



Sub-Soil Manuring Project

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BACKGROUND

With investment from the Australian Government through the 'National Landcare Program', Stirlings to Coast Farmers has been exploring the use of organic material amendments to ameliorate the poorly structured sub soils of the sandy duplex soils typical to the Albany Port Zone (APZ). Sub soil manuring has been successfully implemented on dense, dispersive, and sometimes sodic clay sub soils in the eastern states, whereby an organically rich amendment is placed deep within the soil profile which alters and improves the soil structure by increasing soil porosity and water holding capacity.

Where subsoil manuring has been successful, it encourages extra root development as the roots follow the rip lines down to where the amendment is placed due to the roots seeking out the banded nutrition. The hypothesised co-benefit is that the increased biological activity associated with the breakdown of the manure will lead to an increase in soil structure in the hard packed clay layers.

METHODOLOGY

The SCF trial site, located in Green Range, utilised a locally manufactured organic manure product known as bio-sludge - Alberts Soil Conditioner. Clay was also included in the trial to create two soil amelioration treatments – bio-sludge with and without clay. The soil type at Green Tange is a deep sandy duplex, with sand over gravelly clay. The depth of the compaction layer ranges from 55 to 65cm.

The bio-sludge was surface applied at 20t/ha and worked into the soil profile via a deep ripper. It was applied with and without clay to assess if there would be any increased benefit from adding clay, and how the bio-sludge would compare to clay alone as a soil amelioration method. Crops sown in the trial paddock each season have been:

2021 – Barley

2022 – Wheat

2023 – Pasture

RESULTS

The SCF trial has shown limited crop yield response over the last two seasons, largely due to two key factors.

The bio-sludge amendment with deep ripping is supposed to allow for deeper rooting depth and increased water and nutrient availability. However, ample plant available water throughout the 2021 and 2022 growing seasons meant that it was hard to observe any crop production benefits due to potential changes in sub-soil structure.

The second factor that has influenced the results, is the depth to which the amendment could be placed. Where subsoil manuring has proven to be successful at other locations, the amendment is placed in rip lines to a depth that is at or below the sodic/dispersive clay layer. This results in the enriched manure product (bio-sludge in this case) breaking down this layer over time, increasing microporosity, rooting depth and plant available water. However, within this trial the depth of the hard packed clay layer (non-sodic) was below the depth of incorporation of the enriched manure product due to equipment constraints.



DEPTH TO COMPACTION LAYER

Within the trial site, there has been no observable change in depth to the compaction layer (hard packed clay layer) in the treated plots. The depth to which the amendment was placed, along with the technique of broadcasting the manure on the surface and working it into the soil with a deep ripper with inclusion plates, resulted in an uneven incorporation of the manure product. A final round of compaction testing will be completed prior to the completion of the project to determine if the manuring product has had any later effect on soil strength at depth.

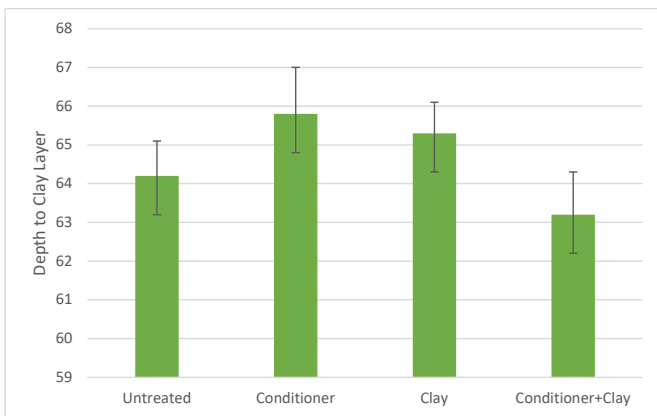


Figure 1. Depth to hard packed clay layer in each of the soil amelioration treatments at Green Range.

VOLUMETRIC WATER CONTENT AT DEPTH

Soil volumetric water content was taken with a TDR probe at a depth of 30 – 43cm, at the end of the 2022/3 summer fallow period. The clay and clay plus bio-sludge treatments resulted in a more plant available water at depth than the untreated control. However, the bio-sludge only treatment performed similarly to the untreated control. In this case, it is unlikely the addition of bio-sludge has increased plant available water at depth.

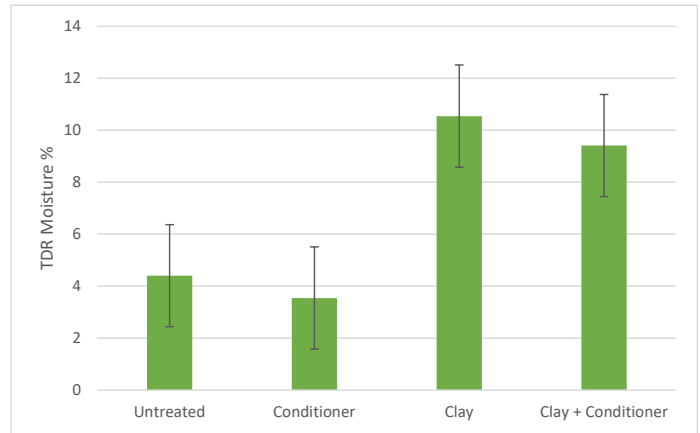


Figure 2. Soil moisture content at depth in each of the amelioration treatments at Green Range.

CONCLUSIONS

While there has apparently been no change to subsoil structure and compaction as a result of the addition of sub-soil manuring, there is potential for the product to increase biological activity and overall soil health. Soil samples taken at depth are currently being assessed for biological population and activity. An increase in soil biological activity is not guaranteed to increase productivity, but it is important for overall soil health and could lead to long term benefits to the farming system. More research is required to quantify these benefits for farmers over the long term.

