Maintaining profitability in retained stubble systems on upper Eyre Peninsula

A joint EPARF and GRDC funded project.

Guideline 13: Economic analysis of reduced row spacing

Background

In all the data reviewed over many trials there was a consistent 8% yield increase to reducing row spacing from 30–36 cm down to 18 cm (Scott et al. 2013)[1].

The largest cost in closer (narrower) row spacing systems is a lower harvest cut required to achieve good stubble flow. Cutting low at harvest affects header capacity and increases fuel consumption. These effects have been measured in the high rainfall >3 t/ha environment but not in the low to medium rainfall environment where average yields are 2 t/ha or less. There has been a move to larger more modern headers in recent years. These headers are capable of harvesting an average crop (2 t/ha) at low harvest height with little or no effect on header capacity. It is only in the above average (decile 7) and well above average seasons (decile 9) that header capacity and higher fuel usage becomes an issue.

Recent work by Breust (2014)[2] in a 3 t/ha wheat crop, showed that to reduce harvest height from 30 cm to 15 cm cost an additional $10.68/ha due to a 20% reduction in harvest speed (using a contractor rate of $400/hour). For this analysis, based on an additional 2.67 hours to harvest 100 ha using an updated contractor cost at $500/hour, this equates to an additional $13.35/ha. These figures represent the yields in a decile 7 year where yields at Minnipa are around 3 t/ha. In a decile 9 year, projected yields are closer to 4 t/ha which would reduce harvest speed by 33.3%, which equates to an additional 3.56 hours at $500/hour (for 100 ha) or $17.80/ha.

Economic analysis

The analysis was based on a whole farm gross margin ($/ha) on a pea/canola/wheat/wheat/wheat program with the additional harvest costings on the wheat years only (main concern for stubble handling).

Key messages

- Using a narrow row spacing of 18 cm instead of 30 cm resulted in wheat yield at Minnipa increasing from 3.0 t/ha to 3.6 t/ha (19% increase) in 2016. A similar result occurred in 2015 with a 0.5 t/ha increase.
- A review of other trials around Australia over a number of seasons gave an average yield increase of 8% when comparing 18 cm rows to 36 cm rows. The exception to this was yields under 0.7 t/ha where there was a small decrease (4%) in yield by narrowing to 18 cm rows.
- 18 cm row spacing had 42% lower grass weed dry matter than 30 cm row spacing.
- There is an economic advantage from moving to closer row spacing based on an 8% yield increase (average increase in all trials).

The yields are based on a farm at Minnipa comprising predominately loam to clay loam soil. Yields were increased by 8% in the decile 3 (below average), decile 5 (average), decile 7 (above average) and decile 9 (well above average) years due to the reduction of row spacing to 18 cm. In a decile 1 year (well below average) the yield was reduced by 4% for reducing row spacing to 18 cm.

Additional costs were based on an increase in contractor use at $13.35/ha in a decile 7 year and $17.80/ha in a decile 9 year. In decile 1 to decile 5 years (2 t/ha), header capacity was assumed not to be affected by stubble load. Additional costs of extra tines on a bar and extra fuel required to pull the extra tines were also included.

What happened?

Besides a small additional loss in the decile 1 year of $9/ha compared to the wider row spacing, all other deciles show the profit increasing even with contractor costs included in the decile 7 and decile 9 years (Table 1). In practical terms, in the decile 7 year the contractor would harvest 20% of the wheat and in a decile 9 year 33.3% of the wheat. This would allow harvest to finish at a similar time whether cutting high (own machine only) or low (using a contractor in decile 7 and decile 9 years).

Table 1. Whole farm gross margin ($/ha) for a range of rainfall deciles and two row spacings.

Decile	Row spacing	
	30 cm	**18 cm**
1	-46	-55
3	74	82
5	204	219
7	363	388
9	500	532

Additional benefits of harvesting low that have not been included in the costs are:

1. 42% lower grass weed dry matter in the 18 cm rows compared with 30 cm rows.
2. Weed seed capture at harvest; whether using chaff rows, windrow burning or chaff carts will always be greater with low harvest height.

What does it mean?

The practicality of getting a contract harvester in decile 7 and decile 9 years can be debated, but financially closer row spacing coupled with low harvest height is a viable option in the low to medium rainfall environment.

The effect on weed seed reduction is well documented in trials around Australia, with a long term trial at Merriden (WA) by Glen Riethmuller[3] showing some clear advantages to closer row spacing. In that trial all plots were treated with full rates of herbicide yet annual ryegrass remained a problem in wider rows, while there was a 98% reduction in ryegrass seed heads in 2013 in the narrow row plots.

Practical solutions for handling stubbles in above average years is the answer to allowing closer row spacing. These could include using a contract harvester, owning a cheaper second header, managing stubbles post-harvest or changing the type of seeding bar.

Produced by Ed Hunt, February 2018

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References

1. Scott BJ et al. (2013). Developments in stubble retention in cropping systems in southern Australia. Report to GRDC on Project DAN 00170. (Ed. C Nicholls and EC (Ted) Wolfe). Department of Primary Industries, Orange NSW pp 103. Available at: www.grahamcentre.net
2. Breust 2014, Header efficiency increases with harvest height, https://grdc.com.au/resources-and-publications/groundcover/ground-cover-issue-118-sep-oct-2015/header-efficiency-increases-with-harvest-height
3. Glen Riethmuller 2017, Eleven years of narrow row spacing, https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2017/02/eleven-years-of-narrow-row-spacing

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