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Wheat quality and wheat variety decisions

By Mark Stevens, Regional Economist, Geraldton

The choice between which wheat variety to plant has always been a trade-off between yield and wheat quality.

When wheat prices were higher and quality payments were less, quality considerations were of little importance and varieties were selected almost entirely on yield potential.

Now, with low wheat prices and a greater emphasis on wheat quality from our customers, growers must place more importance on quality characteristics when selecting varieties. For example, should a grower select a higher yielding, average quality wheat such as Spear, or a lower yielding, good quality wheat such as Machete?

The important question a wheat grower needs to ask for each paddock cropped to wheat each year is:

"At the time I will be seeding this paddock, which variety is likely to give me the combination of yield (quantity) and quality (grain protein) which will maximize my profit?"

Figure 1. Payments for wheat quality

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Spear 1.55 t/ha
Machete 1.50 t/ha

Figure 1 compares the gross margins for Spear and Machete wheats sown at the same time and under the same conditions. Spear is expected to yield 1.55 t/ha while Machete is expected to yield less, at 1.50 t/ha.

For Spear, an Australian Standard White (ASW) variety, the gross margin increases from $23.00 per hectare at 7 per cent grain protein to $46.00 per hectare at 10 per cent grain protein. This is because the premium paid rises by $5.00 per tonne for each 1.0 per cent increase in protein between 7.0 per cent and 10.5 per cent.

The graph for Spear also shows that the premium falls from $5.00 to $3.00 per tonne between 10.5 per cent and 15.0 per cent protein.

While Machete is accepted into the ASW pool, the gross margin is lower because of the lower yield. But the gross margin increases at the same rate as that of Spear as the grain protein level increases. However, Machete is a variety of superior quality, and when its grain protein level reaches 11.5 per cent or more, Machete deliveries will be accepted into the Australian Hard (A. HARD) category.

Figure 1 shows that an anticipated bonus of $10.00 per tonne for the A. HARD category, relative to the ASW category, lifts the gross margin for Machete above that of Spear at the same protein level, even though Machete’s yield is lower. As the protein level increases further, Machete attracts a premium for grain protein at the A. HARD rate, which in this example is $4.00 per tonne for each 1 per cent above 11.5 per cent.
Payment for wheat quality

There are two types of payment for wheat quality:

- Payment for protein — a premium
- Payment differences between pools and varieties — a bonus

Protein premiums are consistent for most varieties. As the percentage grain protein level increases, the price per tonne increases at a similar rate.

Bonuses reflect differences between varieties over a range of protein levels. The quality characteristics of a variety can result in it being accepted into a different category (pool or segregation) which attracts a higher price per tonne. Some pools have threshold levels of protein which must be achieved before the wheat is accepted into the higher category. (see Figure 1).

Risk and uncertainty

There are three main areas of risk when wheat growers select a variety to plant:

- The amount of the pool bonus
- The grain protein level achieved
- The downgrading of the delivery

For each of these points, growers must ask:

- What are the potential benefits of selecting this variety?
- What are the potential costs of selecting this variety?
- What is the probability of realizing the benefits?

Pool bonuses

Pool bonuses are not known with certainty when the crop is sown. For two varieties sold in separate pools, the pool bonus is the difference between the Net Pool Returns (NPR) of the two pools. The size of this bonus will not be known until both pools are finalized.

Growers therefore use estimates of the pool bonus when making their decisions. This market information is available from the Australian Wheat Board and the Department of Agriculture.

Assessing risk

Growers should obtain three estimates of the pool difference:

Figure 2 also shows a comparison between Spear and Machete wheats. The graph shows the gross margin for Machete at three levels of pool bonus: $3.00 per tonne, $10.00 per tonne and $17.00 per tonne.

At the specified yields, the most likely outcome is significantly better than the ASW variety (about $10.00 per hectare at 12 per cent protein) and even at the worst case outcome, the gross margin is only $1.00 per hectare lower (at 12 per cent protein) than that of Spear.
Figures 3a and 3b. Consequences of different protein levels

**Figure 3a**

- **Spear** 1.55 t/ha
- **Eradu** 1.47 t/ha

**Figure 3b**

- **Kulin** 2.12 t/ha
- **Tincurrin** 2.14 t/ha

The yields, prices, grain protein premiums and category bonuses used in these examples are for illustration only. The comparisons between the different varieties mentioned will vary from district to district. Growers should contact their local Department of Agriculture district office to obtain the latest yield comparison and price information.

- The largest likely bonus outcome — 'Best case'
- The smallest likely bonus outcome — 'Worst case'
- The most likely bonus outcome — 'Most likely'

With these three estimates, a grower is better able to assess the potential benefits and potential costs of that wheat crop and probabilities of a particular outcome (see Figure 2).

**Grain protein**

The risk in selecting a variety on its grain protein levels is in estimating the range of possible protein levels into which wheat from a particular paddock is likely to fall.

For ASW, A.HARD and Noodle Segregation (NS) varieties, a high grain protein level is preferred, and the premiums increase as the grain protein level increases. For wheat varieties to be accepted into the Australian Soft (A.Soft) pool, low grain protein levels are required, and the premium decreases as the protein level increases (see Figures 3a and b).

Again, the probability of the different outcomes is important in determining the best variety to select.

For the example shown in Figure 3a, if a grower believed that the protein level was unlikely to exceed 10 per cent, the best variety would probably be Spear. The potential benefits from selecting Eradu if the grain protein level exceeds 9.5 per cent are similar (about $9.00 per hectare) to the potential costs if it does not. Therefore the probability of the grain protein level exceeding the Noodle Segregation threshold would need to be 50 per cent or greater, which in this case it is not.

For the comparison in Figure 3b, Tincurrin is much more profitable than Kulin at lower protein levels ($26.00 per hectare at 8 per cent) while for a protein level above 10 per cent, Kulin is more profitable ($8.00 per hectare). Given the relative differences, a farmer would need a high probability (75 per cent or greater) of protein levels exceeding 10 per cent to make Kulin the best choice.

Grain protein level is influenced by: season, rotation, time of sowing, disease, weeds, rainfall (especially during grain filling), nitrogen supply,
soil type, and variety. A grower can apply nitrogen fertilizer to increase grain protein, but at the current protein premiums, the increased income is less than the cost of the fertilizer.

Wheat growers can best influence protein levels through the choice of rotation and soil type. Legume rotations (good medic or clover pastures, lupins or field peas) increase the nitrogen status of the soil, and provide a break from disease and grass weeds, which can reduce soil nitrogen.

Clay soils retain more nutrients on average but sandy soils can produce good grain protein if the fertility is built up. By matching the variety to the soil nitrogen supply (for example, growing hard wheats in more fertile soils) and to the sowing time, growers can maximize both yield and quality for a given season.

Assessing risk

Where there is a higher likelihood of low grain protein, growers should select ASW varieties which will not be excessively penalised for low grain protein. This would mean early sown crops with high potential yields and paddocks with low to moderate levels of available soil nitrogen.

Where there is a lower likelihood of low grain protein, growers should select varieties which are most profitable at the higher protein levels. This would mean later sown crops with lower potential yields and paddocks with high levels of available soil nitrogen.

Down-grading

A variety can be down-graded from its optimal category to a lower category because of poor quality characteristics such as fungal staining, low hectolitre weight (HLW) or high screenings of small grain.

Fungal staining has caused varieties to be down-graded from a premium category to a GP category. The varieties Eradu (NS), Gutha (A. HARD) and Corrigin (A. SOFT) have shown a relatively high incidence of fungal staining.

Another quality characteristic which results in down-grading of some deliveries is low hectolitre weight. Variety (for example Gamenya) can be one cause of low hectolitre weight, but root and leaf diseases, frost damage, a dry seasonal finish or excess nitrogen fertilizer (especially on late sown crops) can also reduce hectolitre weight to below the limit of 74 kilograms per hectolitre.

Figure 4. Consequences of downgrading

Figure 4 shows the consequences of the variety Eradu being down-graded to the GP1 pool for excessive fungal staining. The graph compares the gross margins for Eradu which is accepted into the noodle segregation (Eradu NS) and for Eradu which is down-graded to GP1 category (Eradu GP1).

The potential benefits for grain protein levels above 9.5 per cent are about half the size of the potential costs (plus $9.00 per hectare compared with minus $17.00 per hectare relative to Spear). The probability of fungal staining would have to be relatively low, at about 33 per cent (one year in three) or less, to justify selecting Eradu rather than Spear at these relative yields.

Assessing risk

Growers should compare the potential benefits of a variety at the premium category and the potential costs of the variety at the down-graded category (see Figure 4).

Conclusion

In comparing different wheat varieties, a grower’s aim should be to select the variety which has the best combination of yield and quality to give the maximum return per hectare.

Variety selection involves a trade-off between profit and risk. To assess risk, a grower must estimate the potential benefits and the potential costs of selecting the variety. When the potential benefits and costs are compared they can indicate the probability required to justify the selection of the variety. □