

Cropping systems

Funded by Caring for Our Country and conducted in collaboration with farmers Michael Jaeschke and Matt Dare, South Australian No Till Association, and Rocky River Ag.

Key findings

- The no-till sowing system had significantly higher grain yields at Hart in 2011.
- Higher fertiliser nutrition significantly increased protein, but not grain yield.
- The strategic treatment produced the most dry matter and shoot nitrogen.
- Mice damage significantly reduced crop emergence in the disc treatment.

Why do the trial?

To compare the performance of 3 seeding systems and 2 nutrition strategies. This is a rotation trial to assess the longer term effects of seeding systems and higher fertiliser input systems.

How was it done?

Plot size	35m x 13m	Fertiliser	DAP @ 100 kg/ha
Seeding date	Disc: 14 th June No-till: 8 th June Strategic: 12 th June	High nutrition	UAN @ 70L/ha and Twin Zinc @ 0.5L/ha 29 th July
		Medium nutrition	No extra fertiliser applied
		Variety	Correll wheat @ 100 kg/ha

This trial is a randomised complete block design with 3 replicates, each containing 3 tillage treatments and 2 nutrition treatments. The strategic treatment was sown using local farmer Michael Jaeschke's seeding equipment. The disc seeding treatments was sown by Andrew Bird from the South Australian No Till Association. The No-till treatment was sown by David Cliff of Rocky River Ag.

Table 1: Previous crops in the long term cropping systems trial at Hart.

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sloop Barley	Canola	Janz Wheat	Yitpi Wheat	SloopSA Barley	Kaspa Peas	Kalka Durum	JNZ Wheat	JNZ Wheat	Flagship barley	Clearfield canola

Tillage treatments:

Disc – sown into standing stubble with Serafin Baldan single discs on 400mm (16") row spacing, closer wheels and press wheels.

Strategic – worked up pre-seeding, sown with 100mm (4") wide points at 175mm (7") row spacing with finger harrows and then prickle chained.

No-till – sown into standing stubble in 1 pass with Flexicoil PD 5700 drill, narrow points with 300mm (12") row spacing and press wheels.

Nutrition treatments:

Medium – No extra fertiliser applied post seeding.

High – UAN applied at 70 L/ha and Twin Zinc at 0.5 L/ha, July 29th.

Soil nitrogen (0-60cm) was measured on 20th May in all plots.

For the plant counts, 4x1m sections of row were counted across each plot.

All plots were assessed for grain yield, grain protein, grain weight and screenings.

All plots were assessed at awn emergence (GS49) for dry matter yield, and tissue analyses conducted to determine total crop nitrogen, zinc content, and phosphorus content.

Results

Tillage treatments significantly influenced the grain yield and quality of Correll wheat in this trial at Hart in 2011 (Table 2). The no-till treatment yielded the highest (2.51 t/ha), followed by the strategic (2.22 t/ha) and disc (1.73 t/ha). However, there may also have been a time of sowing factor involved in these results as the no-till treatment was sown 4-6 days earlier than the other treatments. Row spacings (400mm) in the disc treatment may also have had a negative impact on yield.

There was no significant difference in grain yield between the two nutrition treatments.

The no-till treatment had the lowest grain protein which may reflect an inverse relationship to grain yield. Grain protein was significantly higher (12.7%) in the higher nutrition treatments than the medium treatments (10.2%). This may be explained by higher soil nitrogen (Table 3) and greater crop nitrogen (Table 4) in the high nutrition treatments compared to the medium. Screenings were significantly higher in the disc treatments (1.9 %) compared to the other tillage treatments (1.3 %) but were within industry receiveal standards. Grain weight, although significantly lower (76.3 kg/hL) in the high nutrition treatments than in the medium (78.2 kg/h L) were all within industry receiveal standards (Table 2.)

Table 2. Grain yield (t/ha), protein (%), screenings (%), and test weight (kg/hL) for nutrition and tillage treatments at Hart in 2011.

Nutrition	Tillage	Grain yield (t/ha)	Protein (%)	Screenings (%)	Test Weight (kg/hL)
High	Disc	1.75	12.1	2.0	76.0
	No-till	2.53	12.6	1.5	77.0
	Strategic	2.15	13.4	1.7	76.0
Medium	Disc	1.71	10.6	1.8	77.3
	No-till	2.49	8.9	1.0	79.0
	Strategic	2.30	11.2	1.1	78.4
LSD (0.05)					
	Tillage	0.16	0.62	0.50	1.12
	Nutrition	ns	0.51	0.41	0.92
	Tillage * Nutrition	ns	0.88	ns	ns

Soil available nitrogen to 60cm was measured in autumn and ranged between 52 kg N/ha (disc, medium) and 101 kg N/ha (strategic, high) between the tillage treatments (Table 3). The strategic tillage treatment had significantly higher soil nitrogen. The high nutrition treatments had accumulated 27.8 kg N/ha more soil available nitrogen compared to the medium treatments to a depth of 60cm. These results are consistent with those measured in previous years.

Crop emergence was highly variable with the no-till seeder producing significantly higher plant numbers (210 pl/sqm). The disc treatment produced 104 plants/square metre less than the no-till treatment due to mouse damage (Table 3).

Table 3. Available soil nitrogen (kg/ha), seedling emergence (plants/sq m) and dry matter at awn emergence (t/ha) for nutrition and tillage treatments at Hart in 2011.

Nutrition	Tillage	Available soil nitrogen (kg N/ha)	Emergence (plants per sq m)	Dry matter (t/ha)
High	Disc	65	97	3.8
	No-till	62	207	4.8
	Strategic	101	179	5.4
Medium	Disc	52	114	3.4
	No-till	55	213	3.8
	Strategic	60	152	5.1
LSD (0.05)				
Tillage		ns	22	0.7
Nutrition		21.2	ns	0.5
Tillage * Nutrition		ns	ns	ns

Dry matter produced in the high nutrition treatments (4.7t/ha) was significantly higher compared with the medium nutrition treatments (4.1t/ha). Although crop emergence was lower in the strategic treatment compared with the no-till, by awn emergence the strategic treatment had grown greater biomass.

Total crop nitrogen content was significantly higher (86.5 kg/ha) in the high nutrition treatments compared with the medium nutrition treatments (58.7 kg/ha). Also, significantly higher crop nitrogen was measured in the strategic treatment (93.1 kg N/ha) compared to the no-till (66.8 kg N/ha) or disc treatment (58.0 kg N/ha) (Table 4).

Although the strategic treatment produced significantly more dry matter and accumulated more shoot nitrogen, it did not produce the highest grain yield. However, it did produce significantly higher levels of grain protein (Table 2) resulting from greater levels of soil and crop nitrogen.

The application of foliar zinc on July 29th in the high nutrition treatment produced significantly higher tissue zinc levels (26.6 ppm) compared with the medium nutrition treatments (16.9 ppm) where no zinc was added.

There were no significant differences in phosphorus tissue levels between tillage or nutrition treatments.

Table 4. Total crop nitrogen content (kg/ha) and leaf nutrient content of zinc and phosphorus at awn emergence (GS49) for tillage and nutrition treatments at Hart in 2011.

Nutrition	Tillage	Total Crop nitrogen (kg N/ha)	Tissue test GS49	
			Zinc (ppm)	Phosphorus (%)
High	Disc	66.2	24.1	0.19
	No-till	84.3	26.9	0.22
	Strategic	109.0	29.0	0.22
Medium	Disc	49.7	15.2	0.21
	No-till	49.3	19.4	0.23
	Strategic	77.2	16.2	0.22
LSD (0.05)				
Tillage		16.9	ns	ns
Nutrition		13.8	6.4	ns
Tillage * Nutrition		ns	ns	ns

