

# Long term cropping systems trial

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## Key findings

- There was no significant difference between seeding systems or level of nutrition on grain yield or oil content.
- Soil available N was the same for all seeding systems pre-seeding however, the no till treat had released more available soil N.
- In-season more available N was measured in the high nutrition treatment compared to the medium.

## Why do the trial?

To compare the performance of three seeding systems and two nitrogen strategies. This is a rotation trial to assess the longer term effects of seeding systems and higher fertiliser input systems on soil fertility, crop growth and grain yield and quality.

## How was it done?

|                     |                             |                         |   |
|---------------------|-----------------------------|-------------------------|---|
| <b>Plot size</b>    | 35 m x 13 m                 | <b>Fertiliser</b>       | DAP/Urea (22:14:00:05) + 0.8% Zn at seeding @ 100 kg/ha                           |
| <b>Seeding date</b> | 3 <sup>rd</sup> June 2015   | <b>Medium nutrition</b> | UAN (42:0) @ 87 L/ha on 11 <sup>th</sup> Aug                                      |
| <b>Variety</b>      | 44Y89 (CL) canola @ 5 kg/ha | <b>High nutrition</b>   | UAN (42:0) @ 87 L/ha on 11 <sup>th</sup> Aug and 87 L/ha on 16 <sup>th</sup> Sept |

The trial was a randomised complete block design with three replicates, containing three tillage/seeding treatments and two nitrogen (N) treatments. In addition to this in 2014 all disc treatments were harvested using a stripper front. Both the no-till and strategic stubble height were harvested at 15 cm (Figure 2). The disc, strategic and no-till treatments were sown using local growers Tom Robinson, Michael Jaeschke and Matt Dare's seeding equipment, respectively.

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

|              |                 |                   |               |              |             |                  |                   |
|--------------|-----------------|-------------------|---------------|--------------|-------------|------------------|-------------------|
| 2000         | 2001            | 2002              | 2003          | 2004         | 2005        | 2006             | 2007              |
| Sloop barley | Canola          | Janz wheat        | Yitpi wheat   | Sloop barley | Kaspa peas  | Kalka durum      | JNZ wheat         |
| 2008         | 2009            | 2010              | 2011          | 2012         | 2013        | 2014             | 2015              |
| JNZ wheat    | Flagship barley | Clearfield canola | Correll wheat | Gunyah peas  | Cobra wheat | Commander barley | 44Y89 (CL) canola |

### Seeding treatments:

Disc – sown into standing stripper front stubble with John Deere 1980 single disc 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 (district practice).

High – starter fertiliser plus two in-season N applications.

All plots were assessed for soil available N (0-20, 20-40, 40-60 and 60-80 cm) on the 15<sup>th</sup> of April. Plant establishment was assessed by counting 4 x 1 m sections of row across each plot on 26<sup>th</sup> of June (crop growth stage cotyledon). In season soil N was assessed on 19<sup>th</sup> of August (crop growth stage bud visible-first flowers). All plots were assessed for grain yield and oil content at harvest (16<sup>th</sup> November).

### Results and discussion

Soil available N to a depth of 80 cm was measured in autumn and ranged between 33 kg N/ha (no-till) and 80 kg N/ha (strategic). The high nutrition treatment had not accumulated more available N compared to the medium treatment.

Pre-seeding the no-till treatment had mineralised more available N, while in season there was no difference between seeding systems. At the time of sampling all plots had received 60 kg N/ha (that is, high N rate had not been applied). The average difference between the two nutrition rates was 43 kg N/ha. This increase in available N can be attributed to the long-term addition of higher N levels in these plots, building up organic N levels and mineralising more available N in-season.

*Table 1. Available soil nitrogen (kg/ha) pre-seeding and in season and plant emergence (plants/m<sup>2</sup>) for seeding treatments in 2015.*

| Seeding system     | Nutrition | Available soil N |             | Emergence<br>plants/m <sup>2</sup> |
|--------------------|-----------|------------------|-------------|------------------------------------|
|                    |           | 15th April       | 19th August |                                    |
|                    |           | kg N/ha          |             |                                    |
| Strategic          | Medium    | 51               | 130         | 56                                 |
|                    | High      | 108              | 208         | 70                                 |
| Disc               | Medium    | 43               | 130         | 57                                 |
|                    | High      | 71               | 169         | 68                                 |
| No-till            | Medium    | 31               | 157         | 78                                 |
|                    | High      | 35               | 169         | 83                                 |
| LSD (P≤0.05)       |           |                  |             |                                    |
| Tillage            |           | 35               | ns          | 22                                 |
| Nutrition          |           | ns               | 30          | ns                                 |
| Seeder x Nutrition |           | ns               | ns          | ns                                 |

Crop emergence was highest for the strategic and disc seeding systems 84 and 71 plants per square metre, respectively (Figure 2). The no-till treatment had the lowest crop establishment with 51 plants per square metre.



Figure 2. (L-R) 44Y89 (CL) canola sown with a disc seeder into stripper front stubble, no-till treatment and strategic tillage treatment taken on 18<sup>th</sup> August, 2015.

Seeding treatment did not affect the grain yield of 44Y89 canola, averaging 0.55 t/ha (Table 2.). The canola yields were not reflective of the district given the late sowing date to coincide all seeding equipment. Similarly, there was no difference in oil content, averaging 35.8% across the trial.

Table 2. Grain yield (t/ha) and oil content (%) for nutrition and seeding treatments in 2015. There was no significant interaction ( $P \leq 0.05$ ) between seeding system and nutrition.

| Seeding system        | Nutrition | Yield<br>t/ha | Oil content<br>% |
|-----------------------|-----------|---------------|------------------|
| Strategic             | Medium    | 0.56          | 35.6             |
|                       | High      | 0.61          | 35.1             |
| Disc                  | Medium    | 0.53          | 36.2             |
|                       | High      | 0.54          | 35.6             |
| No-till               | Medium    | 0.55          | 36.4             |
|                       | High      | 0.51          | 35.7             |
| LSD ( $P \leq 0.05$ ) |           |               |                  |
| Seeder x Nutrition    |           | ns            | ns               |

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