

# Management practice results



## Great Barrier Reef

### Report Card 2016

Reef Water Quality Protection Plan



Australian Government



Queensland Government

## Management practice results

The management practice target in the Reef Water Quality Protection Plan (Reef Plan) 2013 is:

- 90 per cent of sugarcane, horticulture, cropping and grazing lands are managed using best management practice systems (soil, nutrient and pesticides) in priority areas by 2018.

Landholders manage complex farming systems made up of many diverse individual management practices. The target acknowledges that the largest water quality benefits will be realised through use of **management systems** that include adoption and integration of a number of critical management practices.

Best management practices in this context are defined in the Reef Plan's water quality risk frameworks for each major agricultural industry. These frameworks identify the management practices with greatest potential influence on off-farm water quality, and articulate a reasonable *best practice* level which can be expected to result in a moderate-to-low water quality risk. The risk levels described for each practice, where relevant, are:

- High risk (superseded or outdated practices)
- Moderate risk (a minimum standard)
- Moderate–low risk (best practice)
- Lowest risk (where innovative practices are expected to result in further water quality benefits, but commercial feasibility is not well understood).

The Reef report card estimates the area of land managed using best management practice systems as at June 2016.

### Drivers of reported adoption

It is important to acknowledge how challenging the achievement of a best management practice system is for many landholders. To varying degrees, each component practice requires new knowledge and skills, and in some cases considerable direct investment in farm equipment and infrastructure.

For those management improvements that are relatively simple to implement and present little perceived production risk, adoption can be fostered through awareness activities and modest extension efforts. Financial incentives can greatly assist landholders to implement these changes rapidly. For example, incentives provided over the previous eight years have enabled more rapid adoption of the following practices:

- using GPS guidance systems, more targeted herbicide application, and improved levels of irrigation water recycling in the sugarcane industry
- fencing to manage cattle access to streambanks and riparian areas in the grazing industry
- installing erosion control structures such as contour banks in the grains industry
- installing fertigation systems in banana and other horticultural crops.

This type of program has been a feature of Reef Plan investments to date. However, since 2013 the investment mix has been changing to reflect more challenging adoption issues—those changes that require new knowledge and skills, and sometimes the trialling of new practices, before landholders have sufficient confidence to invest in implementing the change across the farm.

Investments from both the Queensland and Australian governments have increased the emphasis on extension to build landholders' capacity through:

- industry Best Management Practice (BMP) programs, which support individual landholders in assessing their own management and comparing it with commonly accepted industry standards. This clarifies where there is scope for beneficial management improvements.

- technical extension services to support the industry BMP programs. Where landholders identify potential improvements, accessing professional opinion and advice is often necessary to act on opportunities for improvement.
- delivering programmed learning (training) for certain technical issues
- in-field demonstrations of improved practices in practical situations
- working with facilitated landholder groups to develop a local understanding of how new practices best fit into their farming system
- providing support for on-farm research by farmers, trialling practices that are new for them and working out if the risks associated with adoption are acceptable.

This report describes adoption progress based on the degree of management improvement reported through various federal and Queensland Government projects and programs (see the Management Practices Methods report for details of programs evaluated). The changes are mainly management changes that have been more rapidly implemented due to a level of fiscal subsidy and technical support.

Many other ongoing programs are engaging with landholders, and some of these are occurring on a much larger scale. These processes of engagement, and follow-up interactions to enhance knowledge and skills, are generally **not** included in the Reef report card estimates of best management system *adoption*, or in modelling conducted to estimate pollutant load reductions. These are the outcomes expected from these programs, but learning new knowledge and skills takes time, as does implementing new practices in farming systems with long production cycles (such as sugarcane and beef cattle).

The following programs are expected to *begin* to spatially describe the extent of implemented farm management improvements for the next Reef report card (2016–17):

- industry BMP programs (sugarcane, grazing, grains, horticulture)
- Reef Trust Phase 1 grazing land management projects in the Burdekin and Fitzroy natural resource management (NRM) regions (there are several phases and many distinct projects within the Reef Trust; see [www.environment.gov.au/marine/gbr/reef-trust](http://www.environment.gov.au/marine/gbr/reef-trust))
- Queensland Government ‘major integrated projects’ in the Wet Tropics and Burdekin regions
- Reef Trust Phase 2 gully remediation projects in the Theresa Creek, Mary, Mackenzie, Isaac, Fitzroy, Bowen, Don, East Burdekin, and Normanby river basins
- Reef Trust Phase 3:
  - Reef Alliance – Growing a Great Barrier Reef (all Reef catchments)
  - Mackay Whitsunday Isaac – Sustainable Agriculture – Sugarcane (Mackay Whitsunday NRM region)
  - Project Pioneer: Innovation in Grazing Land Management (Burnett Mary, Fitzroy, Burdekin, and Cape York NRM regions)
  - Project Catalyst (sugarcane farms in the Mackay Whitsunday, Burdekin, and Wet Tropics NRM regions)
- Reef Trust Phase 4 – Sugarcane Reverse Tenders in the Burdekin and Wet Tropics NRM regions (distinct from previous reverse tender projects reported in this 2016 Reef report card)
- the Queensland Government Department of Environment and Heritage Protection’s Environmental Services and Regulation service.

## How progress is reported

The metrics used to describe progress towards the adoption of best management practice systems refer to the degree of adoption of practices relating to major pollutant categories.

For the cropping industries, metrics refer to the adoption of practices that minimise the loss of soil, nutrients and pesticides off-farm. For the grazing industry, metrics refer to the adoption of practices that minimise soil lost through surface (hillslope), streambank and gully erosion processes.

Farm land estimated to be in the two lowest risk categories (lowest risk and moderate–low risk) is reported as being managed under best management practice systems.

The proportions of total areas estimated to be managed under best management practice systems are rounded to the nearest whole number. In instances where the reported areas of management improvement are small, this can result in no apparent change to the (whole number) value.

For each sector in each region, the estimated proportion of farm land managed under each category of management system (from low risk to high risk) is also reported. This indicates where management improvements have occurred in the progression toward best management practice systems.

Estimates of adoption for key constituent practices are also reported, and summarised in a bar graph displaying the proportion of area estimated to be managed at each risk state (low to high).

Paddock to Reef modelling of estimated mean annual pollutant load reductions is based on estimated changes to these farm management practice systems, with off-farm water quality impacts decreasing as management systems progress from high risk towards low risk.

**Table 1: Colour-coded scoring system used to indicate progress**

Adoption progress – scoring system		
0–22%	E – Red	Very poor
23–45%	D – Orange	Poor
46–67%	C – Yellow	Moderate
68–89%	B – Light green	Good
90–100 %	A – Dark green	Very good

## Factors affecting agricultural industries in 2015–16

Changing management practice can be a long and complex process that requires new or expanded knowledge and skills, and sometimes significant capital investment. An agricultural business's capacity to afford such an investment is typically closely related to climatic and market forces beyond the landholder's control. Recent challenges for landholders are summarised below.

### ***Grazing***

Drought conditions throughout much of Queensland have limited the ability of graziers to afford and implement farm management improvements. Most of Queensland continued to be drought-declared at June 2016 (Figure 1), with large portions of central and northern Reef catchments receiving well below average rainfall between 2015 and 2016 (Figure 2). The driest areas included the majority of the Mackay Whitsunday, Burdekin and Wet Tropics NRM regions. With landholders in drought affected areas continuing to destock, fewer cattle were consigned to saleyards and slaughter, resulting in high cattle prices towards the end of the 2015-16 financial year. Increased revenue from high cattle prices may prompt landholders to invest in farm management improvements and spell pastures which may have resulting ground cover benefits following the next wet season.

# QUEENSLAND DROUGHT SITUATION as at 1st June 2016

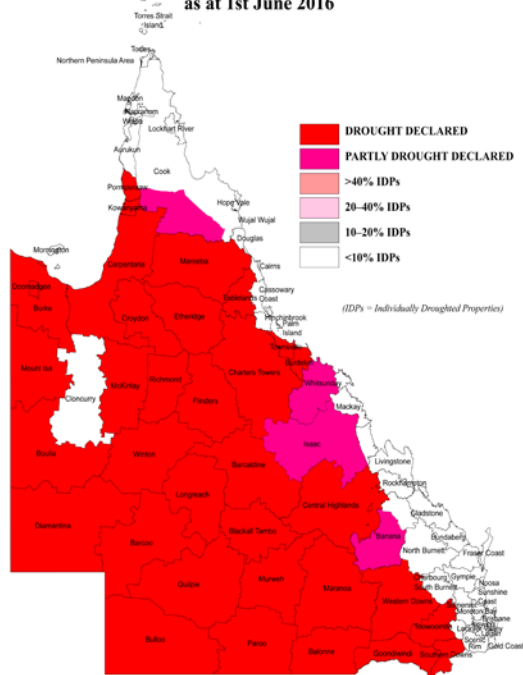


Figure 1: Most of Queensland remained drought-declared at June 2016.

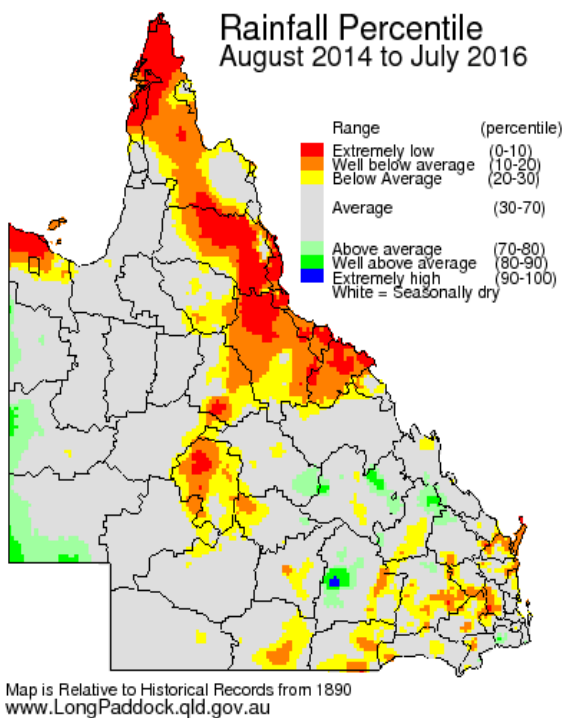


Figure 2: Large parts of the Reef catchment received well below average rainfall between 2015 and 2016.

## ***Sugarcane***

The 2015/16 sugarcane growing season in Queensland produced yields that were above district averages in most regions, with 32.65 million tonnes of cane cut, and an above average CCS reading of 13.97 (CCS represents the sugar content and determines the payment made to the grower). Rainfall was below average for most growing regions during 2015, with the Burdekin and Tablelands cane farming areas being drought-declared.

Following modest sugar prices in the 2014/15 season, predictions of a global sugar deficit and a decline in the Australian dollar pushed sugar prices up by 12–15 per cent in early 2016 and these prices were maintained until late in the year. The cost of fertiliser, particularly urea, has generally fallen since June 2015, although this does not seem to have influenced application rates significantly in this reporting period. While affecting profitability, increases in electricity costs have not appreciably affected the number of growers irrigating or the total area of sugarcane.

## ***Horticulture***

For most major production areas, 2015–16 generally produced good growing conditions and typical market prices for commodities. The value of production of most horticultural commodities in the Reef catchments was at or above that achieved in recent years. The exception to this was the banana industry, with confirmation of the Panama Tropical Race 4 plant disease on a farm near Tully in March 2015. All banana plants on the 140-hectare property were subsequently destroyed. Efforts are now focused on a longer-term response strategy and improved biosecurity measures.

## ***Grains***

Following a wet 2014/15 summer, numerous grain crops were severely damaged by locusts across a wide area of Central Queensland, with many sorghum crops being sprayed multiple times, primarily with the insecticides fipronil and fenitrothion.

All grain growing districts across Central Queensland experienced below average 2015/16 summer rainfall, reducing the area of grain sorghum planted and, consequently, the volumes of residual herbicides applied (especially atrazine and s-metolochlor). High commodity price resulted in large areas being planted to mungbeans during the summer, a crop that typically requires very little use of residual herbicides.

The winter crop planted in 2015 was reduced by a lack of planting rain in some growing regions, particularly the Central Highlands and the Callide, with little to no follow-up rain after Tropical Cyclone Marcia in February 2015. Some regions have since being drought-declared.

Winter crops planted between April and June 2016 experienced mixed conditions. High chickpea prices resulted in a relatively large area planted to chickpea during the 2015/16 winter. Favourable growing conditions for most areas resulted in one of the best chickpea harvests many growers have seen. High yields and high prices enabled many farmers to retire debt and/or upgrade machinery and infrastructure. Much of the chickpea area was treated with the residual herbicides simazine, isoxaflutole or terbuthylazine, and the insecticides thiodicarb and/or indoxacarb.

## Great Barrier Reef-wide

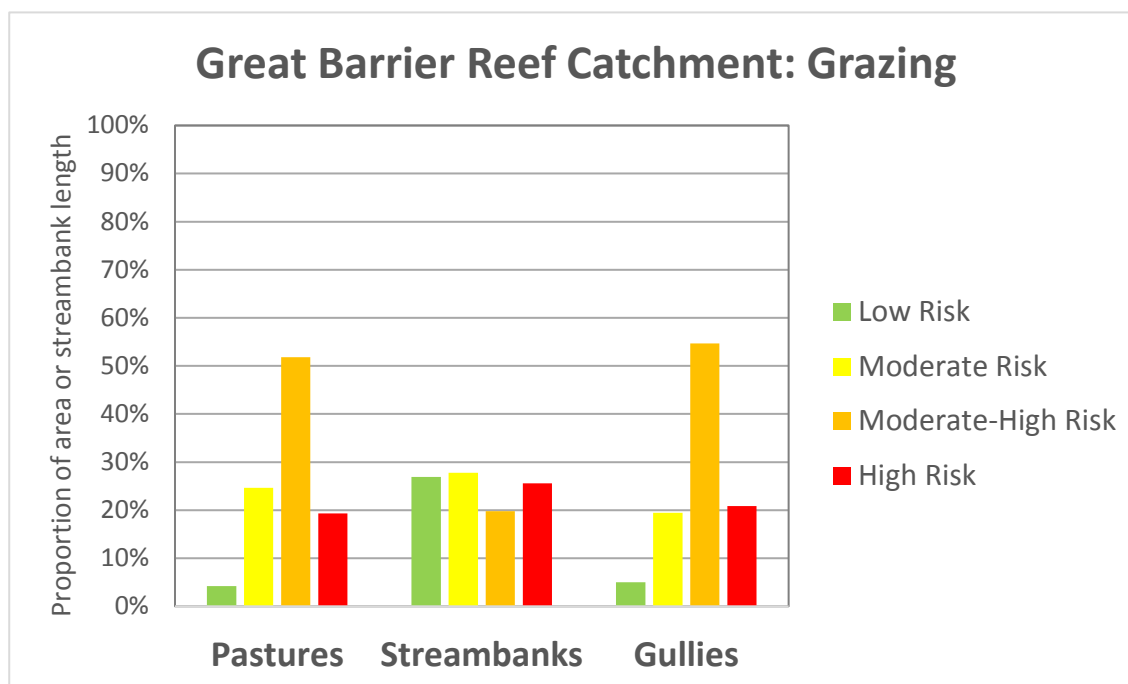
### Grazing

D  
36 %

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	29%	8,976,761 ha
Streambanks	55%	60,390 km
Gullies	25%	7,599,458 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 8545 graziers manage 31.1 million hectares of land and over 100,000 kilometres of streambanks across the Reef catchment. By June 2016, approximately 29 per cent of grazing land was being managed under best practice management systems for practices related to erosion from pastures (8,976,761 hectares), 55 per cent for practices relating to streambank erosion (60,390 kilometres of streambanks) and 25 per cent for practices relating to gully erosion (7,599,458 hectares). On average, this represents a total of 36 per cent.



**Figure 3: Reef-wide proportional area of grazing water quality risk by erosion type**

The Australian Government's Reef Programme directly funded on-farm infrastructure improvements related to best practice adoption on 204 farms and over 109,931 hectares, in the process protecting 999 kilometres of streambanks during 2015–16.

The Grazing BMP program, a partnership involving the Fitzroy Basin Association, AgForce and the Queensland Government, worked with 394 individual grazing businesses during 2015–16. These businesses, managing over 3.7 million hectares, completed BMP (best management practice) modules on soil health and grazing land management which were directly relevant to run-off and soil loss. No soil erosion

reductions are associated with this engagement in this Reef report card, which should not be taken as an indication that the program does not foster improved land management practices. An independent evaluation of the Grazing BMP program contacted 92 grazier participants in the program at the end of the 2015–16 year. Of these, 73 per cent reported commencing or completing some kind of farm management changes as a result of the Grazing BMP, with 61 per cent of these changes related to improved grazing land management. These changes are not reflected in Reef report card results because the program was unable at the time to supply details of which practice changes have occurred, and where. It is acknowledged that the Grazing BMP program is a highly effective and efficient means of engaging with large numbers of land managers; however, verifying the impacts of this engagement and capacity building effort in terms of reduced risk of erosion on farms will require time and evidence.

Queensland Government extension programs supported the implementation of the Grazing BMP program in the Fitzroy and Burdekin NRM regions. The extension teams focused their efforts with graziers in priority areas and graziers of larger commercial scale. During 2015–16 the extension programs engaged with 156 individual businesses managing over 3.1 million hectares of grazing land and one million livestock. Follow-up surveying of participants by a professional independent evaluator in May 2016 indicated that 74 per cent of graziers (n=73) had improved their knowledge and skills, and implemented some kind of management practice improvement, some of which have direct and/or indirect links to risk of soil erosion (for example, preventative measures to reduce the risk of initiating gully erosion). Again, this Reef report card adopts a conservative approach to attributing soil erosion and water quality benefits, and few sediment reductions are attributed to this engagement at this stage. This is expected to change as the impacts become apparent and the spatial extent of management improvements can be described.

**Table 2: Reef-wide grazing water quality risk over time, by erosion type**

Pastures	Baseline	2014 Report card	2015 Report card	2016 Report card
Very Low Risk	4%	4%	4%	4%
Low Risk	23%	23%	24%	25%
Moderate Risk	54%	53%	52%	52%
Moderate - High Risk	20%	19%	19%	19%
Streambank				
Very Low Risk	26%	26%	26%	27%
Low Risk	27%	27%	27%	28%
Moderate Risk	20%	20%	20%	20%
Moderate - High Risk	26%	26%	26%	26%
Gully				
Very Low Risk	5%	5%	5%	5%
Low Risk	20%	19%	20%	19%
Moderate Risk	55%	55%	55%	55%
Moderate - High Risk	21%	21%	21%	21%



## Sugarcane

D  
32 %

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	40%	176,962
Nutrients	18%	77,423
Pesticides	39%	173,042

**Target:** 90 per cent of sugarcane lands are managed using best management practice systems by 2018.

Approximately 3777 growers are managing 400,000 hectares of land for sugarcane production across the Reef catchment. By June 2016, best management practice systems were used on approximately 39 per cent of sugarcane land for pesticides (173,042 hectares), 18 per cent for nutrients (77,423 hectares) and 40 per cent for soil (176,962 hectares).

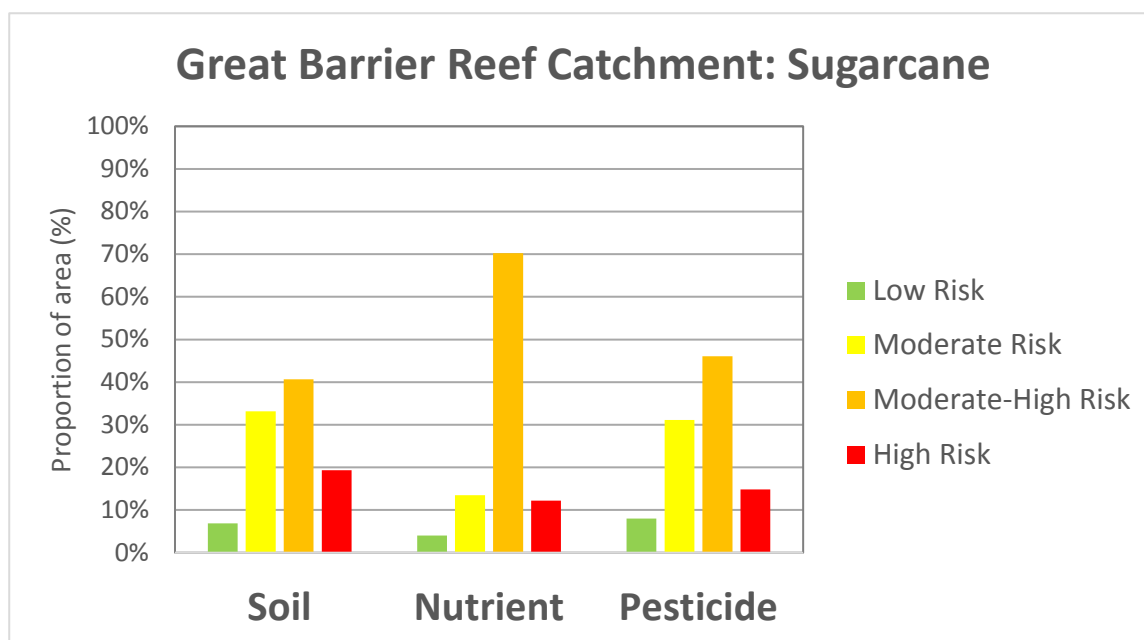


Figure 4: Reef-wide proportional area of sugarcane water quality risk by pollutant

Table 3: Reef-wide sugarcane water quality risk over time, by pollutant

Pollutant	Risk Level	Baseline	2014 Report card	2015 Report card	2016 Report card
Soil	Low Risk	5%	7%	7%	7%
	Moderate Risk	30%	31%	31%	33%
	Moderate-High Risk	43%	43%	43%	41%
	High Risk	21%	20%	19%	19%
Nutrient	Low Risk	1%	3%	3%	4%
	Moderate Risk	10%	10%	11%	14%
	Moderate-High Risk	70%	68%	68%	70%
	High Risk	19%	18%	17%	12%

Pesticide				
Low Risk	7%	8%	8%	8%
Moderate Risk	22%	24%	28%	31%
Moderate-High Risk	53%	51%	47%	46%
High Risk	18%	18%	17%	15%

**Table 4: Reef wide adoption of sugarcane best management practices over time**

Key practices	Proportion of area where key practice has been adopted			
	Baseline	2014 Report card	2015 Report card	2016 Report card
Green cane trash blanketing	75%	75%	75%	75%
Fallow management	33%	35%	35%	38%
Controlled machinery traffic	41%	43%	43%	45%
Tillage - plant cane	25%	27%	28%	32%
Nitrogen surplus	12%	13%	16%	19%
Fertiliser placement	73%	74%	75%	76%
Residual herbicide targeting	25%	28%	31%	34%
Residual herbicide strategy	53%	55%	57%	60%

The major reported influencers of farm management change modelled for this Reef report card during 2015–16 were through regional NRM organisations facilitating financial incentives from the Australian Government’s Reef Programme, Reef Trust Phase 2 reverse tender projects, and the Queensland Government’s RP20C Project in the Burdekin catchment. Table 5 summarises the number of farms and hectares engaged in each program across all catchments and, where data was provided, the reduction in annually applied nitrogen fertiliser achieved through these projects.

**Table 5: The number of farms and hectares engaged in government programs across all catchments**

	Reef Programme*	Reverse Tender^	RP20C (Burdekin only)
<b>Hectares</b>	71,937	10,571	12,721
<b>Farms</b>	270	38	23
<b>Reduction in N fertiliser (tonnes N/year)</b>	-	299	499

\* Wet Tropics, Mackay Whitsundays and Burnett Mary

^ Wet Tropics and Burdekin

The Smartcane BMP program is an initiative of Canegrowers Ltd, supported by the Queensland Government. Smartcane BMP supports growers in assessing their own farm management practices against a range of industry standards. This allows identification of priorities for potential management improvements by growers, and of the support needs (e.g. follow-up technical support) necessary for industry and governments to foster those improvements. By July 2016, the Smartcane BMP program had engaged directly with 1339 growers (managing 233,497 hectares of sugarcane) and accredited a further 116 (managing 36,091 hectares) in the Reef catchments. The number of newly benchmarked growers during 2015-2016 was 630. As this process of engagement and capacity building evolves and the spatial extent of change can be described, future Reef report cards will aim to estimate the impacts of improvements in farm management practice on water quality.

Both the Australian and Queensland governments also invested in extension services in priority sugarcane growing regions, often in support of the Smartcane BMP and/or the fiscal incentives of the Reef Programme and the Reef Trust. As of June 2016, the Queensland Department of Agriculture and Fisheries (DAF) cane extension team reported management change on 42 sugarcane farms covering 6241 hectares of

cane. These changes were designed to support the acquisition of new knowledge and skills among growers and their advisors.

An independent evaluation study of growers involved in all extension activities conducted for DAF and Terrain NRM (n=170) at the end of the 2015–16 period revealed the following:

- 41 per cent (69) of the overall study population indicated they had made changes to their farm operations or decision making during the year. Half of these growers also believed that they had some level of influence on other growers who were now making similar changes.
- The greatest influences on change were (1) the provision of fiscal incentives and (2) extension support from DAF and/or Terrain NRM.

### Horticulture

**C**  
**47 %**

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	72%	61,561
Nutrients	24%	20,605
Pesticides	45%	38,687

**Target:** 90 per cent of horticulture lands are managed using best management practice systems by 2018

By June 2016, best management practice systems were used on approximately 45 per cent of horticultural land for pesticides (38,687 hectares), 24 per cent for nutrients (20,605 hectares) and 72 per cent for soil (61,561 hectares). Approximately 970 horticulture producers are farming 86,000 hectares of land in the Reef catchment. The major identified driver of change in the horticulture industry during 2015–16 was the Australian Government’s Reef Programme, delivered by regional NRM organisations and Growcom, and covering six farms and 98 hectares of crop area.

The Growcom Horticulture Best Management Practice, Hort360, is a voluntary program developed by industry, science and growers to help horticulture growers manage risk and identify opportunities for the growth and durability of their agribusiness. Hort360 helps growers develop action plans to address areas of opportunity that have potential economic, social and/or natural resource management outcomes. Action plans link growers to existing information sources, on-farm assistance, and services to help them carry out the actions.

Delivery of Reef Programme by Growcom in 2015–16 assisted growers in the Burnett, Fitzroy, Bowen and Burdekin river basins to implement improved practices. Extension and on-farm technical support was driven via Hort360 enabling Growcom staff to target efforts towards addressing risks and enabling growers to seize opportunities. During this period, activities in the Bowen, Burdekin and Fitzroy regions focused on finalising projects for previously incentivised growers, extension and on-farm technical support. Within the Burnett Mary region, Growcom delivered and finalised a \$100,000 incentive package following two years of extension and on-farm technical support.

By June 2016, 808 horticulture businesses farming on 65,000 hectares had completed over 1400 Hort360 modules. As this process of engagement and capacity building evolves and the spatial extent of change can be described, future Reef report cards will aim to estimate the impacts on water quality of these improvements in farm management practice.

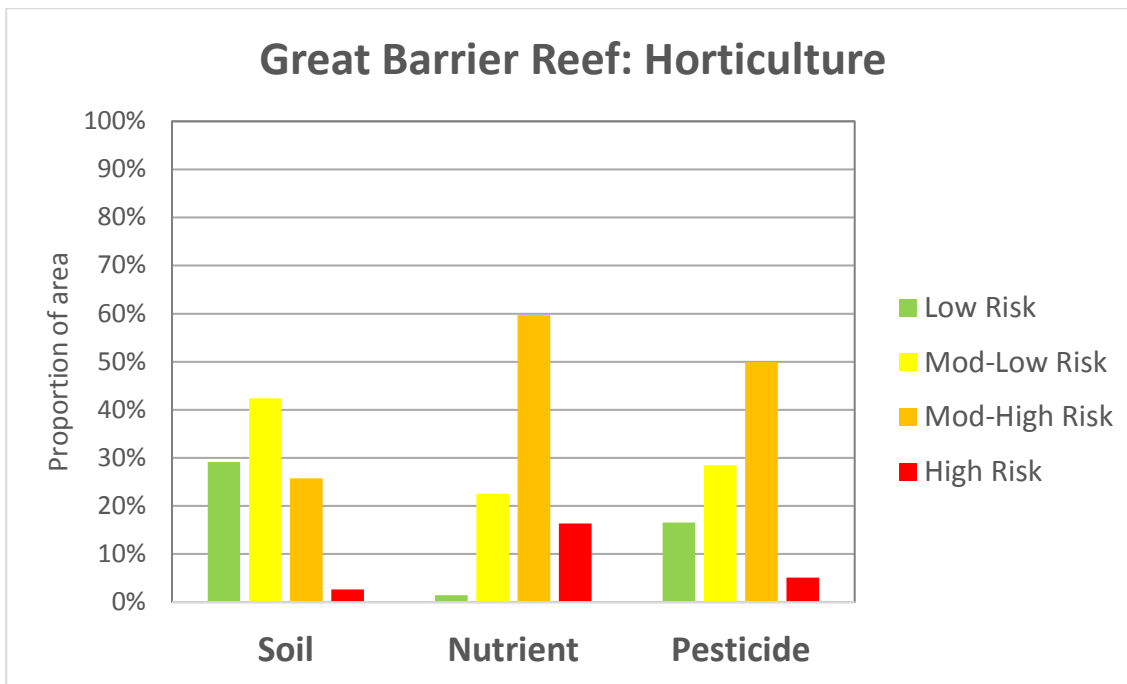


Figure 5: Reef-wide proportional area of horticulture water quality risk by pollutant

**Grains**

**C**  
57%

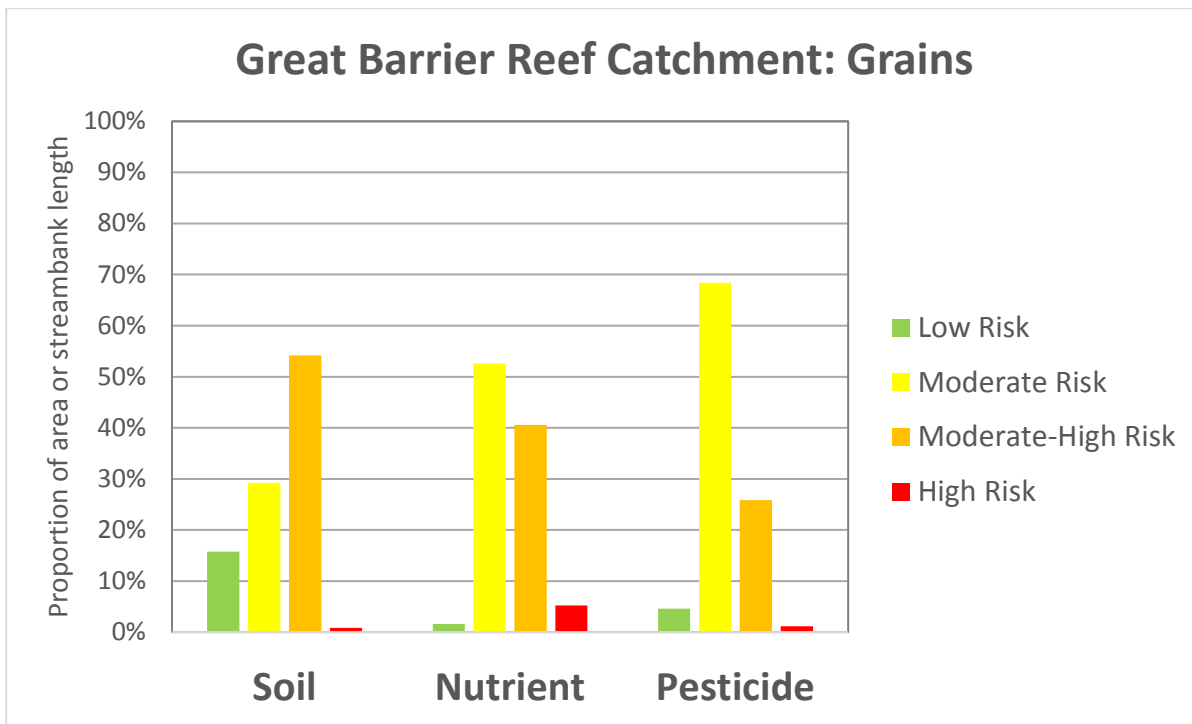
Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	45%	816,914
Nutrients	54%	606,853
Pesticides	73%	503,242

**Target:** 90 per cent of grain farming land is managed using best management practice systems by 2018.

By June 2016, best management practice systems were used on approximately 73 per cent of grain farming land for pesticides (503,242 hectares), 54 per cent for nutrients (606,853 hectares) and 45 per cent for soil (816,914 hectares).

Approximately 600 grain growers are managing about 914,000 hectares of land in the Fitzroy region, and 280 growers are managing 80,000 hectares in the Burnett river basin. The amount of land under grain production in both areas can vary considerably over time due to some land alternating between grain production and pastures for beef cattle. Approximately 44 growers are managing 123,000 hectares under grain crops in the Burdekin region.

The Grains Best Management Practice (BMP) program, developed by the Queensland Government, the Fitzroy Basin Association and Agforce, is a voluntary, industry-led program which helps grain growers identify opportunities to improve management practices and thereby improve the long-term sustainability and productivity of their enterprise. By June 2016, 418 growers across 517,382 hectares had completed the Grains BMP program. As this process of engagement and capacity building evolves and the spatial extent of change can be described, future Reef report cards will aim to estimate the impacts on water quality of improvements in farm management practice.



**Figure 6: Reef-wide proportional area of grains water quality risk by pollutant**

**Table 6: Reef-wide grains water quality risk over time, by pollutant**

Soil	Baseline	2014 Report Card	2015 Report Card	2016 Report Card
Lowest Risk	15%	15%	16%	16%
Moderate-Low Risk	29%	29%	29%	29%
Moderate Risk	55%	55%	54%	54%
High Risk	2%	2%	1%	1%
<b>Nutrient</b>				
Lowest Risk	2%	2%	2%	2%
Moderate-Low Risk	52%	52%	53%	53%
Moderate Risk	41%	41%	41%	41%
High Risk	5%	5%	5%	5%
<b>Pesticide</b>				
Lowest Risk	4%	4%	5%	5%
Moderate-Low Risk	68%	68%	68%	68%
Moderate Risk	27%	26%	26%	26%
High Risk	1%	1%	1%	1%

# Cape York

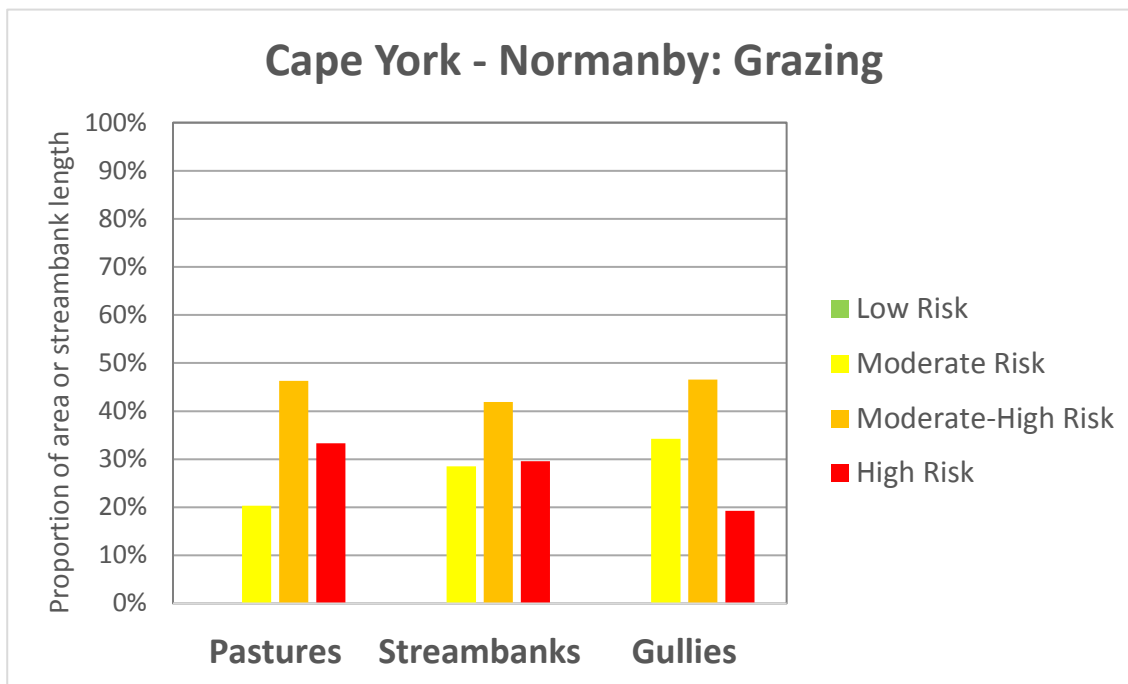
## Grazing

D  
28%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	20%	439,684 ha
Streambanks	29%	2,944 km
Gullies	34%	739,688 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 48 graziers are managing 2.16 million hectares of land in the Normanby River catchment in the Cape York region. As at June 2016, approximately 20 per cent of grazing land was being managed using best management for practices relating to pasture (hillslope) erosion (439,684 hectares), 28 per cent for practices related to streambank erosion (2944 kilometres of streambank), and 34 per cent for practices related to gully erosion (739,688 hectares). Management practice adoption efforts in the Normanby River catchment have focused upon the Hann River sub catchment.



**Figure 7: Cape York proportional area of grazing water quality risk by erosion type**

Cape York NRM facilitated funding through the Australian Government’s Reef Programme to improve management of 5987 hectares on a single grazing property. Work included fencing, construction and repair of whoa-boys to control erosion, and the installation of a new watering point to exclude livestock from streambanks and other degraded areas.

**Table 7: Cape York grazing water quality risk over time, by pollutant**

<b>Pastures</b>	<b>Baseline</b>	<b>2014 Report Card</b>	<b>2015 Report card</b>	<b>2016 Report card</b>
Very Low Risk	0%	0%	0%	0%
Low Risk	20%	20%	20%	20%
Moderate Risk	47%	47%	47%	46%
Moderate - High Risk	33%	33%	33%	33%
<b>Streambank</b>				
Very Low Risk	0%	0%	0%	0%
Low Risk	28%	28%	29%	29%
Moderate Risk	42%	42%	42%	4%
Moderate - High Risk	30%	30%	30%	30%
<b>Gully</b>				
Very Low Risk	0%	0%	0%	0%
Low Risk	34%	34%	34%	34%
Moderate Risk	47%	47%	47%	47%
Moderate - High Risk	19%	19%	19%	19%

## Wet Tropics

### Grazing

D  
35%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	21%	145,000 ha
Streambanks	82%	5,800 km
Gullies	3%	23,000 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

No discrete management practice change investments targeted water quality improvements in the grazing industry in the Wet Tropics region during 2015–16. As at June 2016, approximately 21 per cent of grazing land was under best management practice systems relating to pasture (hillslope) erosion (145,000 hectares), 82 per cent for practices related to streambank erosion (5800 kilometres of streambank) and 3 per cent for practices related to gully erosion (23,000 hectares).

Approximately 935 graziers are managing 698,000 hectares of land in the Wet Tropics region. A large proportion of this grazing land is rangelands in the upper catchment of the Herbert River, where a relatively small number of larger holdings strongly influence the management adoption benchmarks.

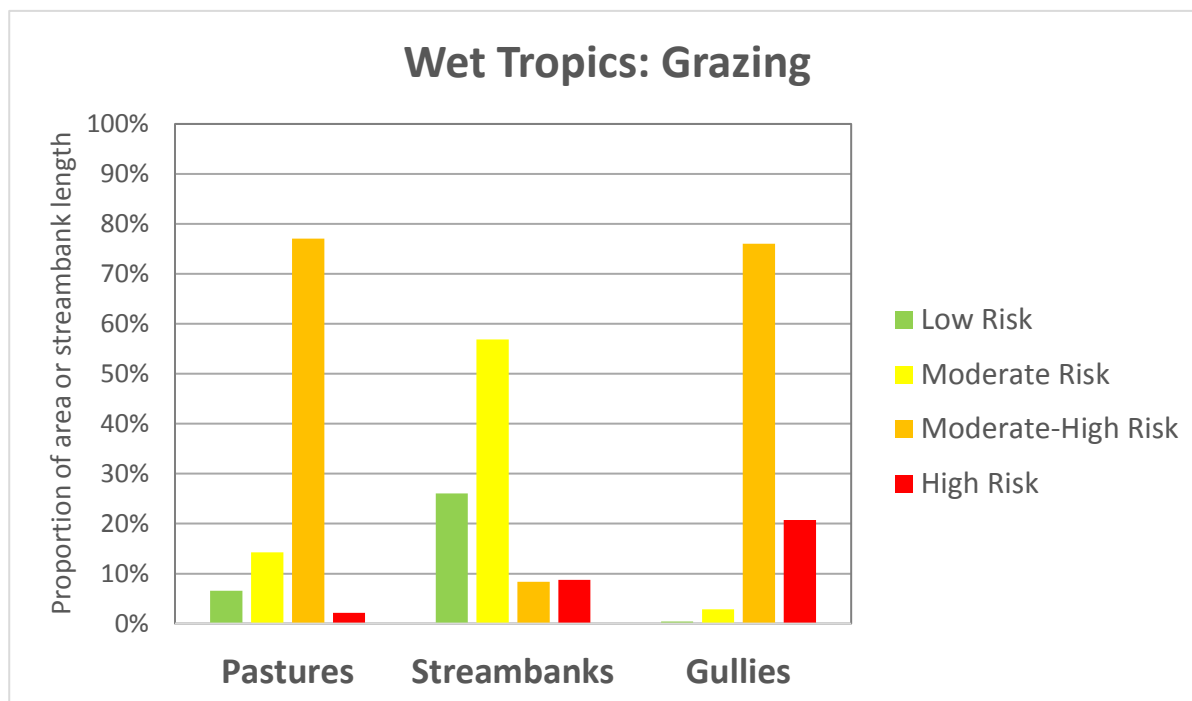


Figure 8: Wet Tropics proportional area of grazing water quality risk by erosion



## Sugarcane

D  
33%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	52%	71,363
Nutrients	16%	21,804
Pesticides	30%	40,862

**Target:** 90 per cent of sugarcane lands are managed using best management practice systems by 2018.

Approximately 1343 growers are managing 136,000 hectares of sugarcane in the Wet Tropics region. As at June 2016, best management practice systems were used on approximately 30 per cent of sugarcane growing land for pesticides (40,862 hectares), 16 per cent for nutrients (21,804 hectares) and 52 per cent for soil (71,363 hectares).

**Table 8: Wet Tropics sugarcane best management practices and their adoption over time**

Key practices	Proportion of area where key practice has been adopted			
	Baseline	2014 Report card	2015 Report card	2016 Report card
Green cane trash blanketing	98%	98%	98%	98%
Fallow management	52%	57%	58%	63%
Controlled machinery traffic	39%	43%	44%	48%
Tillage - plant cane	31%	36%	38%	47%
Nitrogen surplus	5%	9%	9%	16%
Fertiliser placement	73%	76%	77%	82%
Residual herbicide targeting	12%	20%	23%	29%
Residual herbicide strategy	50%	56%	60%	66%

Adoption of improved management practices occurred largely through the Australian Government's Reef Programme, facilitated in the Wet Tropics by Terrain NRM. Terrain NRM worked directly with 128 sugarcane growers (managing 42,517 hectares of sugarcane) in implementing on-farm changes with financial incentives that supported the purchase or modification of farm equipment. Changes included the following:

- 45 farms made changes to row spacing and moved towards controlled machinery wheel traffic.
- 35 farms made fallow management changes, most commonly through equipment that enabled the inclusion of legume break crops in rotation with sugarcane.
- 39 farms modernised tillage equipment resulting in reduced or zonal tillage in preparing land for planting cane.
- 38 farms made changes to the timing of nitrogen fertiliser application, six of them adjusting rates to account for nitrogen variability within blocks.
- 24 farms began applying fertiliser below the soil surface instead of on top of the surface.

- 23 farms made changes to reduce the loss of residual herbicides, which involved purchasing or modifying equipment to enable directed and/or shielded herbicide spraying (which can significantly reduce the volume of residual herbicide applied).
- 54 farms improved application of residual herbicides, and a further 53 indicated they were changing their use of residuals in ratoon cane.
- 16 farms changed the way they dealt with rainfall run-off through laser levelling or modifying headlands, drains and drainage lines.

The Reef Trust Tender – Wet Tropics, funded by the Australian Government and facilitated in the Wet Tropics by Terrain NRM, aimed to reduce the potential nitrogen fertiliser surplus in sugarcane on 22 farms through a market-based competitive tender process. Terrain NRM worked directly with 22 sugarcane growers (managing 2507 hectares) and achieved an annual reported reduction of 116 tonnes of applied nitrogen as fertiliser.

The Smartcane BMP program supports sugarcane growers in self-assessing their farm management practices against a range of industry standards. This allows growers to identify and prioritise areas for potential management improvement. As at July 2016, the Smartcane BMP program had directly engaged with 557 businesses (98,835 hectares) and accredited 75 cane growers (22,621 hectares) in the Wet Tropics region. Future Reef report cards will aim to describe the specific practice change and spatial extent of management improvements resulting from this ongoing engagement and follow-up support.

The Queensland Government Department of Agriculture and Fisheries (DAF) cane extension team reported management improvements on 35 sugarcane farms and 6152 hectares through one-on-one extension support. Management practice changes achieved by the DAF extension team include:

- 10 growers implemented controlled traffic farming systems.
- 21 growers increased row spacing to 1.8–2.0 metres and incorporated a zonal tilled legume/cover crop.
- 10 growers reduced cultivation to less than five passes while 11 growers moved to zonal tillage only.
- 18 growers improved residual herbicide use by implementing a single application of residuals in each ratoon crop as well as band spraying and managing inter-rows with knockdowns.

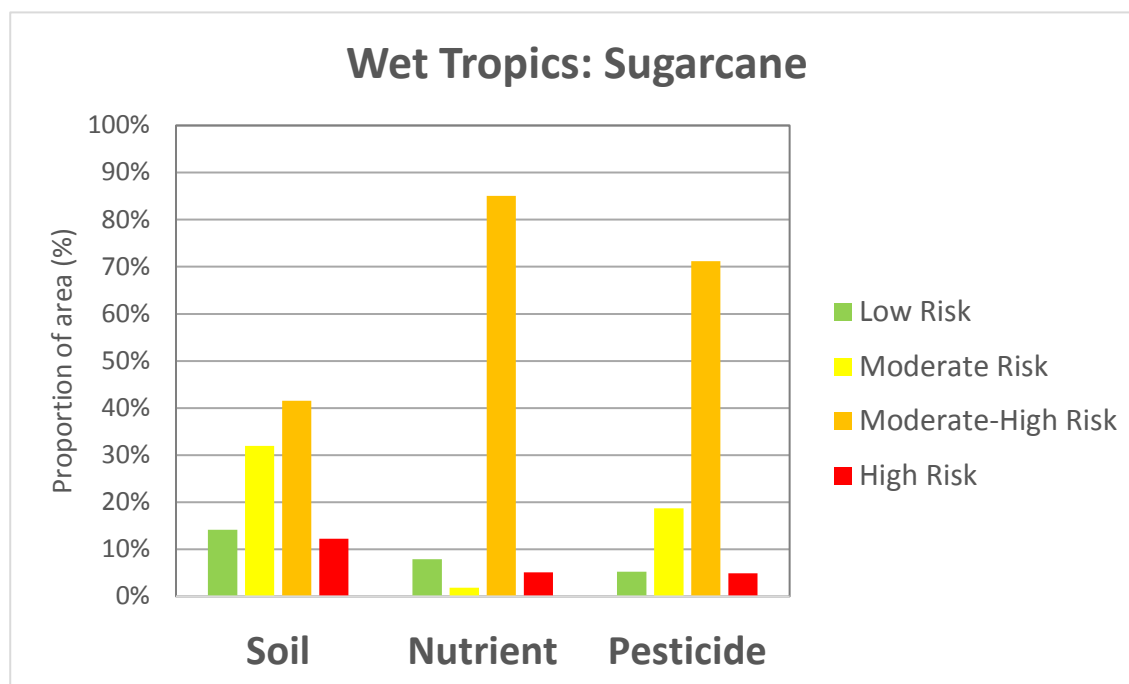


Figure 9: Wet Tropics proportional area of sugarcane grains water quality risk by pollutant

**Table 9: Wet Tropics sugarcane water quality risk over time, by pollutant**

Soil	Baseline	2014 Report card	2015 Report card	2016 Report card
Low Risk	9%	13%	14%	14%
Moderate Risk	31%	32%	32%	38%
Moderate-High Risk	43%	42%	42%	36%
High Risk	16%	12%	12%	12%
<b>Nutrient</b>				
Low Risk	2%	8%	8%	10%
Moderate Risk	3%	1%	2%	6%
Moderate-High Risk	89%	86%	85%	84%
High Risk	6%	5%	5%	0%
<b>Pesticide</b>				
Low Risk	4%	4%	5%	5%
Moderate Risk	8%	16%	19%	25%
Moderate-High Risk	81%	75%	71%	70%
High Risk	7%	5%	5%	0%

### **Bananas**

**C**  
**62%**

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area(hectares)
<b>Sediment</b>	<b>60%</b>	7522
<b>Nutrients</b>	<b>63%</b>	7831

**Target:** 90 per cent of banana farming lands are managed using best management practice systems by 2018.

Approximately 250 growers are managing 11,800 hectares of bananas in the Wet Tropics region. By June 2016, approximately 63 per cent of banana farming land was being managed under best practice systems for nutrients (7831 hectares) and 60 per cent for soil (7522 hectares). Pesticide management systems are not reported due to the relatively low level of use of residual herbicides and insecticides with high potential ecological toxicity.

The main source of identified farm management practice change in 2015–16 was the Australian Government’s Reef Programme, facilitated by Terrain NRM in collaboration with the Australian Banana Growers Association. This program worked with 30 farms across 3338 hectares to fund farm equipment and infrastructure improvements, including the following:

- 4 farms implemented minimum tillages practices necessary for planting crops through installation of GPS units.
- 5 farms improved inter-row ground cover management by maintaining grassed inter-rows and headlands, enabled by purchasing inter-row slashers.

- 4 farms implemented changes to reduce the risk of nitrogen and phosphorus loss by undertaking an annual fertiliser program supported by soil and leaf testing.
- 20 farms installed automated fertigation systems and implemented nutrient management plans, which can significantly reduce risk of nutrient loss associated with nitrogen surplus.
- 13 farms improved their irrigation application methods and 10 farms improved their irrigation scheduling.

The Banana BMP program supports banana growers in self-assessing their farm management practices against a range of industry standards. This allows growers to identify and prioritise areas for potential management improvement. As at July 2016, the Banana BMP program had directly engaged with 73 businesses in the Wet Tropics region, representing 6836 hectares of bananas. Future Reef report cards will aim to describe any management improvements resulting from this ongoing engagement and follow-up support.

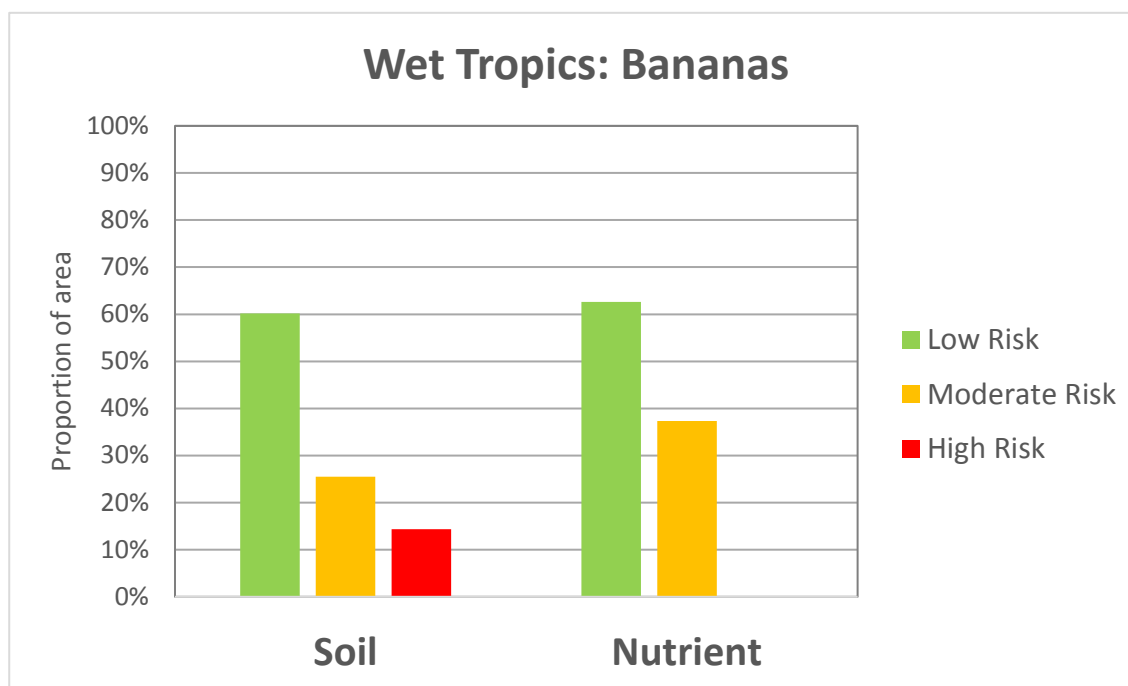


Figure 10: Wet Tropics proportional area of bananas water quality risk by pollutant

Table 10: Wet Tropics bananas water quality risk over time, by pollutant

Soil	Baseline	2014 Report Card	2015 Report Card	2016 Report card
Moderate-Low Risk	45%	53%	57%	60%
Moderate Risk	38%	29%	28%	25%
High Risk	17%	17%	15%	14%
Nutrient				
Moderate-Low Risk	42%	52%	56%	63%
Moderate Risk	50%	40%	37%	37%
High Risk	8%	8%	7%	0%

## Burdekin

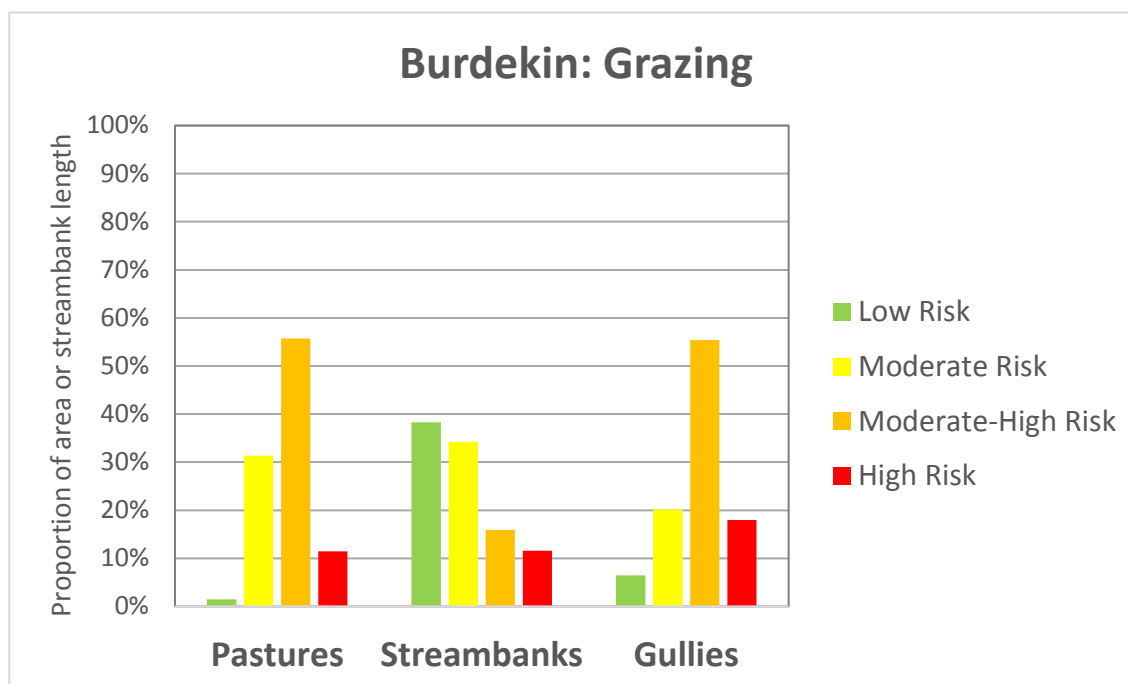
### Grazing

D  
44%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	33%	4,060,585 ha
Streambanks	73%	27,301 km
Gullies	27%	3,293,439 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 983 graziers are managing 12.4 million hectares of land and 37,000 kilometres of streambanks in the Burdekin region. By June 2016, approximately 33 per cent of grazing land was under best management practices relating to pasture (hillslope) erosion (4,060,585 hectares), 72 per cent for practices related to streambank erosion (27,301 kilometres of streambank) and 27 per cent for practices related to gully erosion (3,293,439 hectares).



**Figure 11: Burdekin proportional area of grazing water quality risk by erosion type**

Adoption of improved management practices occurred with 16 graziers through collaboration with NQ Dry Tropics (funded through the Australian Government's Reef Programme), which co-funded management improvements on more than 31,777 hectares.

The beef extension team of the Queensland Government Department of Agriculture and Fisheries (DAF) focused on providing BMP follow-up services and providing information on grazing land management and the sediment loss process and how it impacts end-of-catchment water quality. Management changes reported included improved matching of grazing pressure to feed supply, and preventative measures taken

to minimise the risk of initiating gully erosion. During 2015–16, a total of 121 beef businesses across 2.7 million hectares were engaged by the DAF team through activities to assist with practice changes.

The Grazing BMP program delivered locally by NQ Dry Tropics, in combination with Queensland Government extension support, engaged with 98 grazing businesses that collectively managed 2.5 million hectares of grazing land during 2015, and 20 landholders completed the Grazing BMP audit process. The BMP programs enable graziers to assess their management practices and aim to support them in acquiring the knowledge and skills necessary to adopt improved practices. Many of these grazing businesses have begun to implement management changes; as these changes become apparent the impacts will be estimated in future Reef report cards.

**Table 11: Burdekin grazing water quality risk over time, by pollutant**

Pastures	Baseline	2014 Report Card	2015 Report card	2016 Report card
Very Low Risk	0%	1%	1%	1%
Low Risk	29%	29%	32%	31%
Moderate Risk	59%	59%	56%	56%
Moderate - High Risk	12%	12%	12%	11%
<b>Streambank</b>				
Very Low Risk	38%	38%	38%	38%
Low Risk	34%	34%	34%	34%
Moderate Risk	16%	16%	16%	16%
Moderate - High Risk	12%	12%	12%	12%
<b>Gully</b>				
Very Low Risk	5%	6%	6%	6%
Low Risk	21%	20%	20%	20%
Moderate Risk	56%	56%	56%	55%
Moderate - High Risk	18%	18%	18%	18%

## Sugarcane

**E**  
22%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
<b>Sediment</b>	<b>17%</b>	14,066
<b>Nutrients</b>	<b>14%</b>	11,954
<b>Pesticides</b>	<b>36%</b>	30,217

**Target:** 90 per cent of sugarcane lands are managed using best management practice systems by 2018.

Approximately 556 growers are managing 83,000 hectares of sugarcane in the Burdekin region. By June 2016, approximately 36 per cent of sugarcane land was being managed using best management practice systems for practices relating to pesticides (30,000 hectares), 14 per cent for nutrients (12,000 hectares) and 17 per cent for soil (14,000 hectares).

**Table 12: Key sugarcane best management practices and their adoption rate over time in the Burdekin**

Key practices	Proportion of area where key practice has been adopted			
	Baseline	2014 Report Card	2015 Report Card	2016 Report Card
Green cane trash blanketing	2%	2%	2%	2%
Fallow management	7%	8%	9%	9%
Controlled machinery traffic	12%	12%	12%	12%
Tillage - plant cane	29%	31%	31%	31%
Nitrogen surplus	8%	10%	18%	18%
Fertiliser placement	91%	91%	92%	92%
Residual herbicide targeting	6%	6%	16%	16%
Residual herbicide strategy	64%	65%	68%	68%
Irrigation scheduling	45%	45%	45%	50%
Tailwater recycling	35%	39%	47%	47%

The Smartcane BMP program engaged with 179 growers in the Burdekin region (managing 37,551 hectares of sugarcane), with 24 growers (managing 6593 hectares) undertaking the BMP accreditation process up to July 2016. These growers were supported in completing self-assessments of their farm management practices against a range of industry standards, with a view to identifying priorities for potential improvement. Future Reef report cards will aim to describe the impacts of these management changes as they are reported.

The Reef Trust Tender programme, funded by the Australian Government and facilitated in the Burdekin by NQ Dry Tropics, aimed to improve nitrogen and irrigation management practices on sugarcane farms through a competitive tender process. Growers participated in a reverse auction which involved tender submissions outlining how and to what extent nitrogen and irrigation management practices could be improved. Funding was allocated on the basis of maximum value for money in terms of nitrogen reductions. NQ Dry Tropics contracted 16 sugarcane growers (managing 8064 hectares) and achieved an annual reduction in fertiliser application equivalent to 183 tonnes of nitrogen (an average of more than 22 kg N/ha/year).

The RP20C Burdekin Nitrogen Project, funded by the Queensland Government Department of Environment and Heritage Protection under the Reef Water Quality Science Program, aimed to provide further evidence supporting the industry standard for nitrogen applications and the Six Easy Steps nutrient budgeting process. Sugar Research Australia facilitated the delivery of the project and engaged with 23 cane farmers in the Burdekin catchment. The project has achieved an annual reduction of 499 tonnes of applied nitrogen across 12,721 hectares of cane, with an average reduction of 39 kg N/ha/year and improved irrigation scheduling practices through the installation of soil moisture probes on 3936 hectares.

Both of the above projects (RP20C and the Reef Trust Tender) have successfully targeted high risk nitrogen fertiliser rates. While many of the improvements reported are not reflected in the best management system metric used in this report, they must be acknowledged as having driven significant water quality improvements.

The DAF cane extension team engaged with 7 cane farmers managing 89 hectares. On-farm management practice changes included the following:

- 2 farmers changed fallow management to include a zonal tilled legume/cover crop and changed to calculating nitrogen rate based on Six Easy Steps and the farm or block yield history.
- 5 farmers changed residual herbicide application to incorporate band spraying, only using knockdowns in ratoon crops, and only using residuals when required, thereby reducing the amount of herbicide used across the farm area.

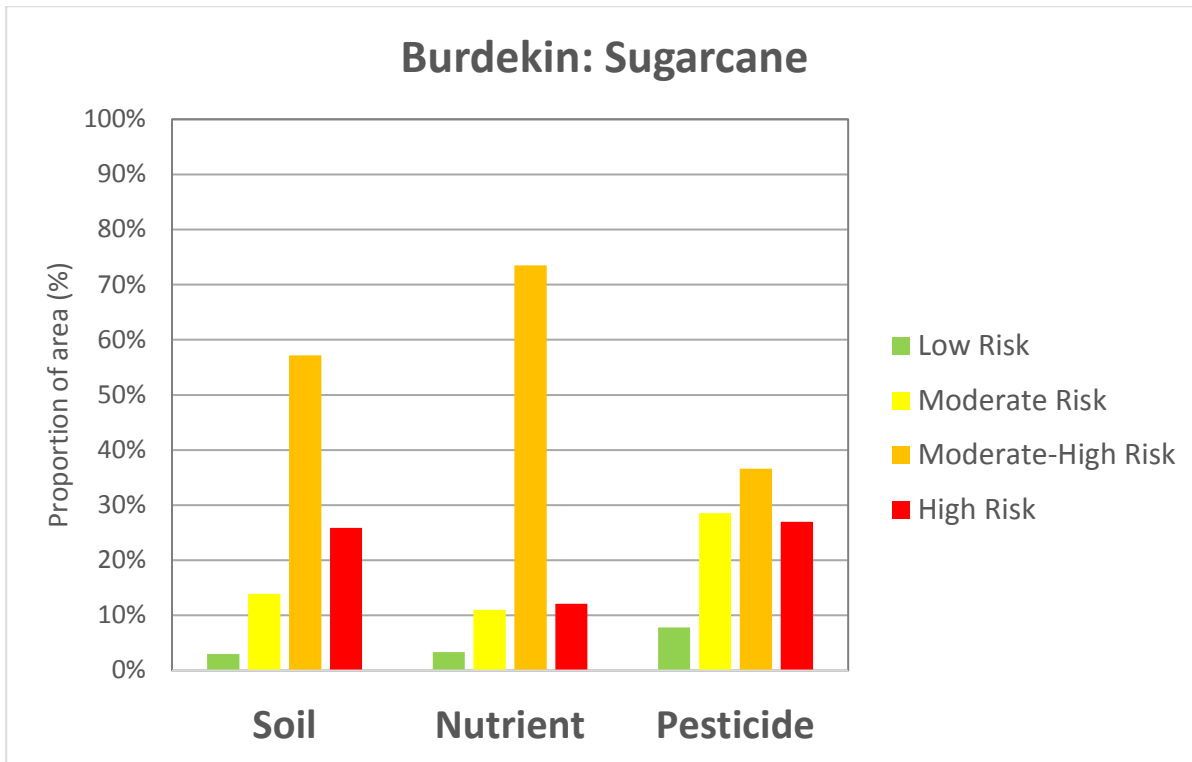


Figure 12: Burdekin proportional area of sugarcane water quality risk by pollutant

Table 13: Burdekin sugarcane water quality risk over time, by pollutant

Pollutant	Risk Level	Baseline	2014 Report card	2015 Report card	2016 Report card
Soil	Low Risk	3%	3%	3%	3%
	Moderate Risk	13%	14%	14%	14%
	Moderate-High Risk	58%	57%	57%	57%
	High Risk	26%	26%	26%	26%
Nutrient	Low Risk	3%	3%	3%	3%
	Moderate Risk	5%	7%	10%	11%
	Moderate-High Risk	67%	65%	62%	73%
	High Risk	25%	25%	24%	12%
Pesticide	Low Risk	7%	7%	8%	8%
	Moderate Risk	19%	18%	29%	29%
	Moderate-High Risk	47%	47%	37%	37%
	High Risk	28%	28%	27%	27%



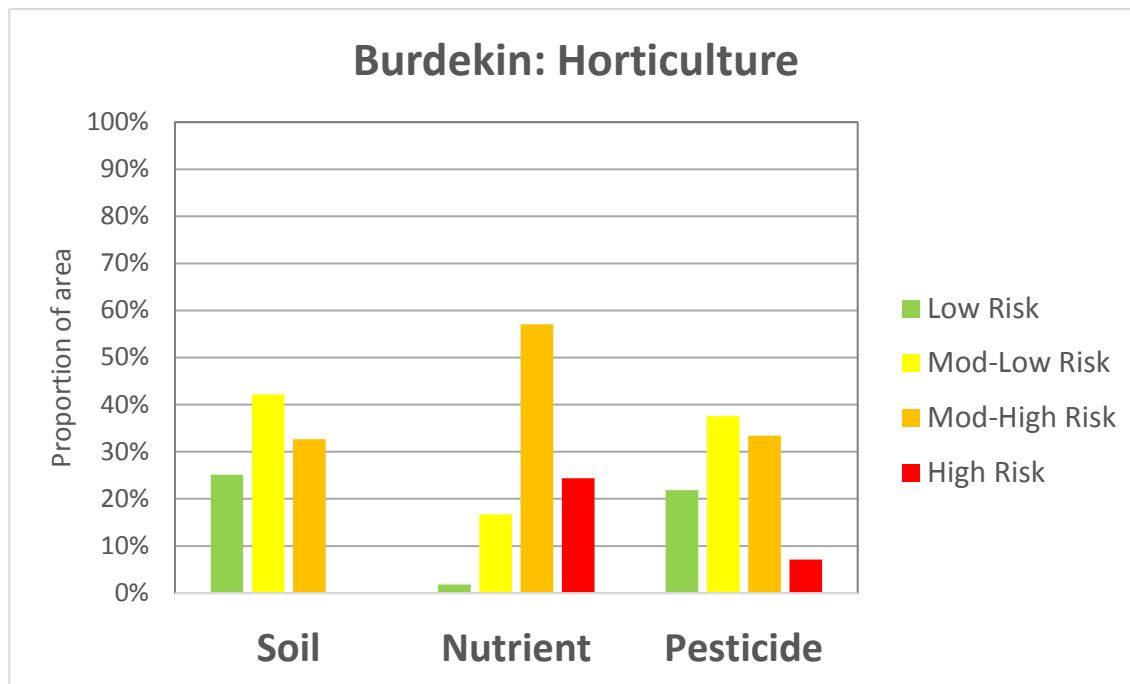
**Horticulture**

**C**  
49%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	67%	16,822
Nutrients	19%	4,635
Pesticides	60%	14,864

**Target:** 90 per cent of horticulture lands are managed using best management practice systems by 2018.

Approximately 200 horticulture producers are farming 25,000 hectares of land in the Burdekin region. By June 2016, best management practice systems were used on approximately 60 per cent of horticultural land for pesticides (14,800 hectares), 19 per cent for nutrients (4,600 hectares) and 67 per cent for soil (16,800 hectares). There was no Australian or Queensland Governments investment in horticulture in the Burdekin during 2015–16.



**Figure 12: Burdekin proportional area of horticulture water quality risk by pollutant**

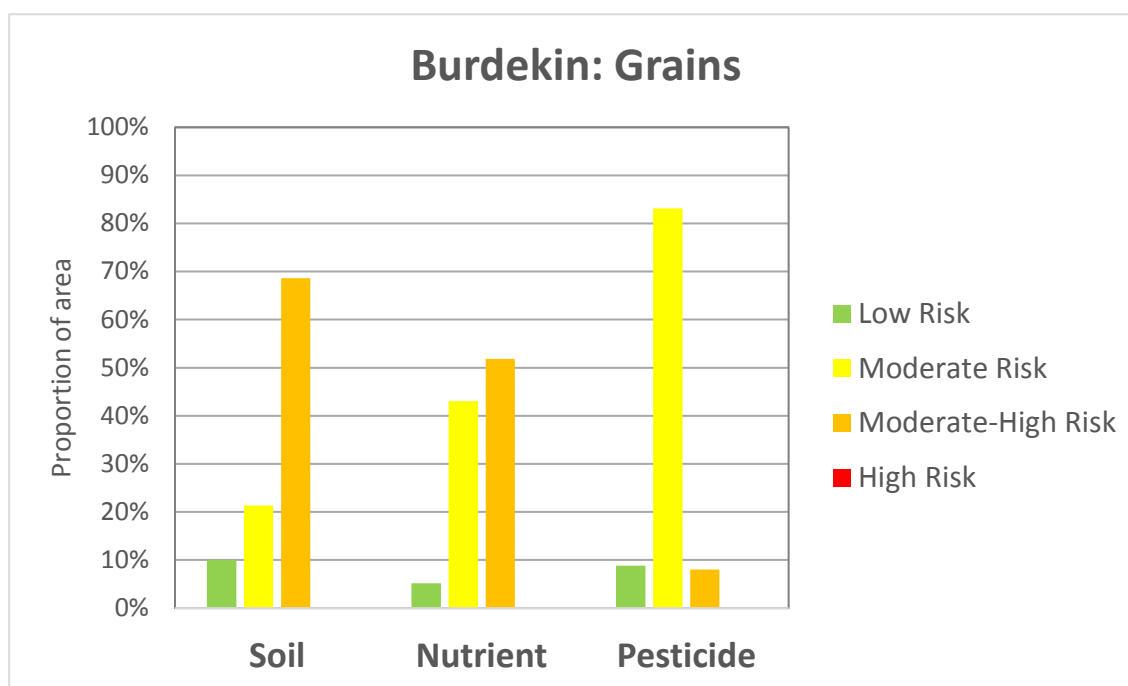
## Grains

**C**  
57%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Sediment	31%	38,612
Nutrients	48%	59,321
Pesticides	92%	113,227

**Target:** 90 per cent of grain farming land is managed using best management practice systems by 2018.

Approximately 44 growers are managing 123,000 hectares under grain crops in the Burdekin region. By June 2016, best management systems were being used on approximately 92 per cent of grain farming land for pesticides (113,000 hectares), 48 per cent for nutrients (59,000 hectares) and 31 per cent for soil (38,000 hectares).



**Figure 13: Burdekin proportional area of grains water quality risk by pollutant**

As of June 2016, **the Grains BMP program** had engaged 34 grain growers managing 98,923 hectares. During 2015–16, no further growers completed the Grains BMP program in the Burdekin catchment, but the total grain production area assessed under the Grains BMP program increased by 6000 hectares.

**Table 14: Burdekin grains water quality risk over time, by pollutant**

Soil	Baseline	2014 Report card	2015 Report card	2016 Report card
Lowest Risk	5%	6%	10%	10%
Moderate-Low Risk	26%	26%	21%	21%
Moderate Risk	69%	69%	69%	69%
High Risk	0%	0%	0%	0%

Nutrient				
Lowest Risk	5%	5%	5%	5%
Moderate-Low Risk	43%	43%	43%	43%
Moderate Risk	52%	52%	52%	52%
High Risk	0%	0%	0%	0%
Pesticide				
Lowest Risk	4%	8%	9%	9%
Moderate-Low Risk	82%	83%	83%	83%
Moderate Risk	14%	9%	8%	8%
High Risk	0%	0%	0%	0%

# Mackay Whitsunday

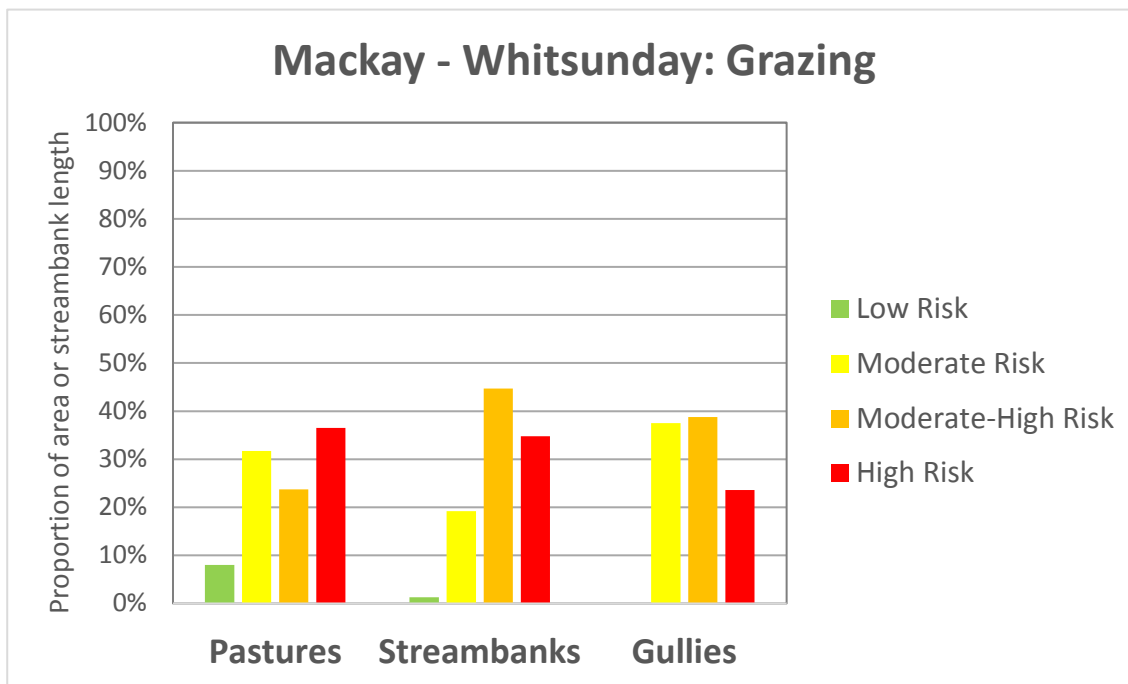
## Grazing

D  
33%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	40%	120,715 ha
Streambanks	21%	474 km
Gullies	38%	113,087 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 416 graziers are managing 304,000 hectares of land and 2300 kilometres of streambanks in the Mackay Whitsunday region. By June 2016, approximately 40 per cent of grazing land was being managed using best management practice systems for practices related to pasture (hillslope) erosion (120,715 hectares), 21 per cent for practices relating to streambank erosion (474 kilometres of streambank) and 38 per cent for practices relating to gully erosion (113,087 hectares).



**Figure 14: Mackay Whitsunday proportional area of grazing water quality risk by erosion type**

A total of 22 graziers in the Mackay Whitsunday region improved their grazing land management practices on 2112 hectares of land and 8 kilometres of streambanks with the assistance of Reef Catchments NRM and the Australian Government’s Reef Programme. At most of these sites, fencing was used to exclude cattle from streams and off-stream watering points were installed.

Through the assistance of the Australian Government Reef program -funded Systems Repair grants, Reef Catchments NRM repaired 30 gully sites and 57 streambank sites protecting 35 kilometres of streambank. Repairs at gully restoration sites included rock armouring and using geofabric to prevent further erosion,

and revegetation of gully heads. Repairs at streambank restoration sites included construction of riparian fences, revegetation of eroding banks and stabilising of bank walls with rocks.

DAF's beef extension team focused on providing BMP follow-up services, information on grazing land management, and information about the sediment loss process and how it impacts end-of-catchment water quality. During the 2015–16 financial year the DAF team engaged with three beef businesses across 8263 hectares to assist with practice changes.

**Table 15: Mackay Whitsunday grazing water quality risk over time, by pollutant**

Pastures	Baseline	2014 Report Card	2015 Report card	2016 Report card
Very Low Risk	8%	8%	8%	8%
Low Risk	30%	31%	31%	32%
Moderate Risk	25%	25%	24%	24%
Moderate - High Risk	37%	37%	37%	37%
Streambank				
Very Low Risk	1%	1%	1%	1%
Low Risk	17%	17%	18%	19%
Moderate Risk	46%	46%	45%	45%
Moderate - High Risk	35%	35%	35%	35%
Gully				
Very Low Risk	0%	0%	0%	0%
Low Risk	37%	37%	37%	37%
Moderate Risk	38%	38%	38%	39%
Moderate - High Risk	24%	24%	24%	24%

## Sugarcane

D  
36%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	42%	57,641
Nutrients	23%	31,074
Pesticides	43%	58,711

**Target:** 90 per cent of sugarcane lands are managed using best management practice systems by 2018.

In the Mackay Whitsunday region, 1380 sugarcane growers are managing 136,000 hectares of land. As at June 2016, approximately 43 per cent of sugarcane farming land was being managed using best practice management for practices relating to pesticides (58,711 hectares), 23 per cent for nutrients (31,074 hectares) and 42 per cent for soil (57,641 hectares).

**Table 16: Mackay Whitsunday key sugarcane best management practices and their adoption rate over time**

Key practices	Proportion of area where key practice has been adopted			
	Baseline	2014 Report card	2015 Report card	2016 Report card
Green cane trash blanketing	84%	84%	84%	86%
Fallow management	13%	13%	13%	14%
Controlled machinery traffic	55%	55%	55%	56%
Tillage - plant cane	17%	17%	19%	20%
Nitrogen surplus	19%	20%	22%	24%
Fertiliser placement	69%	69%	70%	71%
Residual herbicide targeting	37%	37%	39%	41%
Residual herbicide strategy	41%	41%	42%	44%

Reef Catchments NRM, through the Australian Government’s Reef Programme, facilitated management practice improvements with 88 sugarcane growers over 21,833 hectares. These farm management changes resulted from a mix of one-on-one extension and agronomic support, and financial incentives for taking on best practice or innovative practices. Management changes included the following:

- 41 growers undertook Six Easy Steps nutrient management planning on a block-by-block basis to determine the most efficient nitrogen fertiliser rates. Planning also included electrical conductivity soil mapping to understand spatial soil variability and constraints. This work is expected to result in significant reductions in nitrogen surplus in future sugarcane crops.
- 9 growers completed block-by-block chemical management plans to determine the most efficient and lowest risk use of herbicides.
- 38 growers completed both a Six Easy Steps nutrient management planning on a block-by-block basis and a block-by-block chemical management plan.

The Smartcane BMP program engaged with 479 growers (managing 81,001 hectares of sugarcane). At July 2016, 18 of these growers (managing 3779 hectares) had achieved BMP accreditation. These growers were supported in completing self-assessments of their farm management practices against a range of industry standards, with a view to identifying priorities for potential improvement. Future Reef report cards will aim to describe the impacts of these management changes as they are reported.

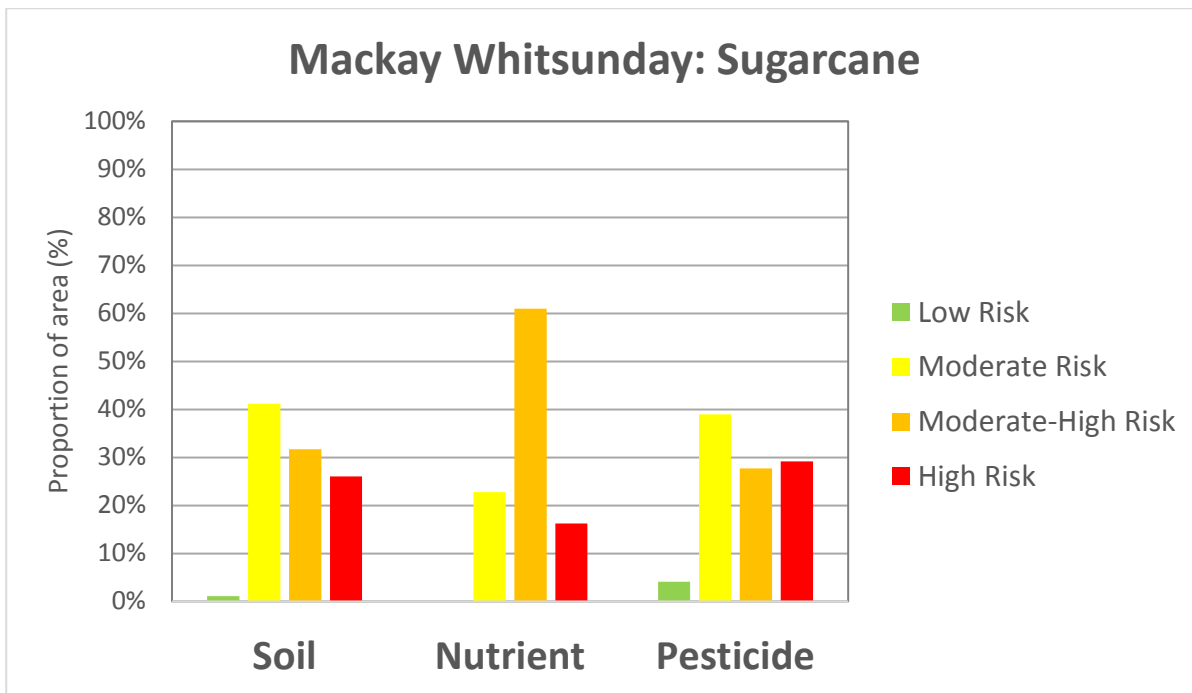


Figure 15: Mackay Whitsunday proportional area of sugarcane water quality risk by pollutant

Table 17: Mackay Whitsunday sugarcane water quality risk over time, by pollutant

Pollutant	Baseline	2014 Report card	2015 Report card	2016 Report card
<b>Soil</b>				
Low Risk	1%	1%	1%	1%
Moderate Risk	40%	40%	40%	41%
Moderate-High Risk	31%	31%	33%	32%
High Risk	28%	28%	26%	26%
<b>Nutrient</b>				
Low Risk	0%	0%	0%	0%
Moderate Risk	19%	20%	21%	23%
Moderate-High Risk	59%	58%	60%	61%
High Risk	22%	22%	19%	16%
<b>Pesticide</b>				
Low Risk	4%	4%	4%	4%
Moderate Risk	32%	32%	36%	39%
Moderate-High Risk	31%	31%	28%	28%
High Risk	33%	33%	32%	29%

## Fitzroy

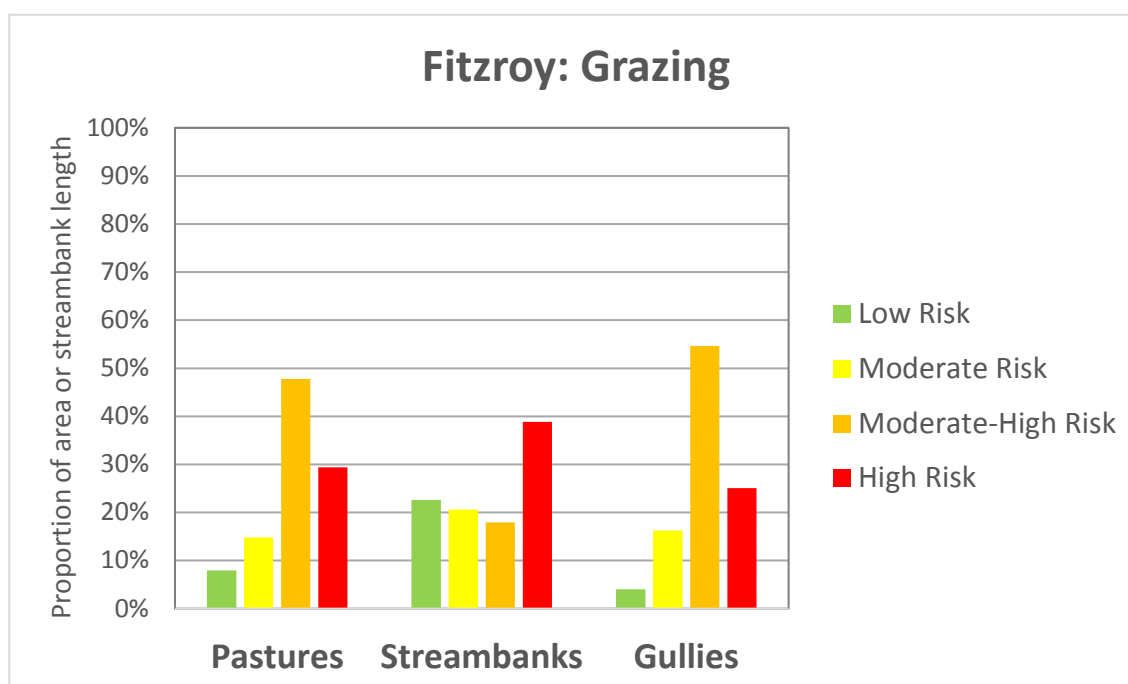
### Grazing

D  
29%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	23%	2,893,407 ha
Streambanks	43%	16,870 km
Gullies	20%	2,575,754 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 3666 graziers are managing 12.7 million hectares of land and 39,000 kilometres of streambanks in the Fitzroy region. By June 2016, approximately 23 per cent of grazing land (2,893,407 hectares) was under best management practice for practices relating to surface (hillslope) erosion from pastures, 43 per cent (16,870 kilometres of streambank) for practices relating to streambank erosion and 20 per cent (2,575,754 hectares) for practices relating to gully erosion.



**Figure 16: Fitzroy proportional area of grazing water quality risk by erosion type**

A total of 117 graziers adopted improved management practices through collaboration with the Fitzroy Basin Association (funded through the Australian Government's Reef Programme), which co-funded management improvements on 90,736 hectares of predominantly river frontage and 921 kilometres of streambank. Of the projects completed, six were specific gully remediation projects aimed at reducing sediment from active gully erosion.

The Natural Resource Management Investment Programme (funded through the Queensland Department of Natural Resources and Mines), facilitated through the Fitzroy Basin Association, funded management improvements with 21 graziers across 5465 hectares and 31 kilometres of streambank frontage to improve,



protect and restore riparian areas and rangelands by managing pests and weeds, and ultimately to improve end-of-catchment water quality.

Through funding from the Australian Government’s National Landcare Program, the Fitzroy Basin Association engaged with 21 landholders (managing 96,375 hectares) on a one-to-one basis to develop grazing land management plans.

The Grazing BMP program and associated Queensland Government extension staff worked with 169 graziers managing 1.1 million hectares of grazing land to assess farm management practices and identify potential actions to improve practices. A further 14 landholders achieved accreditation in the BMP process. With ongoing support, it is expected that graziers will be able to acquire new knowledge and skills which will drive management practice changes on farms. Future Reef report cards will aim to estimate the impacts of such changes as they become apparent and as the spatial extent can be described.

The DAF beef extension team focused on providing BMP follow-up services, providing information on grazing land management, and providing information on the sediment loss process and how it impacts end-of-catchment water quality. During the 2015–16 financial year, the DAF team engaged an additional 35 beef businesses across 390,000 hectares to assist with practice changes.

**Table 18: Fitzroy grazing water quality risk over time, by pollutant**

Pastures	Baseline	2014 Report Card	2015 Report card	2016 Report card
Very Low Risk	8%	8%	8%	8%
Low Risk	13%	14%	14%	15%
Moderate Risk	49%	49%	49%	48%
Moderate - High Risk	30%	30%	30%	29%
Streambank				
Very Low Risk	21%	21%	21%	23%
Low Risk	20%	20%	20%	21%
Moderate Risk	19%	19%	19%	18%
Moderate - High Risk	41%	40%	40%	39%
Gully				
Very Low Risk	4%	4%	4%	4%
Low Risk	16%	16%	16%	16%
Moderate Risk	55%	55%	55%	55%
Moderate - High Risk	25%	25%	25%	25%

### Horticulture

**D**  
32%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	61%	4,663
Nutrients	9%	698
Pesticides	25%	1,889

**Target:** 90 per cent of horticulture lands are managed using best management practice systems by 2018

Approximately 100 horticulture producers are farming 7700 hectares of land in the Fitzroy region. By June 2016, best management practice systems were being used by approximately 25 per cent (1,889 hectares) of horticulture growers for pesticides, 9 per cent (698 hectares) for nutrients and 61 per cent (4,663 hectares) for soil.

The Fitzroy Basin Association, through the Australian Government’s Reef Programme, facilitated financial incentives for farm management improvements on 6 farms and 98 hectares of horticultural land during 2015–16. These improvements involved more efficient use of insecticides and fertilisers, improved irrigation scheduling, and practices to increase ground cover around crop rows.

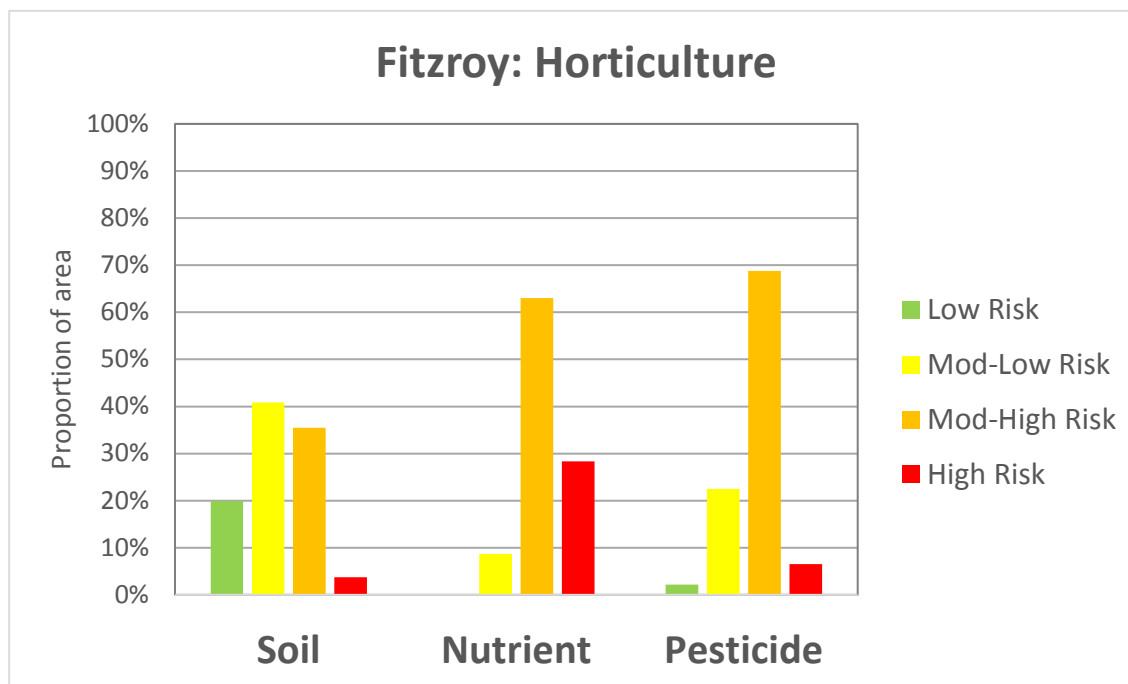


Figure 16: Fitzroy proportional area of horticulture water quality risk by pollutant

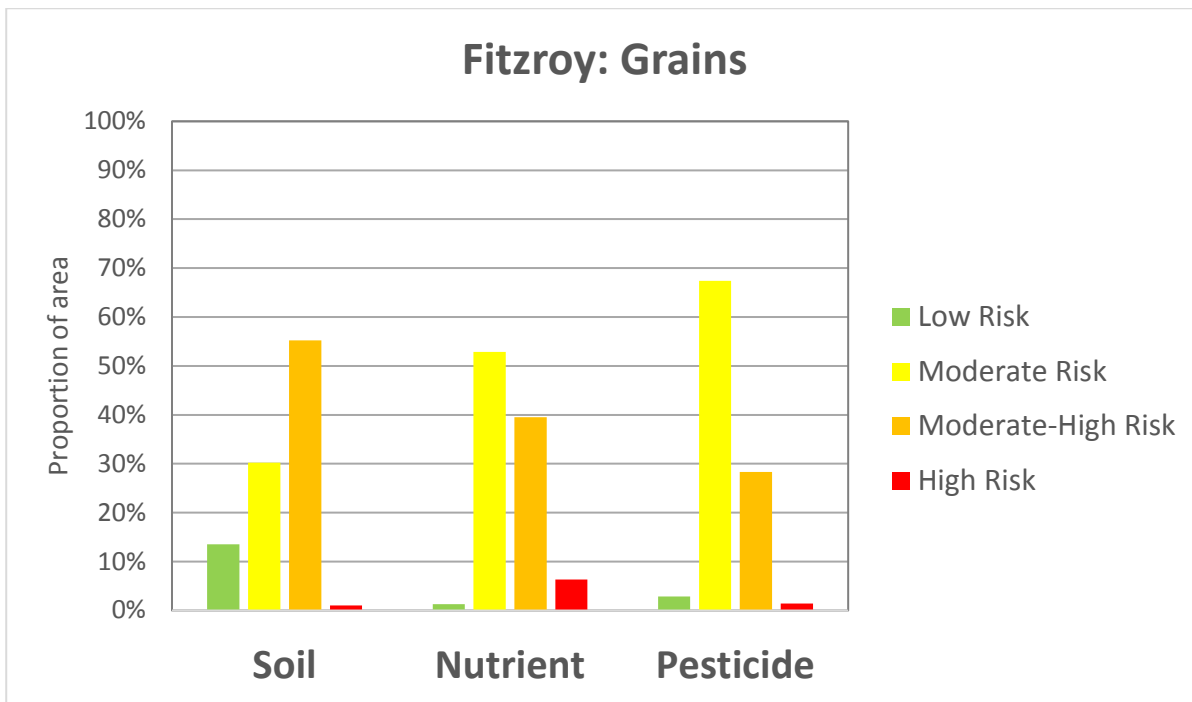
### Grains

**C**  
56%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	44%	400,311
Nutrients	54%	495,257
Pesticides	70%	642,698

**Target:** 90 per cent of grain farming land is managed using best management practice systems by 2018.

Approximately 600 grain growers are managing about 914,000 hectares of land in the Fitzroy region. The amount of land under grain production can vary considerably over time due to some land alternating between grain production and pastures for beef cattle. By June 2016, best practice management systems were being used on approximately 70 per cent (642,698 hectares) of grain-growing land for pesticides, 54 per cent (495,257 hectares) for nutrients and 44 per cent (400,311 hectares) for soil.



**Figure 17: Fitzroy proportional area of grains water quality risk by pollutant**

During 2015–16, the Grains BMP program engaged with 37 growers managing 139,815 hectares in the Fitzroy region. Growers identifying scope for practice improvement relating to off-farm water quality then became eligible for incentive funding to make these changes.

A total of 26 grain growers implemented best practice improvements on 11,693 hectares of land through working directly with the Fitzroy Basin Association (funded through the Australian Government’s Reef Programme), which co-funded management improvements, including the following:

- 18 growers installed contour banks. Contour banks are a critical element of best practice systems for minimising soil erosion from cropped lands.
- 4 growers modified machinery to enable implementation of zero tillage.
- 4 growers adopted innovative controlled traffic farming systems.

The Natural Resource Management Investment Programme (funded through the Queensland Department of Natural Resources and Mines), facilitated through the Fitzroy Basin Association, engaged with 9 grain growers (15,305 hectares) on a one-on-one basis to make the following changes:

- 2 growers (2645 hectares) adopted precision nutrient application practices based on yield data.
- 4 growers (10,143 hectares) purchased equipment to improve fertiliser application efficiency.
- 1 grower (284 hectares) changed from a partially controlled machinery traffic system to a fully controlled traffic farming system.
- 2 growers (2232 hectares) installed contour banks to reduce soil erosion.

**Table 19: Fitzroy gains water quality risk over time, by pollutant**

<b>Soil</b>	<b>Baseline</b>	<b>2014 Report Card</b>	<b>2015 Report Card</b>	<b>2016 Report Card</b>
Lowest Risk	13%	13%	13%	14%
Moderate-Low Risk	29%	30%	30%	30%
Moderate Risk	56%	56%	55%	55%
High Risk	2%	2%	1%	1%
<b>Nutrient</b>				
Lowest Risk	1%	1%	1%	1%
Moderate-Low Risk	52%	52%	53%	53%
Moderate Risk	40%	40%	40%	40%
High Risk	6%	6%	6%	6%
<b>Pesticide</b>				
Lowest Risk	3%	3%	3%	3%
Moderate-Low Risk	67%	67%	67%	67%
Moderate Risk	29%	28%	28%	28%
High Risk	1%	1%	1%	1%

## Burnett Mary

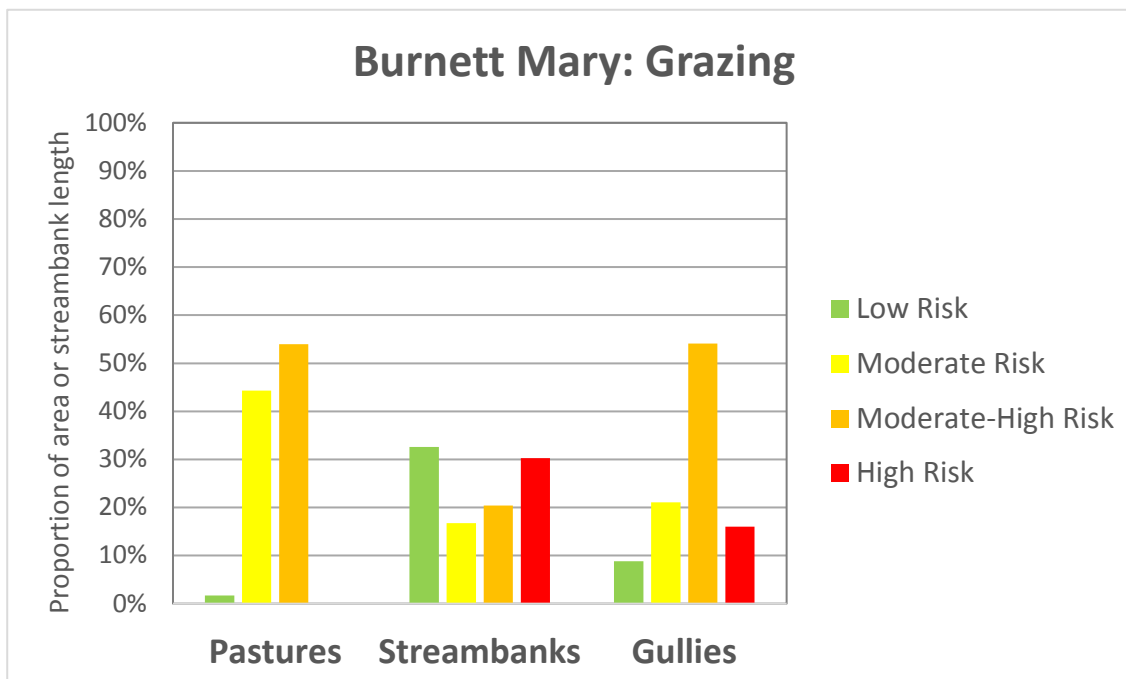
### Grazing

D  
42%

Erosion source	Area managed under best management practice systems	
	Proportion (%)	Area (hectares or kilometres)
Pastures	46%	1,316,893 ha
Streambanks	49%	6,945 km
Gullies	30%	854,931 ha

**Target:** 90 per cent of grazing lands are managed using best management practice systems by 2018.

Approximately 2495 graziers are managing 2.66 million hectares of land in the Burnett Mary region and about 14,078 kilometres of mapped streambanks. By June 2016, approximately 46 per cent (1,316,893 hectares) of grazing land was under best practice management systems for practices relating to surface (hillslope) erosion from pastures, 49 per cent (6945 kilometres of streambank) for practices relating to streambank erosion and 30 per cent (854,931 hectares) for practices relating to gully erosion.



**Figure 18: Burnett Mary proportional area of grazing water quality risk by erosion type**

A total of 64 graziers managing 11,096 hectares of grazing lands adopted improved management practice through collaboration with the Burnett Mary Regional Group and financial incentives provided by the Australian Government's Reef Programme. Most of these projects involved fencing to limit livestock access to a total of 70 kilometres of streambank frontage.

The Sustainable Agriculture project (funded through the Queensland Department of Natural Resources and Mines), facilitated through the Burnett Mary Regional Group, funded management improvements with 17 graziers across 4920 hectares to mitigate erosion and sediment loss, provide advice and support on sustainable best management practices, and develop property management plans with landholders.

Through the assistance of the Australian Government Reef program -funded Systems Repair grants, Burnett Mary Regional Group engaged with 14 landholders across 258 hectares to improve riparian management and reduce erosion across the landscape, which involved fencing 12 kilometres of stream frontages to limit livestock access. Specifically:

- 8 landholders undertook streambank rehabilitation and restoration projects
- 6 landholders completed work to reduce gully erosion in riparian areas.

The Grazing BMP program and associated Queensland Government extension staff worked with 34 grazing businesses managing over 91,000 hectares of grazing lands. As in the Burdekin and Fitzroy regions, the graziers assessed their own management with a view to identifying areas where new knowledge and skills may be beneficial. Future Reef report cards will describe the water quality impacts of farm management changes influenced by this process.

**Table 20: Burnett Mary grazing water quality risk over time, by pollutant**

Pastures	Baseline	2014 Report Card	2015 Report card	2016 Report card
Low Risk	2%	2%	2%	2%
Moderate Risk	44%	44%	44%	44%
Moderate-High Risk	54%	54%	54%	54%
High Risk	0%	0%	0%	0%
Streambank				
Low Risk	32%	32%	32%	33%
Moderate Risk	16%	16%	16%	17%
Moderate-High Risk	21%	21%	20%	20%
High Risk	31%	31%	31%	30%
Gully				
Low Risk	9%	9%	9%	9%
Moderate Risk	21%	21%	21%	21%
Moderate-High Risk	54%	54%	54%	54%
High Risk	16%	16%	16%	16%

### Sugarcane

D  
35%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	39%	33,891
Nutrients	15%	12,590
Pesticides	50%	43,251

**Target:** 90 per cent of sugarcane lands are managed using best management practice systems by 2018.

Approximately 498 growers are managing 86,000 hectares of land in the Burnett Mary region. As at June 2016, approximately 50 per cent (43,251 hectares) of sugarcane land was being managed using best

practice management systems for practices relating to pesticides, 15 per cent (12,590 hectares) for nutrients and 39 per cent (33,891 hectares) for soil.

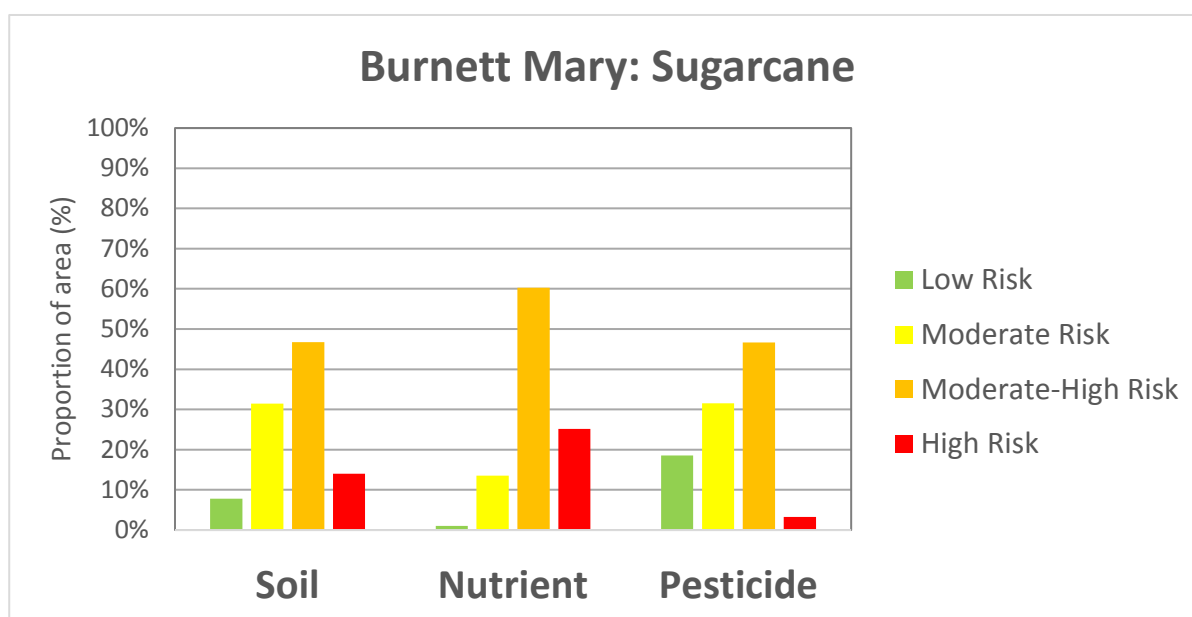
**Table 21: Burnett Mary key sugarcane best management practices and their adoption rate over time**

Key practices	Proportion of area where key practice has been adopted			
	Baseline	2014 Report Card	2015 Report Card	2016 Report Card
Green cane trash blanketing	93%	94%	94%	94%
Fallow management	59%	59%	60%	61%
Controlled machinery traffic	52%	53%	53%	54%
Tillage - plant cane	24%	25%	25%	27%
Nitrogen surplus	13%	13%	13%	15%
Fertiliser placement	61%	62%	62%	62%
Residual herbicide targeting	47%	47%	48%	50%
Residual herbicide strategy	66%	66%	67%	67%

A total of 54 sugarcane growers adopted improved practices on 7587 hectares of land through collaboration with the Burnett Mary Regional Group and accessing financial incentives through the Australian Government’s Reef Programme, including but not limited to the following:

- 9 growers improved fallow management by reducing tillage through purchasing equipment.
- 5 growers moved to zonal tillage prior to planting cane.
- 7 growers adopted the Six Easy Steps nutrient budgeting process.
- 13 growers changed to sub-surface application of nitrogen fertiliser.
- 11 growers improved the application of residual herbicides.
- 3 growers improved management of irrigation and rainfall run-off.

The Smartcane BMP program worked with 124 growers (16,111 hectares of sugarcane) and had accredited 5 growers (3098 hectares) in the Burnett Mary region by July 2016. These growers completed self-assessments of their farm management practices against a range of industry standards, with a view to identifying priorities for future improvement. Future Reef report cards will aim to describe the impacts of management changes stemming from this engagement, as they are realised.



**Figure 19: Burnett Mary proportional area of sugarcane water quality risk by pollutant**

**Table 22: Burnett Mary sugarcane water quality risk over time, by pollutant**

Soil	Baseline	2014 Report card	2015 Report card	2016 Report card
Low Risk	8%	8%	8%	8%
Moderate Risk	31%	31%	31%	31%
Moderate-High Risk	48%	47%	47%	47%
High Risk	14%	14%	14%	14%
Nutrient				
Low Risk	1%	1%	1%	1%
Moderate Risk	12%	12%	12%	14%
Moderate-High Risk	60%	60%	60%	60%
High Risk	27%	27%	27%	25%
Pesticide				
Low Risk	18%	19%	19%	19%
Moderate Risk	29%	29%	29%	32%
Moderate-High Risk	48%	48%	47%	47%
High Risk	5%	5%	5%	3%

### Horticulture

**C**  
**48%**

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	76%	17,572
Nutrients	33%	7,552
Pesticides	36%	8,223

**Target:** 90 per cent of horticulture lands are managed using best management practice systems by 2018

Approximately 280 horticulture producers are farming around 23,000 hectares of land in the Burnett Mary region. The area under horticulture in this region can vary considerably on an annual basis due to rotations between sugarcane and annual vegetable crops. As at June 2016, best practice management systems for pesticides were in place on approximately 36 per cent (8,223 hectares) of horticulture land, 33 per cent (7,552 hectares) for nutrients and 76 per cent (17,572 hectares) for soil.



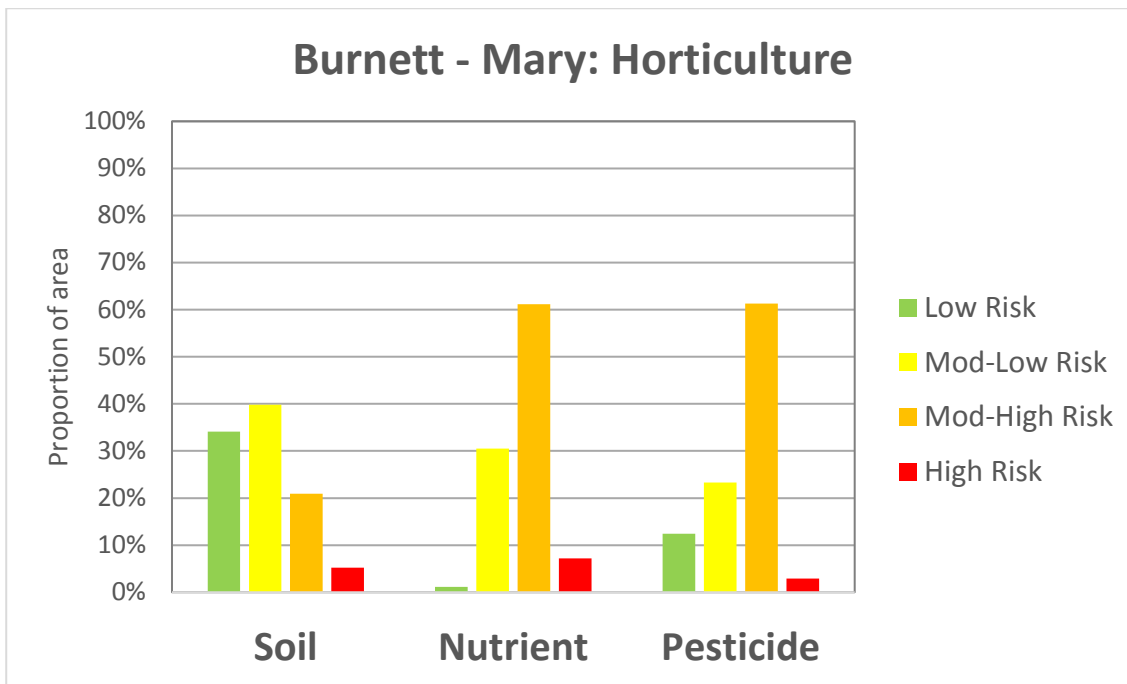


Figure 20: Burnett Mary proportional area of horticulture water quality risk by pollutant

### Grains

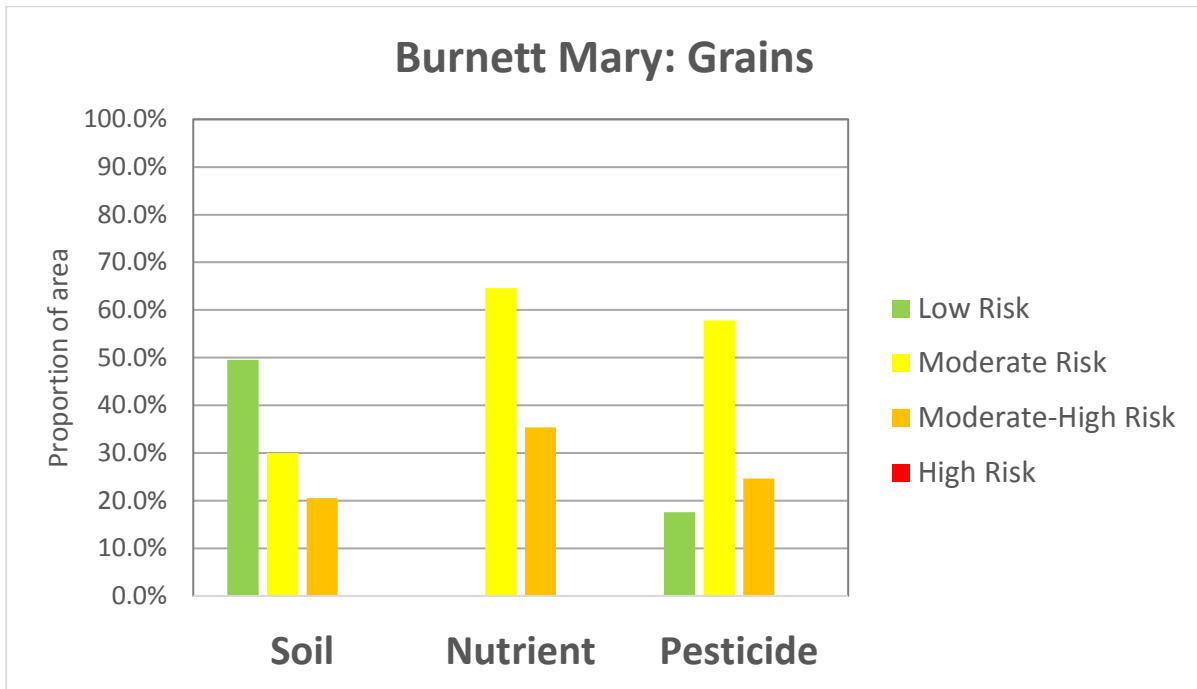
**B**  
74%

Pollutant	Area managed under best management practice systems	
	Proportion (%)	Area (hectares)
Soil	80%	64,318
Nutrients	65%	52,275
Pesticides	76%	60,989

**Target:** 90 per cent of grain farming land is managed using best management practice systems by 2018.

Approximately 280 grain growers are managing about 80,000 hectares of land in the Burnett Mary region. The amount of land under grain production can vary considerably over time due to some land alternating between grain production and pastures for beef cattle. By June 2016, best management systems for pesticides were being used on approximately 76 per cent (60,989 hectares) of grain-growing land, 65 per cent for nutrients (52,275 hectares) and 79 per cent for soil (64,318 hectares).

The Sustainable Agriculture project (funded through the Queensland Department of Natural Resources and Mines), facilitated through the Burnett Mary Regional Group, funded management improvements with 6 grain growers across 944 hectares.



**Figure 21: Burnett Mary proportional area of grains water quality risk by pollutant**

**Table 23: Burnett Mary grains water quality risk over time, by pollutant**

Soil	Baseline	2014 Report Card	2015 Report Card	2016 Report Card
Lowest Risk	50%	50%	50%	50%
Moderate-Low Risk	30%	30%	30%	30%
Moderate Risk	21%	21%	21%	21%
High Risk	0%	0%	0%	0%
<b>Nutrient</b>				
Lowest Risk	0%	0%	0%	0%
Moderate-Low Risk	65%	65%	65%	65%
Moderate Risk	35%	35%	35%	35%
High Risk	0%	0%	0%	0%
<b>Pesticide</b>				
Lowest Risk	18%	18%	18%	18%
Moderate-Low Risk	58%	58%	58%	58%
Moderate Risk	25%	25%	25%	25%
High Risk	0%	0%	0%	0%