

Long term comparison of seeding systems

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Key findings

- Below average rainfall resulted in field pea grain yields of 0.7 to 1.0 t/ha.
- There were small differences among seeder types in grain yields but no effect of historic nitrogen application.
- Available soil nitrogen pre-seeding was similar across all treatments after high yields and good protein levels in the previous season and low summer rainfall for mineralisation.

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 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 nitrogen (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 and grain yield and quality.

How was it done?

Plot size	35 m x 13 m	Fertiliser	DAP (18:20) at seeding @ 75 kg/ha
Seeding date	1 st June – No-till 6 th June – Disc 14 th June – Strategic	Medium nutrition	No extra fertiliser applied
		High nutrition	No extra fertiliser applied
Variety	PBA Wharton field pea @ 100 kg/ha		

The trial was a randomised complete block design with three replicates, containing three tillage/seeding treatments and two N treatments. In addition to this in 2017 all disc treatments were harvested using a stripper front (average stubble height 65 cm). Both the no-till and strategic stubble height were harvested at 24 cm stubble height.

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					
Scepter wheat	Scepter wheat	Wharton field pea					

Figure 1. Crop history of the long-term cropping systems trial at Hart 2000 – 2018.

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 – no additional fertiliser applied this season.

High – no additional fertiliser applied this season.

All plots were assessed for soil available N (0-20, 20-40, 40-60 and 60-80 cm) on the 16th of April. Plant establishment was assessed by counting 4 x 1 m sections of row across each plot on 9th of July. All plots were assessed for grain yield at harvest (23rd November). All data was analysed using ANOVA in Genstat with seeding date as a covariate.

Results and discussion

Soil available N was measured in autumn and ranged between 59 kg N/ha to 106 kg N/ha (Figure 2). The high nutrition treatment had not accumulated more N as in previous seasons, averaging 97 kg N/ha for the high and 78 kg N/ha for the medium treatment. The lack of difference can be explained by high wheat protein levels (6.7% protein in medium versus 10.8% protein in the high) in the high nutrition treatment in 2017 extracting more N from soil reserves. Low summer rainfall would have also reduced soil nitrogen mineralisation and contributed to reduced soil available N pre-seeding.

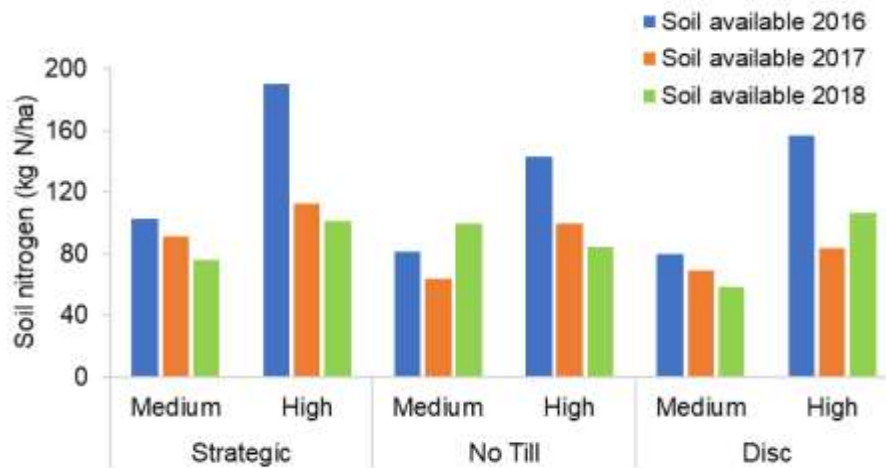


Figure 2. Soil available nitrogen (kg N/ha) pre-seeding for Hart long-term seeding systems trial from 2016 – 2018.

There were significant differences in plant establishment among the seeders. In general, the no-till treatment had the highest plant establishment at 14 plants/m² compared to disc and strategic however, they were only reduced by 5 and 3 plants/m², respectively (data not shown). The images below capture these differences, with more uniform plant establishment in the no-till compared to the strategic (prickle chained post seeding) and disc treatments (tall stripper front stubble).



Figure 3. (Left to right) PBA Wharton field pea sown in the strategic, no-till and disc treatment taken on 27th August, 2018.

Field pea grains yields were low across the trial, ranging from 0.7 to 1.0 t/ha (Table 1). The dry season combined with later seeding dates (early-mid June) resulted in below average yields. The no-till treatment provided the highest yield at 0.9 t/ha however, there was only 0.3 t/ha differences across all treatments.

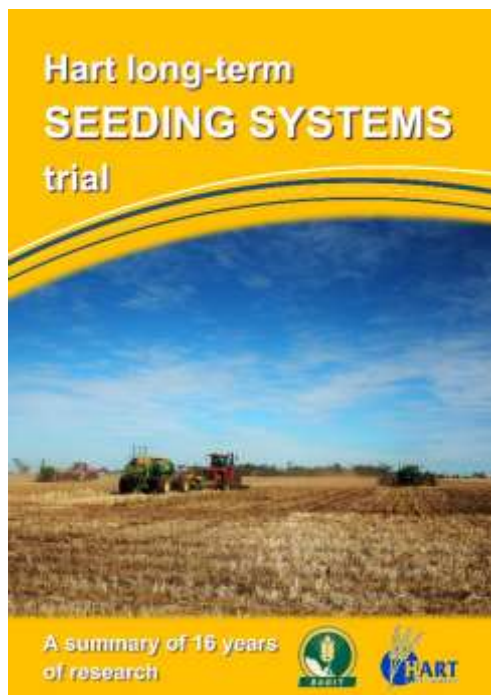
One of the main outcomes from this trial has been the lack of consistent performance in terms of grain yield from any one particular seeding system over the last 19 years. In the last five seasons (Table 1), four years have shown differences in grain yield among the seeding systems. In seasons where yield differences were observed, the no-till and disc alone or together outperformed the strategic treatment.

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

Seeder type	Fertiliser strategy	2014	2015	2016	2017	2018
		Barley	Canola	Wheat	Wheat	Field pea
		grain yield t/ha				
Strategic	Medium	4.4	0.6	4.8	4.8	0.8
	High	3.9	0.6	5.9	5.9	0.7
No Till	Medium	4.7	0.6	4.2	4.2	0.9
	High	4.0	0.5	5.8	5.8	1.0
Disc	Medium	4.5	0.5	5.0	5.0	0.7
	High	4.0	0.5	5.9	5.9	0.7
LSD nutrition (P≤0.05)		ns	ns			ns
LSD seeder (P≤0.05)		0.2	ns			0.2
LSD seeder x nutrition (P≤0.05)		ns	ns	0.3	0.3	ns

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