



Clay Rate x Incorporation Demonstration 2022-24 - Western Dairy

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Background

Although clay spreading sandy soils has been an established practice in broadacre cropping for over two decades, the practice has had limited up-take in the dairy industry. At a recent Western Dairy Inc. Board meeting, there was a great deal of interest to see investment into improving soil fertility through changes in organic matter (OM), plant emergence & establishment, phosphorus retention, and non-wetting through the addition of clay and then incorporating it. Improvements in soil condition and nutrient use efficiency also have the potential to reduce nutrient loss to waterways and the environment, so the project is being supported by Healthy Estuaries WA. The Western Dairy Board felt that the adoption of clay spreading could help dairy farmers be better custodians of their fragile soils through better nutrient use efficiency and early pasture growth.

A preliminary demonstration was completed by a dairy farmer in Denmark who noted improvements in pasture growth since applying clay two years ago. The same farmer, Andrew Jenkins, will host a demonstration site from 2022-24, managed by Stirlings to Coast Farmers (SCF), with a second demonstration site being set up at Scott River, managed by a private agronomist. Stirlings to Coast Farmers were asked to tender for the project given our experience managing similar style projects and the relevance to our mixed farming members. Members grow pastures on their previously clayed paddocks in rotation with crops, but quantitative pasture growth and composition changes have not been previously collected.

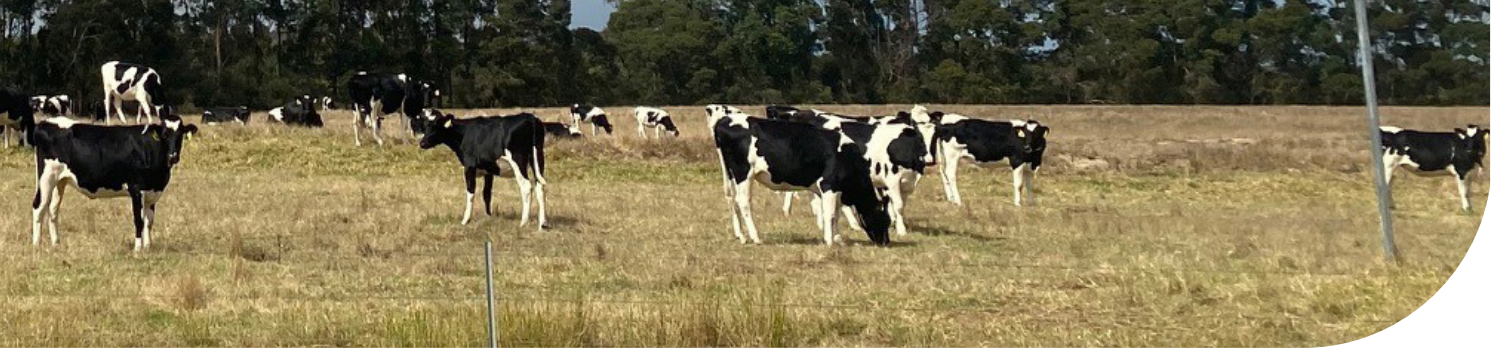
Methodology

The trial will include demonstration strips with four treatments - 0%, 1%, 3%, and 6% clay of the finished soil (after incorporation and measured at 10cm mixing depth). Percentages of clay in the finished soil rather than application rates will be used on the recommendation of DPIRD soils researcher, Glenn McDonald, as all clays are not equal in actual clay content. To determine the amount of clay required based on the clay content of the original soil and the clay content of the donor clay, we will use the clay calculator tool developed by David Hall (DPIRD).

For simplicity, the paddock will be seeded by the host farmer to whatever is being sown over the bulk of the paddock (i.e. rye, clover, cereal mix or similar) and rotationally grazed as per the usual practice on the property. Pre-work baseline sampling will determine starting nutrition levels and any other constraints while also calculating the starting clay content of the original soil.

Baseline sampling will include comprehensive soil testing at 0-10cm, 10-20cm and 20-30cm and measure the following:

- Phosphorus Buffering Index (PBI),
- Phosphorus Retention Index (PRI),
- Phosphorus (Colwell),
- Phosphorus (CaCl₂-extractable)
- Potassium (Colwell),
- Sulfur (KCl 40),
- Organic Carbon (Walkley-Black),
- Nitrate Nitrogen,
- Ammonium Nitrogen,
- Electrical Conductivity,
- pH (water),
- pH (CaCl₂),
- Texture,
- Boron,
- Trace Elements (DTPA) - Copper, Zinc, Manganese, Iron, Magnesium, Exchangeable Cations,
- Sodium,
- Aluminium



Other project observations and assessments will include:

- Soil sampling for clay content in years two and three of the demonstration.
- Comprehensive tissue testing from July-September during peak grass growth periods
- Plant emergence
- Plant density conducted pre-grazing in early winter and mid-spring. Glenn McDonald from DPIRD will measure using drone technology.
- SCF will ground-truth density with tools such as plate meters and pasture biomass cuts.
- Grass and pasture composition

Trial Design

	Boundary Gap		Treatment Gap		Treatment Gap		Treatment Gap		Boundary Gap
40m									
	Boundary Gap		Treatment Gap		Treatment Gap		Treatment Gap		Boundary Gap
36m									
	Boundary Gap		Treatment Gap		Treatment Gap		Treatment Gap		Boundary Gap
40m									
	Boundary Gap		Treatment Gap		Treatment Gap		Treatment Gap		Boundary Gap
36m									
	Boundary Gap		Treatment Gap		Treatment Gap		Treatment Gap		Boundary Gap
	3m	18m	6m	18m	6m	18m	6m	18m	3m
	6% Clay		UTC		3% Clay		1% Clay		

Figure 1: Diagram of the proposed Denmark Clay trial hosted by Andrew Jenkins. The blue highlighted section will be incorporated with a speed tiller to a depth of 15cm. Clay treatments were installed on April 2022.

Field Walk

Local Dairy farmers will invite SCF members to view the demonstration site during the 2022 season. We will invite DPIRD soils researchers Glenn McDonald, David Hall and Tom Edwards to discuss the process of determining optimal clay rates and the potential of adopting claying spreading to dairy farming systems. Initial results and observations from the clay applications will also be presented and discussed.

This project is a part of Healthy Estuaries WA – a State Government Royalties for Regions program that aims to improve the health of our South West estuaries.