

# Growing topsoil: the work continues

## Background

Sub soil constraints can limit crop production on many soils on Kangaroo Island. Many of our soils have only a shallow fertile top soil over an infertile sand or clay. Such soils constrain root growth to the top 10-20 cm of soil, limiting the soil volume that roots can explore for water and nutrients. What if there was a simple way to improve the top soil depth to encourage plants to grow deeper root systems? Could we grow the massive crops you seen grown overseas where they measure top soil in feet not inches?

Trial works conducted inter and intra state has shown that the application of organic matter at depth can significantly increase crop production. The increased plant growth is due to an increase in plant available water in the hostile subsoil and the prolonged supply of nutrients. The deep incorporation of a green manure crop/organic matter into the soil profile may be a way to 'grow' more top soil.

With impressive results (50% yield increase) on last year's spader / burial of organic matter at depth trial, a new trial was established this year using a sub soiler machine that 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 sub soils. 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 Sub Soiler machine (see FIGURE 1). 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

The treatments were applied on 16th May and the site was then seeded to wheat and the trial site treated as a normal part of the paddock.

## Results

The site was harvested using the small plot harvester on the 17th December. Sub samples were sent to KIPG for analysis.



**Sub soiler machine**

**TABLE 1. Soil test results pre treatments applied (8th June 2012)**

| Soil depth (cm) | Phosphorus (P) | Potassium (K) | Sulphur (S) | Org C | pH (CaCl <sub>2</sub> ) | ESP |
|-----------------|----------------|---------------|-------------|-------|-------------------------|-----|
| 0-10            | 24             | 146           | 11.6        | 2.75  | 4.2                     | 4   |
| 10-25           | 11             | 98            | 4.4         | 1.35  | 4.6                     | 4   |
| 25-35           | 2              | 156           | 5.4         | 0.63  | 5.3                     | 6.6 |
| 35+             | <2             | 233           | 8.8         | 0.55  | 5.4                     | 7   |

The site had good fertility levels initially with all nutrients decreasing at depth (as expected) except for ESP (sodicity) which increased with depth in the clay layers.

**TABLE 2. Soil test results September 2012**

| Treatment       | Soil depth (cm) | P  | K   | S    | Org C | pH (CaCl <sub>2</sub> ) | ESP |
|-----------------|-----------------|----|-----|------|-------|-------------------------|-----|
| Control         | 0-10            | 26 | 75  | 6.4  | 2.84  | 4.4                     | 2.6 |
|                 | 25-35           | 4  | 189 | 5.3  | 0.73  | 5.5                     | 4.9 |
| BB at depth     | 25-35           | 53 | 176 | 70.1 | 1.04  | 5.8                     | 5.7 |
| BB surface      | 0-10            | 84 | 96  | 20.6 | 3.23  | 4.9                     | 1.4 |
| Gypsum at depth | 25-35           | 5  | 181 | 50.6 | 0.81  | 5.3                     | 5.4 |

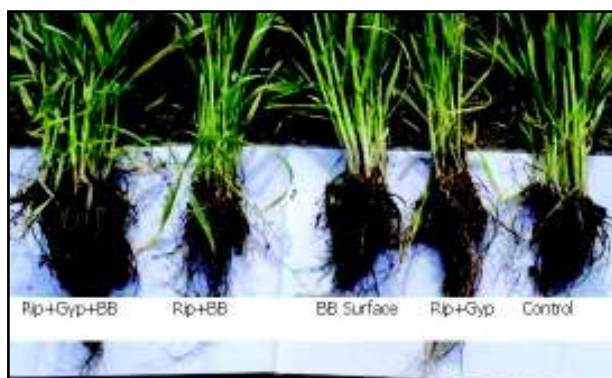
By September the addition of the Bounce Back (BB) on the surface and at depth had increased the phosphorus, sulphur and organic carbon levels. The gypsum had increased the sulphur levels at depth. The site was retested in February but unfortunately results were not available in time for publication, but they will be included in next year's report.

TABLE 3. Harvest yields and protein levels

|                      | t/ha | Protein | % screenings |
|----------------------|------|---------|--------------|
| Control              | 3.84 | 9.8     | 0.65         |
| BB on surface        | 3.92 | 13.2    | 2.8          |
| BB at depth          | 4.12 | 14      | 0.5          |
| Gypsum at depth      | 3.41 | 9.6     | 0.7          |
| Gypsum + BB at depth | 4.00 | 13.7    | 0.7          |
| Deep rip only        | 3.39 | 9.6     | 0.8          |

Whilst the subsoiler treatments did not achieve a 60% yield increase, the best result was a 7% yield increase over control for the BB placed at depth. Work in Victoria indicates that yields will continue to improve over time.

Whilst all applications of BB significantly increased protein levels, it is interesting to note that the application of Neutrog on the surface significantly increased screenings (possibly due the luxuriant crop

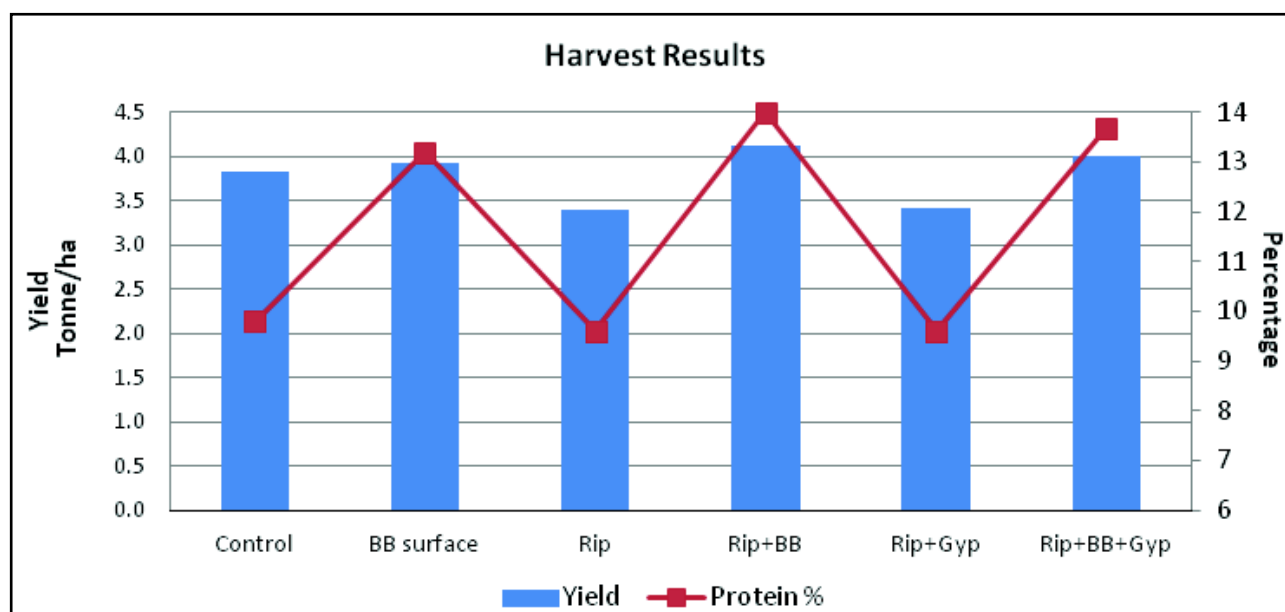


**Plant samples showing root development  
26th July 2012**

growth it produced combined with a short spring) but the BB at depth did not.

Whole plants were collected mid season for root development. The photo above clearly shows the greater root development in the ripped plots.

FIGURE 2: Harvest yields and protein levels



### Take home messages

- Deep placement of organic matter improved root development and increased overall yield and protein levels
- Site needs ongoing monitoring to gauge the long term effectiveness (and profitability) of sub soil manuring
- First commercial machine has now been developed by a farmer in Victoria

### Funding/Sponsors

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

### For further information contact

Lyn Dohle, Rural Solutions SA, Kingscote, on 8553 4999  
or email [lyn.dohle@sa.gov.au](mailto:lyn.dohle@sa.gov.au)