Appendix F6: The Dairy Industry Profile

Appendix E is a generic profile containing information applicable to all industries. Please refer to Appendix E for descriptions of each component.

This appendix provides a profile of the Dairy Industry. It consists of a set of industry-specific component trees. In addition, industry-specific information has been provided for a small number of components and this information can be viewed by clicking on hyperlinks. In a complete industry profile all components would have industry-specific information.

The ‘dairy industry’ is a fairly well-defined industry.

The components for the dairy industry did not differ substantially from the generic industry. Greenhouse gas emissions have been separated into methane and other emissions due to concerns over this particular pathway of greenhouse gas emissions.

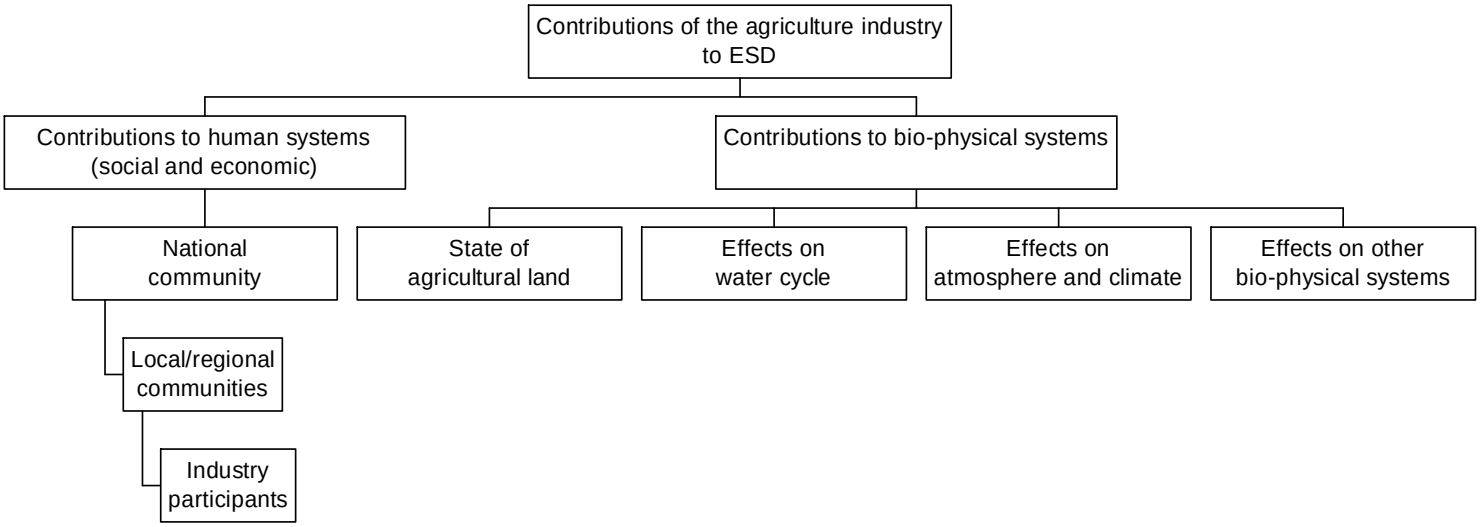
Animal welfare is a relevant component.

Water quality and soil quality were important in this industry, particularly with respect to nutrients, acidity, contaminants and microbiology, with major programs addressing these issues.

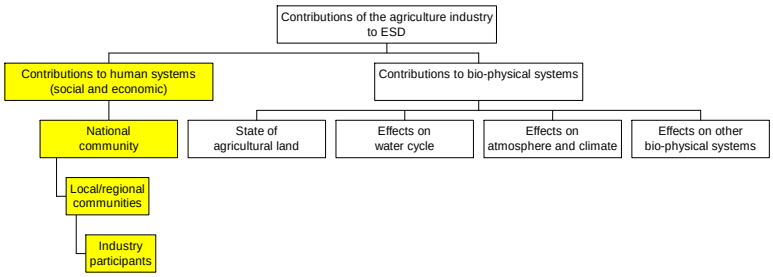
PLEASE NOTE
This material is incomplete. The intention is to demonstrate how a profile might eventually look, not provide a finished product. Desired outcomes, indicators and their interpretation (performance measures) are provided as examples only and will not necessarily be those that are adopted by the Signposts for Australian Agriculture framework. Agreement of desired outcomes, indicators and their interpretation (performance measures) will be part of on an ongoing consultation process. Similarly, results to date, interactions with other components and external drivers are indicative only.

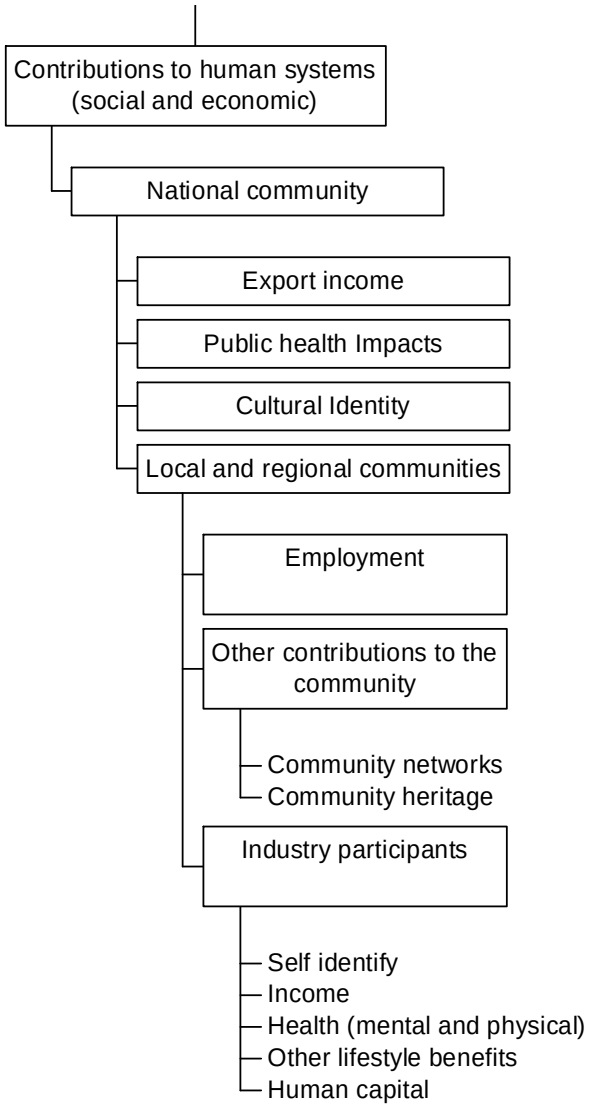
The Dairy industry: Contributions to ecologically sustainable development

Top of tree

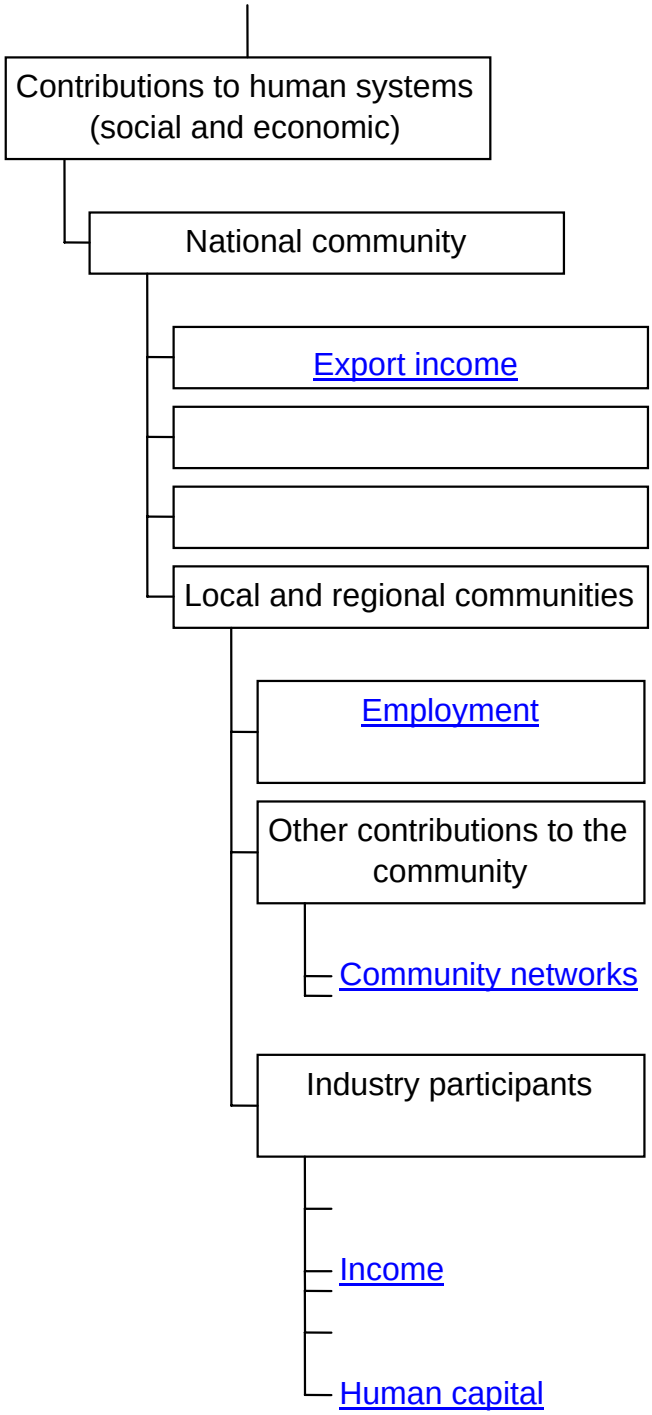


The Dairy industry: Contributions to human systems

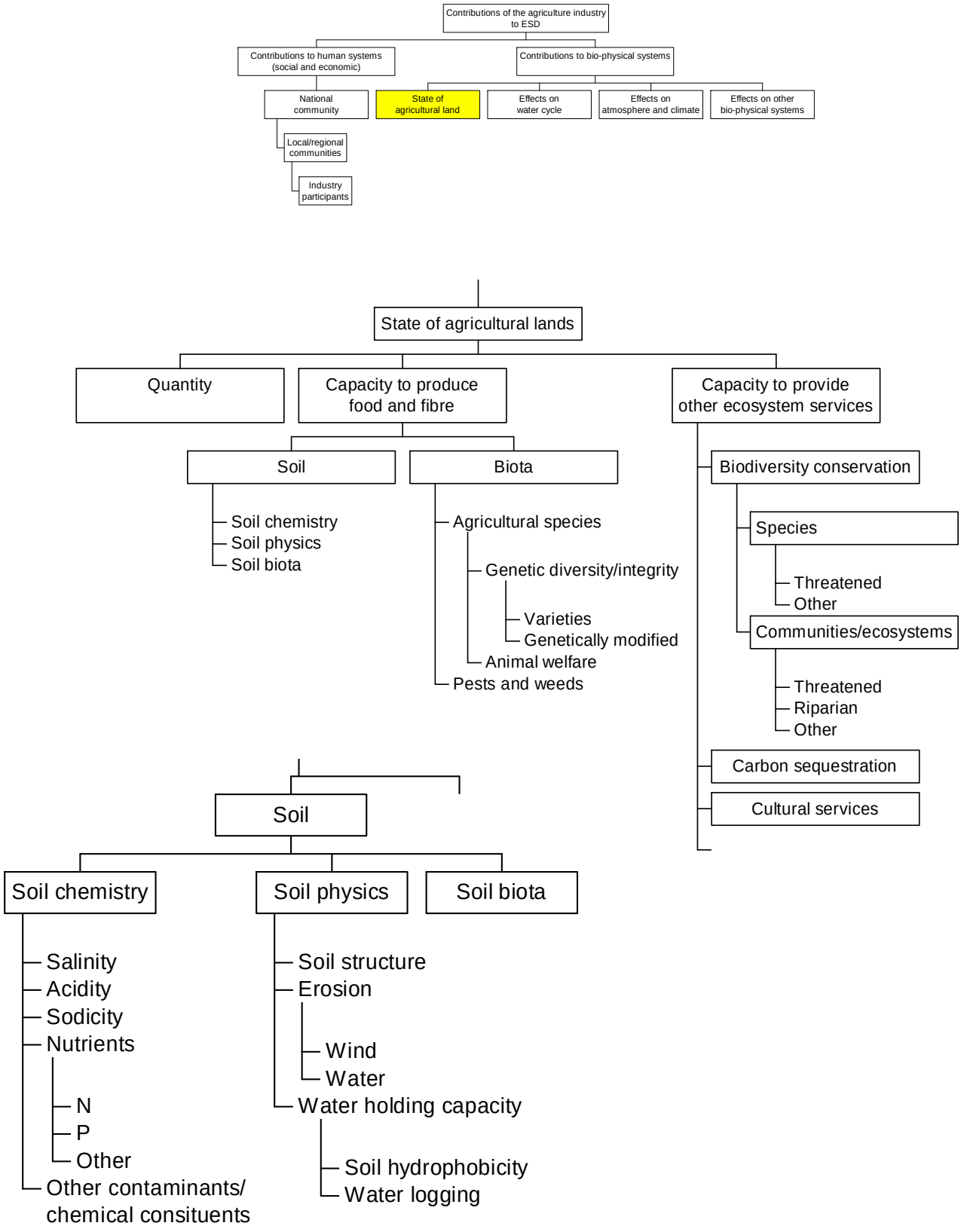




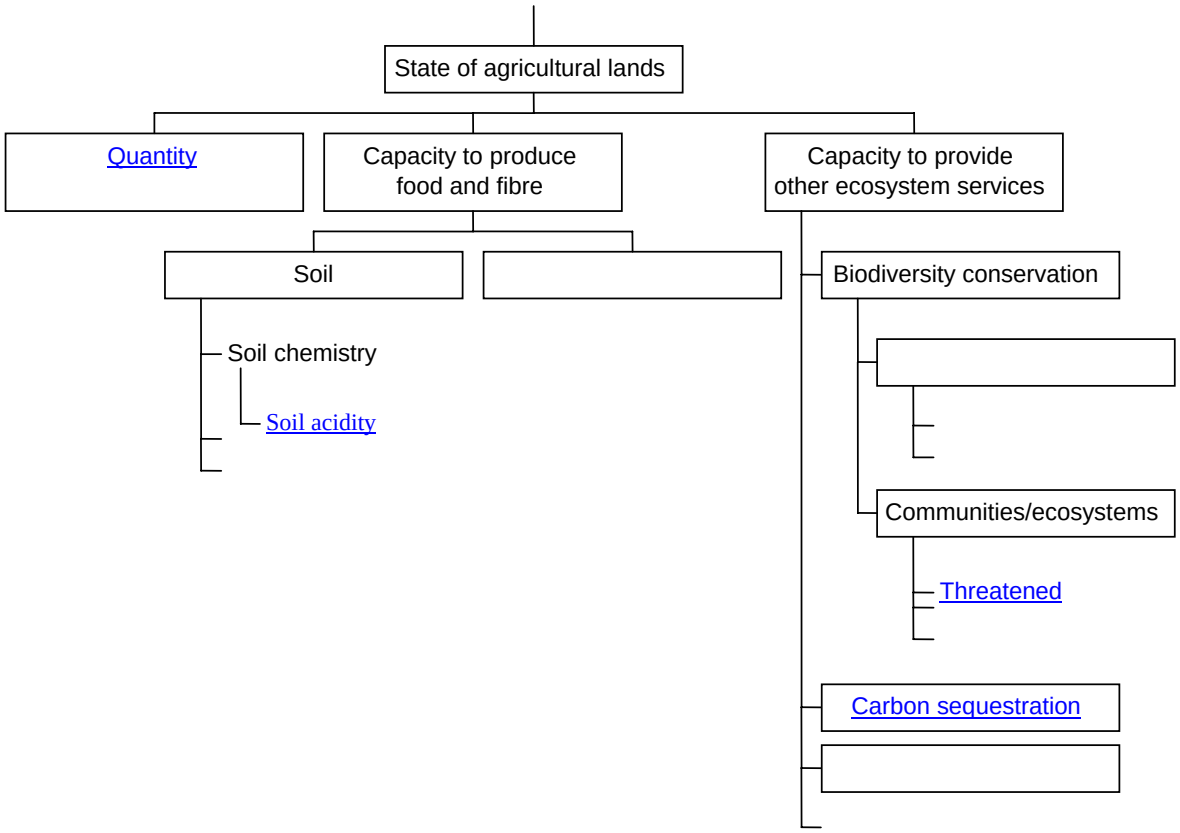
Examples for the Dairy industry: Contributions to human systems
-click on the hyperlinks



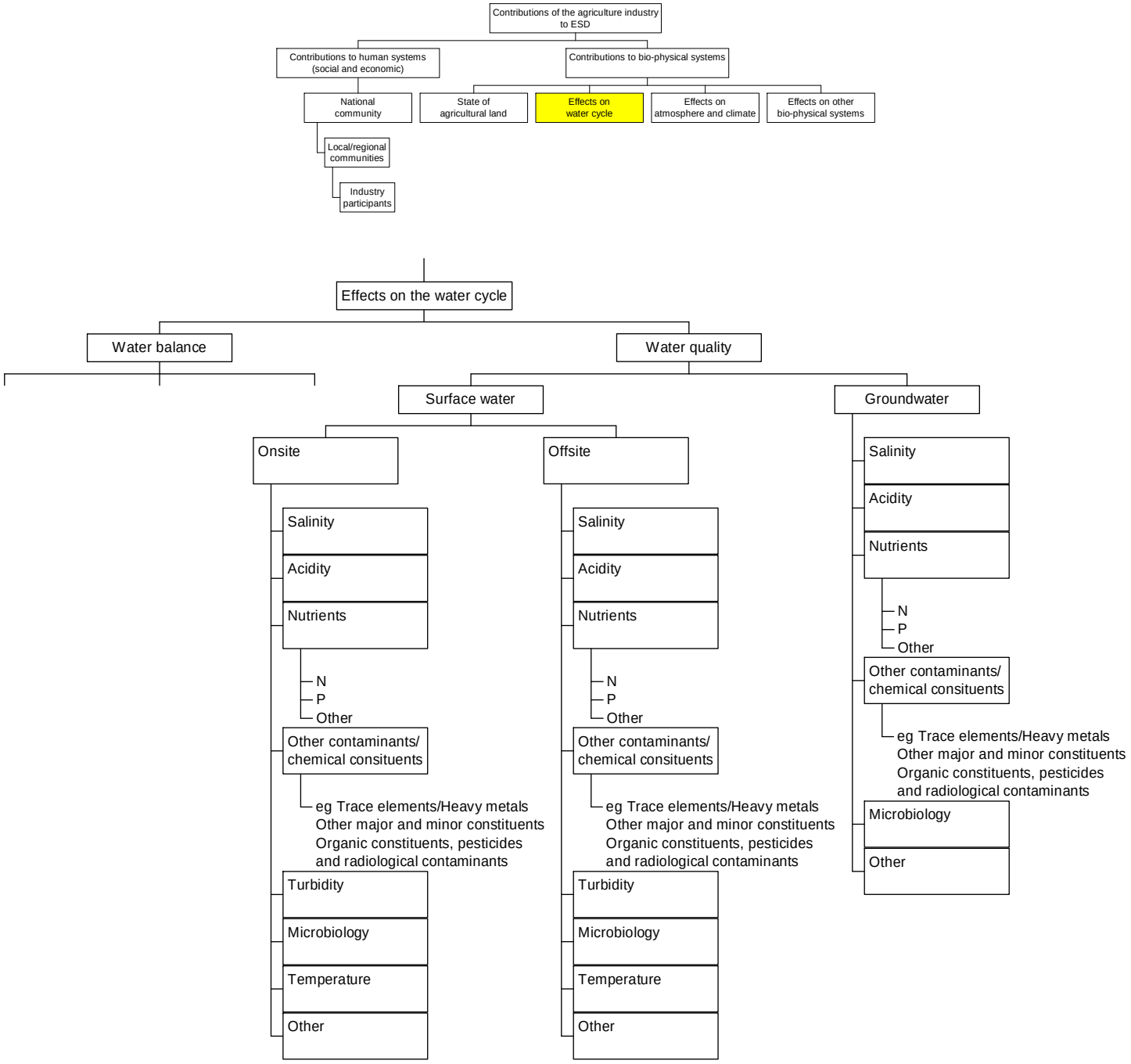
The Dairy industry: State of the industry land



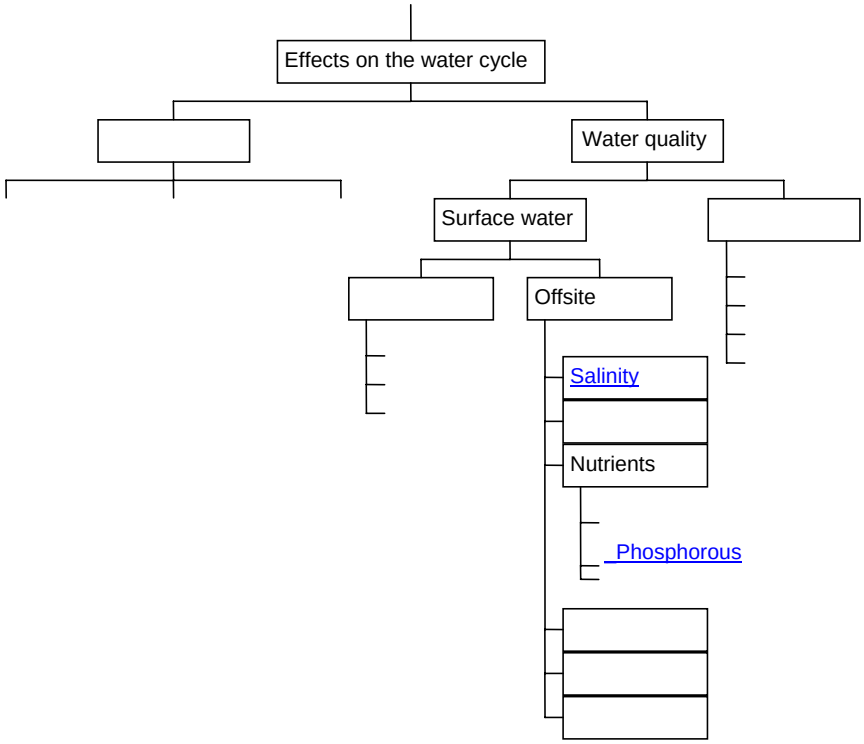
Examples for the Dairy industry: State of the industry lands
-click on the hyperlinks



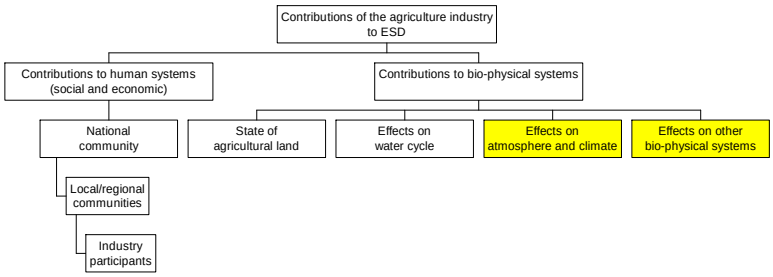
The Dairy industry: Effects on the water cycle

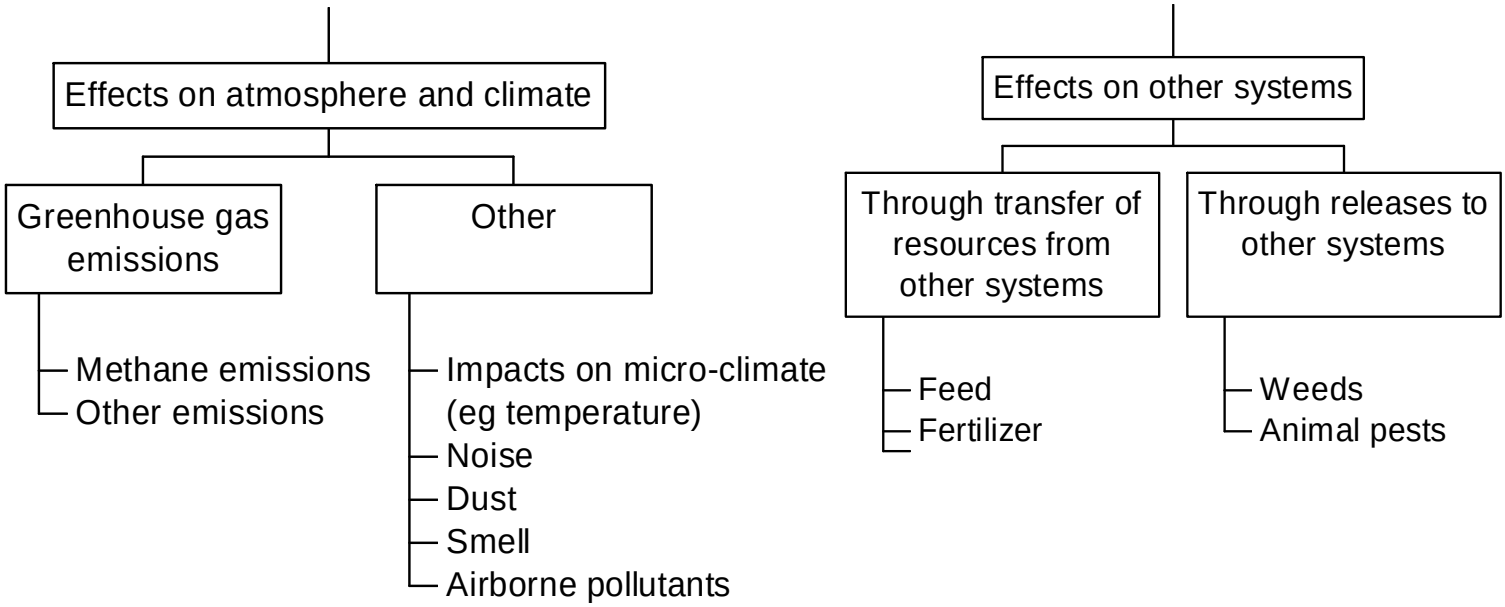


Examples for the Dairy industry: Effects on the water cycle
-click on the hyperlinks



The Dairy industry: Effects on atmosphere and climate and on other systems





Dairy Industry Framework

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)

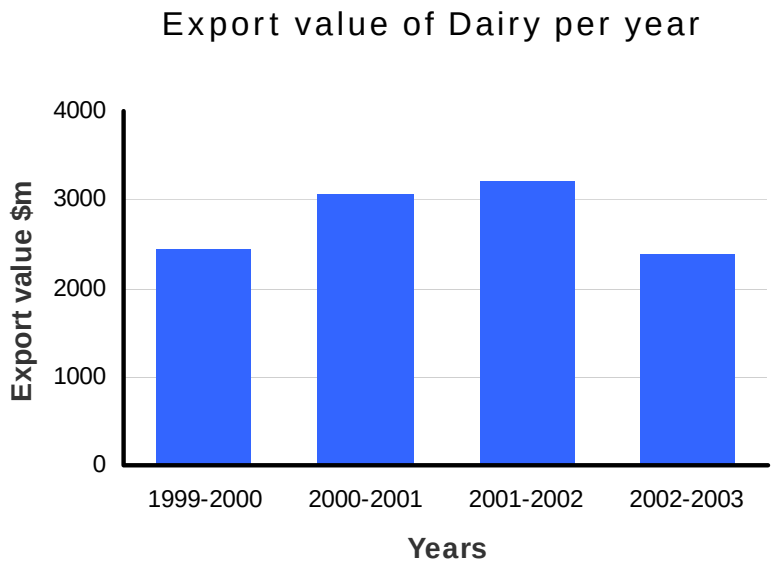
Indicator should remain constant or increase over time.

(This statement could be formalised to create a performance measure. A standardised performance measure ranging from 0 (unacceptable performance) to 1 (optimal performance) is useful for comparing and aggregating performance across different components.)

Results to date

Farm exports contributed $31.1 billion to the Australian economic in 2001-02 representing around 65 per cent of total agricultural output. The total value of farm exports has risen by an estimated 35 per cent over the past five years and represents 3 per cent of world agricultural exports.

As an example of the type of information that is available we have included a graph of export value of the dairy industry.



Source- Australian Agriculture, Fisheries and Forestry at a Glance 2003

For the dairy industry the value of exports has varied between $2 ½ to 3 bn over the past four years.

Possible responses

Increased marketing activities. Actions to satisfy 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 systems

Human Systems / Local and Regional Communities

Employment

The benefits that the industry provides to local and regional communities through employment. Employment is regarded as a major route by which the industry contributes to local and regional communities.

Desired outcome (operational objective)

Maintain or increase employment.

(This statement could be formalised to create a performance measure. A standardised performance measure ranging from 0 (unacceptable performance) to 1 (optimal performance) is useful for comparing and aggregating performance across different components.)

Indicator

Number of people employed in the industry.

Indicator reported by appropriate units (ie, by individual region, community, town)

Interpretation (performance measure)

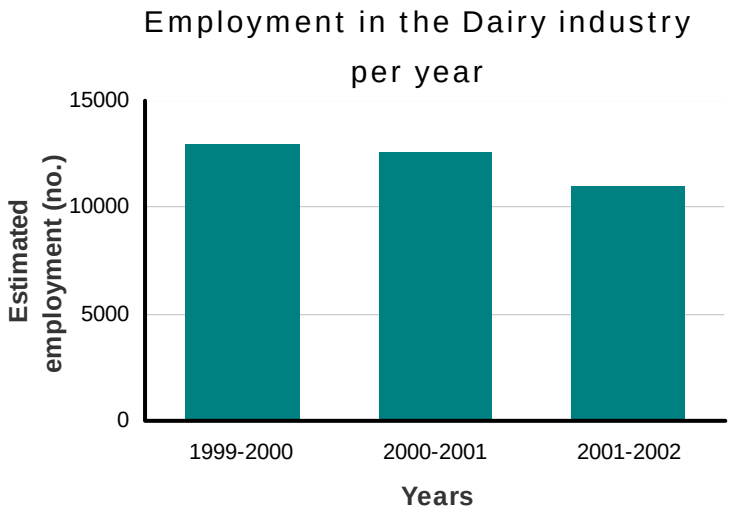
Indicator should remain constant or increase.

Results to date

Between 1996 and 2001 the total number of persons employed in agriculture, fisheries and forestry (AFF) across Australia increased by two per cent. Absolute numbers show that in 1996, 324 068 persons were employed in AFF increasing to 330 510 in 2001

The indicator for this component would ideally be displayed over time. As an example of this indicator we have provided some employment estimates from the dairy industry report by ABARE (2003).

Potential sources of information
ABS Census of Population and Housing: Time Series Profile (1996–2001).
ABS Agriculture census and surveys.
ABS Agriculture census and surveys.
ABARE farm surveys.



Source- Australian Dairy Industry 03.1: productivity and profit (ABARE 2003).

From 1999-00 to 2001-02 the estimated employment in the dairy industry decreased, however 2001-02 data are preliminary estimates and as a result the reduction may not be as substantial.

Possible responses

Increase competitiveness of the food and fibre industry. Increase operational efficiencies and human capital of employees.

Interactions with other components

The change in the percentage of persons employed by agriculture directly impacts on community networks and other human well being indicators and the income derived from food and fibre produce.

External drivers

International and local markets.

Return to component tree: human systems

Human Systems / Local and Regional Communities / Other contributions

Community networks

The contribution of the industry to community networks. Community networks are considered an important factor in determining the well-being of a community. Effective networks are important for communicating information between and among groups and for building trust and transparency within communities

Desired outcome (operational objective)

Maintain or increase contribution to community networks

Indicator

Number of members of Landcare networks

Community facilities
Indicator reported by appropriate units (ie, by individual region, community, town)

Interpretation (performance measure)

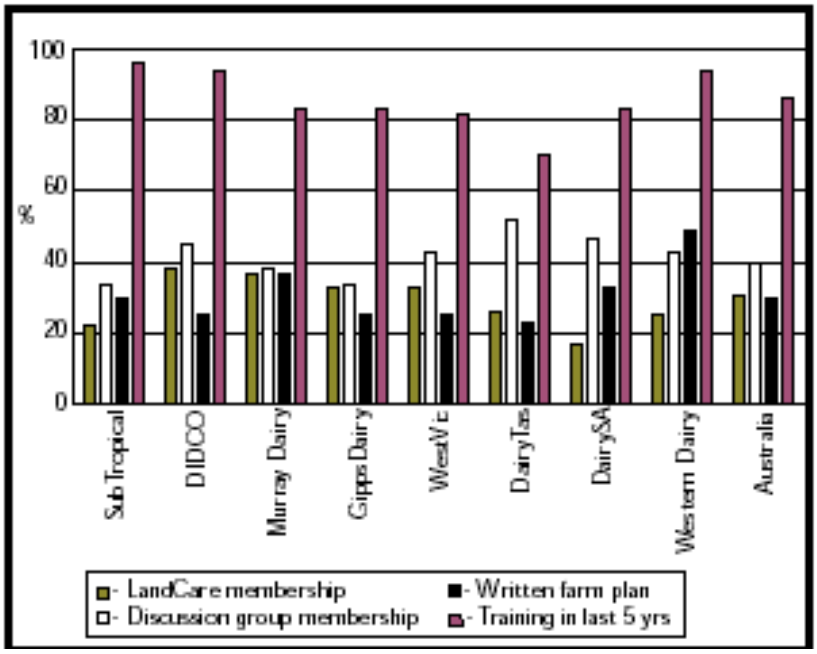
Indicator should be increasing.

(This statement could be formalised to create a performance measure. A standardised performance measure ranging from 0 (unacceptable performance) to 1 (optimal performance) is useful for comparing and aggregating performance across different components.)

Results to date

There are now more than 4,500 Landcare groups across Australia, with nearly 40% of farms reporting membership of a Landcare or similar group (Nelson et al, 2004). Taking account of the flow on effects of Landcare group activity, it is estimated that Landcare is a source of information for up to 75% of farmers (Cullen et al, 2003).

As an example of potential data for this indicator, the proportion of farmers who are members of landcare is provided for the dairy industry (Figure). This is provided nationally (31% participation) and broken down by dairy regions.



Source Sustaining our natural resources- Dairying for tomorrow (2001).

In addition the graph includes data on the membership in discussion groups, development of a written farm plan, and whether they took part in training in the past 5 years. Data was collected through a survey of 1800 dairy producers in the year 2000. Ideally these indicators should be presented over time.

Possible responses

Increase membership of Landcare. Create stronger links between Landcare and industry groups.

Interactions with other components

Any changes in Landcare membership could impact on the quality of the environment

External drivers

Government funding,. Community perception.

Return to component tree: human systems

Human Systems / Industry Participants

Income

The income (or loss) industry participants derive from the industry.

Desired outcome (operational objective)

Income should be positive and non-decreasing over time.

Indicator

Profit at full equity: average per farm

The above is the preferred indicator as identified in the SCARM (1998) report 'Sustainable Agriculture: Assessing Australia's Recent Performance'. Where profit at full equity is not available other indicators have been used, such as:
-Farm cash income
-Farm business profit

These are defined as:
Profit at full equity: Farm business profit, plus rent, interest and finance lease payments, less depreciation on leased items. It is the return produced by all the resources used in the farm business.
Farm cash income: The difference between total cash receipts and total cash costs.
Farm Business Profit: Farm cash income plus buildup in trading stocks, less depreciation and the imputed value of the owner manager, partner(s) and family labor.
ABARE Farm Surveys (2003).

ABARE farm surveys were used as the most detailed surveys of farm income. ABARE uses surveys rather than a census and therefore use a sample of producers. For some industries these detailed analyses do not exist. Other income sources could include ABS Agricultural Census or surveys specific to each industry.

Interpretation (performance measure)

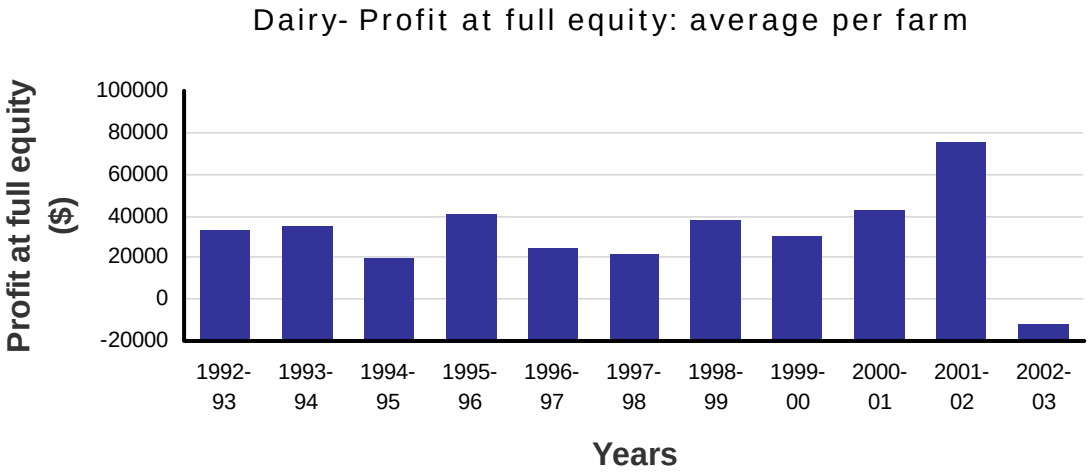
The profit at full equity should be greater than zero and preferably increasing.

(This statement could be formalised to create a performance measure. A standardised performance measure ranging from 0 (unacceptable performance) to 1 (optimal performance) is useful for comparing and aggregating performance across different components.)

Results to date

Profitability for the 1990's has been gradually downwards (CIE, 2002) across agricultural industries as a whole.

As an example of the income of industry participants we have included a graph for the dairy industry.



Source- ABARE Australian Farm Surveys 2003- AGSURF dataset.

For the dairy industry, income for industry participants had oscillated between $20,000 to 40,000 until 2001-02 when it almost doubled to $80,000. The last year is confounded being preliminary estimates and potential impacts of the drought.

Possible responses

Structural adjustment may enhance profitability on average across farms by moving out poor performing farmers. Farm business training can enhance a farmers capacity to achieve profits.

Interactions with other components

Income links to lifestyle benefits from the industry and to employment, as well as to all environmental and social components.

External drivers

Market prices and the value of the Australian dollar can have a big impact.

Return to component tree: human systems

Human Systems / Industry Participants

Human capital

The human capital that resides in the industry participants.

Human capital is the knowledge skills and competencies that individuals develop during their life. Human capital is measured by formal and informal learning and includes competencies such as reading and writing, as well as skills acquired on the job such as the operation of technical equipment. Courses provided by industry and government institutions.

This component needs further subdivision to capture the various aspects of human capital residing in industry participants.

Desired outcome (operational objective)

Human capital should increase over time.

Indicator

Education and training courses

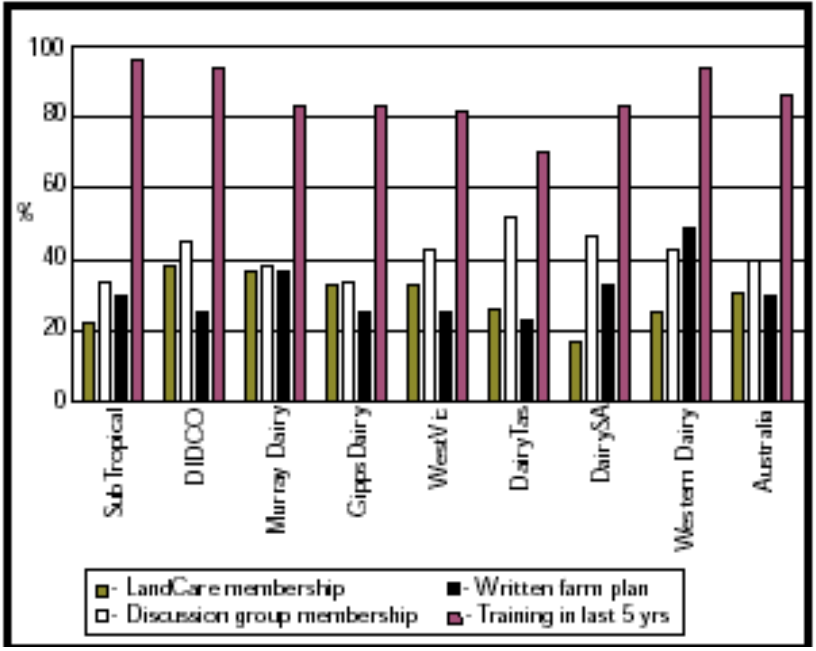
Interpretation (performance measure)

Indicator should increase over time.

(This statement could be formalised to create a performance measure. A standardised performance measure ranging from 0 (unacceptable performance) to 1 (optimal performance) is useful for comparing and aggregating performance across different components.)

Results to date

As an example of potential data for this indicator, the percentage of farmers who took part in training in the past 5 years has been provided for the dairy industry. Ideally, this would be extended in the future to include formal education (Figure).



Source Sustaining our natural resources- Dairying for tomorrow (2001).

The proportion who have participated in training are displayed as the pink bars. Data was collected through a survey of 1800 dairy producers in the year 2000. Ideally these indicators should be presented over time. In addition the graph includes data on industry participants membership in discussion groups, landcare membership, and development of a written farm plan, as stated earlier.

Possible responses

Many government programs are aimed at increasing the knowledge and skills of industry participants.

Interactions with other components

Any changes in human capital impacts on the capacity to produce food and fibre income.

External drivers

Universities, research and development agencies

Return to component tree: human systems

Bio-physical Systems / State of Agricultural Lands

Quantity

The area of land managed by the industry.

Land managed by the industry 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 main role of this component is to provide contextual information that will be combined with information on the quality of agricultural lands to give an overall measure of the natural capital residing in agricultural lands. Its appearance in the tree as a stand alone component is intended to be temporary. When desired outcomes and indicators for other components have been properly defined to take into account quantity as well as quality the quantity component should be deleted.

Desired outcome (operational objective)

No generic desired outcome.

Targets or limits may be specified through state, regional or local planning processes. Ideally, there should be some process that allocates land to different uses in order to provide the greatest long term benefit to society.

Indicator

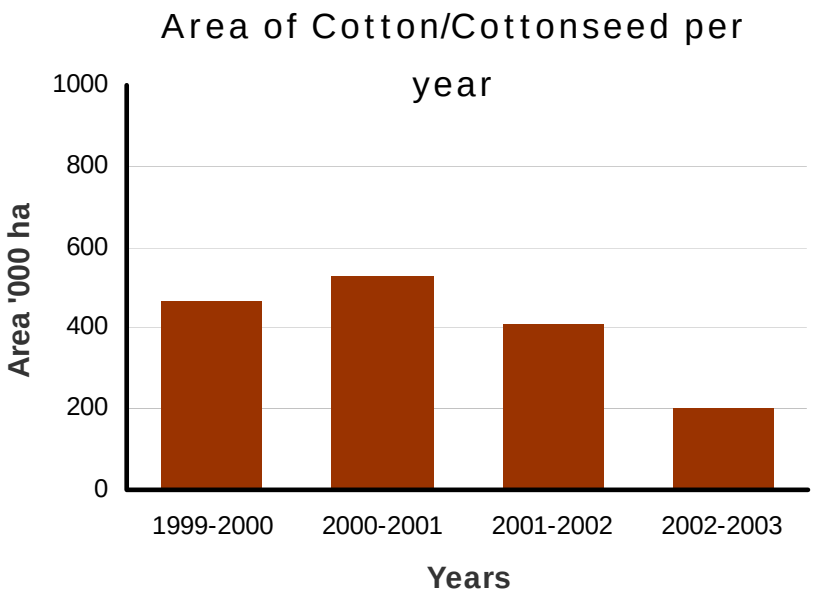
Needs development. Areas attributed to each commodity provide a rough indication but this may underestimate the area of land managed by the industry

Interpretation (performance measure)

This indicator will not be interpreted in its right (ie no performance measure) unless a desired outcome has been specified. It will, however, be combined with other indicators of the state of agricultural land to create performance measures that take into account both quantity and quality.

Results to date

The area occupied by the dairy industry was not obtained but will be sourced through the ABS farm census/surveys. As an example of the type of information that is available we have included a graph of the area in hectares of cotton in Australia.



Source- Australian Agriculture, Fisheries and Forestry At a Glance 2003.

From 1999-2000 to 2001-2002 cotton occupied over 400,000 ha, but this halved in 2002-2003 mainly due to the drought and water shortages. This does not necessarily mean that land managed by the cotton industry declined by the same amount. Results, earlier than those displayed in this graph, show the total area of cotton (ha) increased substantially over the past ten years.

Possible responses

No direct responses unless there is a desired outcome. Intensification and efforts to improve production /ha are examples of attempts to increase the ratio of benefit obtained per area of land used. This may result in an increase in net benefit or a decrease in area of land producing the same net benefit.

Interactions with other components

Changes in the area of land managed are likely to affect almost all other components to some extent.

External drivers

Competition for land use. Public perceptions of the industry. Market value.

Return to component tree: land

Capacity to produce food and fibre / Soil /Soil chemistry

Acidity

Soil acidification is the accumulation of acid in the soil.

Soil acidification is a natural process which, in natural ecosystems, operates over many thousands of years. However, under agricultural management, acidification can accelerate with the rate of change being detectable over decades.
http://www.nrm.gov.au/monitoring/indicators/soil/acidity.html

Desired outcome (operational objective)

To minimise the area of soil that has undesirable levels of acidity.

Indicator

Average area of land limed by industry participants

Ideally, the indicator for this component would be based on soil pH testing. As this is unavailable for most industries at present, the 'average area of land that was treated with lime' has been used as a surrogate indicator. An alternative indicator could have been average lime sales (Kt) per farm. This provides some indication of the problem of acid soils over time, but it does not cover other treatments for acid soils, such as mulching, revegetating and breaking soil crusts, and may be confounded by farmer income and lime costs. It also does not cover farms which have alkaline soils.

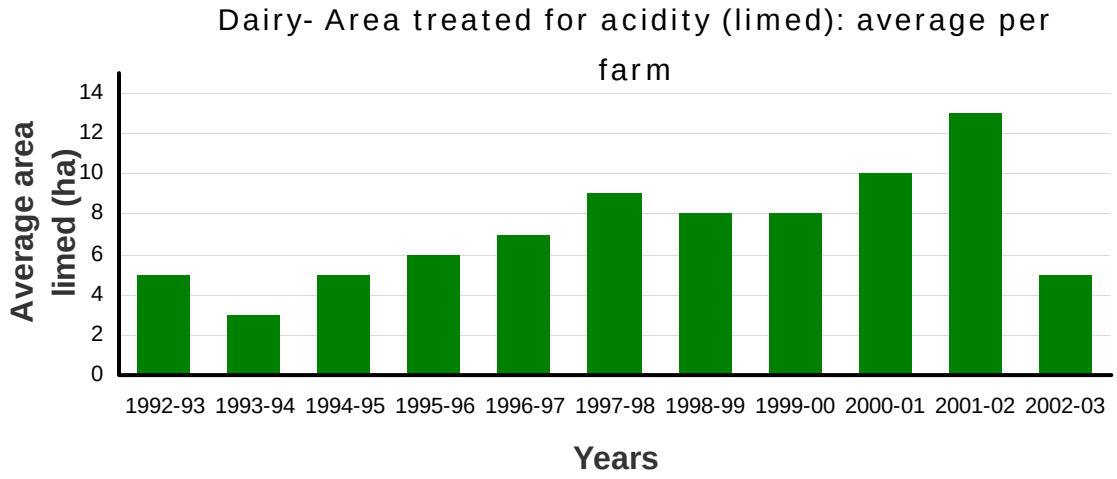
Soil condition is a matter for target in the National NRM M&E Framework (2003) and soil acidification is a recommended indicator.

Interpretation (performance measure)

Interpretation is ambiguous. We assume here that an increase in area treated indicates an increase in the area affected by acidity. However it could also be argued that an increase in area treated indicates a decrease in the area affected by acidity because more farmers are aware of the problem and are taking action to counteract it. An indicator based on soil measurement would be preferable.

Results to date

As an example of the type of information that is available we have included a graph of the average area (ha) treated for acidity (limed) by the dairy industry.



Source- ABARE Australian Farm Surveys 2003- AGSURF dataset.

The average area of land treated for acidity by dairy industry industry participants decreased has risen fairly steadily since the early 1990's. Drought may have affected the area limed in 2002-2003. The importance of acidity to industry participants was also gauged through the report *Sustaining our natural resources- Dairying for tomorrow* (2001), with 33% reporting it as an issue, and 90% of those farmers soil testing and 83% applied lime.

The preferred indicator, soil pH, was collated by the NLWRA for the Australian Agriculture Assessment. The data needs to be combined with land use information to attribute measurements to individual industries.

Possible responses

Breaking the acid scalds to leech acid and salts will enhance revegetation. Mulching scalds and acid soils and revegetating with acid tolerant plants will tie-up acid soils (Woodhead, et al. 2000). Better management of nutrient and carbon cycles by applying fertilizers at appropriate times of year when the plants need it, and to reduce build up in soil. Another method is to apply lime to acid soil areas (NLWRA, 2001).

Interactions with other components

Changes in this component are linked to changes in soil nutrients, acidity in surface and ground water and other (acid water can activate some chemicals).

External drivers

The price of lime.

Return to component tree: land

State of agricultural lands / Capacity to provide other ecosystem services / Biodiversity conservation / Communities and ecosystems

Threatened

The extent to which agricultural lands managed by the industry harbour threatened ecological communities and ecosystems.

Desired outcome (operational objective)

Significant ecological communities/ecosystems are maintained or rehabilitated

This is desired outcome of the National NRM M&E Framework (2003). Other outcomes that relate to this component include:

- Biodiversity and the extent, diversity and condition of native ecosystems are maintained or rehabilitated.
- Ecosystem services and functions are maintained or enhanced.

Indicator

Extent and condition of each significant ecological community/ecosystem on industry lands.

Extent (area in ha) and condition of each significant ecological community are national indicators and matters for targets (National NRM M&E Framework, 2003). Extent could also be measured by presence-absence, or length (river ecosystems).

Interpretation (performance measure)

The indicator should be increasing or maintained.

Results to date

This indicator is not usually measured by agricultural industries. In the report *Sustaining our natural resources- Dairying for tomorrow* (2001), the proportion of farmers who had remnant vegetation was recorded, for the year 2000. The indicator is collated to some extent in the NLWRA and by Department of Environment and Heritage and State agencies for threatened species and communities reporting and State of Environment reporting. However, results are reported for States and regionally rather than industries. As a result the extent of ecological communities on industry land is hard to separate out from the extent on land occupied by other agricultural industries, other industries, other users in the region, or from nature reserves. Similarly if remote sensing is used difficulties also exist allocating native vegetation to specific industries, although techniques for combining land use/tenure with vegetation mapping, may be a way around this. Data collation is being maintained through NVIS and DEH. Some industries do collect this information through NRM surveys, such as the wool and dairy industries, although these surveys are usually once off.

Possible responses

Farmers may often set aside areas for biodiversity conservation under an Agreement with a State (eg wildlife refuges program) or Commonwealth department or with NGOs such as the WWF. Development of Ecosystem Service payments will be an important future mechanism for implementing on-farm conservation of ecological communities. Management practices that combine production with biodiversity conservation such as certain grazing or burning regimes, setting aside of areas for riparian buffers/shelter belts may often be the best mechanisms for achieving biodiversity conservation.

In a survey of the dairy industry 64% of dairy farms have some remnant vegetation, and of those with remnant native vegetation, 36% have fenced off all or most of it (*Sustaining our natural resources- Dairying for tomorrow*- 2001). It in not clear how much of this vegetation is threatened.

Interactions with other components

Often interacts with pests and weeds component and closely with biodiversity conservation of species components. Also links to the Riparian community component, to all water quality components, to soil salinity, and to soil erosion (both through wind and water) components.

External drivers

Changes to legislation on threatened species and communities and listing of new ecological communities.

Return to component tree: land

State of agricultural lands / Capacity to provide other ecosystem services

Carbon sequestration

The amount of carbon that lands managed by the agricultural industry absorb from the environment. The absorption occurs mainly through plants.

Desired outcome (operational objective)

To increase carbon sequestration by the industry

Indicator

Carbon sequestered on agricultural lands.

Alternative indicators:

- Area of vegetation set aside for carbon sequestration.
- Number of plants, by type (eg tree, shrub, grass- annual/perennial) by age.

Interpretation (performance measure)

Larger values of the indicator are preferred. The performance measure could incorporate a target.

Results to date

Information is not available by agricultural industry. The Australian Greenhouse Office has estimated carbon emissions/sequestration across agriculture as a whole (AGO, 2002).

Change in CO2-equivalent emissions and removals for Agriculture, 1990-2002

	1990 Mt CO2-e	2002 Mt CO2-e	Change Mt CO2-e	% Change
Agriculture	95.1	105.6	10.5	11.1%
Land Use, Land Use Change & Forestry	120.4	29.2	-91.2	-75.8%

In the Agriculture sector an increase in emissions from crop production was partly offset by a decline in livestock emissions that was caused by reductions in livestock numbers.

Land Use, Land Use Change and Forestry (Kyoto accounting). The Kyoto accounting provisions take into account emissions from deforestation, and the carbon sequestered in reforestation activities (i.e. plantations) established since 1990.

AGO (2002) *Analysis of Recent Trends and Greenhouse Indicators 1990 to 2002* AGO. Website-http://www.greenhouse.gov.au/inventory/2002/trends/index.html Updated 10 May 2004, Accessed 30/7/2004.

AGO (2004) *Greenhouse and agriculture*. AGO, Website-http://www.greenhouse.gov.au/agriculture/index.html, Updated 8/6/2004, Accessed 30/7/2004.

Possible responses

Carbon credits, may be a useful mechanism for increasing carbon sequestration. Agroforestry is now occurring on agricultural lands. Minimum tillage, reducing burning of stubble/cane, maintaining ground cover, reduced clearing, less use of mechanical instruments (eg tractors), all have an impact on CO2 emissions.

Interactions with other components

This component is directly related to the greenhouse gases component under atmosphere. It may be more convenient to deal with net emissions (ie emissions minus removals) under atmosphere than distinguish carbon sequestration separately.

External drivers

International agreements. Green energy. Agroforestry. Vegetation clearing laws and regulations

Return to component tree: land

Effects on the water cycle / Water Quality / Surface Water / Offsite

Salinity

The salinity that an agriculture industry contributes to surface water.

Salt occurs naturally in surface water, and this component is of most concern when salt concentrations are outside specific bounds. This component is a matter for target in the National NRM M&E Framework (2003), and is specified in the Water Quality Guidelines (ANZECC 2000) and water resources and agriculture reports of the NLWRA (2000 & 2001, respectively).

Desired outcome (operational objective)

Salt entering surface water as a result of industry activities is minimised or maintained below acceptable limits.

This outcome is based upon the Water Quality Guidelines and the NLWRA water resources report. The national high level outcome is: 'The impact of salinity on ... water resources is minimised, avoided or reduced' (National NRM M&E Framework, 2003).

Indicator

Requires development of an indicator that links amount of salt to the industry.

BRS research may provide cost-effective ways to do this.

In-stream salinity as measured by: Electrical conductivity (EC) + Flow, or Total Dissolved Solids (TDS) + Flow (National NRM M&E Framework, 2003).

ABS Agriculture surveys, ABARE Farm Surveys, and RDC industry specific surveys have measured indicators for salinity in agriculture however these have tended to be once off and measure farmer attitudes/responses salinity on-site (rather than off-site).

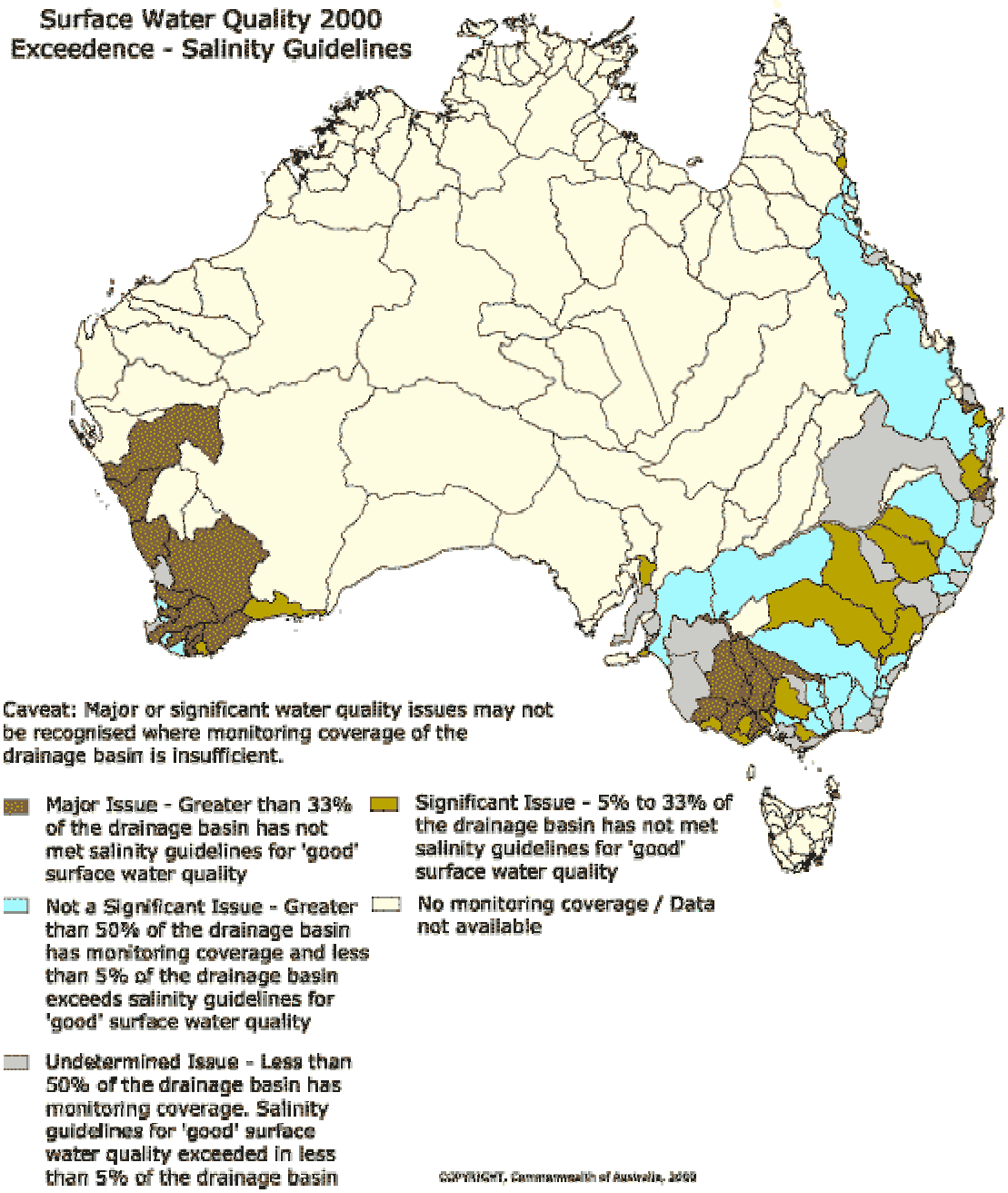
Interpretation (performance measure)

Will depend on the indicator selected.

For general guidelines see ANZECC (2000) aquatic ecosystems chapter which provides EC trigger values for different surface water ecosystems.

Results to date

This indicator is not currently measured for most agricultural industries. The indicator was collated by the NLWRA but results are reported for regions and water catchments rather than industries (Figure). As a result the contributions from a particular industry are difficult to separate out from contributions by other agricultural industries, other industries, other users in the region, or from nature. In regions where one industry dominates, research may be able to tease out the contributions of the industry in this region. Data collation for the NLWRA was a once off, and data is also unavailable for some catchments. A monitoring program could be set up for specific industries, following the ANZECC (2000) guidelines.



Source: NLWRA Australian Water Resources Assessment 2000

Possible responses

Land and Water Australia has been working with agriculture industries, for example Wool, Cotton, and Sugar, and with Research and Development Corporations to develop guidelines for dealing with agricultures impacts on water quality.

Management responses include reducing water tables by planting perennial vegetation, creating buffer zones of perennial vegetation to minimise run off of salts. The importance of soil salinity to farmers was measured through the report *Sustaining our natural resources-Dairying for tomorrow* (2001), 80% of those farmers that reported irrigation induced salinity put in place salinity management responses which may change the impacts of saline runoff on streams and water courses.

Interactions with other components

Examples include groundwater salinity, soil salinity, biodiversity conservation components particularly riparian vegetation, and surface water salinity onsite.

External drivers

For example public awareness of salinity in drinking or surface water. Water table level.

Return to component tree: water cycle

Effects on the water cycle / Water Quality / Surface Water / Offsite / Nutrients

Phosphorous

The phosphorus that an agriculture industry contributes to surface water.

Nutrients such as phosphorus occur naturally in surface water, and this component is of most concern when phosphorus levels are outside specific bounds.

This component is a matter for target in the National NRM M&E Framework (2003), and is specified in the Water Quality Guidelines (ANZECC 2000) and water resources and agriculture reports of the NLWRA (2000 & 2001, respectively). High levels of phosphorus in surface water may cause algal blooms. Changes in phosphorus concentration may cause changes in aquatic vegetation and species diversity.

Desired outcome (operational objective)

Phosphorus entering surface water as a result of industry activities is maintained within acceptable limits.

This outcome is based upon the Water Quality Guidelines and the NLWRA Water Resources Assessment 2000. The national high level outcome is 'Surface... water quality is maintained or enhanced' (National NRM M&E Framework, 2003).

Indicator

Total Phosphorus resulting from industry participants.

Total Phosphorus + flow leaving sub-catchment or whole catchment (National NRM M&E Framework, 2003). Total Phosphorus is a measure that sums the concentration of the major forms of phosphorus including dissolved forms, insoluble particulate forms and phosphorus already incorporated in phytoplankton (NLWRA, 2000). Alternative indicators may include FRP, filterable reactive phosphate (ANZECC, 2000). A surrogate indicator may include the amount of fertilisers applied on agricultural land (eg ABARE Farm Surveys).

Interpretation (performance measure)

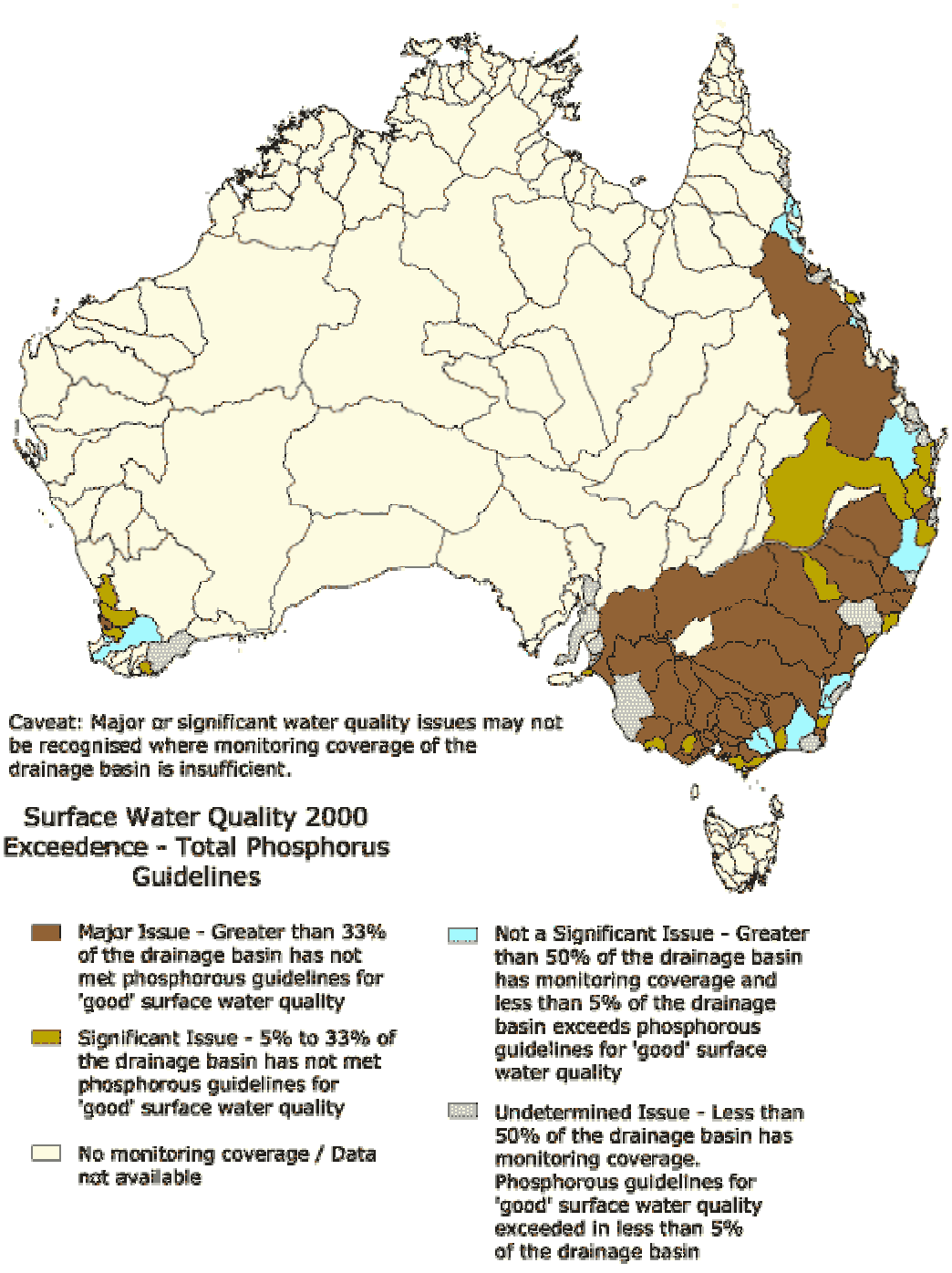
Performance measure could be expressed as proportion of industry participants within water quality guidelines.

For general guidelines see ANZECC (2000) aquatic ecosystems chapter which provides Total Phosphorus trigger values for different water ecosystems.

Results to date

This indicator is not currently measured for most agricultural industries. The indicator was collated by the NLWRA but results are reported for regions and water catchments rather than industries (Figure). As a result the contributions from a particular industry are difficult to separate out from contributions by other agricultural industries, other industries, other users in the region, or from nature. In regions where one industry dominates research may be able to tease out the contributions of the industry in this region (see Table for Phosphorus sources and

sinks in agricultural dominated catchments). Data collation for the NLWRA was a once off, and data is unavailable for some catchments. A monitoring program could be set up for specific industries, following the ANZECC (2000) guidelines.



Source: NLWRA Australian Water Resources Assessment 2000

Total phosphorus budgets (t/yr) for major agricultural regions.

Region	Hillslope (PP)	Gully (PP)	Bank (PP)	Point source (DP)	Run-off (DP)	Floodplain sedimentation (PP)	Reservoir sedimentation (PP)	Export (TP)	Export percent	Times natural
Murray-Darling Basin	10 719	4 387	4 434	124	1 306	16 295	3 977	699	4	2.6
NSW North	987	277	396	5	199	572	10	1 282	7	3.6
NSW South	1 902	667	428	101	283	1 314	279	1 788	9	2.8
Vic East	207	183	216	4	266	303	13	559	3	1.5
Vic West	41	213	174	0	144	285	17	269	1	1.9
WA South	53	1 009	299	146	569	1 254	17	805	4	2.6
Indian	46	342	111	0	81	466	0	115	1	6.5

Source: NLWRA Australian Agriculture Assessment 2001

Possible responses

Land and Water Australia has been working with agriculture industries, for example Wool, Cotton, and Sugar, and with Research and Development Corporations to develop guidelines for dealing with agricultures impacts on water quality.

Erosion control would provide significant reductions in sediment run-off loads, reducing nutrient loads. Appropriate use of fertilisers (including timing) in areas that have high surface water run-off to minimise nutrient run-off. Riparian buffer strips of perennial vegetation should help reduce sediment and water run-off (NLWRA, 2000 & 2001). Point source discharges from intensive rural industries provide an opportunity for managing nutrient run-off by keeping nutrients on-site. The report *Sustaining our natural resources- Dairying for tomorrow* (2001), details management practices relating to effluent (a major potential source of phosphorus particularly for onsite water quality), riparian vegetation, and fertiliser use.

Interactions with other components

Examples include soil nutrients, soil erosion from water, biodiversity conservation ecosystems such as riparian zones, and potential impacts on groundwater.

External drivers

Public awareness of blue green algae incidences. Ecosystem service payments.

Return to component tree: water cycle

References

under development

ABARE (2003) Australian Farm Surveys Report 2003, ABARE, Canberra.

ABARE (2003) *Australian Dairy Industry 03.1: productivity and profit*. Dairy Australia, Melbourne.

Standing Committee on Agriculture and Resource Management (1998) *Sustainable Agriculture: Assessing Australia's Recent Performance*, Vol. Report 70, CSIRO Publishing, Collingwood.