Catalyst Project Report

Grower Information	
Grower Name:	Manuel Muscat
Entity Name:	J & F Muscat and sons
Trial Farm No/Name:	PCK-0305A
Mill Area:	Plane Creek
Total Farm Area ha:	210
No. Years Farming:	35
Trial Subdistrict:	Dawlish
Area under Cane ha:	183

Background Information

Aim:

Reduce yield losses and increase nitrogen use efficiency by tailoring variety to soil type

Background:

This trial is assessing a paddock with variable soil, ranging from sodic to non-sodic, and planting varieties that suit accordingly.

Sodic soils have poor soil structure which affects water infiltration, percolation, and nutrient availability. High sodicity levels causes clay particles to swell excessively when wet to the point they separate and disperse. This results in structural collapse of the soil profile, and as the soil dries out, the dispersed soils reharden and blocks soil pores, which causes issues such as water logging, hard crust formation on the surface and a decrease in gaseous exchanges. Typical impacts of sodic soils on sugarcane crops include reduced plant populations, poorer growth, low yields, which decreases the overall economic viability of the farm.

One strategy to deal with sodic soil without changing the chemical makeup of the soil, is to select a variety that can tolerate such conditions.

Q138 is a variety that Sugar Research Australia classifies as having a high tolerance of poor soils, for example sodic soils; and Q183 has a medium tolerance.

The more vigorously a plant grows, the more nutrients it will use from the surrounding environment. Therefore, customising the variety to soil type will lead to a healthier plant that will utilise more of the nutrients applied to the paddock and increase yield.

The treatments will include:

1. Plant Q138 Variety across the block, incorporating sodic and non-sodic areas
2. Plant Q183 Variety across the block, incorporating sodic and non-sodic areas
3. Plant Q138 in sodic area and swap to Q183 for the rest of the row
4. Mix Q138 and Q183 together and plant across the block

Potential Water Quality Benefit:

Increased nitrogen use efficiency, leading to less nutrients in run off

Expected Outcome of Trial:

It is expected that the Q138 will out-perform the Q183 in the sodic end of the paddock, resulting in a higher yield.

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	**July 2016**	EM map and soil sample to asses soil constraints
Stage 2	**September 2016**	Plant sugarcane according to trial plan
Stage 3	**August 2017**	Harvest trial site
Stage 4	**October 2017**	Catalyst bus trip
Stage 5	**April 2018**	Monitor growth and leaf analysis
Stage 6	**October 2018**	Harvest trial site
Stage 7	**October 2019**	Harvest Trial Site

Project Trial site details

Trial Crop:	Sugarcane
Variety: **Rat/Plt:**	Q183 and Q138
Trial Block No/Name:	PCK-305A-12-02
Trial Block Size Ha:	11.9 ha
Trial Block Position (GPS):	149.150924, -21.416389
Soil Type:	Dermosol Sunnyside - Deep soil with a sandy to loam topsoil over a grey to brown clay

Block History, Trial Design:

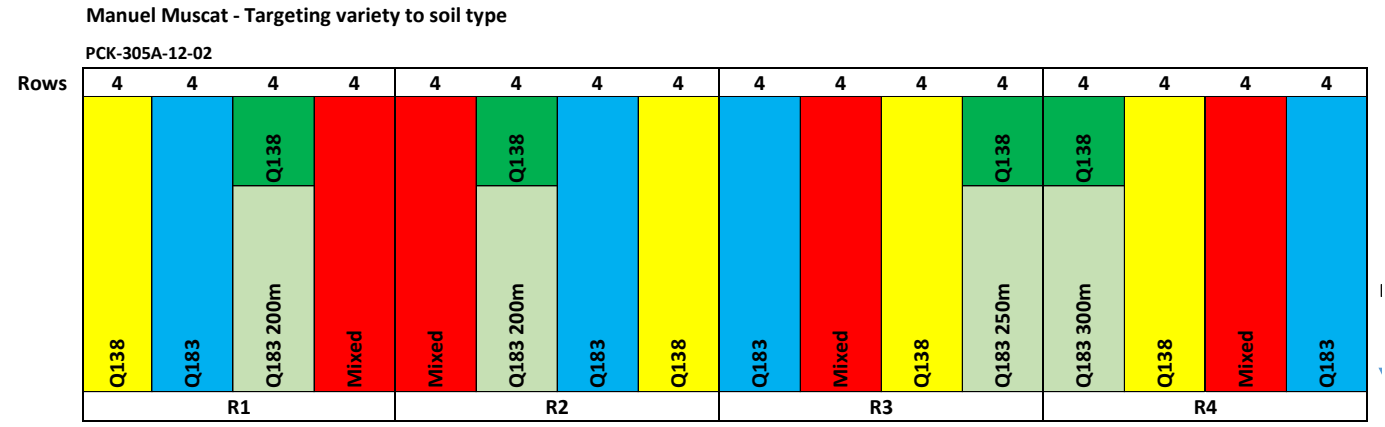

Figure 1 Trial design

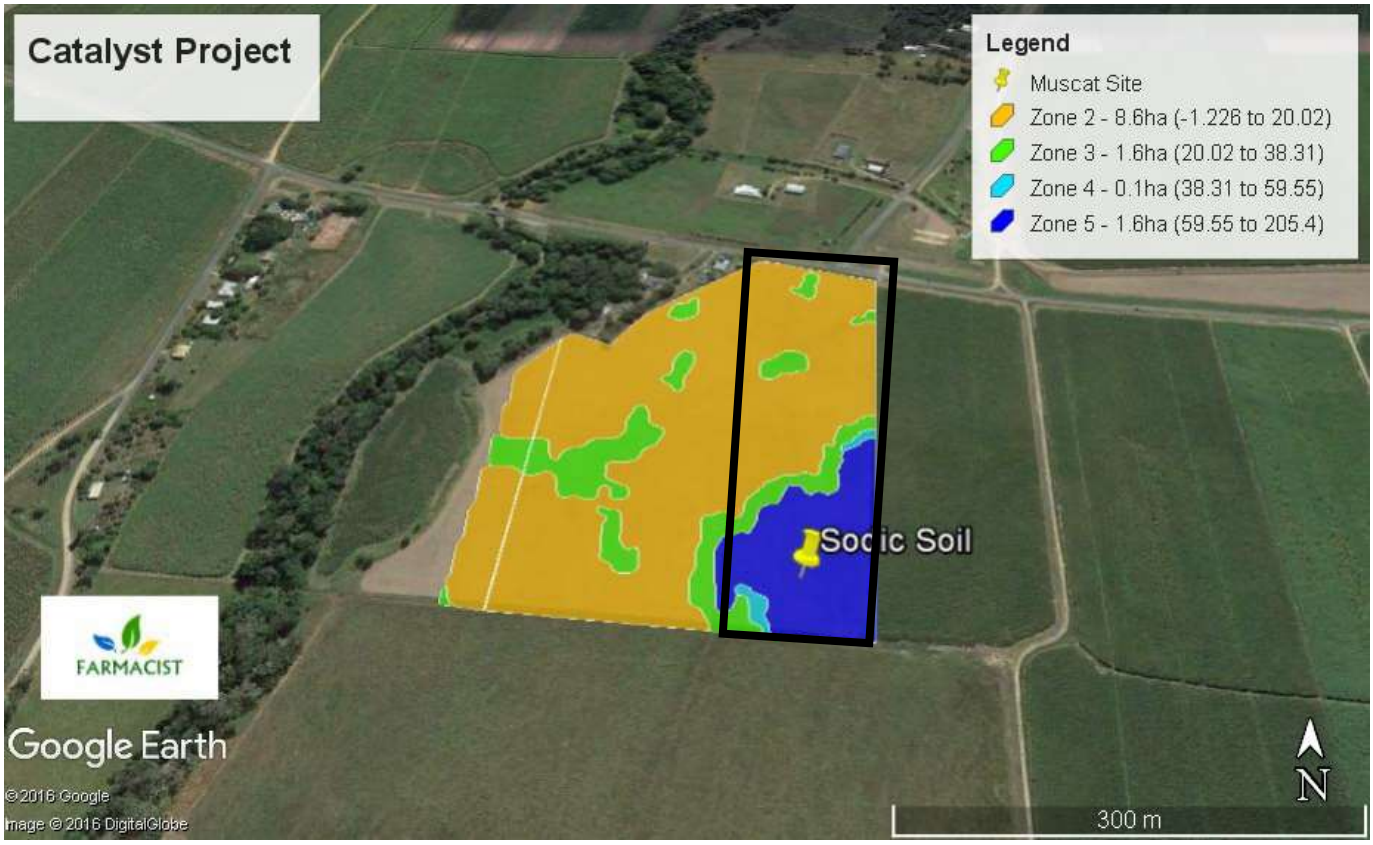

Figure 2 EC map of paddock soil textures

The trial layout shown in Figure 1 was overlaid over the EC map shown in Figure 2 to ensure that all treatments intersected the sodic soil zone of the paddock. This EC map (Figure 2) shows the variations in soil across the paddock. The blue zone is showing a different soil type to the red zones; hence one soil test was taken from the blue zone and one from the red zone to distinguish soil properties.

The black box indicates the section of the paddock that the trial is located. As can be seen, this is where the highest contrast occurs from one end of the paddock to the other. The dark blue region is sodic (1.6ha).

Treatments:

1. **Plant Q138 Variety**
2. **Plant Q183 Variety**
3. **Plant Q138 in sodic area and Q183 in rest of strip**
4. **Plant mixed variety across whole strip**

Results:

Table 1 Soil test results: 110006193 from blue section on EC map and 110006194 from red section.

Soil Sample Analysis Summary Report

Lab Sample Id		110006193	110006194
Test Code		FA3	FA3
GPS Name		1606Manuel1	1606Manuel2
Paddock Name		PCK-0305A-12-02	PCK-0305A-12-02
Sample Depth (cm)		0 - 20	0 - 20
Sampling Date		14/07/2016	14/07/2016
Analyte / Assay	**Units**		
Soil Colour			
Soil Texture		Clay Loam	Medium Clay
pH (1:5 Water)		7.99	5.91
pH CaCl		6.56	4.71
ECSE	dS/m	1.032	0.225
EC (1:5)		0.12	0.03
Chloride	mg/kg	40	11
Organic Carbon (OC)	%	1.06	0.78
Phosphorus (Colwell)	mg/kg	44	20
Phosphorus (BSES)	mg/kg	84	19
PBI-Col		56.8	74.8
Potassium (Amm-acet.)	Meq/100g	0.11	0.12
Potassium	%	1.12	2.9
Potassium (Nitric K)	Meq/100g		
Available Potassium	mg/kg	42.2	47.5
Sulphate Sulphur (MCP)	mg/kg	7.7	10.2
Cation Exchange Capacity	Meq/100g	9.6	4.2
Calcium (Amm-acet.)	Meq/100g	4.17	2.78
Calcium %CEC	%	43.39	66.26
Magnesium (Amm-acet.)	Meq/100g	3.43	1.13
Magnesium %CEC	%	35.65	27
Sodium (Amm-acet.)	Meq/100g	1.91	0.16
Sodium % of Cations (ESP)	%	19.83	3.84
Aluminium Saturation	%	0	4.3
Zinc (HCl)	mg/kg	2.87	0.59
Zinc (DTPA)	mg/kg	1.09	0.39
Copper (DTPA)	mg/kg	1.18	0.81
Iron (DTPA)	mg/kg	41.6	70.2
Manganese (DTPA)	mg/kg	9.09	77.1
Silicon (BSES)	mg/kg	314	106

Min Max

The soil tests (Table 1) show the results of the samples taken from the two different sections of the paddock. The sample in the first column shows a very high Exchangeable Sodium Percentage (ESP) of 19.83, indicating severe sodicity, whereas the soil test taken from the red soil zone shows an ESP of only 3.84 which means this soil type is not sodic. As an indication, soils with ESP > 15 are considered severely sodic.

The image below (Figure 3) shows an aerial view of the trial approximately 6 months after planting and a visual difference between varieties can be seen as strips down the paddock. The differences become less obvious in the foreground of the picture and more obvious at the top.

Figure 3 Aerial image of trial taken in Jan 2018. Sodic part of paddock is at the bottom of the image.

Damage from cyclone Debbie in March 2017 contributed towards the poor yields achieved at this site. The results (Figure 4) however do indicate that the mixed variety (that is where two cane varieties were mixed together and subsequently planted along the row) did yield significantly higher than the other treatments.

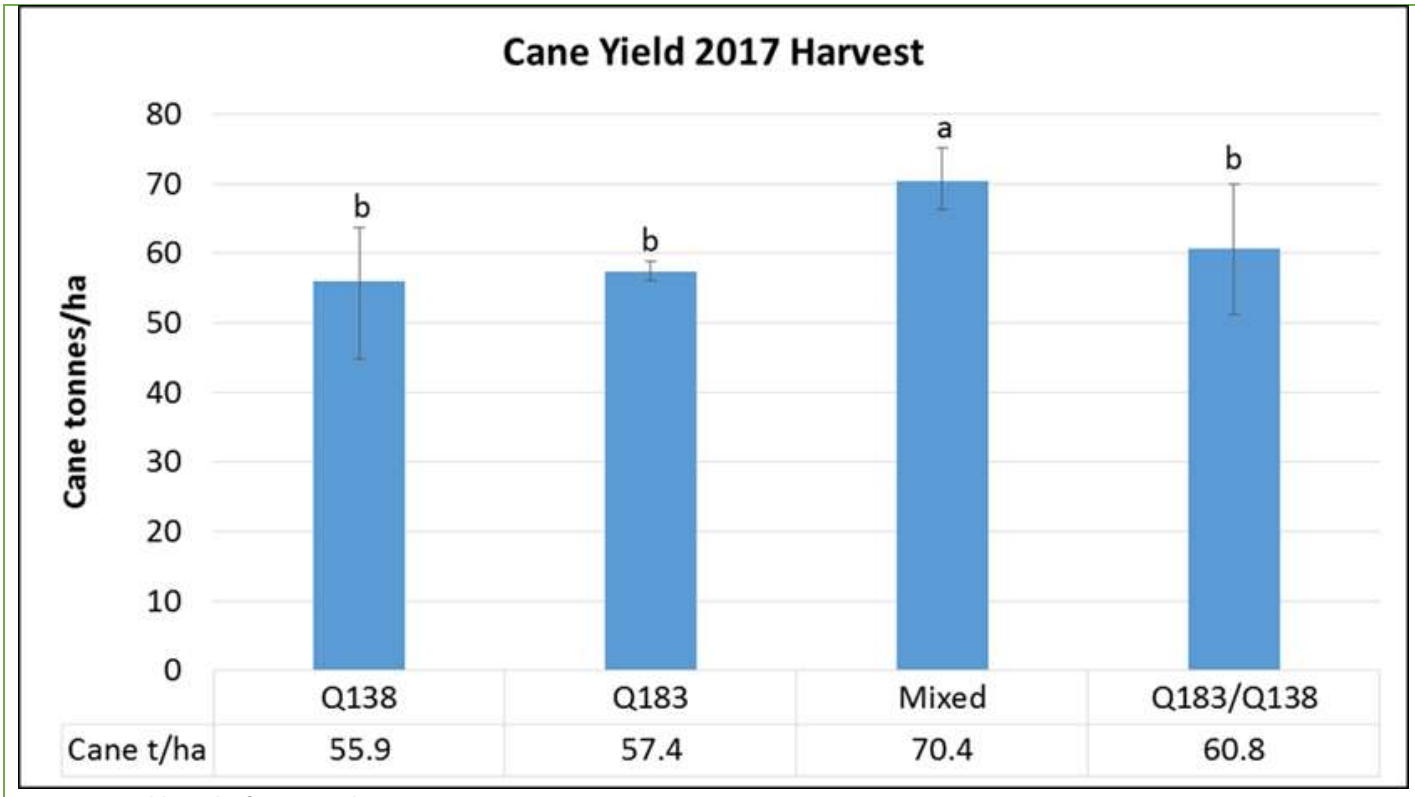

Figure 4 - Yield results from 2017 harvest

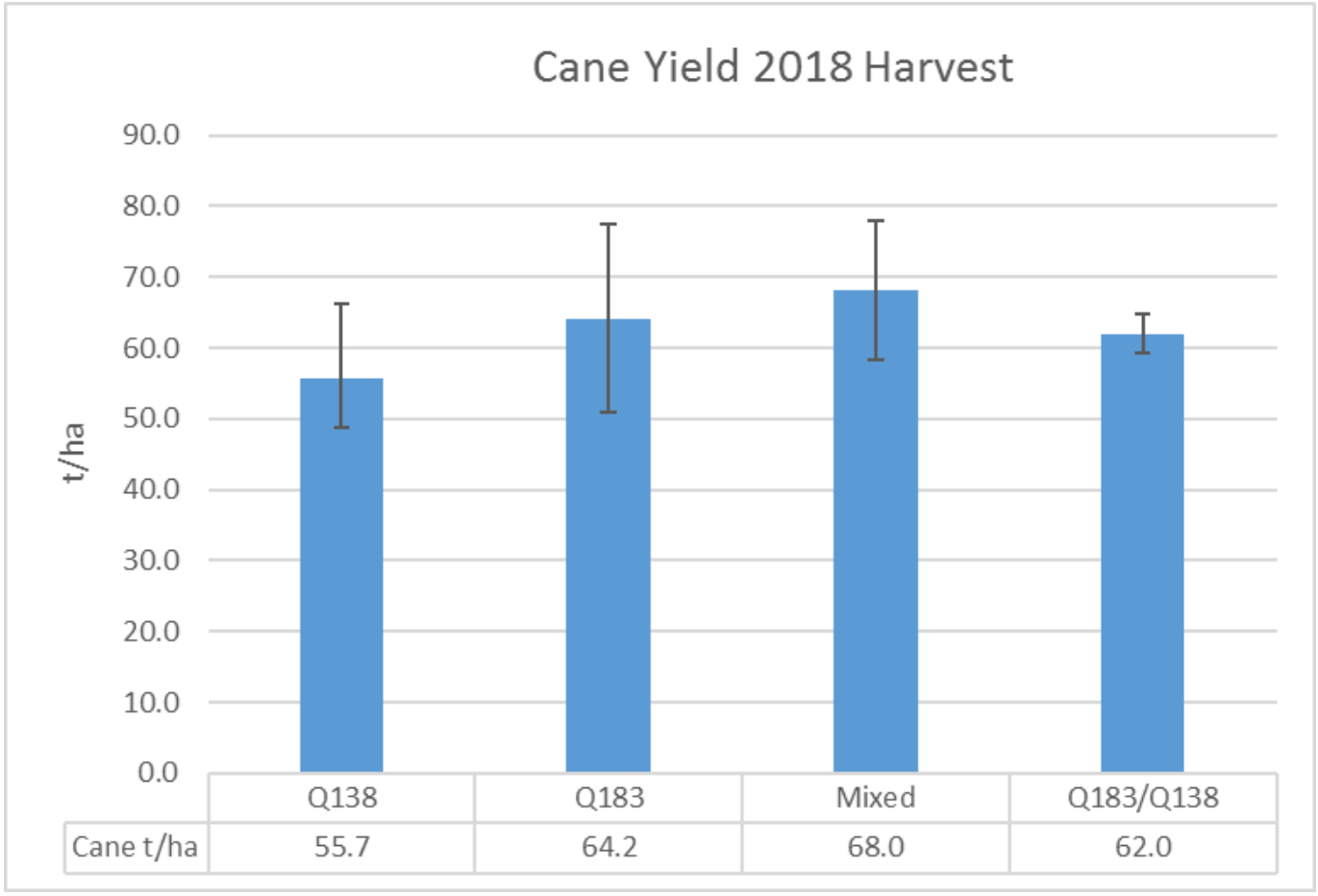

Figure 5 - Yield results from 2018 harvest

Similar to the 2017 results, the yield from the 2018 harvest (Figure 5) shows that the mixed variety treatment once again outperformed the other treatments, however this difference was only minimal. Also, once again, the Q138 treatment was the lowest yielding.

Conclusions and comments

This trial has shown that altering varieties from generic planting methods can impact the yield of the crop. This practice may not be beneficial in paddocks that are uniform or consistently high yielding across the paddock, however in poor areas that cannot be ameliorated, changing varieties to suit the soil type may be an effective way to utilise the area to its highest capacity.

Advantages of this Practice Change:
Improved yield, leading to increased profitability and nutrient utilisation.

Disadvantages of this Practice Change:
Slightly increased time to plant and forward planning

Will you be using this practice in the future: Yes
% of farm you would be confident to use this practice:
Site is continuing 2019