Sugarcane management in the Mackay Whitsunday

Ken Rohde (DNRM), Kaela McDuffie (DNRM), John Agnew (MAPS), Belinda Billing (Reef Catchments)

Introduction and methods

Two monitoring sites have been established in the Sandy Creek Catchment, south-west of Mackay which commenced in 2009. The sites have adopted different levels of soil management and nitrogen and herbicide application across seven different **'**treatment plots**'**.

Site one on Marian soil has five treatment plots of 0.7-0.8 hectares, trialling controlled traffic systems (1.5 metre versus 1.8 metre row spacing), skip row farming, three different nutrient application strategies and the use of residual herbicides versus an increased reliance on knockdown herbicides.

Site two on a Victoria Plains soil has two 1.1 hectare treatments: one with 1.5 metre single rows, "traditional" fertiliser recommendation and residual herbicide (Diuron/Hexazinone) and the second with 1.8 metre single rows (controlled traffic), nitrogen replacement fertiliser application and knockdown herbicides.

Rainfall, runoff quantity and quality soil water quality and farm operations were closely monitored over the 2009-2010 wet season.

Up to 15 rainfall events leading to paddock runoff were monitored in the 2009-2010 wet season at the Victoria Plains site and 13 at the Marian site. Runoff from the plots was collected automatically and measured for suspended sediment, nutrients and herbicides and compared between the different treatments. Soil water solution (drainage) samples were collected twice from each treatment plot at a soil depth of 0.9 metres.

Results

This case study outlines the preliminary results of the Victoria Plains trial site. Due to weather conditions and flooding of the Marion site, accurate runoff results cannot be determined.

The 2009–2010 wet season was in the top 20 per cent of the wettest years on record. This saw high runoff volumes from all seven treatment plots likely causing higher losses of pollutants than would occur in drier years. The wet year may have affected responses to soil management practices, as the soil remained wet for much of the year. Improvements in soil moisture due to the treatment were difficult to discern due to the high rainfall.

The Victoria Plains trial site demonstrated that matching row spacing to machinery track width (1.8 metre row spacing) reduced runoff by 18 per cent, improved soil moisture and reduced pollutant loads which likely led to improved downstream water quality while maintaining cane yields when compared to 1.5 metre conventional tillage.

Nitrogen treatments

Matching nitrogen inputs to soil type and crop requirement can substantially reduce nutrient levels in runoff. Figure 8 shows the reduction in dissolved nitrogen loss in runoff between two treatments at the Victoria Plains site. A planting mix of diammonium phosphate (DAP) was applied to both treatments, which included 38 kilograms of nitrogen per hectare (as calculated via '6 easy steps'. Additional nutrients were added to one treatment, bringing the nitrogen rate up to 133 kilograms per hectare (C Management practice for nutrients) while the second treatment did not receive any additional nutrients (B Management practice for

nutrients). The existing soil nitrogen was high due to a legume crop grown in the preceding fallow.

If nutrients are applied in excess to the crops needs, this excess can be washed into waterways , lost to deep drainage or volatilisation.

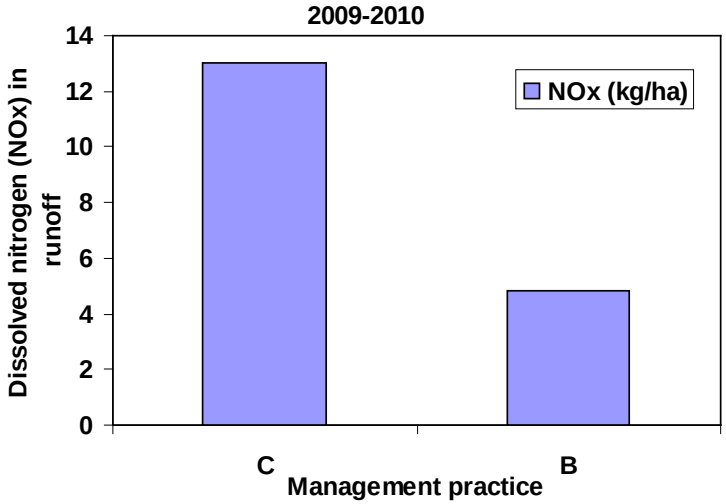

Figure 8 Total losses of dissolved nitrogen (NO_x-N) for the 2009-2010 season from Victoria Plains sugarcane plant crop for two levels of nitrogen fertiliser and soil management practices.

Herbicide treatments

Two treatments for herbicide were applied. Treatment one involved residual herbicide; Diuron 468 g/kg and Hexazinone 132 g/kg. Treatment two involved knock down herbicides; Gramoxone (250 g/L paraquat as paraquat dichloride), Baton (2-4 D as dimethylamine salt), MCPA 250 (250 g/L MCPA as sodium salt) and Starane 400 (333 g/L fluroxypyr as the methyl heptyl ester).

Herbicide residues of Diuron and Hexazinone were particularly elevated in the first two runoff events (within 14 days of application) from Treatment 1 (Velpar K4 applied). These two runoff events represented 64% and 91% of the season's Diuron and Hexazinone losses, respectively (but only 11% of the runoff).

In treatment 2 trace levels of, Diuron and Hexazinone were detected in all runoff samples at concentrations of 1 µg/L or lower. These levels are thought to be residual concentrations from previous applications.

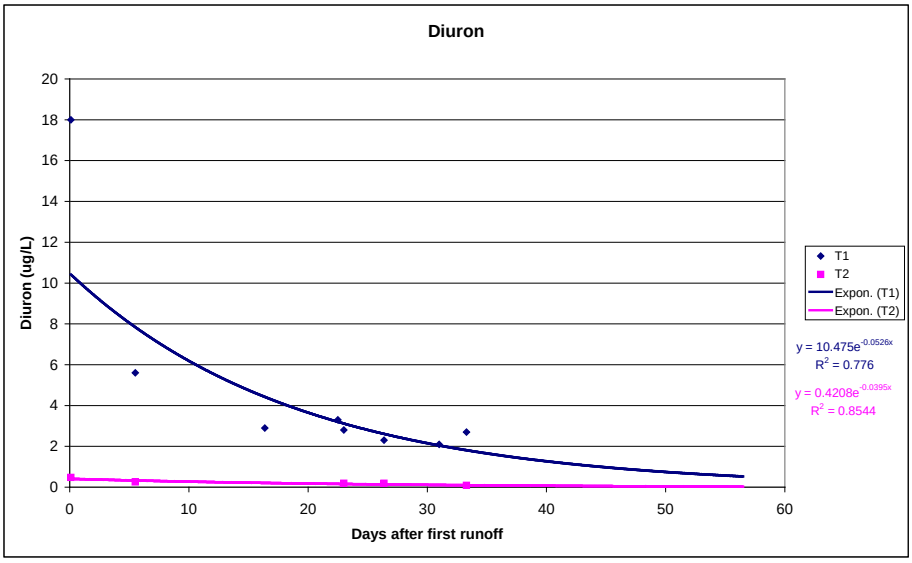

Figure 3 Regression analysis of Diuron concentrations in runoff from the Victoria Plains site, 2009-2010

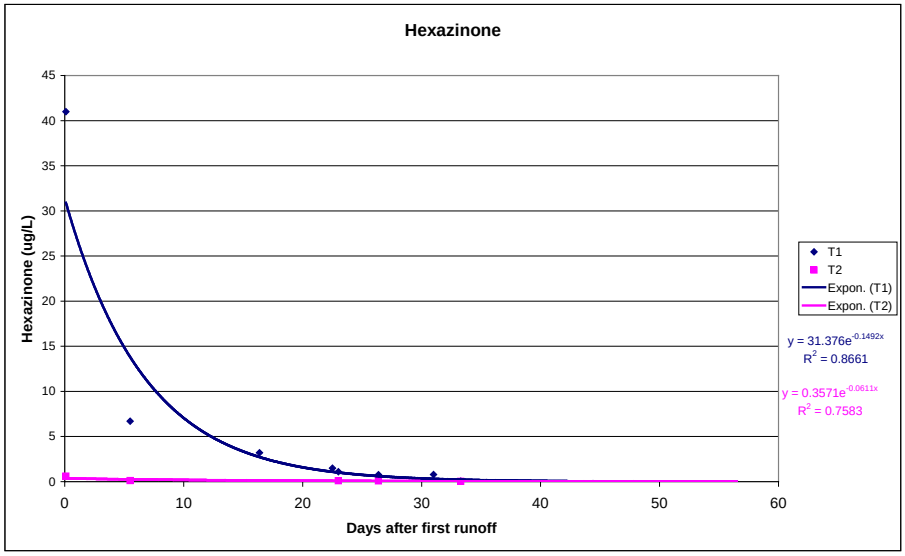

Figure 4 Regression analysis of Hexazinone concentrations in runoff from the Victoria Plains site, 2009-2010

Overall, more efficient practices using fewer inputs of fertilisers and herbicides have resulted in similar yields, but improved economic returns due to the reduced input costs. Thus, both water quality and economic benefits have been observed from improved farming practices. Timing of nutrient and herbicide applications in relation to rainfall and runoff are important factors for nutrient and herbicide losses in runoff. Highest concentration of nutrients and herbicides were observed in the first runoff event after application.

The Paddock to Reef program will continue to measure runoff, nutrient and herbicide losses from the Victoria Plains and Marion treatments, and gather more information on the productivity and economics of the management practices.