

Growing topsoil: year three results

Background

Cropping on Kangaroo Island can be frustrating. How often is the crop finishing off early yet there is plenty of sub soil moisture that the roots don't seem to be accessing? Many of our soils have a shallow fertile top soil over an infertile sand or clay. Often the clay at depth can be sodic or acidic limiting root growth. What if there was a simple way to 'grow more top soil' to encourage plants to grow deeper root systems? Could we grow the massive crops you see grown overseas where they measure top soil in feet not inches?

Trial work has shown that the application of organic matter at depth can significantly increase crop production. The increased plant growth is due to the roots being able to grow more easily through the subsoil, which enables the roots to access the available water and nutrients. The deep incorporation of a green manure crop or organic matter into the soil profile may be a way to 'grow more top soil' out of the otherwise hostile subsoil.

Initial trial work on KI in 2011 showed a 50% yield increase when organic matter (cereal hay) was buried at depth using the spader machine. Work in South Australia and Victoria using a specially designed machine (Peries-Wightman subsoiler) has boosted crop yields by up to 60%. The system, called sub soil manuring, can incorporate high rates of organic material into the upper layers of dense clay subsoils. The machine can also be used to treat sodic or acidic sub soils through the application of gypsum and lime.

What was done

A replicated trial was set up on Bellevista, (Waller's Block) in conjunction with Travis Bell to investigate the impacts burying at depth organic matter (using a Neutrog product Bounce Back) and gypsum using the subsoiler machine in May 2012. The machine rips down to 40 cm deep with the products placed at approximately 30 cm.

The treatments included:

- Bounce Back (BB) @ 20t/ha applied on the surface
- BB @ 20t/ha applied at depth.
- Gypsum @5t/ha applied at depth
- BB @ 20t/ha plus Gypsum @5t/ha applied at depth
- Straight rip to 40cm with no product applied

In 2014 the site was seeded to wheat.

Results

The site was harvested using the small plot harvester in December 2014. Sub samples were sent to Kangaroo Island Pure Grain (KIPG) for analysis.

TABLE 1: **Harvest yields, protein and screenings**

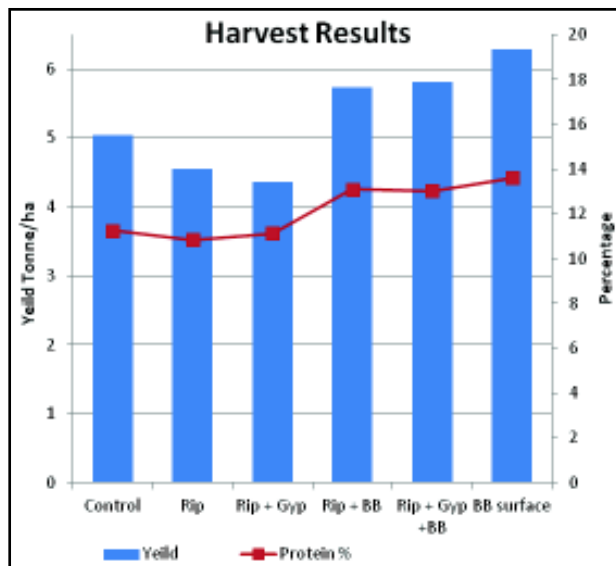
	t/ha	Protein %	Screenings %
Control	2.99	11.25	3.63
Deep rip only	2.7	10.83	3.54
Gypsum at depth	2.59	11.13	4.4
Bounce Back (BB) at depth	3.4	13.1	6.28
Gypsum + BB at depth	3.45	13.03	6.24
BB on surface	3.73	13.6	9.77

Two treatments 'deep rip only' and 'gypsum at depth' has for the third year decreased yield and protein compared to the control. It appears that the application of BB on the surface is mineralising slowly resulting in a yield increase three years after its application.

The addition of Bounce Back (BB) at both depth and on the surface has increased the yield and protein levels compared to the control (Refer to FIGURE 1). The addition of BB at depth increased yield by 7% in 2012 (a year of average rainfall), in 2013 the yield increase was 15% (a year of well above average rainfall). This year (a year of well below average rainfall) the yield increase was still 15%. The high percentage of screenings compared to the control indicates that had we had a better spring and an even greater yield might have been achieved.

This correlates well with work in Victoria that has shown increasing yields over time i.e. a site in the Western Districts of Victoria is still recording incremental yield increases six years on from the initial sub soil manuring.

FIGURE 1: **Yield and protein levels across all treatments**



In late spring 2014 an excavator was used to dig mini soil pits to look at root development down the profile (refer to FIGURES 2 & 3 below). Visually there is little difference between the two, though FIGURE 2 (Bounce Back at depth) possibly has slightly more root development in the 10-20 cm layer. There was no physical evidence of the Bounce Back in the 30cm layer. But the continuing difference in yield results across the treatments is clearly indicating that something is working.



FIGURE 2: **Bounce Back at depth**



FIGURE 3: **Control**

Take home messages

- For the third year in a row and now over a variety of seasonal conditions the deep placement of organic matter has increased both crop yield and quality.

Funding/Sponsors

- Agriculture Kangaroo Island (through Caring for Our Country funding).
- Travis Bell "Bellevista" for providing the trial site
- KI Pure Grain for grain analysis.

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