

Stubble Management Guidelines



Inter-row sowing

Key facts

- » Effective inter-row sowing can boost crop yields through reduced disease, improved plant establishment, more effective weed control and a better microclimate for seedlings in standing stubble.
- » Growers employing inter-row sowing have identified improved stubble handling as a key benefit of the approach.
- » For optimal results, repeatable accuracy and a straight line the length of the field is important.
- » Trackability of the implement is the greatest challenge for inter-row sowing. Careful consideration of machinery set-up is required.



Inter-row sowing has many benefits including increased crop yields, improved herbicide efficacy and reduced disease incidence. Photo: Matt McCallum

Inter-row sowing trials for wheat-on-wheat sown directly into standing stubble in South Australia from 2004–07 revealed an average yield increase of 6% (see Table 1).

Across three of the 10 sites reduced soil-borne disease on the inter-row was a significant factor driving increased yields (see Figure 1, page 2).

In other work during 2014, Dr Margaret Evans (SARDI) surveyed soil-borne disease levels in the Upper North. Consistently lower inoculum levels were found on the inter-row when compared with on-row for take-all, crown rot, common root rot, and root lesion nematodes. Inconsistent results were found for rhizoctonia.

More even plant establishment and possibly an improved microclimate for wheat in standing stubble also contributed to a yield improvement in the SA trials (see Figure 2, page 2).

TABLE 1. Average of 10 inter-row sowing trials from South Australia 2004–07

Sowing technique	Wheat yield (t/ha)
Inter-row	2.05
On-row	1.92

Improved herbicide efficacy

Improved herbicide efficacy is another benefit of sowing between the rows of standing stubble (see Table 2, page 2). Efficacy of soil-applied herbicides is likely to be reduced when more than 50% (2–3t/ha) of the soil is covered by crop residue.

Project information

This inter-row sowing guideline has been developed for the Upper North Farming Systems Group (UNFS) as part of the Maintaining Profitable Farming Systems with Retained Stubble initiative, funded by the Grains Research and Development Corporation (GRDC).

The initiative involves farming systems groups in Victoria, South Australia and southern and central New South Wales, collaborating with research organisations and agribusiness, to address challenges associated with stubble retention.

The GRDC, on behalf of growers and the Australian Government, is investing \$17.5 million in the initiative that has been instigated by the GRDC Southern Regional Panel and the four Regional Cropping Solutions Networks that support the panel.



FIGURE 1. Levels of take-all in wheat-on-wheat at Sandilands, SA 2004



PHOTO: ALAN MCKAY

FIGURE 2. Plant establishment for inter-row (left) and in-row (right) treatments at Sandilands SA 2005



PHOTOS: MATT MCCALLUM

TABLE 2. Herbicide efficacy trials at Sandilands, SA (2006)

Annual ryegrass control (%)			
Stubble	Trifluralin	Matalachlor	Tri-allate
Burnt	89.3	66.7	38.3
Slashed	29.3	37.3	16.3
Standing	84.3	78.3	51.7
LSD (5%)	17.3	35.5	20.2

When is sowing on the row beneficial?

In some situations sowing back into last year's sowing row has proven more beneficial than inter-row sowing. For example, GRDC-funded trials in Western Australia and New South Wales have revealed benefits from 'water harvesting' on water-repellent sands in last year's furrow, and capturing residual nutrition following a dry year by sowing back on the row.

In the Upper North, SA the potential water harvesting and nutrition benefit will apply in some seasons. For example, after a drought year, stubble loads often are not an issue for sowing equipment, allowing successful sowing back on the row and residual nutrition is often higher. Consult with your advisor and carry out a soil test for soil-borne disease in both the previous cropping row and the inter-row soil to help with decision making in this situation.

Inter-row sowing — getting started

Accuracy is the key to success with inter-row sowing and patience is critical — it is a two-year, two-stage process. The first year is about setting up your sowing equipment to achieve straight lines, allowing for the inter-row sowing to come into play the following year.

For the best results, invest in an auto-steer with a 2cm RTK solution. The repeatable accuracy of this system allows seed placement to occur within 2cm of the previous year's crop row, while holding a straight line the length of the field.

Estimated success rates (from grower experience) are:

- up to 90% with a 2cm RTK system
- up to 70% with a sub-metre auto-steer (10–30cm)
- up to 50% by eye using permanent wheel tracks

Regardless of the tractor and GPS equipment used, the ability of the implement to track in a straight line is the greatest challenge.

Talk to other growers who are implementing inter-row sowing to gather information that may apply to your farm and situation.

One of the best resources on how to set up your machine can be found in *PA in Practice II* (Pre-sowing chapter) on the GRDC website. This practical publication can be downloaded as a PDF from: www.grdc.com.au/Resources/Bookshop/2012/10/PA-in-Practice-II.

Inter-row sowing set-up and operator guidelines

Row spacing — wider is better. A common row spacing for inter-row sowing is between 300–380mm.

Drawbar length — longer drawbars deliver greater leverage and better tracking. As a general rule of thumb the drawbar should be half the width of the implement (e.g. a 12m implement will have a drawbar length of 6m).

Implement width — the wider the implement, the worse the tracking. This is because depth control and contour-following capability are compromised as the implement gets wider. Implements wider than 12m can be a challenge for tracking.

Depth control — independent depth control tynes, such as parallelograms help to maintain accurate tracking. An implement that digs in on one side will track poorly.

Tyne layout — even tyne layout (symmetrical either side of the centre of the machine) is important to give equal loading and balance.

Wheels and tyres — tandem wheels offer more lateral stability than castor (free-steering) wheels. However, if tandem axles are bent the system will track poorly.

Seeder box — 'pull behind' seeder boxes tend to be marginally better for inter-row sowing than "pull between" boxes. Twin axle boxes, where the front axels steers through the pull, are by far the best option.

Difficult terrain — undulating terrain and slopes make accurate tracking more difficult. Work up and down the slope, in the same direction each time if possible.



Putting it into practice — farmer feedback on inter-row sowing

Brendon Johns, Warnertown

Why did you decide to invest in inter-row sowing?

There were many reasons we decided to go inter-row sowing, including disease control, stubble management, lentil trellising leading to improved harvestability, and being able to apply pre-sowing herbicides onto last year's seed row to control high weed seed numbers.

What have been the benefits of inter-row sowing?

Since adopting inter-row sowing during 2004 we have been able to leave stubble higher at harvest saving money and time, avoiding the need to slash stubble, improving the harvestability of legumes and reducing soil throw as soil hits the stubble in the inter-row.

It has been more difficult to quantify the effect on root disease but crown rot is present at low levels.

What issues did you have implementing inter-row sowing?

Originally we used a Concord seeder bar, which made inter-row sowing difficult as it had poor tracking and would continually travel into last year's crop row, achieving less than 75% inter-row sowing. The bar would also drift on hillsides and we found tyred tractors difficult to steer straight.

We also had problems losing data, particularly AB lines from one year to next and have had problems with on-board computers crashing.



PHOTO: BRENDAN JOHNS

Improved stubble management is a key benefit of inter-row sowing

Sowing machinery used

During 2013 we bought a tracked tractor and an 18.3m DBS bar with 30cm row spacing. This system has a long A-frame and does not have a floating hitch or castor wheels, ensuring excellent tracking. The seed box is towed behind the bar with a tow-behind water cart for pre-sowing herbicide applications.

Although we also have bought a ProTrakker® guidance hitch we have not needed to use it as inter-row sowing is working extremely well with our current system.

Todd Orrock, Booleroo Centre

Why did you decide to invest in inter-row sowing?

We investigated inter-row sowing mostly to allow us to handle stubble and to limit the working, harrowing and burning we were doing to get back through the previous crop.

What have been the benefits of inter-row sowing?

Inter-row sowing has allowed us to have full groundcover during summer to lower soil temperature and hold in any usable soil moisture. Inter-row sowing has helped reduce disease and we are using the stubble as a windbreak for small canola crops early in the season. Water run-off is now minimal, as stubble seems to slow and dissipate the flowing water.

Tips for implementing inter-row sowing

- Get tyne spacing correct and stick with it.
- Keep the same direction of travel for each AB line from year to year.
- Save your AB lines and use RTK.
- If you get it wrong, offset your sowing by 7 to 12 degrees and get it right next year.



PHOTO: TODD ORROCK

The ability of the seeder bar to track straight is the biggest challenge for inter-row sowing

Sowing machinery used

We use a Primary Sales precision bar with a parallelogram knifepoint tyne assembly at 25cm row spacing and a Flexicoil tow between air cart.

Putting it into practice — farmer feedback on inter-row sowing

[continued]

Rob Dennis, Baroota

Why did you decide to invest in inter-row sowing?

The main reason we embarked upon inter-row sowing was that when we went to 2cm RTK autosteer it gave us the ability to leave standing stubble on our light sandy soils, reducing the risk of wind erosion.

What have been the benefits of inter-row sowing?

Since adopting inter-row sowing during 2011 we have been able to:

1. sow (with reasonable success) between cereal stubble and leave adequate groundcover on the paddocks
2. sow vetch into cereal stubble, which protects and anchors the young plants and stops any direct wind damage.

What issues did you have implementing inter-row sowing?

Our country is only gently undulating and the bar tracks relatively well. However, on the hill slopes you can get some creeping of the machine. When stubble is too long, and paddocks are grazed, then it lies across the inter-row and causes blockages. This can be overcome at harvest by ensuring the stubble is cut short (25–30cm long).

Sowing machinery used

We use a 14.5m Versatile Ezee-on bar with 25cm row spacings with a tow-behind box. The bar has dual fixed wheels at the rear of the machine with swivel wheels at the front. The GPS is mounted on the tractor and provides good tracking of the bar.



Successful inter-row sowing near Baroota



Standing stubble helps reduce the risk of wind erosion on lighter soils

PHOTOS: ROB DENNIS

Further information

- » *PA in Practice II — Using precision agriculture technologies: a guide to getting the best results* Pre-sowing (pages 52-57)
Available as a PDF download from: www.grdc.com.au/Resources/Bookshop/2012/10/PA-in-Practice-II
- » Search 'inter-row sowing' in the GRDC search engine for more articles on current research on inter-row sowing: www.grdc.com.au

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