TRIAL REPORT SUMMARY

TECHNICAL NOTE Assessment of nutrient and sediment mobilisation from a sugarcane cropping soil fertilised with Bio Dunder® Liquid One Shot® (LOS).

INTRODUCTION

Exploring improved nutrient management practices is important in maintaining sustainable productivity and improving environmental health. Excessive concentrations of sediment and nutrients in run-off from Queensland sugarcane systems can enter waterways that flow into the Great Barrier Reef lagoon, impacting reefs and vulnerable ecosystems.

In 2014, Wilmar AgServices commissioned Landloch to conduct a study that compared nutrient and sediment mobilisation via run-off or leachate from sugarcane soil fertilised via various methods of application.

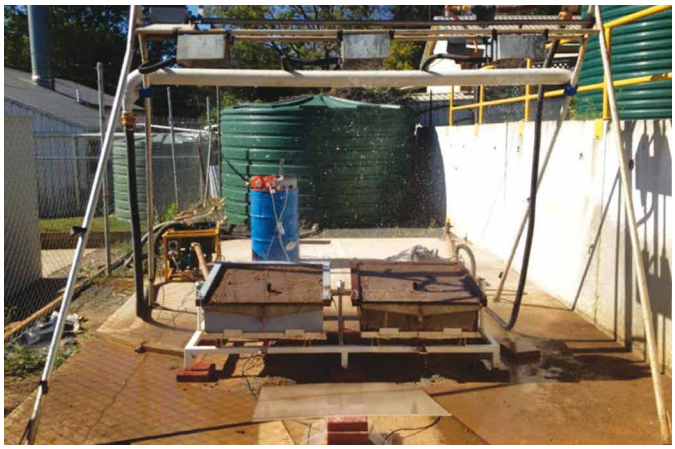
TRIAL METHOD AND TREATMENT

Treatment name	Application details	Nutrients/ha			
		N	P	K	S
LOS SURFACE	Liquid One Shot-surface applied	170	0.3	100	16
LOS SUBSURFACE	Liquid One Shot-subsurface applied	170	0.3	100	16
GRANULAR	Traditional granules applied subsurface	170	0.3	100	0
CONTROL	No fertiliser	0	0	0	0

The study examined the time period between fertiliser application and the uptake of nutrients by cane, with measurements at days 3, 7-11 and 18-20 from fertiliser application. A simulated rainfall event, equivalent to a one in 10-year storm for the Mackay/Whitsunday region in late winter/early spring, was applied to the test plots. Lateral nutrient movement (run-off) and downward nutrient movement (leachate) were measured over the study period.

Measurement parameters

- Electrical conductivity
- Sediment concentration
- Ammonium
- Nitrate and nitrite (NOx)



Above: *Rainfall simulations on sugarcane soil at Landloch's Toowoomba soil laboratory. Run-off and leachate water samples were collected and sent to an external laboratory for analysis.*

Rainfall simulation

Rainfall simulation is produced by flat fan nozzles mounted on an oscillating manifold. The nozzles sweep from side to side, spraying water across the plot to achieve spatial uniformity in rainfall intensity. Rainfall was applied at 90mm/hr until there was enough leachate collected for laboratory testing. The run-off samples were collected from the side of the plots. A Full Stop® was also installed in the centre of each plot to collect leachate samples.

Rainfall simulation is a mature methodology, with an established history in the development of both its equipment and experimental concepts. Simulated rain is used to deliver precipitation when and where it is required, and under the specific conditions of interest, to provide accurate and cost-effective information in a fraction of the time required by studies relying on natural rainfall.

Soil

Soil for the study was collected from a cane farm in Mirani. Classified as a Chromosol, it is common throughout the Mackay/Whitsunday sugarcane cropping region. Its features include:

- Fine texture: 75% particles <0.2mm in diameter (fine sand)
- Slightly sodic: an exchangeable sodium level of 8%
- Low electrical conductivity: 0.09dS/m

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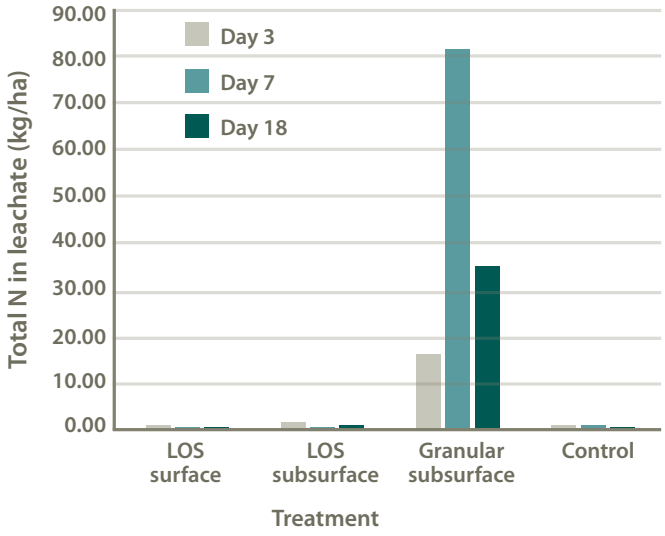
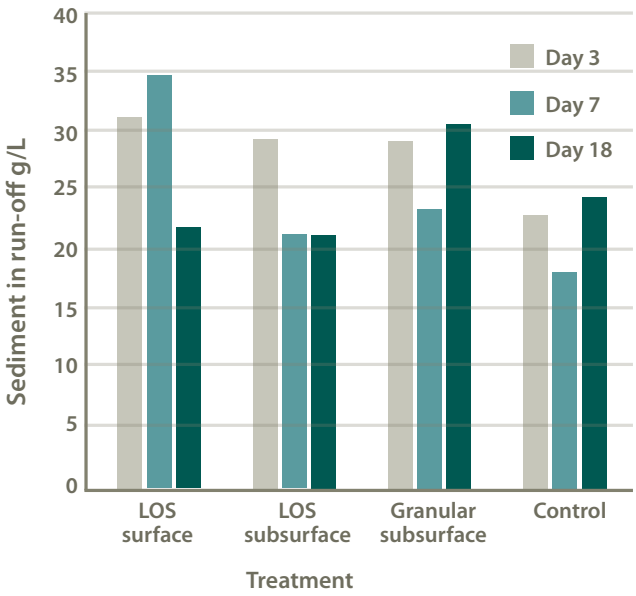
RESULTS

Total nitrogen in leachate between rainfall periods



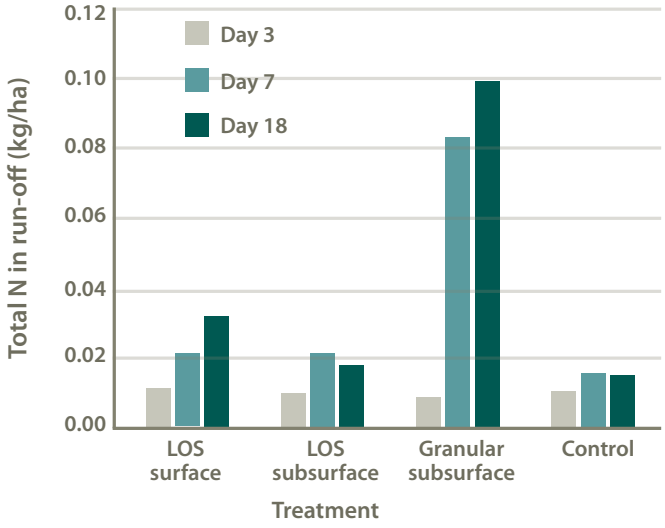
Total nitrogen movement to depth was significantly greater on granule-treated plots, irrespective of the time interval between fertiliser application and rain events. This movement was found to be predominantly in the form of ammonium. The amounts moved to depth are substantial and computed to be up to 81kg/ha or 47% of total nitrogen following a rainfall event seven days after fertiliser application.

Sediment in run-off between rainfall periods



During rainfall events there was an observable increase in sediment concentration in run-off associated with the three fertiliser treatments compared to the unfertilised control plots. However there was no statistical difference between treated and untreated plots, nor was there any consistency with regards to levels of sediment in relation to the event.

Total nitrogen in run-off between rainfall periods



Nitrogen loss in run-off was significantly greater for granule-treated plots at days 7 and 18 after application. The nitrogen captured in run-off was predominantly in the ammonium form. However, amounts lost through run-off were relatively small, ranging from 0.1-0.9kg/ha.

Above: *Plot with a Full Stop installed in the centre for leachate collection.*

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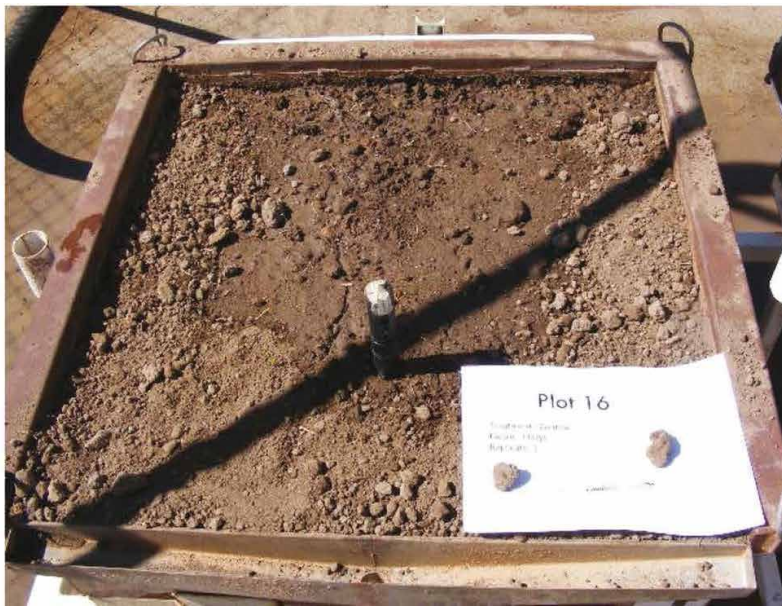
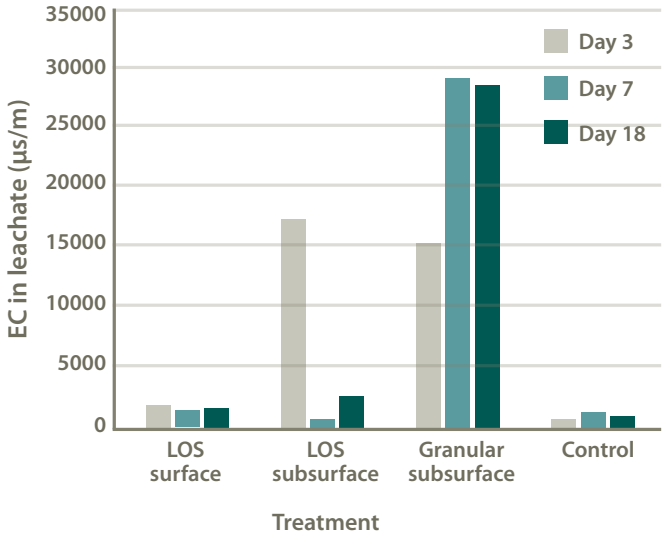


Above: *Surface applied LOS (plot 33 on left) compared to control plot (right).*

Electrical conductivity of leachate



Electrical conductivity in leachate from granule-treated plots was significantly higher than in leachate from LOS surface application plots and the control plots, irrespective of the period between application and a rain event. Where LOS was applied subsurface, electrical conductivity in leachate from samples taken with a three-day interval between application and a rain event were similar to measurements taken from granule-treated plots at the three-day interval. However, in samples taken with rain events at days 7 and 18, electrical conductivity had reduced to levels similar to those from LOS surface applied treatments.

CONCLUSION

- Normal commercial practice of surface applications of LOS results in lower nitrogen mobilisation through run-off or leachate, than in plots treated with equivalent nutrient loads as granules applied subsurface.
- Electrical conductivity measurements in LOS surface applications were similar to untreated plot levels.
- Placement of LOS had no significant effect on nitrogen losses and no benefits were observed from subsurface placement.
- Greater variation in nutrient mobilisation existed between solid and liquid fertiliser types.
- Fertiliser type or placement appeared to have no bearing on sediment concentration in run-off.
- The nutrient movement via leachate was collected at 200mm deep in this trial. It is important to consider that not all nutrients in leachate could be assumed to have been lost and unavailable for plant uptake. Further research would be required to understand the fate of the nutrients as they move through the soil profile.

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