ENVIRONMENTAL INDICATORS COTTON GRAINS AND BEEF

Final Report

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1.0 EXECUTIVE SUMMARY

A set of Environmental Performance Indicators (EPIs) have been developed that provide a means of scoring soil health; water quality; biodiversity, industry health; and carbon emission performance of an enterprise.

The soil and water indicators can be used to translate changes in practice to changes in soil and water resource conditions while biodiversity indicators provide a semi-quantitative indication of vegetation and riparian condition. The carbon emission indicators are included in recognition of greenhouse gas emissions being a new issue that requires development of understanding. Industry health has been included to provide a gauge of an industries commitment to environmental management.

The proposed EPIs have been compared to and are consistent with those being proposed by the beef and grains industries in their respective NRM programs. In addition, the proposed EPIs reflect the objectives of several NRM bodies.

Initial assessment of the EPIs and the use of indicators in general has indicated that even simple indicators (e.g. soil cover) are much harder to use in the real world due to spatial and temporal variability. It is evident and growers do not regularly collect quantitative estimates of inputs or outputs. From a grower's perspective the primary measure of NRM performance is based on maintaining farm productivity and profitability. This knowledge gives an indication that it will be difficult to establish new or formal indicators unless there is a) a direct and immediate benefit to the grower; b) the process is simple and rapid and c) training and support is available to demonstrate benefits.

A system for collation and spatial aggregation of EPIs is required for reporting at catchment, region and industry scales. Currently there are several related activities involving electronic capture of performance indicators. This dispersion of effort across industries will require some rationalisation if there is to be wide spread adoption of environmental performance measurement and reporting.

Web based Cotton Greenhouse Gas and Irrigation WUE calculators have been proposed as simple tools for estimating carbon emissions and WUE. These tools need to be further developed to be more educative. Currently, the logic behind calculations is not readily accessible, and the ability to learn about management options to improve on-farm management is limited as a result.

While a set of EPIs has been developed, a range of approaches is required to demonstrate NRM credentials including; random stratified surveys, establishment of reference sites as benchmarks, monitoring of sentinel sites, remote sensing and publication of case studies. A range of approaches is required to support communication of an industry's environmental management, with different audiences requiring different styles of information.

Key Recommendations

1. Validating the scale for which indicators need to be measured.

The challenge is to attain a balance between grower, industry and high level measurements of environmental performance. A system for collation and spatial aggregation of EPIs is needed for reporting at catchment, region and industry scales.

2. Developing clear benefits for growers to use EPIs

Cost benefit assessment is an essential component in determining the benefits for using EPIs. Growers recognise the importance for industries to report on their environmental performance. However linking EPIs to net benefits for growers is important if adoption is going to occur.

It is recommended that the proposed EPIs and assessment worksheets are trialed further across the cotton industry and that the beef and grains industries as well as NRM regional bodies are further engaged to facilitate collaboration in monitoring efforts.

3. Establishing web based reporting systems that integrate cross industry outcomes

The development of EMS or BMP guidelines for various industries would benefit if they were supported by an integrated or even a single data recording and reporting package. Such a package could incorporate decision support tools developed for EPIs, (greenhouse gas, water use efficiency, energy use, biodiversity etc). This would also allow individual comparative analysis to be more effectively completed but also assist with compilation of data for industry reporting.

2.0 INTRODUCTION

During the last decade, the cotton industry has approached EMS through the development of Best Management Practices which forms a comprehensive set of guidelines to help cotton growers identify and manage the areas of their farms that carry risks to the environment and human activities. These guidelines are incorporated into a manual which also includes the BMPs summarised within self-assessment worksheets for key farm activities that enable risk assessments and action plans to be developed. Cotton growers can choose to have their compliance with BMPs, including meeting regulatory and industry standards, assessed by an industry expert or audited by a qualified environmental auditor. Participation in the BMP program is voluntary. Current participation in the BMP program is almost 40 percent of cotton farming entities.

Over the last five (5) years the industry has introduced a range of modules to its BMP program. The most significant module developed is related to natural resource management, known as the 'Land and Water Management' module. It contains guidelines for the management of soil, water and biodiversity.

While the base criteria for natural resource management on any farm land will be that required under either state or commonwealth legislation, BMP guidelines also allow industry to promote higher or aspirational standards of farm management.

While compliance with BMPs is a good measure of management standards it does not provide a strong measure of resource condition or performance. Therefore the development of suitable environmental performance indicators would not only assist growers better understand the impact of their management as land owners, but would also improve how an industry as a whole is able to report on its environmental performance.

2.1 PROJECT OBJECTIVES

The overall objective of supporting the development and adoption of EMS is to support the sustainable use and management of Australia's land, water and marine resources, and to maintain and improve the productivity and profitability of producers. EMS pathways initiatives were established to encourage partnerships with industry bodies and regional groups that will lead to the broad uptake of environmental management systems approaches by producers.

The project "Environmental Indicators Cotton Grain and Beef" was established under the EMS Pathways to Sustainable Agriculture" program with the key objectives:

- To develop a set of Environmental Performance Indicators (EPIs) for cotton production that can be used by growers and the industry to demonstrate and report on sustainability and environmental performance;

- To develop a set of EPIs for cotton production that are consistent with, and (where applicable) common with the indicators being proposed by the beef and grains industries in their respective NRM programs; and

- Build a set of cross-industry EPIs that will enhance the adoption of sustainable farming practices, reduce the administrative burden on Catchment Management

Authorities, and build a framework for continued collaboration on the identification and determination of appropriate EPIs for multi-enterprise farms.

The Australian cotton industry is the key focus of this project. Project deliverables also link with the grains and meat industries (which are often companions at the enterprise level) as well as two catchment groups (Condamine Alliance in Queensland and Namoi Catchment Management Authority in NSW) who have key roles in NRM investment and reporting.

Importantly it is hoped that the EPIs will provide a relatively simple structure for reporting industry environmental performance, one that uses existing information and establishes robust relationships between management action targets (MATs) and environmental outcomes (e.g. water quality). Once established, regular updating and reporting would need to be efficient in order to provide the industry with a simple environmental benchmarking and reporting system.

2.2 METHODOLOGY

Before developing a set of indicators it was important to understand current approaches taken to measuring environmental performance across the various industries and groups so that key theme areas for EPIs could be developed in recognition of cross industry objectives.

Where possible, the worksheets developed to measure EPIs have used the existing framework established within the Cotton BMP Manual.

2.3 METHODOLOGY FOR SELECTING INDICATORS

Five elements were chosen to describe the status of natural resources specific to cotton production areas:

- Soil and landscape health;
- Water;
- Biodiversity or nature;
- Industry health; and
- Carbon emissions.

Land, water and biodiversity represent the more traditional categories of natural resources. Carbon emissions has been added because of the increasing emphasis being given to greenhouse gases and potential climate change forces, while industry health is an enabling requirement that underpins the capacity to manage natural resources. There are strong interdependencies between these elements.

Initial EPIs were developed for each of these five main elements through a background search of available literature including the comprehensive Cotton BMP Manual. This provided a starting point for further discussion with cotton and grain industries support personnel and farmers through workshop processes and discussion.

Potential indicators were then further assessed through a qualitative process of evaluation. The main factors / criteria considered in the evaluation and selection of each indicator included are shown in appendix 1a.

2.4 METHODOLOGY FOR EVALUATING INDICATORS

An initial set of draft indicators was developed following consultation of key growers within the cotton industry and representatives from the Condamine and Namoi NRM groups. The draft indicators were then modified after consultation with the project steering committee.

An initial draft set of indicators was assessed by interviewing two growers who operated a range of enterprises.

Upon development of the revised draft indicators where evaluated through:

1. A written survey with key industry groups
2. Consultation meetings with Grains and Beef Industries
3. Consultation meetings with various NRM groups

In addition six industry support staff including field staff from catchment management groups were consulted on the indicators to gain feedback based on their experiences in promoting BMP and similar NRM programs for the industry. Four staff were then more extensively briefed on the indicators so that they could evaluate them with growers.

A final draft version of the indicators was developed and assessed in the field by interviewing 12 growers who managed multi-enterprises farms.

Subsequent to the field assessment the indicators were once again circulated to key NRM groups and Beef and Grains industry for comment.

3.0 ACHIEVMENTS

3.1 ENVIRONMENTAL PERFORMANCE INDICATORS

The major outcome from the project was the development and initial field assessment of a set of environmental performance indicators. The indicators and related Worksheets and data summary sheet attached as Appendix 1.

Development of the indicators support the three core objectives of the program.

Capacity Building and Linkages:
The indicators have focused in improving collaboration across industries and NRM groups. Comments related to interactions across each stakeholder group is given below.

In developing the indicators current approaches taken to measuring environmental performance across various industries and groups were assessed. Some of the key approaches being taken by other industries are highlighted in Appendix 1b.

Uptake:
The indicators provide the framework for industry assessment of it environmental performance. While it was not a specific objective of the project to promote adoption of the indicators, CRDC will continue to work with Cotton Australia to seek their integration with the revised version of the industry's BMP program.

Core aspects of indicators developed from project

A description of the indicators is shown in the Table 1.

TABLE 1 ENVIRONMENTAL PERFORMANCE INDICATORS

SOIL HEALTH	WATER	BIODIVERSITY / NATURE	INDUSTRY HEALTH	CARBON EMISSIONS
S1: % soil cover during period of high runoff risk	S1: % soil cover during period of high runoff risk	B1: Length of riparian vegetation managed and scored	I1: Individual's contribution to industry health	C1: Energy use and CO_2 flows better understood
S2: Adoption of water management plan	S2: Adoption of water management plan	B2: Area of natural vegetation managed and scored	I2: Individual's assessment of industry health	C2: Carbon Calculator (t CO_2e/ha for all production components)
S3: Adoption of nutrient budgeting (nutrients in = out)	W1: Water quality risk assessment is carried out	B3: $ spent on NRM issues		C3: Energy use Efficiency (EUE)
S4: Water Use Efficiency (WUE) (production/ha/mm)	S4: Water Use Efficiency (WUE) (production/ha/mm)			

3.2 STRENGTHENING CAPACITY

Strengthening linkages with Cotton Industry

The indicators developed as an outcome of this project were achieved through consultation with the peak cotton grower bodies, the Australian Cotton Growers Research Association and Cotton Australia. Through this interaction the industry is aware of the indicators and has had direct input into their development.

Strengthening linkages with Grains and Beef Industries

A core objective of the project was to develop collaborative links with key representatives from the grains and beef industries so that any environmental indicators developed would be align with objectives of these industries.

Interaction with these industries has proved more challenging than expected. In part this is due to the different stage each industry has reached in the development of their NRM/environmental programs. For example, the grains industry is currently only at the drafting stage of its own 'Environmental Plan'. Nevertheless, representatives developing the grains plan have indicated that the five core themes for the environmental performance indicators associated with this project align well with their industry objectives.

It is apparent in the short-term that each individual industry will continue to develop their own environmental guidelines and plans. However, the framework established within this project on 'Environmental Performance Indicators' will now provide a platform for future engagement and dialogue with the grains and beef industries regarding whole of enterprise performance measures and reporting.

As all cotton growers are also grain growers and many are also beef producers, it is important that any environmental performance indicators developed can be used to meet the most significant environmental outcomes sought by all industries. As a result of this project, this aspect can now be investigated further in the future as the grains and beef industries finalise their environmental plans and programs and the cotton industry revises its BMP program.

Strengthening linkages with NRM groups

In developing environmental indicators, a comparison was made between natural resource management targets established by catchment management groups in Queensland and New South Wales, and existing guidelines within the Land and Water management module of the BMP program.

The objectives of aligning any performance indicators with those developed by catchment management groups was to ensure that growers' achievements in land and water management would be recognised as contributing to broader NRM targets as aspired to by catchment groups.

Two catchment management groups in key cotton producing catchments were engaged in developing the indicators: the Namoi Catchment Management Authority in NSW and the Condamine Alliance in Queensland. Following initial development of indicators by

industry in consultation with these catchment groups, further evaluation of the indicators was made by contact with the Gwydir Catchment Management Authority in NSW, Fitzroy Basin Catchment Management Committee and the Murray Darling Basin Committee in Queensland.

Gaining feedback from catchment management groups proved challenging. While all groups had developed natural resource management targets, alignment of indicators to be used by individual growers against such targets proved to be the most difficult issue. Agreement between catchment groups on suitable targets was also not a straightforward task despite the generic nature of each indicator.

However, through the consultations with the catchment groups, two key indicators that were not included in the initial draft were subsequently developed. These were indicators for industry health and greenhouse gas emissions/energy use.

The cotton industry had already predicted the need for greater assessment of greenhouse gas emissions and energy use and a number of research projects were initiated to develop tools for monitoring these key environmental indicators. The development of an initial on-line calculator for greenhouse emissions has occurred and an on-farm energy use calculator has been developed and used to assess and compare energy use on seven case study farms.

The concept of measuring "industry health" has not previously been considered in industry programs like cotton BMP. In relation to natural resource management, the indicators developed in the project for industry health are broad measures of capacity and include "Individual's knowledge" of how to improve environmental and production outcomes, and how to recognise key risks to the environment. Reportable measures include adoption of the industry's BMP program and developing an industry report on environmental performance. Further consideration of measuring individual farm manager's knowledge is warranted following a successful project completed recently under the Queensland Farmbis program which was able to achieve, through recognition of prior learning methods, Diploma of Agriculture status to managers of cotton BMP certified farms.

4.0 ADOPTION AND UPTAKE OF INDICATORS

The core objective of the project was to develop a set of environmental indicators that could be used across the cotton industry and multi-enterprise farms. The project has been successful in developing the first set of indicators.

While initial assessment of the draft indicators has been achieved through consultation with industry and catchment management groups as well as limited field testing with selected growers it was not an objective of the project to promote the indicators for wide scale adoption.

Draft EPIs were developed based on the range of instruments available. However, as the industry's BMP program is seen as a key mechanism for promoting the use of the EPIs across the cotton industry and NRM bodies that support the adoption of BMP, the EPI's where designed to be compatible with the current BMP manual.

In testing the EPIs a prototype worksheet was used with a small group of growers as a preliminary reality check and to explore whether they were useful and palatable. The simple answer was; "possibly" but "what's really in it for me as a producer" was a common refrain. This question remains a primary concern for the development of any indicator, particularly environmental indicators which require measurement over the long term or have a broader perspective than farm scale. At this stage, the EPIs have been tested with ~12 growers, 3 CMAs, and 6 industry support officers. The worksheets developed for the indicators have been through 6 significant review iterations.

Conclusions drawn from these pilot activities were:

- *Environmental performance indicators (and production indicators) that are not currently being used by growers will be difficult to establish as many decisions are already made using a wide range of intuitive signals;*

- *Even simple indicators (e.g. soil cover) are much harder to use in the real world due to spatial and temporal variability;*

- *Few growers have quantitative estimates of indicators such as calculating WUE, except in its grossest sense. The process of establishing new or formal indicators will be difficult unless there is a) a direct and immediate benefit; b) the process is simple and rapid and c) training and support is available to demonstrate benefits;*

- *Growers were wary of qualitative self assessment as a process, believing this would yield biased data. There was a belief that the lower performers might have an unrealistic view of their performance.*

- *Discussions around evaluation activities were lively, suggesting that the EPI framework maybe useful for structuring a more open discussion on environmental performance. A range of approaches will be needed to gauge an industry's environmental performance*
- *A half day 'train the trainer' exercise is sufficient for trainees to become comfortable in using the EPI worksheets with growers;*

- *Assessing behaviour that is well linked to an environmental outcome is likely to be the most valuable process for gauging performance as it is rapid, can be done retrospectively, is linked to people's beliefs and behaviour and deals with variability better than quantitative approaches.*

To better understand the value of the indicators to growers a small project was initiated to assess the type of economic, social and environmental outcomes that may be achieved from a grower's perspective if they adopted them. In doing this, the EPIs were assessed as farm performance indicators. Initial grower feedback from the pilot group interviewed in this project was that the EPIs were perceived to provide limited benefits directly to them as landholders. Overall these growers perceived that industry and catchment management groups would benefit the most from grower adoption of the indicators. *(Note: Final assessment of the benefits of the indicators will be completed in July and a supplementary report will be submitted)*

These initial results show growers may be wary of qualitative self assessment as a process for measuring production and environmental performance. In addition, it needs to be recognised that the EPIs are not currently being used by growers and it may be difficult to establish their use because many decisions are already made using a wide range of knowledge, experience and intuitive signals. Consequently, a range of approaches may be needed to gauge environmental performance. For example, consideration could be given to tracking attitudes and behaviours that are known to be well linked to environmental outcomes.

5.0 PROJECT HIGHLIGHTS

5.1 INDICATORS

The project has successfully developed a range of simple EPIs which are relevant to mixed farming enterprises involving cotton and grains or cotton, grains and beef production. These EPIs cover the key areas of soil and landscape health, water and biodiversity. Catchment/NRM groups have encouraged the addition of EPIs would allow carbon emissions and industry health, via the capacity to identify, and manage environmental risks, to be reported. The EPIs have been assessed on 12 mixed enterprise farms.

5.2 INTERACTIONS

Interactions have involved the cotton, grains and beef industries including: cotton, grains and beef enterprises, developers of cotton, beef and grains environmental programs and several catchment management/NRM groups. The EPIs thus provide a good foundation for ongoing communication, discussion and collaboration opportunities between these industries and catchment/NRM groups.

6.0 FUTURE PATHWAY

6.1 EMS WITHIN THE COTTON INDUSTRY

The cotton industry considers that its' BMP program is an EMS. The industry is currently revising the BMP program. The need for revision comes from the recognition that, despite significant efforts to encourage uptake, a majority of cotton growers have elected not to be formally involved in the BMP program. Growers give many reasons for non-involvement, but lack of a clear need or driver, difficulty in seeing value to their business and a process that is seen to be too demanding on their time are among the most common.

Future testing and promotion of the EPIs is planned. It will be associated with the review of the cotton BMP program. It should be noted, however, that while incorporation of the indicators into the BMP program is recommended, it is not essential for those growers who may continue to choose not to participate in cotton BMP or other industry environmental management programs. The indicators have been designed to be generic and used across any farm (cotton, grains and beef) and could be promoted as a simple mechanism for measuring and reporting environmental performance at farm enterprise level.

Appendix 1a.

The main factors / criteria considered in the evaluation and selection of each indicator

1. Relevance

A key attribute of an indicator is that it should be relevant to the land manager. A measure has to provide feedback to management to be effective. An indicator, if well linked to an environmental outcome, can also be used to report on progress at the local, industry and catchment scale. While a land manager may not be the person who makes the assessment (ideally they should be), any measure needs to support management, else it will be unhelpful, will not be recorded in the long term, and thus be ineffective as a long term measure of performance.

2. Practicality

Considerations included:

- The feasibility of measuring the indicator;
- Simplicity and practicality, focusing on those indicators that can be assessed by growers or their advisers, and have direct production and environmental impacts;
- Having flexibility to accommodate different styles of enterprises (e.g. dryland vs. irrigation);
- Costs;
- Time taken to measure the indicator;
- Potential for surrogate measurement (i.e. can the measurement be a proxy for an indicator requiring significantly more time, budget and skill to measure); and
- Level of skill required (including the use of specialist for identification or data analysis); or training required if staff are unskilled).

Indicators are considered practical if they are not expensive to measure and data is easy to analyse.

3. Measurability

This includes the technical and scientific value of the indicator and its ability to provide scientifically valid results which can be easily measured and interpreted: Good indicators will have a well established relationship between the indicator and the value(s) of concern.

4. Usability

This refers to how useful the indicator will be in providing guidance on how a resource can be more effectively managed. How will the indicator contribute to management decisions?

5. Complementarity

This refers to how the indicator articulates with existing environmental management processes particularly the Cotton BMP Manual, Grains Australian Farming Practices Database, MLA/AWI Landleader, Condamine and Namoi Catchment NRM Plans and LWA Dashboard Project.

The EPIs proposed are not as comprehensive as many other 'lists' of indicators available, but the list is designed to be more acceptable and usable by industry and catchment groups to benchmark and report on their performance.

Appendix 1b.

CURRENT ENVIRONMENTAL MANAGEMENT APPROACHES

A key objective of this Project is to develop a set of EPIs for cotton production that are consistent with and where applicable, common with the indicators being proposed by the beef and grains industries. To achieve this, the following sections summarise the current environmental management schemes and systems of the beef and grain industries in Australia. In addition, NRM approaches for the Condamine and Namoi Catchments have also been examined as their respective catchment bodies have key roles in NRM investment and reporting in significant cotton production areas.

1. GRAINS AND MEAT INDUSTRIES

Current environmental management approaches for the grains and meat industries generally reflect a shift towards developing, documenting and implementing best management practices. Both industries are in the draft stages of developing and documenting management practices and performance indicators for relevant environmental aspects.

2. LANDLEADER – BEST PRACTICE FOR A BETTER FUTURE

The draft "Landleader" Australian Grazing Industry Stewardship Questionnaire seeks quantitative information directly from graziers on issues ranging from soil and animal health to industry ability to monitor and manage natural resources. The ~110 questions can be responded to in one hour. Questions are generally evenly split between the main elements of industry health; soils and water; animal health; and nature. Other environmental elements touched on include weeds / pests, chemical use and green house emissions. A database is being constructed to capture this data for analysis and to provide individual feedback to graziers and aggregated information to industry.

The environmental elements identified for this Project are adequately covered by the "Landleader" questionnaire with the exception of green house emissions (referred to as carbon emissions for this Project). The proposed carbon worksheet provides a quantitative assessment of carbon emissions and energy efficiency whereas this element is addressed qualitatively in the "Landleader" questionnaire. Additionally, nearly one quarter of the "Landleader" questions are related to animal health and are not relevant to the cotton or grains industry.

The proposed worksheets are considerably more simplistic than the "Landleader" questionnaire, often using one or two pertinent questions to obtain a broad understanding of the management or condition of the environmental element. Each worksheet uses the minimum number of questions to capture the essence of each element making them easy to use and more likely to be used.

3. Optional Environmental Stewardship Module (Draft)

The meat industry identifies five environmental elements and associated performance indictors in their draft "Optional Environmental Stewardship Module". Listed environmental elements include: land use and management; biodiversity; water and soil; feral animals and weeds; and greenhouse gas and energy efficiency. Draft performance indicators are generally worded as actions rather than indicators and do not really provide a means for comparison of current environmental conditions with set benchmarks. However, indicators could be fairly easily reworked to provide a more meaningful contribution to best management within the meat industry.

4. AUSTRALIAN FARMING PRACTICES DATABASE (DRAFT)

Communications from the grains industry indicate that environmental aspects and benchmarks are currently being developed. Several environmental aspects are identified in the draft "Australian Farming Practices Database", including: industry health; soils; water; pest management; and native vegetation.

The database uses ~40 quantitative measures for assessing farm environmental impacts and reporting on performance against industry benchmarks. The environmental elements identified for this Project adequately covered by the "Australian Farming Practices Database". The proposed worksheets are to some extent more simplistic than the "Australian Farming Practices Database". As stated above, each worksheet uses the minimum number of questions to capture the essence of each element making them easy to use and more likely to be used.

5. BMP GRAINS (DRAFT PESTICIDE APPLICATION MODULE)

BMP grains is an initiative of the Queensland Department of Primary Industries, AgForce and the Fitzroy Basin Association and aims to help grain growers identify improved practices leading to more profitable and sustainable enterprises. A draft of the first of five modules has been released for testing.

The first module has 25 questions covering all aspects of application of agri-chemicals and is designed to be able to be completed in a 2 hour session. It has a similar level of comprehensiveness to the Cotton BMP and uses a three level self assessment (below, minimum and above compliance for each criteria) similar to the Victorian Dairy Self Assessment Tool (DairySAT).

The proposed worksheets are much simpler than the approach adopted in BMP Grains and these issues are covered mainly in the Water Quality and Industry Health sections. As stated above, each worksheet uses the minimum number of questions to capture the essence of each element making them easy to use and more likely to be used.

6. FARM SUSTAINABILITY DASHBOARD

Land and Water Australia, working with a group of 12 farmers have developed a set of questions that are presented as a set of 'gauges' on a computer 'dashboard' describing the status of environmental, social and financial aspects of a farm business. Questions within the environmental theme are well aligned with those proposed in the project.