

CASE STUDY

ADAPTIVE

MANAGEMENT

The Use of 'Real Time' Water Quality Monitoring for Adaptive Management on Sugarcane Farms.

Funded through NQ Dry Tropics Reef Rescue and Reef Programmes and the Queensland Government Department of Environment and Heritage Protection, the Adaptive Management Project is driving management practice changes for water quality improvement in the Northcote sub-catchment.

Project

This will be achieved through in-stream water quality monitoring that provides sub-catchment specific data for management of nutrients and pesticides. Growers will be able to access real-time data to evaluate farm management practices and their impact on water quality.

For close to 20 years, the Burdekin-Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC) has been a community-based natural resource management organisation based in Ayr, North Queensland. BBIFMAC developed and

delivers the Adaptive Management project to assist sugarcane farmers to understand and manage the loss of nutrients from their farms in the Burdekin River Irrigation Area (BRIA).

Technology advances driving change

In the BRIA, extensive water quality monitoring has taken place over past years, both on-farms and in-stream through a number of regional water quality monitoring programs.

The missing link in this water quality monitoring has been the connection between farm specific management practices and the water quality in the drainage systems, which ultimately run into the Great Barrier Reef lagoon.

Recent advances in instrument technology and data communication, have provided the ability to monitor water quality, water volume and nutrient flux leaving farms. The data produced by this system is available in real time.

This allows farmers to directly relate their farm management practices to the water quality leaving their farms.

These technological advances have provided great opportunities and captured the attention of the industry as it shows the direct impact their farms may be having on the downstream ecosystems.

Connecting farmers to solutions

This project is primarily aimed at working with and assisting farmers to make the direct connection to the potential impact of their practices, from paddock to stream.

It is intensively monitoring runoff at the downstream end of this sub-catchment stream/drain which has a limited number of farms draining into it.



Hourly water samples are automatically taken with the real-time water quality monitoring equipment installed at the site.

Results are routinely ground-truthed, with manual samples collected by BBIFMAC staff at major events and sent away for laboratory analysis.

Through regular collaboration with the farm managers and on-site visits, daily farm activities, such as irrigation and fertiliser application are recorded and compared with

the water quality results obtained from the monitoring site.

This means that significant changes in concentration of nutrients can be traced back to specific farms and fields.

The contributing management practices can therefore be identified and discussed with the farmer.

This directly enables the farmer to adjust farm management practices accordingly, and work

towards improved water quality downstream from the farm.

Real-time results - from paddock to stream

The project to date has already shown how effective the approach is, connecting water monitoring results to activities in the paddock or environmental factors. For example, several isolated spikes in electrical conductivity (salinity) levels were traced back to a farmer irrigating with a groundwater pump.

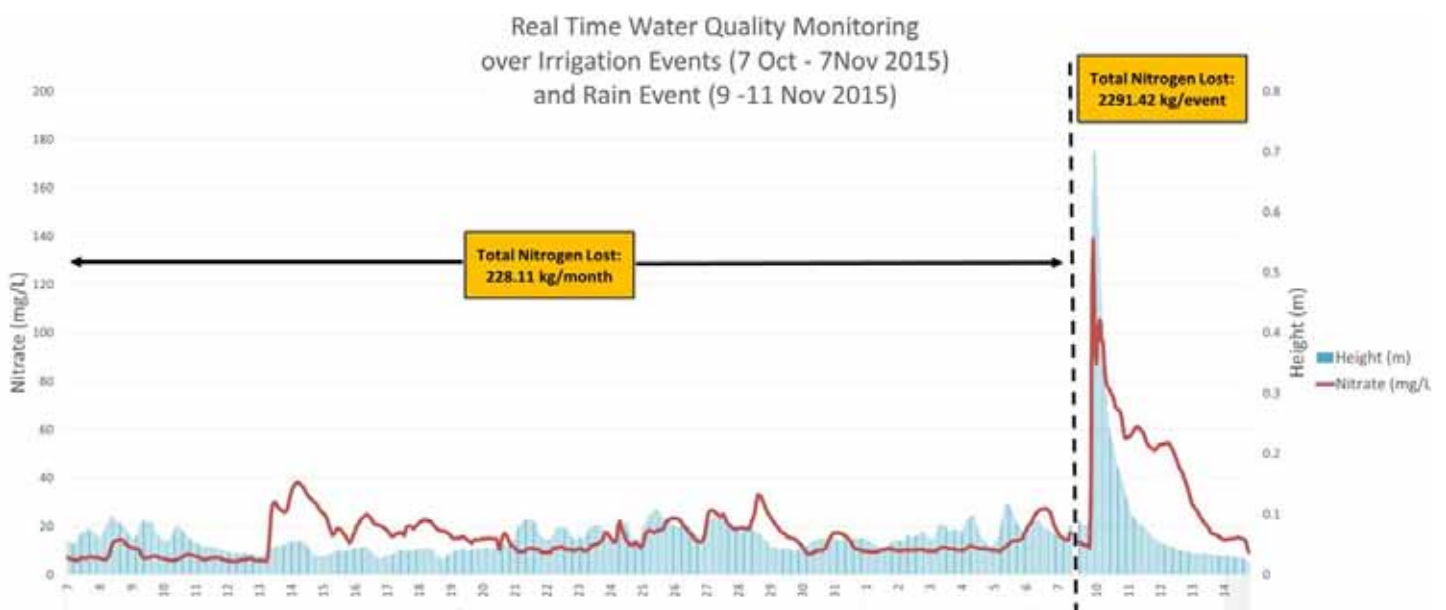


Figure 1: Nitrate levels and height of water above constructed weir recorded at sampling site.



In another instance, a marked increase in turbidity was able to be attributed to a large flock of water birds feeding in the drain which were disturbing sediments in the bottom.

The most interesting result was a huge spike in nitrate concentrations as a result of runoff from a 60mm rain event on the 9th and 10th of November 2015 following a long period of more than 8 months with little or no rain in the sub-catchment. (See Figure 1 previous page)

Nitrate concentrations measured in the drain averaged 15mg/L during the preceding month and were from irrigation runoff only. This equated to 228kg of nitrogen lost from the sub-catchment farms during this period.

During the rain event this increased ten-fold to more than 2,291kg nitrogen lost due to the huge increase in the volume of water leaving the farms in the sub-catchment.

The nitrate concentrations in the water also increased substantially during the rainfall event with a peak nitrate concentration of 139mg/L was measured during the event.

The large flux of nitrogen from the sub-catchment from the short, intense rainfall event could be explained by the fact that there is likely a relatively high concentration of residual nitrogen on or near the soil surface in the beds.

This is due to furrow irrigation the net water in the beds is generally moving upwards. This nitrogen is therefore readily available to be flushed into the furrow by a rainfall rate that exceeds the infiltration capacity of the soil.

A secondary reason for excessive losses occurring in rainfall events may be due to the surface water rising rapidly in the furrows and beds, and carrying the readily mobile nitrates off the field and into the drainage system.

Informing better nutrient management

This project has quantified the amount of nitrogen lost from sugarcane fields in irrigation events and compared this to rainfall events in real time with samples automatically taken and analysed every hour.

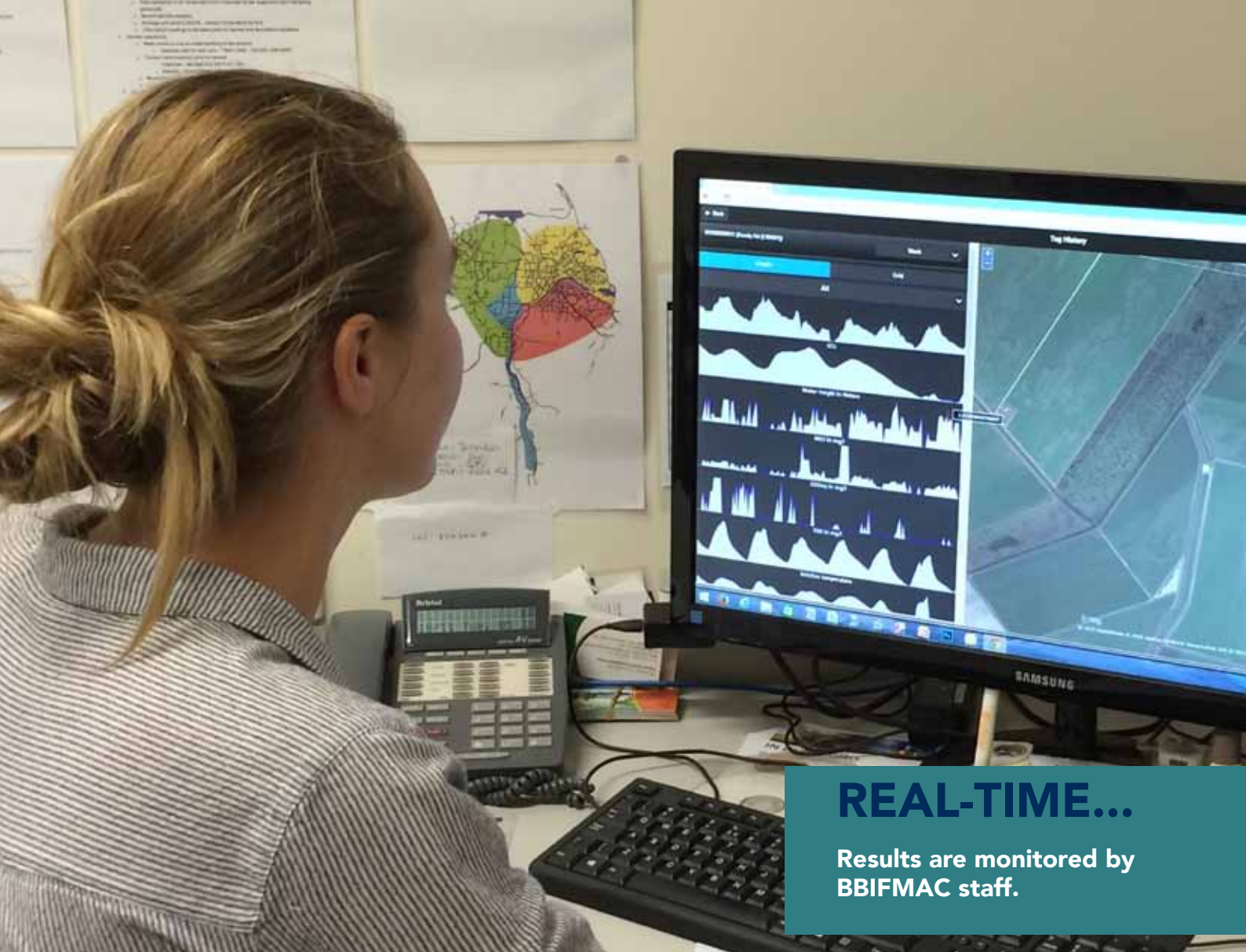
The results indicate that the challenge for farmers and the

wider industry is to limit the amount of nitrogen that is available for loss in irrigation and rainfall events, particularly because of the sheer volume of runoff generated by intense rainfall events.

The results of these findings highlight that from an environmental/water quality management perspective, as well as from a farm financial management viewpoint, there is a strong case for farm managers to work towards better matching nutrients with crop requirements.

Methods of achieving this include, better matching nitrogen fertiliser rates to crop growth, using the optimum form of nitrogen such as controlled release, and enhanced efficiency fertilisers, and improved fertiliser placement, which may include sub-surface application, banding or fertigation.

The NQ Dry Tropics Sustainable Agriculture programme is supporting Burdekin cane farmers to trial improved practices to target N use and reduce nutrient runoff entering the Great Barrier Reef.



REAL-TIME...

Results are monitored by BBIFMAC staff.

Who are we?

NQ Dry Tropics is an independent, not-for-profit, non-governmental organisation that supports the Burdekin Dry Tropics community to sustainably manage its land and water. As the leading Natural Resource Management body for the 146,000km² Burdekin Dry Tropics region, NQ Dry Tropics views innovation as crucial to the future of the agriculture sector.

The Programme

NQ Dry Tropics Sustainable Agriculture programme offers information, training and support to assist agricultural producers to use best management practices for resilient landscapes and productive enterprises. Within this program, the Sugarcane Innovations Program delivers a number of projects that support innovative farmers with opportunities to trial their practice ideas with the assistance of technical experts.

The Project

The three-year (2013-2016) Australian Government Reef Programme is reducing the impacts of agriculture on the Great Barrier Reef through implementation of a water quality improvement programme to achieve sustainable agricultural practices in the Burdekin Dry Tropics NRM region. The targeted extension and financial incentives programme aims to improve water quality by focusing on reducing pesticide and nutrient loss from Burdekin properties.

For more information

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