

## Improving water use efficiency

This trial is funded by the GRDC in collaboration with the University of Adelaide and CSIRO

### Key findings

- The best WUE for 2008 occurred at the Tarlee site for barley, 28.5kg/mm/ha or 141%.
- Frost in August and October reduced WUE at Spalding.

### Why do the trial?

Impressive gains in improving crop and systems water use efficiency (WUE) have been captured by Australian farmers over the past 30 years and some farmers are achieving close to their environmentally attainable yields in most seasons.

This increase has presumably come through a combination of:

- Earlier sowing times
- Effective summer weed control
- Stubble retention
- Nitrogen management and reduced sowing rates
- Residual soil moisture

However, the WUE on farms over the Mid North varies considerably, with the understanding for this variation being limited. This trial will investigate the reasons for these differences in WUE by establishing four sites on different soil types and rainfall zones in selected grower paddocks. The sites established are:

- Hart, 400mm annual rainfall, sandy clay loam
- Condowie, 350mm, sandy loam
- Spalding, 450mm, red brown earth
- Tarlee, 550mm, cracking red earth

### How was it done?

**Plot size** 8m x 10m

<b>Seeding date</b>	Hart 28 <sup>th</sup> May	<b>Fertiliser</b>	Hart	DAP@60kg/ha+2% Zn
	Condowie 28 <sup>th</sup> May		Condowie	DAP@40kg/ha+2% Zn
	Spalding 9 <sup>th</sup> May		Spalding	DAP@85kg/ha+2% Zn
	Tarlee 4 <sup>th</sup> June		Tarlee	DAP@130kg/ha+2% Zn

Each the trial was a randomised complete block design with 3 replicates and 5 crops.

The 5 crops were Gladius wheat, Keel barley, Buckley wheat hay, Kasper peas and Tornado canola. These were grown in rotation to ensure weed free plots are available for wheat in each successive year.

All trials were sown with 50mm chisel points and press wheels on 225mm (9") spacing.

All plots were assessed for grain yield, test weight, protein, wheat screenings with a 2.0mm screen and barley screenings with a 2.2mm screen.

Hay was cut and removed from the plots by hand and assessed for hay yield.

The grain yield for canola was measured by quadrat cuts and threshing by hand.

Drained upper limit and crop lower limit (wheat) was measured at each site to calculate plant available water (PAW).

WUE was calculated for the cereal crops at each site using the French & Schultz formula.

Wheat

Yield potential = (GSR-110mm)\*20 kg/mm/ha

Barley

Yield potential = (GSR-90mm)\*20 kg/mm/ha

## Results

Tarlee produced the highest wheat and barley yield, 3.56t/ha and 5.07t/ha respectively with Spalding producing the highest wheat protein (Table 1).

Frost at Spalding caused yield loss in the wheat, canola and peas (Table 1 & 2). The high screenings level in the wheat (70%) is also a result of frost. It is likely that the barley was also affected.

Table 1: Grain yield (t/ha), protein (%), test weight (kg/hL), and screenings (%) for wheat and barley at the four water use efficiency trial sites in 2008.

Site	2007 crop	Crop	Grain yield (t/ha)	Protein (%)	Test weight (kg/hL)	Screenings (%)
Condowie	Barley + Vetch	Wheat	0.92	13.8	73.6	4
		Barley	1.66	12.9	55.3	38
Hart	Wheat	Wheat	0.93	13.7	78.1	4
		Barley	1.93	12.0	64.4	27
Spalding	Barley	Wheat*	0.62	15.4	70.5	70
		Barley	2.03	10.5	69.3	41
Tarlee	Peas	Wheat	3.56	12.0	73.7	2
		Barley	5.07	9.1	61.6	4

\* The wheat at Spalding was frosted, district wheat yields were approximately 2.0t/ha.

Between the four sites the greatest WUE for wheat came from Tarlee producing 22.5kg grain/mm/ha (Table 3). WUE at Spalding was low due to frost. However when using the district average wheat yield WUE was (15.6 kg grain/mm/ha).

WUE for barley in 2008 ranged from 28.5 to 13.7 kg/mm/ha at Tarlee and Spalding sites respectively.

WUE at Hart over the past five years has averaged 14 kg/mm/ha. The lowest was 2.4kg/mm/ha in 2004 and the highest was 28 in 2006 (Figure 1).

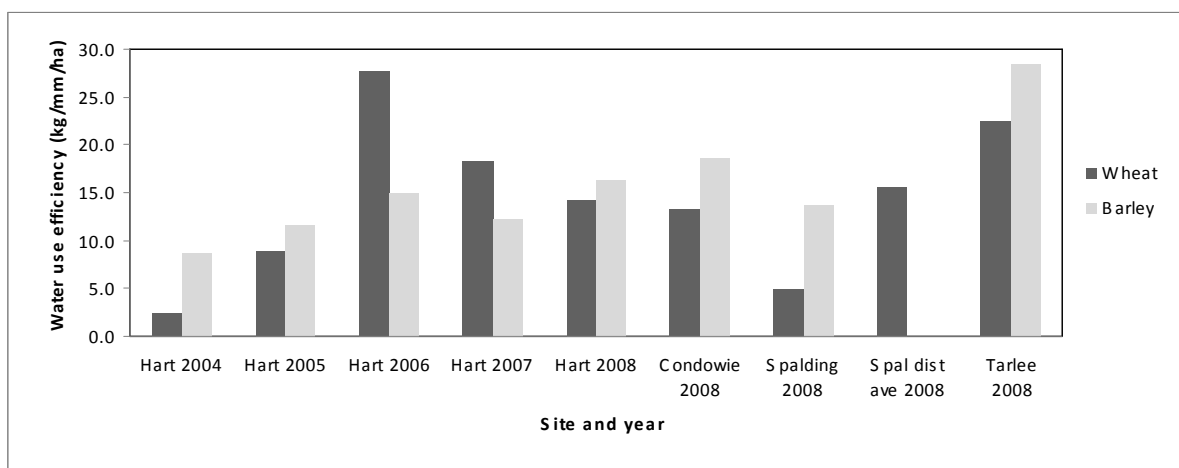


Figure 1: WUE for Hart 2004 to 2008 and Condowie, Spalding and Tarlee 2008.

Table 3: Soil type, total rainfall, growing season rainfall (April – October) (GSR) and water use efficiency for wheat and barley at the four WUE trial sites in 2008.

Site	Soil type	Total rainfall (mm)	GSR	Wheat WUE (kg/mm/ha)	Barley
Hart	sandy, clay loam	317	208	14.3	16.4
Condowie	sandy loam	278	179	13.3	18.6
Spalding	red brown earth	350	238	4.84*	13.7
Tarlee	cracking red earth	436	268	22.5	28.5

\* Using the district average wheat yield WUE = 15.6 kg/mm/ha

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