

## Soils & Tillage

### Stubble and nutrient management trial to increase soil carbon

**RESEARCH**

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#### Searching for answers



**Location:**

Minnipa Ag Centre, South 2/8

**Rainfall**

Av. Annual: 325 mm

Av. GSR: 241 mm

2012 Total: 253 mm

2012 GSR: 185 mm

**Yield**

Potential: 1.44 t/ha (Yield prophet)

Actual: 1.14 - 1.37 t/ha

**Paddock History**

2012: Scout wheat

2011: Mace wheat

2010: Axe wheat

2009: Pasture

**Soil Type**

Red sandy loam

**Plot Size**

12 m x 3 m x 4 reps

#### Why do the trial?

This DAFF funded national trial will examine existing, new and alternative strategies for farmers in the wheat/sheep zone to increase soil carbon. The trial will be used as base line data for carbon accumulation in soils and to;

- discuss the various forms of soil organic carbon (plant residues, particulate, humus and recalcitrant)
- investigate how management affects each of these pools and how humus can be increased over the medium to long term
- communicate how soil organic matter affects soil productivity (through nutrient and water supply, and improvements in soils structure).

#### How was it done?

Four wheat stubble samples from 2011 were collected in MAC S2/8 in May across the trial site and dried at 40°C for 24 hours to calculate the stubble load.

Soil samples were collected for soil carbon (0 to 10, 10 to 30 cm), air dried (40°C for 48 hrs) and stored for future processing, and soil samples were also taken for Yield Prophet (0-10, 10-40, 40-70, 70-100 cm) for soil available nitrogen and soil moisture.

In May the stubble management treatments of (i) Stubble left standing, (ii) Stubble worked in with single operation of the seeder using knife points before sowing (18 May), (iii) Stubble raked and burnt (21 May) were imposed.

Nutrient application treatments at seeding were: (i) normal practice for P at sowing and N in crop as per Yield Prophet recommendations; (ii) normal practice PLUS extra nutrients (N, P, S) required to break down the measured wheat stubble which is 5.8 kg N/t of wheat stubble, 2.2 kg P/t of stubble and 0.9 kg S/t of wheat stubble. The treatments were replicated 4 times.

The trial was sown on 30 May with Scout wheat @ 60 kg/ha and base fertiliser of DAP (18:20:0:0) @ 50 kg/ha. The extra nutrient requirement applied (N, P and S) at sowing to break down the stubble load was 19.5 units P, 33.9 units N and 3.8 units S, which was applied as DAP @ 97.5 kg/ha, ammonium sulphate (21:0:0:24) @ 16 kg/ha and urea (46:0:0:0) @ 28.5 kg/ha.

Emergence counts, flowering date and grain yield and grain quality were measured.

#### Key messages

- **The extra nutrition treatment had no effect on yield or grain quality this season.**
- **In the 2012 season the stubble removed treatment had the highest yield.**

**Table 1 Yield (t/ha) and grain quality measurements of stubble and nutrition treatments at MAC, 2012**

Stubble treatment	Nutrition treatment	Yield (t/ha)	Protein (%)	Test weight (g/hL)	1000 Grain weight (gm)	Screenings (%)
Stubble removed	DAP @ 50kg/ha	1.34	11.65	84.32	30.66	4.8
Stubble removed	normal practice PLUS N, P & S	1.35	11.85	83.85	30.48	4.6
Stubble standing	DAP @ 50kg/ha	1.29	11.70	83.84	29.52	4.6
Stubble standing	normal practice PLUS N, P & S	1.24	11.75	83.84	29.28	5.1
Stubble worked	DAP @ 50kg/ha	1.25	11.65	84.15	30.26	5.6
Stubble worked	normal practice PLUS N, P & S	1.24	11.60	83.81	30.41	5.7
LSD ( $P=0.05$ )		0.08	ns	ns	0.54	0.7

### What happened?

The mean stubble load calculated was 4.33 t/ha.

Emergence counts were taken on the 26 June with an average of 95 plants/m<sup>2</sup>. There were no differences between treatments with plant emergence. Due to seasonal conditions, low rainfall and hot weather around 18 September, there were no differences in flowering date (GS 65 (when 50% of heads have anthers)) which occurred between the 18 and 21 September.

The trial was harvested on 6 November. The results are presented in Table 1.

Yield Prophet was used early in the season (30 July) to predict if extra nitrogen fertiliser was required to achieve potential yield. The report showed 200 kg/ha of soil nitrogen was available to the crop so extra nitrogen did not need to be applied

to increase plant growth. The soil moisture profile at this stage of the season was almost at capacity.

### What does this mean?

A decile 3 season, with little spring rainfall resulted in a very tight finish to the season. Flowering time was condensed due to higher temperatures between 18 and 21 September. Soil nitrogen was not a limiting factor in this paddock this season so no extra in-crop nitrogen was applied.

Soil moisture may have been a limiting factor as the treatment with stubble removed had increased yields. In this season the removal of stubble may have allowed better infiltration of rainfall and increased soil moisture available to the plant. The extra nutrient treatment had no effect on grain yield or quality this season.

It is expected that the imposed treatments to increase soil organic

matter will take a few years to become noticeable. The trial will be repeated on the same site for at least the next two years.

### Acknowledgements

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Yield Prophet® is an on-line modeling service based on APSIM that provides simulated crop growth based on individual paddock information and rainfall, and is registered to BCG.



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