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Holding our edge in noodle wheat

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For many years, the Japanese milling and noodle industries have regarded Australian Standard White (ASW) wheat from Western Australia as the best in the world for the manufacture of white, salted Japanese noodles known as 'udon' (pronounced oo-don).

Recently, the Australian Wheat Board has also developed a significant market for this wheat type in South Korea, where it has been readily accepted for the production of Korean dried noodles.

The Wheat Board has estimated the total market demand from Japan and South Korea for this type of wheat to be 1.0-1.2 million tonnes, equivalent to about 20-25 per cent of Western Australia's total wheat production.

This article outlines the development of our noodle wheat industry and challenges for the future.

Reputation of ASW for udon

The reasons for the superiority of Western Australian ASW wheat were not recognised until the late 1970s, when Japanese cereal chemists identified the quality of starch in this wheat as different from other wheat types imported into Japan.

The role of Gamenya

The starch quality of Western Australian ASW largely reflected that of Gamenya, the main variety sown from 1966 to 1985. Although not widely recognised, this arose more by chance than design.

• Gamenya rose in popularity in Western Australia following a devastating epidemic of stem rust in 1963. Stem rust occurs relatively infrequently in this State, and Gamenya had the best resistance at that time.

• Gamenya’s development coincided with Japan’s need to import substantially larger quantities of wheat to offset a decline in domestic production, a traditional source of flour for udon.

• The main type of Gamenya grown in Western Australia differed from that originally developed by the University of Sydney. At release, Gamenya was considered a ‘hard’ or ‘semi-hard’ variety, but when introduced into Western Australia, it was a mixture of soft- and hard-grained types.

As a result of the Western Australian Department of Agriculture’s method of developing pure seed from a few plants, a soft-grained type was multiplied by the late J.T. Reeves for release to growers. This combined the quality traits of soft grain, medium dough strength, moderate level of yellow pigment, and high-swelling starch that were recognised later as important for udon.
While production of Gamenya in Western Australia remained high, so did the quality of ASW for udon. However, during the 1980s there was a marked change as growers replaced Gamenya with higher yielding varieties with poor quality for noodles. This was partly offset by the emergence of Eradu, a variety of similar quality to Gamenya.

**Call for segregation and separate pooling**

Between 1983–84 and 1988–89, the combined sowing of Gamenya and Eradu had dropped from 44 per cent of the total wheat area to only 17 per cent. This made it increasingly difficult to ensure enough of these key varieties was shipped to Japan. It also became difficult to meet the 10.5 per cent protein requirement of the Japanese market because fewer receival points had enough Gamenya and Eradu.

At the same time, the Japanese flour milling and noodle manufacturing industries had emphasised their reliance on the quality of Western Australian ASW. They had also reported a slight deterioration in the wheat quality received.

There had been some earlier discussion on the possible need to segregate wheat for the Japanese market, but no positive action had been suggested. Also, no market signal was being given to growers that Gamenya and Eradu were needed for the valuable Japanese market; the system was merely responding to what growers decided to grow.

At a wheat industry seminar in Perth in March 1989, the author called for the immediate introduction of a noodle wheat segregation to concentrate the dwindling supplies of key varieties, and to encourage increased production by the payment of market-driven incentives through the separate pooling of the proceeds from the sale of this wheat.

To maximise the market price, it was also recommended that noodle wheat should be promoted with its own class name, as a special wheat type, different in quality and application to ASW.

Although there was strong industry support for segregation, there was considerable disagreement by some sections on the suggestion for separate pooling. The main concern was that separate pooling would hasten the demise of the long-established, Australia-wide ASW pool.

The Australian Wheat Board decided to introduce the segregation in 1989–90, but opposed separate pooling, electing instead to pay varietal bonuses for Eradu and Gamenya. In the first year these were $4 for Eradu and $7 for Gamenya. By 1991–92, after calls for more appropriate payments and to encourage increased production, the AWB had increased bonuses to $12.50 for Eradu and $15 for Gamenya.

However, the bonus payment system had a weakness — bonuses were based on perceived yield differences and not on quality.
Production levels

Segregation has not resulted in increased production of the key noodle wheats Gamenya and Eradu, but the higher payments to growers in recent seasons have helped stabilise receipts.

Slightly less than 400,000 t of prime noodle wheat has been segregated each season since 1989-90, providing a firm base into which specially selected ASW wheat has been blended to meet the 1.0-1.2 million tonnes required. The ASW component contains highest levels of the varieties Halberd and Gutha which, although hard-grained, have the high-swelling starch needed for udon manufacture.

The segregation has enabled Western Australia to maintain its reputation as a supplier of high quality noodle wheat, while providing time for the development of new, higher yielding varieties.

Western Australian Noodle Wheat Growers' Association

Alongside wide industry support for segregation, there was considerable debate on the suggestion for separate pooling. Active support on the need for change came from a group of Mullewa growers led by John Hawkins, who in 1992 formed the Western Australian Noodle Wheat Growers' Association (WANGA).

WANGA aims to:
- represent the interests of noodle wheat growers in Western Australia;
Research into market requirements

In 1988, the author and two other quality specialists, Diane Miskelly of the Bread Research Institute and Tim Dewan of the AWB, visited Japan as members of an AWB-sponsored technical mission to study trends in noodle processing and wheat quality requirements, noodle assessment, and Japanese research.

Development of noodle expertise

Links with the Japanese milling and noodle industries were strengthened further through a visiting experts program developed by the Grain Products Laboratory. The program, which was jointly funded by the Grains Research and Development Corporation and major Japanese milling companies, involved a two-month visit by a noodle technologist from Nisshin Flour Milling Co. Ltd in 1990, and a similar visit by a noodle expert from Nippon Flour Mills Co. Ltd in 1991. The AWB helped arrange these visits.

The program emphasised a two-way exchange of information and expertise. Each expert learned of developments in noodle wheat in Western Australia and of new quality testing procedures used by the Grain Products Laboratory.

In return, each technologist provided excellent training for the Laboratory's staff in the making and quality assessment of noodles. As a result, potential noodle wheats arising from the Western Australian wheat breeding program can be assessed earlier and more thoroughly.

Rapid screening test

A significant breakthrough has been the development by the Grain Products Laboratory of the flour swelling volume (FSV) test, a rapid screening test for potential noodle quality that can be applied to early generation wheat crosses. This test uses less than 0.5 g of flour or wholemeal and more than 100 samples can be tested each day. The development of this test was supported by the Grains Research and Development Corporation.

Separate pooling was introduced in 1992-93 and ensured that returns to growers fully reflected what the market was prepared to pay for their wheat.

Development of links with Japanese market

As a result of the farmer input into the development of the noodle wheat industry, an excellent relationship exists between WANGA and the AWB.

In February 1993, the WA Government and the AWB jointly funded a visit to Japan and South Korea by officers of the two organisations and the Department of Agriculture. This visit was to establish direct links between growers and end-users of Western Australian noodle wheat, to inform the market of developments, and discuss the latest trends in requirements.

Quality research

Since the late 1970s, the Bread Research Institute of Australia at North Ryde in NSW has played a principal role in noodle research. This has included the development of testing facilities for different noodle types, and research into processing and end-use quality. The AWB has supported some of this research and has established close technical contacts with Japanese milling and noodle industries.

In more recent times, the Department of Agriculture's Grain Products Laboratory has contributed substantially to an improved understanding of market requirements and the introduction of new quality testing procedures.
Cadoux wheat

The development of the new variety Cadoux should significantly boost production of noodle wheat. This variety, which was released to registered seed growers in 1992, has its main application in medium and high rainfall areas of Western Australia. Quality testing by the Grain Products Laboratory and the Technical Committee of the Japanese Flour Millers' Association has confirmed Cadoux's high quality for udon. Boiled noodles produced from this wheat have excellent texture and are a bright, creamy colour.

Future developments and issues

Receival standards for protein content

Since noodle wheat segregation started in 1989–90, receival standards and payment scales for protein content have been the subject of considerable debate. In the first season of the segregation, the receival standard for individual loads was a minimum protein content of 9.5 per cent, with no upper limit. The payment scale for protein was identical to that for ASW, with payments increasing for higher protein content.

This arrangement was criticised because it gave incorrect market signals to growers. For most end-uses of ASW, higher protein content meant higher quality, but not with wheat for Japanese noodles, for which the requirement was 10.5 per cent protein. Growers who delivered wheat at say 12 per cent protein received higher payments than those who delivered at the level required by the market.

The lack of an upper protein limit also exposed the segregation to risk, because in a high protein season the segregated wheat could be too high in protein. The author suggested a system involving lower and upper protein limits, with the opportunity to vary these slightly according to expectations based on pre-harvest sampling.

By 1993–94, the receival standard for individual loads had been modified to include upper (11.5 per cent) and lower (9.5 per cent) protein limits. The payment scale for protein content had also changed, with payments increasing over the range 9.5 per cent to 10.5 per cent, and then held constant for values through to 11.5 per cent. Further refinements may include some scaling down of payments for loads above 10.5 per cent and approaching 11.5 per cent. A receival system based on wider protein limits and payments according to the average protein level of individual growers' deliveries is also being considered.

Australia-wide pooling

The call for introduction of separate pooling for noodle wheat had always been in relation to a pool from Western Australia, rather than for noodle wheat that may eventually be produced throughout Australia. However, when the AWB's support for separate pooling was announced in February 1992, it was indicated that this was for a national pool. Western Australian noodle wheat growers are concerned about several aspects of national pooling. They point out that the price achieved in sales to Japan includes a component associated with the reputation that has been developed over 25 years. Some Western Australian growers consider it unfair that others should share in the same premium pool.

They are also worried that there is no mechanism in place to regulate production in different States according to market demands. The Japan-South Korean noodle wheat market requires 1.0–1.2 million tonnes, a quantity that Western Australia is likely to produce regularly within a few years. If the market prefers Western Australian noodle wheat, why should surplus quantities produced in other States share in the same pool and dilute the return to Western Australian growers?
On the other hand, the AWB maintains that it is keen to encourage limited production of noodle wheat in other States, to insulate against adverse seasons in Western Australia.

The issue of national pooling is likely to be the subject of further debate as production levels increase in other States.

Over-production of noodle wheat
Apart from increased production interstate, Western Australia is fast approaching a situation of over-supply of noodle wheat. This will arise from the introduction of the new noodle variety Cadoux and other higher yielding varieties in the near future.

AWB forecasts of likely returns for different levels of production will have a significant influence on growers’ sowing intentions. Also, WANGA will have an important role in communicating with its members on the mix of noodle and non-noodle varieties that should be sown.

Future market price
Western Australian noodle wheat is the main category of Australian wheat imported by Japan, but some 250,000 t of Prime Hard wheat are also imported, mainly for alkaline Chinese-style noodles.

Although the quality requirements for Japanese-style noodles are different from Chinese-style, they are no less exacting. The Japanese can also buy high quality hard wheats from the USA and Canada as an alternative to Australian Prime Hard. However, they rely much more on Western Australian noodle wheat for udon manufacture, because our competitors are currently unable to supply this type.

It can be argued that the price for Western Australian noodle wheat should move higher and be closer to that of Prime Hard.

A separate class name
To maximise its price, Western Australian noodle wheat needs to be marketed as a special wheat type, clearly different in quality and application to ASW, and with its own class name - such as Prime Soft Noodle wheat.

Future quality research
Our competitors are aiming to develop wheat varieties comparable to the key Western Australian varieties. For this reason Western Australia needs to further develop segregation, marketing, wheat breeding and quality research to maintain our reputation as the world’s leading supplier of wheat for Japanese noodles.

An important objective in quality research is the development of improved small-scale quality tests for use in screening early generation crossbreds and identifying useful quality traits in introduced wheats. The Grain Products Laboratory has already made significant advances in this area and will continue to seek research funding for initiatives.

The Laboratory hopes to build on its work on Japanese noodles, by developing expertise in the manufacture and assessment of other important noodle types. Suitability for yellow, alkaline noodles is an important breeding objective for Prime Hard wheats. WANGA, the Department of Agriculture, the Wheat Advisory Committee and the AWB are keen to develop this wheat type in Western Australia.

Alkaline noodles are also important for wheat at lower protein levels below the 13 per cent protein minimum for Prime Hard. Hokkien noodles are consumed throughout much of South-East Asia and require a wheat protein level of about 10.5-11.5 per cent. Instant noodles, manufactured by steaming the fresh noodle, then frying or drying, are another important end-use for wheat from Western Australia.

It is important that we have a good understanding of product and process quality requirements for these noodle types.

Conclusion
The considerable debate associated with the introduction of the noodle wheat segregation in Western Australia and the separate pooling of this wheat, have greatly assisted the Australian wheat industry in clarifying its future directions.

The main benefit has been the development of a system that may serve as a blueprint for further wheat segregations, to better meet the requirements of discerning markets and to enhance Australia’s competitiveness as a supplier of high quality wheat for a wide range of end-uses.