Western Dairy: Clay rate x incorporation trial

Dan Fay, Research and Development Co-ordinator, SCF

SCF, in collaboration with Western Dairy, have established a clay rate by incorporation trial examining the novel use of clay amelioration to improve pasture production on the typically sandy and low fertility soils of the Great Southern and Southwest regions of WA. This trial stems from a member driven research priority to treat pastures like a crop, whereby pasture management, research and agronomy are brought in line with that of broadacre cropping. The trial is based around the utilisation of varying clay rates and incorporation to determine the best strategy for maximising pasture production.

The following article describes the trial and some key findings so far. The SCF trial site is one of two sites established in the project, with the other site hosted at Scott River.

TRIAL SITE – JENKINS DENMARK

Results and discussion

Baseline soil testing was conducted at the claying site on the 28th March when the site was established. The testing was to determine the existing clay fraction within the topsoil, as well as the nutrient status of the soil. On the 25th April the clay was spread at rates to target varying clay percentages in the topsoil, and soil strength measurements were taken. The paddock was seeded with 35kg/ha of a pasture mix comprising multiple varieties of ryegrass, clover, brassicas and perennial herbs and 80kg/ha of oats on the 7th May.

Plant establishment

Plant establishment counts were conducted on the 22nd May and showed an even distribution of plants across each claying rate regardless of whether clay was incorporated or not. Species composition was also similar across all treatments when recorded on the same date. It was interesting however, that the brassica varieties (in all treatments) in the pasture mix appeared in patches, rather than being evenly distributed within each plot, this may have been due to the competition with the grasses.

Dry matter production & plant vigour

On the 1st July pasture biomass cuts were taken to measure dry matter production within the plots and GreenSeeker values measured, to determine the plant health status and growth productivity in response to the claying treatments.

As noted early on, the feed production at the site was uniform across each of the plots in terms of feed composition, with the forage grasses/legumes making up around 65% of the pasture, while the brassicas made up 25% and 10% was made up of weeds.

There was no significant relationship between dry matter production and clay rate. There was, however, a significant dry matter response between the incorporated plots vs the unincorporated plots ($p = 0.0016$), claying treatments aside. The mean dry matter across all incorporated plots was 3.86t/ha, while the unincorporated plots had a mean dry matter production of 2.9t/ha. The same trend was observed in the plant vigour assessment (GreenSeeker), where there was no significant response between claying treatments but there was a significant increase where incorporation occurred compared to where it didn't. This is likely a result of the incorporation allowing the plants roots to access a greater proportion of the profile, through reducing soil strength coupled with the clay (where applied) increasing the nutrient and water availability. The trial points to incorporation (with or without clay) driving the increased pasture growth at this stage, rather than the claying, although this may change over time. Also worth noting is the much-reduced dry matter production where a 6% clay percentage was targeted and not incorporated. The high rate of clay in this treatment formed a barrier on the surface and appeared to act like a sponge, restricting water from reaching the root zone.

Table 1: Average dry matter (t/ha) measured across each plot in response to claying rate and incorporation method. Plots were incorporated to approx. 15cm.

Target clay % for topsoil	0%	1%	3%	6%
Incorporated	4.2075t/ha	3.7125t/ha	3.4875t/ha	4.0275t/ha
Unincorporated	2.6775t/ha	2.9925t/ha	3.8475t/ha	2.07t/ha

Figure 1. Images showing pasture composition and biomass of 6% incorporated (right) and 6% unincorporated (left) clay.

Table 2: Average GreenSeeker value in response to targeted clay rates, and incorporation method. The values expressed an assessment of plant vigour.

Target clay % for topsoil	0%	1%	3%	6%
Incorporated	0.824	0.817	0.828	0.811
Unincorporated	0.826	0.753	0.778	0.788

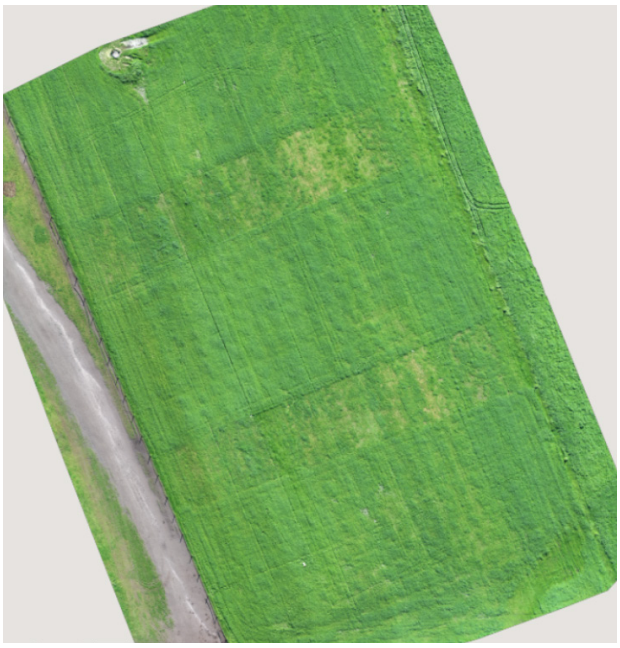

Figure 2. Drone imagery taken on the 7/7/22, showing the difference in plant biomass and ground coverage between the incorporated and unincorporated plots.

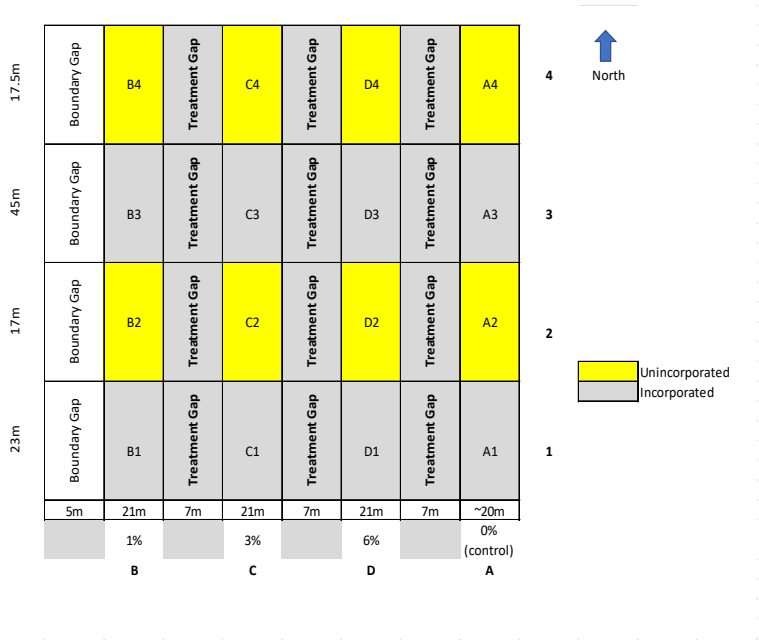

Figure 3. Denmark trial design.

Conclusion

In this case the utilisation of clay alone has not resulted in a positive benefit to pasture growth. If claying is to be utilised on pastures, even at low rates, it is necessary to incorporate the clay to receive a benefit in pasture production, at least in the the first year. Given there was an improvement in the nil clay x incorporation plots, there is obviously a benefit derived simply from the tilling of the soil. This poses the question as to whether strategic tillage could possibly be a solution to improving pasture production on the south coast of WA. As this project progresses, we will be able to establish the longitudinal benefits from each treatment, which should shed further light on the prolonged productivity and yield gains resulting from the various claying treatments. While it is known that the positive effects of tillage have a limited life span, claying is a long-term amelioration strategy. Therefore, the true benefit of the varied percentages of clay applied will be more likely to be expressed over the coming months and years.