Western Dairy Claying Trial

Host: Jenkins Family (Denmark).

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KEY MESSAGES:

- Soil incorporation (tillage) had a significant effect on plant dry matter production at the time of first pasture cut.
- Surface applied clay produced less dry matter at the first cut; this was likely due to the initial water repulsion effect of the clay.
- By the 4th grazing, a production benefit was observed in the clay x incorporation plots over and above the tillage only affect.

Background

Stirlings to Coast Farmers (SCF) are working in collaboration with Western Dairy on a project exploring the use of claying as an amelioration technique to improve pasture production and to manage nutrient run-off and improve fertility. As part of this investment, two trials have been established to examine the viability of claying to ameliorate sandy, low fertile soils that are typical to the Great Southern and South-West regions of WA. Clay spreading is a common practice for soil amelioration on light sandy soils in broadacre agriculture, however the practice is considered novel within the dairy industry. This is largely due to the high up-front cost, the need for specialised equipment to ameliorate at scale and the lack of available data on the economic and productivity returns for pastures. Given the novel nature of claying in the dairy industry and the difference in scale compared to broadacre claying, this project utilised farmer held equipment to apply the treatments. This report examines the results from the site established at Denmark.

Methodology/Treatments

The trials examine three differing clay rates, as well as a nil control, to determine the most efficient level of clay to improve pasture production. Additionally, there is an incorporation treatment, where two replications of the plots have been incorporated with a speed tiller, while the clay has been left on the soil surface of the other two replications.

The trial is replicated and blocked in a fashion to ensure trial rigour; however, randomisation could not be achieved with the farm scale equipment.

Clay Spreading

The clay for the project was sourced on farm, and prior to spreading it was sampled and tested for both clay % content and nutrients. Soil samples were also taken from the paddock to ascertain the baseline clay % and soil

nutrient status. The clay was spread using a Marshall Muck spreader, and rates were determined using measurements of applied clay per m2, per pass, the approximate incorporation depth, and the targeted clay percentage.

Pasture composition assessments

The site was seeded with a pasture mix at 35kg/ha and comprised a multiple of varieties of ryegrass, clover, brassicas and perennial herbs along with 80kg/ha of oats.

Plant health status

Plant health measurements were recorded in season via a handheld Trimble GreenSeeker (NDVI), and drone (green/red index).

Dry Matter Cuts

Dry matter cuts were taken in-season to determine the treatment effect of claying and/or incorporation on pasture production. Two in-season cuts were taken at the Denmark site prior to grazing.

Results and Discussion

The applied clay had an average clay fraction percentage of 38%. Soil samples from the site were tested for clay fraction prior to clay being added, the average clay percentage of the 10cm topsoil horizon was 2.94%.

Dry Matter

The first pasture cut, taken prior to grazing, showed no significant effect of the claying on pasture production. Comparisons between the applied rates showed that there was no dry matter yield increase from applying higher rates of clay (Table 1). However, there was a significant biomass response in the incorporated plots versus the unincorporated plots ($p = 0.0016$). This result shows that tillage is driving the pasture production. Given these are heavily trafficked paddocks, with high stocking rates, it is unsurprising that tillage was the first treatment to significantly increase pasture production. Sandy soils that are responsive to claying are also prone to soil compaction, which reduces the soil porosity and aggregation, impacting root growth and ultimately plant development.

Table 1. Denmark trial site dry matter production from Cut 1 (t/ha) against varying clay percentages.

	0%	1%	3%	6%
Incorporated	4.21	3.71	3.49	4.03
Unincorporated	2.68	2.99	3.85	2.07

The second pasture cut was taken prior to the 4th graze on the 20th of October. The incorporated plots produced a greater level of dry matter across all claying treatments compared to the un-clayed treatments (Table 2). However, the tillage effect on dry matter production was reduced, with the incorporated nil treatment only marginally outperforming the unincorporated nil treatment.

Table 2. Denmark trial site dry matter production from Cut 2 (t/ha) against varying clay percentages.

	0%	1%	3%	6%
Incorporated	2.67	3.31	2.99	2.87
Unincorporated	2.36	2.00	2.10	2.61

Pasture composition

Where the ground had been cultivated (clay incorporated), the Brassica species were dominant particularly early in the growing season. The increased level of brassica in the pasture mix is likely a result of the tillage/clay reducing non-wetting in the incorporated areas, whereas the surface applied clay formed a physical barrier to establishment and created localised surface waterlogging. However, after multiple grazing periods the pasture make up equalised.

Conclusion

The first year of the claying project showed some promising results at the Denmark site. However, most of the gains in pasture production this season resulted from incorporation and tillage in combination with the clay, rather than a specific rate response. Positive plant health effects, greater plant diversity, and increased dry matter yield differentials were observed as the season progressed. These results highlight the potential benefits of claying high production pastures, however further examination is required to distinguish the results as a product of the clay rates, rather than the tillage. It is notable that this season has had favourable growing conditions, which may have limited the potential positive benefits of claying (e.g. alleviating non-wetting soils at the break, and improved water holding towards the end of the season). If claying is shown to be successful within dairy-focused pasture systems, it could prove to be an effective management tool to increase productivity on a wider range of pasture-based farming systems.

Acknowledgments

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