Rob Sluggett

Adoption of precision agriculture

REGION: Mackay Whitsundays | Koumala

Robert, with an agricultural degree, worked as an extension officer for 15 years with BSES (now SRA) and became interested in controlled traffic farming systems. He worked closely with local growers to develop machinery and refine techniques. In 2001, Rob and his wife Maree managed a sugarcane farm near Koumala and in 2006 purchased their own small farm. Rob still works off farm and plays a lead role in Farmacist independent agronomy service.

Rob's new farm was ex-cane land that was abandoned during the sugar industry downturn in the early 2000's. Rob established the new crop on a best practices footing. All fields were soil mapped and targeted soil sampling undertaken. A farm nutrition plan was developed and a new crop was established on controlled traffic with GPS marking out service.

Rob believes the adoption of improved farming practices has been an important contributor to the farms achievement of highest tonnes sugar per hectare productivity award for 2008 for Koumala and Bollingbroke districts of the Plane Creek Mill area.

The farm straddles Cherry Tree Creek, which runs into Rocky Dam Creek, a very important coastal catchment. Parts of the creek through the Slugget's property retains remnant vegetation while other parts are degraded. Hundreds of trees have been planted to improve habitat linkages, stabilise creek banks and enhance the aesthetics of the creek

Issues being addressed

A major focus in improving sugarcane management in recent years has aimed at reducing the level of pesticides and herbicides entering local waterways and the Great Barrier Reef. The adoption of precision agriculture techniques: specifically Variable Rate Application (VRA) is seen by many as a viable mechanism through which pesticides can be reduced. Rob's past trials with Catalyst include variable rate application of pesticide for control of cane grubs.

This trial looks at mapping areas where herbicides are required and only applying in those locations.

Solution being tested

Variable rate strategies utilising canopy sensors

This trial works to determine spatial variability at an intra-block level on his property using biomass sensor technologies. The trial itself is a multi-stage process that includes the recording of spatial distributions of weeds and cane yields via crop biomass sensors. The spatial data will then be validated by ground-truth mapping and the formulation of VRA of herbicide and nutrients. Precision agriculture techniques to analyse intra-block variability of weed pressures and biomass crop values will be mapped, with the aim of identifying and matching nutrition and herbicide rates to the mapped areas.

Rob is interested in better understanding the economic costs and benefits of undertaking the management practice change, as well as understanding how the management change will affect his farms exposure to risk. By transitioning to a variable rate system Rob hopes to make significant cost savings by reducing the total amount of nitrogen used on his property, as well as improving water quality.

Economic analysis

The economic implications of implementing a VRA system can be captured by undertaking partial budget and investment analyses. The gross margins were calculated for both the "before" (conventional SES herbicide and nutrient application regimes) and "after" (VRA systems) production systems. The gross margins were then used to estimate the change in annual profitability generated under the VRA system. This change in annual profitability is then incorporated into an investment analysis by calculating the net present value (NPV) of the management practice change. The project's NPV is calculated by comparing the capital costs incurred as part of the management practice change to the discounted (annually at a rate of 7%) stream of future benefits estimated to be yielded. This provides an indicator as to the viability of the investment as it compares the costs and benefits of the management practice change over the expect lifetime of the investment.

Key economic drivers of change for this trial:

- Reduce total herbicide applied
- Reduce total nitrogen applied
- Reduced risk of restricting CCS
- Optimise a growers return on investment in nitrogen inputs
- Improve the quality of water leaving farms by not exceeding a crop's capacity to utilise nitrogen inputs Use technology to improve accuracy and manage farm practices at the intra block scale

Grower Case Studies

Economic analysis (continued)

Key assumptions:

- Capital cost for the biomass sensors $29,500 (6 biomass sensors)
- VRA does not result in reduced total rate of applied herbicide or nutrient.
- There is no yield bump due to the management change.
- Analysis is conducted on plant cane and fallow.
- IInputs, CCS and yield were assumed at a steady state to capture the change in costs affecting Rob's production system

Right:
Rob Sluggett on the Project Catalyst trial site in Koumala. This trial works to determine spatial variability at an intra-block level on his property using biomass sensor technologies. The trial itself is a multi-stage process that includes the recording of spatial distributions of weeds and cane yields via crop biomass sensors.

Outcome and change

Due to the change in management practices, the change in gross margin (GM) from the before to the after scenario results in a decrease of $3/ha (Table 1). The annual change in GM is discounted at 7% over a 10 year investment period, the negative change results in a Net Present Value (NPV) estimation of -$835/ha. This result reflects the relatively large capital costs incurred from purchasing the crop biomass sensor has a negative effect on the viability of this trial.

This economic analysis indicates that based on Rob's machinery, implements and production system, utilising crop biomass sensors to implement VRA nutrient and herbicide systems is unlikely to be viable economic investment. However, this analysis includes a number of case specific assumptions that are likely to affect the result, including the number of crop sensors utilised in the management practice change. In addition without an observable yield increase or reduction in the total product utilised on the farm (as mentioned in the assumptions) the high capital costs are likely to outstrip any potential benefits. If a positive yield and a reduction of inputs occurred, than a more favourable GM and NPV are likely to be seen.

Table 1: Investment analysis results

Change in gross margin ($/ha)	-3
Net Present Value ($/ha)	-835

Water quality improvements

The proposed reduction in nutrient and pesticide loads by using variable rate application offers significant water quality benefits for the Plane Creek catchment and the Mackay Whitsunday region. Limited source data for the sub-catchments surrounding Koumala hinders more precise reporting of the actual water quantity benefits of this exact region. Additionally, pesticide loads have reduced in the Mackay Whitsunday region by 42% from when monitoring began in 2009.

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Contacts

Rob Eccles, Catchment Solutions
M: 0439 308 179
E: reccles@catchmentsolutions.com.au

Andrew Law QLD Department of Agriculture, Fisheries and Forestry
Ph: (07) 4923 6210
E: andrew.law@daff.qld.gov.au

Megan Star QLD Department of Agriculture, Fisheries and Forestry
Ph: (07) 4923 6225
E: megan.star@daff.qld.gov.au