PURCHASING WHEAT ON A QUALITY BASIS: TECHNICAL ASPECTS

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ABSTRACT

Each of the aspects of wheat quality, purity, milling value and dough strength contribute to the intrinsic value of a parcel of wheat. An increase in milling potential from a flour yield of 75 per cent to one of 80 per cent adds approximately $10 per tonne to the value, while an increase from ten per cent protein to twelve per cent may add value of the order of $20 per tonne. Actual prices on world markets are governed by many other factors and often are quite different to the intrinsic value.

INTRODUCTION

There are three distinct components of the intrinsic value of a particular lot of wheat. These are the physical qualities, the milling value and the price commanded by the flour. To some extent these factors interact. For instance, physical test are carried out largely because of their relationship to milling value and the milling yield itself, if taken beyond a certain point, becomes inversely related to flour quality.

The price commanded by wheat on the world's markets is often quite different to the intrinsic value, being affected mainly by events environmental, commercial and political in the northern hemisphere. Freight rates and the relative supply and demand of different grades of wheat also serve to distort the price structure.

PHYSICAL COMPONENTS OF INTRINSIC VALUE

Most grading systems take into account bulk density, moisture content of the grain, hardness impurities, broken and shrivelled wheat grains and soundness. In most cases a tolerance level is set, beyond which a discount is applied or the grain is declared unfit for receival into storage. Most of these standards are set because of their relationship with ability to store the wheat safely, with milling value or with flour quality.

The various aspects of soundness require special vigilance, as heat damage, sprout damage or bug damage can render wheat quite useless for processing.

MILLING VALUE

There are two main components of milling value and the yield of flour of acceptable quality which may be achieved with the available equipment and the rate at which the wheat can be milled without difficulties arising such as choking of the conveying system or overloading of sieves.

Flour yield may be limited by low endosperm content, as flour is finely ground endosperm. Yield may be limited by excessive hardness of the grain, making if difficult to reduce to flour fineness with the available equipment. It may be limited by excessive softness causing difficulties with the flow of intermediate products in the mill. If the sub-aleurone endosperm does not readily separate from the outer, branny layers either because of hardness, excessive moisture or thick outer endosperm cell walls, there will be a loss of yield. Sieving problems, either through blocking by cell wall material, or too fine or too moist stocks, can also limit the milling value as the rate of feed of wheat into the mill will have to be reduced to allow efficient dressing of stocks.

Mixtures of grain of differing milling requirements can result in a lower yield than if the components were milled on the merits of each separately. Sustained uniformity of a grist over a long period is important if a flour miller is to make the most of his raw materials.

Value itself in monetary terms may be gauged by assuming a price of say $350 per tonne for flour and $150 per tonne for mill offal. The products of milling a tonne of wheat will be worth $10 more if 80% flour and 20% offal is achieved than if 75% flour and 25% offal, assuming comparable moisture levels.

As there is an optimum moisture level at which each lot of wheat should be milled, the moisture content of the original wheat must affect the economics of milling it. The clean wheat content of the delivery is also of interest.

When the yield potential of the wheat has been reached, the quality, and hence the value, of the flour declines when additional flour extraction is attempted. Excessive starch damage with heavier grinding detracts from flour quality. Poor colour due to difficulty in excluding fine particles of bran and germ is the main manifestation of excessive milling yield. Some flours milled in New Zealand show obvious signs of unacceptably high extraction.

PRICE OF FLOUR

Many factors affect the price commanded by flour. Price is related to grade. In some countries prices are fixed for each grade, the grade being determined by such factors as ash content or falling number. In other circumstances there may be specifications based on particular physical tests such as paste viscosity (Amylograph), mixing requirement (Farinograph) or stretching properties

(Extensograph). Protein content, colour grade, ash content, moisture or some other particular test may be specified. The actual value of a wheat which will furnish flour to meet these specifications is obviously much greater than that of wheat which will not. Furthermore, a wheat with sufficient quality above the minimum to carry the inferior wheat will be worth even more. In New Zealand the limiting factors seem to be high alpha amylase activity, inadequate inherent strength in the gluten and inability of some wheat to furnish an economic yield of flour without loss of colour and dough strength, associated with inclusion of bran specks and particles of germ in the flour.

The most important constituent governing the price and quality of wheat flour is the protein content. Wheat protein or gluten governs many of the other test responses as it is the component which confers the unique qualities of wheat flour dough. Bread quality increases with protein content at least up to 14 per cent protein. Higher prices may be charged for bread with protein content above a certain statutory minimum in some countries. Adequate gluten content also confers processing tolerance on doughs, a necessary characteristic with many breadmaking procedures.

A value for protein may be derived in a number of ways. The permitted premium on protein-increased bread gives one indication. The price of dried gluten, $1.50 per kilogram, provides a direct measure, although indigenous gluten is preferred to added gluten. Grades such as Dark Northern Spring, Canadian Red Spring, or Australian Prime Hard command a premium of the order of $10 per tonne per one per cent protein increment over base grades such as Western White, Hard Winter Ordinaries or Australian Standard White. Some of this premium may well attach to superior milling value and higher inherent strength of the gluten. Nevertheless the figure is consistent with the price of dried gluten.

DETERMINATION OF MILLING VALUE

Milling Value may be estimated by such tests as particle size index, thousand kernel weight and neutral detergent fibre taken together. Varietal reputation is also useful. For accurate assessment there is no alternative to a milling test. Mills such as the Allis Chalmers test mill, properly clothed, fitted with entoleters and augmented with a bran finisher provides the best measure of the combined factors which add up to milling value. In this context it is essential that a yield of the same order as commericial yields be achieved as the quality of the flour must also be determined. The relationship between milling yield and flour quality over the range of interest should also be noted.

Fortunately assessment of flour quality is more straightforward and the methods are much more established than those for milling quality. The reputation of the wheat variety provides a useful initial indication when taken in conjunction with the protein content.

CONCLUSION

The three essential factors to include in any schedule of intrinsic values for wheat are its purity, milling value and protein content. Assuming an acceptably clean flour substantially free from non-endosperm material and undesirable enzyme activity, each extra kilogram of flour which can be achieved is worth 20c in round figures and each kilogram of gluten $1.50 in an area such as New Zealand where low gluten content is a factor limiting the value of wheat. Of course these remarks are modified by such variables as gluten quality, moisture content and purity. The value of protein is necessarily different in products other than bread.