



## Western Dairy pasture claying trial shows promising first year results

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This year Stirlings to Coast Farmers established a broad scale claying trial at Denmark. The objective of this trial, and another set up at Scott River, is to assess the viability and productivity of the soil amelioration technique of claying on sandy, low fertile pasture paddocks. The trials will be monitored until 2024.

### Background

Claying is an often-used amelioration technique within broadacre farming. However, claying as an amelioration technique to primarily improve pasture production is novel. Given the high upfront cost and labour intensity involved in applying clay, there is a need for a large improvement in productivity to drive a positive return on investment (ROI). Within broadacre farming, particularly on non-wetting low fertility sands, claying is proven as an effective and profitable amelioration tool. Given the long lifespan of claying (30+ years), there is an increasing level of interest to assess how these techniques could be applied in livestock/pasture driven farming systems, and whether they would be profitable.

### The site

The claying site in Denmark is located on a high production dairy farm, where the farmer sows short term pasture mixes to maximise productivity. The trial itself is looking at differing claying rates, with and without incorporation of soil after claying. Incorporation is a key component of claying within a broadacre setting where high rates of clay are applied to ameliorate to depth. The Denmark trial is looking to compare surface applied treatments, where the idea is that livestock will work in low rates of clay over time, with incorporation (tillage) which adds an addition expense.

### Treatments, measurements & results

The trial site in Denmark had three different clay rates applied to achieve increases of +1%, +3% and +6% clay content in the soil (assuming 10cm incorporation depth). At these clay rates, spreading was possible with the farmers equipment. The trial was replicated and there were two zones for each treatment, an unincorporated and incorporated zone. Following claying, the trial was seeded on the 7th of May, with a pasture mix containing 35kg/ha of a mix comprising multiple varieties of ryegrass, clover, brassicas and perennial herbs along with 80kg/ha of oats.

Pasture cuts and a pasture composition assessment were taken prior to the first grazing (55 days after sowing). A significant relationship between tillage and dry matter production was

observed with all the incorporated plots outperforming all the unincorporated plots, irrespective of clay rate. This positive response to soil incorporation, was likely due to the soil being highly compacted after years of heavy stocking rates, restricting plant growth. The tillage effect of the incorporation method would have alleviated some of this compaction, resulting in improved plant growth (Table 1).

Table 1 Denmark trial site dry matter production from cut 1 (55 days post seeding) (t/ha)

Clay %	0%	1%	3%	6%
<b>Incorporated</b>	4.21	3.71	3.49	4.03
<b>Unincorporated</b>	2.68	2.99	3.85	2.07

A second round of pasture cuts were taken on the 20th of Oct, prior to the 4th grazing (Table 2). The unincorporated plots showed no statistically significant difference in dry matter production between the clay rates and the control. However, the plots that were clayed and then incorporated did show an increase in pasture production over the nil control. While the specific clay rate did not have an impact on pasture yield, the presence of any amount of clay when incorporated did improve pasture production. The combined average dry matter from the 1%, 3% and 6% clay treatments combined with incorporation was 3.05 t/ha of dry matter, compared to the 2.67t/ha of dry matter on the nil control (nil clay, incorporation only).

Table 2. Denmark trial site dry matter production from cut 2 (20 October) (t/ha)

Clay %	0%	1%	3%	6%
<b>Incorporated</b>	2.67	3.31	2.99	2.87
<b>Unincorporated</b>	2.36	2.00	2.10	2.61

The feed composition at the time of the first grazing was uniform across each of the plots. At the time of the second grazing the pasture composition had changed. The incorporated plots appeared to have approximately 30% more brassica compared to the unincorporated plots that were largely made up of the grasses, and only contained around 15% brassica.



## Conclusions

The measured response of pasture production to claying x incorporation is likely a result of the following factors;

- The clay could be providing greater plant available water, which has had a positive impact on dry matter production as the season dried out. This benefit would have been unlikely to be observed early in the season as the paddock was at field capacity and water was not a limiting factor for plant growth.
- The clay could be providing greater nutrient availability. The presence of clay within the soil has been able to 'hold onto' mobile nutrients, or provide nutrients within the clay, that would otherwise not be present in the sandy soil.
- Incorporation alleviated the impact of non-wetting on the brassica species within the pasture mix. The brassicas were slower to germinate than the grass species, which could explain why this impact was not observed until the second dry matter cuts were taken. Brassicas are particularly susceptible to non-wetting and the presence of clay in combination with incorporation, alleviating the non-wetting constraint, could explain the higher proportion of brassica in the pasture mix later in the season.

Overall, the first year of the claying project showed some promising results at the Denmark site. However, the long-term success of claying as a soil amelioration technique for pasture production will determine the likelihood of widespread adoption. Most of the gains in pasture production this season resulted from claying followed by incorporation, regardless of the specific clay rate. In saying this, 2022 was a particularly wet season in Denmark, and non-wetting and plant available water were less of a limitation to pasture growth overall. Production differences between clay rates may be more evident in a season with a drier start and/or drier finish. This season, the unincorporated plots appeared to be negatively impacted by the presence of the surface clay. However, as the livestock work the clay in over time, and residue break down assists with the dispersion of the clay, the surface application without tillage, could provide some positive results.

Claying is a long-term investment, and it is impossible to draw conclusions to the effectiveness and profitability of claying on pasture production in the first year. Stirlings to Coast Farmers will continue to monitor the site in 2023 and 2024 so local farmers can better understand the benefits of this longer-term return investment.



Figure 1: Pasture composition of the +6% clay surface applied plot prior to the 4th grazing



Figure 2: Pasture composition of the +6% clay incorporated plot prior to the 4th grazing