NORTHERN MILL-MUD CASE STUDY

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION
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Mill-mud coated legumes – the new delicacy or misplaced effort?

Introduction

Growers in the Coastal Burnett have prioritised investigation into whether there would be a peanut productivity response to mill-mud application on marginal soils. With broadcast mill-mud application costing more than $1000/ha, peanut growers in the sugar-based farming systems of the Coastal Burnett need a clearer understanding of the productivity benefits to their system.

Background

Peanuts are a valuable rotation crop in the sugarcane farming systems of the Coastal Burnett. Sugarcane and grain legume production is gradually being forced onto more marginal soils that are typically low in organic matter, nutrients and water-holding capacity, are hard setting and commonly have elevated sodium levels at depth.

MILL-MUD EXPOSED: WHAT IS IT REALLY?

- Mill-mud is a by-product of the sugar milling process
- Equates to 8% of the mill's throughput
- Source of nutrients and organic matter
- Mill-mud in the Coastal Burnett has fly-ash from the boiler added to the mix providing a source of potassium and silicon
- Mill-mud acts as a soil conditioner and supplies part of the nutrients needed for subsequent crops
- Mill-mud has a liming effect
- SRA's six-easy-steps nutrient guidelines recommend where mill-mud/ash is applied at 150 wet t/ha, 50kg N/ha can be subtracted from plant cane fertiliser applications, 20kg N/ha from 1st ratoon and 10kg N/ha from 2nd ratoon, [Schroder B.L., Wood A.W., Moody P.W., Bell M.J., Garside A.L., (2005). Nitrogen, Soil Specific Guidelines, Nutrient Management, Sources of N. *Proc. Aust. Soc. Sugar Cane Technol.*, Vol. 27, 291-304].

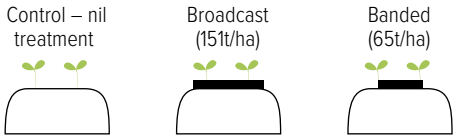
Trial objectives

Three paddock trials have been conducted to test this grower question about the impact of mill-mud on peanut and soybean production. Impact was assessed by comparing:
Maximum biomass – determined from 1.83m^2 quadrats of each plot
Yield – determined by harvesting and grading 14.64m^2 quadrats of each plot.

Trial 3: Site overview December 2016, showing broadcast surface application of mill-mud (foreground) and cane trash (background).

TRIAL 1: 2014/15

TRIAL SITE Simon Andreoli's farm, Kinkuna
SOIL TYPE Yellow Redoxic Hydrosol
VARIETY Holt peanuts 120,000 plant/ha
TRIAL DESIGN A randomised complete block design of 3 treatments, 8 replicates in plots of 3 beds (1.83m) wide, 20m long
TREATMENTS

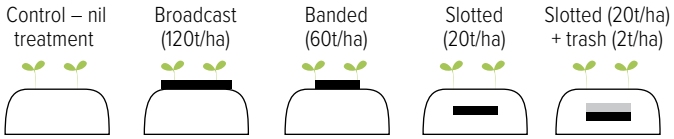


RESULTS

- No significant difference in crop yield or grade between the control (nil treatment), broadcast mill-mud or banded mill-mud at this site.
- However, this trial was compromised by leaf rust (*Puccinia arachadis*).

TRIAL 2: 2015/16

TRIAL SITE Isis Cane Services EMDEX farm, 18km south of Bundaberg
SOIL RYPE Redoxic Hydrosol
VARIETY Holt peanuts 120,000 plant/ha
TRIAL DESIGN A randomised complete block design consisting of 8 treatments, 4 replicates in plots of 5 beds (1.83m) wide, 30m long
TREATMENTS



RESULTS

- Peanut productivity was significantly worse in the plots where mill-mud was applied compared with the control plots where no mill-mud was applied.
- When applied at depth, the cane trash mixed with the mill-mud treatment improved production by 50% compared with the mill-mud only treatment, although it was not statistically better than the control.
- In the mill-mud only treatment plots, broadcast surface application of mill-mud tended to produce higher yields and better grades than when slotted at depth, but there was still no statistical difference between these treatments.
- Slotted mill mud produced the lowest yield, lowest grade and the highest shell percentage.

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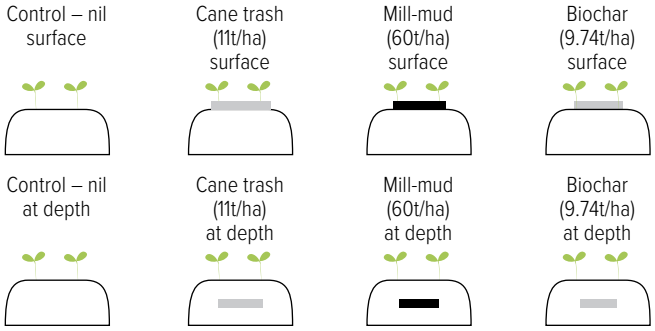
TRIAL 3: 2016/17

TRIAL SITE Bundaberg sugar farm, Alloway
SOIL TYPE Sandy loam
VARIETY A6785 Soybeans 325,000 plants/ha and Holt peanuts 120,000 plants/ha
TRIAL DESIGN A split-split plot trial design with the main plot crop (peanuts and soybean); subplots organic matter (nil, cane trash, biochar and mill-mud) and the sub-subplots placement (surface or slotted at depth) with 4 replicates in plots of 2.5 beds (1.83m) wide, 30m long
TREATMENTS The amount of organic matter applied (in the form of cane trash, mill-mud and biochar) was calculated to add about 4t of carbon/ha. The surface-applied treatments were incorporated with a rotary hoe.



Slotted (foreground) and surface mill-mud application.

Mill-mud banded (foreground) and broadcast (background).

Slotted cane trash treatment at Trial 3.

Pit dug at trial site to show placement of organic matter (mill-mud) additions at depth.

Pit dug at trial site to show placement of organic matter (cane trash) additions at depth.

RESULTS

- The addition of organic matter (cane trash, mill-mud and biochar) had no statistical effect on legume yield, gross crop value, maximum biomass or plant population.
- The placement of organic matter had no effect on grain yield, gross crop value and plant populations; however, the slotting of organic matter produced significantly more maximum biomass than surface incorporation.
- Notably, peanut productivity and gross crop value were significantly better than soybean at this site due to sclerotinium base rot limiting the soybean yield potential. There was no treatment effect on the incidence of the disease.

Summary of results

After three years of trials of applying mill-mud in peanut cropping systems, results indicate that no significant difference in yield or grade was obtained.

While there may be significant sugarcane yield improvements through the addition of mill-mud to the soil in the fallow, there was no evidence to suggest that peanut crops would benefit from mill-mud being applied pre-plant.

No productivity or profitability gains were achieved through mill-mud application prior to peanut sowing as either broadcast, banded or slotted at depth, over the three years of trials.

There was no evidence from these experiments to justify the cost of mill-mud application. All three experiments showed that the costs of mill-mud application would have a negative effect on the peanut crop gross margin comparative to the control.

Future challenges

Although these field trials demonstrated that there were no effects of organic matter addition to the soil on the performance of the peanuts or soybean planted, it is possible there could be soil health benefits that could enhance the productivity of subsequent crops in the broader farming system and soil sustainability.
A sugarcane rotation has now been planted at Trial site 3 (as part of an SRA-funded project) to assess the impact these soil ameliorations may have on the subsequent cane crops, and essentially close the loop of the farming system in the Coastal Burnett region.

This project leads to the question of exactly how and when can the mill-mud product best be used to optimise legume crop yield and gross margin as well as increase soil health for the benefit of the whole farming system.

GRDC RESEARCH CODE

Grower Solutions Project for Coastal/Hinterland QLD & NSW North Coast. GRDC Project Code: DAQ00204

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