Catalyst Project Report – Final report

Reduced N following legumes

Grower Information	
Grower Name:	Zac Woolston
Entity Name:	ZD & SK Woolston
Trial Farm No/Name:	MKY-03567A
Mill Area:	Mackay Sugar
Total Farm Area ha:	117
No. Years Farming:	5
Trial Subdistrict:	Eton
Area under Cane ha:	90

Background Information

Aim:
To determine the rate of nitrogen reduction possible on a plant cane crop following a soybean fallow affected by severe flooding.

Background:
Soybean are commonly planted during a fallow season to assist in fixing nitrogen in the soil for the following cane crop. The yield of the soybean crop is a reliable indicator of how much nitrogen the soybean plant will have fixed. However, there is limited information available in regard to the amount of fixed Nitrogen lost during a severe rainfall and flooding event. In situations of uncertainty, full rates of Nitrogen are usually applied.

Following cyclone Debbie, many paddocks that had grown a successful soybean crop were inundated with flood water. Nitrate strip tests of these fields indicate minimal available Nitrogen is present in the top 30cm of the soil, however we don't have enough knowledge of this type of situation to determine the amount of Nitrogen fertiliser that should be applied for the following cane crop.

This trial will compare varying rates of Nitrogen topdress application to determine the impact on the cane crop yield. Topdress treatments will include: 0kg/ha of N; 80kg/ha N; 110kg/ha N and 140kg/ha N.

Potential Water Quality Benefit:
Reduction in nitrogen use per hectare following flooding events

Expected Outcome of Trial:
A better understanding of the impact of flooding on Nitrogen fixed from legume crops. Nutrient application better matching plant and soil requirements with no differences noted in the yield of sugar cane

Service provider contact: Farmacist

Where did this idea come from: Grower /Farmacist

Plan - Project Activities	**Date:** (mth/year to be undertaken)	**Activities** :(breakdown of each activity for each stage)
Stage 1	**January 2016**	Plant soybean crop
Stage 2	**March 2016**	Biomass sample soybeans
Stage 3	**August 2017**	Plant cane
Stage 4	**September 2017**	Apply topdress fertiliser according to trial plan
Stage 5	**February – March 2018**	Leaf samples
Stage 5	**September 2018**	Harvest production

Project Trial site details

Trial Crop:	Soybean and Sugar Cane
Variety: **Rat/Plt:**	Fallow –Mitchell? soybean
Trial Block No/Name:	MKY-03567A-6-1
Trial Block Size Ha:	1.1
Trial Block Position (GPS):	148.992046, -21.261810
Soil Type:	Marian - yellow duplex soil

Block History, Trial Design:

Repetition		1			2			3			
Treatment	Guard	2	1	3	3	2	1	1	2	3	Guard
No Rows	7	3	3	3	3	3	3	3	3	3	3

1. No Topdress application
2. 75 kg/ha topdress Nitrogen application
3. 130kg/ha topdress Nitrogen application

Figure 1 - Woolston soy bean trial design

Treatments:

Altered nitrogen rates following whole paddock of soybean that was subsequently flooded

Topdress applications of:

1. No topdress application
2. 75kg/ha topdress Nitrogen application
3. 130kg/ha topdress Nitrogen application

Results:

Results from the soybean fallow crop:

Three biomass samples were collected from the soybean crop to provide an indication of the level of Nitrogen fixation by the crop. The results from these samples are shown in Table 5.

Table 1 - Woolston soybean biomass results

	Soybean Biomass/1m (g)	wet t/ha	Biomass Wet Weight (g)	Biomass Dry Weight (g)	% Moisture	Dry t/ha	N %	Uptake N kg/ha
Zac 39	1616	9.2	199.2	56.4	71.7	2.6	**2.86**	74.1
Zac 40	1990	11.3	200.2	51.9	74.1	2.9	**2.32**	67.8
Zac 41	1554	8.8	202.5	55.8	72.4	2.4	**2.8**	67.9

As can be seen the average level of Nitrogen available to the following cane crop is 69.9kg/ha. This indicates that minimal application of Nitrogen as granular fertiliser should be required for the cane crop. However, following a flood event there is less certainty as to the level of Nitrogen still available in the soil. Nitrate strip tests undertaken prior to planting cane indicated available Nitrogen levels ranging between 0 and 35kg/ha. This trial will be critical in providing an insight into the effect of flood events following soybean fallow crops.
Results from the 2018 cane crop harvest are presented in figure 28.

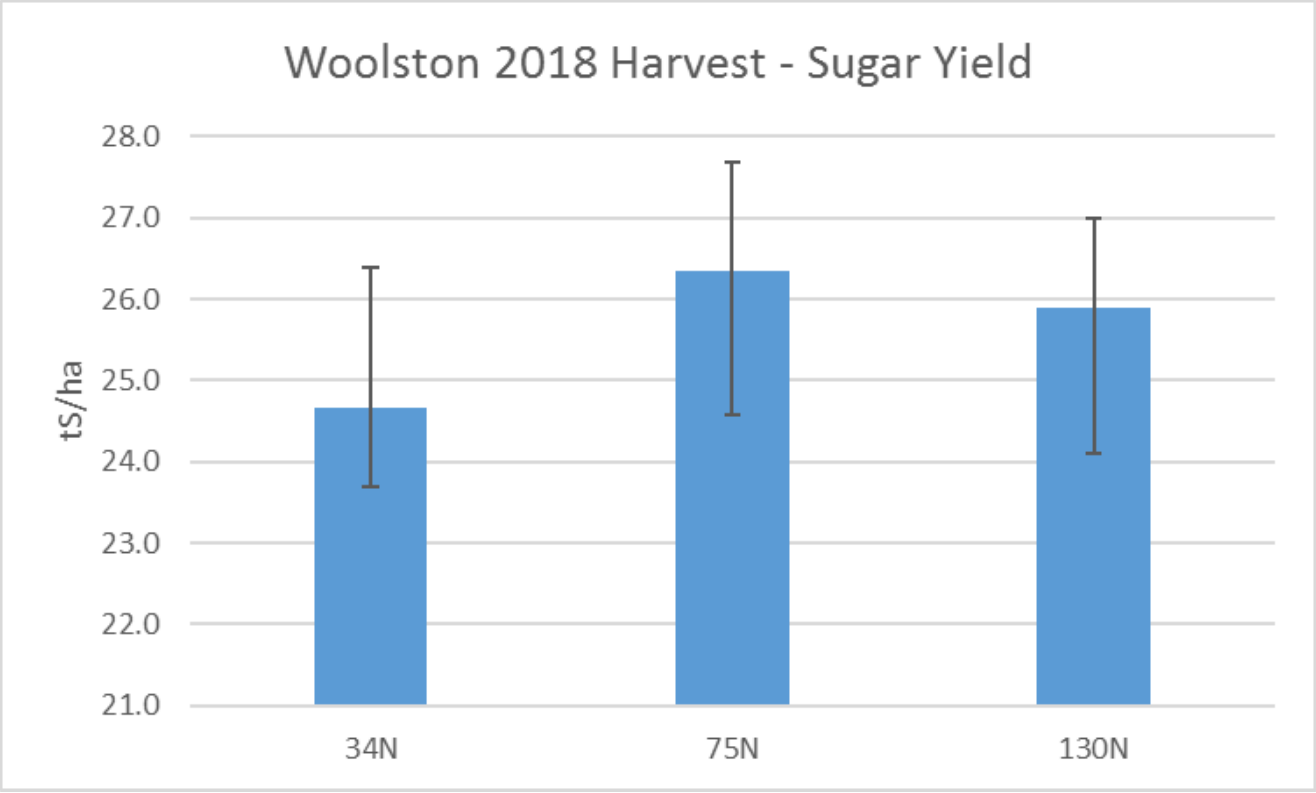

Figure 2 - Woolston sugar yields 2018

The figure above shows that the lower nitrogen rate of 34 kg/ha may not have been sufficient for this large crop as its sugar yielded slightly lower than the other treatments. The cane yield per hectare ranged from 140 t/ha (34kgN/ha treatment) to 145 t/ha and 146 t/ha for the 75 kgN/ha and 130 kgN/ha treatments respectively.
As the cane yield was so high for this paddock, it would be advisable to this grower to ensure he adequately top dresses his plant cane following soybean in the future.

Conclusions and comments

Although not significant, a difference in yield was noted between the lowest nitrogen rate and the higher two, suggesting that the lowest nitrogen rate may have been limiting to crop growth. In saying this, it was still possible to reduce nitrogen to almost half of what would have been applied if no soybean was grown.

Advantages of this Practice Change:
Reduced fertiliser application, increasing profitability and reducing environmental risk.

Disadvantages of this Practice Change:
Reducing nitrogen too low could result in yield penalties.

Will you be using this practice in the future:
Yes

% of farm you would be confident to use this practice: Where applicable following legumes prior to planting sugar cane

Site complete