# Increasing the effectiveness of claying in the Albany Port Zone

*Hosts: Goad Family (Kojaneerup South), Webb Family (Kojonup) and Brown Family (Woogenellup)*

*By: Dan Fay, Research and Development Co-ordinator, SCF*

## KEY MESSAGES:

- **If growers want to increase the efficiency of their claying operations, they need to adequately consider the following three factors:**
  - **the initial clay content within the non-wetting zone (0-15cm);**
  - **the clay fraction of the "clay" they are spreading; and**
  - **the incorporation depth to which they will work in the clay.**
- **Located on a deep sandy duplex soil, the Kojaneerup trial validated the need to achieve a soil clay content of at least 5% within the incorporation zone to adequately address non-wetting. A clay rate of 270 t/ha achieved this.**
- **The Scotts Brook trial showed that claying may be an effective amelioration technique to alleviate non-wetting on forest gravels. All three incorporated clay treatments outyielded the untreated control.**
- **Additional work should be undertaken to better quantify the claying versus tillage effect when incorporating clay on forest gravels. This will give growers further confidence in this relatively 'novel' practice.**

## Background

Clay spreading adds clay enriched (>20% clay content) soil into clay deficient and water repellent topsoils. In very sandy soils, clay is incorporated to depths of <50cm, depending on the equipment available. The overall aim is to lift the clay content of the soil up to 5%. Claying topsoils reduces water repellence, water and wind erosion risk, increases water holding capacity, and has the potential to increase organic matter and carbon over time.

Claying has become a vital amelioration tool in the Great Southern region and along the South Coast of WA. The soils are typically sandy, low in organic matter, non-wetting and prone to wind erosion. Claying significantly increases grain yields on these sandy duplex soils by ameliorating one or more of these constraints (predominately non-wetting).

Based on the successful adoption of claying sands to alleviate non-wetting, growers with forest gravels are keen to assess the benefits of claying gravel soils (also alleviating non-wetting).

## Methodology/Treatments

Two demonstration sites, located at Kojaneerup and Scotts Brook, had clay spread in the autumn of 2022 and were subsequently seeded with a cereal crop. The claying was applied with a contractors' equipment (CAT Scraper) at Scotts Brook and the farmer's own equipment ('SPREAD-IT' spreader) was used at Kojaneerup.

At the Kojaneerup site, three treatments were applied: a low (140 t/ha), a medium (270 t/ha) and a high clay rate (350 t/ha). Clay incorporation was completed with off-set discs to 100mm of soil depth. At Scotts Brook (site managed by Southern Dirt), the primary treatment

variable was incorporation method; 'Plozza plough', Speed Tiller and off-set chisel plough, with these treatments incorporated to differing depths of 30, 15 and 10cm respectively. Prior to incorporation, the clay was spread at a consistent rate of 400t/ha across the site, with untreated zones left inbetween. In addition, a Plozza plough only area was done by the farmer as a comparison to measure the tillage effect.

Soil samples were taken at depths of 0-10, 10-20 and 20-30cm and soil organic matter (OM) levels collected before the clay was applied. This data formed the baseline to observe any changes that result from the claying and incorporation.

Plant counts were conducted prior to tillering to measure the plant establishment response to each treatment.

Harvest was conducted using the farmer's machinery, the yields of each plot were determined by analysing the harvest yield files with a statistical analysis conducted. Grain quality samples were analysed.

## Results and Discussion

The initial clay percentage at Kojaneerup was 1.7% across the site to a depth of 20cm. Table 1 shows the resulting topsoil clay percentage after the clay had been applied at the three different rates. The resulting clay content is a factor of three elements, the initial clay percentage in the topsoil, the clay fraction of the clay to be spread and the incorporation depth to 15cm.

*Table 1: Clay content increases with each rate of clay applied (Kojaneerup)*

| Clay application rate | 350t/ha | 270t/ha | 140t/ha |
|---|---|---|---|
| Ameliorated topsoil clay %, incorporated to 150mm | 7% | 5.8% | 3.8% |
| Increase in topsoil clay % from 1.7% | 5.3% | 4.1% | 2.1% |

*Table 2: Clay content increases for each treatment (Scotts Brook)*

| Implement | Incorporation depth | Initial clay % | Resulting clay % | Change in clay % |
|---|---|---|---|---|
| Speed Till | 10cm | 4.4 | 10.7 | 6.3 |
| Offset Chisel Plough | 15cm | 4.4 | 8.6 | 4.2 |
| Plozza Plough | 30cm | 4.4 | 6.5 | 2.1 |

At Scotts Brook, the initial clay percentage in the topsoil was 4.4% which was quite high for a paddock that is to be clayed (Table 2), however, the soil had a high organic carbon (OC) percentage, ranging between 3.3 and 5%. Prior research conducted by DPIRD, showed that where OC was higher than 1.5%, the 5% threshold to alleviate non-wetting would likely be higher, due to a greater concentration of water repellent particles within the soil that are associated with the higher level of OC.

At the Kojaneerup site, plant establishment was significantly better where the resulting clay percentage was more than 5%. At the Scotts Brook site, plant establishment was significantly best in the clay incorporated by plozza plough treatment.

Barley yields at the Kojaneerup site showed significant yield increase in the two clay treatments (270t/ha and 350t/ha) that resulted in a final soil clay percentage above the critical threshold of 5% within the incorporated zone (Figure 1). In this trial, the yield penalty for not achieving 5% clay content (140 t/ha treatment) was more than 1 t/ha. These yield results highlight the importance of achieving the critical level of clay within the topsoil to alleviate the non-wetting and allow for unconstrained crop development in the early growth stages, while the root depth is still shallow.

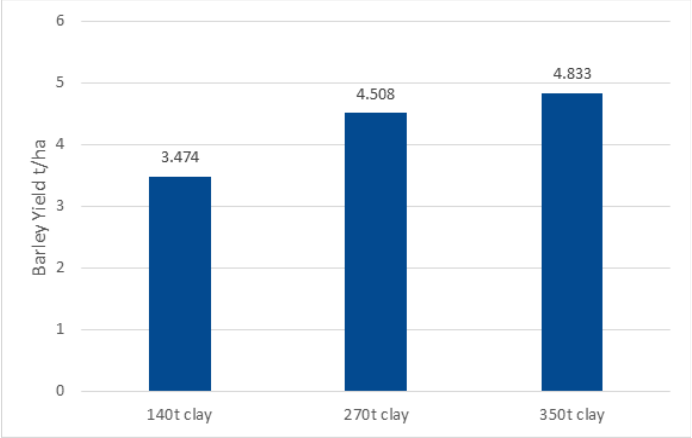


*Figure 1. Average barley yields (t/ha) in response to three different clay rate treatments at Kojaneerup South.*

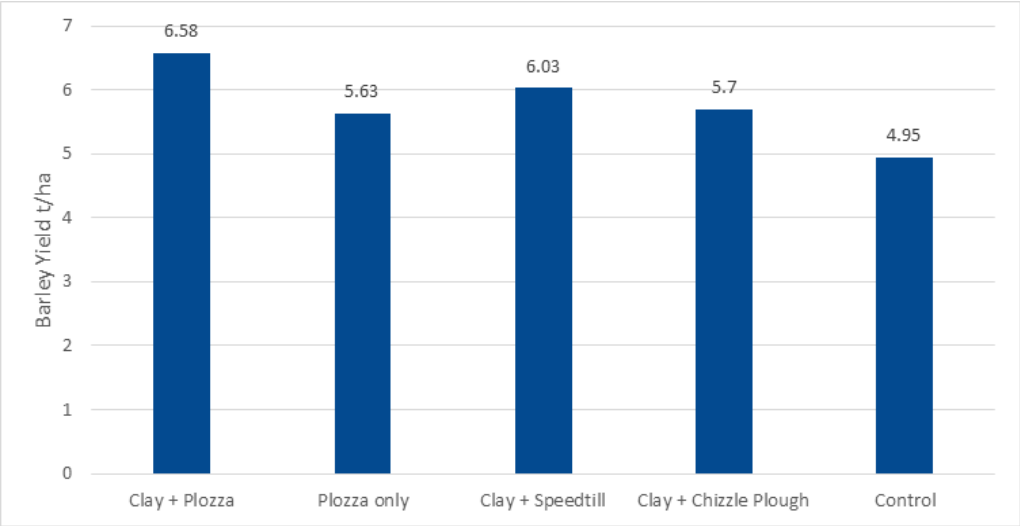


*Figure 2. Average barley yields in response to clay incorporation and tillage treatments at Muradup.*

The yield results from the Scotts Brook trial site showed that all three clay incorporation treatments outperformed the untreated control (UTC) (Figure 2). The UTC yielded an average of 4.95t/ha and the clayed treatments ranged from 5.7t/ha to 6.58t/ha. These yield improvements are significant enough to justify the expense of the claying incorporation process. In addition, the host farmer Plozza ploughed a part of the paddock where no clay had been spread prior, allowing some quantification of the tillage only yield impact. The yield results show that the clay with Plozza incorporation treatment yielded almost a tonne more than the Plozza plough only section and provides some indication that the claying is having an effect over and above that of the tillage.

## Conclusion

Strategic tillage has been shown to be an effective short-term measure in alleviating non-wetting, while claying is a more permanent solution. The trial site at Scotts Brook should be monitored over subsequent seasons to see how the clayed treatments perform after the tillage effect has diminished. It is also important to consider the short-term nutritional effects the clay could be having on the yield results, especially given the high rate of clay that was applied (400 t/ha). It is highly probable that the clay itself has provided the crop with a nutrient boost that it would not have otherwise had. In the coming seasons, this nutritional boost from the clay will also diminish, allowing the long-term benefits of the clay to be observed in isolation.

Both sites will continue to be monitored in 2023. In addition to these sites, two new gravel soil claying trials have been included in the project. One located at Woogenellup and the other again at Scotts Brook (to be managed by Southern Dirt) with the aim to better quantify the benefits of claying on gravel soil, given these promising preliminary results.

## Acknowledgments

Grateful acknowledgement to Southern Dirt for assistance with the Scotts Brook trial site and to GRDC (and the levy paying growers) for continued investment in the project.