

Long term comparison of seeding systems

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Key findings

- Below average rainfall resulted in wheat grain yields of 0.9 to 1.3 t/ha.
- There were small differences among seeder types in grain yield but, no effect of historic nitrogen application.
- Available soil nitrogen pre-seeding ranged from 95 to 151 kg N/ha following field pea grown in a marginal year. The high nutrition treatment had accumulated 40 kg N/ha more soil available nitrogen compared to the medium nutrition treatment.

Why do the trial?

The Hart cropping systems trial is unique, running since 2000, it provides SA grain growers with information on the long-term effects of cropping systems (a combination of seeders, tillage and stubble management) and nitrogen (N) fertiliser regime. There continues to be industry interest in disc seeders due to their ability to retain heavy stubble, minimise soil disturbance, increased seeding speed and seed depth uniformity. To date the trial has shown no one cropping system or nutrition regime is consistently higher in grain yield, quality or gross margin.

The trial aims to compare the performance of three seeding systems and two N strategies. This is a rotation trial (Figure 1) to assess the long-term effects of seeding systems and higher fertiliser input systems on soil fertility, crop growth, grain yield and grain quality.

How was it done?

Plot size	45 m x 13 m	Fertiliser	MAP (10:22) at seeding @ 50 kg/ha
Seeding date	May 30 – No-till May 31 – Strategic June 4 – Disc	Medium nutrition	Urea (46:0) @ 50 kg/ha on Aug 6
Variety	Sheriff CL Plus Wheat @ 100 kg/ha	High nutrition	Urea (46:0) @ 50 kg/ha on Aug 6 Easy N (42.5:0) @ 70 L/ha + Twin Zn @ 0.5 L/ha on Sept 5

The trial was a randomised complete block design with three replicates, containing three tillage/seeding treatments and two N treatments. Stubble was uniformly managed across the trial area (previously a stripper front was used for the disc seeder) as the crop was field pea in 2018.

The disc, strategic and no-till treatments were sown using local growers Tom Robinson, Michael Jaeschke and Matt Dare's seeding equipment, respectively.

2000	2001	2002	2003	2004	2005	2006	2007
Sloop barley	ATR-Hyden canola TT	Janz wheat	Yitpi wheat	Sloop barley	Kaspa peas	Kalka durum	Janz wheat

2008	2009	2010	2011	2012	2013	2014	2015
Janz wheat	Flagship barley	Clearfield canola	Correll wheat	Gunyah peas	Cobra wheat	Commander barley	44Y89 (CL) canola

2016	2017	2018	2019
Scepter wheat	Scepter wheat	Wharton field pea	Sheriff CL wheat

Figure 1. Crop history of the long-term cropping systems trial at Hart 2000 – 2019.

Seeding treatments:

Disc – sown into standing stripper front stubble with John Deere 1890 single discs at 152 mm (6”) row spacing, closer wheels and press wheels.

Strategic – worked up pre-seeding, sown with 100 mm (4”) wide points at 200 mm (8”) row spacing with finger harrows.

No-till – sown into standing stubble in one pass with a Flexicoil 5000 drill, 16 mm knife points with 254 mm (9”) row spacing and press wheels.

Nutrition treatments:

Medium – starter fertiliser plus one in-season N application (refer to previous page)

High – starter fertiliser plus two in-season N applications and Zn (refer to previous page)

All plots were assessed for soil available N (0-20, 20-40, 40-60 and 60-80 cm) on May 25, 2019. Plant establishment was assessed by counting 4 x 1 m sections of row and NDVI in each plot on August 2. All plots were assessed for grain yield at harvest (November 27). All data was analysed using ANOVA in Genstat.

Results and discussion

Soil available N was measured in autumn (post field-pea) and ranged between 95 kg N/ha to 151 kg N/ha (Figure 2). The high nutrition treatment had accumulated 39 kg N/ha more, averaging 149 kg N/ha for the high and 110 kg N/ha for the medium treatment. The difference indicates field pea fixed more N in the high treatment compared to the medium even in the dry 2018.

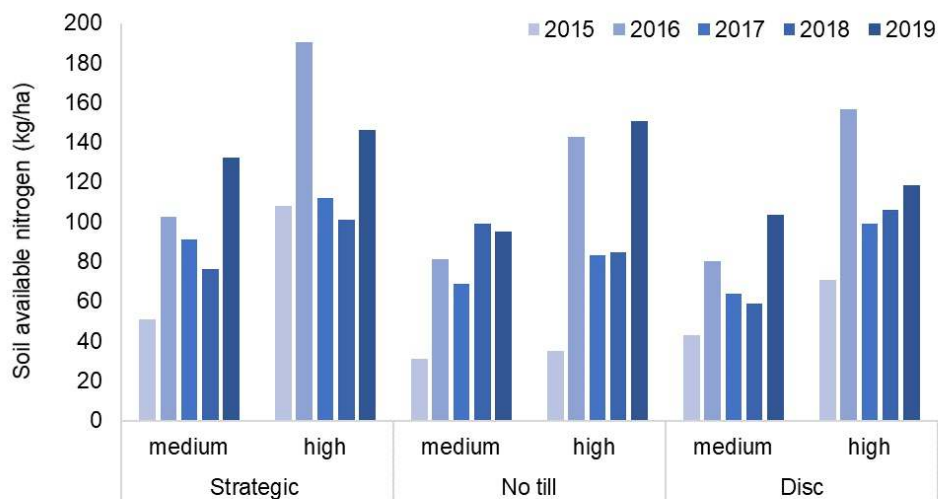


Figure 2. Soil available nitrogen (kg N/ha) pre-seeding for Hart long-term seeding systems trial from 2015 – 2019.

There was no difference in wheat plant establishment across the three seeders (data not shown). On average plant establishment was 172 plant/m² disc, 166 plants/m² for the strategic and 159 plants/m² for the no-till seeder.

Wheat grain yields across the trial ranged from 0.9 to 1.3 t/ha (Table 1). The dry season combined with later seeding dates (late May - early June) resulted in below average yields. The disc and strategic treatment provided the highest yields at 1.3 and 1.2 t/ha, respectively. However, there was only 0.4 t/ha differences across all treatments.

One of the main outcomes from this trial has been the lack of consistent performance in terms of grain yield from any one particular seeding system over the last 20 years. In the last five seasons (Table 1), four years have shown differences in grain yield among the seeding systems. In seasons where yield differences were observed, generally the no-till and disc alone or together outperformed the strategic treatment.

Grain quality values for screenings and test weight were not affected by seeding system or nutrition treatment (data not shown). The trial average screening level was less than 4% and test weight averaged 74 kg/hL. This lack of difference in grain quality among the seeder and nutrition treatments is consistent across the history of the trial.

Grain protein levels were high as a result of carry-over soil available N pre-seeding (Figure 2) and the accumulation of 39 kg N/ha more under the high nutrition treatment. It is not surprising that this translated to protein differences between the medium 12.8% (H2 classification) and high 14.1% (H1 classification) nutrition treatments.

Table 1. Grain yield (t/ha) for all seeder and nutrition treatments for the past five seasons.

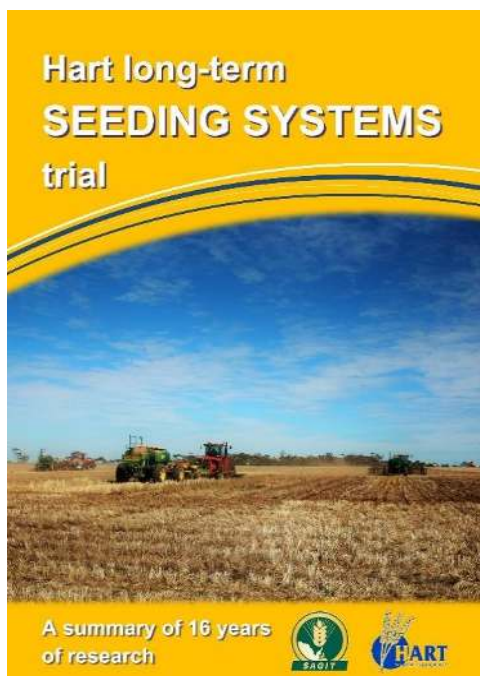
Seeder type	Fertiliser strategy	2015	2016	2017	2018	2019	Protein (%)
		Canola	Wheat	Wheat	Field pea	Wheat	
		Yield (t/ha)					
Strategic	Medium	0.6	4.8	4.8	0.8	1.3	12.3
	High	0.6	5.9	5.9	0.7	1.2	14.9
No Till	Medium	0.6	4.2	4.2	0.9	0.9	13.7
	High	0.5	5.8	5.8	1.0	1.1	13.5
Disc	Medium	0.5	5.0	5.0	0.7	1.3	12.6
	High	0.5	5.9	5.9	0.7	1.3	13.8
LSD nutrition (P≤0.05)		ns			ns	ns	1.2
LSD seeder (P≤0.05)		ns			0.2	0.1	ns
LSD seeder x nutrition (P≤0.05)		ns	0.3	0.3	ns	ns	ns

Read the full summary of 16 years of results at:

<http://www.hartfieldsite.org.au/pages/trials-results/hart-long-term-seeding-systems-trial.php>

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