Barley – should I grow malt or feed?

Jon Midwood[1] and Megan Beveridge[1]
[1] Southern Farming Systems

Take home messages

- In 2013, performance of feed barley varieties was better than malt varieties, on average across both sites.
- Even in 2013's favourable season, malt varieties failed to make any considerable increases in yield over 2012 whereas feed varieties did increase their yields.
- The feed variety Oxford has yielded consistently well across several years of trial data at SFS and NVT.
- Generally, a narrowing of the spread between feed and malt barley prices means less extra yield is required from feed barley over malt barley for the same gross return.
- In 2013, the additional costs involved in managing feed barley trials were only $50/ha.

Background

With the accreditation of a number of new barley varieties over the last few seasons with far higher yield potential than Gairdner, the old industry standard, a new question facing many growers and advisers relates to whether they "should grow malt or feed barley". Malt varieties tend to be lower yielding but hold the promise of higher price, as long as the quality is good enough. Feed varieties generally yield better but at a lower price. The "right choice" varies from farm-to-farm and grower to grower depending on their specific costs, productivity potential, perceived market price, and overall risk. The "right choice" accounts for both risk and profit. A series of trials were set up in 2013 at our Inverleigh and Westmere sites to evaluate a range of commercially available varieties of barley that are either grown for malt, grown for feed or varieties that have the potential to be grown for yield but could still be accepted as malt at receivals. Increasingly variety specific management is an important consideration as varieties need to be managed in a particular way in order to reach their yield potential and/or maximise their grain quality.

Method

Two trials were set up, one at the Inverleigh site and the other at our Westmere site. Both trials were sown using the SFS cone seeder on 200 mm row spacings and using 25 mm knifepoints. The trial was managed according to best practices with regards to pests, weeds and disease control. Nitrogen applications were based on crop requirements determined by a deep N soil test in the autumn, soil type, and yield estimates made in August (assisted by Yield Prophet). Crop details and applications for each site are listed in Table 1.

Table 1. Agronomic and management details for Westmere and Inverleigh sites.

	Westmere		Inverleigh	
Previous crop	Wheat		Field Peas	
Soil type	Clay, 1.7% Org C		Sandy Loam, 0.98% Org C	
Sowing date	28 May 2013		24 May 2013	
Soil N (0 – 50 cm)	26 July 2013	189 kg N/ha	26 July 2013	253 kg N/ha
N applications	28 May	MAP 80 kg/ha (8N)	24 May	MAP 60 kg/ha (6N)
	28 August	UAN 135 L/ha (57N)	27 August	Urea 100 kg/ha (46N)
	17 Sept (feed only)	Urea 100 kg/ha (46N)	13 Sept (feed only)	Urea 100 kg/ha (46N)
	Total N	300 kg N/ha	Total N	351 kg N/ha

The nitrogen management was based around achieving acceptable grain protein for the malting barley trial and achieving a 10 t/ha yield target for the feed varieties. This yield was based on what was felt to be achievable given the season up to the beginning of September 2013 and the forecast for the next three months. Ultimately, the grain protein in the feed barley trial would give us the best indicator of how close we had come to optimising nitrogen input.

Results

The dry summer followed by a decile 7 growing season rainfall at the Inverleigh site meant that we were able to optimise yield potential as we had minimal waterlogging over the winter, excellent October rainfall and no extremes of temperature. After a late break to the season and warmer than average winter temperatures, crops grew well through the winter and developed deep root systems which would help them find moisture at the end of the season in November. Disease levels were kept under control with two fungicides timed at GS32 (second node) and GS49 (awns emerging). The perennial issues of ryegrass and wild radish were well controlled with Boxer Gold PSPE and a post emergence application of Jaguar in June.

The previous crop of field peas had left us plenty of residual nitrogen in the soil (253 kg N/ha) but in order to achieve our target yield, two applications of urea were applied in August and September. A grain protein of 11.5% is a good indicative level to assess previous nitrogen management, albeit retrospectively, and with an average of 11.9% at the Inverleigh site we had judged the amount and timing almost perfectly. The variety Oxford yielded highest at both sites, showing that it really is the current variety of choice if you're going all out for yield of feed barley in the HRZ. All other varieties were very similar in yield, with only Navigator not yielding lower statistically than Oxford at Inverleigh.

Feed

The weather at the Westmere site was very similar to the Inverleigh site with slightly less winter rainfall giving a decile 6 growing season. Disease levels were kept under control with two fungicides timed at GS32 (second node) and GS49 (awns emerging). The ryegrass and wild radish were well controlled with Boxer Gold PSPE and a post emergence application of Precept in June.

The trial was following a previous wheat crop and so residual soil N levels were lower than at Inverleigh at 189 kg N/ha in the top 50 cm, in July. In order to achieve our target yield of 10 t/ha, we applied an additional 103 kg N/ha over two applications in August and September. Unlike the Inverleigh trial, the grain protein figures (especially for Oxford and Navigator) would suggest we still didn't apply enough N and more yield was left in the paddock. Yields were still very respectable and only Henley was statistically (P=0.1) lower yielding than Oxford, Navigator and GrangeR.

Table 2. Feed barley variety performance across Inverleigh and Westmere sites.

	Inverleigh					Westmere			
Variety	**Yield (t/ha)**		**% of site mean**	**Protein (%)**		**Yield (t/ha)**		**% of site mean**	**Protein (%)**
Oxford	10.70	a	108	11.1	c	9.62	a	103	10.6
Navigator	9.99	ab	100	12.3	ab	9.38	a	100	10.6
GrangeR	9.75	b	98	12.7	a	9.39	a	100	11.9
Westminster	9.75	b	98	11.7	bc	9.23	ab	99	11.1
Henley	9.52	b	96	11.7	bc	9.16	b	98	11.1
Mean	**9.94**			**11.90**		**9.36**			**11.07**
LSD $_{(P=0.05)}$	**0.72**			**0.90**		**0.41 $_{(P=0.1)}$**			**NS**
CV	**4.69**			**5.10**		**4.04**			**7.14**

Means followed by the same number do not significantly differ (P=0.05). NS=not significant.

Malt

Growing barley for malt is rewarded with a premium over feed but this premium can often come at a cost, and the cost is often yield. This is because for any variety, nitrogen is a key driver of yield and hence gross margin and when growing malt barley grain protein must be below 12% to gain Malt1 grade. This is normally achieved by limiting the amount of nitrogen supplied to the crop and secondly applying it early enough so it is used up by the plant producing yield rather than being laid down in the grain as protein.

All the varieties grown in the Inverleigh malt trial made Malt1 grade but average yields compared to the feed barley were over 2.3 t/ha less, for an additional $50/ha for a urea application in September. The two varieties which were statistically (P=0.05) lower yielding than the highest yielding three varieties were being widely grown up until a few seasons ago namely; Gairdner and Commander. It is interesting to note how well the barley varieties from Nickerson seeds in the UK have performed. We have GrangeR, Westminster and Oxford all of which are top performing varieties. GrangeR and Westminster have both yielded statistically the same in all the malt and feed barley trials at both sites in 2013 with average yields of 8.91 t/ha and 8.7 t/ha respectively.

At the Westmere site the average yield for the malt trial was nearly 0.7 t/ha more than at the Inverleigh site which may have been as a result of using a higher rate of nitrogen in August as UAN and the ability of the heavier soils with higher organic carbon levels at Westmere providing more mineralised nitrogen later in the season.

Table 3. Malt barley variety performance at Inverleigh site.

Variety	Yield (t/ha)		Protein (%)	Test Weight (kg/hl)	Retention (%)	Screenings (%)	Grade	Gross Margin ($/ha)
SY Rattler	7.98	a	10.5	67.4	89.1	2.3	MALT1	1818
GrangeR	7.87	a	10.9	69.5	95.3	1.0	MALT1	1789
Henley	7.83	a	10.7	67.0	96.3	1.0	MALT1	1779
Bass	7.53	ab	11.9	68.1	97.8	1.0	MALT1	1700
Westminster	7.49	ab	10.8	68.7	95.3	1.5	MALT1	1690
Flinders	7.48	ab	11.6	69.2	95.3	1.0	MALT1	1687
Commander	7.28	b	10.5	67.6	94.8	1.8	MALT1	1635
Gairdner	7.08	b	11.1	67.9	91.1	2.0	MALT1	1583
Site mean	**7.57**		**11.0**	**68.2**	**94.4**	**1.5**		**1710**
LSD $_{(P=0.05)}$	**0.52**		**0.6**	**1.5**	**2.3**	**0.7**		
CV	**4.61**		**3.82**	**1.52**	**2.02**	**31.04**		

Means followed by the same number do not significantly differ (P=0.05).
Grain prices for Malt1: $261/t; Feed1: $223/t. (Delivery to Geelong Port. Source: Profarmer Australia 2/1/2014)
Average variable costs at Inverleigh site: $265/ha.

Table 4. Malt barley variety performance at Westmere site.

Variety	Yield (t/ha)		Protein (%)	Test weight (kg/hl)	Retention (%)	Screenings (%)	Grade	Gross Margin ($/ha)
GrangeR	8.63	a	11.0	65.7	95.3	2.5	MALT1	1852
Henley	8.59	a	10.4	64.2	97.3	1.0	FEED1	1516
Westminster	8.33	ab	10.3	66.9	95.3	1.8	MALT1	1774
SY Rattler	8.23	bc	10.0	67.2	92.3	3.3	MALT1	1748
Commander	8.23	bc	10.4	66.5	96.0	1.5	MALT1	1748
Gairdner	8.06	bcd	10.6	67.3	92.8	2.3	MALT1	1704
Bass	7.99	cd	10.8	67.2	96.8	1.3	MALT1	1685
Flinders	7.90	d	10.4	67.3	96.5	1.5	MALT1	1662
Site mean	**8.24**		**10.5**	**66.5**	**95.3**	**1.9**		**1739**
LSD $_{(P=0.05)}$	**0.32**		**1.2**	**1.8**	**1.9**	**0.9**		
CV	**2.68**		**7.80**	**1.83**	**1.37**	**32.40**		

Means followed by the same number do not significantly differ (P=0.05).
Grain prices for Malt1: $261/t; Feed1: $223/t. (Delivery to Geelong Port. Source: Profarmer Australia 2/1/2014)
Average variable costs at Westmere site: $400/ha.

Commercial Application

Figure 1 below has been put together to look at long term yields of varieties that have been grown over at least four seasons in NVT and SFS variety trials to help growers and advisers choose a variety which has been grown in the Western Districts. Oxford has consistently yielded well across SFS and NVT trial sites based in Inverleigh, Lake Bolac and Hamilton over the last 5 years.

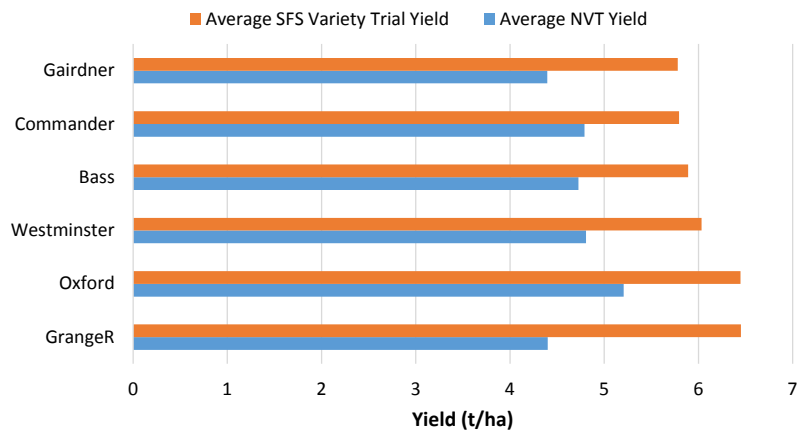

Figure 1. Yield performance of barley varieties in the Western Districts of Victoria (average of SFS and NVT yields 2009-2013).

SFS has initiated some comparison trials between feed versus malt barley over the last two seasons to look at whether it is more cost effective to grow a high yielding feed variety like Oxford, or a malt variety like Westminster or even the possibility of growing a variety like Westminster or GrangeR for yield and seeing if it makes malt at harvest.

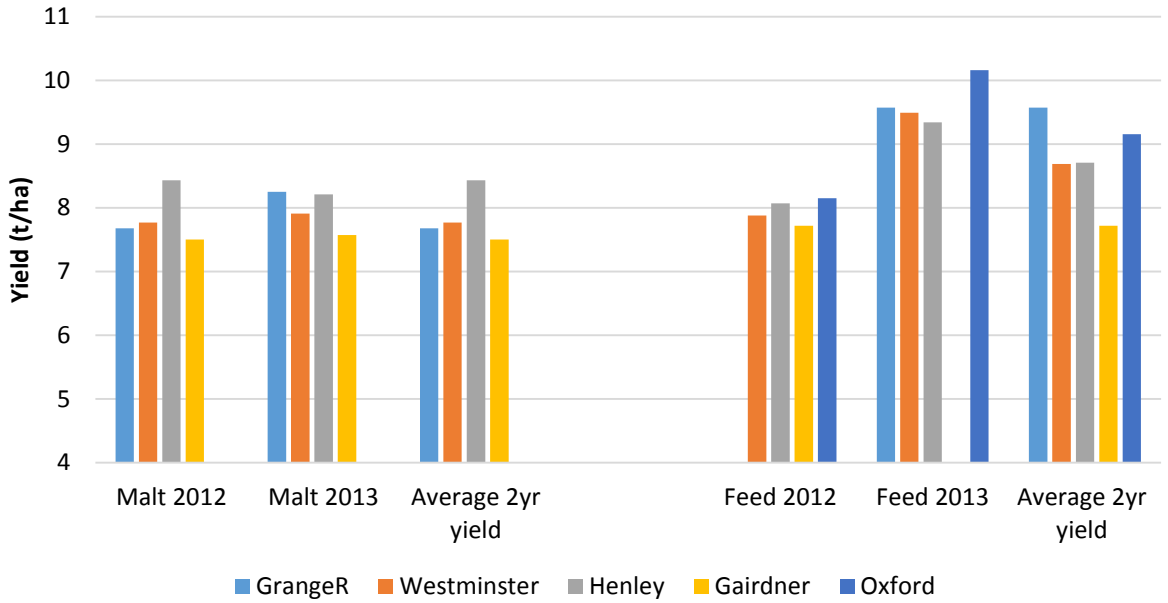

Figure 2. Yield of barley varieties grown for malt or feed (average of Inverleigh and Westmere sites 2012-13).

In the malting barley trial the yields from Figure 2 show little variation in yield from one season to the next with an average yield in 2012 of 7.9 t/ha between the four varieties in the trial compared to 8.0 t/ha in 2013. This helps to illustrate how constrained you are as a grower of malting barley in terms of increasing yield potential when you get a season as good as 2013.

In the feed barley trial the difference between the two seasons becomes a lot more obvious. An average yield between the four varieties of 8 t/ha in 2012 increasing significantly to an average of 9.6 t/ha in 2013. So the two year difference between malt versus feed is 1 t/ha – which is "the right choice"?

Gairdner was included in 2012 as a control variety but was replaced in 2013 with Oxford as the standard, with GrangeR being included in the feed as well as the malt trial. As mentioned in "Additional Information" at the end of this report, Henley has now been withdrawn from the market which is a shame given its performance. Figure 3 below allows you to do your own calculations.

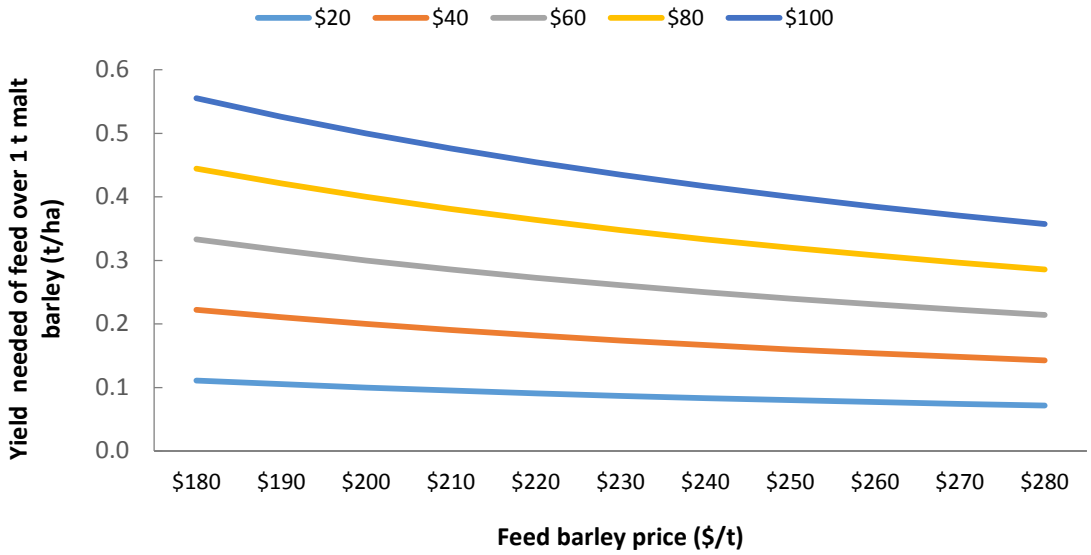

Figure 3. Equivalent yield advantage of feed barley (t/ha) required to return the same profit as 1 t of malting barley with the same input costs

Scenario: You deliver 100% of your malting barley as malt grade and receive the full malting premium (i.e., no discounts). Using Figure 3, at a feed price of $200/t and a malt premium of $40/t, feed barley needs to yield 0.2 t/ha more than 1 t/ha of malting barley for the same gross return or 1 t/ha more if your malt crop yields 5 t/ha.

As a general rule, as the feed barley price increases, then the extra yield required from a feed barley decreases. However as the premium for malting barley increases, then the extra yield required from a feed barley increases. There are also additional costs involved in getting higher yields, but in the SFS trials looking at malt versus feed we have only applied $50/ha more in nitrogen costs and all other costs have stayed the same. On the reverse there are far higher risks of price reductions at receivals for malt barley compared to feed barley.

Acknowledgements

This project was funded by SFS members. Special thanks to Graeme McCrow and John and Stew Hamilton for providing land for these trials.

Important Notes

Henley has been withdrawn from the market by Heritage Seeds due to the risk of blue aleurone. It will not be offered for sale in 2014.

SY Rattler and Flinders are not fully malt accredited, but are due to become so in 2015.