1-1-1990

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The segregation of wheat for noodles

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The Western Australian segregation of wheat of selected varieties to cater for the requirements of the established Japanese noodle wheat market and an emerging market for this type of wheat in South Korea started in the 1989-90 season.

In this article, Graham Crosbie, who pressed strongly for this segregation, explains the background behind its introduction and the need to ensure its success.

Until the 1960s, Japan had traditionally used mainly domestic wheat for the production of white noodles. From the 1960s to the mid 1970s there was a rapid decline in domestic wheat production and an increased use of imported wheats for making noodles. During this period Japanese manufacturers recognised the high quality of Australian Standard White (ASW) wheat from Western Australia for the white Japanese noodle.

Japanese imports of ASW rose from between 300,000 and 400,000 tonnes a year during the 1960s to between 600,000 and 700,000 tonnes a year in the 1970s. These levels have remained up to the present time (Figure 1), despite a resurgence in Japanese domestic production from levels of less than 500,000 tonnes in the 1970s to about 1 million tonnes in recent years.

Most of the white noodles are now made from a blend of ASW and domestic wheat, although the domestic component is considered lower in quality than ASW (Figure 1).

Figure 1. Japanese imports of Australian wheat, 1974 to 1988 Japanese fiscal years (April 1 to March 31). Source: Japan Wheat Research Association reports.
Recognition of quality characteristics of ASW

Studies carried out in Japan during the 1970s associated the high quality of Western Australian ASW with its gluten (protein) quality and particularly the quality of its starch (Nagao et al., 1977; Oda et al., 1980). These qualities largely reflected those of Gamenya, the main variety grown in Western Australia from 1965-66 to 1985-86. Similar qualities have been recognised in Eradu, a variety released in 1982 (Figure 2).

Reduced sowings of prime noodle varieties

Sowings of Gamenya have declined substantially in recent years as growers changed to higher yielding wheat varieties. Although this decline has been partly offset by the emergence of Eradu, combined sowings of the two varieties (as a percentage of total wheat sowings) halved in the five years to 1988-89, the season before the introduction of the noodle wheat segregation (Figure 3).

While the receipt of Gamenya remained high, the Australian Wheat Board had a relatively easy task in ensuring high quality shipments to Japan. With its decline, the levels of Gamenya and Eradu had to be monitored closely at individual receipt points to ensure that those points with highest levels were selected for shipment to Japan. Shipments also had to be matched with the protein requirement of the Japanese market - preferably about 10.5 per cent.

During the period of decline in production of prime quality, soft-grained noodle varieties, the hard-grained Halberd and Gutha proved useful complimentary varieties. Shipments to Japan have always contained a component of
hard wheat and these two varieties are the best available because of the quality of their starch. However, Japanese millers prefer mainly soft-grained wheat for the white noodle and by 1988-89 they had observed a decline in quality of ASW due to its increased component of hard wheat.

Another concern to Japanese millers was a lowering of protein levels to 10.0 per cent and less in recent seasons. This reflected not only the lowering of protein in Western Australia because of seasonal effects, but also less flexibility in selection for protein level on a receipt point basis because there were fewer receipt points containing enough Gamenya and Eradu.

The decline in production also presented another problem, because the Australian Wheat Board had recognised an emerging market for this type of wheat in South Korea. A substantial increase in production of noodle wheat would be needed to cater for both the Japanese and South Korean markets.

The likelihood of increased competition

During a visit to Japan in November 1988 sponsored by the Australian Wheat Board, a technical group comprising G. Crosbie, D. Miskelly and T. Dewan learned of a renewed emphasis being given to quality improvement by Japanese wheat breeders. The quality of their domestic wheat had declined during the period of increased production from the mid 1970s and breeders were now giving increased attention to quality, particularly for the end-use for which this wheat had traditionally been used, the Japanese white noodle. Of particular significance was their objective to improve quality toward that of Western Australian ASW.

A further initiative learned about during 1988 was the introduction of a wheat segregation in Japan, into which was placed the better quality noodle wheat from the domestic production.

Also in 1988, while on a visit to the United States, the author was advised of quality research that had been conducted at Pullman, Washington, in the Pacific Northwest region - the home of U.S. Western White. This research had involved the reconstitution and interchange of components fractionated from Western Australian ASW and various U.S. wheat classes, including Western White.

The study showed that when starch separated from flour milled from U.S. soft white wheat was replaced by starch from ASW, it resulted in a substantial improvement in quality of the U.S. flour for Japanese noodles. The importance of the starch component was already known to Australian and Japanese cereal chemists and breeders, but here was a major competitor for the Japanese market that had also recognised the quality advantages of ASW and was taking positive steps to determine how the quality of its wheat could be improved.

By the end of 1988, the Western Australian wheat industry was faced with a number of predicaments:

- A pronounced downward trend in the production of prime quality noodle varieties;
- Increased difficulty in supplying the needs of the long-established and highly valued Japanese market;
- An observation by that market of a recent slight deterioration in quality of the wheat being supplied;
- Increased attention being given to the development of better quality noodle wheats by Japanese wheat breeders;
- Another major competitor for the Japanese market, the U.S.A, carrying out research to determine how to match the quality of our wheat.
A need to increase production to cater for an emerging market for noodle wheat in South Korea.

Changes had to take place quickly to ensure continued supplies of high quality wheat to Japan and to maintain Western Australia’s lead in that market.

What was needed was a plan to increase production of the existing high quality varieties, Gamenya and Eradu, or at least to halt the decline in their production, until newer, higher yielding noodle varieties were released. There was hope that a new high yielding, soft-grained wheat, Reeves (then known as 79W:783), may prove suitable in quality for noodles, but this was not assured. (Reeves needs further testing to assess its suitability for inclusion in this segregation.)

Segregation should be introduced immediately to concentrate the dwindling supplies of Gamenya and Eradu wheat. It was also essential that growers receive an incentive to encourage increased sowings of these two varieties. The payment of an incentive was logical. With segregation, the wheat quality would improve and it was reasonable to expect that a premium payment to growers would result. But Gamenya and Eradu were outyielded by other ASW varieties by at least 5 to 10 per cent in most areas of the State. To maximise production, it was important that the premium over ASW should reflect the true market value of this wheat.

**Noodle wheat segregation in 1989-90**

The plan that was implemented in 1989-90 was based largely on the deliberations of a sub-committee appointed by the Western Australian State Wheat Advisory Committee. Details of the arrangements were not finalised until after growers had completed their seeding operations, although by that time there was a substantial expectation that a scheme based on the varieties Gamenya and Eradu would apply in the coming harvest.

The selection of receival points at which the segregation was to be carried out was based on expected deliveries of Eradu and Gamenya (from area sown data) and the ability to segregate at those points. A minimum delivery of 1,000 tonnes was used as a guideline in the selection of points. More than 50 points were selected, and all but one, Albany, were in central or northern areas, reflecting the relatively lower yields of Gamenya and Eradu compared with other varieties in southern areas.

Kazue Tanaka, of the Department of Agriculture, assessing the eating quality of boiled Japanese noodles made from Western Australian ASW wheat. Judging by her smile, they taste terrific.

Rather than create a new class of wheat, the Australian Wheat Board decided to treat the noodle wheat segregation as a grade of ASW. Growers received an incentive in the form of a variety bonus, with growers of Gamenya which met the receival standard receiving a bonus of $7 per tonne and those with Eradu $4 per tonne.

The receival standards were almost identical to those applying to ASW, but a minimum protein standard of 9.5 per cent, with no upper limit, was also applied.

The 1989-90 season also saw the introduction of a quality payment scheme operating within the ASW class, in which growers received payment according to the protein levels of individual loads. A sliding scale which gave increased payments up to 14 per cent protein content was also applied to noodle wheat.

Before the segregation started, an estimate was made of potential receivals of Gamenya and Eradu with a protein level of 9.5 per cent and above in the Geraldton and Fremantle port zones. Although not all of the eligible wheat was segregated, the estimate of 450,000 tonnes gave a guide to the final result which totalled 390,000 tonnes.

The tonnage received was less than that required for the Japanese market, but this wheat served as a firm base into which specially selected ASW wheat was carefully blended.
The future

The plan to implement the new noodle wheat scheme was, through necessity, developed over a very short time. Over the next few years all aspects of the scheme will be closely reviewed to ensure its success. The present system of incentives and the current ties between the noodle segregation and the ASW class need close attention.

The present system of incentives has several weaknesses. Of particular concern is the incorporation of the payment for protein scheme which applies to ASW wheat. The aim of this payment scheme is to give a market signal to growers that high protein can be equated to high quality. This is the case for most end-uses of ASW, but not to wheat for Japanese noodles. The protein requirement in wheat for this end-use is about 10.5 per cent, and wheat containing 12.5 per cent protein is of lower quality. With the system of payment that applied in the 1989-90 season, growers who delivered into the noodle wheat segregation at a protein level of 12.5 per cent received $4 per tonne more than those who delivered at 10.5 per cent. Those fortunate enough to deliver at 14 per cent protein would have received an additional $3.

One argument in support of the higher payment for higher protein was that this wheat would be particularly useful to upgrade lower protein wheat, of which there had been considerable amounts in recent seasons. There is a good argument for paying more for high protein grain than low protein grain in a low protein season, but the reverse would apply in a high protein season, and high protein seasons will occur again. In no situation, however, can a case be made to pay more for noodle wheat at protein levels higher or lower than the optimum of 10.5 per cent.

A better scheme would be to disregard the protein scale for noodle wheat, to apply upper and lower protein receival limits, and to channel all of the premium into variety. The variety is the key to the noodle wheat segregation. It is the variety that largely determines the starch and protein quality characteristics, which together distinguish Gamenya and Eradu from nearly all other current Australian varieties and from all other major wheat classes.

To maintain an average of 10.5 per cent protein, the upper and lower protein limits may have to be slightly varied from season to season according to protein expectations. During the 1970s, the Department of Agriculture regularly gave accurate predictions to the industry (generally to within 0.3 per cent) of the State average wheat protein level. These predictions were based on the sampling of crops several weeks before harvesting started.

A noodle wheat class

The best market signal to growers would be the price gained by marketing noodle wheat as a separate class, for which all receipts would be separately pooled.

The noodle wheat is a unique wheat type, with quality characteristics unlike ASW in Western Australia or any other State. It deserves to be marketed in its own right, and unshackled from the lower quality constraints and prices imposed by ASW.

Until production levels of noodle wheat reach those required, continued blending with specially selected ASW would be needed. For fairness, receipts from noodle wheat sales Western Australia is seeking to increase its production of noodle wheat to meet highly valued markets in Japan and South Korea.
would have to be apportioned to both noodle wheat and ASW pools.

*Expanding the area sown to noodle wheat*

The Australian Wheat Board favours an expansion of the area sown to noodle wheat and sowings of these varieties in other suitable areas. The Board is particularly keen for noodle wheats to again be grown in the Albany port zone. Some years ago, when Gamenya was grown widely in this zone, substantial quantities of wheat for Japan were shipped from Albany. However, increased production in southern areas depends on the development of new, higher yielding noodle wheat varieties.

Weather damaged wheat is unacceptable for noodle manufacture. For this reason some south coastal areas would not be favoured for the production of this wheat class.

*Attention to quality*

Excellence in quality should be the permanent aim for the noodle wheat segregation. This will need a continuing emphasis on quality in the breeding of new varieties and the enforcement of strict standards in determining their acceptability for the noodle wheat class.

Quality research will also have an important role. Wheat breeders need further information on the important quality requirements for noodles. New methods must be developed to select for these requirements at early stages in the breeding programme. The effects of environment and agronomic practices on quality are also important research areas.

Wheat varieties giving improved noodle colour must be developed. When Eradu was released it was thought that the whiteness of its flour would be a distinct advantage over the slight yellowness of Gamenya for the manufacture of white noodles. But as the level of Gamenya declined and varieties such as Eradu became more prominent, a change toward whiter noodles was noticed in Japan. This change was seen to be adverse, because the Japanese consumer had come to associate a creamy colour (due to the slight yellowness of Gamenya) with high quality. The opinion has also been expressed that extreme whiteness is not wanted because this may be associated with the use of bleaching agents, which is viewed unfavourably in Japan.

**Conclusion**

The timely introduction of the noodle wheat segregation has ensured that Western Australia will continue to supply high quality noodle wheat to Japan and, once production is increased, take advantage of other noodle wheat markets which are likely to develop.

However, further developments are needed in noodle wheat segregation, marketing, wheat breeding and quality research to ensure that Western Australia maintains, in the long-term, its reputation as the world's leading supplier of wheat for Japanese noodles.

**References**
