Farming Systems Trial 2009

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Take home messages

- *There is no clear difference between till and no-till crop establishment systems for yield at the Farming Systems Trial.*
- *Low protein in some plots indicated nitrogen deficiency in 2009.*
- *Pre-sowing deep soil nitrogen tests indicated low protein but not at the levels expected.*

Background

The BCG Farming Systems Trial continued on a 'maintenance' basis in 2009. The systems were managed as previously but minimal data was collected. This is the first year since the new no-till Fuel Burner and Hungry Sheep systems were established (2006) to have had something like 'average' rainfall and crop yields.

Aim

To compare the yields of crops in southern Mallee farming systems in 2009.

Method

Four farming systems (Fuel Burner, Hungry Sheep, No Till and Reduced Till) were established on the trial site in 1999, along with a Standard Wheat-Pea-Canola-Fallow rotation.

A brief description of each of the four systems is as follows:

- Fuel Burner: mainly cereals, regular use of tilled fallow (1 – 2 of 5 plots) commenced prior to harvest, low intensity livestock mainly for fat lambs, full-disturbance tillage at sowing.
- Hungry Sheep: intensive cropping (mainly cereals) and intensive grazing, winter lambing with stocking rate decided in May and feeding to fill feed gap, sheep trading over summer to take advantage of stubbles and control weeds, early sown cereal/pasture forage for feed (1 of 5 plots), generally full-disturbance tillage at sowing.
- No Till: minimum soil disturbance seeding with knife-points and press wheels on 30cm spacing (has varied prior to 2007), no livestock, initial high use of break crops, now mainly cereals and some chemical fallow (commenced prior to harvest).
- Reduced Till: flexible approach, can use tillage/full disturbance sowing but has mainly been chemical weed control and same seeding system as No Till, mix of cereals, canola and lower-value break crops, some livestock on agistment over summer.

The systems have been managed by farmer champions who have directed crop choice, timing and method of operations, and the use of livestock in the systems.

Originally each plot was 1ha in size, however in 2006 the plots were split to develop new systems: no-till versions of Fuel Burner and Hungry Sheep systems, and added straw (5 t/ha in Feb 2007) and tillage (single pass in summer 2006 or 2007) treatments in No Till and Reduced Till systems. The new plots have been managed with the same crop choice, sowing date, seed and fertiliser inputs, but using establishment and weed management techniques to suit each system.

Location: Jil Jil (20km north north-east of Birchip)

Sowing date: 9 May – 13 May 2009 (11 March for oats in Hungry Sheep)

Seeding equipment: 30.5cm, knife-points press wheels for No Till, Reduced Till and no-till Fuel Burner and Hungry Sheep, Standard peas; 25.4cm full-cut with 10cm seed spread, tyre packers for 'till' Fuel Burner, Hungry Sheep and Standard.

Pre-sowing soil samples were taken on 16 April to a depth of 70cm.

Results

Cereal yields in the trial ranged between 1.2 and 2.3t/ha (Table 1). Canola and pea crops in the Standard rotation produced small grain and were not harvested. Crops with preceding fallows (Standard wheat, and plots 19, 27 and 29) were not especially high yielding. There were some big differences in yield between till and no-till plot halves (Fuel Burner and Hungry Sheep), but no consistent trend for 1 establishment technique to yield higher than the other across all of the plots for a system. Straw treated plot halves had higher yield in plots 27, 19 and 6, but not 24. Standard wheat yields, which should have all been similar, were spread between 1.3 and 1.6t/ha.

Proteins were generally high (13+%) but lower proteins in some plots indicated nitrogen (N) deficiency, particularly the no-till Fuel Burner plots (Table 1). There was also considerable variation in Standard wheat proteins. Screenings were high particularly in some Correll wheat crops, perhaps related to small grain in late tillers after the late September rain event.

Table 1. Yield (Y) and quality (P: protein dry basis %, S: screenings %, R: retention %) of crops grown in the Farming Systems Trial in 2009.

Plt	Crop	No till	Till	Straw
		Fuel Burner		
8	Hindmarsh barley	Y: 1.57t/ha P: 14.2, S: 1.7, R: 86.3	Y: 1.78t/ha P: 14.7, S: 1.6, R: 89.7	
10	Fallow			
18	Correll wheat	Y: 1.43t/ha P: 13.7, S: 2.0	Y: 1.19t/ha P: 14.4, S: 2.2	
21	Hindmarsh barley	Y: 1.63t/ha P: 11.2, S: 2.0, R: 88.1	Y: 1.30t/ha P: 13.8, S: 2.3, R: 91.9	
29	Correll wheat	Y: 1.46t/ha P: 11.3, S: 5.8	Y: 1.68t/ha P: 13.8, S: 6.3	
		Hungry Sheep		
2	Correll wheat	Y: 1.71t/ha P: 15.5, S: 2.8	Y: 1.54t/ha P: 16.6, S: 5.7	
5	Hindmarsh barley	Y: 1.37t/ha P: 15.1, S: 4.1, R: 80.4	Y: 1.48t/ha P: 9.5, S: 4.7, R: 77.6	
13	Correll wheat	Y: 1.56t/ha P: 14.3, S: 7.3	Y: 1.17t/ha P: 14.3, S: 7.9	
26	Correll wheat	Y: 1.46t/ha P: 14.2, S: 3.3	Y: 1.64t/ha P: 13.9, S: 3.3	
32	Oats/sheep			
		No Till		
6	Correll wheat	Y: 1.30t/ha P: 16.0, S: 2.9		Y: 1.43t/ha P: 15.3, S: 3.5
11	Hindmarsh barley	Y: 1.42t/ha P: 16.0, S: 1.8, R: 88.2	Y: 1.51t/ha P: 16.6, S: 5.4, R: 76.5	
16	Fallow			
22	Hindmarsh barley	Y: 1.70t/ha P: 11.2, S: 1.4, R: 92.8	Y: 2.06t/ha P: 13.7, S: 1.5, R: 93.1	
27	Correll wheat	Y: 1.84t/ha P: 12.9, S: 5.1		Y: 2.30t/ha P: 11.3, S: 5.3
		Reduced Till		
3	Hindmarsh barley	Y: 1.89t/ha P: 16.6, S: 1.7, R: 82.8	Y: 1.86t/ha P: 16.6, S: 1.8, R: 83.0	
14	Correll wheat	Y: 1.20t/ha P: 15.1, S: 7.1	Y: 1.19t/ha P: 15.0, S: 10.8	
19	Derrimut wheat	Y: 1.75t/ha P: 16.1, S: 5.4		Y: 1.84t/ha P: 13.3, S: 4.3
24	Gairdner barley	Y: 1.36t/ha P: 13.7, S: 2.9, R: 75.7		Y: 1.37t/ha P: 13.8, S: 4.0, R: 76.2
30	Buloke barley	Y: 1.36t/ha P: 11.4, S: 1.8, R: 93.2	Y: 1.37t/ha P: 12.6, S: 2.5, R: 91.4	
		Standard		
4	Yitpi wheat		Y: 1.47t/ha P: 11.1, S: 5.1	
25	Yitpi wheat		Y: 1.30t/ha P: 14.7, S: 2.4	
31	Yitpi wheat		Y: 1.60t/ha P: 14.3, S: 3.0	

Interpretation

2009 economic data has not been collated for the trial yet, but production results confirm findings from the last three seasons (which have been dry) that the no-till establishment system is not compromising yields with either the Fuel Burner or Hungry Sheep. Without the economic results it is difficult to judge which system would be ahead in 2009.

Note that the result from each plot is unreplicated, and there is some variation between Standard wheat yields this year, which indicates that spatial variation at the site may be important for explaining differences between plot halves. The differences between plot halves are higher than in previous years, which may indicate that the no-till and till treatments are beginning to accumulate differences.

Some of the 2009 crops had relatively low protein, indicating N deficiency in some plots in all systems. Pre-sowing soil N measurements showed that most plots had sufficient N for 1.5t/ha cereal crops (Figure 1). Although there is a general relationship between protein and pre-sowing soil N, it appears that soil measurements are only a rough guide. Only pre-sowing N measurements of 140kg N/ha or more (in theory enough for a 3.5 t/ha crop) were guaranteed of high protein, whereas crops with some of the lowest pre-sowing N measurements had the highest yields.

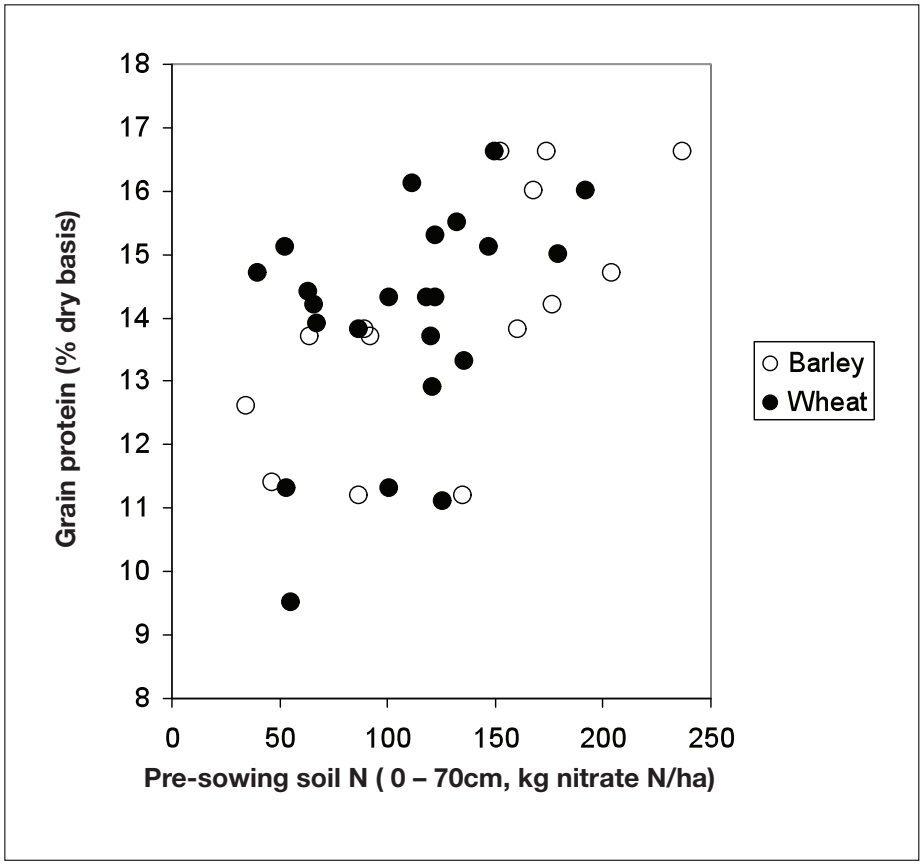

Figure 1. Relationship between grain protein and soil N measured pre-sowing for the Farming Systems Trial wheat and barley crops.

Acknowledgments

This project was funded by the Grains Research and Development Corporation, BCG and Mallee Focus. Soil sampling in 2009 was supported by Mallee CMA through funding from the Australian Government's Caring for our Country program.