

## Appendix 5 Case Study D: Monitoring and Evaluation for Sustainable Agriculture

### Guidelines for MER in regional NRM

Monitoring, evaluation and reporting of the outcomes of investment through the regional NRM model in Queensland cascades through three tiers to meet reporting and management requirements at regional, state and national levels. In the regions, MER is guided by:

- the National Framework for Natural Resource Management Monitoring and Evaluation (DEH, 2003); and National Framework for Resource Management Standards and Targets (DEH 2003)
- Queensland's Monitoring and Evaluation Implementation Plan (NRM&E, 2004); and
- the accredited regional NRM plan.

The National Framework is structured around four output areas:

- **Outcomes** – change in regional resource condition, derived from progress towards regional resource condition targets
- **Intermediate outcomes** – achievement of management or capacity building activities which contribute to resource condition change, derived from progress towards management action targets
- **Outputs** – goods or services delivered through the regional planning processes which achieve management action targets
- **Investment** – financial investment in the regional planning process and its implementation.

The major MER responsibilities of the regional bodies are set out in the Framework:

- Regional bodies will be accountable for, and will need to report against the progress of management action targets
- Regional bodies are responsible for measuring progress towards resource condition targets, although this should focus on the effectiveness of management and capacity building actions
- Queensland Government has responsibility for monitoring some resource condition and trend across the State
- Regional bodies will not be held accountable for change, or lack of change, in natural resource condition and trend.

The focus on the short-term management actions provides an opportunity to begin the process of improving catchment health, demonstrate efficiency and effectiveness of the planned activities and promote natural resource management successes.

Queensland's Monitoring and Evaluation Implementation Plan outlines the state's natural resource management monitoring, evaluation and reporting framework. The framework focuses on the measurement and assessment of:

*“condition and trend in land, water, vegetation, biological and cultural resources, and landscape health, and performance of programs, strategies, policies and structures which support and promote sustainable use, conservation and rehabilitation of these resources” (NRM&E, 2004).*

The Implementation Plan sets out the structure, timing, reporting categories and roles and responsibilities at the regional, state and national levels.

Recommendations for regional body monitoring, evaluation and reporting activities in Queensland are:

- The identification of Australian, Queensland, and Local Government monitoring programs and information sources and the development of links and information sharing agreements
- Monitoring natural resource condition at the local and regional level, with the initial emphasis on collecting baseline and trend data sufficient for target setting
- Monitoring of management action targets, outputs and activities linked to natural resource condition
- Monitoring resource condition at the local and regional level to measure change in condition and trend

### **Monitoring, evaluation and reporting systems in general**

In their regional plans, most of the regions undertake to develop a formal monitoring, evaluation and reporting system (MER). The plans generally include a fairly comprehensive chapter setting out operating principles for MER and a basic framework. These vary considerably but in broad terms they adopt the logic of the Queensland and national policy guides for reporting against national indicators.

The regions report regularly on performance against their regional plan targets. At this stage, they are primarily reporting on progress towards MATs. Reporting on RCTs is still very patchy, generally qualitative and mostly at low confidence levels. The focus is on monitoring and reporting and there is still comparatively little evaluation taking place - although several regions have successfully integrated their progress reporting into catchment condition reports, state of the region reports, thematic snapshots, etc. There would be significant benefits for most regions from rationalising the targets to achieve fewer, more meaningful targets that tell more about what they are getting for their investment.

Progress towards development of a formal system is variable and most regions operate at a program specific level of MER. But there has been significant progress in several regions that is yet to be formalised. Some are testing new approaches to logic and reporting (e.g. Monitoring, Evaluation, Reporting and Improvement - MERI) and others are formulating MER frameworks and carrying out capacity building in MER.

The new Monitoring, Evaluation, Reporting and Improvement (MERI) approach, that incorporates program logic, is proving useful for setting and testing the logic of target setting and for articulating the linkages between different investment streams and different timeframes. It helps to identify intermediate targets that are better linked to the longer term RCTs. Once the logic is established, it will be easier to aggregate results in time and

spatially. The Most Significant Change (MSC) approach, which is utilised in some regions, provides an evaluation process that is easy to relate to and is engaging. The performance stories which may incorporate MSC can help to provide evidence of change and trends linked to investments and behaviour. However, statistics such as those collected by ABS on adoption and practices are also needed along with better, more consistent resource condition trends monitoring (targeting specific investment streams) or stronger science-based linkages between practices and resource base condition coupled with good monitoring of adoption.

The MERI approach is one part of the solution to the problems encountered in the regions in trying to move from monitoring to evaluation and from performance assessments to assessing likely outcomes and returns on investments. Most regions will also find it necessary to carry out less intensive but quantitative monitoring of surrogates and intermediate targets that are easily measured and closely linked to longer term RCTs.

### **Sustainable agriculture**

Sustainable agriculture features prominently in the goals and objectives of all of the Queensland agricultural regions. In these regions, much of the investment in NRM is directed to programs to encourage development and adoption of sustainable management practices. These investments in the east coast agricultural regions is driven by dual objectives relating to:

- Sustaining the agriculture production resource base
- Protecting the Great Barrier Reef including from agricultural runoff

The regions do report on milestones and MATs in programs and projects aiming to achieve sustainable agriculture in relation to the resource base and the reef. These reports can tell us a lot about progress but they don't give a comprehensive picture of impacts and benefits for the resource base.

There are significant capacity barriers and methodological bottlenecks in the system of MER, which requires the regions to report against RCTs:

- The regions rely on other agencies for the data and have no control over how or what is collected
- The scale of regional investment in sustainable agriculture, while significant, is not sufficient to produce a signal in the condition of the resource base unless measurements are made at the points of investment and extrapolated. There is no signal at a landscape scale and will not be for some time to come.

## Overview of approaches

### NRM Plans

Within these broad frameworks, Queensland regional NRM bodies have adopted a range of approaches to MER. The accredited NRM plans generally include a chapter on MER. These set out guiding principles, basic approaches and (some) simple frameworks for monitoring. Examples for South East Queensland, Southern Gulf, QMDC, South West NRM, Mackay Whitsunday and Northern Gulf are provided below.

#### South East Queensland

Asset	Performance criteria	Indicator	How measures?

#### Southern Gulf

Level of review	Measures	Example indicators (drawn from training activities)
Outputs	What was done	How many courses? How well delivered?
Outcomes	What is occurring as a result of what was done	How are people using what they learned?
Impact	How a target has changed	How has the target changed as a result of these efforts?

#### QMDC

Matter for Target	NRM Plan asset	Asp targets	RCTs	MFT indicator heading	MFT indicators	MATs	Action monitoring	Reference point

#### South West NRM

##### Key elements of MER

- Record project details
- Track expenditure
- Spatial referencing of on ground works
- Tracking project outputs
- Measuring outcomes

*From Hyder Consulting Translation of Best Practice to South West NRM Regional Plan Development report for the SWNRM Plan (2007)*

Issue	Threatening process	Values compromised	Indicators	Baseline	Data custodian

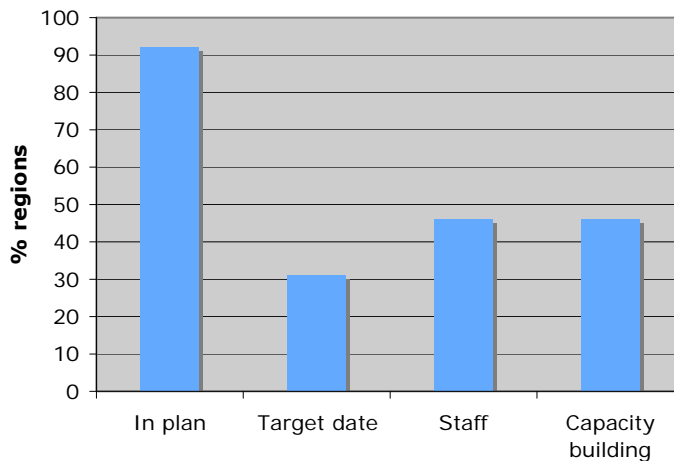
**Mackay Whitsunday, Northern Gulf (based on Queensland model)**

M&E component	Result	Reporting categories	Performance reporting requirements	Reporting responsibility	Reporting target
Plan monitoring	Outputs	Resource assessment	6 monthly	Regional body	JSC RB
	Investments	Progress against milestones	6 monthly	Regional body	JSC RB Stakeholders
	Outcomes	MATs	Annually	Regional body State and national governments	JSC RB Stakeholders
Outcomes monitoring	Outcomes	RCTs	Annually	Regional body	JSC RB Stakeholders
Adaptive management evaluation	Process	Review plan and investment strategy	Annually	Regional body	JSC RB Stakeholders
	Effectiveness	Evaluation of RIS	Every 2 years	Regional body	JSC RB Stakeholders

## MER systems

The Queensland regions are at various points in developing detailed MER systems and most are at a fairly early stage. Formal progress is indicated overall in Figure 1.

**Figure 1 Formal progress in MER**



However, most regions have made progress in developing MER systems that is not yet formalised (i.e. not documented) but is evident in the annual reports, performance reports and various condition reports. In most regions, the systems are largely integrated into programs and projects. They focus primarily on monitoring at the point of investment and on reporting performance against investment milestones and MATs. Some reporting against RCTs is occurring based on the nationally agreed 1-5 scale of measuring progress towards achievement of targets but with a highly variable and largely unquantified evidence base.

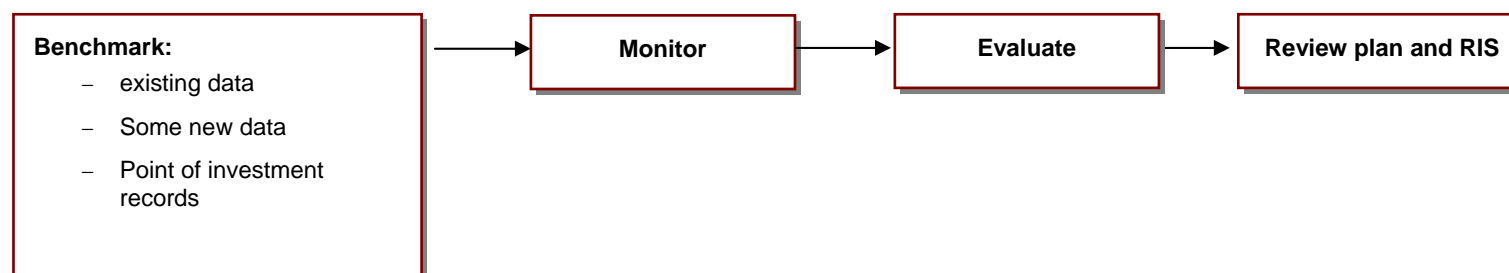
Most regions are establishing baselines, at least at the point of investment and plan to monitor at these points (e.g. adoption of practices where incentives have been provided for those practices).

Some regions are undertaking more integrated reporting such as 'catchment condition' and 'state of the region' reports (e.g. Condamine catchment snapshots using a scorecard approach). The Fitzroy Basin and QMDC are piloting 'Most Significant Change' methods and 'Performance stories'.

In some regions, thematic planning (land, water, biodiversity) is taking place that will involve monitoring of the condition of these assets. However, there is no evidence that integrated thematic evaluations are occurring or planned.

A generalised picture that seems to represent current approaches to MER in most of the regions is outlined in Figure 2.

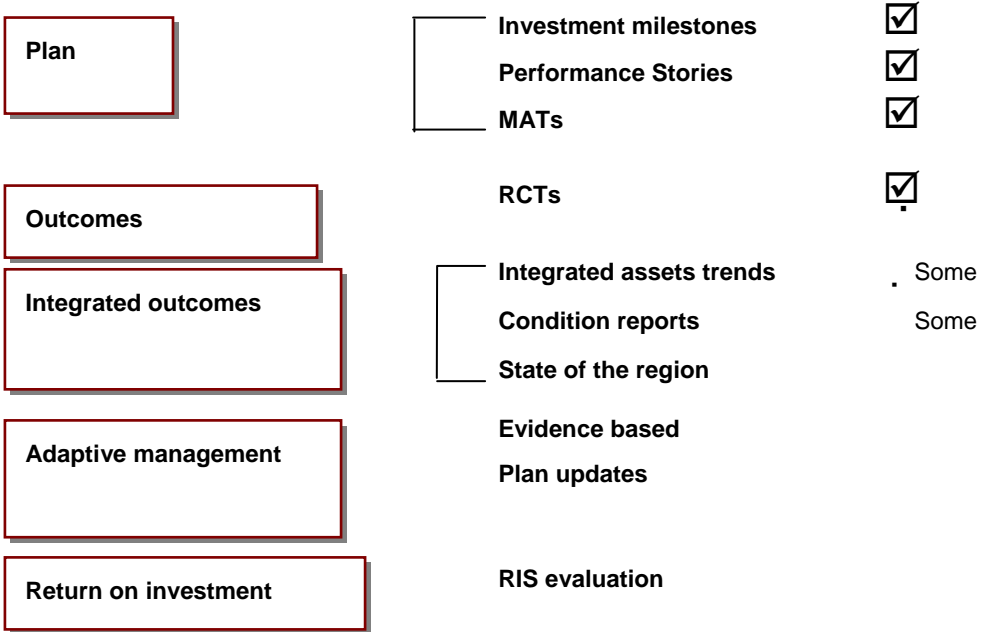
Figure 2: General model of Queensland regional NRM group MER frameworks



	<b>Impact on what</b>	<b>Measured by</b>	<b>How often</b>	<b>Reported by</b>	<b>To</b>
<b>Plan monitoring</b>	Activities	MAT progress	Annually	Regions	JSC and stakeholders
<b>Outcomes monitoring</b>	Assets	RCTs	Annually	Regions, state and National govts	JSC and stakeholders
<b>Adaptive management</b>	Plan	Review Plan	1-3 years	Regions	JSC and stakeholders
<b>Return on investment</b>	RIS	Return for \$s	2-7 years	Regions	Govts and stakeholder

In this model, most Queensland regions are up to the stage of monitoring and reporting against plans. Since the 2006-07 annual report, all regional bodies have been reporting against RCTs. A few are producing integrated assessments (Figure 3).

**Figure 3: Progress in MER**



## **Sustainable agriculture**

*“In central Queensland we will use our natural resources in a sustainable and balanced way for the prosperity of our community and the health of our natural environment.*

*Aware of the past, meeting the needs of our present, we work towards a sustainable future.”<sup>9</sup>*

Agriculture is a major industry and land use in most Queensland NRM regions and is a key focus of most NRM regions. These regions aim to sustain the asset base for agriculture and move agricultural systems to a more sustainable footing. A significant proportion of investment in the Queensland agricultural regions is directed at developing and encouraging adoption of best management practices (BMPs) to conserve soil, improve soil health and productivity and control invasive plants and animals.

The east coast regions in Queensland have the related challenge of sustaining the Great Barrier Reef asset. Regional bodies in these regions are investing in agricultural practices that reduce risks to the reef from agricultural runoff (sediment, nutrients and herbicides/pesticides).

### **Integrated MER for sustainable agriculture**

The assets based approach adopted for the regional planning and investment model means that sustainable agriculture investments occur across a number of thematic programs. For example, Mackay Whitsunday has a ‘Sustainable landscapes’ program that focuses on providing incentives to producers to adapt and adopt best management practices, but also invests in sustainable agriculture through closely related themes, especially water (e.g. through the new Water Quality Improvement Plan).

Fitzroy Basin’s ‘Sustainable landscapes’ program provides incentives for maintaining groundcover and property planning services, but the FBA also invests in sustainable agriculture through the ‘Healthy waterways, rivers and wetlands’ program. The Condamine Alliance invests in sustainable agriculture through ‘Land use and management’, ‘Salinity’ and ‘Water’ programs. All of the agricultural regions have investments in different themes that cut across the domain of ‘sustainable agriculture’.

Given that monitoring and reporting is also based around the asset based thematic framework of the plans and RISs, and that few, if any, regions intend to produce a specific MER framework for sustainable agriculture, reporting and evaluating outcomes in sustainable agriculture requires integration of information across a number of projects and themes. The logic for this integration would be something like that presented in Figure 4.

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<sup>9</sup> Central Queensland Strategy for Sustainability 2004 and beyond, Fitzroy Basin Association, 2004 p.i

**Figure 4: Integrated MER for sustainable agriculture- an example logic**

<u>Asset</u>	<u>Trend</u>	<u>Process</u>	<u>Addressed by</u>	<u>Indicated by</u> (short term)	<u>Indicated by</u> (long term)
Soil	↓ Groundcover	Drought	BMP Grazing	Groundcover	Soil health
Land	↑ Erosion	Grazing pressure	Property plans	Water quality	Land productivity
Water	↓ Water quality	Tillage	Drought proofing		River health
Reef			BMP cropping		Reef health

**Key questions we want to answer about investments in sustainable agriculture**

If we were to report and evaluate progress in achieving sustainable agriculture, key questions we would want to answer include:

- Are BMPs defined for the main industry/enterprise mixes in the region?
- If they are not defined, is research underway to define them?
- Are the links between BMPs and resource condition understood or being defined?
- Are the drivers and constraints to adoption of BMPs in the region well understood?
- Are extension programs in place to promote adoption of BMPs?
- What proportion of producers in the region are adopting BMPs and is this changing over time?
- Will our investments in sustainable agriculture result in positive outcomes for the resource base over time?
- How will we know when we have achieved sustainable agriculture?

## **What do the approaches used tell us about investments in sustainable agriculture?**

### **Are BMPs defined?**

BMPs are well defined for relatively few industries and regions. The Condamine benefits from a long history of local research based out of Toowoomba. This research provides a strong evidence base for BMPs especially in cropping systems. However, there are still some unknowns such as the effect on groundcover from fencing off waterways.

BMPs for grazing systems are less well defined and will vary greatly between and within regions and from season to season. The intensive mixed systems near the coast for example, are based on very different and generally more resilient assets than the extensive grazing and rangelands systems to the west. They require very different management systems.

BMPs for integrated pest management and for water, nutrient and herbicide/pesticide management in horticulture and cane farming are partially defined. For some industries, for example cotton and cane, there are relatively well established BMP packages.

Most of the Queensland regions are engaged more or less in development of BMPs for their major industries.

### **Is research underway?**

Queensland regions are defining BMPs. For example Mackay Whitsunday region is developing targets and best practice models for cane and grazing systems under their Water program using the ABCD framework. The ABCD framework promotes and tracks adoption from level D (basic) to A (cutting-edge innovative). An example from the Mackay Whitsunday is attached at Annex 1 (and more fully described in another case study in this report). The Mackay Whitsunday regional NRM group is very active in developing these BMPs as part of the programs to protect and restore water quality.

This region is also investing under their Sustainable Landscapes Program in incentives for improved practices. The incentives meet 40% of the upfront costs of actions such as off-river water points.

This program has catalysed development of new technology, for example a shielded sprayer that provides a safer and more cost-effective way to apply herbicides on cane with less drift and less time. In the Fitzroy Basin, the regional body is brokering partnerships with industry to develop and refine BMP for grazing systems.

### **Are the links between BMPs and resource condition understood?**

Point of investment recording and monitoring of key indicators such as groundcover in association with adoption of BMPs in grazing and cropping systems will in time yield valuable information relating these BMPs to resource condition. But the links generally need to be modelled except in a few data rich cases.

### **Are the drivers understood?**

The drivers of and constraints to adoption of BMPs are well understood by regional groups in Queensland. Some have undertaken formal surveys of farmer attitudes and issues in adoption. The close engagement of the groups with farming communities and industries provides them with good knowledge on the drivers and constraints. This knowledge doesn't mean that all the problems are easily addressed. Some of the drivers (e.g. drought, financial and labour constraints) are beyond the influence of the regional groups.

### **Extension programs**

Incentives to promote adoption of BMPs are a cornerstone of the Queensland agricultural regional RISs. Most regions report that these schemes are well if not oversubscribed. Most regions also employ some form of property management planning to promote holistic adoption of BMP systems.

The incentives and other actions to promote adoption are limited in their reach by resources available for investment by both the regional groups and the producers.

### **Pace of adoption**

Some Queensland regions are conducting surveys of uptake of BMPs either at point of investment (where incentives are provided) or more generally (through performance stories or wider surveys). The Condamine conducts regular surveys of management practices for cropping and grazing (e.g. zero till) - annually in non-drought years. These surveys are telling the group that adoption is much lower than people generally believe (although there could be pockets of high adoption that the surveys miss).

The Fitzroy Basin Association monitors adoption where there has been an incentive or a contribution to encourage uptake of particular practices. Fitzroy and QMDC are developing performance stories that may show evidence of wider adoption. These stories will not provide the quantitative survey data (such as ABS statistics) that would provide this bigger picture. Fitzroy is piloting an approach that employs ABS style statistics as well as performance stories.

Mackay Whitsunday can determine uptake of BMP from incentives programs (relatively small number) and hope to monitor wider adoption in future.

### **Positive outcomes for the resource base**

Some regions are monitoring key indicators of resource base condition such as groundcover and water quality and some of this monitoring at point of investment will provide information of whether the investment is having a positive outcome for the resource base. However, there seems to be little monitoring taking place that links BMPs to resource base outcomes. In most cases, it is too early in the investment program. Mackay Whitsunday is aiming to be able to monitor changes in the resource base due to adoption of BMPs in around 7-10 years time.

One issue here is that adoption is not sufficiently widespread to have an impact at a landscape scale but monitoring at all points where adoption has taken place is expensive and time consuming. Some regions are using modelling and scenario building for parts of the system (e.g. waterways) to test the likely impacts of BMPs.

## How will we know?

The regions are mostly not integrating results from monitoring across the assets to report on outcomes of investments in sustainable agriculture as a package. This requires more than simply aggregating progress against MATs because of the way the MATs are defined in relation to assets.

Some regions are producing integrated asset condition reporting, and sustainability reporting across social, economic and biophysical assets. Others are providing state of the catchment or state of the region reports that integrate to some extent across assets. An example from the Condamine is attached.

The snapshots and condition reports provide valuable information to the groups and their stakeholders and provide a framework of what an integrated report on sustainable agriculture outcomes may look like.

Long term monitoring of progress against RCTs will tell us when we have achieved sustainable agriculture. For some RCTs, this is close to possible because of strong evidence-based links to BMPs (e.g. groundcover in cropping systems in southern Queensland, water quality in cotton and cane systems). For others it is not yet plausible (e.g. groundcover in extensive grazing systems in central Queensland and the rangelands).

## Summary of findings

The National outcomes sought for sustainable agriculture set out in the National Framework for Natural Resource Management Standards and Targets (2003) are stated as:

*'Sustainable production systems are developed and management practices are in place, which maintain and rehabilitate biodiversity and ecosystems services, maintain or enhance resource quality, maintain productive capacity and prevent and manage degradation.'* – p 10

The Queensland NRM regions are reporting on their investments in sustainable agriculture across their various programs but they not able to systematically report on these outcomes yet because:

1. The NRM groups are not responsible for monitoring resource base condition but rely on negotiated agreements with state and other data custodians. From these agencies, they inherit and access a lot of data about many elements of resource base interactions but with the exception of native vegetation there is very little consistent monitoring that shows trends in resource condition.
2. Sustainable production systems are not defined for all industries in all regions.
3. Where they are defined, the linkages between the management practices and resource base condition are not always sufficiently described to provide confidence that adoption will lead to the desired outcomes for the resource base.
4. Adoption is not sufficiently widespread or consistent enough yet to enable regional trends detected or modelled in resource base condition to be linked to the management practices invested in by the regions.

5. The assets approach to planning and investment makes it difficult to report against the resource base outcomes of investment in sustainable agriculture because these need to be integrated across a number of themes and programs (e.g. water, land, biodiversity etc).
6. The logic of setting the intermediate management action targets (MATs) and the longer term resource condition targets (RCTs) is not always closely linked, therefore reporting against outcomes of investment in sustainable agriculture is not a simple matter of aggregating related MATs.

## **Moving forward**

### **Knowledge base**

*'We have oceans of data, lakes of information, pools of knowledge and drops of wisdom.'*<sup>10</sup>

Under the bilateral agreements between the Commonwealth of Australia and the State of Queensland to deliver the NHT2 and the NAPSWQ, the Queensland regional NRM groups are not responsible for or resourced to independently monitor the condition of assets other than at a very local scale. To obtain these data, they are required to negotiate data sharing agreements with the state agencies and other custodians. Many of the data sharing agreements are not yet in place.

In their own MATs and RCTs monitoring, the regions are focussing on point of investment records, project level monitoring of milestones in outcomes based contracts, commissioned surveys of the condition of and risks to local assets (e.g. waterways) and surveys of behaviour change as a result of investments.

The Queensland regional NRM groups are dealing with significant gaps in the data and monitoring they need to adequately and comprehensively report on outcomes of investment in sustainable agriculture for RCTs from a resource condition focus.

The regions are dealing with the gaps by conducting program specific assessments and asset or catchment condition reports based on largely qualitative assessments. For the most part they are still establishing baselines and will need to be highly strategic in monitoring beyond this. Some data sets (such as groundcover) can be provided from excellent state-wide monitoring programs but these are difficult to relate directly to investments on-ground. The regions will need to do some local and regional monitoring of resource condition linked to their investments.

### **Multiple reporting requirements**

The NRM regions must accommodate regional, state and national requirements for reporting. They report frequently against targets and performance measures and in a range of formats (MATs, RCTs, Resource Condition Matters for Targets (RCMfTs), milestones, outputs, financials etc). Anecdotally, the reporting requirements of regional NRM groups seem to be growing leaving less capacity or resources for the much more informative integrated assessments and evaluations that could inform adaptive planning.

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<sup>10</sup> Southern Gulf The Natural Resource Management Plan M&E Strategy, 2005 p. 2

## Moving from monitoring to evaluation

Most of the reporting to date is performance level reporting against MATs. The regions, state and national governments also require evaluations of likely impacts and longer term outcomes in order to review and adapt the NRM program designs and plans. They will also require evaluations of returns on investment to prioritise future investment in NRM.

Current MER systems are not well geared for evaluations of the outcomes of investments in sustainable agriculture within regions, across a state or nationally. For example, the national RCMfTs relate to the resource base assets and threats which impact or are impacted by sustainable agriculture outcomes in the long term. However, monitoring is not sufficient or consistent enough in most places to enable trends in these RCMfTs to be related directly to investments in sustainable agriculture at regional level.

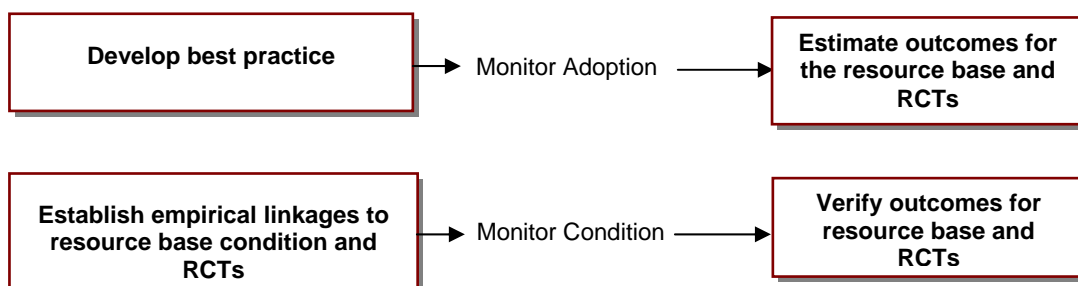
## A way forward

The simplest and most logical way for NRM regions to monitor, evaluate and report on the outcomes of investments in sustainable agriculture is to:

- Help establish quantified scientific linkages between best practice and resource base condition in the region and then
- Encourage and monitor adoption (see Figure 5).

The rate of adoption will indicate outcomes for the resource base. As an intermediate surrogate, the rate of adoption will signal progress against RCTs while direct monitoring of resource condition takes place over a longer term.

**Figure 5: A way forward for MER in sustainable agriculture**



In some regions (e.g. the Condamine) there is a long history of agriculture and soils research and as a result, there is reasonably robust knowledge about the linkages between best practice and resource base condition- for some components of the resource base (especially soils). For example:

- Minimum tillage is known to reduce soil and nutrient loss from paddocks and therefore sustain yields
- Specific stock traffic controls are known to be beneficial for soil structure and yields
- Certain fertiliser and pesticide application practices are known to reduce leakage, drift and runoff of chemicals

The knowledge base about best practices in some areas and industries is such that by promoting adoption of the established practices, the regional groups can be confident that the outcomes for the resource base will be positive. Adoption is much easier to measure than resource base condition. Confidence can be increased through strategic site specific monitoring to test whether or not the best practices are having the desired effect. This strategic monitoring can then feedback knowledge to inform further development and refinement of practices.

There are some industries and areas for which best practice is yet to be defined holistically. Grazing industries are generally in this category although significant advances are being made in the regions and by industry/government research and development partnerships.

The NRM regions in agricultural areas already play a role in development of best practice. Examples are cited in this report. It is appropriate then industry and governments together continue to drive this work but the role of the regions in catalysing the research and development needed to fill in the gaps could be much greater. Once the empirical linkages between the practices and resource condition are established, the regions then have a significant role to play in monitoring adoption and projecting (modelling) the likely resource condition outcomes.

The way forward described has many advantages:

- It clarifies the role of the regions in sustainable agriculture (helping to define best practice and the empirical links to resource base condition; promoting and monitoring adoption)
- It will enable setting of realistic goals and targets relating to resource base condition
- It provides a focus for regional monitoring and reporting in sustainable agriculture that will yield timely results as well as feedback to inform ongoing development of best practice
- It acknowledges and deals with the reality that the regions are not resourced to monitor resource base condition, that no-one is consistently doing this for them (except for vegetation) and that their scale of investments will not produce a landscape scale signal in any case until well into the future. They nonetheless need to know about trends, progress and directions now.
- It provides a point of linkage between the regions and industry/government programs to develop best practices that reflects the nature of the investment and the benefit streams (industries and governments drive development of BMP, the regions catalyse, promote and monitor)

## Mackay Whitsunday BMP for cane

### Draft Cane, Horticulture and Grazing Management Practice Classifications 1

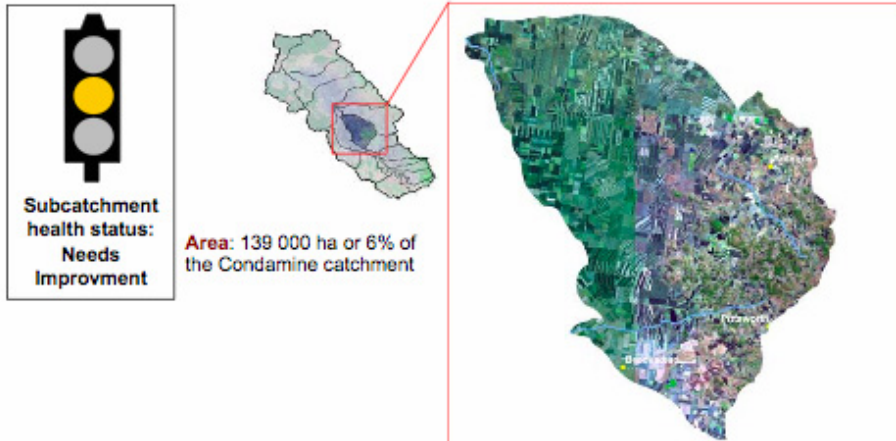
<p style="text-align: center;"><b>Class D Cane Soil Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Cultivated bare fallow</li> <li>2. Cultivated plant cane</li> <li>3. Zero till ratoons</li> <li>4. Records kept in head</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. None</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Standard equipment</li> </ol>	<p style="text-align: center;"><b>Class C Cane Soil Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Minimum till bare fallow or legume fallow</li> <li>2. - 3. Same as Class D</li> <li>4. Records kept in daily diary</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Develop basic Soil Management Plan</li> <li>2. Keep daily diary</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Standard equipment</li> </ol>
<p style="text-align: center;"><b>Class B Cane Soil Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Controlled traffic permanent beds</li> <li>2. Zero till fallow, plant and ratoons</li> <li>3. Headlands, drains and waterways managed as filter strips</li> <li>4. Records kept in Paddock Journal</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Identify soil types and productivity zones for each block using existing farm maps</li> <li>2. Develop Soil Management Plan using soil mapping.</li> <li>3. Keep records (including yield) in Paddock Journal</li> <li>4. Adjust soil management for next year if required.</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Standard wheel spacing on all equipment, Bed Former, Zero Till Seed Planter, Zero Till Cane Planter, Harvester and Haulouts</li> </ol>	<p style="text-align: center;"><b>Class A Cane Soil Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Controlled traffic permanent beds with <b>GPS guidance</b> of planting and harvesting operations</li> <li>2. - 3. Same as Class B</li> <li>4. Records kept in computer database /Paddock Journal</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Identify soil types and productivity zones for each block using <b>GPS mapping</b></li> <li>2. Develop <b>GPS</b> based Soil Management Plan using soil mapping and remote sensing</li> <li>3. Keep records in computer database/ Paddock Journal</li> <li>4. Same as Class B</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Standard wheel spacing and <b>GPS Guidance</b> on all equipment, Bed Former, Zero Till Seed Planter, Zero Till Cane Planter, Harvester and Haulouts</li> </ol>

<p style="text-align: center;"><b>Class D Cane Nutrient Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. One rate for whole farm</li> <li>2. Application rates based on historic application rates or rules of thumb</li> <li>3. Records kept in head</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. None</li> </ol> <p><b>Machinery costs:</b></p> <ol style="list-style-type: none"> <li>1. Surface or sub-surface fertiliser box</li> </ol>	<p style="text-align: center;"><b>Class C Cane Nutrient Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Soil testing</li> <li>2. One or two rates for the whole farm</li> <li>3. Application based on old industry recommendations</li> <li>4. Records kept in daily diary</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Conduct soil tests</li> <li>2. Develop basic Nutrient Management Plan</li> <li>3. Keep daily diary</li> </ol> <p><b>Machinery costs:</b></p> <ol style="list-style-type: none"> <li>1. Subsurface fertiliser box</li> </ol>
<p style="text-align: center;"><b>Class B Cane Nutrient Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Variable rate <b>between</b> blocks</li> <li>2. Application rates based on latest industry recommendations</li> <li>3. Timing nutrient applications with respect to crop stage, irrigation and rainfall</li> <li>4. Records kept in Paddock Journal</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Identify soil types/productivity zones for <b>each block</b></li> <li>2. Develop Nutrient Management Plan using yield, soil mapping and latest industry recommendations</li> <li>3. Change fertiliser rates <b>between</b> blocks</li> <li>4. Attend nutrient management course</li> <li>5. Conduct soil tests and leaf analysis</li> <li>6. Keep records (including yield) in Paddock Journal</li> <li>7. Adjust nutrient rates for next year if required</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Sub-surface variable rate fertiliser box with manual rate control</li> </ol>	<p style="text-align: center;"><b>Class A Cane Nutrient Management</b></p> <p><b>Description:</b></p> <ol style="list-style-type: none"> <li>1. Variable rate <b>within</b> blocks</li> <li>2. Application rates based on <b>specialist interpretation</b> of the latest industry recommendations</li> <li>3. Same as Class B</li> <li>4. Records kept in computer database /Paddock Journal</li> </ol> <p><b>Planning and record keeping:</b></p> <ol style="list-style-type: none"> <li>1. Identify soil types/productivity zones <b>within each block</b> using GPS yield and soil mapping</li> <li>2. Develop <b>GPS</b> based Nutrient Management Plan using yield, soil mapping and <b>specialist interpretation</b> of latest industry recommendations</li> <li>3. Apply variable fertiliser rates <b>within</b> blocks</li> <li>4 – 5. Same as Class B</li> <li>6. Keep records in computer database /Paddock Journal</li> <li>7. Same as Class B</li> </ol> <p><b>Machinery:</b></p> <ol style="list-style-type: none"> <li>1. Sub-surface variable rate fertiliser box with remote/automatic rate control and GPS guidance</li> </ol>

This report available for download from [www.mwnm.org.au](http://www.mwnm.org.au) – Reference: John Rolfe, Jill Windle, Judith Wake, Will Higham, Philip Trendell- 2007

## Asset based catchment snapshot from Condamine

### Ashall Ck Subcatchment 2005 Snapshot



#### COMMUNITY

**Towns:** Aubigny, Brookstead and Pittsworth

**Local Governments:** Jondaryan Shire (47%), Pittsworth Shire (51%)

**Landcare:** Central Downs Landcare Group

**Traditional Owners:** Western Wakka Wakka people and Jarowair people

**Partners working in the subcatchment:** Central Downs Landcare Group, Environmental Protection Agency, Darling Downs Regional Organisation of Councils, Aubigny Catchment Landcare Group, Natural Solutions, Condamine Balonne Water Committee, Feedlot Services Australia, Greening Australia, Condamine Catchment Management Association, GHD, Phillips Group, QLD Egg Farmers Association, Pittsworth Shire Council, South West Region Department of Natural Resources and Mines, Jondaryan Shire Council, Department of Primary Industries, and North East Downs Landcare Group, Sustainable Agriculture State Investment Project's integrated area-wide management



#### WATER

**Rainfall:** 650-700 mm

**Creek length:** Fourteen Mile Ck 27 km, Linthorpe Ck 19 km, Ashall Ck 9 km

**Stream overall condition:**



**Main stream condition issues:**

Condition of reach environs, channel diversity, riparian vegetation condition, aquatic vegetation condition, aquatic habitat condition.



#### LAND USE AND MANAGEMENT

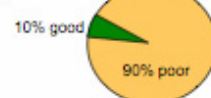
**Elevation:** 350-620 m above sea level

**Land uses:** dryland cropping (60%), grazing (17%), irrigated cropping (16%), intensive animal production and urban uses

**Subdivision:** <1% increase in property parcels between December 2003 and February 2005

**Pasture condition:**

October 2004



April 2005



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