"Assessing the adaption of long season wheats in South Australia, 2014"

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Key Outcomes:

- Maturity drivers are an important consideration for wheat production. When opportunities arise to sow very early, some long season varieties yielded well. Mainstream varieties that are well adapted to sowing in May can perform poorly.
- Trojan wheat produced excellent yields at both sites, however suffered significant yield loss due to frost at Riverton when sown at the end of March.
- Optimum profitability was obtained by growing high yielding wheat. Quality was less important but still had some influence on profitability.

Trial Objectives:

1) To determine if the profitability of wheat in South Australia can be improved by sowing long season varieties early when the opportunity arises

2) Investigate if there are any long season varieties currently available that are adapted to South Australia's unique combination of soils and climates

3) To determine if there is potential to improve whole farm profitability by ensuring that all wheat/other crops are sown in their respective "optimum" sowing window

Trial Duration: 2014

Location: Navan **Farmer Co-operators**: Pat & Mary Connell

Soil Type: Red Clay Loam

Paddock History: 2013 – Faba Beans
2012 - Wheat

Monthly Rainfall:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2	81	7	69.5	64.5	99.5	67.5	18.5	20	9	18.5	4.5

- **Yield Limiting Factors:** Below average spring rainfall
- **Type of Trial:** Replicated small plot trial
- **Trial Design:** Randomised Complete Block Design, split plots, 4 replicates

Treatments:

There were two trial sites sown, one at Paskeville (Avg ARF 400mm) and Riverton (Avg ARF 525mm). Each site had 2 times of seeding: Very Early (28th March, Riverton & 31st March, Paskeville) and Early (28th April, Riverton & 29th April, Paskeville). 20 varieties were sown in each trial (See **Table 1**). Each variety was treated with imidacloprid seed dressing to avoid BYDV infection. All varieties were sown at 100 seeds/m^2 and with 80 kg/ha MAP. Nitrogen was applied to all plots at a rate sufficient to prevent nitrogen becoming a limiting factor in the experiment. Plots were cut for dry matter a various stages during the year (data not shown), harvest indices taken for each variety (data not shown) as well as yield and grain protein. Other quality perameters were not recorded such as screenings and test weight.

Table 1: *Varieties sown in SAGIT long season wheat trials, Paskeville and Riverton, 2014*

Variety	Maturity / Type (Max Grade SA)	Variety	Maturity / Type (Max Grade SA)
Trojan	Mid Late Spring Wheat* (APW)	***Estoc***	Mid Late Spring Wheat (APW)
Mace	Early Mid Spring Wheat* (AH)	***Yitpi***	Mid Late Spring Wheat (AH)
Cobra	Early Mid Spring Wheat (AH)	***Kiora***	Mid Late Spring Wheat (AH)
Forrest	Late Spring Wheat (APW)	***Revenue***	Very Late Winter Wheat (FEED)
Chara	Mid Late Spring Wheat* (AH)	***Naparoo***	Late Winter Wheat (FEED)
Beaufort	Late Spring Wheat (FEED)	***Lancer***	Mid Late Spring Wheat (APW)
Osprey	Late Winter Wheat (AGP)	***Bolac***	Mid Late Spring Wheat (AH)
Rosella	Late Winter Wheat (AGP)	***Wylah***	Late Winter Wheat (APW)
Eaglehawk	Late Spring Wheat (APW)	***Whistler***	Late Winter Wheat (ASW)
Gazelle	Mid Late Spring Wheat (SF1*/AGP)	***Wedgetail***	Late Winter Wheat (APW)

* - Gazelle able to be delivered as Soft biscuit wheat (SF1) in Mid North

Results:

YIELD

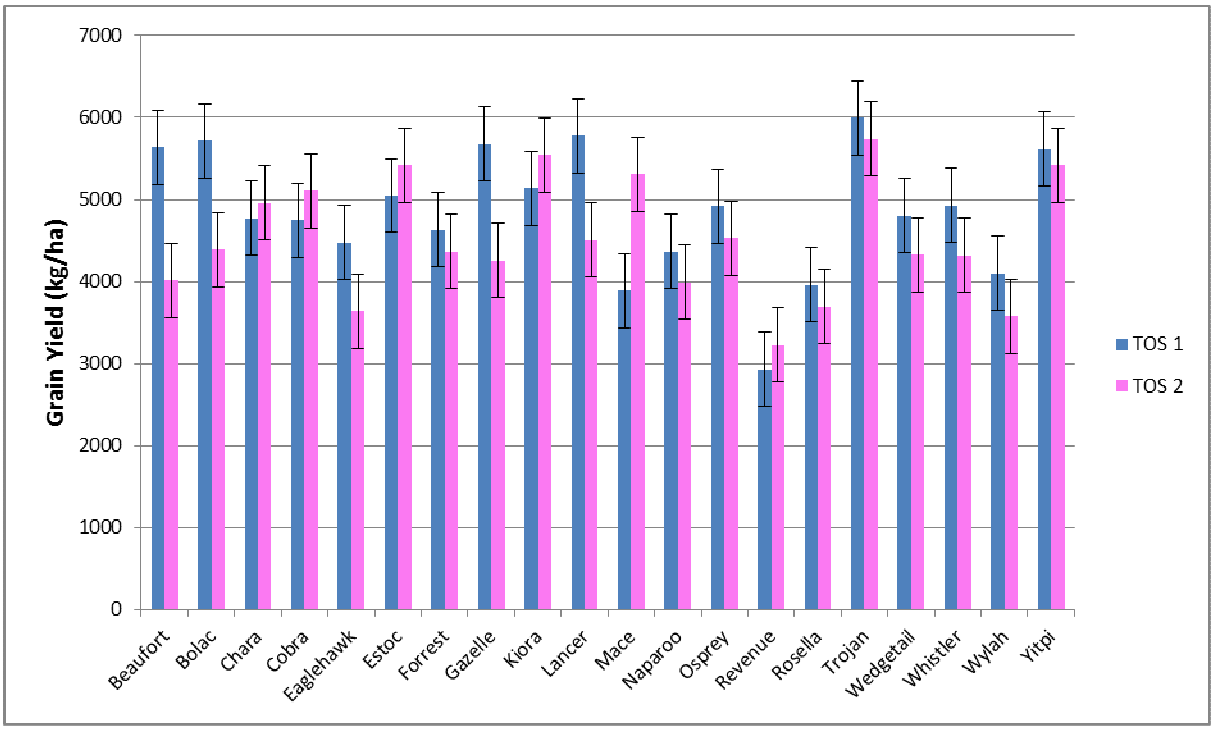
Yield varied between sites, both with highly significant variety x time of sowing (TOS) effects. The yield results for Paskeville (**Figure 1**) and Riverton (**Figure 2**) are displayed below.

TOS 1 Paskeville: The yields of the mid-late season spring wheats Beaufort, Bolac, Gazelle, Lancer, Trojan and Yitpi were significantly higher than all other varieties at this time of sowing. This result demonstrates that well adapted main season varieties like Mace can be sown too early, thereby not achieving their potential yield. The winter types and some of the late spring varieties tested did not perform well at this site at this time of sowing revealing they may be poorly adapted to the soil type.

TOS 2 Paskeville: The yields of Trojan and Yitpi were significantly higher than most of the other varieties. This result demonstrates how well adapted these varietal types are to this environment. Both varieties have photoperiod responsive developmental triggers, which allows them to be planted early, but "hold back" development to maximize the time they have to utilize water during the season.

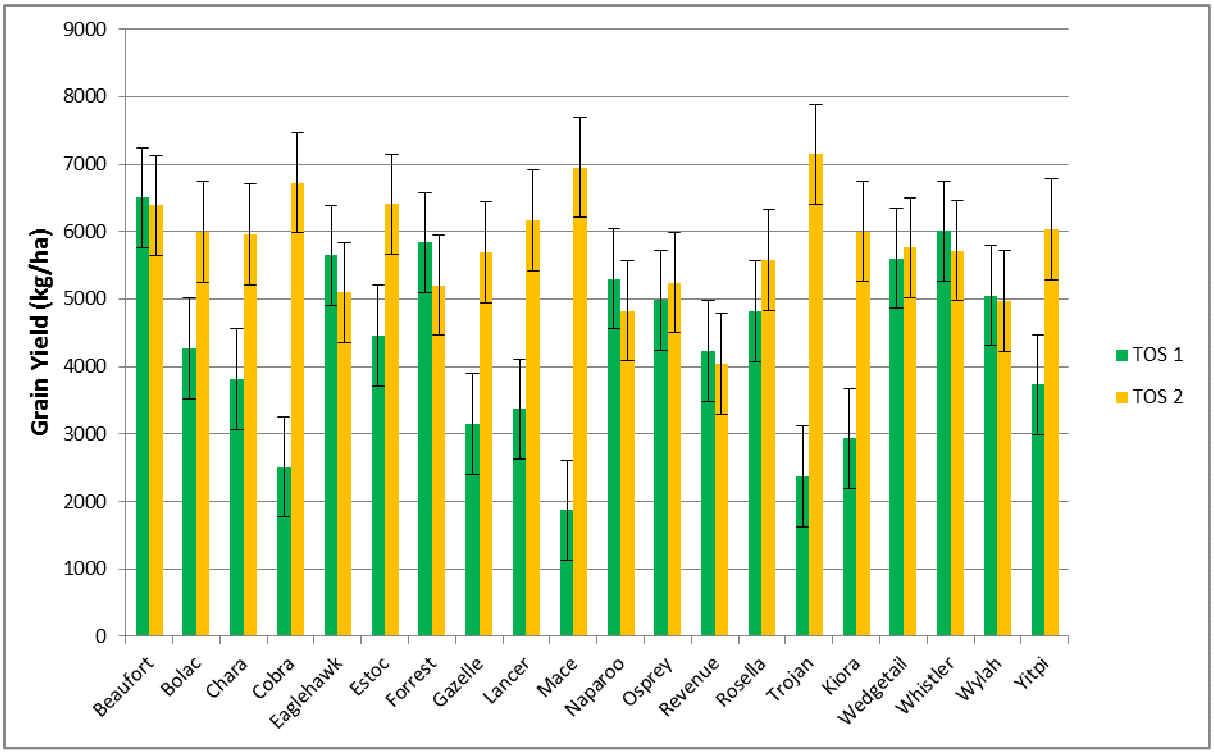
TOS 1 Riverton: The yields at Riverton were highly variable due to frost events that occurred during early August and September. Early-mid and many of the mid-late spring wheat varieties were frosted at flowering, during grain fill or during early head emergence, resulting in very low yields. The late season varieties Beaufort, Eaglehawk, Forrest, Wedgetail and Whistler were all able to produce yields in excess of 5.5 t/ha indicating they may have significant potential for early sowing *TOS 2 Riverton*: The well adapted early-mid (Cobra, Mace) and mid-late (Trojan) produced the highest yields. This shows the value of sowing well adapted, main season varieties on time. The winter and late spring lines produced slightly lower yields at this time of sowing, with the exception of Beaufort, Wedgetail, Rosella and Whistler which were still able to produce yields in excess of 5.5 t/ha.

Figure 1: Grain Yields vs. Time of Sowing and Variety at Paskeville, 2014



TOS x Variety LSD 5% - 451.99

Figure 2: Grain Yields vs. Time of Sowing and Variety at Riverton, 2014



TOS x Variety LSD 5% - 743.2

GRAIN PROTEIN

The grain protein content (**Table 2**) at Paskeville were generally lower at the first time of sowing than the second. This was expected as grain fill occurred under cooler conditions for many of the varieties at this time of sowing with adequate soil moisture. Additionally, many of the varieties tested at this first time of sowing were higher yielding, resulting in "protein dilution" in the grain.

At Riverton, the protein content of many varieties tested were very high at the first time of sowing, as a result of the frost and significantly lower grain yields producing less "protein dilution". Generally the varieties that yielded well at this time of seeding had significantly lower grain protein levels.

Grain protein was also used as the basis for a simple financial analysis along with grain yield and the maximum grade achievable for that variety in South Australia. The prices used can be seen in **Table 3**.

Table 2: Grain Protein Content (%) vs. Time of Sowing and Variety at Paskeville and Riverton, 2014

	Paskeville		Riverton	
Variety	**TOS 1**	**TOS 2**	**TOS 1**	**TOS 2**
Beaufort	11.0	11.2	9.2	10.4
Bolac	11.5	12.2	12.8	11.1
Chara	11.1	11.3	13.0	10.3
Cobra	11.3	10.3	15.4	9.9
Eaglehawk	12.0	11.4	10.1	11.1
Estoc	12.2	11.9	12.8	10.9
Forrest	11.8	12.3	10.6	11.7
Gazelle	11.1	11.0	11.0	8.1
Kiora	11.1	11.6	13.0	10.8
Lancer	12.2	12.1	15.1	10.6
Mace	11.0	11.3	16.0	9.0
Naparoo	12.4	13.1	10.4	13.5
Osprey	12.8	14.0	11.4	12.3
Revenue	13.2	13.1	11.3	12.7
Rosella	13.2	13.4	11.2	12.7
Trojan	10.7	10.4	14.7	10.1
Wedgetail	12.7	13.2	10.9	11.9
Whistler	12.1	12.6	10.4	11.6
Wylah	14.2	13.2	11.6	12.4
Yitpi	11.2	11.4	13.0	11.4
TOS x Variety LSD 5%	***0.39***		***1.59***	

Table 3: Wheat Prices and Grade Spreads, Dec 11th 2014, Delivered Port Adelaide

Grade	$/tonne
AH1	310
AH2	297
APW	285
ASW	270
AGP	265
FEED	245
SF1*	285

*Gazelle able to be delivered as Soft 1 (<9.5% Protein) in Mid North

ECONOMICS

The grain yield and protein for each variety at both times of sowing were combined to produce a simple financial analysis for each site (See **Figure 3 & Figure 4**). No other grain quality parameters such as screenings or test weight were used to grade the varieties for this analysis. It is acknowledged that there is likely to be potential downgrades based on higher screenings and lower test weight in certain varieties that were tested, particularly those that were frosted at Riverton.

From this simple analysis, very early sowing of mid-late season varieties that could achieve APW grade or better were most profitable at Paskeville. The exception to this was Beaufort wheat (Feed in SA), which yielded well at this time of sowing, highlighting the contribution that yield makes to $ returns.

The second time of sowing at Paskeville indicated sowing well adapted varieties (Mace, Yitpi, Trojan, Kiora, Estoc) in their preferred seeding window resulted in the highest gross income. The profitability of these varieties sown at the second time of seeding matched, and often exceeded, those of many longer season varieties sown earlier.

The Riverton site revealed that sowing certain varieties too early can result in catastrophic financial implications, particularly due to yield reduction by frost. At this site however, some of the early sown, late season varieties were able to perform similarly to early-mid season varieties sown later.

These results highlight the value of testing varieties in two distinct environments within South Australia. Some varieties that have poor adaptation at Paskeville (albeit after 1 seasons trials), have performed well at Riverton.

Many of the interstate varieties appear less well adapted to the 1) soils and subsoils at Paskeville and 2) warmer temperatures that may not allow some of the longer season varieties to build plant structures essential for high yields.

Figure 3: Gross Income ($/ha) of wheat varieties vs. Time of Sowing at Paskeville, 2014

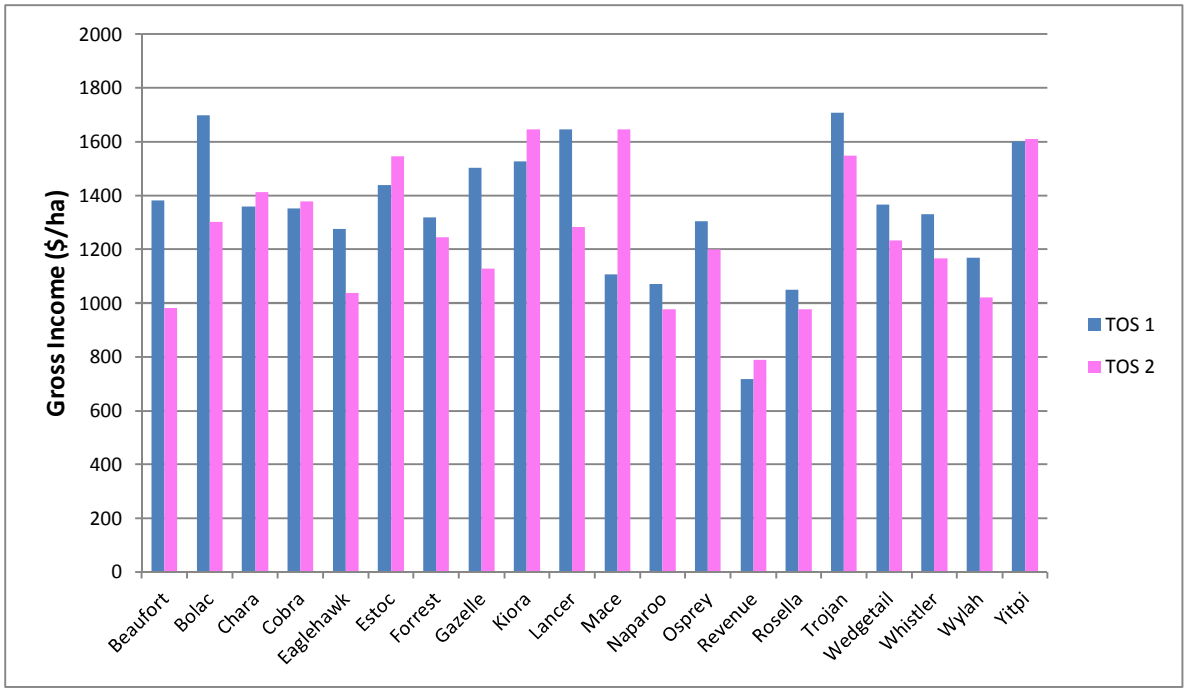
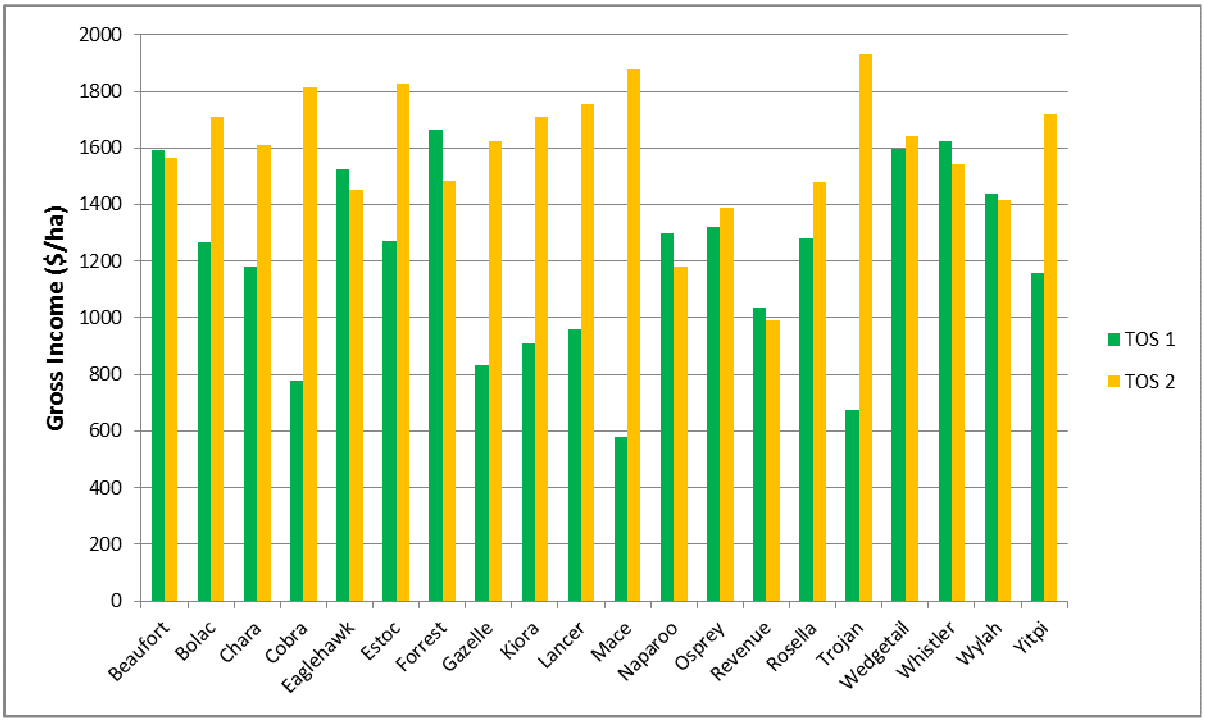


Figure 4: Gross Income ($/ha) of wheat varieties vs. Time of Sowing at Riverton, 2014



Comments:

- The current practice of sowing well adapted varieties at their optimum time is well suited to SA. However, there may be opportunities to utilize longer season varieties in some environments, or where large seeding programs prevent sowing all varieties in their optimum planting window.
- Long season varieties sown early have a definite role in environments that can experience significant frost events early in the season.
- Profitability can be similar when sowing wheat very early, provided varieties are chosen that are adapted to their growing environment.

Acknowledgements

South Australian Grains Industry Trust for supporting the trials

Pat & Mary Connell for the use of their land for the trials at Riverton

Leighton Wilksch, Agbyte for conducting the trial program at Paskeville

Peter Telfer, SARDI for harvesting the trials at Riverton

Dr James Hunt, CSIRO for assistance with variety selection and supplying seed