Multiple Benefits from Inter-row Sowing with 2cm RTK GPS

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INTRODUCTION

The advent of affordable 2cm autosteer for broadacre farmers is an exciting development in Australian agriculture. It allows farmers to sow crops with a high level of precision never thought possible before GPS. Inter row sowing is rapidly being adopted by no till farmers across Australia. Inter row sowing refers to the sowing of crops precisely (-/+2cm) between the previous years crop rows. Over the last 4 years a number of research trials and farmers have discovered a number of agronomic benefits associated with inter row sowing. This paper highlights these benefits.

METHODS

Replicated experiments were established in wheat stubble that ranged in biomass from 2 to 6 t/ha. The wheat-on-wheat data presented in this paper refers to inter row and in row sowing of crops into standing stubble from the previous year. The lentil, herbicide efficacy and canola trial data also included a slashed stubble treatment. Most of the data is from trials in SA, with one trial included from NSW (DPI project). Row spacings ranged from 225 to 300 mm.

RESULTS AND DISCUSSION

Yield Increases for wheat-on-wheat

Yield increases for wheat-on-wheat sowing into standing stubble were measured on 5 out of 7 sites over 3 years (Table 1). In 3 of the sites less soil-borne disease on the inter row was a significant factor in increasing yields. Better plant establishment and possibly an improved micro-climate for wheat in standing stubble also contributed to a yield improvement for inter row wheat in standing stubble.

Table 1. Wheat-on-wheat yields in inter row sowing experiments 2004 to 2006

Site	Sowing row	Yield t/ha	Yield difference	Disease effect
Sandilands SA 2004	Inter row	4.11	0.23	Take-all
	In row	3.88		
Tammworth NSW 2004	Inter row	2.51	0.21	Crown rot
	In row	2.30		
Sandilands SA 2005	Inter row	3.74	0.32	CCN and Take-all
	In row	3.42		
Hart SA 2005	Inter row	2.99	0.22	None
	In row	2.77		
Buckleboo SA 2005	Inter row	2.82	0.03*	None
	In row	2.79		
Kimba SA 2006	Inter row	0.26	0.09	None
	In row	0.17		
Waikerie SA 2006	Inter row	0.83	0.13*	None
	In row	0.70		
Average all sites	**Inter row**	**2.47**	**0.21**	
	In row	**2.29**		

* not significant

Farmers adopting inter row sowing are finding the establishment of crops in paddocks with medium to high stubble loads (3 to 10t/ha) are significantly improved with inter row sowing. Inter row sowing virtually eliminates the need to use other machinery for stubble management e.g. off-set discs, prickle chains, slashers and rollers to break stubble down.

Yield increases for canola in wheat stubble

Two experiments in 2006 were established to investigate the benefits of inter row sowing canola into standing wheat stubble. At Sandilands, although not significant, visually the standing and burnt stubble treatments had more even and higher establishment than the slashed treatments. Yields of canola in standing stubble were significantly higher than slashed stubble at Sandilands (Table 2). At Karkoo, inter row canola into standing stubble had both higher establishment and yield than the on row treatment (Table 3).

Table 2. Canola at Sandilands 2006

Stubble treatment	Plant # per m2	Yield t/ha
Burnt	68	0.45
Slashed	47	0.32
Standing	70	0.59
l.s.d	n.s.	0.22

Table 3. Canola at Karkoo 2006

Stubble treatment	Plant # per m2	Yield t/ha
On row	36	0.27
Inter row	47	0.35
l.s.d	10	0.06

Farmers inter row sowing canola into cereal stubbles are also observing improved establishment, early vigour and yield.

Improved herbicide efficacy in stubble retained systems

In 2006, an experiment was established to test the efficacy of Treflan, Dual and Avadex on ryegrass in 3 stubble systems (Burnt, Slashed and Standing). Ryegrass control in standing stubble was significantly better than slashed stubble with all three products used (Table 4). Stubble loads in this trial were 6 t/ha. In the standing treatment, 3 t/ha was actually standing and 3 t/ha was lying on the surface, and in the slashed treatment 6 t/ha was lying on the surface. In 2005 the same trial was established on a site with only 2 t/ha of stubble, and no difference in herbicide products was observed.

Therefore, with stubble loads above 2-3 t/ha we expect better herbicide efficacy when stubble is left standing.

Table 4. Ryegrass control at Sandilands 2006

Stubble treatment	% ryegrass control		
	Treflan	Dual	Avadex
Burnt	89.3	66.7	38.3
Slashed	29.3	37.3	16.3
Standing	84.3	78.3	51.7
l.s.d	17.3	35.3	20.2

In stubble retained no-till systems, the efficacy of soil applied herbicides (Dual, Diuron, Treflan, Avadex etc) on ryegrass is very important given the heavy reliance on these herbicides. Inter row sowing allows no-till farmers to keep stubble standing.

Harvestability benefits for inter row lentils

From trial data, there appears to be significant potential advantages in the harvestability of inter row lentils sown into standing stubble (Table 5). Lentils plants sown into standing stubble were taller by 6-8 cm and the height of the first pods was also greater by 4-5 cm compared to burnt and slashed stubble. Increasing the height to where the first pods develop and by the lentils using the stubble to "lean on" at harvest time will prevent less lentils lying over onto the ground. This can result in less harvest losses by physically being able to pick up more lentils with the harvester front, and also increase harvest speeds by having the harvester front higher from the soil surface. Indeed, farmers are finding they can reduce harvest losses by 0.4 t/ha and one farmer doubled his harvest speed in an on-farm trial of inter row vs. in row lentils.

Table 5. Lentils at Sandilands 2006

Stubble treatment	Plant ht. cm	Ht. to 1st pod cm	Yield t/ha
Burnt	23.8	14.6	0.58
Slashed	25.7	16.1	0.65
Standing	31.4	20.2	0.58
l.s.d	3.3	1.1	n.s.

What GPS accuracy do you need?

If you are serious about inter row sowing, a ±2 cm RTK system with your own base station is the way to go. This is because repeatable accuracy enables your sowing rig to come within ±2 cm of your sowing rows from the previous year and be able to hold a straight line down the length of the field. Sub-metre autosteer (±10-20 cm) does not have this level of repeatable accuracy, but you can re-set your A:B line by eye and attempt to inter row sow the following year. However, this will not be as successful as a ±2 cm system. Also, owners with sub-metre systems will allow for some overlap to compensate for the lower level of accuracy in the system. This results in an uneven row configuration across the field. From farmer experience, an estimated success rate for inter row sowing with various systems is as follows,

Up to 90% for ±2 cm RTK system with your own base station (Fig. 5)
Up to 70% for sub-metre autosteer (±10-20 cm)
Up to 50% by eye using permanent wheel tracks

Some rules to follow for inter row sowing

The base station must remain at the same location for a particular paddock year-in year-out.
Your auto-steer must have the ability to store and recall an A:B line for a particular paddock.
Your auto-steer must have a 'nudge' feature in order to move the required distance to go inter row e.g. nudge over 5" in year 2 if you are on 10" spacings
You must keep the same row spacing year-in year-out
It is preferable to sow in the same direction each year for each run because sowing rigs will crab, but hopefully crab in the same pattern as the previous year.

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