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ENVIRONMENTAL IMPACTS ON FARM MANAGEMENT

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ABSTRACT

Major changes in farm management practice are likely to occur in Australia over the next decade. These are likely to be paralleled by significant changes in land use. This will be a consequence of increased community awareness and global concern at the adverse environmental impacts of many agricultural practices.

Major agricultural changes are likely to be;

- *a reduction or cessation of burning of native vegetation to maintain biodiversity and conservation values and reduce greenhouse gas emissions*
- *reduced stocking rates on pastoral properties in the arid rangelands to limit land degradation affecting sustainability and to maintain biodiversity*
- *retirement of significant areas of high conservation value and low profit lands from agriculture, and a shift to managing for biodiversity*
- *higher rates of stubble retention in cropping systems to improve sustainability and reduce greenhouse gas emissions*
- *reduced crop intensity and minimal cultivation to reduce soil loss in summer rainfall cropping systems to improve agricultural sustainability*
- *increased prices and reduced availability of irrigation water, leading to a shift to higher value crops and much improved water use efficiencies*
- *more complex property rights as indigenous peoples control more resources, resulting in a broader and richer range of environmental values to be considered.*

These changes will require new attitudes and skills from farm managers.

AUSTRALIAN AGRICULTURE

Background

Australian agriculture is relatively young in global terms, although Aboriginal people have been hunters and gatherers for 50,000 years and clearly knew a great deal about the land's resources and how to care for certain plants - mainly through the use of fire. With the arrival of Europeans just over 200 years ago, the rate of human-induced change accelerated dramatically. Early settlers believed the land had boundless potential but soon came to see the environment and the original inhabitants as hostile and alien.

As the newcomers colonised more and more land, clearing it and introducing European agricultural practices and exotic plants and animals, the prevailing view changed from early dismay to unrealistic expectations. The environment could be

tamed to create great wealth. Only recently did people begin to realise that Australia's environment has many limitations, and that its development has come at great cost (SoE 1996).

The landscape

Australia is the world's lowest continent, it is geologically stable with no active volcanos. It is the driest inhabited continent with more than one-third of its area receiving less than 250 mm of rain per year (classified as arid), and another third classified as semi-arid and receiving 250-500 mm per year. The climate, especially the rainfall, is highly variable and mainly associated with the El Nino-Southern Oscillation effect. It has few sizeable rivers and less runoff than any other inhabited continent, and large but diminishing groundwater resources. Its soils are generally nutrient-poor and unproductive: only 10% of the country has soils which can support agriculture or dense vegetation. Australia is a land of natural hazards such as drought, flood, fire, earthquake, and cyclone (SoE 1996).

Productivity

Australian agriculture is productive, export-oriented and profitable in aggregate. It is relatively unsubsidised and is widely exposed to global markets, which are characterised by fluctuating and generally declining terms of trade for agricultural commodities.

Strong productivity growth has been achieved in agriculture over the past two decades, so that extensive industries such as grains (5% pa), mixed crops and livestock (3% pa) and beef (2% pa), have remained internationally competitive, as have more intensive industries such as dairy, cotton, sugar and wine. In contrast the sheep industry, which operates over significant areas of improved pasture, arable and range lands, has achieved productivity gains of only 1% pa, and is facing strong competitive forces for adjustment.

Larger farms, regardless of industry, have achieved much higher rates of productivity growth (3% pa) than medium and small sized farms (1% pa), and produce the majority (about two thirds) of farm output (ABARE 1995).

Further, there are regional differences in productivity, with the states of West Australia in particular, and South Australia, outperforming other regions. This regional effect may be related to the increased use of private sector providers of agricultural information, and an increase in the use of grower groups in this region (Marsh and Pannell 1997).

Similarly larger farms are much more profitable than medium and small farms, and within these size groups the top quartile achieve significantly higher rates of return (ABARE 1996), as well as having greater involvement in land care activity.

Farm viability and good environmental management are inevitably linked (Robertson 1997).

Some characteristics of these highly productive and profitable farms which may explain their relative performance include: younger age of managers, improved economies of scale, higher levels of investment, many new technologies are better suited to larger scale farming, larger farms have more scope for input substitution, a bigger capital base may provide a competitive edge in financing new management and farming practices (ABARE 1995), and increased use of farm advisers and groups (GRDC 1997).

THE ENVIRONMENT

Increased environmental awareness

Recent studies show that Australians place considerable value on the environment, they expect that environmental issues will increase in importance in future, and that a majority of people believe that environmental values rank ahead of economic considerations (ASTEC 1996) and (SoE 1996). Thus all sectors of the economy, including agriculture will need to develop ways of better managing their environmental impacts. These impacts broadly cover four areas: environmental sustainability of production systems or the maintenance of productive capacity and resilience from perturbations, maintenance of biodiversity or the variety of all life forms, integrity of ecological systems or the health and resilience of natural life-support systems, and global and trade issues.

Environmental impacts of agriculture

The initial development, growth and current productivity of Australian agriculture has come at a cost. The 1996 Australian State of the Environment Report details the key threats to sustainability for land resources;

- land clearing has important implications for land degradation processes especially salinity, loss of biodiversity and increased greenhouse gas emissions. Most regions have clearing controls and active programs to maintain remnant vegetation and replant, however one state continues to allow the clearing of substantial areas for cropping, planting of sugar cane, grazing and urban development
- many agricultural areas are subject to slow cumulative threats such as soil acidification, salinity and structural decline
- rangeland grazing is very sensitive to management practices and significant areas are severely degraded. Only a small proportion is in formal reserves and some important conservation sites such as waterholes are threatened because they are the focus of domestic herbivore activity
- cropping lands in marginal areas with shallow soils and variable climate are a concern and severe degradation will increase if current practices continue.

The long term sustainability of cropping on sloping lands is threatened by soil erosion.

- forests are inadequately conserved, particularly in old growth native forests. Logging competes with other uses in native forests. Management methods are improving but monitoring is not yet adequate
- irrigation is the greatest use of water and a major pressure on inland waters. Over allocation of water for irrigation has starved rivers of environmental flows and led to nutrient and pesticide pollution, and waterlogging and salinisation on land.

The sustainability of agriculture as a whole remains unclear, while the environmental impacts listed are not easy to quantify in the absence of the systematic use of accounting for the environmental impacts of agriculture (SoE 1996). Agriculture and food production are likely to contract over time unless each of these issues is better managed.

MANAGING THE CHANGES

Strategies for change

Strategies for change will be needed to meet increased community awareness and global concern at the adverse environmental impacts of many agricultural practices. Many elements of such a strategy are already in place in Australia, although this is not yet demonstrated by large scale changes in land management and use.

Successful strategies for change will need to be based on a partnership between agriculture, the community and customers of food and fibre. The farm sector, conservation organisations, rural and urban communities, governments, processors and suppliers, farm managers, researchers, universities, schools and training colleges, and farm advisers all have a role. Specific needs include stronger political leadership to articulate environmental imperatives and a vision for an environmentally benign agricultural sector, an improved understanding and acceptance of the environmental impacts of agriculture, more effective land management legislation and enforcement in most states, improved marketing linkages between sustainable farm practices and customer desires, and focused R&D to search for sustainable systems and technologies.

Ultimately changes in land use will be expected and required, and the farm sector will suffer least in these changes if it negotiates from a position of strength as a key member of a broad community partnership aimed at producing healthy food, competitive export performance and ecological sustainability which maintains environmental resources and values for future generations.

The Landcare movement

There have been many private and public sector responses to the growing realisation of the paradox of agricultural development: significant increases in yield, area farmed and grazed, technological inputs, production and productivity have been matched by equally significant degradation and threats to the future sustainability of farming.

Australia's Landcare movement was established in the mid 1980s as one response to the worsening degradation of farmland, and has attracted international attention. Landcare is a partnership between the Commonwealth and state governments, the National Farmers Federation and the Australian Conservation Foundation. It is a national land management program with a key element of funding Landcare groups: people with an interest in land care, mostly farmers but including many urban and town people. More than 2000 groups and 25000 people are involved, and over 25% of all farmers are involved. The major challenge for Landcare is to convince all land users to adopt best management practices to ensure sustainable use of resources: this will entail widespread changes to standard methods of land management which will be difficult for a voluntary organisation to achieve.

The Landcare movement has generated great expectations for its success, and it could become a model for other 'care' programs that enlist stakeholder commitment to sustainable resource use (SoE 1996).

Technologies for sustainability

Sustainable farming technologies are available to ameliorate many of the environmental impacts of agriculture, and have been rapidly adopted in many industries and regions as evidence of their effectiveness becomes available, as well as their medium and longer term profitability. Rapid adoption appears to be strongly associated with industries and regions which have adopted productivity-enhancing technologies, such as the grain industry in south and west Australia, dairy and cotton. The reasons for slow or non adoption are complex and include: a lack of awareness, an emphasis on political rather than managerial solutions, inappropriate marketing and farm business support arrangements, and the lack of effective legislation in some states.

However even continuous innovation, with its novel combinations of management skills, new knowledge and new and old technologies is unlikely to achieve sustainability in all regions and situations. Therefore many current and emerging industry practices are unlikely to meet community and consumer expectations for agricultural sustainability and minimal ecological impact, and will be paralleled by slow but over time significant changes in land use.

Management changes

Major management changes for agriculture are likely to include;

- reducing or in some cases the cessation of burning of native vegetation for the clearing and management of land for agricultural and pastoral purposes: to maintain biodiversity and conservation values and to reduce greenhouse gas emissions
- reducing the stocking rates set by management authorities and by farm managers on pastoral properties in the arid rangelands to retain ground cover through dry periods and maintain plant and animal diversity: to limit land degradation affecting sustainability and to maintain biodiversity
- managing the retirement of significant areas of high conservation value lands returning low profits under agriculture: to manage land to achieve increased biodiversity, either by payment to current managers for specified conservation outcomes, or by changing management and/or ownership
- retaining higher rates of stubble and crop trash in cropping systems to improve surface cover and soil organic matter levels: to improve agricultural sustainability and reduce greenhouse gas emissions
- reducing crop intensity and minimal cultivation to reduce soil loss from erosion events in summer rainfall cropping systems: to reduce the likelihood of loss of cropping soils and to improve agricultural sustainability
- managing with steadily increasing prices of irrigation water as it reflects its true economic and environmental cost, and reduced availability of irrigation water as non-agricultural users compete successfully for supplies. The outcome is likely to be a shift to higher value crops and much improved water use efficiencies: leading to enhanced river condition and improved agricultural sustainability
- planning and managing in a complex and probably uncertain situation with regard to land tenure and property rights, as the reality that indigenous peoples through Native Title legislation control some aspects of land management over many regions of Australia: leading to a broader and richer range of environmental values recognised in the community than in the past.

These changes will require new attitudes and skills from all farm managers.

FARM MANAGEMENT IMPLICATIONS

Open attitudes and new skills

Australian agriculture over the next decade will need leaders and managers with open and accepting attitudes to the environment, who are able to recognise environmental values and non-farming land uses as valid and often complementary to agriculture, and able to negotiate and manage on that basis. High level skills will be required from managers and the work force in order that

farming remains sustainable and competitive, and utilises the best resources available. In particular, skills will need to be developed in assessment and management of the environmental impacts of agriculture (ASTECH 1996). Targeted investments in skill development by the agricultural sector of 3-5% pa will be required to compete with other sectors in the economy.

Managing environmental information

Much improved management information will be required by farm managers and their advisers to enable the effective integration of environmental considerations into agriculture. Some of this information will become available as output from a comprehensive system of environmental indicators being developed for Australia, however there will be a need for specific data tailored to suit the agricultural sector, and for each industry and land use. Managers will need strong skills in accessing, analysing and managing environmental information.

Close links to R&D providers

R&D priorities and investment will need to change to meet the ongoing knowledge needs of an agricultural sector growing in environmental consciousness, and to some degree will become the responsibility of individual farm managers. Current R&D investments by the farm sector are good, typically ranging from 0.3% to 1% of the gross value of production, and partly matched by the Commonwealth government to the extent that industry R&D supports public good objectives and ecological sustainability. However considerably higher rates of R&D investment are already commonplace outside agriculture (ASTECH 1996), and targeted industry and farm business investments of 2% to 3% pa will be required to maintain productivity and competitiveness across sectors and globally, as well as meet environmental goals. Those farm managers who value continuing access to new knowledge and technologies are already recognising the need for environmental as well as production information and are establishing close links with providers.

Changes in agricultural education

Education levels in Australian agriculture will need to increase to match the complexity of incorporating environmental and agricultural goals at sector and business level, and broaden to recognise the dual trends of concern for the environment and the underlying need for increased global food production. Agriculture may need to see itself as a field of natural resource management (Falvey 1996). Aspiring and retraining farm managers are already changing emphasis in their choice of education courses, matched by increases in the availability of natural resource based university and skill training courses.

SUMMARY

In summary, increasing community awareness of the adverse environmental impacts of agriculture, coupled with emerging consumer concerns locally and globally, are likely to lead to major changes in farm management practices in Australia. These changes will require: the development of political and agricultural sector strategies: new knowledge and new technologies: significant management changes on farm, changes in supporting legislation and in public sector resource management agencies: and the development of changed attitudes and increased levels of education, skills and information.

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