Farming Systems Trial 2010

Ben Jones *(BCG/Mallee Focus) and* ***Claire Browne*** *(BCG)*

Take home messages

- *Long chemical fallow plots achieved record yields in 2010.*
- *Rotation was a factor in higher 2010 yields, but the cause of differences is not clear.*
- *Pre-sowing soil nitrate nitrogen was not a good predictor of crop yield potential in 2010.*

Background

The BCG Farming Systems Trial continued on a 'maintenance' basis in 2010, with a much-awaited good rainfall year. The systems were managed normally with a minimal dataset collected.

Aim

To compare the yields of crops in the southern Mallee under various farming systems in 2010.

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. The systems have since been managed by farmer champions, who have directed crop choice, timing and method of operations and the use of livestock in the systems. In 2010, we welcomed a new No-Till champion, when Cameron Warne took over from Allen Postlethwaite.

The plots at the trial site were split in 2006 to develop new systems: No-Till versions of Fuel Burner and Hungry Sheep systems were put in place. Straw (5t/ha in Feb 2007) was added and tillage treatments were implemented 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 knife points as opposed to conventional points and weed management techniques to suit each system.

Location:	Jil Jil (20km NNE Birchip)
Replicates:	1 - 3
Sowing date:	6 May – 18 May 2010 (16-18 March for oats in Hungry Sheep)
Seeding equipment:	30.5cm, knife points + press wheels for No-Till, Reduced Till and No-Till halves of the Fuel Burner and Hungry Sheep, Standard peas; 25.4cm full-cut with 10cm seed spread, tyre packers (Concord) for 'till' halves of the Fuel Burner and Hungry Sheep and Standard.

Results

The year 2010 delivered the highest cereal yields recorded since the trial began (Table 1), in plot 16 (No-Till) (fallow in 2009) and the Standard wheats (fallow in 2009). Canola yields were also the highest recorded. If the trial had been harvested earlier than December 30, yields would have been higher. Unfortunately, rain delayed harvest and occurred too late for pea crops, which may have yielded 1t/ha or more if harvested on time.

Yields were generally higher for the Reduced Till and No-Till cereal plots. Among the lower-yielding plots, yield in plot 22 was limited by volunteer barley (knockdown accidentally omitted at sowing), as was yield in plot 32 by ryegrass

Across the split-plots, the 'Till' treatments generally yielded higher in the Hungry Sheep system compared with the no-till half. The 'No-Till' and 'Till' halves did equally well in the Fuel Burner system. In the No-Till and Reduced Till split plots there was no clear trend for residual effects from 2007 straw treatments or 2006/7 tillage treatments.

Treatment differences also need to be considered against the likely level of error; the three standard wheat plots which should be identical showed up to a 0.85t/ha difference in yield. Spatial and other variations could cause differences as significant as this.

Proteins were generally low, but low protein was not always associated with low yield. Higher screening levels in 2010 were probably related more to grain damage during threshing than to small grain.

Table 1. Yield (Y) and quality (P: protein dry basis %, S: screenings %) of crops grown in the Farming Systems Trial in 2010.

Plt	Crop	No-Till	Till	Straw
Fuel Burner				
8	Wheat (Yitpi)	Y: 2.41t/ha P: 12.4, S: 6.8	Y: 2.78t/ha P: 12.2, S: 6.0	
10	Wheat (Correll)	Y: 3.01t/ha P: 13.2, S: 1.0	Y: 2.56t/ha P: 12.5, S: 6.1	
18	Wheat (Correll)	Y: 2.10t/ha P: 9.6, S: 7.0	Y: 2.47t/ha P: 9.7, S: 4.9	
21	Fallow			
29	Wheat (Correll)	Y: 2.41t/ha P: 10.1, S: 5.3	Y: 2.15t/ha P: 9.0, S: 5.2	
Hungry Sheep				
2	Wheat (Correll)	Y: 2.43t/ha P: 9.9, S: 6.8	Y: 2.76t/ha P: 9.9, S: 5.8	
5	Oats (grazed)			
13	Oats (grazed)			
26	Barley (Hindmarsh)	Y: 2.00t/ha P: 10.0, S: 3.0	Y: 2.38t/ha P: 9.5, S: 2.9	
32	Wheat (Yitpi)	Y: 1.39t/ha P: 10.7, S: 4.5	Y: 1.69t/ha P: 10.3, S: 20.5	

Plt	Crop	No-Till	Till	Straw
No Till				
6	Wheat (Catalina)	Y: 2.69t/ha P: 11.7, S: 2.8		Y: 3.09t/ha P: 11.5, S: 2.1
11	Wheat (Correll)	Y: 2.69t/ha P: 10.8, S: 5.9	Y: 2.77t/ha P: 10.5, S: 3.3	
16	Wheat (Correll)	Y: 4.55t/ha P: 13.1, S: 3.9		Y: 4.62t/ha P: 12.9, S: 2.8
22	Wheat (Correll)	Y: 1.14t/ha P: 10.4, S: 11.8	Y: 1.23t/ha P: 10.7, S: 6.2	
27	Wheat (Catalina)	Y: 2.21t/ha P: 9.1, S: 3.5		Y: 1.96t/ha P: 10.4, S: 6.2
Reduced Till				
3	Wheat (Correll)	Y: 3.71t/ha P: 10.4, S: 3.8	Y: 2.93t/ha P: 10.3, S: 6.8	
14	Barley (Hindmarsh)	Y: 3.48t/ha P: 10.9, S: 4.5	Y: 3.54t/ha P: 11.1, S: 3.4	
19	Barley (Buloke)	Y: 2.58t/ha P: 9.6, S: 2.5		Y: 2.47t/ha P: 9.8, S: 3.4
24	Fallow			
30	Peas (Kaspa)	Not harvested (rain)		
Standard				
7	Wheat (Yitpi)		Y: 4.77t/ha P: 13.5, S: 2.8	
17	Wheat (Yitpi)		Y: 3.91t/ha P: 13.4, S: 4.3	
28	Wheat (Yitpi)		Y: 4.46t/ha P: 13.5, S: 6.9	
9	Canola (44C73)		Y: 1.53t/ha P: , S:	
12	Canola (44C73)		Y: 1.87t/ha P: , S:	
23	Canola (44C73)		Y: 1.58t/ha P: , S:	

Commercial Practice

The results show that yield in wet years is limited in the Fuel Burner and Hungry Sheep systems, compared with No-Till and Reduced Till. A full assessment should include the value of livestock in the Hungry Sheep system, but that had not been collated at the time of writing. Adjustments also need to be made for the late harvest, and the spraying error on plot 22.

There is still little difference between establishment methods for the Fuel Burner system, but Till (conventional full-cut crop establishment) did give better results with the Hungry Sheep

system in 2010. This implies that the difference between the champions' systems is probably related not to establishment technique (till/No-Till) but rather rotation history and possibly fertiliser use.

A phosphorus (P) audit of crops to 2008 showed all systems had a net P balance, with No-Till and Fuel Burner being highest, and Hungry Sheep and Reduced Till lowest, so P (simplistically) is not the explanation. The difference in yield in wet years may relate to nitrogen nutrition and mineralisation.

An occasional theme of these articles (see 2006 Members Manual systems trial article) has been the usefulness of pre-sowing soil tests at the site. In a wet year nitrogen nutrition should have been important, but the highest yielding plots had low soil nitrogen pre-sowing (Figure 1). Little nitrogen was added in fertiliser, suggesting that the difference must have been made up by mineralisation. There was relatively little nitrogen in the 70-100cm soil (average 17 kg N/ha, no more than 30 kg N/ha).

Pre-sowing soil nitrogen tests were not a useful predictor of potential yield at the site in 2010. There was no nitrogen applied in crop during 2010.

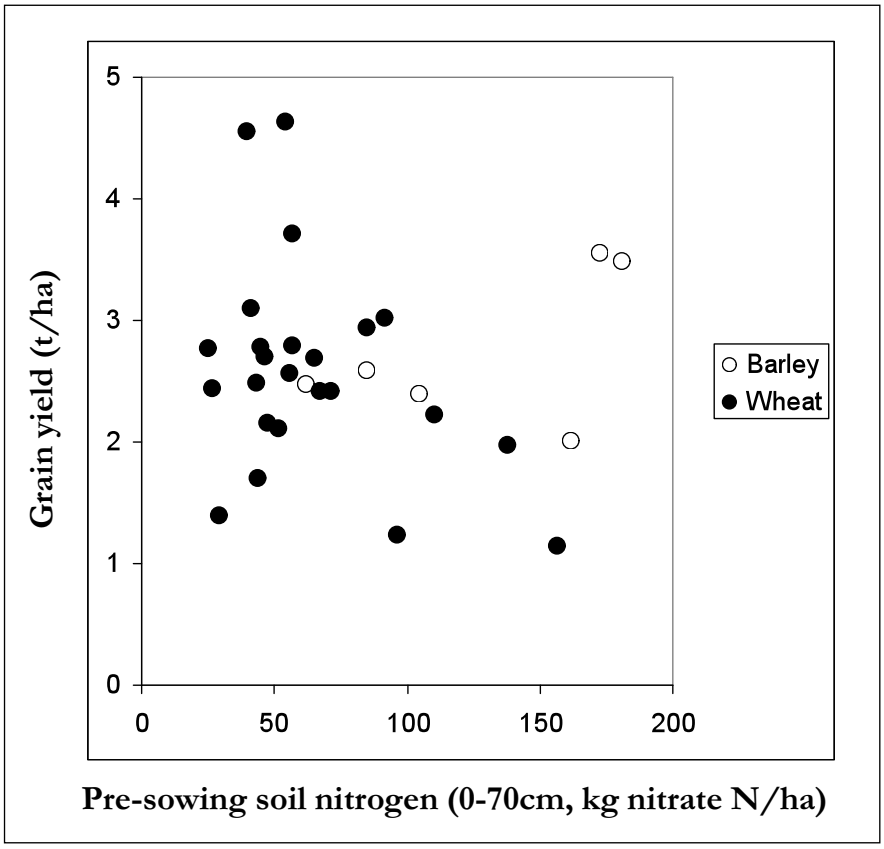

Figure 1. The relationship between pre-sowing soil nitrate, measured 0-70cm, and yield in 2010.

Pre-sowing soil water tests were slightly more useful: higher yields were achieved in plots with higher measured soil water pre-sowing (Figure 2). As observed previously, (2006 Members Manual systems trial article), the 'crop lower limit' for the soils at the systems site is likely to be quite variable. Plots with higher total soil water may not necessarily have had more plant available water (crop lower limit may also have been higher), but the high soil water measurement probably reflects some differences in soil type that were favourable for yield in 2010.

The commercial implication is that farmers and advisers interpreting soil tests on these soils need to be cautious, and pay attention to crop symptoms during the season. None of the crops in the 2010 trial was top-dressed with nitrogen, and where soil tests indicated that they should have been, some may not have needed it. There may also have been some paddocks which, despite testing quite well, were deficient.

Paddocks in the area would need a high number of soil cores taken to get a sample that was representative of the paddock as a whole.

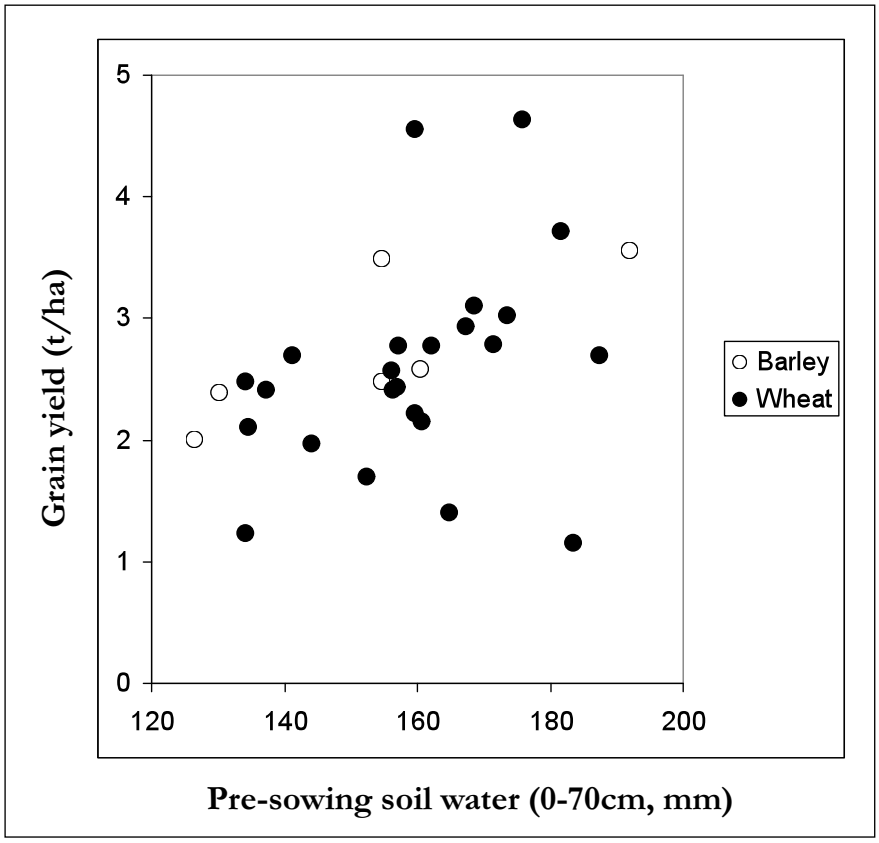

Figure 2. The relationship between pre-sowing (total) soil water, measured 0-70cm, and yield in 2010.

Acknowledgments

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