Evaluating the fit of Long Season Oat Varieties as Alternative Hay Varieties in South-West Western Australia 2017

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Key Finding

- Delaying cutting to avoid rainfall does come at a cost of quality. This was especially apparent in Brusher, which had previously been one of the best performing varieties.
- Wizard showed to be a very high yielding hay oat but low quality for export markets.
- On average the yield gain from early sowing did not increase returns enough to compensate for poorer quality.
- The implication of leaf disease on hay quality needs further investigation.

Introduction:

This is the third year of a trial series that seeks to evaluate the hay performance of oat varieties of different maturities. Unlike the previous two seasons we have sort to gain more powerful data by narrowing down our variety selection and replicating the trial twice. Exploring new varieties with different maturities has been driven by the risk associated with post-cutting rainfall, which, has been exacerbated by growers electing to sow short season varieties earlier. Sowing earlier has historically resulted in higher yielding crops particularly when the end of season rainfall is minimal. Earlier cutting time not only means that the hay is on the ground when there is a higher chance of rain, but the cooler conditions usually result in the hay taking longer to cure.

Trial Aims

This trial aims to assist growers with variety choice and time of sowing (TOS) in order to reduce risk and increase returns to the hay grower. The trial includes seven varieties at two times of sowing to establish differences in maturity and subsequent cutting and baling times. Yield data and hay quality will be collected to determine the suitability of newer hay varieties compared to those widely grown.

Methods

The trial was located 18km north east of Cuballing in the medium rainfall zone. The trial was designed using two large blocks separated by times of sowing. Each block was established as a complete randomised block with two replicates. The plots were configured to be a length of 11m in

width by 188m in length. Seven varieties were included in both times of sowing which included Brusher, Wizard, Bannister, Carrolup, Williams, Kojonup and Mulgara. It was identified early that the Mulgara seed used for TOS1 was actually Brusher seed and hence TOS1 of Mulgara was removed from analysis and the additional Brusher data was combined with the other Brusher treatments to give four replicates total for TOS1.

The first time of sowing occurred on the 1st of May and the second on the 18th of May. Sowing rates were determined using 1000 grain weights of each variety and commercial rates of fertiliser were applied. The trial was sown using an Ausplow DBS bar on 10 inch spacings. Industry standard herbicides were applied to control weeds and fungicides were applied to reduce septoria and rust infections.

Varieties were cut at flowering which was determined using industry practice for maximum quality. Grab samples were taken at the time of cutting and core samples taken at the time of baling to assess quality. Subsamples were taken of Carrolup, Mulgara and Wizard oats 12 days after cutting to identify reductions in quality during curing. Visual observations and plant counts were made in season and bales were weighed on scales post baling to determine crop yield. Quality was assessed using Gilmac's standards and graded and priced accordingly.

Table 1. Fertiliser applications

Product	Timing	Rate	N	P	K	S	Cu	Zn
Vigour	At seeding	80	8.00	9.60	9.60	4.00	0.08	0.16
Urea (S)	At seeding	50	23.00					
NK11	Post emergent	150	35.85		35.85			
Total Units			66.85	9.60	45.45	4.00	0.08	0.16

Table 2. Herbicide applications

Timing	Product	Rate
Knockdown	Glyphosate	1.25L
	Ester 680	400ml
	Nail (carfentrazone 240g/l)	10ml
Pre-seeding	Diuron	400g
	Metolachlor (960)	750ml
	Paraquat	800ml
Post-emergent	Bromoxynil	200ml
	MCPA LVE (570)	500ml
	Logran	10g
	Alpha Forte	50ml

Results

Seasonal Conditions

The trial site (east of Cuballing) is located in the medium rainfall zone of Western Australia (Ag Zone 2). The year was characterised by significant rainfall events in February in which 149mm was recorded for the month. For much of the state late April and May were very dry which meant that in

many areas crops struggled to emerge. At the trial site however sporadic rainfall events meant that at both times of sowing the profile was wet and crops emerged within 7-10 days. July, August and September rains were all above average and contributed to a good biomass growing opportunity. Total rainfall for the growing season (April-October) was slightly above the long term average due to the good end of the season. Late rainfall events continued into October and November and resulted in much of the states hay (including the trial) experiencing some degree of weather damage.

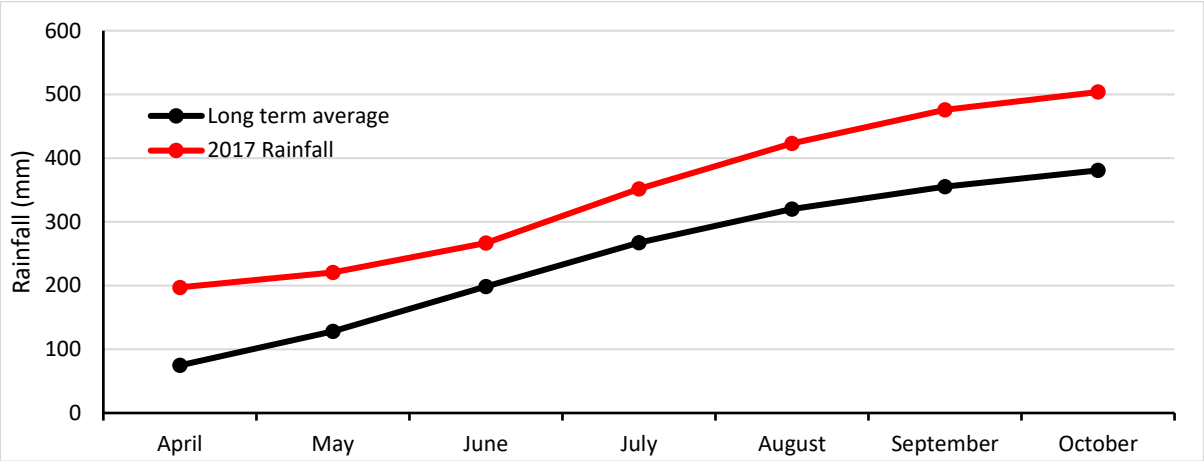

Figure 1: Wickepin Cumulative growing season rainfall (Source: BOM)

Crop Establishment

Crop establishment was very similar between varieties at different times of observation. This was true for both times of sowing as there was adequate soil moisture at both timings to allow for germination. The crude adjustment for seed rate available with the seeding box made it extremely difficult to meet the desirable rate to optimise plants per square metre. The wizard seed established far better than expected which is why the rate was so high. The aim was to establish a crop at a rate in excess of 320 plants per square metre. Time of sowing one for Williams and both the times of sowing for the Wizard exceeded 400 plants per square metre which were above the optimal sowing rate.

Table 3: Plants per square metre achieved for each variety for each time of sowing.

	Time of Sowing One	Time of Sowing Two
Brusher	344	364
Carrolup	350	339
Williams	419	333
Bannister	348	383
Kojonup	369	373
Wizard	519	523
Brusher 2	309	
Mulgara		318

Hay Yield

On average TOS1 yielded higher than TOS2 (698kg/ha). Though on average the yield was higher there was no consistent trend across all varieties to a higher yield in TOS1. Wizard both yielded higher in TOS2, in general however the difference was fairly small. Williams showed the greatest variation in yield with TOS1 yielding 1.31t/ha higher than TOS2. This was unexpected as the maturity of Williams is similar to Bannister and Kojonup.

Wizard was consistently the highest yielding variety with both times of sowing yielding more than all the other varieties over both times of sowing. Carrolup and Williams yielded similarly. Brusher with the later time of sowing yielded similar to Bannister but gave an improved yield return over Williams and Carrolup.

Kojonup was the lowest yielding variety in each time of sowing. The lower yield of Kojonup has been observed in the past when compared to the varieties in this trial. There was also significant disease pressure on the Kojonup which may also have limited yield.

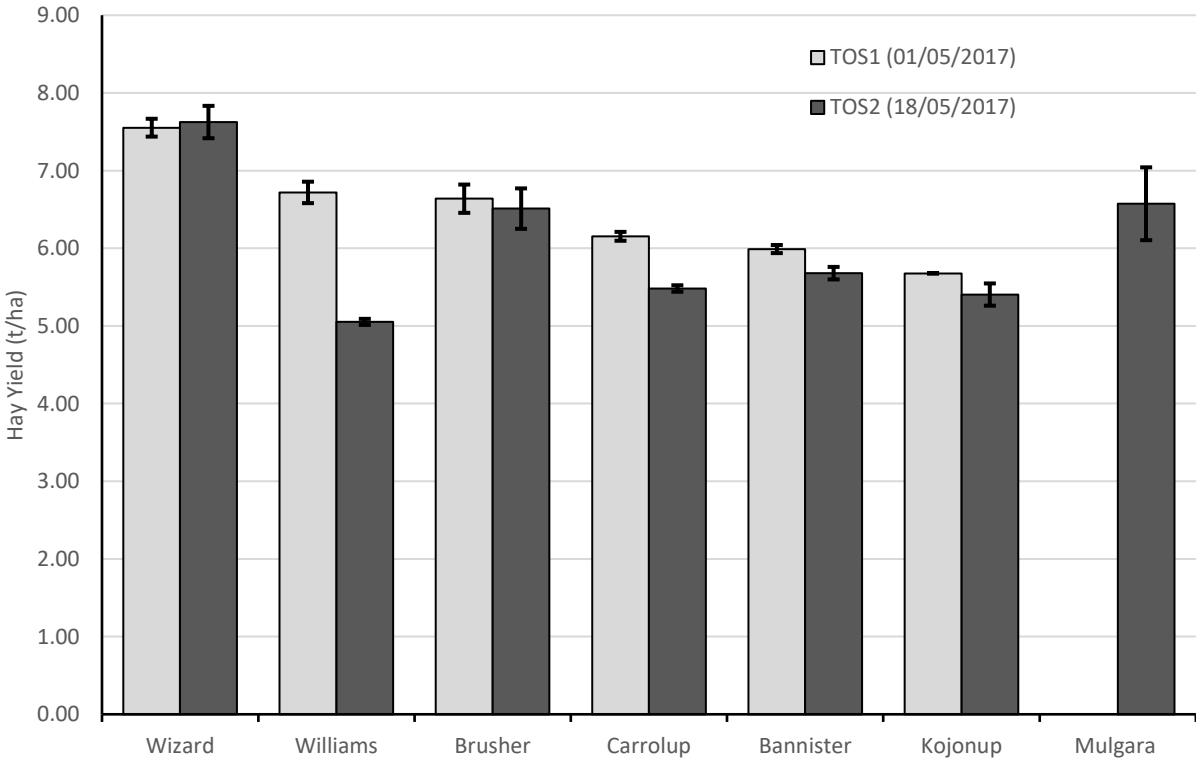

Figure 2: Hay yield by variety at two times of sowing (note Mulgara only had one time of sowing)

Hay Quality of Time of Sowing One

Hay quality was determined using Gilmac's grading system based upon feed test data and visuals. Dates of cutting and baling were used to determine how much rainfall fell on each of the varieties after they were cut. There were also significant rainfall events prior to the cutting of time of sowing one which delayed the cutting dates of some varieties.

All of the varieties except for Wizard were exposed to a cumulative total of 9.8mm of rainfall between cutting time and baling time. In all but one case this had implications on hay quality. This either involved a downgrade due to poor visuals as the results of discolouring due to weather damage or a total grade drop on the back of typically ADF and NDF results.

The cutting time was slightly late (2-3 days) in TOS1 for the early-mid varieties (Carrolup, Bannister, Kojonup and Williams) and was late (approximately 9 days) for the early season variety Brusher. These cutting dates had to be adjusted due to large rain events just prior to cutting. This resulted in a significant impact on the quality of the hay as drop in quality did not differ between the time of cutting and baling. Only Wizard gave a poorer return at baling time as both samples failed to meet the export grade on the back of very poor visuals. Quality at cutting was better for Wizard with the combination of yield and poor-average quality feed tests resulting in it having the highest return per hectare.

Carrolup achieved the highest grade on average from bale samples and when combined with yield achieved the highest return at baling time. Carrolup had a slight weather grade drop in one sample and the other was unchanged between cutting and baling.

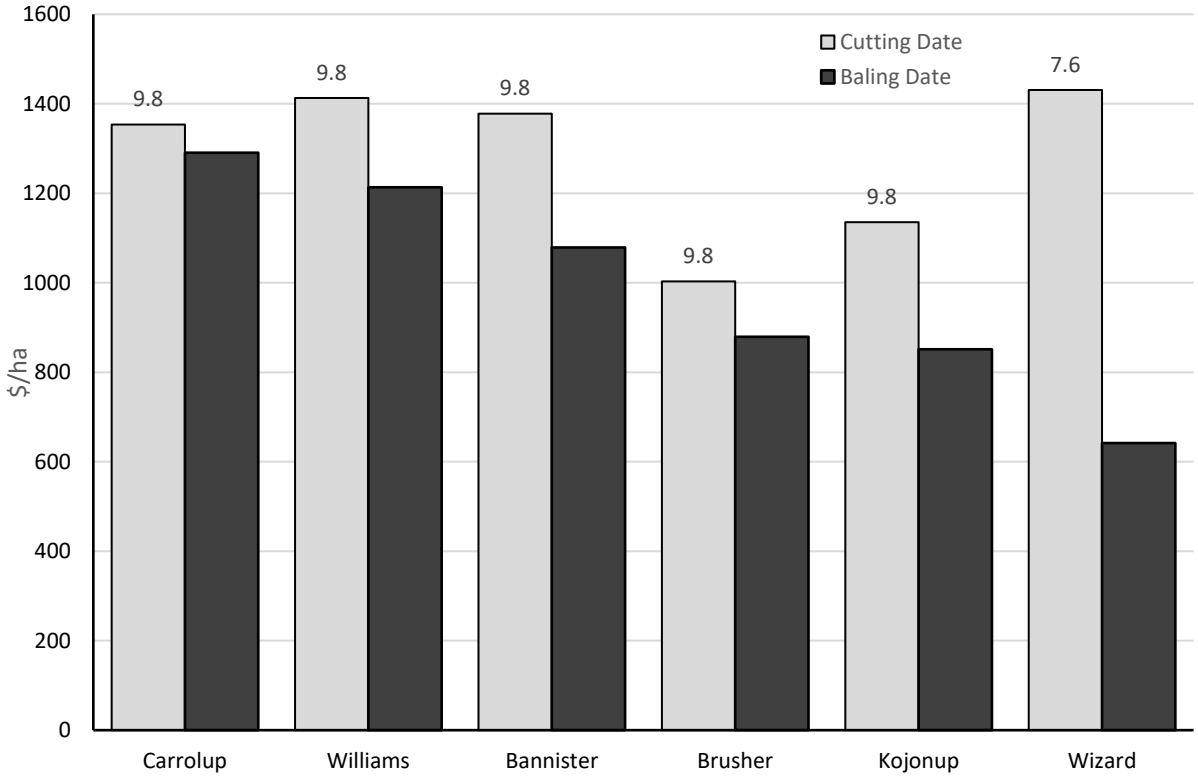

Figure 3: Changes in returns based upon change in quality of varieties between cutting and baling in Time of sowing 1 (TOS1). Numbers above baling columns indicate amount of rainfall (mm) which fell on varieties between cutting and baling.

Hay Quality of Time of Sowing Two

Generally speaking there was less of an impact on hay quality between the time of cutting and baling in TOS2 compared to TOS1. On average TOS2 returned $23.50/t more than the TOS1 samples at the time of baling across all varieties. The average price at the time of cutting was very similar with just a $6.80 improvement in TOS2 over TOS1 across all varieties.

For Carrolup, Williams, and Bannister the hay in TOS2 spent 4 days less on the ground than it did in TOS1. The result for Williams was improved the quality by reducing the downgrading as a result of weather of TOS2 over TOS1. Bannister in TOS2 had very little drop in quality between cutting and baling compared to TOS1, on average in TOS1 the Bannister dropped two grades, in TOS2 it dropped one or none. The retention of quality of Bannister compared to the other varieties coupled with its strong yield resulted in it being the most profitable variety in time of sowing two.

The Wizard was exposed to significant rainfall events which resulted in a significant quality downgrade and again resulted in it giving the lowest return. The hay quality of Carrolup was poorer in TOS2 than TOS1 which gave it a comparable lower return to its TOS1 result.

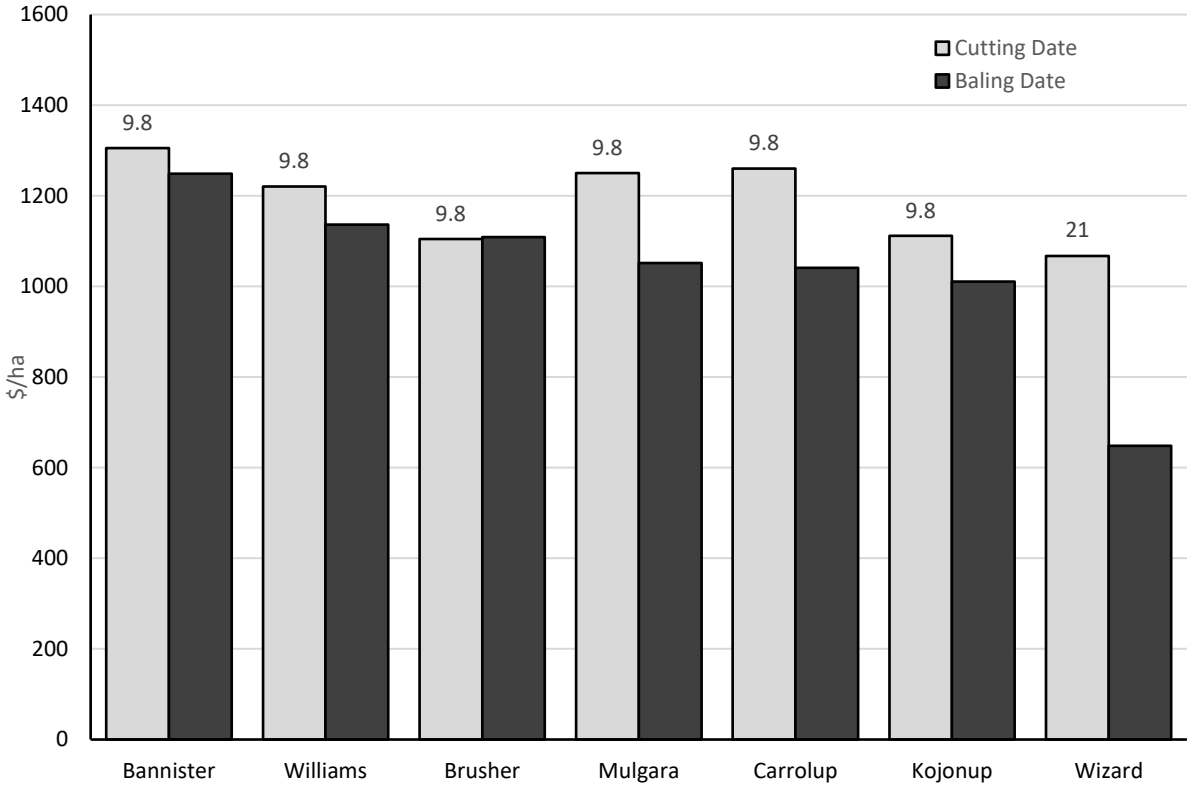

Figure 4: Changes in returns based upon change in quality of varieties between cutting and baling in Time of sowing 2 (TOS2). Numbers above baling columns indicate amount of rainfall (mm) which fell on varieties between cutting and baling.

Economics

The highest average yield was greater in TOS1 which on average was 698kg/ha more than TOS2. Again the average price at the time of cutting was very similar with just a $6.80 improvement in TOS2 over TOS1 across all varieties. Quality however was highly variable and for some varieties the quality was significantly better in one time of sowing than the other.

Carrolup in TOS1 gave the greatest return ($1290/ha) which was a slight improvement over Bannister in TOS2 ($1249/ha). The clear trend between these two results was that both of these varieties were the leaders in their respective times of sowing for hay quality which generated the greatest return. Wizard although it was the highest yielding variety in both times of sowing but also consistently returned the lowest quality hay. The high yields of the Wizard were unable to compensate for the low quality and as a result it gave the poorest return over both times of sowing.

Bannister, Brusher and Kojonup all performed better in TOS2 as a result of improved quality over TOS1. The higher yield of Williams and Carrolup in TOS1 coupled with improved quality of Carrolup and the comparable quality of Williams resulted in these varieties having a higher return in TOS1.

Generally TOS1 had greater price fluctuations between replicates due to quality variability than TOS2.

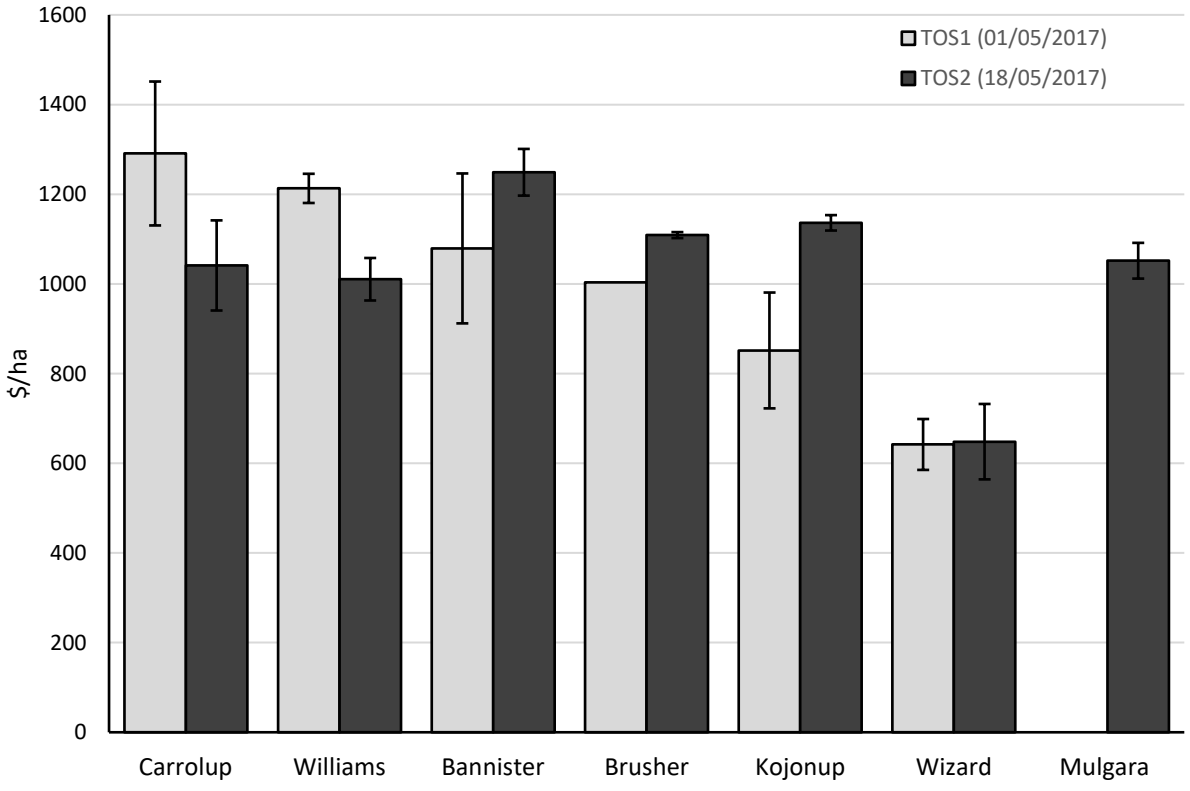

Figure 5: Economics returns of TOS1 vs TOS2 (returns do not take into account the costs of baling and transporting the hay)

Discussion

The dry conditions experienced throughout the state at the beginning of the year did not impact on the emergence of any varieties. The trial site was located on a paddock which received a storm early in the season which resulted in the profile being wet close to the surface. The use of a DBS seeder meant that seed depth was able to be controlled and the seed sown into moisture. After seeding there was low falls in the May and June period which limited the rate of crop growth. The site being set high on the hill and limited frost events in the region during the season meant that frost was unlikely to have had an impact on the crop.

There was a "soft finish" to the season as rainfall continued to fall up till cutting and after the trial had been cut. This assisted in boosting the yield of grain crops but had a significant impact on the quality of hay throughout the state. The constant rainfall events around cutting time pushed back the cutting dates in an attempt to dodge the rain. The result was a late cutting day for Brusher, Carrolup, Bannister, Kojonup and Williams. This resulted in a 4 day difference in cutting between TOS1 and TOS2 for Carrolup, Bannister and Williams and the same day cutting for Brusher and Kojonup. Wizard managed to have a 7 day period between the cutting of TOS1 and TOS2.

The first time of sowing of Carrolup gave the highest economic return on the back of high quality hay. Overall TOS1 of Carrolup was the 7th highest yielding (6.15t/ha) between both times of sowing. The quality for TOS1 average OH1QQ or OH1QQV which is second from the top grade in the Gilmac system which was paying between $200 and $220/t. The Bannister oats in TOS2 gave the second greatest return again on the back of hay quality. The Bannister averaged a grade of OH1QQV ($220/t) which was on average the highest quality hay in the trial. Bannister in TOS2 was the 9th highest yielding variety (5.68t/ha).

Brusher and Wizard were disappointing when it came to hay quality. The Wizard consistently experienced the biggest drop in quality between cutting and baling. In both TOS1 and TOS2 the wizard dropped from a deliverable grade of hay into the reject level which delivered a poor price per tonne ($85). Typically the quality was low however in TOS1 one replicate had a recorded grade of OH1QQV (the second highest) from the samples taken at cutting time. This is indicative that the poor drying conditions may have been exacerbated by the significantly higher yield of the Wizard. There were also significant rainfall events recorded before the Wizard was cut which may have contributed to the poor feed tests and visuals. Brusher performed similarly to previous years in terms of yield being a top-end performer. The economic returns from this season's trial however were down significantly due to the poor quality of the Brusher hay. It is apparent that disease and the delayed cutting time have had a significant impact on the hay quality as this result is atypical.

This highlights the challenged found by growers in trying to avoid cutting hay when rain is imminent. Later sowing reduces this risk by delaying cutting times

Appendix

Table 4: Total days between cutting and baling for each variety for each time of sowing.

Days between cutting and baling		
	TOS1	TOS2
Brusher	21	21
Carrolup	21	17
Williams	21	17
Mulgara		17
Bannister	21	17
Kojonup	21	21
Wizard	9	13
Average	**19**	**17.5**