

Very Wide Wheat Rows for Shallow Soil and Dry Seasons on the Eastern Edge of the NAR

Aim: Quantify the benefits of very wide rows for wheat quality and yield

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Department of Agriculture
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Farmer: Mike Kerkmans 'Marlingu'

Location: Pindar

With help from; Gemma, Ross, Liam and Elders Geraldton. Collaborators were DAWA and the Northern Agricultural Group at East Binu and the Liebe Group. Supported by GRDC.

Background: Wheat production on soils with less than 1m rooting depth, low water holding capacity and dry winters is a major challenge on the eastern fringe of the Northern Agricultural Region. Yields can often be low and grain size poor.

These trials at Pindar on shallow sand over rock are testing similar concepts used at the same latitudes in Queensland; growing wheat on wide rows of about 500mm row spacing, which provides some benefits in low yielding soil conditions. Interest in testing this concept at Pindar came from observing the yield in tramline edge rows. This trial was started in 2003. Two hundred millimeters of growing season rain resulted in about 1.5 t/ha wheat yields from 300mm, 600mm or 300/900 mm (known as 'double skip' 2 rows in then 2 rows out) row spacing. However the very wide rows had lower levels of screenings and small grain than the 300mm rows. In 2004 the trial was repeated; seed and fertiliser was diverted to the very wide rows, using a double shoot system to separate seed and deep band fertiliser (a single shoot system was used in 2003).

Trial Details:

Property	Mike Kerkmans, Marlingu, Pindar
Plot size and replication	300m long and 15m wide; four replicates
Soil type	Loamy sand over laterite and granite at 300mm to 900mm.
Sowing date	30 th May
Conditions at sowing	7mm of rain just after seeding
Growing season rainfall	150mm (plus 500mm summer rain)
Machinery	DBS digging to 5"seed and fertiliser diverted to wider rows double shoot system on a Fusion air seeder box
Seeding rate	60 kg/ha Arrino
Fertiliser	60 kg/ha DAPZn at seeding 25L FlexiN 30 th June
Herbicides and Insecticides	Trifluralin 1 L/ha pre seeding; 4g Ally, 500mL MCPA and 3g Glean 30 th June
Paddock History	2003 = wheat or fallow; 2002 = pasture/fallow

Treatments:

Main treatments: wheat on wheat; mechanical fallow/wheat; chemical fallow/wheat.

Sub-treatment: 300, 600 or 300/900 mm row spacing.

The trial is also integrated with plantings of oil mallees and part of a tramline farming system with autosteer (2.5m track bare tramlines for spraying; 3:1 ratio to the boomspray).

Measurements were made on 1m² subplots for components of yield and quality; most reliable yields came from the farm header (12m wide front) and a weighing trailer.

Results:

Table 1: The effect on yield of fallow and row spacing treatments at Pindar wide row trial collected by farm header (**bold figures** =95% chance of increase; **bold italics** = reduction)

1.1 Fallow effect (300mm row spacing)	Yield, t/ha	Difference, kg/ha
Wheat '04 after wheat 2003	0.728	
After disc fallow 2003	0.702	-26
After chemical fallow 2003	0.775	47
1.2 Row spacing effect		
300mm	0.735	
600mm	0.766	31
300/900mm	0.699	-37
Between 600mm and 300/900mm		67

Table 2: The effect of soil depth on crop yield, at Pindar wide row trial collected by farm header.

	Deep >0.5m soil depth to rock	Shallow <0.5m soil depth to rock
300mm	0.871	0.516
600mm	0.875	0.620
Benefit, kg/ha	4	104
% Response =	0.5	20
sd response, kg/ha	55	43
N (number of measurements)	7	4
Standard error of the difference, kg/ha	21	22
	No real difference	Real difference

Table 3: Hand harvesting Pindar wide row trial 2004, 1m² samples (**bold** = 95% chance of increase; **bold italics** = 95% chance of reduction, F=fallow, W=wheat, udf= undiverted fertiliser).

		Row spacing	F/W	W/W	W/Wudf
3.1	Yield t/ha	300mm	1.3	0.7	
		600mm	1.2	0.8	
		300/900mm	1.2	0.9	1.0
3.2	Grain size 2.5 - 2mm %	300mm	6	27	
		600mm	9	21	
		300/900mm	10	18	<u>9</u>

3.3	<2mm screenings CBH %	300mm	0.6	5.9	
		600mm	0.9	2.6	
		300/900mm	0.8	2.6	<u>0.7</u>
3.4	Plants/m ²	300mm	148	154	
		600mm	181	175	
			148	128	
3.5	Heads/m ²	300mm	196	152	
		600mm	206	160	
		300/900mm	177	137	
3.6	Plant dry weight/m ² at anthesis g/m ²	300mm	362	248	
		600mm	343	253	
		300/900mm	306	208	
3.7	Harvest index Dry crop biomass/ grain weight	300mm	0.5	0.4	
		600mm	0.45	0.35	
		300/900mm	0.44	0.3	0.39

Summary:

- Annual disc fallow provided no benefit this season (table 1.1) and **chemical fallow would be less profitable than wheat on wheat with 600mm row spacing.**
- **600mm spacing on shallow soil showed a significant improvement in yield compared to the 300mm spacing.** This could be the difference between an unprofitable and a 'break-even' crop in a dry season on shallow soils ($\leq 0.5\text{m}$ sand over rock).
- **600mm row spacing consistently out yielded 300mm/900mm row spacing,** by about 10% (table 1.2). 600mm is an easier configuration to manage, especially for inter-row shield spraying, which may be needed to control weeds in the wide rows and reduce the reliance on trifluralin.
- For the wheat on wheat rotation, table 3.2 and 3.3 show that wider rows produce larger grain size than 300mm rows. The large September rain (35mm) presumably helped to fill grain in the 300mm rows, compared to the dry season in 2003 where there was no difference in yield between row spacing.
- The results strongly suggest that fertiliser should also be banded on the inter-row of these very wide rows. 'Double skip' (300/900mm) rows with all fertiliser banded below the row in the trial had more small grain and screenings than the same configuration with half fertiliser banded under in the inter-row in an adjacent paddock (table 3.2 and 3.3 treatments W/W and W/Wudf). The same variety and fertiliser regime was used in both cases and soil was similar in texture and depth to rock and laterite. Further trials will be needed to check this theory.
- The fallow produced about 40% more biomass and more heads, but little yield benefit, due to more water being needed to cool a larger canopy, probably resulting in less available water after flowering (table 3.6).
- Wider rows produced a less 'bulky' crop with less biomass/ grain weight (table 3.7).

The 'best bet' use of very wide rows for wheat suggested so far is:

1. Shallow rooting depths from 300-900mm especially sand and 300-500mm depth.
2. About 600mm row spacing; better than even wider spacing.
3. Keep a tyne in the inter-row; to incorporate Trifluralin and retain a furrow to harvest water; for heavy stubble levels add stubble tubes.
4. Deep band the fertiliser on all tynes; to retain some fertiliser on the inter-row.
5. Be careful to avoid salting by fertiliser if you do not have a split system.
6. Keep the same seed and fertiliser rates as normal row spacing (if possible).
7. Be wary of backpressure when blocking or diverting rows.
8. Experiment with varieties and seed and fertiliser rates.

Technically reviewed by: Bindi Webb