators; and
- NRM best practice management standards for institutions to achieve in support of the framework.

The Department of Agriculture has provided significant technical support, over a number of years, to regional groups in the development of regional plans for NRM and is continuing to assist them to develop implementation plans, prioritise investment and have the plans accredited. There is also a major opportunity, emerging from the NAP and regional plans, for the state to develop a coordinated and long term approach to monitoring trends in resource condition and evaluating the effectiveness of intervention.

The Department of Agriculture is also setting up processes and guidelines for the development of best management practices (BMPs) for farmer groups and individuals.[†] BMPs are characterised as management practices for pursuing sustainable agriculture that also consider enterprise and commodity implications. To be effective, BMPs will need to be robust, consistent and meet standards that transparently demonstrate the pursuit of sustainable agriculture.

The Department is currently developing BMPs for irrigators in the South West Irrigation Area. The approach being taken involves comparing an environmental situation analysis with an industry practices audit to identify the practices that pose the greatest environmental threat. This is then used to prioritise the practices that require the development of BMPs. This process is now being examined as a model to be adopted on a broader scale. Other examples are given in greater detail in later sections of the paper.

In the rangelands there is an identified need to undertake research to understand the 'cause and effect' relationships between use and impacts on the rangelands. At present, much of the information is reaction based, dealing with the *post-facto* impacts of decisions. This flows through into the whole area of Environmental Management Systems and consequently BMPs

[†] Refer to Appendix 1 for a current example of a strategic approach that the Department of Agriculture intends to refine and implement together with industry.

for the northern beef industry. While there are on-going activities in this area, there is a need to improve the basic understanding of the interactions of human and natural factors (management decisions, weather/climate, fire and so on) in determining outcomes.

Pursuing sustainable agriculture will also provide opportunities in developing new industries that already have a set of BMPs associated with them. It is essential that both local and wider sustainability opportunities are captured in the development of new agricultural industries. An emerging example is the development of a bio-fuels industry based on canola oil. Demand is driven by government policy imposing targets for renewable energy supplies. The requirement for downstream processing near the source will lead to increased employment prospects in regional areas.

It is expected that the importance of BMPs will increase as they may be used as the basis for incentives or regulation.

5.2 Research and development

Research and development will be a major tool for developing new industries and innovations that are both profitable and environmentally responsible.[11] Given the current systems of production a number of research areas have been defined and are being implemented.

Cooperative Research Centres

The Cooperative Research Centre for Plant Based Solutions to Salinity is undertaking extensive research into new industries that not only provide options for slowing the onset of salinity, but also allow for the productive use of saline land.

A bid is currently being mounted for a Cooperative Research Centre for Application of Earth Observations. The bid involves a consortium that includes the WA Departments of Agriculture and Land Administration and CSIRO. The CRC will focus on applying satellite-derived information to assist sustainable management of the State's renewable resources. Satellite imagery has been recognised for its potential in both improving the efficiency and profitability of farming systems as well as increasing their environmental sustainability. Importantly, the technology will provide the tools for farmers to measure and manage spatial and temporal variation.

For example: it will help land managers match land capability with enterprise and management; it will help target diagnosis of soil constraints and amelioration; it will provide general farm management information regarding feed on offer and crop condition, enabling tactical decision making such as cover management to prevent erosion and fine specification of fertiliser needs. It also has major potential in monitoring, such as vegetation for fire and pest management and land clearing.

Fire is an integral part of the natural eco-system and, while occurring in pastoral lands, virtually none is a consequence of recommended pastoral practice. The increasing human activity in the north, plus the weather aspects of fire (lightning, etc.) make fire one of the major issues, in relation to biodiversity change, greenhouse and the negative impacts on overall sustainability of current industries, including pastoralism, tourism (including eco-tourism) and nature conservation. The CRC on Tropical Savannas, of which the Department

is a partner, is conducting research on fire and other sustainability issues faced by Australia's tropical savanna regions.

Land use planning

Integrated land use planning[12] (ILUP) at the local/sub-regional level has an important role in managing change towards sustainable agricultural systems. Integration implies the simultaneous addressing of economic, social and environmental objectives.

An overarching framework has been used for some years by the Department in respect to the identification, planning and development of areas of key agricultural significance. Areas of key agricultural significance are defined as areas that contain unique combinations of resources suitable or potentially suitable for high value forms of agriculture. There has been a conscious strategy to identify and protect areas of agricultural significance through the statutory planning system and then to build on the certainty that this creates for government and private investment by encouraging detailed land use planning of the areas.

Integrated planning processes have been initiated or completed for a number of areas including the Scott Coastal Plain, the South West Irrigation area, the Leeuwin Naturaliste Ridge (Jindong/Marybrook/Wilyabrup and Margaret River) and the Gascoyne Murchison region. The impetus for our involvement in these processes has differed significantly in each case. A common similarity however has been the need to manage potential threats to agriculture and to identify and promote new land use opportunities aligned with land suitability or to promote improvements to current practices.

ILUP is now being undertaken or proposed for a number of other regions, largely to foster adjustments in land use. These regions include the Peel, the Warren-Blackwood, Central South Coast, Katanning and Avon Arc regions.

There are numerous areas of key agricultural significance (up to 60 potential areas) and other regions where the need for ILUP is emerging or may emerge over the next few years.

The Department is now developing a standard approach to integrated land use planning and developing the capacity and information tools to improve the efficiency and effectiveness of implementation.

New industry opportunities

There is also scope for research and development to pursue opportunities that lie outside the sphere of conventional agricultural production. For instance, productive uses of native species as the source of a range of products, such as cut flowers, oils, drugs and wood fibre.

Emerging markets in response to consumer demands will also provide many opportunities for Western Australian agriculture. For example, demand for Clean Green Food will open a niche for suppliers who are able to meet the demands of the consumer for safe, high quality and/or environmentally sound production. Access to these markets could be facilitated through verified compliance with production processes that ensure food safety/quality and/or sound environmental management.

It is expected as well that farmers will participate in supply chains as equity partners as well as raw product suppliers. This will allow for increased product integrity and consequently increased opportunities.

Selling environmental services

Future farms may benefit from the sale of environmental services to bodies such as water authorities for water quality protection and power companies for carbon off-sets. Funding for such services has the potential to improve incomes, protect remnant vegetation and drive significant revegetation. Research and development supported by appropriate policy is required to establish rights and market systems for trading, to develop appropriate models reliably relating actions to outcomes and to establish limits to biomass increase and consequent soil and plant carbon sequestration.

5.3 Business as usual with some adjustments

Many agricultural businesses have already made the change towards developing and adopting more sustainable agricultural systems. Although the majority do not produce sufficient surpluses to fund reasonable living standards, investments in the business and investment in protecting the environment, a small number do.[13] For these businesses a number of small changes may give them access to opportunities that will arise from the momentum towards pursuing sustainable practices. For instance, if the business is already implementing sustainable farming practices, there is the opportunity for the business to target and develop a niche market delivering higher returns for the product. The flow on effects to the surrounding community and primary producers could be considerable.

Precision farming

Precision farming techniques are a major opportunity for farmers to operate their current farming systems with increased sustainability. Precision agriculture can be defined as the use of land management systems that recognise, interpret and manage spatial variability. The spatial recording and management of inputs and outputs offers primary producers real opportunities to capitalise on spatial variability and improve triple bottom line performance.[14]

Precision agriculture has two levels that are a function of scale. There is the macro level zone management (with land use planning and then within-paddock zone management) and micro level zone management (the operational zoning involved in line farming including tramlining, row cropping, targeted application of ameliorants and crop inputs, the integration of winter, perennial and warm season crops, and raised beds) which is supported by high accuracy guidance systems.[15]

Biosecurity

Currently the State and National Governments are developing and implementing a program for biosecurity. Biosecurity is a general description for a set of measures designed to protect our country, State and individual farming properties from the entry and spread of unwanted animals, pests, diseases and weeds. (This definition includes the health of the environment and of people.) Increasing standards of biosecurity will be needed to retain market access and market competitiveness for agricultural products.[16]

Biosecurity is an issue of broad national concern. Traditionally, biosecurity has been mostly the business of agriculture and allied industries often under the more restrictive title of quarantine. However this is being broadened to include other major sectors of the economy and the whole community. Biosecurity has major economic and social implications for the following sectors:

- Environment and biodiversity - terrestrial and marine.
- Agriculture - animals and plants.
- Forestry - native forests and plantations.
- Fisheries - marine, freshwater and aquaculture.
- Tourism - tourists and the environment.
- Water supplies.
- Amenity and recreation.

The term biosecurity better describes the issues than the more limited and outdated term quarantine and has more appeal to the general community.[17]

The Department is currently engaging farmers in the drive towards property, region and state biosecurity with an awareness program that focuses on reducing the spread of pests and disease. By promoting measures of checking for pests and disease such as looking for weeds whilst harvesting, cleaning harvesters between paddocks and checking grain seconds for weed seeds, it is expected that the spread of weeds, pests and disease will be reduced.

Policy

State Government has a role in making changes as well, particularly in exploring policy options for rural Western Australia that fall outside the normal context of rural policy. At a conference recently held in the United States it was discussed that rural policy needs to shift away from a focus on the individual to one of cooperation between communities and businesses. Partnerships are a key to sustainable agriculture, and it is important to set up the mechanisms for the development and operation of these partnerships. Strategic cooperation was seen to be an important theme for rural policy for the United States. Cooperation will allow for increased networking, innovation and product orientated alliances. The government will be a key player in helping to develop strategic cooperation by writing policy that encourages the formation of these partnerships and offers them support.[18] The other highlighted outcome was that rural policy needs to *'shift from a focus on sector to a focus on place'*. The suggested shift highlights that communities are like businesses and therefore must value add to survive. For communities this will mean differentiating themselves in some way to attract people to visit and/or live there.[19]

Improved management and business performance

Considerable potential exists within current businesses to improve profitability and thus the potential to invest in improved land management.

The Planfarm survey [20] ranks farm performance amongst the top 25 per cent, average, and bottom 25 per cent of farmers and reveals a large variation as well as the characteristics of top performing farms. For example in the 'low rainfall group' of the survey, farm operating

surpluses ($/ha) are $72.87, $28.43, and -$14.54. Corresponding figures for wheat yields (t/ha) are 1.45, 1.19 and 0.92.

Considerable scope thus exists for improvement in a large number of businesses. Significant opportunities exist for farmers to improve planning, management and technical skills through programs such as FarmBis and to improve productivity through best practice groups such as TopCrop and WoolPro. It is a high priority for the Department to increase voluntary uptake by farmers of these programs.

The examples given above all tend to be measures that can be implemented in the short to medium term that focus on improving the current production systems.

5.4 Structural adjustment

Adjustment could result from global, national, state, regional or local community pressures. Although forced change through regulatory or market pressures can be viewed negatively; it also can be an opportunity.

Forced adjustment as a result of community pressure for environmental improvements, such as in the case of old growth forests (see Section 4), is likely to be applied more broadly as we seek to move towards a more sustainable future.

In the case of agriculture, adjustment policy needs to focus on a just process for achieving desired landscape scale change to meet sustainability targets and protect high priority public assets, rather than focus on the economic viability or survival of individual businesses. This shift would depend on the revision of national policy and availability of public funds, however, there appear to be opportunities emerging under the National Action Plan for Salinity and Water Quality and through the realignment and coordination of current regional adjustment programs. (See Appendix 3 for example.)

Primary production in Western Australia could be required to make adjustments through regulatory pressures. For instance global and national decisions will have regional consequences. Ratification of the Kyoto agreement will have ramifications on primary producers who would be required to reduce emissions. For agricultural enterprises the main foci of attention would be on reducing burning in the rangelands, reducing artificial N use and reducing emissions from livestock. The forced change in this case can have the beneficial effect of encouraging research and development and the adoption of more sustainable practices.

New markets could also develop as a response to policy or legislation. For instance developing the market for carbon trading in response to greenhouse concerns. Carbon sinks, including commercial plantations, alley farming and landcare plantings, are seen as one of the least cost options to offset much of the State's expected emissions growth in the energy and resources sectors. The sale of carbon credits would help farmers recover establishment costs and, pending transaction costs, provide some net income. Potentially, this could drive major land use change for Western Australia. As well as fibre and other tree products, there is also the potential to create a large renewable energy resource for power generation. Extensive revegetation is likely to have associated environmental benefits.

5.5 State, national and global considerations

At State, national and international levels, there are a number of conventions, declarations, agreements and programs that the national and State governments have endorsed. These can guide and support change. A number of these that are applicable to agriculture are listed below.

The National Action Plan for Salinity and Water Quality (2000). The goal of the Action Plan is to motivate and enable regional communities to use coordinated and targeted action to:

- prevent, stabilise and start to reverse trends in dryland salinity affecting the sustainability of production, the conservation of biological diversity and the viability of our infrastructure; and
- improve water quality and secure reliable allocations for human uses, industry and the environment.

Natural Heritage Trust. The Commonwealth Government has committed $1 billion over five years to consolidate and continue the achievements of the first phase of the Trust, established with $1.5 billion from the partial sale of Telstra.

Rio Declaration on Environment and Development, 1992.[21] Statement of higher order international principles in policy making. Includes recognition of sustainable development - not compromising the environment and resource base of future generations, recognising the interdependence of environment, development and security, actively integrating economic and social policies, preserving ecological integrity, and employing the precautionary approaches.

Convention on Biodiversity, 1992.[22] Overall objectives are the conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources. It provides a framework for global action to conserve and use biological diversity in a sustainable manner. It addresses the full range of biological diversity at genetic, species and ecosystem levels in all environments. The precautionary principle is to be a guiding concept, and each country is responsible for the conservation and sustainable use of its biological resources.

National Strategy for Ecologically Sustainable Development, 1992.[23] Core objectives are to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations; provide for equity within and between generations; and protect biological diversity and maintain essential ecological processes and life support systems.

Intergovernmental Agreement on the Environment, 1992.[24] Seeks to facilitate a coordinated approach by three tiers of government and operates on four main principles: the precautionary principle, intergenerational equity, conservation of biological diversity and ecological integrity; and improved valuation, pricing and incentive mechanisms.

National Strategy for the Conservation of Australia's Biodiversity, 1996.[25] The goal is to protect biological diversity and maintain ecological processes and systems. It aims to bridge the gap between current activities and those measures necessary to ensure the effective identification, conservation and ecologically sustainable use of Australia's biodiversity.

National Water Quality Management Strategy, 1992.[26] Provides a basis for improving the whole-of-government management of water resources. Its objective is to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development. This is now underpinned by a State strategy.

National Water Resource Policy, 1994.[27] In 1994/1995 the Council of Australian Governments (COAG) agreed to reform water policy with the intent of separating water rights from land rights, increasing the reliance on market mechanisms for water allocation, ensuring that water is available for maintaining natural resources and the environment and ensuring the sustainable use of an increasingly scarce resource amongst uses and users.[28] Currently Western Australia is completing its policy for water reform.

National Dryland Salinity Program, phase II, 1998.[29] "Researching, developing and extending practical approaches to manage dryland salinity effectively across Australia". It targets development of understanding and tools that will support on-ground works financed by other programs. It also targets development of best practices by land managers.

National Weeds Strategy, 1997.[30] It takes a strategic approach to weed management problems of national significance, addressing environmental and agricultural weeds equally. The NWS describes the nature of the problem, discusses why existing weed management measures are not adequate, lists the roles and responsibilities of government, community, landowners and land users. It lists three goals with underpinning objectives and strategies, which are to be addressed by the Executive Committee and government at all levels in tackling this form of land degradation.

State Weed Plan, Western Australia, 2001. The State Weed Plan is a broad, over-arching document that offers the approach of weed control through raising the awareness of all Western Australians of weed problems, by providing opportunities for their involvement in weed management through integrated and prioritised programs, and by support services for landholder and community action.

The Kyoto Protocol, 1997.[31] An international treaty under which developed countries have agreed to limit net greenhouse gas emissions.

State Bioenergy Policy (Draft), 2002. The Cabinet Standing Committee on Environmental Policy has decided to develop a State Bioenergy Policy.

6. TRENDS IN WESTERN AUSTRALIAN AGRICULTURE OVER THE LAST 25 YEARS[‡]

Below is an overview of the trends in Western Australian agriculture over the last 25 years for each of the three main areas of sustainable agriculture.[32] Each produces its own challenges for sustainability.

6.1 Vibrant agricultural communities

To increase the State's wealth WA agriculture needs to increase exports, which requires it to be internationally competitive through (usually) increased efficiency and scale. This adjustment is inimical to the notion that communities dependent on agriculture can grow and remain 'vibrant'. Where country centres grow it is usually due to opportunities existing outside agriculture.

Most farm businesses are owned and operated by families. However, because farming is a business, farm families make decisions from which they intend to benefit financially. Since the 1950s many of these decisions have involved adoption of labour-saving technologies and increases in farm size that together have reduced opportunities for on-farm employment and reduced the number of farm families. The dominance of agriculture in many parts of Australia means there are limited local employment opportunities outside of agriculture. Hence, reduced numbers of farm families and reduced employment in agriculture necessarily cause an exodus of some other families directly or indirectly reliant on population size.

Remaining farmers live in districts comprising fewer and larger farms. Farm management is increasingly complex with farmers having access to many more options regarding technology, crop choice, input selection, rotation, marketing, and information sources.

In spite of continued cross subsidisation to rural areas as a result of government policy on providing rural services and infrastructure (although government policy, for example National Competition Policy, has also tended to drive rationalisation), rural regions continue to face a lack of employment opportunities, particularly inland, and depopulation. The decline in agricultural employment has added to de-population pressures in inland rural areas of Western Australia. In inland regions where the local towns each had a population less than 2000 and where agriculture, forestry and fishing accounted for over 30 per cent of employment then total employment in these regions declined by 7 per cent between 1986 and 1996.[33] A further encouragement to the exodus of labour is that male full time weekly earnings in agriculture are often less than in other industries and average earnings in inland regions are often less than in metropolitan regions.[34] An additional disincentive is that many inland agricultural regions have much less industrial diversity compared to metropolitan regions[35] so there are limited opportunities for employment in other sectors and fewer career pathways.

[‡] All the information on agricultural trends has been taken from: Kingwell, R. (2002). *Issues for Farm Management in the 21st Century: A view from the West.* An Invited Paper to the 46th Annual Conference of the Australian Agricultural and Resource Economics Society, 13-15 February, 2002, Rydges Lakeside Hotel, Canberra. pp 4-10.

Higher rates of employment and pay in other sectors (e.g. housing, retail trade) that typically are located in metropolitan areas attract some families away from rural regions. Other factors contributing to reduced employment and population in these areas are the trend toward providing children with more years of education away from the farm and the decline in family size. All these influences result in the depopulation of many rural regions. For example, in 1991 the population of the central wheatbelt of Western Australia was 9585, which was 34 per cent less than its population in 1966. During this same period the number of people engaged directly in agriculture in this region fell by 43 per cent from 3593 to 2057.

From 1976 to 1995 the population of Western Australia grew by 47 per cent. However almost all inland rural shires experienced population declines over the period. Many of these shires have experienced population losses of over 20 per cent.

The reality for many farming communities is that countering the social, economic and government policy pressures that encourage depopulation is extremely difficult. Attempts to reverse the decline can be at the expense of some other adjacent region and can strain existing resources. Tonts and Jones[36] report that *"any services which were previously provided by state and federal government are now the responsibility of extremely small, and usually declining, country shires."*

In terms of sustaining and further energising vibrant agricultural communities the following challenges were identified in the above discussion:

- Depopulation of rural areas
- Decreasing rural employment with increased mechanisation, comparatively low wages for the rural workforce and low diversity of job opportunities
- Reduction of services in rural towns
- Increasing isolation for those remaining in rural communities
- Rationalisation of country towns into large regional centres.

The United States is currently facing similar challenges and at a recent conference held to discuss policy options for revitalising rural America gave some direction as to how this issue may be addressed. Two key conclusions were drawn. Firstly that strategic cooperation will be an important theme for rural policy for the United States. Cooperation and partnerships of communities and of businesses will be integral in developing communities that will prosper. Alliances will need to be established to create increased networking, innovation and product oriented ventures. The government will be a key player in helping to develop strategic cooperation by writing policy that encourages the formation of these partnerships and offers them support.[37]

Secondly that rural policy needs to *'shift from a focus on sector to a focus on place'*. Much of rural policy in the past has focused on the individual industries rather than on the specific qualities of the regional centres. The suggested shift highlights that for sustainability communities need to be treated like businesses and therefore must value add to survive. For communities this will mean differentiating themselves in some way to attract people to visit and/or live there.[38]

6.2 Profitable agricultural systems

Agriculture and Fisheries is the second largest export sector in Western Australia (Minerals and Energy being the largest). In 2000, Agriculture and Fisheries exports totalled $4,522 million or 18 per cent of the total States exports. Food and beverage processing now represent the largest sector of the manufacturing industry, recording a turnover of $3.2 billion. Food manufacturing turnover has grown on average by 3.6 per cent per annum from $2,674 million in 1992/93 to $3,216 million in 1998/99.

Agriculture continues to be an important economic engine for Western Australia.

Over the last 20 years there have been a number of trends experienced by primary producers that have had some effect on farm profitability. The main trends are given below:

- *Weakening relationship between farm and food prices*

The farm-gate share of each dollar spent by consumers on food is continuing to decline in many developed countries. (For example in the US the farm-gate share of each dollar spent on food has declined from 32 per cent in 1970 to 23 per cent in 1996.)

- *Decreasing terms of trade*

Real prices for agricultural commodities products have continued to decline, while the cost price squeeze continues.[39] Agricultural businesses have managed the financial pressures of decreasing terms of trade through productivity improvement as a result of adopting new technology and better management. The recent Australian Bureau of Agricultural and Resource Economics conference in Adelaide predicted this trend was going to continue and that terms of trade for primary producers are expected to decrease by twenty per cent in the next five years.[40]

- *Deregulation of markets*

As part of their quest for cost-savings and commitment to 'free market' solutions Australian governments moved away from market interventions by removing subsidies, reducing tariffs and removing price guarantees. Direct government involvement in commodity marketing lessened. The guaranteed minimum price scheme for wheat, the reserve price scheme for wool and market milk pricing arrangements were all removed, exposing primary producers to price risk. Fuelling the withdrawal of direct government involvement in agricultural marketing was the Council of Australian Governments (COAG) endorsement in 1995 of the Competition Principles Agreement drawing on Hilmer *et al* (1993).[41] All Australian governments were committed to review, by the year 2002, all legislation that restricted competition. This has assisted in increasing industry efficiency, which is essential, as it is WA agriculture's main competitive advantage.

- *Relative importance of agriculture in the nation's economy is declining*

As an economy develops, technological change and increased productivity contribute to rising income levels. Through time, there is typically a decline in the relative importance of agriculture and an increase, first in the relative importance of manufacturing industries, and, later in service industries. This does not necessarily mean that the actual agricultural output declines rather that agriculture grows less rapidly than other sectors of the economy.

This is a phenomenon occurring in all developed countries. For Western Australian primary producers this changed from an economy 'riding on the sheep's back' to one with diminished relative importance of rural production. This is manifest in the decreased power of the rural vote.

- *Introduction and spread of quality assurance (QA) schemes*

Increasingly discerning consumers have become more interested in the origin of the products being consumed for safety, ethical, lifestyle or other reasons. The introduction of QA schemes allows farmers to sell produce into these favoured markets, but requires them to develop new skills, change practices and often work collaboratively with other growers to manage supply risks.

There have been a number of other factors influencing profitability for primary producers. These include environmental threats such as pesticide resistance, and salinity; and economic factors such as increasingly volatile agricultural commodity prices[42], and increasing production risks due to reduced margins between costs and returns.

Historically primary producers have been able to meet these challenges by increasing production efficiency and scale. These trends are expected to continue with profitable producers increasing their reliance on technology and research and development to increase productivity and reduce input costs.

However this mostly reflects the top end of agricultural businesses; those that are able to adjust by either intensification or increasing scale. The National Land and Water Resource Audit (Theme 6) looked at the economic aspects of farm capacity to manage or repair natural resources. The study identifies the trend towards the 'shrinking middle'.[43] That is, an increasing disparity between large profitable farms that grow by absorbing middle sized farms and small farms operated on a part time basis by owners who tend to hold on to their land.

Using an assessment based on profit at full equity the Audit study found the following nationwide[44]:

- Sixty per cent of Australia is used for cropping and grazing[§];
- about 80 per cent of the profits come from less than 1 per cent of the area used by agriculture;
- about 50 per cent of the profits come from irrigation reinforcing the importance of access to water for agricultural development; and
- Ten per cent of farm establishments produce 40-50 per cent of gross agricultural income.

The final report is currently not published and as it was a national study, figures are not available specific for Western Australia, however a similar pattern is expected. The data

[§] Agriculture is defined in the National Land and Water Resource Audit as all agricultural, horticultural and pastoral lands.

highlights the large area of land managed as small unviable farms. The farmers of this land have a strong sense of place, little ability or incentive to value the resource base, or the capacity to manage change and undertake environmental repair. As a result there are significant structural barriers to change and they represent a challenge to future policy where what is a significant socio-economic problem is manifest as a major resource degradation threat.

In Europe [45]specialisation and concentration of production units are dominant features of agriculture. Agriculture in the EU is characterised by two prevailing trends in current farming practices:

- Intensification and specialisation in regions where agriculture is most productive. Since 1975, the number of holdings has dropped by 1.4 million, which is equivalent to a reduction of almost 20 per cent, and average farm size has increased by a third.
- Marginalisation and possibly even abandonment of agricultural land. This tends to occur in remote areas with unfavourable economic or social conditions, or on less fertile land where agriculture is unable to compete effectively with intensive production in other regions. In Spain, for example, the abandonment of agricultural land is potentially affecting 12 million hectares of land, with a major risk for erosion, loss of biodiversity and landscape deterioration.

Similar features appear to be emerging in Australia.

6.3 Conservation of environment

For many decades prior to 1970 agricultural development in many parts of Australia had focused on the release and clearing of land for agriculture and improvements in agricultural technology and production. In Western Australia, for example, in the 1960s a million acres per year was released for farming before the severe drought of 1969 brought land release to an abrupt end. Concerns began to be raised about the impact of traditional farm practices on farmland.

Salinity and soil acidity became topical issues.[46, 47, 48, 49] The first national State of the Environment report[50] identified extensive deterioration of natural resources through dryland salinisation, particularly in Western Australia. Nulsen and Evans[51] estimated the agricultural area affected by salinity in Western Australia in 1996 was 1.8 million hectares and that across the State the potential area affected was 6.1 million hectares. Other land quality issues were raised such as loss of soil structure [52, 53] water-repellence of some soils[54], waterlogging[55], wind erosion[56], traffic hard-pans[57], deterioration in remnant vegetation[58] and nutrient run-off causing pollution problems.[59, 60]

The use of land for growing traditional annual pastures for sheep production came under criticism. McFarlane and George[61], for example, considered that grazing sheep on annual pastures in the woolbelt was not ecologically sustainable. They said:

> *"…shallow-rooted annual pastures contribute to widespread salinity in the area, annual legumes are acidifying the soils and making them water repellent, and bare, detached soils from heavy grazing cause sheet and rill erosion during autumn storms. To counteract this degradation, the woolbelt needs more perennial pastures and deep rooting crops, fodder shrubs and trees. Only then can it become sustainable in both economic and conservation terms."*

Already it is known that among OECD countries, Australia has a higher percentage of threatened mammals than USA, Japan, Finland, Ireland and Norway[62] and a high number of extinct and threatened plants.[**] Land use, mainly for agriculture, has caused nearly 90 per cent of temperate woodlands and mallee to be cleared[63, 64] and replaced mainly with annual crops and pastures.

Currently 60 per cent of birds and 80 per cent of mammals, listed as threatened[65], have suffered habitat loss. Also introduced pests and weeds are affecting not only agricultural production but also bushland, reducing its native flora and fauna. Yet over 70 per cent of international visitors to Australia identify the main reasons for their visit as the unique flora and fauna and the open landscape.[66]

In several States, in Western Australia and New South Wales in particular, large scale clearing and planting of agricultural plant species is resulting in increasing problems of dryland salinity.[67] Farm land, rural infrastructure, waterways and bushland are being affected by salt. Certain farm practices, including fertiliser and pesticide applications, are linked to off-site problems of waterway contamination. Draining wetlands or reducing water flows to water courses and wetlands have become socially and politically sensitive issues.

7. FUTURE CHALLENGES TO SUSTAINABLE AGRICULTURE

In developing sustainability policy is important to recognise the challenges faced by agriculture in relation to the above trends.

Environmental quality and landscape amenity are likely to be increasingly important influences upon farm practices into the future. In Australia an increasingly urban population with its heightened awareness of environmental issues is likely to press for land management change. Also in some international markets, mainly Europe, environmental concerns may increasingly be used as a trade barrier and require incoming agricultural goods to be produced in ways that verifiably do not harm the environment.

The World Trade Organisation in November 2001 agreed a comprehensive negotiating agenda on trade and environment, and also reaffirmed its commitment to the objective of sustainable development. There is a growing international demand from consumers that products be derived from ecologically sustainable systems and processes, with an increasing momentum for some form of environmental credentials to be required for future market access.

[**] see the IUCN red list of threatened species at http://www.wcmc.org.uk

The challenges for sustainable agriculture are not just based on current trends, but also expected trends and issues. The list below highlights a number of challenges that have been predicted for agriculture over the next two decades.

7.1 Salinity

Of the major land degradation issues, salinity is the least tractable.

Dryland salinity currently affects some 1.8 million hectares, or nine per cent, of land in the south-west agricultural region of WA. It is predicted that, unless there is significant and widespread change to land use in the region, eventually about 6.1 million hectares (32 per cent) will be affected over the next 200 years. Most of this will occur over the next 50 years.[68] The land affected will be both agricultural and public, with significant effects on rural towns and other infrastructure, biodiversity, water supplies[69] and productive agricultural land.

Already the whole of government and the community are responding to this challenge. With research and development being directed towards finding solutions, skilling and education the community with skills for coping with and living with salinity and finally monitoring the progress of salinity.

It is currently doubtful that the process of salinisation can be reversed while operating within current farming systems. However, research being conducted is trying to identify ways of slowing the progress of salinity. Another research priority is in the development of crops that are able to be productive when grown in high levels of salt. The research expects to develop new and profitable opportunities for farmers that offer greater prospects for containment of, and adaptation to, salinity.

With increasingly discerning and affluent consumers seeking products that have been produced through methods that do not degrade the environment, salinity can be expected to be a challenge that remains with agriculture for some time into the future.

7.2 Water quality and availability

Climate change is thought to have led to a 50 per cent reduction in run-off into public reservoirs in the southwest. Recharge to groundwater supplies has also reduced.

Future development of agriculture and thus regional economic growth will be dependent on continued access to water resources. About 45 per cent of Western Australia's water use is for agriculture compared with around 30 per cent for mining and industry. Irrigation use of groundwater is about 300 giga-litres per year with over 90 per cent of this occurring in the Perth groundwater division[††].

Irrigation water use will come under increasing pressure from competing uses such as public water supply and industrial use. Agriculture will also be under scrutiny in regard to

[††] The Perth groundwater division is one of the most stressed in terms of percentage of available water allocated

efficiency of use, allocation levels, cross subsidisation of supplies, e.g. the Comprehensive Water Scheme, economic returns from water use and impacts on water quality. Effective industry input will be essential in strategy development.

The Department of Agriculture is working on developing sustainable irrigation practices and the introduction of the 'Water Wise on the Farm' program. Future policy, regulation and monitoring needs to provide greater incentives/ drivers for the adoption of more efficient irrigation practices. Improved strategic analysis of the future water demands for agriculture is required for input to planning at State and regional levels.

At the same time water quality is decreasing in developed areas, reducing the useable water supply for agricultural and other uses. Environmental water quality is also declining due to processes such as salinity, sedimentation and nutrient export. Agricultural land use is a major contributing factor to these processes.

7.3 Acidity

The removal of product from paddocks and leaching of nitrogenous fertilisers is increasing the acidity of many soils in agricultural regions. Acidity damages plant root structure, reduces plant water use and changes soil nutrient availability resulting in reduced productivity.[70]

By contrast with salinity, soil acidity (and wind and water erosion) can largely be ameliorated. However, in the long term it could have a major impact on the productive potential of soils unless acidity is recognised as factor limiting production and appropriate management is widely adopted.

7.4 Greenhouse gas emissions

The agriculture sector is the second biggest contributor to greenhouse gas emissions through its emissions of methane and nitrous oxide[‡‡]. The National Greenhouse Gas Inventory estimates that agriculture contributes approximately 27 per cent of total national greenhouse emissions, although in Western Australia agriculture is estimated to contribute approximately 32 per cent of state emissions.

Savanna and temperate grassland burning emissions, as estimated for WA, largely account for both the relatively high contribution by agriculture to the State's emissions profile and to agriculture sector emissions growth. In 1999 savanna burning emissions accounted for 40 per cent of WA agriculture sector emissions. Nationally, savanna burning represented only 14 per cent of agriculture emissions.

Nitrogen fertiliser use in WA has increased since 1995 by just over 50 per cent on an nitrogen nutrient basis, contributing to a large increase in nitrous oxide emissions. Yet a decline is

[‡‡] carbon dioxide emissions are not accounted for as international inventory methodology assumes there is balance between uptake and emissions in agriculture crops and pastures, and for livestock.

noted in nitrous oxide emissions due to 'soil disturbance', with a smaller area of crops and pastures recorded in use in 1999.

Enteric fermentation (methane) and animal excreta (nitrous oxide) emissions have declined since 1995 with reduced livestock (particularly sheep) numbers. Although it is predicted that livestock numbers will increase into the future. With livestock contributing to approximately 60 per cent of emissions from agriculture, there is a need to maintain or increase research undertaken in the area of reducing the emissions from enteric fermentation.

The Kyoto Protocol will have significant implications for Australian agriculture. The protocol is an agreement that requires ratifying countries to restrict greenhouse gas emissions to a specified percentage of 1990 emissions.[71] Australia is a signatory to the protocol, but it has not been ratified. If the protocol is ratified then greenhouse gas emissions will be restricted to108 percent of 1990 levels in the first commitment period of 2008 to 2012.

The challenge exists for agriculture to respond to increasing pressures to reduce greenhouse gas emissions[§§]. It is not yet clear that farmers will be able to make sizable emission reductions through changes in management practices. Agriculture has other important avenues for contributing to greenhouse emissions abatement. For example, if tree crops are accredited as carbon sinks under the Kyoto Protocol then (especially in the presence of emission trading), their area is likely to increase[72] as primary producers see the industry as profitable. Increased tree planting will meet a number of sustainability objectives including reduced water recharge, and its consequent salinity effects, and will affect other land management decisions of primary producers. Renewable agricultural bioenergy, including biodiesel, also has considerable potential to replace fossil fuel use. Tree crop residues (for example, from oil mallees) and tree planting specifically for fuel wood offer low emission, regional power generation possibilities in addition to contributing to sustainability objectives.

7.5 Climate change

Climate change is predicted because of greenhouse gas emissions and is expected to have a number of impacts on the agricultural sector including:

- A decrease in autumn rainfall implying that the growing season would tend to start later than at present, while decreasing spring rainfall would tend to cut the season short (as in 2000). Combining these rainfall changes with expectations of increased evaporation suggests that the length of growing season would decline. Growth of southern rangeland pastures would also be affected.
- A mitigating factor is that a warming to of up $1^{o}C$ combined with higher CO_2 concentrations, may increase wheat yield, even under declining rainfall. Higher concentrations of CO_2 improve photosynthetic and water use efficiency. However, these benefits decline as warming continues, especially if rainfall decreases. Also, wheat protein is decreased by 9 to 15 per cent when grown under higher CO_2 levels. These figures come from CSIRO APSIM modelling.

[§§] There are high uncertainty levels associated with most of the methodology for estimating greenhouse emissions associated with agricultural management practices

- Rising temperatures have implications for all agricultural crops via potentially large changes in heat or chill accumulation and the frequency of temperature extremes. A potential benefit for wheat and other field crops would be the reduced risk of frost. However, conversely more hot days during grain filling could reduce yields. Tree crops are particularly sensitive to temperature trends because of the longer lead times associated with their establishment and development compared with annual crops. Those currently growing at the warm margin of their climatic range will likely face reduced cold accumulation and increased heat stress. Adaptation will require a wider range of varieties to be available.
- The dairy industry could be affected from possibly decreased pasture production and from lower milk yield at higher temperatures. Other animal husbandry issues will also change under a warmer climate.
- The rate of spread of salinity would be expected to decrease under a drier, more evaporative climate. However, daily rainfall events over summer are projected to become more intense, and this might lead to increased episodic recharge.
- On-farm water storage will be affected by changes in the daily rainfall distribution. Although the intensity of events might increase, so will the period between rain events. Combined with higher evaporation rates, it is likely that storage capacity would need to be increased.
- The risk from insect pest and weed competition will probably change. Higher temperatures are favourable to many insects, though their ultimate activity will be dependent on any changes to summer rainfall. A warmer climate might also favour many plant diseases.
- The management of remnant vegetation will have to face the possibility of extinction of many species that have a restricted range.

However, the effects of global warming on agriculture are expected to be addressed largely through incremental technological improvement and plant breeding improvements.

7.6 Pests and diseases

Current agricultural systems are heavily reliant on the use of chemicals to control both pests and disease. A number of pests and disease are already expressing tolerance to chemical control methods, threatening the productivity of agricultural systems. Resistance is expected to be a continuing problem.

There is also the concern exotic weeds, pests and diseases could establish themselves in Western Australia, threatening many existing agricultural systems

7.7 Biotechnology

A main influence on broadacre farming in the future will be the impact of biotechnology[73] that may assist farm diversification, but is likely to result in systems being increasingly crop

(annual) dominant. Consider the current developments in biotechnology. In various stages of development or commercialisation*** are:

- herbicide resistant crops (e.g. Roundup® resistance, Basta® resistance);
- herbicide resistant pastures (e.g. bromoxynil resistance in subterranean clover)[74];
- insect resistant crops (e.g. pea weevil resistance in peas[75]; cotton weevil resistance in cotton[76]);
- insect resistant pastures (e.g. insect resistant clover);[77]
- disease resistance in crops; and
- quality improvement in crops (e.g. high laurate, high oleic and low linoleic canola).

Nutraceutical production is also commencing. For example, Agracetus, a Monsanto subsidiary, has begun clinical trials with human anti-bodies purified from genetically engineered corn and soybeans. These plantibodies are to be used as anti-cancer agents. A potato that contains an antigen for cholera has been developed. By eating the potato, people become immunised against cholera. In the future plants could be modified genetically to make biopolymers or to be processed into chemicals, polymers, and fibres. Industries such as cosmetics and nutraceuticals are looking for new plant-based products.

Because many of the biotechnology innovations are targeting input traits of broadacre crops, it seems likely that productivity improvement in cropping enterprises will continue to outstrip that likely in the wool industry or broadacre livestock industries. Even using traditional breeding methods there is a greater likelihood of productivity improvement in broadacre cropping. Also the R&D support provided by grain growers and commercial firms in the grains industry, relative to that from the wool and meat industries, suggests that greater R&D advancement is likely in the grains industry. Consumers are more likely to accept transgenic modification of feed grains and oilseeds than transgenic modification of animals slaughtered for human consumption. Accordingly the land allocation in broadacre farming could swing more towards cropping. Yet there are downsides to this revolution.

Firstly, although in the United States there is general acceptance of the food safety, environmental and nutritional merits of genetically modified crops, there are concerns, particularly in Europe, about such crops and foodstuffs. Hence, although genetically modified crops may offer the advantage of higher yields, or less expenditure on inputs and eventually better qualities; difficulties are likely in marketing these products. Towards 2025 as second and third generation genetically modified crops become available it is anticipated that food safety and environmental concerns for a majority of voters and grain purchasers would be assuaged. However, to satisfy consumer concerns will require quality assurance and identity preservation systems to be in place. Preventing contamination, protecting consumer confidence and greater regulation in labeling are likely to become increasingly important to agricultural production, marketing and retailing. Only those farm managers with, or able to acquire, the necessary skills, will benefit.

*** There are several other confidential biotechnology developments mainly applicable to broadacre crops, horticulture and floriculture.

Secondly, a switch into more cropping means a more capital-intensive business with greater demands for working capital. With such a business structure a few poor seasons, especially if coupled with poor prices, can rapidly cripple a farm business. Hence, although farms are likely to maintain a diversity of crops (cereals, pulses and oilseeds), and although climate forecasting may improve to facilitate crop and livestock management, nonetheless managing enterprise and business risk will be increasingly important towards 2025.

Thirdly, because broadacre crop enterprises rely on economies of scale, a move towards crop dominance will reinforce farm amalgamations and continue depopulation pressures, particularly in inland areas.

Fourthly, imprudent management of the technology could have important impacts on the farming system[78] and the environment. For example, in the event that several varieties of an out-crossing crop, each with a different herbicide tolerance (whether naturally or genetically engineered) were introduced to the same system, the genes would combine through cross-pollination and selection, leading to plants with tolerance to multiple herbicides. The resulting plants are likely to be hard to control and contaminate other crops and grains. Also, heavy reliance on a herbicide tolerance gene will almost inevitably lead to weeds with resistance to the herbicide being selected, reducing scope for their management in the system.

Although biotechnology will affect crop production, large areas of farmland will remain unsuited to cropping which will restrict the impact of crop biotechnology. Soils may remain unsuitable for cropping due to terrain, waterlogging, soil infertility or attributes like subsurface acidity. It may not be cost-effective to ameliorate or change these characteristics so these parts of the landscape will remain as grazing lands or, if suitably located, lands providing environmental services. Rotational, disease, salinity, pest or weed management decisions will lead to retention of pastures (annual, phase, perennial) and establishment of deep-rooted species) (trees and shrubs) on parts of the landscape.

If farming systems become more crop-dominant, and as saline-affected soils become more common, then placement of pasture in the farming system will change. New pasture species and varieties may need to be developed for the poorer soils unsuited to cropping. Deep-rooted phase pastures to combat rising watertables and herbicide-resistant weeds and GM crop contamination are likely to be introduced. Raised-bed, drainage and de-salinisation technology may become increasingly important. Simultaneously, perennials and annual crop and plant species more tolerant to salt will be developed. Niche areas of horticultural crops in broadacre farm regions are likely to be introduced as cash crops, in some cases using de-salinised water. The area of traditional pastures on 'good' soils may diminish with the increased adoption of more crop-dominant rotation sequences.

7.8 Constraints of broadacre industries

In their discussion paper Barr and Cary[79] list a number of constraints in broadacre farming systems for the adoption of natural resource management (NRM) practices and these are presented below.

- NRM practices frequently involve increased skills, risks and complexity. The benefits to the farmer tend to be intangible and are frequently captured by someone else.

- Farmers (like other people) tend to suffer from the proximity effect. They often do not recognise degradation on their own property, see it as a moderate problem for their catchment, but see degradation as a serious problem for their region. This suggests that programs designed to encourage voluntary change to adopting NRM practices due to future degradation are unlikely to work.
- Structural constraints (as outlined earlier) of broadacre farming are a major barrier to change.

7.9 Maintaining vibrant agricultural communities

Current trends and pressures in rural communities have resulted in depopulation of rural areas. How can the communities be revitalised when current economic conditions are forcing business to scale up to remain viable? Technological advances, the replacement of labour with capital and reduced profitability have conspired to reduce employment opportunities in rural towns. Given the dynamics of the current agricultural industry, it is a major dilemma for sustainability that the economic and social components are in direct opposition to each other.

Consequently the challenge exists in developing new industries that maintain or revitalise rural communities. Alternatives to agricultural commodity production will be needed for this.

7.10 Other challenges

There are a number other of challenges facing agriculture in terms of sustainability. These are summarised below:

- fewer, larger farms and fewer people employed directly in farming and aging managers;
- agricultural commodity prices continuing to decrease in real terms[80] and the cost-price squeeze continues;
- more volatile agricultural commodity prices[81];
- soil erosion and soil structural decline;
- changing dietary patterns, increasing incomes and shifts in population structures in many countries will be an increasingly important market drivers impacting on international competitiveness; and
- increasing price and production risks surrounding contract and marketer relationships and changes in consumers' perceptions of food health, safety and environmental impacts.

8. ROLE OF GOVERNMENT, BUSINESS AND COMMUNITY IN FACILITATING CHANGE

> *"While the principle of ecological sustainability is sound, government intervention in its implementation is fraught with practical difficulties and difficult choices. At the end of the day, the limiting factor will be the willingness of the community to forgo what can often be short-term material advantage, in return for longer-term environmental benefits for themselves and future generations"* [82]

Government, business and the community will all have important roles to play in moving agriculture towards a more sustainable future. Some of the projected roles for each of these groups are given in the discussion below.

In terms of how the government might respond to the issue of pursuing sustainable agriculture, a template framework has already been described in the preparation of the State Salinity Strategy. The document comprehensively outlines the role of government in responding to the issue of salinity. The roles fall into four main categories:

- protecting priority public resources. For instance if an area of endangered plants is threatened, the government may take action to ensure its survival.
- research and development. This will include understanding the interactions of agriculture with the environment, developing agricultural management and land use systems that sustain the resources, as well as developing new industries through new crops or techniques or new markets.
- inventory, classification, capability assessment and monitoring; and
- increasing the knowledge base of the community – this can be undertaken through methods such as supporting land managers and groups in developing and implementing sustainable production systems or offering training to land managers and groups through the FarmBis program.
- government policy needs to:
    - develop and implement strategies for achieving sustainability e.g. ERA framework (Appendix 1), Biosecurity
    - creating a process to ensure consistency in sustainability actions between scales; and
    - develop agricultural policy that meets the criteria for sustainable agriculture.

The role of the supporting industry will be:

- raising awareness of the opportunities and threats to sustainability;
- promoting management and land use systems that sustain the resource base;
- supporting land managers with the skills, knowledge and values to adopt sustainable production systems; and
- raise understanding the interactions of resource condition with its management and the consequent impacts on the economic and environmental performance of the industry.

The community has a role in supporting the move towards sustainable agriculture by:

- guiding and defining the criteria for sustainable agriculture
- defining areas of the public resource that need protecting; and
- providing local experience and practical knowledge to the pursuit of sustainable management.

9. R&D IS NEEDED TO ENSURE SUSTAINABILITY OUTCOMES CAN BE ACHIEVED

As growth and consequent pressures on natural resources use increase, significant innovation and technological advance will be required to achieve sustainability goals. In Australia holistic approaches towards sustainable agriculture have emerged only in the last two decades and there is still much research to be undertaken to ensure sustainability outcomes can be achieved.

SCARM[†††] has developed and tested for relevance a number of sustainability indicators to assess Australia's agricultural performance. These indicators together with assessment of their baseline condition provide a good basis for monitoring trends in resource condition and evaluating impacts of management. These indicators will guide farming systems and other research by clarifying environmental objectives and targets for on-going improvement.

Such monitoring and evaluation frameworks, though vital for an adaptive approach to sustainable management, are expensive to establish and maintain and require a long-term commitment.

Research will need to be undertaken to develop improved and cost-effective monitoring and systems models to enable evaluation of expected versus actual outcomes as a part of adaptive management.

Leeuwis (2000)[83] comments that the nature of knowledge necessary for achieving sustainable forms of agriculture differs considerably from that currently used in agricultural production. If knowledge of this nature is to be generated a different approach will need to be taken to research projects that focuses more towards applied knowledge and information rather than marketable end products.

The following areas also need investigation and will provide guidance for research and development for the different agricultural industries:

- models of system function to enable better understanding of relationship between actions and outcomes and support the validity of policy interventions;
- developing new industries and new landuse systems that uphold all three components of sustainable agriculture;

[†††] Standing Committee on Agriculture and Resource Management

- developing processes for scenario planning that ensure broad ownership by stakeholders and the rigorous assessment of different futures as to their credibility;
- research to better understand the range of community attitudes to and understanding of, sustainability, to improve the effectiveness of its promotion to the community as a product that is relevant and beneficial to them; and
- appropriate institutional/governance arrangements for ensuring decision making is consistent at all scales, and that government and business collaborate in support of strategies for a sustainable future.

10. BEST PRACTICE EXAMPLES TO DEMONSTRATE HOW SUSTAINABILITY IS BEING PROGRESSED

Already the community, business and government are responding to the community demands of making agriculture more sustainable. The outline of three case studies as to how this is being done is represented below. Further information on the case studies can be found in Appendix 2.

10.1 Mingenew-Irwin Group[84]

The Mingenew-Irwin Group (MIG) is a farmer driven organisation formed in 1997. The Group has a strong environmental focus but also farming system development and the education/up-skilling of its membership. Numerous agricultural companies support the Mingenew-Irwin Group, with sponsors including Elders, Nufarm, Aventis, AWB Ltd and the WA Department of Agriculture.

For the past 20 months the Mingenew-Irwin Group (MIG) has been working on the environmental equivalent to Quality Assurance (QA) through testing the application of 'Environmental Management Systems' (EMS). Like QA, an EMS is an auditable system which is used to prove to a third party a particular level/ type of management. But where QA focuses on food safety and quality an EMS focuses on a business's environmental impacts.

The Mingenew-Irwin Group has built its own EMS guidelines, which include:

- identification of activities which potentially result in environmental hazards;
- significance assessment of each of the identified hazards;
- identification of legal requirements;
- setting of objectives and targets;
- development of management programs (for each significant hazard);
- monitoring;
- procedures for activities surrounding significant hazards;
- responsibility, training and communication;
- records and documents; and
- system and management review.

At this stage MIG members will be able to undergo EMS training from early 2003, so that the environmental module can be added to their QA program. Once a number of growers have been trained the next step will be identifying market niches which may see premiums paid for QA and EMS. Already several marketing organisations have indicated their support.

The significant outcome of this process is MIG members will remain at the cutting edge of the industry. Adoption of QA and EMS will place growers in a position whereby they are ready to respond to market signals, changes and requirements.

10.2 Sustainability in the southern rangelands[85]

Pastoralists in the Gascoyne-Murchison region are progressing toward sustainable production assisted by the Gascoyne-Murchison Strategy (GMS)[‡‡‡] in formulating and coordinating a number of sustainability initiatives.

The GMS is comprised of four core programs, one of which is the Regional Environmental Management Program (REMP). The aim of this program is to improve natural resource management from the paddock scale through to the regional scale encompassing advancement of sustainable pastoral production.

Initiatives under the REMP are helping the pastoral industry prepare for future change and are part of a strategic drive to ensure the industry is accountable for its use of public resources. To satisfy these demands, the pastoral industry is in the process of constructing a management framework that demonstrates responsible production to industry stakeholders and consumers.

The framework will provide a quality assurance approach to enterprise management that clearly defines management objectives across a range of themes including financial, social, environmental and legislation. This framework will link the productive capacity of a property with:

- the capital value of the lease
- responsible environmental management and measurable environmental outcomes
- market access and product liability requirements
- statutory and common law requirements.

It will provide:

- information necessary for a continuous improvement in enterprise management
- evidence of responsible resource use across a range of scales.

The building blocks of the framework are currently being put in place through two initiatives under REMP; the Ecosystem Management Unit (EMU) and Rangelands Accreditation

[‡‡‡] See Appendix 3 for more information regarding the GMS.

Project. The achievements of pastoralists involved in two of these initiatives - demonstrate significant progress toward sustainable rangeland management.

By June 2002, each of the participating stations will have had their management system independently audited, after which time they will have a foundation for launching a credible 'clean, green' marketing program. Environmental mapping has helped the managers to work towards ecological sustainability and ensures they are producing 'green' products. SQF ensures they are controlling critical product safety and quality hazards and producing 'clean' products. It also enables their 'clean, green' claims to be independently verified.

10.3 Biospheres for developing quality economies[86]

The project is in its infancy but is a demonstration as to how community, conservation groups, government and business can work together in the pursuit for sustainability. These groups have come together to develop the idea for the biosphere.

The Fitzgerald Biosphere reserve is one of 12 areas in Australia identified as areas of significant biological diversity closely linked with economic activity. The Fitzgerald and Bookmark Biospheres are the only two that recognise and attempt to exploit the potential of such a partnership.

The area has traditionally relied on agricultural industry for its community and economy, both of which are now in decline. The biosphere reserve concept, however, may provide opportunities to revive the local economy. One of the tasks of the biosphere reserve management is to promote the significant value of the biosphere reserve, particularly its terrestrial and marine diversity, the image of the biosphere reserve, and its role as a place for recreation and as an important source of livelihood in the future.

Primary production will remain as a part of the biosphere community but emphasis will be placed on undertaking primary production that is sensitive to the needs of the environment. Primary producers in the area recognise the marketing niche this may create and are currently investigating the idea of branding. A Biosphere Reserve label has the potential to attract investment into the community provided investors can see integrity in the operations undertaken in the biosphere.

The community is interested in shifting away from its reliance on primary industry by developing tourism and other industries to diversify and expand the local economy. Diversification of the local economy is essential in all areas including primary production, value adding and service industries such as tourism and eco-tourism.

Promotion, education and general awareness raising in all sections of the local and wider community of the biosphere reserve is essential. The value, potential and importance in helping to create a sustainable future need to be demonstrated to all, but particularly younger generations who have a vested interest in the future.

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APPENDIX 1. ENVIRONMENTALLY RESPONSIBLE AGRICULTURE (ERA) A FRAMEWORK FOR DEFINING IT, MEASURING IT, ACHIEVING IT

1. Purpose

The purpose of this Position Paper is to outline departmental policy for developing and implementing a framework for environmentally responsible agriculture.

SUMMARY STATEMENT

The Department of Agriculture will develop and implement a framework for Environmentally Responsible Agriculture. The framework will be developed in partnership with key stakeholders and provide the basis for government decision-making and criteria for measuring performance in environmental outcomes.

Guiding principles for the framework

- Ecological Sustainable Development principles provide the basis for achieving environmentally responsible agriculture.
- Industry awareness of community and market demands is a key driver for environmentally responsible agriculture.
- Adaptive management and processes for review and evaluation ensure continuous improvements in environmental performance.
- A coordinated approach across the Department ensures consistency in the development and promotion of extension messages.
- A risk management approach underlies the framework.
- The Department provides leadership in the management of on-site and off-site impacts of agricultural industry.
- Initiatives for achieving environmentally responsible agriculture are driven through industry.

2. Background

2.1 Ecological Sustainable Development (ESD)

State, Federal and International Governments have agreed to commit to ecological sustainable development (ESD) principles. In Western Australia, the Government is developing a Western Australian strategy for sustainability with the aim of maximising economic and social benefits whilst preserving options for future generations.

For agriculture this implies that industries and the Government has a stewardship responsibility to ensure that the agricultural resource base is maintained or enhanced and a responsibility to manage the environmental risks and impacts of agriculture.

2.2 Industry and sustainability

For many reasons such as market, regulatory or altruistic drivers, industry increasingly wants to achieve and demonstrate its commitment to pursuing sustainability. One way of undertaking this is by adopting the framework for environmentally responsible agricultural. From the perspective of maintaining and building its market share and international competitiveness it is increasingly important for industries to demonstrate that community and political expectations are met with regard to biodiversity, animal welfare, and food safety

In addition, for agriculture to exist in the medium term it is widely accepted that the management of natural resources must become an integral part of the business of farming or pastoralism and that decisions consider both the on-site and off-site impacts on these resources. This will require that issues of sustainability are considered by agriculture in the context of productivity and community and market demands.

Agriculture must also be prepared for an increased regulatory regime in line with other resource based industries. Legislation and Government policies are progressively being tightened and framed to require compliance with Codes of Practice. For example, under the Environmental Protection (Amendment) Bill 2001, due to be introduced to Parliament in 2002, it will be an offence to cause environmental harm. In defence, proof must be provided that approval was given to undertake the activity. Alternatively the defendant must prove they were operating under a code of practice endorsed by the Department of Environmental Protection or by the Agricultural Practices Board under the Agricultural Practices (Disputes) Act 1995.

2.3 Roles of Government - Department of Agriculture

The role of the Department of Agriculture is to assist agricultural industries in Western Australia to sustainably manage the resource base at the same time as contributing to the social and economic well being of Western Australia.

This includes:

- understanding the natural resources used and affected by agriculture - this includes inventory, classification, capability assessment and monitoring;
- understanding the impacts of agriculture on natural resources, e.g. salinity, soil acidity, biodiversity;
- developing indicators and performance measures for the sustainable use of the resource base;
- developing agricultural management and land use systems that sustain the resources;
- understanding the interactions of resource condition with its management and the consequent impacts on the economic and environmental performance of the agricultural business; and
- supporting land managers and groups in developing and implementing sustainable production systems. (Robertson, G.A. 2001).

2.4 Framework for Environmentally Responsible Agriculture (ERA)

The term 'Environmentally Responsible Agriculture (ERA)' reflects the inter-generational equity and precautionary principles of ESD. This is demonstrated through the adoption of management practices judged as sustainable through a transparent and scientifically rigorous process. The Better Environmental Management Project (BEMA) is charged with developing the framework for ERA to describe processes and outputs for the achievement and demonstration of environmentally responsible agriculture. The Framework for ERA will define the roles, responsibilities and communication strategies that underlie the processes and outputs and will be developed in consultation with relevant stakeholders from industry, community and government.

The major processes and outputs described in the framework are outlined below and discussed further in the next section of the paper.

- Engagement of relevant producer and community groups.
- Environmental condition assessment using spatially defined zones.
- Natural Resource Management (NRM) outcome targets
- Industry performance standards linked to NRM outcome targets;
- BMPs underpinned by these standards which allow for profitable agriculture and address environmental outcomes;
- Sign off and reporting to a third party on compliance with BMPs - probably EPA;
- Evaluating and reporting progress towards NRM outcome targets

Under the Agriculture Act 1988, the Department has a clear role to help farmers profitably manage the environmental risks of land use. The development and implementation of a framework for Environmentally Responsible Agriculture will be a major step towards addressing this commitment.

3. Description of the ERA Framework elements and development activities

3.1 Engagement of relevant producer and community groups

Many of the natural resource issues facing agricultural industries are complex and interrelated. In addition, differing goals, values and levels of understanding mean that there is a whole spectrum of perspectives on many issues. Therefore, an essential element of the ERA framework is the building and utilisation of formal and informal partnerships between government, community and industry. This will ensure valuable input into the framework to focus efforts on strategic areas where a difference can be made.

Communication is considered a key factor in the engagement of relevant industry and community groups and in the building of partnerships. The BEMA project will develop and implement a communication strategy to keep relevant stakeholders informed and updated on the progress of developing the ERA framework. In addition, the BEMA project will produce an ERA framework consultation paper for feedback from producer and community groups.

3.2 Environmental condition assessment

It is essential for environmental accountability that ERA practices, standards and measures are founded on a sound understanding of the condition of the natural resource base and the processes of degradation. For this reason the environmental condition assessment is an important element of the framework and is seen as a key role for the SRD Program. The environmental condition assessment will also provide the basis for a number of other planning and evaluation efforts in the Department.

The environmental condition and degradation processes are not uniform across the State or across regions but have a geographic context. Therefore the environmental condition assessment should be based on logical spatial units. For practical reasons the assessment should be focused at a regional scale. Currently the Rapid Catchment Appraisal project is undertaking assessments of risks and impacts of salinity and other key NRM issues in catchments across the agricultural region. The Rapid Catchment Appraisal process could be enlisted to expand its role and undertake the environmental condition assessment on a formal basis. This option will be further investigated.

3.3 Natural Resource Management (NRM) outcome targets

Developed with good scientific knowledge and effective community involvement, NRM outcome targets establish criteria for defining environmentally responsible agriculture. In addition, by ensuring that industry scale environmental performance standards are linked to the NRM outcome targets, the validity and credibility of environmental claims can be demonstrated. The development of quality NRM outcome targets is therefore an important part of the ERA framework.

To address the requirements under the ERA framework for quality targets, it will be important that the targets are geographically based, are supported by good quality technical information, that there is adequate community involvement and procedures for reviewing the targets to ensure continuous improvement is built in. The BEMA Project will develop a consistent and thorough process for the setting of quality NRM outcome targets in partnership with regional NRM groups and the relevant government agencies. In addition, the process of developing targets will align with Commonwealth guidelines to ensure compliance under the National Action Plan (NAP) for Salinity and Water Quality.

3.4 Industry performance standards

An environmental standard is the level of environmental quality that is regarded as adequate or acceptable. The NRM outcome targets will define acceptable levels of environmental quality at the regional scale. To translate this into the industry responsibility, practical and acceptable enterprise and industry scale environmental performance standards are needed. It will be necessary that they clearly link to the targets and are developed through industry networks. The ERA framework will establish a process for linking the targets to the development of industry standards and ensure this can be clearly demonstrated.

For the Department, the industry environmental standards will play a key role in ensuring that extension activities have consistent environmental messages. In addition, research and development proposals and activities may be measured against environmental standards before being given approval or are continued.

3.5 Development of Best Management Practices (BMPs)

Under the framework for ERA, Best Management Practices (BMPs) provide the on-ground implementation tools to address regional scale environmental outcomes. In the context of the framework for ERA, BMPs are characterised as management practices for environmentally responsible agriculture, which consider enterprise and commodity implications. Therefore the links between BMPs for environmentally responsible agriculture and NRM outcomes must be clearly demonstrated and documented. The BEMA project has the role of establishing a robust and quality assured standard process for the development of BMPs that clearly demonstrates this link.

Part of the process of BMP development is the identification of which practices require BMP development. An approach is discussed by Mark Rivers (2002) based on work with the South West Irrigation Area. The approach involves comparing an environmental situation analysis with an industry practices audit to identify the practices that pose the greatest environmental threat. This is then used to priorities the practices that require the development of BMPs.

For the development of a full suite of agricultural BMPs based on the model described above, present practices audits need to be completed for each agricultural industry. The Hortguard process, modified for the purpose, will be considered as a means of engaging industry groups in this process. The environmental situation assessment is seen as a key role for the SRD Program and could be undertaken through expanding the functions of the Rapid Catchment Appraisal process.

Once the need for BMP development is recognised, the process of developing the individual BMPs is seen as the role of the industry programs. However the framework for ERA needs to set up quality assurance procedures for the process of development of BMPs to be followed by industry. This will involve ensuring that appropriate specialists develop the individual BMPs and that the BMPs are subjected to adequate peer review. In addition, the BMPs need to be assessed against environmental criteria as a means of demonstrating links to environmental outcomes. The industry environmental performance standards, developed under the ERA framework, will provide the appropriate criteria for such an assessment.

3.6 Establishing procedures for endorsement on compliance of BMPs by third party (e.g. EPA)

Political and regulatory trends as well as an increasing need to support trade related environmental claims are key drivers for providing credible evidence of practice changes leading to broad scale environmental improvements. The adoption of BMPs may be used as a measure of environmental performance. However, it is essential that BMPs are developed objectively and that progress towards regional environmental outcomes can be clearly demonstrated. It is therefore important that BMPs developed under the ERA framework are developed through a transparent and systematic quality process and that the validity of claims can be endorsed by an appropriate and recognised third party.

The BEMA project will investigate the need and process for endorsement and build this into the framework for ERA. This may involve working with a Government body such as the Environmental Protection Authority or a widely recognised NGO such as the World Wildlife

Fund to establish a process in which they can confidently certify the adoption of BMPs contribution to improvements in environmental outcomes.

3.7 Evaluation and data management

The establishment of an evaluation and reporting framework is an important component of the framework for ERA. This will include clearly defining the evaluation rationale and uses, identifying the indicators and data management arrangements.

A key purpose for evaluation is to assess progress towards environmentally responsible agriculture and for continuous improvements in the ERA framework processes. Evaluation results will allow for agricultural sector input into State of Environment reporting, provide information for Department external reporting requirements and contribute to department program planning.

Indicators are defined as 'information tools that summarise data on complex issues to indicate the overall status of trends of those issues' (Ministry for the Environment, 1997). They are useful performance measurement tools if developed and applied appropriately. The framework for ERA will include a robust process for identifying appropriate indicators that provide a quantitative measure against which to assess environmental performance.

The availability of quality data is an important aspect of any evaluation effort. The framework for ERA needs to establish procedures to ensure that data meets an acceptable quality to allow meaningful and verifiable conclusions and to meet the necessary confidence level for decision-makers. The responsibility of providing the required quality data, as specified under the ERA framework, would best be managed through the current SRD Programs' Targets and Monitoring Project.

Roles in the development and implementation of the framework

The existing program structure in the Department currently separates the operations of market focused programs (Industry and Market Development - IMD Programs) and the two risk management programs (Sustainable Rural Development - SRD Program and Agricultural Protection Program). The framework for ERA defines the roles of the programs and ensures integration of research, development and extension activities within the Department.

The SRD Program has expertise in understanding the on and off-site environment impacts of agriculture. The role of the SRD Program under the framework for ERA will involve setting performance measures, monitoring regional condition trends and compliance with best practice, evaluating the impacts of Department programs and providing input into resource allocation decisions to ensure priorities issues are addressed.

It is through industry itself and the IMD Programs that innovation and technological improvement can best and most rapidly be achieved and integrated into farming systems. Therefore the relationship between the SRD and the IMD Programs will revolve around the negotiation of industry environmental performance standards and the development of best management practices (BMPs). In addition, the ERA framework will provide the basis for resource allocation decision to ensure priority is given to research and extension programs that address environmental outcomes in addition to economic objectives.

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5. Glossary of terms

Best Management Practice (BMP)

A practice, or combination of practices, that is determined to be the most effective, practicable means of preventing or reducing the amount of environmental impact to a level compatible with environmental standards. (Rivers, M. 2002).

Codes of Practice

Codes of Practice are developed and adopted by an industry and promoted amongst industry members. These may incorporate BMPs. They are adopted by an industry and promoted amongst members. (Environmental Management Systems Working Group, 2001).

Environmental management system (EMS)

EMS is a generic term used to describe any systematic management approach used by an enterprise or an organisation to manage its impacts on the environment. Environmental impacts and legal responsibilities are identified and a structured approach taken to review and improvement. An EMS provides a management framework that achieves continuous improvement through a 'plan, do, check, review' cycle, within which BMPs can be integrated, and Codes of Practice upheld. An EMS can be externally audited and may be certified to the international standard, ISO 14001. (Environmental Management Systems Working Group, 2001).

Environmentally Responsible Agriculture (ERA)

'Environmentally Responsible Agriculture (ERA) is achieved where the agricultural resource base is deemed to be managed in an environmentally responsible manner. This is demonstrated through the adoption of practices determined through a transparent and rigorous process to meet environmental standards and lead to improved environmental outcomes.

Process standards

Specified processes and procedures to be followed for the purpose of environmental management. An example of a process standards is ISO 14000. (Environmental Management Systems Working Group, 2001).

Environmental (Performance) Standards

Specifies a level of environmental quality which is regarded as adequate or acceptable. (Rivers, M. 2002).

Natural Resource Management

Natural Resource Management seeks to manage our natural resources in a sustainable manner for the long term, achieving balance between economic and social development and the needs to protect the environment. (Department of Primary Industries, Water and Environment, 2001).

Sustainable agriculture

Sustainable agriculture is the use of farming systems and practices which maintain or enhance the economic viability of agricultural production, the natural resource base, and other ecosystems that are influenced by agricultural activities. (Dore, J. 1997).

Sustainability indicators

A practical set of measures that enable decision-makers to evaluate the sustainability of a process or activity under review (e.g. agriculture, forestry and fishing). In order to be meaningful, indicators need to be expressed within a framework that includes the objectives or values that society is seeking to maintain with respect to those processes or activities. (Environmental Management Systems Working Group, 2001).

Target

Time bound and measurable statements of desired outcomes or practices.

Target (National Action Plan)

Measurable interim levels that will be achieved on the way to a regional objective at some specified time in the future - for example river salinity < 800 EC by 2005 (Interim National Standards Framework for Surface Water and Salinity as part of the National Salinity and Water Quality Action Plan).

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REGIONAL NRM TARGETS PROJECT

The project in a nutshell

- NHT funded ($96,000) to September 2002.
- Coordinated by the Department of Agriculture in partnership with CSIRO, NACC, ACC, SWCC, SCRIPT and working with CALM and DEWCP.
- The project will assist the regional groups to set targets in their regional strategies or implementation plans.
- The current project will focus on the process for setting targets and, where appropriate, setting interim/progressive targets.
- After the project, the Department of Agriculture and CSIRO would also like to continue to assist regional group to refine targets.

Workplan

- Engage with the regional groups to explain the project and, where appropriate, develop partnership agreements.
- A review of similar processes elsewhere in Australia and overseas is currently underway.
- Links will be made with developments in the National Action Plan for Salinity and Water Quality, which is one impetus for setting regional targets.
- The broad process the Department of Agriculture will use is very similar to the planning of any group in NRM.
    1. Assessment of risks to natural resources.
    2. Setting regional targets.
    3. Developing Best Management Practices (BMPs) that help to achieve targets.
    4. Evaluating and reporting on progress.
- In other words:
    1. What are the problems?
    2. Where do we want to get to?
    3. What do we need to do?
    4. How do we know if it's working?

What are targets?

- In general, a target is a time bound and measurable statement of the outcome we want.
- The National Action Plan describes targets as "measurable interim levels that will be achieved on the way to a regional objective at some specified time in the future".
- An example they give is for river salinity to be less than 800 EC by 2005.

Proposed approach

Department of Agriculture and CSIRO are proposing to base this work on:

- building on existing work;
- all of the partners learning from our experiences;
- useful, realistic and achievable targets;

- stakeholder/community involvement;
- strong technical input; and
- coordinated work across government departments.

Project team		**Further questions, please contact**
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APPENDIX 2. CASE STUDIES

1. Biospheres for developing quality economies[§§§].

This project is currently in its infancy but is a demonstration as to how the community, conservation groups, the government and business can work together in the pursuit for sustainability.

The Fitzgerald Biosphere reserve is one of twelve areas in Australia identified as areas of significant biological diversity closely linked with economic activity. The Fitzgerald and Bookmark Biospheres are the only two that recognise and attempt to exploit the potential of such a partnership.

Economic activity and conservation are often and seen to be at odds and even mutually exclusive. The UNESCO Man and Biosphere initiative recognised that not only are these activities not mutually exclusive, but that one can enhance the other.

Why is the Fitzgerald biosphere so important? It forms a significant sub region on the South Coast covering an area of 1.3m ha of which 48 per cent is National Park, the remainder an area of significant agricultural production. While the Park carries some 1,800 species of plants (75 endemic) 22 mammals, 41 reptiles and 184 species of birds, the farming area is dominated by possibly 20 plants species and 5 mammals (all introduced). Stark contrasts from the diversity point of view and the latter presenting many challenges to longer term economic and environmental sustainability on which thousands of people depend in the region.

Primary production and the rural economy in the biosphere has and continues to be faced with many challenges to it sustainability and viability, and the National Park and its diversity and long term survival. So how can the Biosphere concept encourage sustainable and viable production that has minimal impact on remaining diversity and promotes conservation.

First is should be remembered that Land conservation District Committees were in many respects born here with the urgent need to address wind erosion and rising saline water tables. Controlling wind erosion was the first great success and achieved through the adoption of no and minimum till techniques. Fencing and tree planting have helped to protect creek lines and lucerne and other perennial pastures have provided some measure of water table management. Biological control and poisoning has reduced populations of feral animals. Salinity and more importantly soil acidity, herbicide resistance and climate change continue to be threats.

More recently effort has been put into diversifying primary production to reduce the exposure to risk. It has been realised that it is not feasible to 'go back' and that we have to maintain if possible the current status of the Biosphere. Water table management is improving with a better balance of annual and perennial crops and cropping systems.

[§§§] Prepared by Giles West, Sustainable Rural Development Manager, Albany. Department of Agriculture, Western Australia (2002).

Schools and wider community awareness has been developed through Agricultural, Education and Conservation Department initiatives. Primary producers have become more aware of the need for environmental management systems, accreditation and demonstrated quality assurance. This provided marketing advantages through appealing to consumers increasingly aware of the environment and to responsibly produced products. The Fitzgerald Biosphere Marketing Association has been formed to promote the Biosphere and develop a culture of responsibly produced market edged products.

We have come a long way in balancing production with conservation but have a way to go. The key point to guide us is that a thriving Biosphere is a thriving community.

2. Mingenew-Irwin group[****]

The Mingenew-Irwin Group (MIG) is a farmer driven organisation formed in 1997. The Group has a strong environmental focus but also focuses on farming system development and the education/up-skilling of its membership. Numerous agricultural companies support the Mingenew-Irwin Group, with Diamond sponsors including Elders, Nufarm, Aventis and AWB Ltd. The WA Department of Agriculture is also a major supporter of the Group.

The Mingenew-Irwin Group is now considering the opportunity to diversify its role by forming a commercial arm to take advantage of numerous identified profit making opportunities. Several of which are based around the marketing of agricultural produce under a local branding concept.

Grain Growers in Western Australia are adopting quality assurance at a faster rate than anywhere else in Australia. The drive via the Grain Pool of WA to quality assure primarily lupins and barley saw about 240 growers become quality assured in 2001, with a further 600 or more having registered for the relevant training in 2002.

Food safety is of great concern to premium paying markets throughout the world. Unfortunately we are unlikely to see obvious premiums flowing back to growers via the large marketing organisations. What QA is doing though is further securing better paying markets and possibly opening doors for the future. Premiums in themselves, but not obvious ones!

For the past 20 months the Mingenew-Irwin Group (MIG) has been working on the environmental equivalent to QA through a GRDC funded project testing the application of 'Environmental Management Systems' (EMS). Like QA, an EMS is an auditable system which is used to prove to a third party a particular level/ type of management. But where QA focuses on food safety and quality an EMS focuses on a business's environmental impacts.

Unfortunately, unlike QA (where 'SQF1000' and 'Great Grain' have been developed specifically for agriculture) a standard EMS has not yet been developed specifically with agriculture in mind. Currently the only internationally recognised EMS code is ISO14001, which is very general but is more suited to large businesses.

[****] Prepared by Cameron Weeks, Department of Agriculture, Geraldton (2002).

To minimise duplication and maximise understanding the Mingenew-Irwin Group has built its own EMS guidelines based on the major components of ISO14001, but with a strong SQF1000 flavour. The MIG EMS includes:

- Identification of activities which potentially result in environmental hazards.
- Significance assessment of each of the identified hazards.
- Identification of legal requirements.
- Setting of objectives and targets.
- Development of management programs (for each significant hazard).
- Monitoring.
- Procedures for activities surrounding significant hazards.
- Responsibility, training and communication.
- Records and documents.
- System and management review.

The MIG final product will be similar to 'Great Grain' in many ways. Great Grain is based on the internationally recognised HACCP process - Hazard Analysis Critical Control Point, but makes use of 'master HACCP plans' for the grains industry.

The Group will soon have available to members an EMS based on the above listed principles but with a 'master plan' to help guide a business when adopting an EMS. The master plan will include lists of typical farm activities, which could have an impact on the environment, typical targets, monitoring, management programs, records, etc. Essentially many of the possible 'answers' will be in front of a person undergoing EMS training. Hopefully this will make the adoption of our EMS easier and less costly.

Because we have put a lot of effort into EMS and because we have a system designed to meet local members needs, it is obvious that we should try and get some value out of our efforts. With premiums for QA hard to develop, premiums for EMS will possibly be even harder. That is unless MIG adopt QA and EMS and sell ourselves into the market place!

After discussions with SGS (the international company providing the auditing service for WA growers adopting QA) we have decided to include our EMS as a module of already adopted QA (the co-badged SQF1000/Great Grain system). This will make it possible for SGS to audit the EMS at the same time as they are auditing the QA system on farm. Because our generic system will not be fully compliant with ISO14001 we will not have our EMS certified against that particular standard but the audit will ensure that a business is "doing what it is saying it is doing" with regard environmental performance. This will give our system and environmental efforts credibility, which should make for a saleable product.

To my knowledge there will not be any other growers of grain, meat and wool that could claim to be quality assured and have in place an auditable EMS in Western Australia!

With the advent of a MIG commercial arm (company or cooperative) QA and EMS have the potential to add significant value to produce from Mingenew and Irwin!

At this stage MIG members, outside of the EMS working group, will be able to undergo EMS training from early 2003, so that the environmental module can be added to their QA program. Once we have numerous growers at such a level we can start testing the market place for niches which may see premiums paid for QA and EMS. Already several marketing organisations have indicated that they would be happy to help.

Most significantly though MIG members will remain at the cutting edge of the industry. Adoption of QA and EMS will place growers in a position whereby they are ready to respond to market signals, changes and requirements. Members will also be in a position to respond to any future legal and/or legislative requirement to prove the safety and environmental performance of a farm operation.

3. Sustainability in the southern rangelands[††††]

Pastoralists in the Gascoyne-Murchison region are progressing toward sustainable production. Pastoralists have been assisted by the Gascoyne-Murchison Strategy (GMS) in formulating and coordinating a number of sustainability initiatives.

The Gascoyne-Murchison Strategy (GMS) is a regional initiative addressing critical economic development, structural adjustment and natural resource management needs of the pastoral industry in the Gascoyne-Murchison region of Western Australia.

The Strategy is the largest of the twelve national Rural Partnership Programs (RPP) and operates as a partnership between industry, government and the community: the Department of Agriculture acts as lead agency.

The GMS is comprised of four core programs, one of which is the Regional Environmental Management Program (REMP). The aim of this program is to improve natural resource management from the paddock scale through to the regional scale encompassing advancement of sustainable pastoral production.

Initiatives under the REMP are helping the pastoral industry prepare for future change and are part of a strategic drive to ensure the industry is accountable for its' use of public resources. To satisfy these demands, the pastoral industry is in the process of constructing a management framework that demonstrates responsible production to industry stakeholders and consumers.

The framework will provide a quality assurance approach to enterprise management that clearly defines management objectives across a range of themes including financial, social, environmental and legislative issues. This framework will link the productive capacity of a property with:

1. the capital value of the lease;
2. responsible environmental management and measurable environmental outcomes;

[††††] Prepared by Lucy Taylor, Department of Agriculture, Carnarvon (2002).

3. market access and product liability requirements; and
4. statutory and common law requirements

And will provide:

1. information necessary for a continuous improvement in enterprise management; and
2. evidence of responsible resource use across a range of scales.

The building blocks of the framework are currently being put in place through two initiatives under REMP - the Ecosystem Management Unit (EMU) and Rangelands Accreditation Project. The achievements of pastoralists involved in two of these initiatives - demonstrate significant progress toward sustainable rangeland management.

3.1 Identifying critical ecological issues - The Ecosystem Management Unit

The Ecosystem Management Unit (EMU) is a mapping and monitoring process designed by pastoralists and ecologists to help station managers conserve the landscapes and ecosystems within their station boundaries.

Over the course of a two-day workshop, pastoralists record key landscape and ecological information on maps of their stations. This information includes the location of waters, breakaways, drainage systems, areas of erosion, and eco-junctions. Eco-junctions are a particularly important part of EMU. As areas where many land types come together, eco-junctions represent local biodiversity 'hotspots'.

The initial EMU workshop helps pastoralists to capture their knowledge of the land on reference maps. Mapping provides an understanding of critical management issues from an ecological and production perspective. Once these issues are documented, pastoralists can strategically monitor the condition of significant areas and instigate management controls where necessary. The mapping workshop represents the first step in a process of ongoing learning.

The simplicity and effectiveness of EMU is popular with the pastoral community. Participants have indicated that through ecological management they can improve their use of the land and care for specific ecological values at the same time.

So far, close to six million hectares of the Gascoyne-Murchison region have been volunteered for the EMU treatment. Real environmental improvements are already apparent: rare plants species have been identified and management plans developed. Plans are also under way to protect fragile land systems and areas of regional biodiversity value.

Station-level monitoring, based on EMU, is complemented at a strategic level by the Western Australian Rangelands Monitoring System (WARMS). WARMS is a regional monitoring program that enables assessments to be made of overall range condition.

3.2 Connecting to 'clean, green' markets - Rangelands Accreditation

There are widespread consumer demands for safe food and fibre products. Increasingly these demands are broadening; many consumers are now seeking food and fibre products that also come with an assurance of low environmental impact. By virtue of their free-range, low-

chemical production techniques, well-managed pastoral properties are in an ideal position to satisfy demands for safe and sustainably produced - 'clean, green' - products.

Whilst EMU is assisting pastoralists to improve their management of the rangeland, the process cannot verify a clean, green image: an independently audited management system that focuses on product quality, safety and environmental management can.

At the beginning of 2001, the managers from three stations - Challa, Minilya and Winderie - began trialing various management systems in an attempt to find the most suitable means of assuring product safety and environmental responsibility in the rangelands. Each of the stations had already completed the EMU process. Of the systems trialed, an integrated SQF 1000^{CM} system, which combines environmental issues with product safety and quality hazards, has proved to be most suitable.

SQF 1000^{CM} is a quality assurance code that offers food and fibre businesses a means of verifying the safety and quality of their products (SQF means Safe Quality Food). Whilst the code does not deal with environmental issues specifically, the risk assessment and management processes used for safety and quality hazards can be applied to environmental issues to develop an Environmental Management System (EMS). An EMS is a management tool that a business can use to continually improve its environmental performance.

To develop their management systems the managers:

1. Conducted a safety and quality risk assessment and an environmental review
    - Product specifications were determined.
    - Product safety and quality hazards were identified using the Hazard Analysis Critical Control Point methodology (HACCP).
    - Legal obligations to manage the environment were identified.
    - Environmental hazards were identified and the level of risk associated with each hazard was assessed to determine management priorities.
2. Developed management plans for each priority issue.
    - Critical limits, objectives and targets were determined for each priority issue.
    - Control methods were documented.
    - Monitoring requirements were identified and recorded.
    - Responsibilities were assigned.
3. Developed supporting documentation and records, including:
    - A business policy statement.
    - Standard operating procedures.
    - Chemical treatment records.
    - Range condition assessments.

By June 2002, each of the stations will have had their management system independently audited, after which time they will have a foundation for launching a credible 'clean, green' marketing program. EMU has helped the managers to work towards ecological sustainability and ensures they are producing 'green' products. SQF ensures they are controlling critical

product safety and quality hazards and producing ‘clean’ products. It also enables their ‘clean, green’ claims to be independently verified.

Supported by resources developed through the EMU and Rangelands Accreditation initiatives, the pastoral industry of the future is likely to be operating under a commercially backed management framework that industry and government can employ to drive environmental and production outcomes.

APPENDIX 3. OVERVIEW OF THE CASCOYNE-MURCHISON STRATEGY

The Gascoyne-Murchison Strategy (GMS) is a regional initiative addressing critical economic development, structural adjustment and natural resource management needs of the pastoral industry in the Gascoyne-Murchison region of Western Australia.

The Strategy is the largest of the twelve national Rural Partnership Programs (RPP) in terms of committed funding, area and scope (Figure 1).

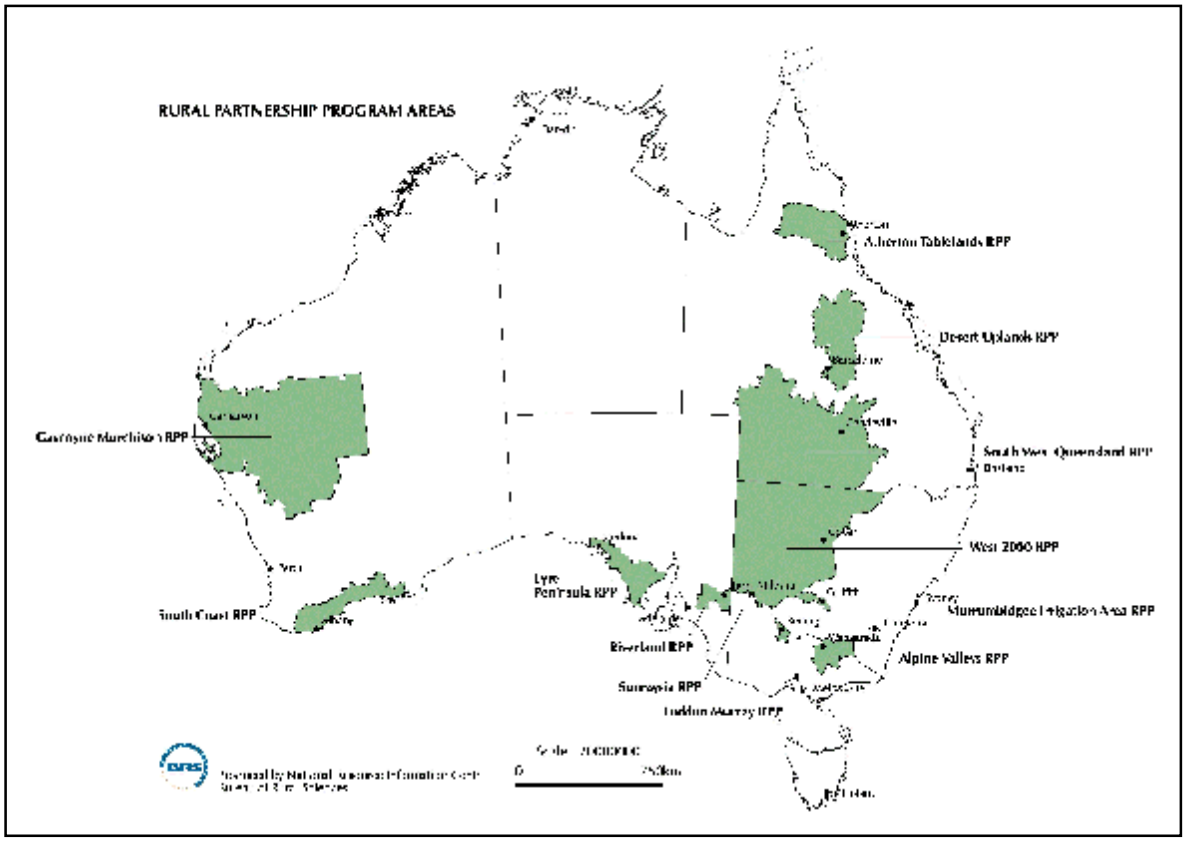

Figure 2. Rural Partnership Program areas around Australia.

The Strategy is based on an area in excess of 570,000 km^2, encompassing the Gascoyne River and Murchison River catchments.

This Strategy is the broadest of its type covering the areas of business and industry development, sustainable environmental management, structural adjustment, and the development of new management tools for the rangelands.

Established in response to community and government recognition of problems with economic and environmental sustainability across much of the region, the Strategy was developed through an extensive consultation and planning process over more than two years.

State Cabinet approved the formation of an official committee of government and appointed a board and approved the GMS Action Plan in December 1997. Subsequently a State/Commonwealth Agreement for funding its implementation was signed and the Strategy

was launched by the Premier in April 1998. The strategy agreements are generally timed to complete in December 2003 however the Strategy is recognised as a regional organisation and consideration of its role beyond 2003 as a regional organisation is to be decided.

Total government funding for implementation of the GMS is around $35 million over five years, including:

- $22 million State funds (agency allocations and new resources approved by Cabinet);
- $13 million from the Natural Heritage Trust and Rural Adjustment Scheme.

1. The GMS comprises four core programs

1.1 Industry research and development

Commissioned projects including:

1. Better climate information for use in property planning and land management.
2. Market premiums for 'sustainable' rangeland products.
3. Investigation of new commercial finance options for rural businesses.
4. New technology that reduces overheads, increases gross margins and turnover.
5. Better water quality, distribution and capacity to control and monitor stock and water supplies.
6. Increased community awareness of rangelands and rangeland industry issues.

2. Voluntary lease adjustment

Brokered commercial subdivision of pastoral leases to increase sustainable production and diversity of land use in the region. The Strategy will only get involved in cases where the subdivision creates significant economic and environmental benefits and has Pastoral Lands Board approval.

3. Regional Natural Resource Management

Initiatives to improve natural resource management at paddock level through to regional level:

1. Development of a regional biodiversity database that identifies and monitors threatened and at risk biological processes.
2. Acquisition of conservation reserves and development of off-reserve management agreements with landholders (based on the above database).
3. Development of a new approach to landscape function and capability.
4. Guidelines for ecologically-sustainable management within production systems.
5. Development of product and property accreditation systems based on ecological sustainability.
6. Research and development grants for establishment of supply chains for accredited products.
7. Industry-driven institutional structures for ongoing regional delivery of NRM in the rangelands.

1.4 Business and industry development grants

(Closed 30 September 2000 - Grants paid to 30 December 2003)
Comprises: Grants Program and Carnarvon Artesian Basin Bore Rehabilitation Program

Grants for individual businesses and business groups to implement business plans that improve productivity, profitability and sustainability through:

1. Information and skills for business development.
2. Innovative on-ground works and activities that improve the stations business position.
3. Installation of approved Total Grazing Management systems.
4. Development of new enterprises and industries with regional benefits.
5. Rehabilitation and reticulation of artesian bores for better land and water management in the Carnarvon Artesian Basin and the development of an on-going management framework.
6. Development of financial benchmarks for the region and business review assistance.
7. Financial restructuring advice.

GMS is now managing grants to over 60 per cent of the eligible businesses and co-operatives from the GMS area. These grants assists these enterprises to undertake a range of productivity enhancing activities.

2. What areas of regional enterprise development have the grants gone to?

(Excludes Carnarvon Artesian Basin Bore Rehabilitation works)

Activity	GMS $	% of total grants
Fencing of fragile and normally highly productive land systems	717,405	11
Fencing for increased cattle productivity and improved management	705,475	11
Fencing for increased sheep productivity and improved management	301,873	5
Construct. of Total Grazing Management (TGM) yards	1,771,217	26
Construction of stock handling yards	181,700	3
Development of domesticated goat enterprises	773,425	12
Development of new waters through bores or pipelines	1,236,213	18
Development of new and expanded tourist facilities, pathways	404,450	6
Development of expanded viticulture projects	121,700	2
Creating tourism and industry development plans	33,524	1
Development of aquaculture projects	157,524	2
Development of wool marketing project	140,000	2
Creating Supply Chains in the rangelands (forum)	10,000	0
Development of mineral prospectivity map	10,000	0
Development of horticulture enterprises	129,750	2
Development/expansion of commercial fabric dyeing project	3,250	0
Total	**6,697,506**	**100**

(Note: Some stations have been allocated funding for more than one activity.)

Funding provided to regional groups	$
Arid Land Timbers Project	2,500
Gascoyne Inland Aquaculture Group	157,524
Regional Based Alternative Forums & Projects	62,900
Rangeland Fibre & Produce Association Inc.	40,000
Eco Wools Western Australia Pty Ltd (agreement pending)	100,000
WA Rangeland Meat Cooperative	5,000
Group total	**367,924**

3. What regional areas has the funding gone to?

Shire	GMS funds $	Enterprise funds $	Total funds $
Carnarvon	1,125,218	1,502,168	2,627,386
Cue	133,590	149,938	283,528
Exmouth	159,350	299,900	459,250
Upper Gascoyne	719,050	877,750	1,596,800
Mount Magnet	421,614	543,278	964,892
Meekatharra	807,275	893,275	1,700,550
Mount Marshall	119,550	103,100	222,650
Morawa	10,300	10,920	21,220
Murchison	1,020,600	1,059,080	2,119,680
Northampton	70,250	87,450	157,700
Perenjori	35,853	24,728	60,581
Shark Bay	141,750	245,650	387,400
Sandstone	114,100	130,000	244,100
Wiluna	633,446	1,067,743	1,701,189
Yalgoo	817,636	1,091,691	1,909,327
Pastoral total	**6,329,582**	**7,869,221**	**14,238,803**

4. Other schemes of assistance

GMS attracted and administers additional funding to the Strategy area from the State and Federal Government following the devastating outcomes of Cyclone Vance (the strongest cyclone ever to cross the Australian mainland). In addition GMS with the Waters and Rivers Commission project manage the Carnarvon Artesian Basin Bore Rehabilitation Project.

To date, the Gascoyne-Murchison Strategy has contributed:

Grant scheme	GMS $
Cyclone Vance Water Supply Recovery Scheme	705,000
Carnarvon Artesian Basin Bore Rehabilitation Project	3,359,000
Business and Industry Development Grant	6,697,506
Total	**10,761,506**

This is a significant investment into the region and one that is matched by a total pastoralist contribution in the vicinity of $9,200,000 through cash and ‘in-kind’.

5. Whole-of-government delivery

The Gascoyne-Murchison Strategy is delivered through a whole-of-government approach utilising the support and services of a number of government agencies including:

1. Western Australian government agencies:
2. Department of Agriculture (*lead agency*)
3. Department of Environment, Water and Catchment Protection
4. Department of Conservation and Land Management
5. Gascoyne Development Commission
6. Mid West Development Commission
7. Department of Fisheries
8. Department of Local Government and Regional Development
9. Department of Minerals and Energy
10. Department of Land Administration
11. And the Federal Government
12. Department of Agriculture
13. Fisheries and Forestry Australia
14. Environment Australia

6. The GMS Board

Ian Laurance	Chairman
Mark Lewis	Director and State Government Representative
Ken Baston	Chair, Carnarvon Artesian Basin Advisory Committee and Industry Representative
Ross Donald	Represents as Chair of the Rural Business Development Corporation
Kelly Gillen	Regional Manager – CALM, representing environmental interests
Tom Morrisey	Chair, Regional Environment Management Sub-committee and Industry Rep.

7. For further information:

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