



Hello 10 t/ha!

- moving towards winter cereals better suited for irrigation

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IN A NUTSHELL

- In 2007, trials of wheat, durum, barley and triticale showed that yields of 10 t/ha and higher can be achieved in irrigated production systems
- The results demonstrated that grain protein levels of 11% or greater are achievable
- The results of the project thus far provide wheat growers with a guide to which varieties can be grown to maximise productivity from irrigation water

High yielding winter cereals are very much a possibility in irrigated production systems in south east Australia. A three year trial, established in May 2007, has recorded in its first season yields in excess of 10 t/ha for breeders' lines of wheat, durum, barley and triticale.

This article will focus on using the results from the 2007 trials to help select winter cereal varieties best suited for irrigation and dryland production. The ICF project "High yielding genotypes of winter cereals for irrigated regions of south east Australia" achieved outstanding results. Due to the constraints of water availability for full irrigation we have combined these results with the National Variety Trials (NVT) and predicted yields to assist decisions about the best management strategies for 2008 crops and planning for 2009.

Yield - irrigated versus dryland

The 2007 trials showed that very high yields under full irrigation are attainable in our region. There are breeders' lines which have yield potential well beyond that of the currently available varieties. Some examples of this are barley 10.8 t/ha (WB261), durum wheat 11.5 t/ha (WID22221), triticale 13.0 t/ha (TSA0222) and wheat 12.0 t/ha (WW13602) at Yanco.

However how confident can you be that your variety will perform if it is irrigated?

This question can be answered in part by comparing the 2007 irrigated performance of varieties with their dryland performance in south western NSW over the last seven years. Comparisons of trial results for three crops (barley, wheat and triticale) indicate that if a variety is high yielding in the NVT analysis that it also has performed well in irrigated trials relative to the other released varieties. Figure 1 shows this relationship by the positive slope between dryland and irrigated trials. It was not possible to compare the durum varieties because the NVT analysis was not available.

One factor that may be influencing the positive relationship in Figure 2 between NVT results and irrigated trials is that a proportion of the trials in the NVT analysis over the last seven years have received some irrigation. This shows that some of

the top dryland varieties with intensive management have the potential to achieve high yields for example Yenda (wheat) 11.8 t/ha, Kosciuszko (triticale) 10.5 t/ha and Fleet (barley) 8.8 t/ha. These are only the varieties that have been included in the NVT analysis for south western NSW for 2000–2007.

The irrigated trials showed other varieties not in the NVT analysis such as Hindmarsh (barley) and Tobruk (triticale) can also perform when irrigated. However, others such as Stirling, Tahara and Sunvale even under optimal conditions in 2007 performed poorly. Thus management strategies and expectations of response to irrigation and nitrogen need to be variety specific.

The management of the trials was based on the crop checks developed for the '8 tonne club' by John Lacy and modified for achieving 10 t/ha. The nitrogen budget and timing of irrigations were critical to achieving our results.



Figure 1. The 'winter cereals for irrigation' trials have shown many current varieties and breeders' lines yielding close to and above 10 t/ha



Table 1. The trial averages for the receival standards for the 2007 irrigated trials at Yanco. Numbers in brackets () are standard deviation of the mean

Trial averages	Wheat	Barley	Durum	Triticale0
Screenings (%)	2.9 (1.2)	3.8 (2.5)	7.7 (2.3)	6.6 (1.7)
Black point (%)	0.4 (0.5)	-	0.3 (0.4)	-
Retention (%)	-	87.7 (6.8)	-	-
Test weight	78.6 (1.6)	68.7 (1.6)	80.1 (1.5)	71.8 (2.8)
1000 kernel weight (g)	44.3 (4.6)	47.3 (4.0)	51.9 (4.6)	49.2 (4.7)
Protein (%)	12.62 (0.7)	14.81 (0.8)	13.16 (1.0)	-

Table 2. A selection of a number of the top performing dryland varieties in south western NSW for wheat, durum, barley and triticale and their crop performance and grain quality results

Crop	Variety	Yield t/ha	Lodging %	Screenings %	Black point %	Retention %	Test weight	1000 kernel weight g	Grain protein %
Barley	Buloke	8.272	6.0	5.3		81.8	66.7	46.7	14.5
	Capstan	10.152	1.0	5.6		80.5	66.9	46.4	14.6
	Dash	9.814	4.5	2.2		89.8	67.3	39.7	13.3
	Fleet	8.768	8.3	2.4		91.0	67.1	56.5	14.2
	Keel	8.351	7.5	4.3		90.6	68.4	49.5	14.8
	LSD 5%	1.119	2.2	1.5		4.7	1.4	2.2	0.5
Durum	Arivato	10.895	1.5	6.7	0.5		81.9	54.3	13.4
	Bellaroi	10.282	5.6	7.6	0.1		79.7	51.0	13.6
	Gunderoi	9.817	7.9	7.7	0.2		80.5	44.9	12.9
	Tamaroi	10.532	7.0	9.2	0.2		80.5	52.3	12.3
	Wollaroi	10.050	7.1	7.3	0.3		80.5	47.4	13.4
	Yallaroi	10.793	8.4	5.3	0.3		79.7	53.1	12.3
	LSD 5%	1.426	2.2	1.5	0.5		1.4	2.2	0.5
Triticale	Everest	9.948	7.6	7.0			75.6	49.9	
	Kosciuszko	10.524	6.9	6.5			74.2	50.8	
	Speedee	9.506	6.8	8.7			70.4	54.7	
	Tahara	8.307	8.3	6.3			69.5	46.9	
	Tickit	9.030	7.7	5.8			69.9	45.4	
	LSD 5%	1.662	1.8	1.5			1.4	2.2	
Wheat	Barham	9.741	3.8	2.0	0.0		76.7	42.9	12.0
	Bolac	10.491	3.8	3.3	1.0		77.8	35.7	12.8
	Derrimut	10.594	6.5	2.6	0.2		78.1	45.1	11.7
	Drysdale	10.170	6.5	3.7	0.6		80.2	47.3	12.8
	Giles	10.607	5.1	3.1	1.0		78.4	40.9	11.9
	Gladius	9.903	2.1	1.3	0.4		77.2	50.8	13.3
	Ventura	10.133	6.8	2.1	0.1		79.5	48.5	13.6
	Yenda	11.805	1.0	3.3	0.2		78.1	38.9	12.1
	LSD 5%	1.348	2.0	1.5	0.5		1.4	2.2	0.5

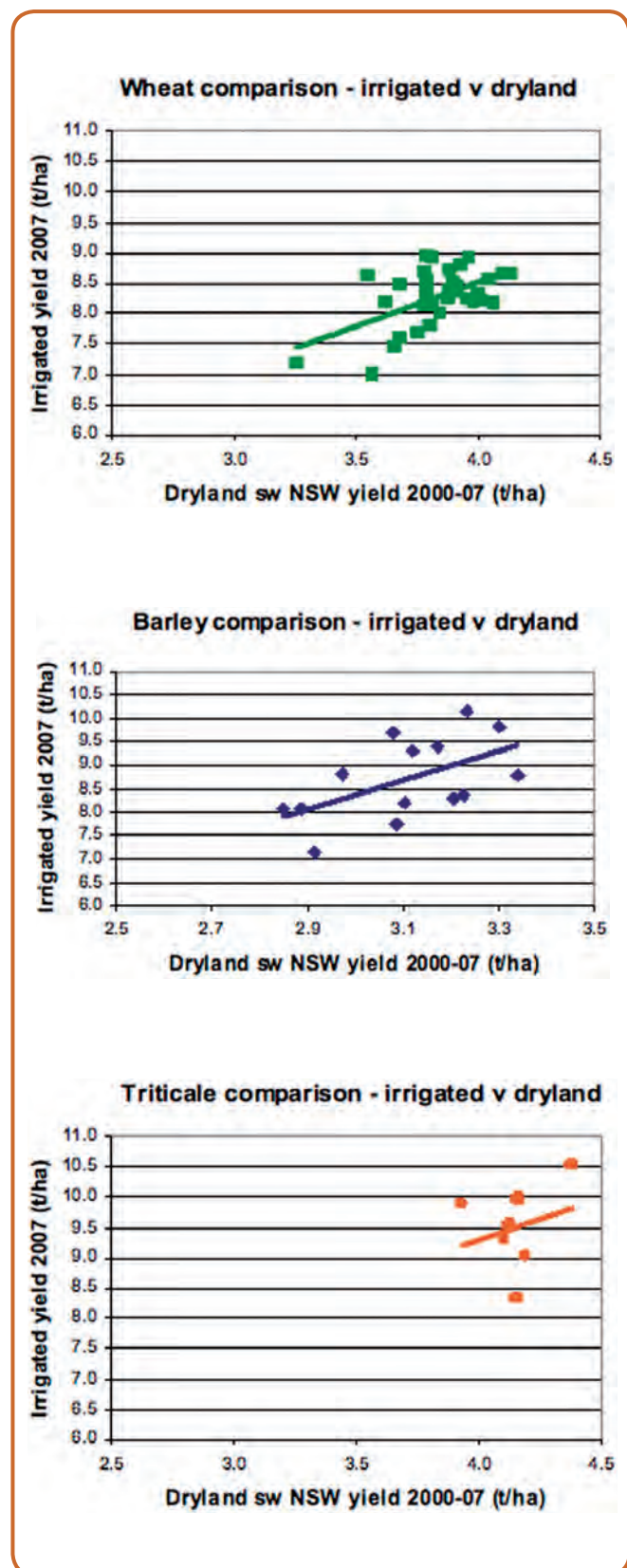


Figure 2. Comparison of irrigated yield performance of wheat, barley and triticale in 2007 with results from National Variety Trials for dryland main season varieties 2000 in south west NSW. Comparisons are based on separate trials and are not an analysis of trials. Note that a number of the dryland trials over the last seven years in south west NSW have received limited irrigated.

The total nitrogen budget was 300 kg/ha, and comprised 70 kg/ha in the soil, and 50, 68 and 110 kg/ha, applied at sowing, 1st top dressing (Zadocks 31), and 2nd top dressing (Zadocks 41-45), respectively.

Irrigations consisted of pre-watering 1.7 ML/ha and 5 spring irrigations (1 x 0.8 ML/ha and 4 x 0.7 ML/ha).

Lodging

Lodging was variable between the winter cereals and amongst the varieties. The best performers for each crop were Yenda, Arivato, Capstan and Jaywick. These varieties appear to be suitable for more intensive management. Table 2 provides the lodging score for a selection of the varieties under irrigation in 2007.

Grain quality

One of the objectives of the trials is to produce grain suitable for receipt into the Australian Hard (AH) segregation for bread wheats. The results from 2007 in Tables 1 and 2 show this was achieved. Analysis of the results show there was a negative trend of grain protein with yield. Our target grain protein was 11% at 10 t/ha yield, the minimum grain protein value observed in the tested samples was 10.7% for a durum sample. The trial averages in Table 1 show the late application of nitrogen was sufficient to increase grain protein. The levels achieved show for wheat and durum it is possible to produce grain suitable to be accepted into high quality grades even at these very high yield levels.

The barley samples analysed showed the nitrogen regime was too high for this crop. This resulted in the very high grain protein (average 14.81%) and that the retention percentage was lower than 95–90%. These results imply considerable savings on late application of nitrogen for barley can be made.

Diseases

The irrigated trials are managed to eliminate any reductions in yield due to diseases. It is important that the disease reactions of varieties and individual farmer ability to manage the disease risks for any variety be taken carefully into consideration. However, the relationship between varieties and disease incidence have not been measured or analysed.

High yields possible

In summary, the 2007 irrigated trials in the project “High yielding genotypes of winter cereals for irrigated regions of south east Australia” have shown current varieties can be managed to achieve high yield and high grain quality. In 2008 and 2009 this will assist growers make economic decisions on their use of what water is available for irrigating their crops. ☀️

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Further information

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