Ecologically sustainable grain production in Australia

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Abstract

The Australian grains industry covers 21 million hectares of crop in an average year with annual production in 2005-06 of 43 million tonnes. The majority (70%) of grain produced enters international markets. The industry faces both challenges and opportunities to compete globally and must achieve greater on-farm productivity at the same time as the broader community expects a higher level of environmental stewardship. To better demonstrate the industries environmental credentials and to identify where environmental issues need to be addressed the industry has developed an environmental plan. The plan is based on principles of ecologically sustainable development with an examination of risks and opportunities in dealing with key issues for the industry across the catchment's in which it operates. A key part of the plan has been the gathering of data from grain producers about the level of desirable practices currently used on-farm. Scientific knowledge of the environmental impacts from the farming practices of interest, allows these data to be useful in tracking changes in how grain producers in Australia are dealing with the dual needs of increased productivity and environmental management.

Partnerships with regional natural resource management bodies, which have a responsibility for achieving a range of resource target in Australia, have been a key element in the development of the plan. Key issues for the industry will be addressed through targeted research and development, communication and leadership development. The implications for crop science include the identification of traits, breeding of cultivars and development and communication of practices that allow for improved environmental outcomes.

Media summary

An environmental plan for the Australian grains industry will assist in continually improving and communicating the industry's environmental credentials and identify research and development needs to improve the sustainability of the industry.

Key Words

Grains, sustainability, farming practices, environment

Introduction

The Australian grains industry faces great challenges and opportunities to compete in the international market place. The industry must achieve greater on-farm productivity at the same time as the broader community expects a higher level of environmental stewardship. The industry's environmental plan complements the Grains Research and Development Corporation's 2007-12, Strategic Research & Development Plan, adding more detail regarding environmental priorities. The plan is consistent with the Grain Council of Australia's Environment Policy. The plan has been developed for industry by the GRDC and GCA, through broad consultation with industry and stakeholders.

The regional Natural Resource Management model has become well established through Australian Government funded initiatives such as the National Action Plan for Salinity and

Water Quality and the Natural Heritage Trust. Fifty-six natural resource management (NRM) regions have been established for the purposes of determining natural resource management and sustainable agriculture priorities across the nation. Twenty-seven of these regions are in grain-growing areas. These priorities are a valuable resource to inform the grain industry environmental plan for industry action.

The framework

An issue management approach has been taken to assist in prioritising GRDC investments to enhance the sustainable management of natural resources (Chudleigh 2007). The impact of an issue is balanced against the likelihood of that issue occurring. Obvious issues to the industry are greenhouse gas emissions, climate change, salinity, soil nutrient and chemical loss, air quality impacts from wind erosion and smoke and loss of biodiversity.

These issues do not occur uniformly across the whole geographic range of the industry. Different grain growing catchments are exposed to different issues. A matrix of risk by catchment assists to target future R&D and communication investments. A risk framework has been validated regionally against information contained in the plans of the NRM regions (Chudleigh 2007).

The key issues are best mapped against the agreed reporting framework of the Research and Development Corporation's Natural Resource Management Working Group (Figure 1). The scope of the issue, current scale (ha) and impact ($A), and the NRM catchment most at risk have been identified, along with the potential and likely scale of future impact. R&D and communication activities already carried out have been examined together with an assessment of good practice management options, community benefits of mitigation, opportunities for the grains sector, communication, RD&E needs, and potential partners. Many of the environmental issues are also significant productivity constraints to the industry eg. water availability and soil constraints (Beeston *et al*. 2005). These "win-wins" through multiple benefits are identified and highlighted.

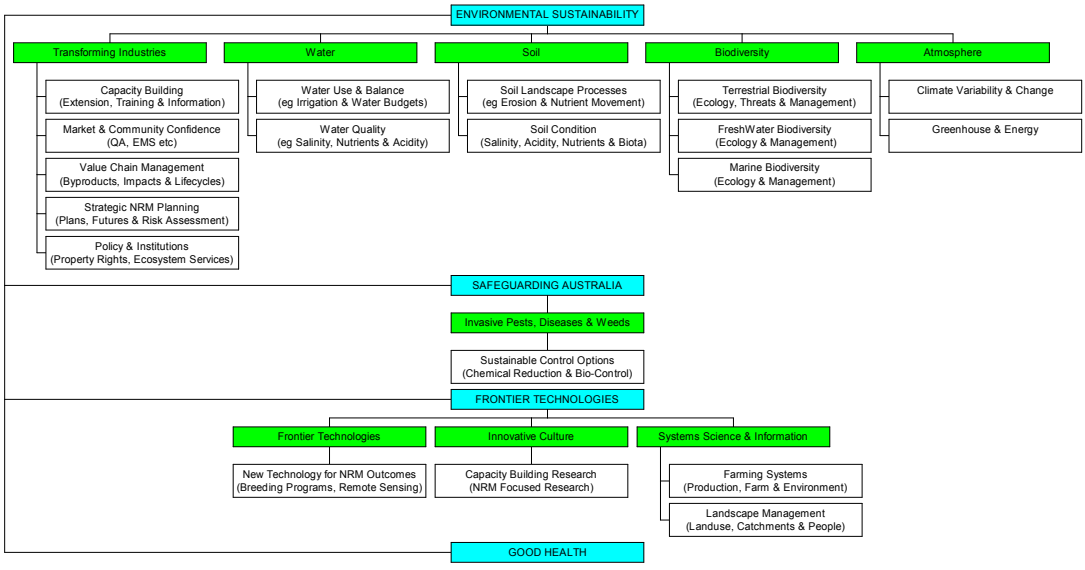

Figure 1. A framework for reporting industry contributions to environmental sustainability agreed by the Australian rural industries research and development corporations.

Provincial workshops

Information sheets on each of the key sustainability issues were taken to five workshops, one in each of the mainland states where grain is grown in Australia. Grain growers, NRM or catchment, state agency and CSIRO stakeholders were all present. It was clear that environmental issues often merge with, and certainly interact with, economic and social issues; from the farm scale to the global scale. It is important to assess issues in that context – interactions between issues and between scales – in order to fully appreciate the challenges and opportunities ahead (Table 1).

Table 1. Issues affecting the Australian Grains Industry.

	ENVIRONMENT	TRADE/ECONOMICS	SOCIAL
Global	▪ Climate change; Greenhouse, Climate variability, weather extremes ▪ Water availability ▪ Energy; oil availability and price, Biofuels ▪ Biosecurity	▪ Global food demand and supply; world stocks, reliable supply, ▪ Changing competitive positions of countries ▪ Crops for food, feed or fuel? Grain prices ▪ Market access; barriers, subsidies, Food-Miles, "buy local", labeling, GMOs ▪ Increasing cost of inputs; energy, fertilizers, chemicals ▪ Carbon trade / farming ▪ Climate futures/derivative trading	▪ Population growth, living standards, dietary changes ▪ Consumer demands; Secure supply and "quality", clean-green? ▪ Eco-accounting; Food-miles, Carbon Footprints ▪ Urbanization; loss of arable land ▪ Terrorism; threat of war
National / Industry	▪ Water; secure supply, quality & quantity, WUE, ▪ Drought ▪ Land degradation; erosion, salinity, acidity, biodiversity decline ▪ Biosecurity; pests, weeds and diseases ▪ Changing landuse (forestry) ▪ Adoptable, adaptive farming systems ▪ GMOs ▪ Greenhouse emissions; carbon sequestration, Life Cycle Assessment / accounting	▪ Terms of trade; international competitiveness, ▪ Market deregulation; market intelligence ▪ Changing mix; domestic consumption, export, import ▪ Marketing high cost, high quality crops ▪ Water trading ▪ Drought policy; preparedness, self reliance ▪ Infrastructure; costs ▪ Corporate farming; Feedlots	▪ Changing demographics; aging, urbanization, rural decline ▪ Mining; competing for labour, land and water resources ▪ Changing community values; consumer expectations, environmental regulations ▪ Right to Farm; Social licence to farm ▪ Making farming attractive to next generations; lifestyle, advocacy ▪ Education; training, knowledge management
State / Regional	▪ Resource Condition and Management Targets; ground cover, WUE ▪ Environmental flows, water quality, sediments ▪ Land degradation; biodiversity, dust, erosion ▪ Shifting production zones, changing farming systems, "marginal" cropping ▪ Biosecurity	▪ Production targets; export targets ▪ Infrastructure; transport ▪ Quality Assurance ▪ Commodity differentiation; niche market production ▪ Plant breeding; GMOs ▪ Grain storage	▪ Environmental regulations; air, vegetation, water ▪ Regional NRM bodies ▪ Stewardship; public benefit, ▪ Competition for land; forestry, urban growth ▪ Infrastructure; communication, education, health ▪ Declining influence of agriculture; leadership
Local / Farm	▪ Healthy soils; carbon, soil biota, nutrients, erosion, acidity, hydrophobic soils	▪ Profitability; terms of trade, ▪ Land costs – farm size, ROI ▪ Administration costs;	▪ Rural decline; fewer service providers, high costs ▪ Stress; uncertainty, apathy,

	▪ Managing drought; variability ▪ Managing pests and weeds; IPM, herbicide resistance, feral animals ▪ Balancing; environment / production, crop / stock ▪ Local environment; off-farm impacts, lag times	regulations, QA, EMS, levies, OHS, ▪ Different enterprise options; different skill sets and risks ▪ Marketing variable outputs ▪ New business models; leasing, investors, Boards, succession planning ▪ Climate futures/derivative trading	mental health, succession planning, ▪ Knowledge; access to brokers, skilled labour ▪ Personal development; investing in people, time poor, not taking holidays ▪ Leadership; attracting and retaining bright people

At the global scale, climate change may result in shifts in where grain production is optimal and be a factor in changing competitive advantage of different countries. The impacts of climate change will vary across the globe, favouring expansion of cereal production in some world regions and not in others. Attempts to reduce greenhouse emissions to combat climate change (and other energy availability considerations) introduces new options for producers – including future options such as bio-fuel (starch, oil or cellulose-based) in addition to staple food; which in turn may result in increased prices for grain. Fuel prices are also likely to rise, and contribute to increases in the cost of fertilizers and farm chemicals.

Climate change is anticipated to result in higher temperatures and evaporation in many grain growing regions of Australia and greater climate variability between years, as well as increased frequency of extreme weather events (e.g. storms). Management for drought will become more important, stimulating the evolution of farming systems. Future systems will also need to be compatible with policies affecting production such as carbon trading or emission accounting and reduction, payments for environmental stewardship, or the generation of wind or solar energy.

The ability to respond to such pressures and opportunities will require new skills (e.g. in marketing - finding willing buyers for high quality, high cost grain). Regions and the industry in total will need structures to assist, skilled people able to train and develop others, and respected leadership to harness enthusiastic people and align their efforts. These likely future changes highlight how environmental issues are interwoven with social and economic factors and how they need to be considered at a farm scale through to a global scale.

Farming Practices database

A key element of the plan is support of a grain industry Farming Practices Database. Grain farms operating in NRM catchments can have direct or indirect effects on environmental resources. It is of interest to the NRM bodies how the industry operates to address these issues. A natural partnership exists between grain producers and NRM bodies in wanting to assess progress and effects on catchment condition from the use of those practices impacting on resource condition. By identifying those farming practices that have positive or negative environmental impacts and measuring the adoption levels of these practices across the country, the industry can use these data as surrogates for estimating environmental effects. Where feasible and available, direct impact measurement of environmental effects will also be used to validate the effects from farming practice adoption.

The industry sees wide value in a system of gathering data, directly from farmers about the farming practices in use on grain farms across Australia. To this end a national farming practices database has been developed allowing farmers to electronically enter quantitative data about the farming practices in use on their farms. This database has many features:

- It allows rapid data gathering, by using farmers email systems,
- It contains baseline and benchmark data for comparative use,
- It can regionally ‘know’ about the best or desirable practices in use,

- It can partner with many groups or NRM Bodies to ensure relevance and reporting of indicators of value,
- It returns back to farmers an assessment of their individual environmental effects, and shows comparisons between one farm and its peers in a region, shire or catchment,
- It is able to operate at very low cost by using electronic and automated processes,
- It gives farmers productivity and environmental data and comparisons against others and against accepted benchmarks, and
- It can transform basic data about certain farming practices into environmental indicators for reporting.

The database is able to be accessed at www.farmingpractices.com.au where a PDF dataform is available, or where farm data can be directly entered.

The plan

The key environmental issues for the industry are aimed to be addressed through:

- Targeted R&D of knowledge gaps
- Communication of current best practice to grain growers and their advisers
- Communication and demonstration of the industries credentials to industry participants, the community and markets
- The development and support of industry leadership in the achievement of ecologically sustainable industry outcomes.

The implications for crop science include the identification of traits, breeding of cultivars and development and communication of practices that allow for improved environmental outcomes.

Delivery of the plan will be through the GRDC R, D & E investment with partners and through communication of the industries credentials through the industry peak and provincial bodies.

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