

# Overcoming non-wetting soils:

## The importance of clay incorporation 2010-2013



### Project Snapshot

|                              |                          |
|------------------------------|--------------------------|
| Land Manager's Name/s:       | Trevor and Renae Syme    |
| Property Size:               | 4000 ha                  |
| Location:                    | Bolgart                  |
| Annual rainfall (mm):        | 397mm                    |
| Soil:                        | 80% cropping, 20% cattle |
| Soil types/vegetation types: | Red clay to sandy soils  |



### Key Messages

- Clay incorporation using a spader and rotary hoe, markedly improves crop yields supposed to offset discs. These methods also make claying more affordable.
- Deep ripping prior to claying can significantly improve crop yields by ameliorating physical soil constraints such as compaction.
- Soil testing is important before and after the claying process as soil nutrition can be greatly when soil is mixing with the profile.
- Depending on depth to clay, alternative methods can be used to eliminate the need for claying and bring existing clay to the soil surface (e.g. deep ripping, mouldboard ploughing, delving).

## Their story

Trevor grew up on a farm in Coorow and only moved to Bolgart in 1994 when he and his parents bought 'Waddi Park'. Recently the property has been mainly managed by Trevor and his wife Renae. The Syme's were aware that most of the farm had non-wetting problems and so in 1996 they bought a DBS air seeder bar for furrow sowing. Unfortunately this wasn't enough to combat the problem and with an increase in dry years it became worse. Trevor first tried clay incidentally in 2001, after the neighbours dug out marron ponds and had some on offer. Trevor decided to spread it on the farm's weakest soils. "We had to go over it three times with the multispreader to get 90t/ha", Trevor said.

With around 80 per cent of the farm having non-wetting issues Trevor turned to the services of a contractor for greater efficiencies (e.g. 250t/ha in one pass). He also tried incorporating clay with offset discs; however this incorporation method seemed to create a constraint in the topsoil. "Plant roots would grow vigorously until about 100 mm due to additional

clay, but then hit sand causing the crop would drought off", Trevor explained. He added, "Claying is a pricy job [~\$900/ha], especially when there is a lot to be done, so you what to do it right". Knowing that the application of clay was not as straightforward as one would think, Trevor sought funding in 2010 through Wheatbelt NRM's Soil Conservation Incentive Program (SCIP). With this financial support he hoped to uncover a better method for spreading and incorporating clay.

## The trialling period

With the help of the Western Australian No-Tillage Association (WANTFA) a uniform site was selected for a replicated trial in a paddock where Trevor had already intended to spread and spade clay. During the contracted spreading operation two rates of clay (260t/ha & 520t/ha) were spread (5m wide) randomly in three 80m long runs. Three runs with no clay were also included to act as controls. Utilising owned and hired implements (offset discs, rotary hoe and spader) Trevor then incorporated the soil at a right angle to the spreading runs at different speeds.

**Table 1. Average yield (t/ha) results representing most of the treatments**

| Clay rate                            | Incorporation method   | 2010<br>Wheat | 2011<br>Wheat | 2012<br>Canola |
|--------------------------------------|------------------------|---------------|---------------|----------------|
| Nil (0 t/ha)                         | Nil                    | 0.7           | 2.0           | 0.55           |
| 260 t/ha                             | Nil                    | 0.5 (-0.2)    | 1.6 (-0.4)    | 0.2 (-0.35)    |
| 520 t/ha                             | Nil                    | 0.5 (-0.2)    | 1.7 (-0.3)    | 0.2 (-0.35)    |
| 260 t/ha                             | Offset Discs           | 1.0 (+0.3)    | 2.5 (+0.5)    | 0.8 (0.25)     |
| 260 t/ha                             | Rotary Hoe             | 1.4 (+0.7)    | 2.7 (+0.7)    | 0.55 (+0.0)    |
| 260 t/ha                             | Spader                 | 1.4 (+0.7)    | 3.2 (+1.2)    | 0.9 (+0.35)    |
| Bulk paddock<br>260 t/ha             | Deep ripped and Spader | 1.8           | 3.6           | 1.1 (+0.55)    |
| Growing season<br>rainfall (Apr-Oct) |                        | 178mm         | 403 mm        | 188 mm         |

**Table 2. Yield monitor readings (t/ha) for nil, spader and mouldboard plough with no additional clay application**

| <b>Incorporation method</b>              | <b>2010 Wheat Sand</b> | <b>2010 Wheat Gravel</b> | <b>2011 Wheat</b> | <b>2012 Canola</b> |
|------------------------------------------|------------------------|--------------------------|-------------------|--------------------|
| <b>Nil</b>                               | 0.15                   | 0.70                     | -                 | -                  |
| <b>Spader</b>                            | 0.40                   | 1.50                     | *                 | 1.20               |
| <b>Mouldboard plough</b>                 | 0.50                   | 2.70                     | 2.90              | 1.50               |
| <b>Growing season rainfall (Apr-Oct)</b> | 178mm                  | 1.0 (+0.3)               | 403mm             | 188mm              |

**\*No yield recoded as the spaded area was sprayed out due to weeds**  
**NB. Where 250t/ha of clay was added and spading was used for incorporation, yields of 1.41t/ha and 4.60t/ha was recorded respectively on sand and gravel areas of the paddock in 2010.**

The Syme's found (as shown in Table 1) that the rotary hoe and spader were better at dispersing the clay evenly through the soil profile, and in turn achieved the greatest production through better water availability. The treatment of the bulk area of the paddock also proved the added value of deep ripping. For example the 260t/ha clay rate incorporated by the spader had a yield benefit of 0.7t/ha versus 1.1t/ha when deep ripping occurred prior to incorporation in the dry 2010 season. This yield advantage was also proven in the wet 2011 season and the 2012 season.

In a neighbouring paddock across an area with shallow clay, a mouldboard plough was hired to see if this cheaper alternative to claying could reduce the non-wetting problem. "I found it was less effective than spading clayed country and was sometimes damaging in sandy soils", Trevor mentioned. "I've learnt if the clay is deeper than 250 – 300mm it needs to be dug up and spread before incorporation".

The project has been a very valuable experience for the Syme family. Without the Caring for our Country funding, and the support from WANTFA and the Department of Agriculture and Food, they wouldn't have been able to explore the issue of non-wetting soils to such a degree. For example, the project drew Trevor's attention to how soil nutrition and weed burdens change after soil is incorporated. Even more importantly other interested farmers facing similar

problems with non-wetting had the opportunity to visit the Syme's farm to see the results first hand. "The project has confirmed in my mind the viability of claying and has taught me that incorporating it is more important than the actual amount and spreading of the clay", Trevor said.

## Further areas of investigation

Although the Syme's have learnt a lot during this project, when it comes to addressing the big issue of water repellence there is much 'untrodden ground'. The next step they are taking to battle non-wetting soils on the farm is to trial delving. A delver is used to bring clay to the surface. Trevor explained, "By using this technique the spreading, smudging, ridging and deep ripping machinery operations shouldn't be necessary, reducing the cost to around \$350/ha". To help decide where it is most appropriate to use this technique Trevor has paid Precision Agronomics Australia to survey 1300ha of his land using Gamma and Electro Magnetic technology. "If the clay is not detected within 700 mm of the surface, I would have to spread clay as the delver wouldn't reach it", Trevor said.

Trevor is currently trying different rates of lime and gypsum prior to delving. With the help of WANTFA's Researcher Manager Dr Matthew McNee he is also investigating discs versus tynes in non-wetting soil.





## Acknowledgements

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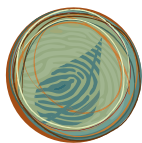
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