National Land & Water Resources Audit

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Signposts for Australian Agriculture - Preliminary framework and collation of industry profiles

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Signposts for Australian Agriculture - Preliminary framework and collation of industry profiles

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Executive Summary

The National Land & Water Resources Audit (the Audit) has been commissioned by the Australian Government (Department of Agriculture, Fisheries and Forestry) to explore means of reporting on the contributions made by Australia's primary industries to ecologically sustainable development. The project - entitled 'Signposts for Australian Agriculture – the role of agriculture in natural resource management, economic growth and community life' will report in December 2006.

The Audit has commissioned the Bureau of Rural Sciences (BRS) to work with selected research and development corporations (RDCs) to develop and pilot a reporting framework suitable for use by governments and agricultural sectoral agencies and industry producers in measuring and assessing the overall performance and direction of agricultural production in Australia. The RDCs include Australian Wool Innovation, Cotton Research and Development Corporation, Dairy Research and Development Corporation, Grains Research and Development Corporation, Horticulture Australia, Meat and Livestock Australia and Rural Industries Research and Development Corporation. The reporting framework will provide outcome statements and associated indicators for measuring the contribution of industry to ecologically sustainable development; which are practical, consistent and enjoy industry support.

It is intended to use the results of the pilot for consultation and refinement with a broader range of industries and the States. The final framework will underpin the Audit's Signposts for Australian Agriculture report. It builds on the work of the National Collaborative Project on Indicators of Sustainable Agriculture (SCARM 1998) and has some significant common interests with the National Food Industry Environmental Sustainability Initiative (Allen Consulting Group 2004). It will use indicators from the National NRM Monitoring and Evaluation Framework and State of Environment Reporting where appropriate.

Agriculture, in common with other resource-based industries, is coming under increasing pressure to demonstrate its environmental, social and economic performance to the broader community, governments and the market. A conceptual framework has been developed through consultation with the Audit, the RDCs and a Department of Agriculture, Fisheries and Forestry Reference Group. The framework is designed to answer the question 'How does an agricultural industry contribute to ecologically sustainable development?' Ecologically sustainable development (ESD) is defined in terms of increasing total quality of life measured by our total assets (human capital, produced capital, social capital, natural capital). The contributions of an industry to ESD include its contributions to human (social and economic) and bio-physical systems. Contributions can be positive or negative and include both short-term and long-term contributions.

Under the framework, contributions are further sub-divided through ongoing stakeholder consultation to create a flexible, but logically structured set of components. A desired outcome needs to be specified for each component before identifying an indicator to measure performance with respect to that outcome. The framework also incorporates an additional dimension to provide a conceptual link

between the achievement of ESD outcomes and intermediate outcomes such as changes in management practices and participation in major programs.

A series of meetings with the RDCs culminated in a workshop on 23 June 2004 in which preliminary industry profiles for six industries were presented: grains, wool, meat and livestock, cotton, horticulture and dairy. Profiles were subsequently modified in response to discussion and comments and have been populated to a limited extent with desired outcomes, indicators and some data. The profiles are designed for interactive use. The user can click on a component to obtain information on that particular component and move up and down the component tree to get the desired level of aggregation or disaggregation.

The Signposts for Australian Agriculture Project will progressively engage relevant industry based organisations and state agencies to advance the development of a consistent framework for monitoring and reporting on the contribution of Australian agriculture to ecologically sustainable development. The outputs of Project 1.1 provide the basis for this engagement. Readers are invited to respond to questions posed throughout the report.

In recognition of the importance of evaluating the contributions of agricultural industries to sustainable development, the Bureau of Rural Sciences has initiated a special 'keystone' project to demonstrate what can be achieved with existing data and modern techniques. The project will take a demonstration industry and work with that industry to refine the framework and populate it using some of the latest developments in areas such as land use mapping, water balance accounting and social analysis. Approaches developed for the demonstration industry will be available for application to other industries and will feed into the overall Signposts for Australian Agriculture Project. BRS is currently seeking volunteers for the demonstration industry.

Please send your replies to the questions and other comments by 28th October 2004 to

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Acknowledgements

We thank the members of the Department of Agriculture, Fisheries and Forestry Reference Group, representatives of Research and Development Corporations and colleagues in the Bureau of Rural Sciences for their support and willingness to contribute to this project.

1 Introduction

The National Land & Water Resources Audit (the Audit) has been commissioned by the Australian Government (Department of Agriculture, Fisheries and Forestry) to explore means of reporting on the contributions made by Australia's primary industries to ecologically sustainable development. The project - entitled 'Signposts for Australian Agriculture – the role of agriculture in natural resource management, economic growth and community life' will report in December 2006.

The Audit has commissioned the Bureau of Rural Sciences (BRS) to work with selected research and development corporations (RDCs) to develop and pilot a reporting framework suitable for use by governments and agricultural sectoral agencies and industry producers in measuring and assessing the overall performance and direction of agricultural production in Australia. The reporting framework will provide outcome statements and associated indicators for measuring the contribution of industry to ecologically sustainable development; which are practical, consistent and enjoy industry support.

It is intended to use the results of the pilot for consultation and refinement with a broader range of industries and the States. The final framework will underpin the Audit's 'Signposts for Australian Agriculture' report.

The Signposts for Australian Agriculture project aims to contribute towards:

- reporting on the broad contribution of agriculture to Australia's economic, social and environmental conditions,
- industry benchmarking on the adoption of agreed and sustainable management practices
- the evaluation of major whole of government policy/program initiatives from a sectoral perspective
- ways of better informing the community of the role and contribution of agriculture, and
- providing signposts indicating threats and opportunities for ongoing sustainable resource use and development.

As a result, the outcomes of the Signposts project will help shape future policy development and priorities for investment in natural resource management, whether through government-funded programs or industry research and development.

The Signposts project has been planned to allow for a three-phase delivery approach, with each subsequent stage to be refined on the basis of the learnings identified in the preceding elements. This report provides the outcomes of an initial scoping phase designed to lead to more detailed work on developing a trial framework in partnership with selected sectors of Australia's agricultural industries. The second phase of the project is intended to develop and trial a robust framework to monitor, assess and evaluate the delivery and impacts of sustainable agricultural policies and practices. Phase two is to be completed in the 2004/05 financial year, and will involve a broad based stakeholder steering group and up to six partnerships with different industry sectors, developing, trialing and documenting the application of the proposed pilot

framework. Based on the outcomes of phase two, the third phase, to be conducted in 2005/2006, aims to provide a CD/web based Signposts report that details the current status of agricultural land and the impact of the selected industries on it and the related broader ecosystems. It will be based on data collected from the six industries trialed in phase two and provide a summary hard copy report that overviews the work and learnings made in phase two of the Signposts project. It will also provide recommendations on sustainable resource use threats, and the future opportunities for development and reporting mechanisms.

It is intended that the framework will be pivotal in leading to the development of a range of performance and status indicators for environmental and agricultural performance that are relevant to each of our agricultural sectors and usable at the national and regional natural resource management levels. The framework will provide a lead to the work being undertaken by government agencies and regional catchment management authorities in developing national and regional monitoring and evaluation reports on Australia's agriculture practices and their real or potential impacts. It should inform the future directions for the ongoing collection of monitoring and evaluation data at a national level by agencies such as the Australian Bureau of Statistics, the Australian Bureau of Agricultural and Resource Economics, the Bureau of Transport and Regional Economics and BRS, and at the regional level by relevant State and Territory natural resource management agencies. For the RDCs, the Signposts framework may offer a way to explore how whole-of-government initiatives could enhance the collection, analysis and presentation of relevant information on their industries in a consistent and robust way.

The Signposts for Australian Agriculture project is intended to build on, complement and integrate the outcomes of other initiatives – the Audit is leading efforts to collate information to assess and report on the condition, trend, use and management of Australia's natural resources. The project builds on the work of the National Collaborative Project on Indicators of Sustainable Agriculture (SCARM 1998) and the Audit's Australian Agricultural Assessment 2001 (NLWRA 2001). It also has some significant common interests with the National Food Industry Environmental Sustainability Initiative (Allen Consulting Group 2004). The Signposts project will use indicators from the National NRM Monitoring and Evaluation Framework and State of Environment Reporting where appropriate.

The BRS has been contracted by the Audit to carry out 'Project 1.1: Preliminary framework and collation of industry profiles.' The objectives of Project 1.1 are to:

1. Pilot the development of a preliminary framework and associated outcome statements and indicators for measuring the contribution of industry to ecologically sustainable development which are practical, consistent and enjoy industry support and directly contribute towards:

    - a report on social, economic and bio-physical aspects of selected agricultural land users, using existing information held by the Australian government;

    - the identification of relevant attributes to be included in a framework for primary industry triple bottom line reporting;

- consultation with selected Research and Development Corporations (RDCs) to obtain input into the development of a consistent framework for monitoring and reporting on their respective industries' contribution to ecologically sustainable development.

2. Draft a report on the outcomes of the consultation process on the preliminary framework and associated outcomes statements and indicators.

3. Deliver a final report which incorporates comments on the Draft Report from the Audit Advisory Council (representing the Australian Government, States and jurisdictions) a broader range of RDCs, and Stakeholders.

This report fulfils Objectives 1 and 2. The conceptual framework developed through consultation with the Audit and a Department of Agriculture, Fisheries and Forestry Reference Group is presented in Chapter 2. Chapter 3 documents the process of engagement and consultation with selected RDCs and Chapter 4 discusses the assembly of profiles for six agricultural industries. The actual profiles are provided as Appendices. Chapter 5 explores the relationships between the framework and other initiatives. Chapter 6 contains conclusions and recommendations.

Readers are invited to respond to questions posed throughout the report.

Under the next stage of the Signposts for Australian Agriculture Project, the Audit will progressively engage relevant industry based organisations and state agencies to advance the development of a consistent framework for monitoring and reporting on the contribution of Australian agriculture to ecologically sustainable development.

2 Conceptual framework

The BRS Evaluation Procedure (Chesson 2004) provides a step-by-step approach to designing a reporting and evaluation framework:

1. Identify the question, subject and scope
2. Determine the components
3. Specify the desired outcome for each component
4. Develop the measurement process
5. Link the measured values to decision-making and management actions.

These steps were followed to develop a preliminary framework for Signposts for Australian Agriculture.

2.1 Question, subject and scope

Over the past two decades, there has been increasing concern about the condition of Australia's natural resources and the environmental and economic viability of its farming and land management systems. As managers of over 60 percent of Australia's land and 70 percent of its diverted water resources, farmers and graziers have a profound influence on the condition of the nation's natural resource base, the creation of national wealth and the welfare of rural and regional communities. Because farming practices may contribute to some forms of natural resource degradation as well as help solve some environmental problems, both on and off the farm, they are an obvious focus for industry management and policy attention.

Agriculture, in common with other resource-based industries, is coming under increasing pressure to demonstrate its environmental performance to the broader community, governments and the market. The Audit, in its Australian Agricultural Assessment 2001, concluded that Australia could enhance its capacity to deliver both productivity outcomes on-farm and environmental benefits off-farm (NLWRA, 2001). It identified a need for leadership in monitoring and reporting from industries and their research and development corporations, including developing industry databases to monitor and report on environmental and economic performance and continued definition and improvement of best practice and tracking of implementation, including through research and extension.

In short, agriculture has a challenge to:

1. monitor and report on its use of natural resources and its farm management practices; and
2. communicate the progress agriculture is making to improve environmental, economic and social performance to governments and the wider community.

To do this, questions need to be asked of each of the participating sectors that comprise our agricultural industries, clarifying the full suite of impacts and returns they generate in going about their business. The effective collection of this information will be critical in guiding the continuous improvement needed to minimise adverse impacts while improving relative performance in the national and global marketplaces and providing social and economic benefits. In this respect, the overarching question to be addressed is:

> How does an agricultural industry contribute to ecologically sustainable development (ESD)?

where ESD is defined as:

> *Using conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased* (National Strategy for Ecologically Sustainable Development, Commonwealth of Australia 1992).

This question has been selected because it is arguably the most inclusive question that can be asked of an industry. It encompasses all the costs and benefits generated by an industry and can be used to determine whether contributions are increasing or decreasing over time. It is the basis for predicting future contributions. It directly addresses a policy that has been adopted by all Australian governments. A framework to answer the question 'How does an agricultural industry contribute to ESD?' will provide a basis for addressing many issues of relevance to agricultural industries. Appendix A provides examples together with what would be required in terms of data collection, modelling etc.

Question 1: Does the question 'How does an agricultural industry contribute to ESD?' need to be answered? If not, what question does need to be answered?

The subject is a particular agricultural industry where the industry is defined in terms of a group of people carrying out a particular activity. The precise definition of an industry will vary from industry to industry and there will invariably be ambiguities when individuals are engaged in more than one industry simultaneously. Individual

industries, rather than agriculture as a whole, have been selected so that the framework can be used to identify appropriate networks for program delivery consistent with portfolio focus. This enables appropriate incentives to be designed for different farming systems and improves understanding of responsibilities for outcomes and how industry is responding to management challenges.

The Reference Group decided that the definition of an agricultural industry would be restricted to activities carried out within the farm gate. For example, for the purposes of this project the 'grains industry' refers to the growing of grain and excludes activities further along the supply chain such as milling, biscuit making and retailing. Industry definitions and groupings correspond to existing institutional arrangements and categories commonly used for data collection and reporting. This decision was made for practical purposes and is particularly appropriate for handling natural resource management issues. In order to report on a particular product, rather than an industry, the contributions to ESD of the entire supply chain will need to be evaluated. The National Food Industry Strategy is planning to do this, but only for environmental contributions (Allen Consulting Group 2004).

Question 2: Is it appropriate to restrict the definition of an agricultural industry to activities carried out within the farm gate? If not, what would be a better definition?

Restricting the subject of the evaluation to activities within the farm gate does not restrict the scope of those contributions. We propose to measure an agricultural industry's contributions to ESD in terms of its social, economic and environmental contributions in both the short and long term. Many of these contributions will be to systems far beyond the farm gate. We will be attempting to assess the return from agricultural land uses now and in the future taking into account the full range of environmental, economic and social costs and benefits. The Reference Group decided that contributions should be restricted to those received within Australia although it was acknowledged that some agricultural industries could make significant contributions to ESD beyond Australia's borders.

Question 3: Should contributions be restricted to those received within Australia? If not, what contributions beyond Australia's borders ought to be included?

2.2 Components

The question 'How does an agricultural industry contribute to ESD?' has been disaggregated into manageable components. We have done this by identifying the systems that are affected by the industry. Figure 1 represents human systems (the social and economic constructs of our species) embedded within bio-physical systems (the 'natural' world). Total quality of life can be expressed in terms of the total value we ascribe to these systems – the sum of various capitals such as produced capital, human capital, social capital and natural capital. Development can be defined as an overall increase in our capital assets. *Sustainable* development is characterised by increasing capital assets over time. *Unsustainable* development is characterised by a short-term increase in our capital assets followed by a longer-term decrease leaving us worse off than before.

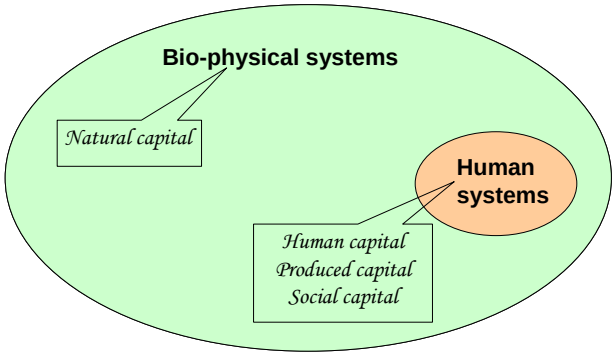


Figure 1. Human systems embedded in the natural world of bio-physical systems. Sustainable development is characterised by increasing capital assets over time.

We have taken the view that sustainable development and ecologically sustainable development are equivalent terms although it could be argued that the definition of ESD places additional requirements on natural capital. The way in which we are proposing to disaggregate an industry's contributions to ESD is applicable whichever view is adopted.

The contributions of an agricultural industry to ESD are depicted in Figure 2. The contributions consist of:

1. the contributions (positive and negative) of the industry to human systems
2. the natural capital residing in the land managed by the industry
3. the contributions (positive and negative) of the industry to natural capital residing in other bio-physical systems.

The component tree in Figure 3 provides the same information in a form that facilitates further subdivision.

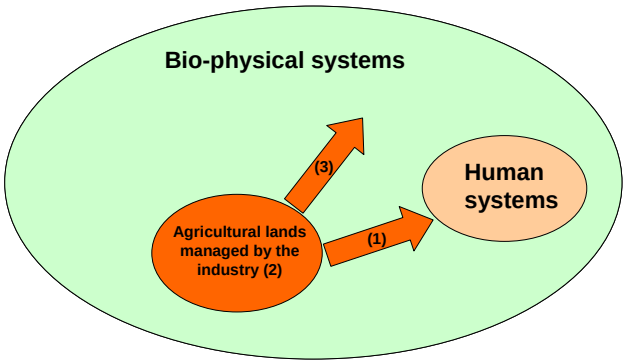


Figure 2. The contributions of an agricultural industry to sustainable development consist of (1) its contributions (positive and negative) to human systems, (2) the natural capital residing in the land managed by the industry and (3) its contributions (positive and negative) to natural capital residing in other bio-physical systems.

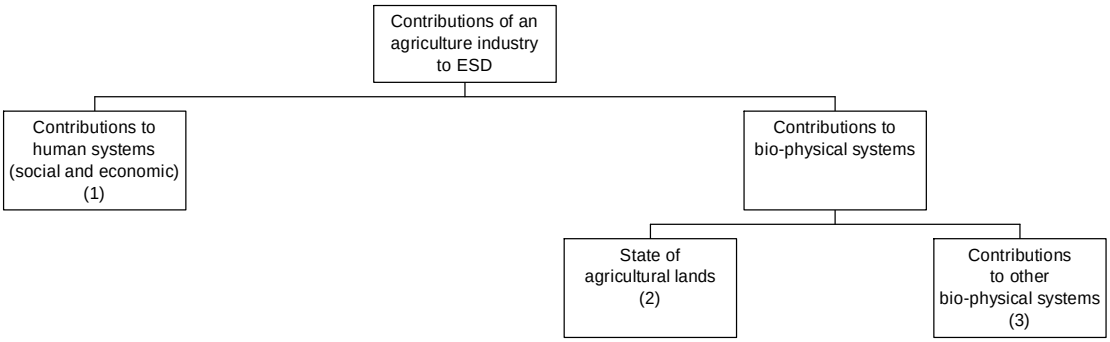


Figure 3. Contributions of an agricultural industry to sustainable development are displayed in a component tree to facilitate further subdivision.

Contributions to human systems

It was decided to further subdivide contributions to human systems according to the primary recipients of those contributions (Figure 4). Contributions relevant to Australians as a whole are listed under 'national community.' Contributions received primarily by specific local or regional communities are listed under 'local or regional communities.' Contributions received primarily by individuals engaged directly in the industry (producers, their employees and their families) are listed under 'industry participants.' The main advantage of subdividing contributions in this way is that it facilitates stakeholder discussions and invites comment according to each stakeholder's perspective. Different stakeholders can identify with one or more of the classes of recipients. All stakeholders belong to the 'national community', some also belong to one or more 'local and regional communities' and some - the industry participants - belong to all three.

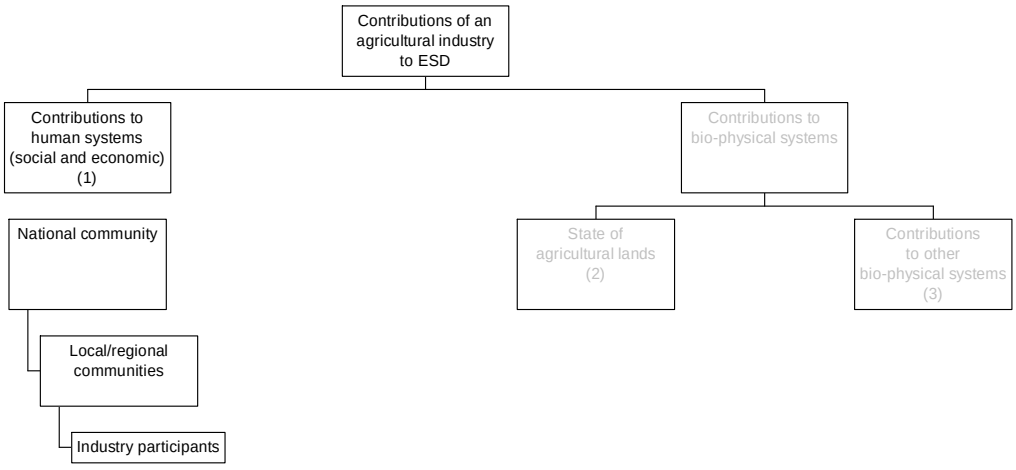


Figure 4. Contributions to human systems are subdivided according to the primary recipient.

Contributions to bio-physical systems

Contributions of an industry to bio-physical systems are subdivided into the state of agricultural lands and the contributions of the industry to other bio-physical systems. These other systems include the water cycle and the atmosphere. 'Agricultural lands' is intended to include all the land managed by people as a result of them being engaged in the industry, not just the land actually grazed or cropped at any particular time. It includes areas set aside for wildlife conservation or other purposes. It excludes land that would be more sensibly ascribed to another industry. For example, a large softwood plantation is more sensibly attributed to a forest industry than to the meat and livestock industry even if both activities occur on a single property. The conceptual goal within the Signposts framework is to have all land attributed to one and only one industry so that combining across all industries gives a complete picture of the state of agricultural land in Australia. The degree to which this is achievable will vary with different farming systems and may lead to new definitions of 'industries.'

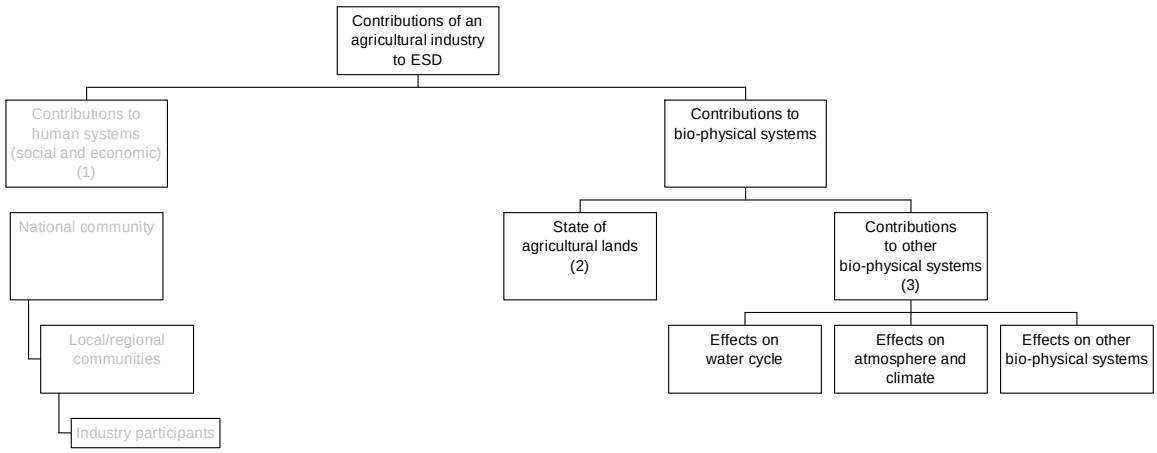


Figure 5. Contributions to bio-physical systems are subdivided into the state of agricultural lands managed by the industry and the contributions of the industry to other systems.

Regarding an agricultural industry as accountable for the state of land that it manages is an important feature of the proposed framework. As well as providing a conceptual basis for linking performance across all land managers (agricultural and other) to create a picture of the entire Australian continent, it also provides a means of incorporating the concept of ecosystem services (Box 1).

The component trees have been further subdivided to create the generic component trees described more fully in Chapter 4. A condensed version is shown in Figure 6 and an expanded set in Appendix B. The structure and content of the component trees reflect discussions at and after the workshop held in June 2004 (see Chapter 3) and are expected to continue to evolve with ongoing stakeholder input. The goal is to continue to subdivide until the components at the lowest levels of the tree can be assigned objectives that are amenable to measurement (Step 3). We expect the generic component trees to be tailored to meet the specific needs of each industry by deletion of some components and further sub-division of others. There is great flexibility in

how components are structured provided they qualify as non-overlapping contributions of the agricultural industry.

Question 4: Is the proposed conceptual framework based on contributions to human and bio-physical systems (human/social/produced capital and natural capital) appropriate? If not, what would be more appropriate?

Box 1. Ecosystem Services

Ecosystem services can be defined as the benefits people obtain from ecosystems. An ecosystem is a dynamic complex of plant, animal and micro-organism communities and the non-living environment functioning as a functional unit. Ecosystem services include products such as food, fuel and fibre; regulating services such as climate regulation and disease control; and non-material benefits such as spiritual or aesthetic benefits (UNEP 2004).

The state of a particular area of land can be measured in terms of its capacity to provide ecosystem services. Different ecosystems differ in the suite of services they provide. Ecosystems on agricultural land have been deliberately modified to enhance their capacity to provide products desired by society. In the Signposts for Australian Agriculture framework, the 'state of agricultural land' is subdivided into 'capacity to produce food and fibre' and 'capacity to provide other ecosystem services.' Three 'other' ecosystem services are specifically identified: biodiversity conservation, carbon sequestration and cultural services (non-material benefits). Others are likely to be added as our understanding of ecosystem services increases.

Water- related ecosystem services are currently included within the 'effects on the water cycle' rather than under 'state of agricultural land.' This is in acknowledgement of the large and complex interactions between agriculture and water. Some agricultural industries are major modifiers of the water cycle extracting water from systems beyond the boundaries of their agricultural land and redistributing it in time and space as well as influencing the quality and quantity of water that flows from their land. This decision on the location of water-related ecosystem services within the overall component tree structure can be revisited at any time.

By regarding an agricultural industry as accountable for the a specific area of land, the ecosystems within it and hence the ecosystem services they provide, the Signposts framework provides a direct link between the evaluation of an industry's contribution to ESD and the assessment of ecosystem health by initiatives such as the United Nations Millennium Ecosystem Assessment (UNEP 2004). In theory, combining results for the 'state of agriculture lands' component across all agricultural industries should provide the assessment sought by the Millennium Ecosystem Assessment or State of Environment reporting.

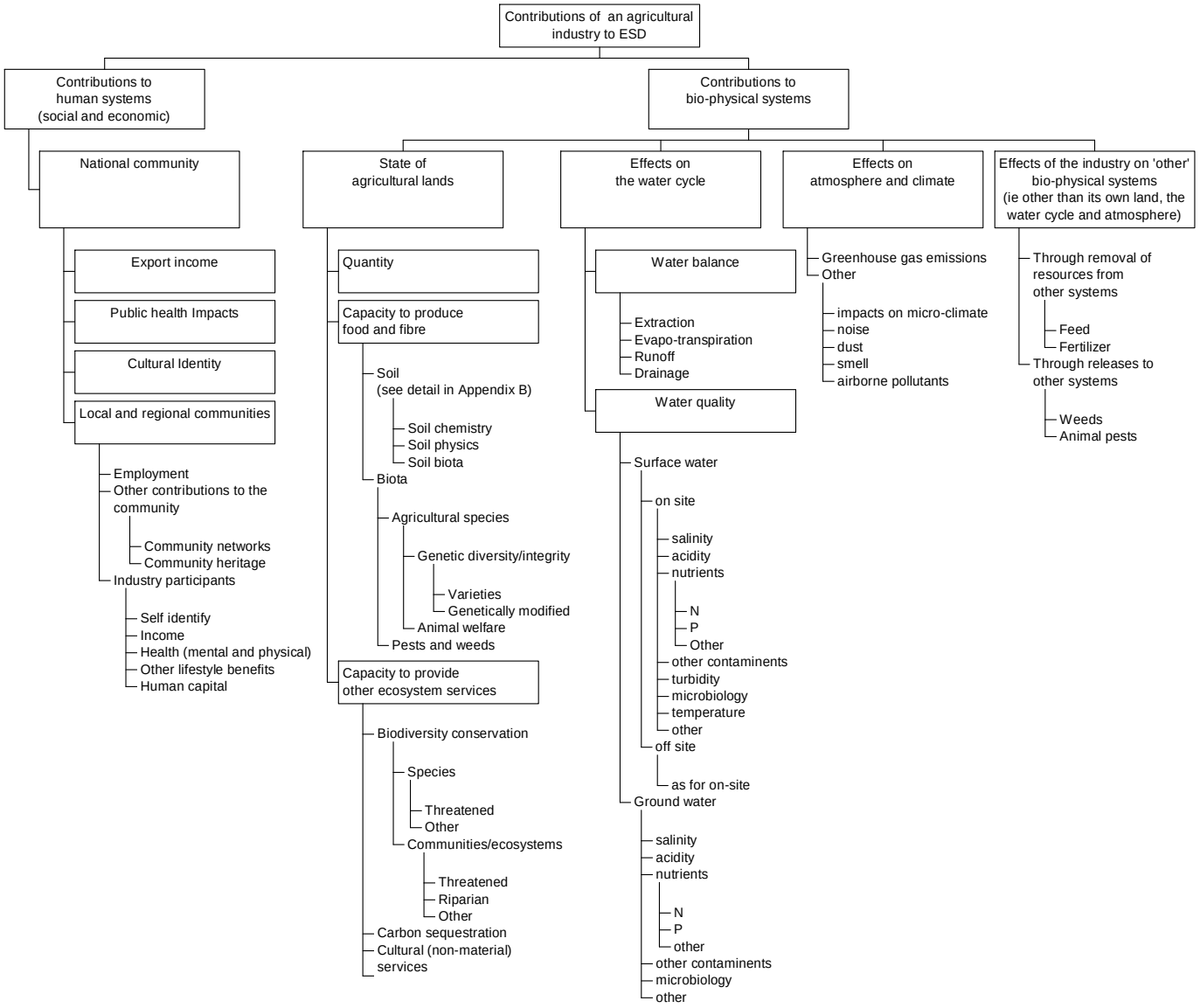


Figure 6. A condensed version of the full component tree. Individual branches are shown in expanded form in Appendix B.

2.3 Desired outcomes

Once components have been identified to the satisfaction of all stakeholders the next step is to specify the desired outcome for each component. This may be in the form of an objective, criterion or an attribute of success. For each of the lowest level components in the component tree the desired outcome should qualify as an operational objective, that is an objective that has a practical interpretation that can be measured and against which performance can be evaluated. Objectives at the lowest level should link directly to higher-level objectives thereby creating a logically consistent framework for addressing the overall question. For example, an operational objective to maintain the concentration of soil phosphorus within a certain range is linked to the higher-level objective to maintain soil condition which in turn is linked to the objective to maintain the productive capacity of the land (an ecosystem service). If the concentration of soil phosphorus falls outside the specified range, natural capital is reduced (assuming all other components are unchanged) and there is a negative contribution to ESD.

Specification of desired outcomes should involve the full complement of stakeholders so that a consensus can be reached or at least the differences in views can be understood. This step should be informed by, but not relegated to technical experts. For the purpose of demonstrating the process, the industry profiles discussed in Chapter 4 suggest desired outcomes for some components. Where possible the suggestions are based on desired outcomes explicit or implicit in existing government and industry policy. Reaching agreement on desired outcomes will be a major role for ongoing stakeholder consultation. A framework built for government decision-making may express some desired outcomes differently from a framework built for regional or local decision making.

2.4 Measurement process

Once the components of a framework have been identified and desired outcomes specified in the form of operational objectives, the next step is to determine how to measure performance. An indicator is quantity that can be measured directly and used to track changes over time with respect to an operational objective. Instructions are needed for interpreting the indicator. Is a high value good or bad, should it be increasing or decreasing, should it remain within certain limits? The instructions can be formalised by a 'performance measure' – a function that converts the value of an indicator to a quantitative measure of performance with respect to the operational objective. The operational objective, indicator and performance measure together define the measurement process for a particular component.

In Chapter 4 we have suggested some indicators and their interpretation (performance measure) using wherever possible information that is already available or could be derived from existing data collection activities.

Performance measures can be formulated to give a standardised result (eg, a score between 0 and 1). This allows a framework to cater for local variations in the choice of indicators and to aggregate results from lower levels to report a result at a higher level in the framework. Methods of aggregation and examples of how the results can be displayed are discussed in Chesson and Clayton (1998), Whitworth et al (2000), and Garcia et al. (1999). Very flexible methods of aggregation using expert systems are now available and have been applied successfully in the Sustainable Rivers Audit

(MDBC 2004). The choice of a hierarchical structure for components is deliberate as it facilitates the application of a wide range of aggregation methods. Different aggregation methods can be applied to different branches of a component tree within a single framework.

2.5 Links to decision making and action

The 'Signposts for Australian Agriculture' framework is intended to inform rural policy development and implementation. To do this it needs to be embedded within an adaptive management cycle as shown in Figure 7. Ongoing monitoring provides a value for each indicator. Within the framework these are converted to performance measures which are the basis for reporting and decision-making. The same framework forms the basis for evaluating proposed (future) policy or management actions as shown in Figure 8. In the latter case, the indicator values are generated by various predictive tools (modelling, risk assessment, expert opinion) rather than by monitoring actual outcomes.

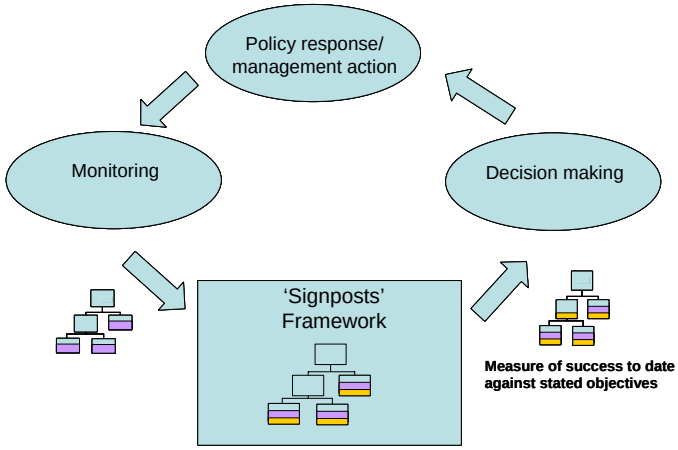


Figure 7. The role of the Signposts for Australian Agriculture framework within an adaptive management cycle.

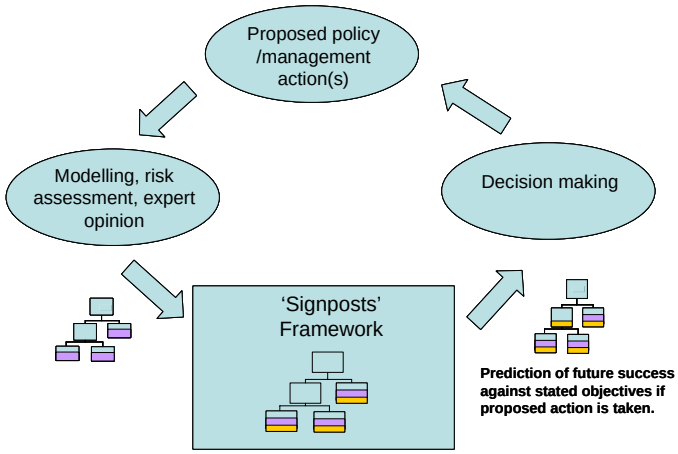


Figure 8. The role of the Signposts for Australian Agriculture framework in evaluating proposed policy or management actions.

The links between an industry's contributions to ESD and actions, whether policy decisions of government, investments by RDCs or management practices adopted by industry, are much more complex than suggested in Figures 7 and 8. The 'Signposts for Australian Agriculture' framework will incorporate an additional dimension as illustrated in Figure 9. The darker components in the horizontal dimension represent the contributions of the industry to ESD outcomes as described in Section 2.2. The lighter components in the vertical dimension represent short-term or intermediate outcomes that form a pathway to those contributions as expressed by program logic (Owen 1993, Funnell 1997).

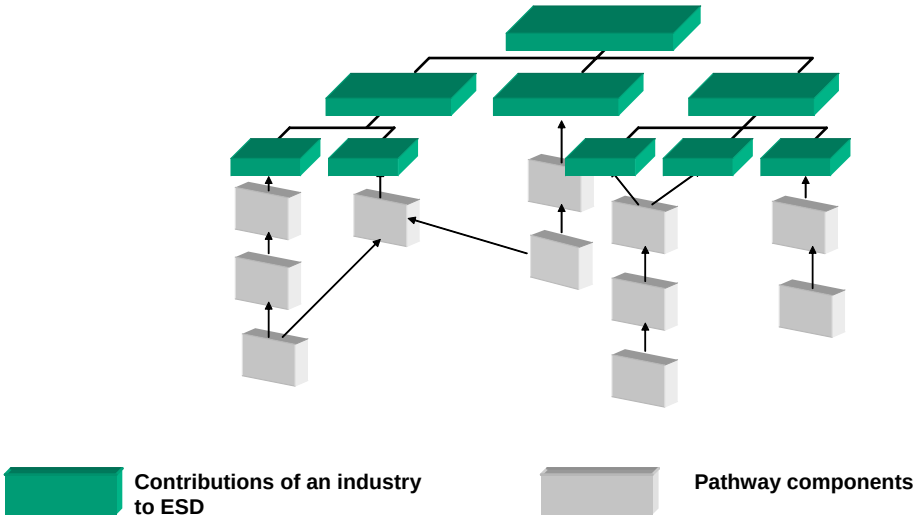


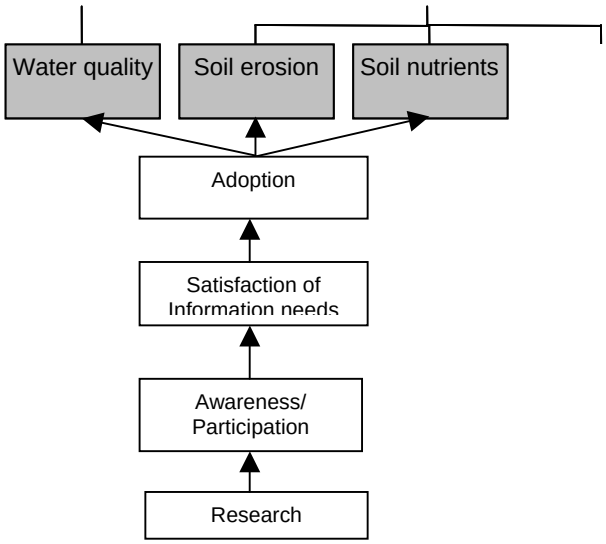
Figure 9. Relationship between the contributions of an industry to ESD and pathways intended to achieve those contributions.

Each of the pathway components can be assigned a desired outcome, indicator and performance measure to evaluate progress along the pathway. A pathway component can relate to more than one contribution. For example, a pathway might start with an action to increase industry awareness leading to adoption of a recommended tillage practice that is intended to have beneficial effects on soil condition, water quality and farm income. We anticipate that the structure of most pathway components will be quite specific to each industry and will vary over time as particular programs or policies are initiated, implemented and concluded. Where the ultimate contribution (eg change in depth of water table) is unlikely to be measurable within the time frame of decision making, it may be necessary to judge performance and hence make decisions on the basis of progress with respect to a pathway component rather than direct measurement of the long term outcome.

Pathway components have not been considered in detail within this scoping study, but are expected to be an important part of the framework. An idealised example of the interaction between pathway and outcome information in an adaptive management cycle is provided in Box 2.

Box 2. Idealised example of the interaction between pathway and outcome information in an adaptive management cycle.

Suppose an evaluation framework includes components for water quality, soil erosion and soil nutrients. Ongoing monitoring provides a performance measure for each of them. During the first adaptive management cycle, performance with respect to soil erosion is very poor whereas performance with respect to the other two components is acceptable. This result prompts a decision to invest in research into methods of reducing soil erosion. A program logic pathway is created and an operational objective, indicator and performance measure specified for each component in the pathway.



The research identifies reduced tillage and stubble retention as an effective management practice for reducing soil erosion. The research also checks for potential impacts on other outcome components and concludes that the practice is likely to also have a beneficial impact on water quality but may reduce soil nutrients. A decision is taken at the end of cycle 2 to improve producer awareness through various extension activities. At the end of cycle 3, awareness and participation in training activities is high, but producers indicate that they do not have the information they need to take action. Further research is undertaken to characterise the costs and benefits of the management practice and assist producers to tailor its application to their particular circumstances. Adoption rates increase and an improvement in water quality is observed in areas where the practice has been applied. There is good reason to believe that improvements in soil erosion will follow and these are detected in subsequent monitoring cycles.

	Pathway				**Outcomes**			**Response**
Cycle	**Research**	**Awareness**	**Satisfaction of inform'n needs**	**Adoption**	**Soil erosion**	**Water quality**	**Soil nutrients**	
1	Not measured	Not measured	Not measured	Not measured	Poor	OK	OK	Fund research
2	Management practice identified.	Low	Not measured	Very low	Poor	OK	OK	Invest in extension
3		High	Low	Low	Poor	OK	Slightly reduced where practice has been adopted	Invest in research to characterise costs and benefits under different situations
4	Management practice improved. Full set of costs and benefits articulated.	High	Moderate	Moderate	Poor	Improved	OK	Continue monitoring pathway and outcomes
5		High	High	High	Improved	Improved	OK	Continue monitoring outcomes

In summary, we are proposing a framework consisting of the contributions that an agricultural industry makes to ESD and pathways intended to achieve or modify those contributions. Each component (whether a contribution to ESD or part of a pathway towards one or more contributions) houses a desired outcome, an indicator and instructions on how to interpret that indicator (performance measure). The structure is designed so that details can be modified without destroying the overall integrity of the framework. The process used to develop the framework to date is documented in the next chapter and the application to specific industries is demonstrated in Chapter 4.

Question 5: Is the approach that combines a high degree of rigour (eg distinguishing contributions from the pathways intended to generate those contributions, insisting on articulating desired outcomes before identifying indicators) with a high degree of flexibility (eg ability to tailor components to suit industry needs and modify over time) appropriate and workable? If not, what would be better?

3 Consultation Process

A DAFF Reference Group provided initial direction for the project. The Reference Group made decisions on scope as described in Chapter 2 and commented on early versions of the component trees. The Reference Group also identified the six industries to be used as case studies: grains, wool, meat and livestock, cotton, horticulture and dairy.

BRS contacted each of the RDCs responsible for the case study industries and held a meeting (teleconference or in person) to discuss the project and their involvement. A workshop was held on 23 June 2004 to present progress on the project to date and invite comment. The agenda and list of attendees are provided in Appendix C. After the workshop, component trees for each industry were e-mailed to all attendees with an invitation to provide further comments over the next two weeks.

Comments from workshop participants are listed in Appendix D. These comments include those made at the workshop and afterwards.

Overall, workshop participants were broadly supportive of the approach. They saw benefit in a common reporting framework across agricultural industries that provided quick access to relevant data and facilitated balanced decisions regarding resource access and use. There was interest in Triple Bottom Line reporting and the potential link with reporting on the adoption of Best Management Practices. The framework could enable an industry to demonstrate that it is responding to public perceptions of its management of the environment and correct those perceptions where appropriate. Consistency in reporting across industries with respect to major programs such as the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust was also seen as a benefit.

The workshop participants expressed understandable concerns about the monitoring and reporting burdens this might place on them and the limited resources they had at their disposal. Some were worried about the possibility of huge numbers of indicators and emphasised the need for aggregation and integration in order to convey

meaningful results. There was some scepticism regarding the ability of the framework to simultaneously address the needs of multiple stakeholders, but also recognition of common needs even if they were at different scales.

The content of this report in general and the structure of specific component trees in particular reflect the input and suggestions of the DAFF Reference Group, RDC workshop participants, NLWRA project staff and BRS colleagues. The purpose of the case studies described in the next chapter is to provide a more tangible demonstration of the sorts of outputs that could be generated by the Signposts for Australian Agriculture project. They will provide a basis for further consultation and discussion with a broader range of stakeholders.

4 Case studies of selected industries

Chapter 2 provides the proposed conceptual framework. In this chapter we make a preliminary application of the framework to six different industries to provide a more tangible example of what the framework might look like in practice. The objective of this exercise is not to provide a finished product, but to promote further discussion. We have embarked along the five steps of the BRS Evaluation Procedure:

1. Identify the question, subject and scope
2. Determine the components
3. Specify the desired outcome for each component
4. Develop the measurement process
5. Link the measured values to decision-making and management actions.

Steps 1 and 2 are largely completed although many details still need to be agreed and major changes are possible. A start has been made on Step 3 and some suggestions have been made for Step 4 for some components.

For each of the six cases studies the subject is ‘the industry.’ The six industries are: grains, wool, meat and livestock, cotton, horticulture and dairy. An industry is a group of people engaged in a set of activities. The activities are restricted to those carried out within the farm gate. In some cases the identity of the industry is clear, in other cases who and what is included or excluded will need to be specified.

The question is ‘How does the industry contribute to ecologically sustainable development?’ As discussed in Chapter 2, contributions may be positive or negative and include social, economic and environmental contributions received within Australia in both the short and long term.

An industry profile is intended to consist of an industry-specific set of component trees covering both contributions to ESD (outcome components) and pathways to them. They will be presented in electronic form either on the web or on CD or other electronic media. Clicking on a particular component reveals the details of that component including a description of the component and its role in the overall framework, the desired outcome for that component, the indicator used to measure achievement of the desired outcome and how to interpret the indicator (performance measure). Also shown, is the actual value of the indicator in time and space using graphs and maps as appropriate. Other important information includes identification

of external drivers and other components with which the component interacts as shown in Figure 10. This is a rough indication only. The actual content and layout will need to be developed to provide optimal user convenience, proper acknowledgement of data sources and limitations and allow for easy maintenance and update. It is envisaged that clicking on higher-level components will eventually provide an aggregated assessment of all the components below it as well as the option to interrogate those sub-components individually. In this way the user will be able to get an assessment of the full range of industry contributions, positive and negative, social, economic and environmental, at whatever level of aggregation or disaggregation they desire.

Human Systems / National Community

Export Income

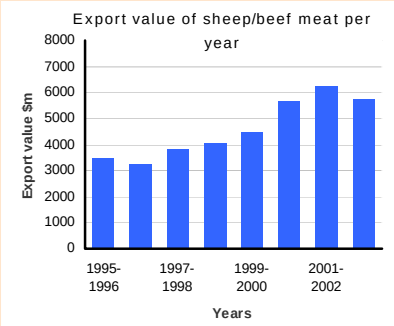
The contribution of the industry to Australia's export income.

Desired outcome (operational objective)
The contribution to export income should be maintained or increased

Indicator
Dollar value of exports

Interpretation (performance measure)
Indicator should remain constant or increase over time.

Results to date



Source- ABARE Commodity Statistics 2003

For the meat and livestock industry (sheep/beef) export income has almost doubled over the past 8 years, with a slight reduction 2002-03 due to the drought.

Possible responses
Increased marketing activities. Actions to satisfying requirements of importing countries.

Interactions with other components
Any changes in 'Capacity to produce food and fibre' components could affect export income.

External drivers
Terms of trade. Exchange rates. Trade agreements. Requirements of importing countries – disease, animal welfare, environmental performance.

Return to component tree (human)

Figure 10. An example of the sort of information to be provided as a result of clicking on a component within a component tree.

Component trees for each industry were developed, discussed at the workshop and further modified in response to comments and further discussions. It was apparent from the beginning that many components were common across all industries and industry-specific components are the exception rather than the rule. To minimise repetition, we have created a generic industry profile in Appendix E. This profile includes material that is expected to be identical or very similar across all industries. It is an intermediate output of this scoping project and a convenient way for us to

present material. We have used the generic industry profile to provide a description and rationale of the components and comment on the existence or otherwise of desired outcomes, indicators and performance measures.

An industry profile is intended to be completely self-contained with any generic material incorporated seamlessly with the industry-specific material and the industry-specific indicator values. The industry profiles in Appendix F consist of component trees with a small number of active components. Clicking on an active component brings up the information for that component. If this approach is adopted, we envisage an ongoing, evolving process in which the contents of components are populated and updated and when necessary the components themselves are subdivided, collapsed, modified or moved. The modular structure of the framework is designed to provide this flexibility.

More detailed discussion is provided within the profiles themselves, particularly the generic profile. Some of the key points that have emerged are:

- Although there will be differences of opinion with respect to specific targets or limits, it appears possible to identify an operational objective for most components.

- Indicators for social and economic components such as export income, employment, income of industry participants and aspects of human capital are available although not always for all industries or regional groupings. Sources include the ABS and ABARE.

- Indicators for other social components will need to be constructed from various sources (eg public health, industry participant health) or through new data collection efforts such as surveys (eg national identity, self identity). The framework should take advantage of advances in areas of social science such as the measurement of resource dependency.

- Indicators for many of the components of the 'state of agricultural lands' and 'water quality' are reported by the National Land and Water Resources Audit (NLWRA 2001) but not by industry. It may be possible to combine this information with recent advances in land use mapping to generate industry-specific information. However the NLWRA data represents an accumulation of past information. In many cases, there is no comprehensive ongoing national data collection. The National Vegetation Information System (NVIS) is a notable exception.

- Indicators for water balance components are likely to emerge as a result of the increased interest in water management and water trading.

- Most industries have reported on some of their priority NRM issues. These reports usually provide detailed Best Management Practice recommendations and surveys of farmer attitudes and behaviour. If repeated they can provide valuable performance information for adaptive management.

These observations suggest that while there are considerable obstacles to overcome, it is feasible to construct a framework of this type. The greatest threat appears to be the

lack of land condition monitoring. The NLWRA (2001) stated that 'there are few regions in Australia where comprehensive trends in land condition, and soil properties in particular, can be deduced from reliable time-series data.' Techniques based on remote sensing may provide a cost-effective solution for some components.

Question 6: Are you happy with the high level structure of the component trees (ie the first three or four levels)? If not, what alternative structure would you suggest.

Question 7: What changes would you suggest to the lower level structure, either generically or for a specific industry?

Question 8: Do you have any comments on desired outcomes either generally or for specific components? If so, please elaborate.

Question 9: Do you have any comments on indicators either generally or for specific components? If so, please elaborate.

Question 10: Can you identify relevant data sources or areas where data availability is a problem?

Question 11: Do you have comments on other information provided with each component either generally or for specific components? If so, please elaborate.

5 Relationships to other initiatives

Signposts for Australian Agriculture is intended to build on, complement and integrate the outcomes of other initiatives – the Audit is leading efforts to collate information to assess and report on the condition, trend, use and management of Australia's natural resources. The relationship between the proposed framework and other initiatives is described briefly in Table 1.

Table 1. Relationship between proposed Signposts for Australian Agriculture framework and other initiatives

Initiative	Relationship
National Collaborative Project on Indicators for Sustainable Agriculture (SCARM 1998)	The Signposts framework builds on this previous work but has a slightly different question and a more specific subject (individual industries rather than agriculture as a whole). The Signposts framework covers more components and will not exclude components just because data are currently unavailable. The Signposts framework is more flexible as it is defined first by its structure then by desired outcomes and then by indicators. The SCARM framework is defined primarily by its indicators and therefore a change in an indicator implies a change in the entire framework. All SCARM indicators have a potential role in the Signposts framework but not necessarily at equivalent levels. For example the SCARM natural resource condition indicators address 'state of agricultural lands' components; the SCARM 'level of farmer education' addresses the human capital component within industry participants; and the SCARM 'extent of participation in training and Landcare' addresses a pathway component intended to effect changes in resource condition.
National Food Industry Environmental Sustainability Initiative (Allan Consulting Group 2004)	The subject is a food product rather than an agricultural industry. The question is essentially the same as the Signposts framework but with scope restricted to environmental contributions. There is a significant area of common interest for the environmental components of the agricultural production segment of the supply chain. The Signposts framework could inform the structure and choice of indicators for NFIS.
National NRM Monitoring and Evaluation Framework	The Signposts framework is designed to use National NRM M&E resource condition indicators and identify the contribution of agricultural industries to the achievement of national Matters for Target related to soil condition, water quality and biodiversity.
Primary Industries and Energy Research and Development Act 1989	The Signposts framework should improve accountability by articulating the objects of the Act thereby making them more amenable to evaluation and reporting. The framework articulates the economic, environmental and social benefits (positive and negative) derived from primary industries and

	the components of sustainable use and management.
State of Environment Reporting	The Signposts framework is designed to contribute to reporting on the state of agricultural lands and to use State of Environment indicators where appropriate.
Environmental Management Systems	The Signposts framework provides a basis for determining the content (as opposed to the process) of environmental management systems (EMS) at any level (government, industry, individual farm). Since the framework is defined by components and desired outcomes rather than by indicators, an EMS may choose to address a subset of the components, adopt the same or compatible desired outcomes (adapted to the scale of the EMS) and select indicators to suit its own requirements. Management practices identified in an EMS can be pathway components in the Signpost framework. The Signposts framework covers more than just environmental components. The scope of an EMS can be similarly extended. Information collected in a compatible EMS could feed into the Signposts framework. Some information collected for the Signposts framework may be used in an EMS (more likely for regional and higher level EMS rather than individual property EMS.)
OECD Agri-environmental indicators	Essentially a list of indicators with relatively little structure. The indicators not always relevant to Australian circumstances. The Signpost framework can assist reporting to OECD. The structure of Signposts framework could be used to influence further development of OECD indicators.

6 Conclusions and recommendations

This initial consultation and preliminary collation of industry profiles suggests that the proposed framework is workable and has some stakeholder support. The next step is to expose it to wider scrutiny.

We recommend that stakeholders be invited to address the following four questions in addition to those that have been inserted throughout the text.

Question 12: Would the framework as it is currently proposed, be of any use to you? What would make it more useful? How well does it relate to other initiatives you are involved in?

Question 13: Could the Signposts project provide you with useful data? Please elaborate.

Question 14: Would you like to be actively involved in the further development of this framework? If so, please indicate how (eg opportunity to comment on

further developments, participation in workshops, contribution of specific technical expertise)

The Bureau of Rural Sciences has identified the ability to evaluate an agricultural industry's contribution to ESD as a key ingredient in achieving the Department of Agriculture, Fisheries and Forestry's goal to increase the profitability, competitiveness and sustainability of our Australian industries and to enhance the natural resource base to achieve greater national wealth and stronger rural and regional communities. BRS has therefore initiated a special 'keystone' project 'Measuring the contribution of portfolio industries to sustainable development' to demonstrate what can be achieved with existing data and modern techniques. The project will take a demonstration industry (yet to determined) and work with that industry during 2004-05 to refine the framework and populate it using some of the latest developments in areas such as land use mapping, water balance accounting and social analysis. Approaches developed for the demonstration industry will be available for application to other industries and will contribute to the larger Signposts for Australian Agriculture project.

Question 15: Which industry would be a good demonstration industry for the BRS Keystone project? Would you like to volunteer your industry as a demonstration industry?

All questions are repeated here for convenience.

Question 1: Does the question 'How does an agricultural industry contribute to ESD?' need to be answered? If not, what question does need to be answered?

Question 2: Is it appropriate to restrict the definition of an agricultural industry to activities carried out within the farm gate? If not, what would be a better definition?

Question 3: Should contributions be restricted to those received within Australia? If not, what contributions beyond Australia's borders ought to be included?

Question 4: Is the proposed conceptual framework based on contributions to human and bio-physical systems (human/social/produced capital and natural capital) appropriate? If not, what would be more appropriate?

Question 5: Is the approach that combines a high degree of rigour (eg distinguishing contributions from the pathways intended to generate those contributions, insisting on articulating desired outcomes before identifying indicators) with a high degree of flexibility (eg ability to tailor components to suit industry needs and modify over time) appropriate and workable? If not, what would be better?

Question 6: Are you happy with the high level structure of the component trees (ie the first three or four levels)? If not, what alternative structure would you suggest.

Question 7: What changes would you suggest to the lower level structure, either generically or for a specific industry?

Question 8: Do you have any comments on desired outcomes either generally or for specific components? If so, please elaborate.

Question 9: Do you have any comments on indicators either generally or for specific components? If so, please elaborate.

Question 10: Can you identify relevant data sources or areas where data availability is a problem?

Question 11: Do you have comments on other information provided with each component either generally or for specific components? If so, please elaborate.

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Question 15: Which industry would be a good demonstration industry for the BRS Keystone project? Would you like to volunteer your industry as a demonstration industry?

Please send your replies to the questions and other comments by 28th October 2004 to

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Appendix A: Selecting the question

This material was provided to the Reference Group during deliberation on what question the Signposts for Australian Agriculture project was intended to address. Note that the measurement system referred to in the last row of the table has been added to the proposed framework through the inclusion of pathway components. This will allow questions on the implementation of management practices to be addressed.

NLWRA Signposts for Australian Agriculture Project

It has been proposed that the project be designed to address the question:

> 'How does a particular industry contribute to ecologically sustainable development?'

Ecologically sustainable development (ESD) is defined in Australia's National Strategy as

> *using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased* (Commonwealth of Australia 1992).

Contributions to ESD include positive and negative contributions, long and short term contributions, environmental, social and economic contributions. Contributions can be structured in various ways including contributions to natural, produced, human and social capital.

Given this starting point the following issues can be addressed to varying degrees.

Issue/question	**Can information collected by the project be used to address the issue?**	**Requirements**
Are contributions of the abc industry improving over time?	Yes	Measurements over time Method of aggregating contributions if wish to give an overall conclusion as well as a contribution by contribution answer
Are contributions of the abc industry bigger or smaller than the xyz industry?	Yes	Comparable measurements for the rtz industry.
Do positive contributions of the abc industry outweigh negative contributions?	Yes	A method for weighing positive and negatives. Does not necessarily require a common metric. Can be done intuitively by politicians. Benefit–cost analysis is the traditional method used by economists. Systems people have approaches that sit between the extremes.
Is adoption of a particular management practice having an impact?	Maybe	Need to be able to compare with and without management practice – ideally have a proper control. 'Before and after' easily confounded with other factors. Better answered through a targeted research effort.
What will future contributions of the abc industry look like?	Yes	Method of modelling/estimating future contributions. May involve collecting

of the abc industry look like?		data specifically for this purpose. Need to make assumptions about future external factors (world economy, climate change etc etc)
Who will benefit/lose if the abc industry changes?	Yes	Measurement of contributions on an appropriate scale (geographically, socially). For example, if economic contributions are measured only at a national scale then this will not help in identifying communities needing assistance if the industry leaves a region.
Will action/policy A have a better result overall than action/policy B.	Yes	Contributions modelled/estimated for each action or actually carry out experiments (active adaptive management)
Is the abc implementing a particular recommended practice?	No (unless implementation of the practice happens to have been identified as a indicator needed to predict a future contribution)	This question requires another measurement system. A system designed to address the overarching question of contributions to ESD will not address implementation of practices that are not linked to predicting future contributions to ESD.

From this we can distinguish three types of data collection/collation:

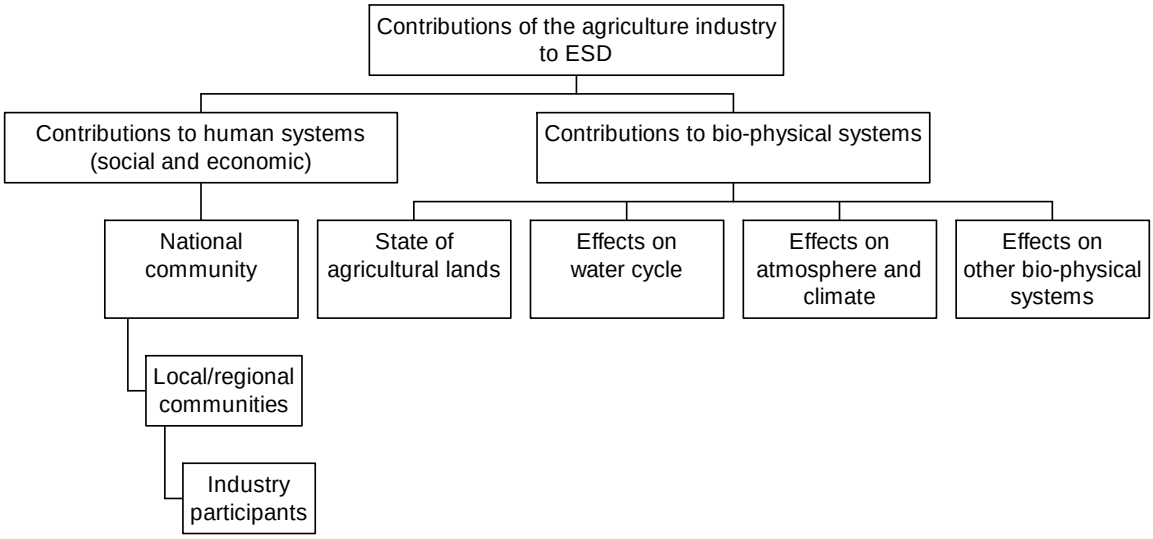
1. data to construct indicators of contributions to date
2. data to construct indicators of future contributions
3. other useful data for
    a. predictive modelling
    b. testing out particular hypotheses

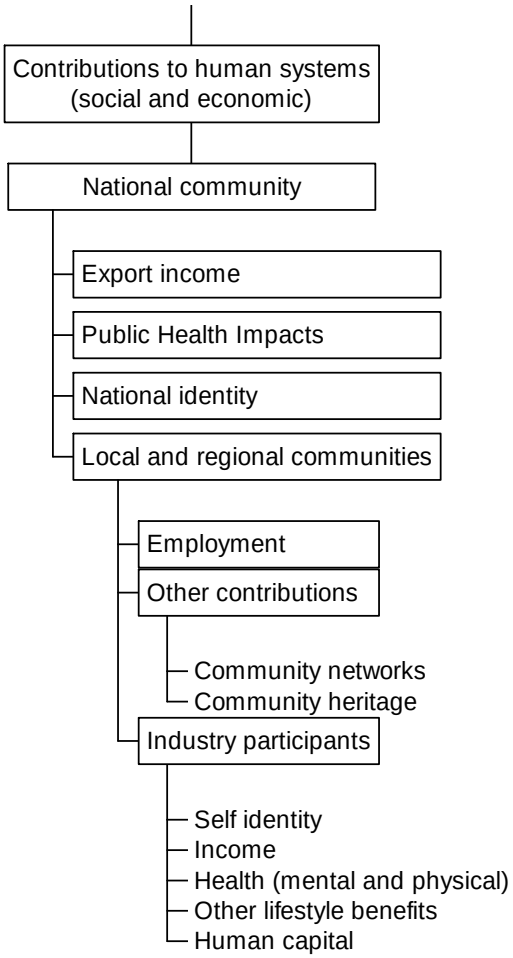
The data content of the project should be dynamic and respond adaptively as assessment and reporting needs change. However at any given time, the role of particular data collection and collation activities should be clearly specified.

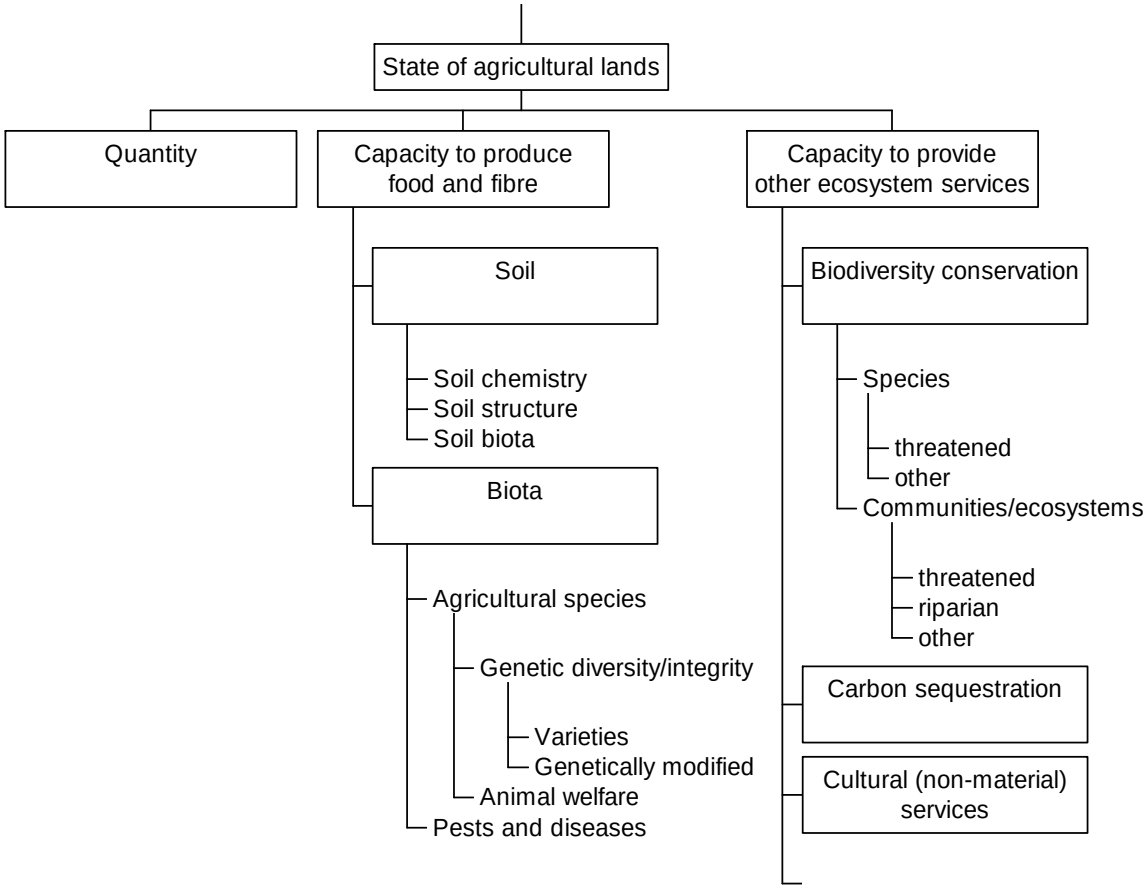
Data of type 1 are expected to form the fundamental ingredient of the project. Data proposed under type 2 need to qualify, ie there needs to be a clear understanding of what future contribution(s) a predictive indicator is addressing. Similarly the role of data of type 3 needs to be clear and routinely reassessed.

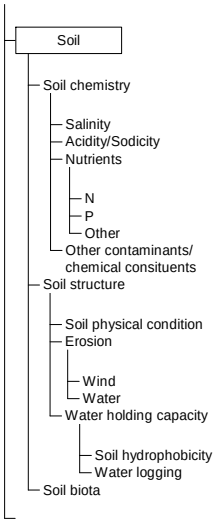
Jean Chesson
Bureau of Rural Sciences
24 February 2004

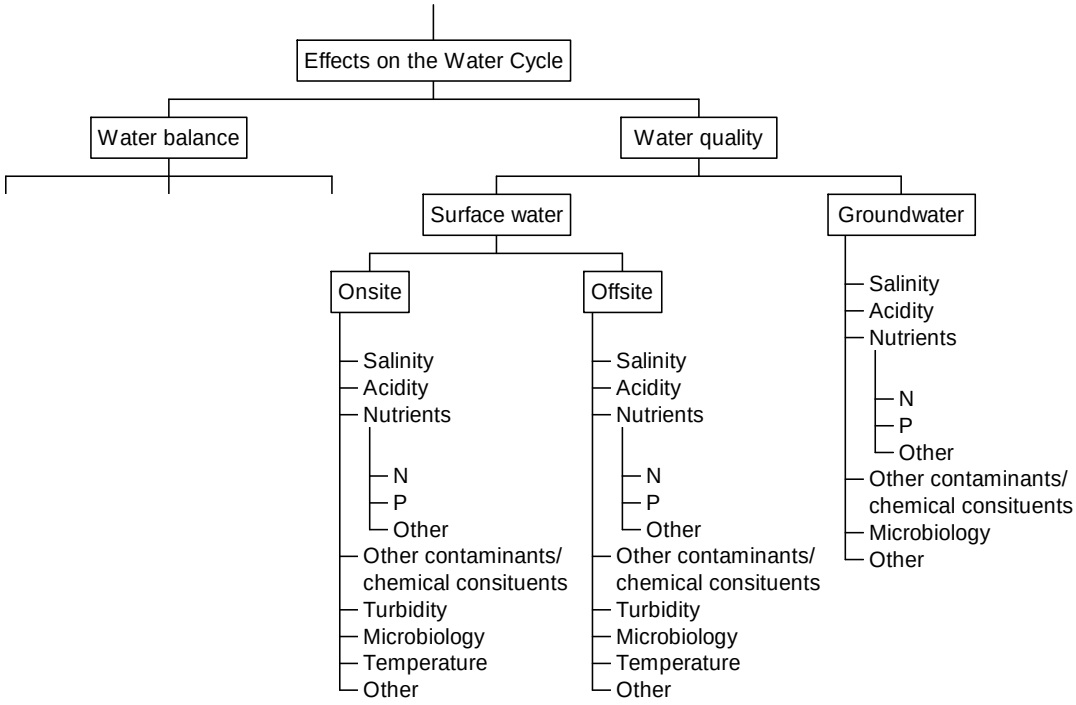
Appendix B: Generic component trees

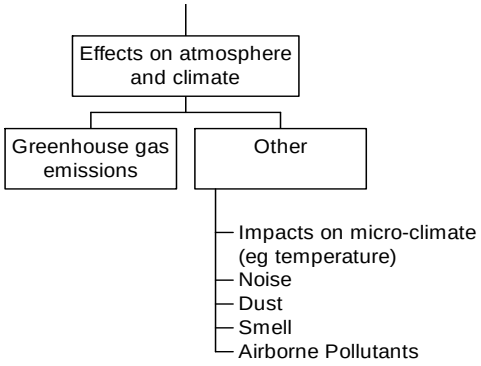


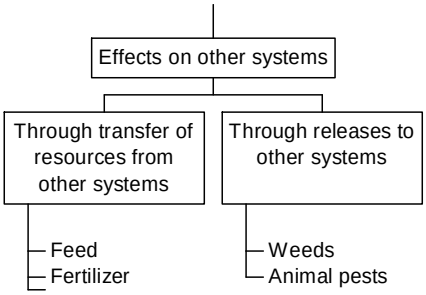

Contributions to human systems (social and economic)
National community
Export income
Public Health Impacts
National identity
Local and regional communities
Employment
Other contributions
Community networks
Community heritage
Industry participants
Self identity
Income
Health (mental and physical)
Other lifestyle benefits
Human capital


State of agricultural lands
Quantity
Capacity to produce food and fibre
Capacity to provide other ecosystem services
Soil
Soil chemistry
Soil structure
Soil biota
Biota
Agricultural species
Genetic diversity/integrity
Varieties
Genetically modified
Animal welfare
Pests and diseases
Biodiversity conservation
Species
threatened
other
Communities/ecosystems
threatened
riparian
other
Carbon sequestration
Cultural (non-material) services


Soil
Soil chemistry
Salinity
Acidity/Sodicity
Nutrients
N
P
Other
Other contaminants/ chemical consituents
Soil structure
Soil physical condition
Erosion
Wind
Water
Water holding capacity
Soil hydrophobicity
Water logging
Soil biota


Effects on the Water Cycle
Water balance
Water quality
Surface water
Groundwater
Onsite
Offsite
Salinity
Acidity
Nutrients
N
P
Other
Other contaminants/ chemical consituents
Turbidity
Microbiology
Temperature
Other


Effects on atmosphere and climate
Greenhouse gas emissions
Other
Impacts on micro-climate (eg temperature)
Noise
Dust
Smell
Airborne Pollutants


Effects on other systems
Through transfer of resources from other systems
Through releases to other systems
Feed
Fertilizer
Weeds
Animal pests

Appendix C: Workshop agenda and attendees

SIGNPOSTS FOR AUSTRALIAN AGRICULTURE WORKSHOP

Meeting Date: 23rd June
Time: 9:30 am to 3 pm
Lunch and refreshments provided

Location*: Large Agriculture Conference Room Core 5 Level 1 Wing 6
Department of Agriculture Fisheries and Forestry
Macquarie Street, Barton, Canberra

Agenda

9.30 am	Welcome and introductions	*Alice Woodhead, Facilitator*
9.45 am	Background to the project	*DAFF NRM – Peter Thomas/Jim Donaldson* *NLWRA – Blair Wood*
	Other relevant projects	*Peter Day*
10.15 am	Approach to scoping phase	*Jean Chesson, BRS*
10.45 am	Questions/discussion	
11.00 am	**Morning Tea**	
11.30 am	Report on six case studies	*Benj Whitworth, BRS*
12.00 noon	Simulated stakeholder workshop	*Jean Chesson/Benj Whitworth*
12.45 pm	**Lunch**	
1.30 pm	Group discussions: Relevance of project to various stakeholders including R&D Corps	
2.00 pm	Response from groups	
2.30 pm	Discussion/next steps	
3.00 pm	**Close**	

Workshop Attendees

Karen Cody	National Land and Water Resources Audit
Peter Day	National Land and Water Resources Audit Consultant
Jim Donaldson	Natural Resource Management Business Unit (DAFF)
Michelle Kellaway	Meat and Livestock Australia
Caroline Lemerle	Rural Industries Research and Development Corporation
Zoltan Lukacs	Grains Research and Development Corporation
Jeff Peterson	Horticulture Australia
Karren Powell	Hassalls & Associates
Ralph Schulze	Cotton Research and Development Corporation
Peter Thomas	Natural Resource Management Business Unit (DAFF)
Andrea Vicic	Horticulture Australia
Blair Wood	National Land and Water Resources Audit

BRS Project Team
Jean Chesson
David Hyndman
Benj Whitworth
Alice Woodhead

Appendix D: Comments received

Topic	Comments	Response
Component trees-Horticulture	Human 1 Remove reference to A and B class members	Done
Component trees-Horticulture	Human 2 Noise is a minor issue, perhaps replace with "Urban encroachment" or "Urban interface issues" (These include noise, dust, spray use, competition for use, amenity issues and smell (think mushrooms (and poultry))	Component tree has been modified. These types of contributions fall under contributions to other bio-physical systems and 'atmosphere' can be appropriate for airborne effects. The intention is for the framework to be as spatially explicit as possible and therefore some effects such as noise will be bigger issues in some locations than others.
Component trees-general	Human 3 Under "industry participants" include reference to "Skills development" (this picks up training etc, eg mechanical, chemical usage, food safety systems, management kills, business skills etc), and "Leadership development" (There are a number of leadership development programs running in horticulture (and other industries)	Included under new component of Human capital
Component trees-general	Human 4 Replace "Residues" with "Safe, nutritious food" (This is a broader issue)	Updated to 'Public health impacts'
Component trees-Horticulture	1. Air. Dust is a minor issue and should not be given the prominence it has here	See earlier comment. Dust is one of a suite of possible components under 'atmosphere'
Component trees-general	2. Land. Not sure what "Land Quantity" means. Should this be replaced with a heading to reflect the industry's sustainable access to land? Need to think about this one but perhaps transfer it to the next slide.	Agree. It is not clear initially what Land quantity is referring to and the explanation of the component will include a definition to explain why it was included.
Component trees-general	3. Land. "Soil quality and condition" should be replaced with "Soil", with two subsets "Soil health" and "Soil loss"	Updated to 'Soil'. Also see below
Component trees-general	4 Land. Under "Soil health", four issues: Physical (soil health), including compaction, organic matter, erodability etc Biological, (there are good indicators for this) Chemical (nutrients, acidification, sodicity, pesticide residues, heavy metals etc), and Water related (soil health) (Salinity, drainage etc)	We have added soil biota, so components are now closer to suggested components.
Component trees-general	5 Land. Under "Soil loss", include Erosion (Water, wind etc) Nutrient loss Off site effects (Eutrophication of waterways etc c-	Nutrients are both added and lost. The 'nutrient' component is intended to capture the outcome. Erosion has been included to be consistent with the National NRM M&E Framework. Eutrophication is picked-up under Water

	see next slide)	component trees.
Component trees-general	6 Water. Under "Water" (Slide 37), two subsets: "Sustainable access" (Your water quantity), including efficiency of water use, competitive access (environmental flows etc) , sustainable aquifer use, management of recharge areas etc "Water quality" eg salinity, chemical and biological contamination, on- and off site impacts. The distinction between surface and ground water is unnecessary at this level.	Water Quantity has been updated to Water Balance to try and incorporate all issues stated at left. Different water quality issues relate to groundwater and it is therefore kept separate under quality (but not quantity or water balance).
Component trees-general	7. Biota. Should include "Marine" after estuarine etc (I'm thinking specifically about the impacts on the Great Barrier Reef).	Estuarine was only an example. The biota components have been reorganised and emphasis is on onsite biota. Impacts offsite are captured through their mode of action, in this case under 'water offsite/water quality'.
Component trees-general	1. Human well-being: Agree strongly with Jeff Peterson's suggestion to include reference to 'skills development' and 'leadership development'.	Included as a part of human capital. Processes intended to develop skills and leadership will be captured in the third dimension of the framework.
Component trees-general	Include an external drivers component for things that are beyond the industry's control, but affect its performance and its contribution to human well-being. Factors include drought, terms of trade, $AU/$US exchange rate, commodity prices, government regulation, community perceptions.	The intention is to have external drivers discussed within each component. They are not contributions, but they are important for understanding contributions to date and predicting future contributions. External drivers are expected to be an element of any future State of Agriculture Report.
Component trees-general	I'd prefer Industry 'members' be used instead of industry participants.	We agree that this is not an ideal term, but 'members' suggests a more restrictive definition than is intended. Will seek a better term.
Component trees-general	Replace 'Residues' with 'quality assurance'.	Residues removed and replaced with Public health issues. Quality assurance is a method for achieving the quality outcome.
Component trees-general	What is meant by the 'heritage' and 'indigenous' components? I fear that any objectives developed in relation to these would be little more than lip service. How would you measure heritage value and impact/contribution to indigenous communities? Who would measure it?	Components have been clarified. These can be measured to some extent: Indigenous: Impacts on cultural heritage, such as indigenous sites can be measured, ie DEH. Heritage: Impacts on Australians perceptions can be measured through surveys.
Component trees-general	Under land, water and biota components, insert a new component for landholder stewardship role/duty of care. Need to recognise stewardship role and clarify expectations before setting objectives.	Components reorganised so that industry is assumed to have a stewardship role/responsibility for land under its management. Agree that expectations need to be clarified before setting objectives. The framework is intended to facilitate this process.
Component trees-general	New component for community willingness to pay for natural	Willingness to pay is one way to assign a value to a particular contribution. The framework is

	resource management and duty of care. Growers should not be expected to bear the full cost of managing the environment for the public good. If there is a public good benefit, then the public should be willing to bear part of the cost through higher prices.	designed to identify and measure contributions so that decisions can be made about who pays for what.
Component trees-general	Include an external drivers component for externalities like drought, which can impact on environmental well-being.	Included as a heading in the description of the components.
Component trees-grains	Replace agro-ecological zones with 'area planted to crops' (or cropping area). Consider breaking this down further and having a box for each state where crops are grown-- QLD, NSW, VIC, TAS, SA, WA.	Updated
Component trees-grains	Remove 'spatial variability' and 'temporal variability'.	Updated
Component trees-grains	Make sure 'acidity' is included under restructured soil health component.	Included
Component trees-general	4. Biota: Insert new component for landholder stewardship role/duty of care under species, biological communities and ecosystems components. Need to recognise stewardship role and clarify expectations before setting objectives.	Discussed previously under land water and biota
Component trees-general	Under Native biodiversity and/or Biological communities, include new component for remnant vegetation.	To be considered.
Component trees-general	New component for community willingness to pay for farmers to maintain and manage remnant vegetation to provide habitat for native biota.	Discussed above.
Component trees-general	Move animal welfare component away from Domesticated component and make it a sub-component of vertebrate pest management.	Updated
Component trees-general	I don't think crop species should be considered as part of biota or species. Crop plants generally displace native habitat and native species and don't contribute to species richness and diversity-- which is what I think is the focus here.	Moved. Crops may not contribute to 'native biodiversity' but are an important feature of 'non native biodiversity' and is an outcome that is managed for. They are separate components.
Component trees-general	5. Ecosystems: Insert components for landholder stewardship role/duty of care. Need to recognise stewardship role and clarify expectations before setting objectives.	Discussed previously under land water and biota
Report-RDC comments	First, the RDCs have to report against the Commonwealth Govt's four National Research Priorities and their numerous related priority goals; the	The framework is meant to be flexible enough to help users (ie DAFF, RDCs) to meet their needs for ESD reporting, rather than add to them. The RDCs were invited to the workshop

	seven DAFF Ministerial Priorities for rural R&D; PIERD Act objectives; and that's before we report back to industry on how we are addressing industry priorities. RDCs spend an enormous amount of time reporting against statutory reporting obligations and feeding information into numerous annual whole-of-government reports including the DAFF Rural RDC outcomes report and the DEST Innovation report. Your project just adds an extra layer of reporting for the RDCs and the industries they represent. What's more, Jean's paper says (p.10) that 'A complex system requires a complex set of indicators to adequately monitor performance'... and since most agricultural systems are quite complex, RDC involvement is likely to become increasingly difficult.	because they were knowledgeable on each industry. Not all components will be relevant to RDCs and not all RDC requirements will be met by the ESD reporting Framework. Nevertheless, the ESD framework should be consistent with other requirements where at possible. It may be useful in the Next Phase of the project to identify where the ESD framework can meet the needs of RDCs more specifically.
Report-RDC comments	Second, please tell me exactly how the RDCs are meant to select from the various monitoring/evaluation/reporting frameworks being developed. There is significant fragmentation and duplication in the development of national NRM/ESD frameworks, even at the Commonwealth Government level, of which BRS is but one player. We have: * the BRS National ESD reporting framework for Australian Fisheries; * the NRM-MinCo National NRM Monitoring & Evaluation framework; * the SCARM Sustainable agriculture indicators framework; Then we have: the OECD Agri-Environmental Indicators framework; a Unilever Sustainable Agriculture indicators project to consider, among others.	Reporting requirements do differ depending on purpose and scope, for example regional reporting cf industry reporting. The intent of this ESD reporting framework is to streamline reporting by assisting with reporting on multiple requirements. Chapter 4 of the Report explains relationships.
Report-RDC comments	Third, the GRDC is very big on monitoring practice change and using this as an indicator of Corporate performance. For instance, we surveyed over 900 growers in 2004 and asked them for information on practice change, uptake of new crop varieties and adoption of new farming practices. Yet, page 7 of Jean's paper appears to argues that farm management indicators do not	Practice change is critical step in achieving some of the desired outcomes. It is part of the 'pathway' dimension described in the project report. The framework intends to cover both the outcomes society desires from agriculture and where we are on the pathway of getting there. It is important to monitor practice change. The Signposts project aims to make explicit links between practices and desired outcomes and

	measure actual contributions to environmental well-being and should therefore be excluded from the core set of components included in the component trees. While GRDC is keen to promote/facilitate and monitor practice change in the expectation and belief that it will lead to a future positive industry contribution to ESD, we would probably be very hesitant to commit to setting objectives that would require the actual measurement of environmental parameters. We simply lack the expertise and resources to do this, and would rely instead on Land and Water Australia, NLWRA, CSIRO, Universities etc to carry out these measurements.	hence ensure that information such as that collected by GRDC has a clear role in the overall picture, thereby allowing effective adaptive management. The project makes no assumption that RDCs will be the primary data provider or reporter. Current focus is on information collected and held at the national level.
Component trees-generic	-Human. I think that a very important component to be added to the Industry Participant component under human well-being would be 'capacity'. This would allow for objectives such as producer skills, knowledge and access to information, risk management and resilience and robustness (capacity to manage change), which are all important for the sustainability of primary industries, to be included.	See previous comments on this.
Component trees-generic	-Water. An objective relating to the seasonality of flow should be included.	Included
Component trees-generic	-Biota. I suggest the amalgamation of the biological communities and ecosystems objectives because of the difficulties that arise when you start to identify performance indicators for objectives within each of these components and that some of the examples in the biological communities component also incorporate physical features, which I understand was your defining characteristic for what would be considered an 'ecosystem';	Updated
Component trees-Grains	Following our discussions with GRDC about TBL indicators, it appears that components relating to the following might be important:	
Component trees-Grains	-Human\Industry participants. Income at both the whole farm AND enterprise level (as measured by gross margins, profit, return on capital and/or disposable income);	The component is intended to represent the financial benefit industry participants receive. How best to measure this, ie the identity of the indicator is to be determined.
Component trees-Grains	-Human\Other lifestyle benefits might include	Yes, these will be included. The first is a useful indicator of social capital included under

	participation/membership in organisations, days off-farm, achievement of personal goals;	Human\Regions. The other suggestions will be discussed under the lifestyle and human capital components.
Component trees-Grains/Report	- Sub-components under biota\species\domesticated should be included to allow mixed farming activities to be included. Indicators such as kilograms of beef/lamb turned off have been proposed for inclusion in GRDC indicators for performance across the TBL but do not currently align with any of the objectives being proposed. However we would see that both of these objectives also warrant consideration in the financial component of a TBL evaluation, which would mean that they may need to be considered as measures of income under human well-being;	This scoping phase has defined industries according to their commodity definitions. The report will raise the question of how best to define industries to deal with important issues such as mixed farming.
Component trees-Grains	- Biota\ species\domesticated\genetic diversity-integrity\crop varieties\genetics could also be split according to annual and perennial species.	The categories used are those from GRDC. No difficulty in splitting in other ways if that is preferred.
	a. Expand upon how the framework will contribute to adaptive management	Included in report
Component trees/report	b. Provide examples of how management practices are linked to ESD outcomes	Included. Each component now includes a 'possible responses' heading. Many of these will be management practices. Framework includes three dimensions with management practices being a significant part of the 'pathway' dimension.
Report/component trees	c. Identify the relationship of the pilot framework to the concept of Ecosystem Services	This is discussed in the report and component trees have been adjusted to incorporate ecosystem services.
Component trees/report	Human\ Local and Regional communities. Differences in region's "level of dependency on agriculture". Eg. While the overall level of employment in agriculture may be small, it may the only source of employment within a region. Restrictions in resource access would therefore have a very large impact.	Agree. The contributions to local and regional communities is arguably the least developed and further development is needed making use of the latest social science tools and thinking.
Component trees/report	Human\Local and Regional communities. Industry's interest in regional development reporting. The broader benefits of economic production within a region – eg. the concept of value adding occurring within a region.	Agree. The scope of the current project limits the consideration of flow- on effects in the first instance. Linking this framework with , for example, the NFIS focus on the food industry supply chain could capture the broader regional development outcomes.

Appendix E: Generic profile material

Presented as a separate file on accompanying CD.

Appendix F: Industry profiles

Presented as six separate files on accompanying CD.