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CASE STUDY

REEF CATCHMENTS

Australian Government | National Landcare Programme

TO TACKLE THEIR SODIC SOIL ISSUES, JOHN AND PHIL HAVE BUILT ON CURRENT STANDARD INDUSTRY FARMING TECHNIQUES.

TRIAL: DEEP SUB-SURFACE APPLICATION OF MILL MUD AND VARIABLE RATE MILL ASH

LANDHOLDER: John and Phil Deguara

LOCATION: Brightly

FOCUS ON

- EC MAPPING OVER THE PROPERTY TO ASSIST IN IDENTIFYING THE AREAS OF SODIC SOIL
- TRIALLING DEEP SUB-SURFACE APPLICATION OF MILL ASH, MILL MUD AND BAGASSE TO HELP IMPROVE THE PHYSICAL AND CHEMICAL STRUCTURE OF FARMING SOILS

BACKGROUND

John and Phil are 3rd and 4th generation sugarcane farmers. Their home farm at Brightly is 252 ha and is located near the southern branch of Sandy Creek. A number of their paddocks are badly impacted by sodic soils, which results in varying yields within individual blocks. Yield zones can vary from as high as 85 tonnes per ha to below 60 tonnes per ha within some blocks.

IMAGE 1

IMAGE 2

Sodic soils result in poor soil structure which affects water infiltration, percolation and availability. High sodicity causes clay particles to swell excessively when wet to the point where they separate and disperse. This results in structural collapse of the soil profile and closing-off of soil pores, severely restricting water and air movement throughout the soil. Water logging is also common in sodic soils. Typical impacts of sodic soils on sugarcane crops include reduced plant populations, poorer growth within those populations and reduced root growth and distribution. A reduction in yields impacts on the overall economic viability of the farm.

John and Phil's deep sub-soil application trial is the first of its kind in the Mackay region and it is hoped that this research will provide more information for all of the sugarcane community on strategies for improved management techniques of sodic soils.

TRIAL OVERVIEW

John and Phil have obtained funding that has enabled them to have agronomists from Farmacist conduct EC Mapping over their property to assist in identifying the areas of sodic soil. From the EC Maps, soil testing and analysis were carried out to gain understanding of the various soil zones, including pinpointing the sodic areas and gauging the degree of sodicity.

To tackle their sodic soil issues, John and Phil have built on current standard industry farming techniques. They are trialling deep sub-surface application of mill ash, mill mud and bagasse to help improve the physical and chemical structure of their farming soils.

A trial site has been established to allow comparison of soil properties and crop performance over time. In the treated plots, furrows are dug to a depth of 30 cm using a specially designed and constructed furrowing implement.

In the sodic soil areas, mill ash is applied to the furrow first at variable rates of 50 t/ha, 100 t/ha or 150 t/ha, depending on the soil moisture.

SUPPORT FOR THIS PROJECT IS PROVIDED BY REEF CATCHMENTS, THROUGH FUNDING FROM THE AUSTRALIAN GOVERNMENT NATIONAL LANDCARE PROGRAMME (NLP).

The varying rates are determined by the EC Mapping and applied to the furrows using a banded ameliorant applicator, which is guided by the soil mapping data via GPS. Mill mud is then applied to the entire area followed by bagasse, both at rates of 50 t/ha. The Deguara's then bedform back over the furrow, covering the mill ash, mud and bagasse. The untreated sections had the furrows opened and the bed forming process completed to remove compounding effects from the tillage activity. **Figure 1** shows the trial design.

The mill ash will act as the treatment component of the trial. It is used to improve both the physical and chemical properties of the sodic soil by increasing the structure, aeration and permeability of the subsoils. The mill mud and bagasse helps to build soil nutrient and increase the carbon component of the soil, making it more friable and less compacted.

The overall result should see a reduction in the sodicity of the soil, with increases in water storage and reduced water logging.

Funding obtained was able to support John and Phil in the purchase of their banded ameliorant applicator and in the purchasing of parts to construct their furrowing implement.

FIGURE 1: Deguara site trial design.

Untreated	Buried	Untreated	Buried	
Furrows opened no ameliorant	Ash 100t/ha Mud 50t/ha Bagasse 50t/ha	Furrows opened no ameliorant	Ash 100t/ha Mud 50t/ha Bagasse 50t/ha	WATER FURROW
15 rows	18 rows	6 rows	6 rows	

OUTCOMES TO DATE

In early 2014, John and Phil began the trial on a 1 ha plot. They started with a small area first to see if there were any noticeable improvements to the sodic soil before committing to the expense of treating a larger area. The results appeared promising, so they expanded the trial site to 15 ha and the application of the mill ash, mud and bagasse was completed in November 2014.

Soil profile cores to 900mm were taken to compare selected soil physical and chemical properties including bulk density, soil water content, slaking and dispersion characteristics at treated and untreated sites. At this sampling time, results show that there was little to no difference in results between the treated and untreated sites for physical and chemical soil properties. Sub-surface amelioration had not contributed to a reduction in sub-surface dispersion at this point in time.

Soil profile cores show that the ameliorants were only located in the top 100 – 200mm of the soil profile and had not reached the desired sub-surface depths. The profile cores highlight the texture contrast occurring at approximately 250mm (see **Image 1**: Soil Profile Cores – deep placement ameliorant top, untreated bottom).

Future work will attempt to place ameliorants into the B horizon, around 300mm deep. Modifications will need to be made to the furrowing equipment to achieve this.

Plant cane in the trial block was also established and is due for harvest in 2016 (see **Image 2**: newly established plant cane in the trial block). Crop yield assessments have been undertaken on previously treated areas to provide some preliminary data to support this deep banding of ameliorants concept.

Changes in soil properties and crop development will continue to be monitored.