

1971 FARRER MEMORIAL ORATION

"Wheat Quality - Yesterday, Today and Tomorrow"

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WHEAT QUALITY - YESTERDAY, TODAY AND TOMORROW

My selection as Farrer Memorial Medallist for 1971 is an honour of which I am deeply appreciative. I am also conscious of its significance, not only to me personally but to all those cereal chemists who, since the time of Farrer, have been so closely associated with wheat breeding in Australia. This occasion in fact, marks the recognition of the important role which the cereal chemist and technologist has played and is playing in the wheat industry.

It has been my privilege to have enjoyed the friendship of many of the previous recipients of this award and to have worked in close collaboration with them. Particularly do I recall my association with the late Dr. George Sutton in the latter years of his very active life and the vigorous and bitter debates, in which we were often joined together, against the f.a.q. system of marketing wheat; with Professor W.L. Waterhouse whose outstanding work at the University led to the development of the variety Gabo which set a new and high standard of quality for Australian wheat and established a pattern for the successful segregation and marketing of a prime hard class of wheat; with Dr. S.L. Macindoe and with our present close collaborator Professor Irvine Watson and his colleagues at the University of Sydney who have carried on so magnificently the work of Waterhouse.

FARRER'S CONTRIBUTION

My first thought in the preparation of this address, was to pay due tribute to the life and work of Farrer and then to turn to the more immediate problems of today, to the scientific and technological achievements which have led to progress, and to future developments as I see them for the industry. However, a study of Farrer's work, of his aims and achievements, brings a realisation of their very real relevance to the present time. His objectives as a wheat breeder were so close to those which we state today that the question must arise - how is it that only in comparatively recent years has been achieved, to any significant degree, the high quality goal set by Farrer? This is not to decry the achievements of so many outstanding Australian wheat breeders, and the great contributions which they have made to the wealth and well being of the wheat industry, for many of them had to overcome great obstacles to achieve even minor improvements in wheat quality. But today we live under conditions where the quality of wheat is a paramount factor and where there is a need to satisfy the changing needs of old markets and the specific requirements of new ones.

Farrer, when he commenced his work in the latter part of the last century, recognized the need to satisfy the buyer. In a letter to Professor Lowrie of Roseworthy College written in 1893 he wrote "In order to do my work more effectively this year I entered in my field book a description of the grain - size, colour, length, plumpness, depth of crease etc. I also sent to a milling expert samples of about 180 sorts, that I thought of using for parents, to be submitted to the chewing test. I got him to state in numbers the relative degree in which each variety possessed the following qualities: hardness, gluten and thinness of bran. I got him also to state the flavour and his verdict on the milling quality". Again in writing to M.A. Carleton of the U.S. Department of Agriculture he said "I am fighting single handed in this country, a battle of the hard wheats which our millers and consequently our farmers will have nothing to do with. I am anxious to get definite and reliable information in regard to what are the reasons why the hard wheats are better for roller mills than the soft".

Farrer was aided in his work by F.B. Guthrie, Chemist with the Department of Agriculture, who had a great admiration for Farrer's efforts. Guthrie's examination of Farrer's material from the 1897-98 harvest at Lambrigg led him to observe - "It represents very clearly the success Mr. Farrer is achieving in the breeding of strong flour wheats suitable for growing in Australia Mr. Farrer has at least a considerable number of fixed varieties which are the highest value from the milling point of view".

The results of these tests, in which flour colour, gluten content, flour strength and baking quality were determined, were the first published on breeding material using a mechanically operated test roller mill which had been installed by Mr. Guthrie. Previous to that the mill had been operated by hand. Mr. Guthrie in writing of Farrer's work said that it was now possible to reject an enormous number of crosses by test milling without going to the trouble of obtaining enough seed for a miller's judgement. Farrer was thus able to lessen his labours considerably and at the same time to restrict the propagation of grain of inferior milling quality. In two or three years he was able to release four or five varieties which while they met certain requirements such as drought or rust resistance also were good milling wheats.

Towards the end of the last century, therefore, there were, in Australia, a breeding programme and quality evaluation methods directed largely to the same objectives as we have today.

There have, of course, been very great advances in prediction testing over the years. Test milling results can be quite unreliable and misleading unless carried out under conditions in which temperature and humidity are controlled. Dough strength is measured by a variety of physical testing instruments which were unknown in Farrer's time. Water absorption is still an important factor in assessing flour strength, but the influence of mechanically damaged starch, in addition to gluten content, on the water absorbing capacity of the flour was unknown at that time.

A CHANGING PATTERN OF VARIETIES

While Farrer was concerned primarily with breeding wheat which was disease and drought resistant, he was conscious, particularly in the later years, of the need to improve quality standards by the production of strong hard wheats. Jonathan, Comeback and Cedar were the results of his work at this time. Florence, a hard wheat of excellent quality, was grown for many years and in 1938 was the second leading variety in Queensland. Federation, the variety which is most closely associated with Farrer, represented a breakthrough in combining an improved quality with high yield; it was, however, a soft wheat of weak strength on today's standards even though it represented a distinct improvement in Farrer's time. In addition to Federation, the most popular varieties in the period 1910 to 1925 were Marshalls No. 3, Yandilla King and Early Gluyas, the last named variety being only second to Federation during that period. Nabawa was developed by Dr. Sutton, named in 1915 and occupied a leading position through to the mid 30's.

Quality wise, Australian wheat suffered in the 1930's with the proliferation of soft wheats of poor quality. Bencubbin and Free Gallipoli were prominent varieties at this time and caused many difficulties for Australian millers and bakers. The generally poor standard of quality existed through into the 50's.

At this time the quality hard wheats bred in New South Wales by Dr. S.L. Macindoe and Professor W.L. Waterhouse began to make an impact and commenced the gradual but significant improvement in quality standards which has continued up until the present day. Mention should also be made of Mr. E.J. Breakwell in South Australia, whose breeding of quality hard wheats formed the foundation of the segregated hard class in that State.

A significant increase in the production of hard wheats occurred in the

period from 1950 onwards. During this time hard wheat for export purposes was effectively segregated in New South Wales and South Australia.

Table I gives a comparison of the production of hard and soft varieties for the period 1931/32-1968/69:

TABLE I

Year	% of Total Acreage Grown to Leading Varieties		Grain Types Comprising Leading Varieties			
	N.S.W.	Aust.	N.S.W.		Australia	
			% Hard	% Soft	% Hard	% Soft
1931-32	73.8 (9)	73.7 (13)	0.0	100	0.0	100
1935-36	78.2 (9)	79.2 (16)	4.5	95.5	0.0	100
1940-41	81.2 (9)	87.6 (14)	8.6	91.4	1.9	98.1
1946-47	79.6 (9)	72.1 (14)	11.2	88.8	1.9	98.1
1950-51	80.0 (9)	76.0 (15)	39.4	62.6	18.5	81.5
1955-56	82.1 (9)	76.6 (11)	44.3	55.7	24.9	75.1
1960-61	83.8 (15)	81.1 (13)	48.7	51.3	37.2	62.8
1968-69	87.9 (9)	83.4 (9)	45.0	55.0	27.1	72.9

() number of varieties included

THE F.A.Q. SYSTEM

There is little doubt that the marketing of Australian wheat on an f.a.q. basis is largely responsible for the fact that we have not capitalized as well as we might on the foundations laid by Farrer. The f.a.q. system, a misleading description because it in no way relates to quality, has encouraged a lack of quality consciousness which persisted until the last decade or so. The practice, if not the name, was first adopted in South Australia in 1888 followed soon after by the other wheat exporting States Victoria, New South Wales and Western Australia.

Dr. George Sutton, a co-worker of Farrer, fought strenuously for the recognition of quality in Australian wheat right up until his death in 1964. Giving evidence before a South Australian Royal Commission on the wheat industry in 1908, Dr. Sutton said "I don't think it is in the interests of good farming because it places slovenly farmers on a par with the careful farmer, the careful man does not get proper value for his wheat". In its subsequent report the Commission emphasised the disadvantages of marketing our wheat on a single standard and more particularly an average one; the refusal of buyers to give farmers a corresponding price if their wheat was superior to the average quality; the absence of any incentive to produce the best sample obtainable and, the alleged deterioration

in the quality and the cleanliness of wheat.

In my view an overlong adherence to the f.a.q. system of marketing wheat has reacted to the disadvantage of the wheat industry by clouding the whole issue of quality improvement.

For many years Australian wheat, because of its dryness, good colour and ease of milling, had a high reputation on overseas markets. Compared with today however, the markets were few in number and the dominating one was the United Kingdom. Canadian Manitoba has for years been recognized as the quality wheat on the European market while filler hard wheats, such as the Argentine and U.S. hard winters occupied a recognized place in bread grists with a proportion of soft wheats, including Australian. The physical attributes of Australian wheat undoubtedly represented a cost advantage to the British miller and ensured its place in the grist. He could buy quality wheat from other sources and could thus use the often cheaper Australian wheat to good effect.

Undoubtedly there have been advantages also for the wheat industry in the marketing of wheat on an f.a.q. basis, mainly because it is a simple and uncomplicated procedure which minimises handling problems. Indeed on several occasions after World War I Australian f.a.q. sold at a higher price than quality hard wheats.

From Farrer's time there have been strong critics of the f.a.q., but with its built in advantages, it has always been difficult to gain support for any radical change to the system. In the post World War II period the Chairman of the Australian Wheat Board the late Sir John Teasdale, took up a strong and uncompromising position in opposition to any change.

However, it was the General Manager of the time Mr. C.J. Perrett who, in 1954, first offered a "separated" Queensland hard wheat to Japan and in 1956 proposed the separation of the heterogeneous S.A. f.a.q. wheat into soft and hard wheat classes. The findings of the wheat marketing committee set up by an Australian Conference on Wheat Quality in 1956 stated for the first time the quality requirements of different markets and established a basis for new quality objectives and the modification of the f.a.q. system.

Wheat Varieties and the f.a.q. The effect of the f.a.q. system on the quality of wheat varieties which were developed from 1925 onwards was disastrous. It was obviously bad business for the wheat grower to produce a lower yielding high quality wheat if he was to suffer a monetary loss by so doing, and this is still a valid argument.

In this period there was a multiplication of poor quality soft wheats such as Free Gallipoli, Bencubbin, Gluclub, Ghurka, Quadrat and Glenwari. These varieties by setting high yield standards made the task of the breeder more difficult since they involved the task of breeding superior quality wheats of equivalent high yield.

The problem of combining high yield with good quality has always posed difficulties and it is only in recent years that significant progress has been made in combining these two requirements. High yielding capacity at the expense of quality is built into the f.a.q. system and it has proved to be, and indeed still is, a severe handicap to the industry.

The extension of wheat growing into the north western areas of New South Wales and the success of Dr. Macindoe and Professor Waterhouse in breeding hard wheat varieties high in protein and of good quality for this region, gave rise to the first break in the f.a.q., and the development of the premium wheat system whereby millers dealt directly with the wheat growers through licensed receivers and paid premiums for specified varieties. The premium wheat was in essence auctioned on the basis of its variety and protein content. The private arrangement between miller and grower was put on a firmer basis in 1957 with the establishment of the Premium Wheat Growers Association which, under the control of the Australian Wheat Board, has set quality standards based on variety and protein content and has presented a prime hard class of wheat which has been well accepted by overseas buyers.

In South Australia hard wheat, identified by variety and visual appearance, was first segregated in 1957-58 from the remainder of the crop and found markets in Rhodesia and Norway.

With the recognition and segregation of hard wheat, more clearly defined quality goals were set for the wheat breeder. Growers also became more quality conscious through the 1950's and 60's and now we find the drive for improved quality coming from within the industry itself as much as from pressures without.

Much yet remains to be done both in the production of quality wheats to suit market requirements and in the adoption of a more effective system of wheat classification. Certainly we can and do offer buyers a range of different classes of wheat today but strangely we still maintain an f.a.q. standard, which comprises the major part of the crop, in all States.

In effect what has evolved from the all inclusive f.a.q. system of past years has been the segregation of certain distinct classes, and the

recognition of regional differences in quality based broadly on State boundaries and, to a less clearly defined extent, on regions within the States. Thus we have prime hard, hard, specially selected f.a.q., f.a.q. and soft classes.

F.a.q. in fact now ceases to have any meaning, if it ever had one, and refers only to a mixed sample taken from the residue of wheat which remains after the segregation of certain quality classes. Clearly there is room for improving such an arrangement to give more clearly defined categories of wheat which will be recognized and accepted by the buyers.

Past history aids us little unless we are prepared to learn from it and act accordingly. It serves no purpose simply to reflect to what extent, if any, the wheat industry has been disadvantaged by too long an adherence to the f.a.q. system. What one must consider today is whether or not we are still labouring under some of its deficiencies and, if so, should we act more drastically in revising the standards by which Australian wheat is sold.

MARKET REQUIREMENTS

(a) Changing Agricultural and Economic Policies:

The status of Australia as a wheat exporter, from the time of Farrer up until World War II, was determined largely by exports to the United Kingdom and Europe. Quality demands expressed by the buyers were few and although there were technological advances in the milling and baking industries during the period, quality requirements were met by the judicious buying and blending of the wheats of the world. In the post World War II period many new markets have been opened to and by us, and wheat production has increased significantly to satisfy these demands. Changes in the requirements of traditional markets as well as the demands of new markets have required a fresh assessment of our standards of quality and of methods of marketing and handling the crop. There have been departures from the f.a.q. system sufficient to provide some buyers with a more acceptable type of wheat.

Agricultural policies in Europe, particularly in the European Economic Community and in the United Kingdom, have been quite dramatic in their effect on imported wheat. The great increase in domestic wheat production, comprising mostly low protein soft grain, has resulted in much greater emphasis on the quality of imported high protein hard wheats and future requirements will be restricted very largely to this class of wheat. The production of quality hard wheats in New South Wales, Queensland and, to a lesser extent, in South Australia, should enable

us to adjust successfully to these market demands, although we have suffered a severe setback through crop failures over the past two seasons.

Post war food policies in Japan, now one of our main markets, have had a great impact on wheat sales - increased wheat consumption through natural growth, the encouragement of a revitalised milling and baking industry, and a feed milling programme at a low flour extraction rate and higher bran production, have provided outlets for a range of wheat types which Australia has shared with the United States and Canada.

The establishment, only in recent years, of a milling industry in Singapore and Malaysia has been of considerable significance, and locally produced flour has now completely replaced imported flour in these countries. This market is a rapidly growing one in close proximity to us and requiring types of wheat which we are able to supply.

While price, including freight costs, is paramount in all considerations, credit terms and other trading arrangements in recent times have also played and are playing an increasing role in determining sales and have opened up significant markets in the Middle East and South America. At times political considerations in buyer countries also may intrude to complicate matters further.

(b) Technological Change:

My own interest in the wheat industry is concerned with the nature and quality of the product. I am well aware, however, that this has not been the main factor responsible for any decline or expansion of the industry, nor today is it the sole factor to be considered. A study of the history of the wheat industry in this country emphasises the very great influence which economic conditions at home and abroad have had on wheat policies, and the importance of the industry to the national economy has made it a subject of study more by economists than by technologists.

However, while balance in favour of supply or demand for specific types of wheat determines the respective attitudes of buyer and seller in relation to price and is a major factor in influencing sales for that type of wheat - a truism which is constantly put to us by economists, there are other factors which influence the acceptability or otherwise of wheat. One must be in a position to supply the right wheat at the right price.

Farrer had an awareness of the quality requirements of miller and baker. He judged the quality of wheat by the amount of flour it yielded, by the amount of

water absorbed by the flour, by the way the dough felt to his hands and by volume of the loaf of bread. Neither miller nor baker, however, had the means or the knowledge to specify in precise terms their quality requirements.

It was the application of modern technology to the baking industry in Australia, motivated by changing industrial conditions, which first caused a critical appraisal of quality standards. With restriction of working hours, the elimination of night baking and a short working week, greater emphasis was placed on the production of bread with better keeping quality. This in turn established a demand for higher protein content which bakers in the early 1930's could only achieve by washing gluten from flour and then adding it back to the dough.

The motivation for technological development and innovation stems from a number of different factors. Rising standards of living and generally improved labour conditions, with higher pay and a shorter working week, have gone hand in hand with the mechanisation and the automation of the industry, a diminishing number of small bakers and the growth of large plant bakeries. This has been a common phenomenon in most western countries. The development of the baking industry along these lines has placed much greater emphasis on quality standards and specifications; it has resulted in much greater technical control in the flour milling industry, the more careful selection of wheats for blending and the demand for wheat of higher and specific qualities.

The world today is generally divided into two broad groups, the highly developed or affluent societies and the developing countries. Bread is still generally recognized as a staple article of diet in our own affluent society, and its consumption is confined mainly to Europe, the Middle East and peoples of European descent or influence. It does not form a major part of the diet of a great section of Asia although wheat in other forms is consumed.

A study of present day food habits shows that while there has been an increase in the per capita consumption of cereal based foods in developing countries, their consumption generally in affluent societies is diminishing, sometimes at quite a spectacular rate. In western countries, including Australia, the position is one of a steady decline in bread consumption.

In such a world the cereal technologist is faced with a great challenge. He must present bread and other cereal products, new and old, in a way which will retain consumer demand, which will lend them to modern day methods of presentation and marketing and which will fit in with our current mode of living. To do this he

has produced a lighter loaf, a softer loaf; a loaf with a number of additives other than flour such as milk, fats, soya and sugars; a pre-sliced and packaged loaf; a thick and thin sliced loaf; a toasted loaf and so on. To meet the demands for this type of production requires close quality control over ingredients. But the technologist has gone further than changing formulations, he has looked critically at the process of bread making itself, a process which until the last twenty years has remained basically unchanged for many thousands of years.

Advances in Baking Technology: The conventional method of breadmaking, whether by hand or by machine processing, comprises a number of basic stages - mixing, fermentation, dividing, moulding, fermentation and baking, all of which, in one way or another, modify and change the properties of the dough to the extent that when it is placed in the oven it gives bread of maximum volume and good crumb texture.

In 1926 Dr. Swanson in the United States found that by the intensive mixing of dough it was possible to produce bread of acceptable quality with the elimination of the subsequent fermentation and moulding stages. It was some 30 years later that this principle was applied commercially by a radical continuous process whereby the dough is mixed continuously and extruded directly into the bread tins. This process is now used extensively in the United States. Seven continuous plants were introduced into Australia in the late 1950's but because the quality of the bread produced was markedly different from our standard loaf, the process has been discarded in this country.

Later research into the mechanical development of dough as it is known, carried out principally at the British Baking Industries Research Association and our own Institute, resulted in the successful development of a batch system for producing bread more commercially acceptable than that produced from the continuous American process. In the United Kingdom 80% of the bread is now produced by the Chorleywood Bread Process. The Australian baking industry has not adopted mechanical dough development to any significant extent although a number of bakeries are using it quite successfully.

Further advances in baking technology have involved the activation of dough development by chemical as well as mechanical means whereby dough properties are suitably modified by approved oxidizing and reducing agents. Research work in this field, undertaken by the Bread Research Institute, has been applied very successfully by Australian bakers and a very significant proportion of our bread

is now made by this process which offers most of the advantages of mechanical dough development.

Several factors encouraged the adoption of the Chorleywood Bread Process in the United Kingdom. Firstly, it came at a time of great change in the industry and provided considerable savings in the re-organization and re-planning of bakeries. More importantly, however, bread of a more acceptable quality was produced from a softer flour than was possible with conventional breadmaking processes and thus British flour millers have been able to reduce the quality hard wheat content of their grists from 60% to 40%, and conversely to increase the usage of domestic soft wheat.

This technological development, therefore, has been one of great significance to Australia and other exporters of wheat as well as to the United Kingdom. It has made possible the greater use of domestic wheat with savings to the British taxpayer, and illustrates the way in which technology today can be called upon to solve the production and supply problems of importing countries. For Australia the result combined with the greater use of domestic wheat in Europe is a lessening demand for soft f.a.q. wheat by these markets. This situation places greater emphasis on the quality, particularly with respect to the protein content, strength, and milling value, of imported hard wheats. When available our prime hard wheat has met these market requirements against strong competition from other countries.

New baking techniques such as these offer the possibilities of further developments which could influence the future wheat marketing situation. While they have enabled a greater percentage of soft wheat to be used in U.K. grists they might also be applied in some other countries to enable the admixture of the products of indigenous crops, other than wheat, with flour to produce an acceptable end product. The cassava bean in the Philippines, ground nut meal in India and Brazil, millet in Senegal and other African countries could well be utilized in this way with advantage to the countries concerned.

Advances in Milling Technology: Technological developments in the flour milling industry must also be considered as they affect market requirements. Basically the flour miller requires certain quality characteristics in a particular wheat which when blended with other wheats will give the flour quality specified by the baker. He requires that the conversion from wheat to flour be carried out as profitably as possible. Least cost gristing, a favoured term used these days by importers of wheat, describes the purchase and blending of wheats at the best value to give a

required quality of flour.

The introduction of roller flour milling in the early part of the nineteenth century represented a major technical advance. Previously wheat had been ground between stones operated by animal or human labour, water, or wind. Roller grinding was introduced with the objective of producing a clean white flour. The separation of bran with a minimum contamination of the flour and the gradual reduction of the endosperm material to floury fineness required a long system of roller grinding, sifting and separating.

In recent years there has been a major change in flour milling technology. Many old ideas have been discarded and new approaches which give a greater production per inch of roller surface have replaced the older methods. The development of higher capacity milling has distinct advantages for the miller as it enables him to produce flour of good quality often at a higher extraction rate than previously and with a lower capital investment in plant.

In terms of wheat quality, greater emphasis is now placed on milling value in which is taken into account not only the natural dryness of our wheat but its capacity to produce flour of good colour at a high and easily obtainable extraction rate. Price, milling value, protein content and quality are all considered in the assessment of the value of a wheat by the buyer.

QUALITY STATUS AND CURRENT MARKETING SITUATION

We should now consider more specifically the quality of Australian wheat in terms of the marketing situation in recent years.

Table II shows the major changes which have taken place during the past thirty years or so, the features of which are the diminishing proportion of wheat exported to the United Kingdom and the emergence during the past ten to fifteen years of China and Japan as major outlets.

TABLE II

MARKET DESTINATIONS - PAST AND PRESENT

% of Total Exports

	1935/6-1939/40	1950/51-1954/55	1968/69
United Kingdom	64%	33%	14.4%
Western Europe	7%	20%	5.5%
China	6%	-	28.2%
Japan)			(19.7%
S.E. Asia)	9%	23%	31.6% (7.8%
Ceylon, India,)			(4.1%
Pakistan)			(
South America			4.5%

1968/69 has been chosen as the latest year of reference as it is the most recent season in which adequate quantities of various classes of wheat were available for export.

As these figures relate only to percentages of total exports, they can be deceptive and in terms of wheat disposal they take on greater significance in Table III which is expressed in bushels exported.

TABLE III

WHEAT EXPORTS (Approx.) IN BUSHEL

	1950-1955	1968/1969
U.K.	19 million	34½ million
China	-	67½ "
Japan	2 ")	47½ ")
S.E. Asia, Ceylon etc.) 13½ million) 82 million
Sth America	-	20.7 "

Table IV shows the real significance of China and Japan as far as f.a.q. wheat is concerned at this time.

TABLE IV

F.A.Q. EXPORTS

	1968/69
China	59.13 million bushels
Food Aid	3.95 " "
Other Markets	53.54 " " (Japan 24.75 (U.K. 5.56

The loss of the Chinese market this year must exacerbate the difficulties associated with marketing an f.a.q. wheat even though some relief has been obtained by sales to other markets.

The great expansion which has been a feature of our wheat marketing scene in recent years has been aided by the availability of wheat of the quality required by certain markets and by modifying the f.a.q. system to segregate it. While the emphasis of many new markets (excluding China) has been very much on quality wheat of both hard and soft types, the retention of older markets in the United Kingdom and Europe also has been aided by our ability to supply wheat of the prime hard and hard types, to fit in with their changing needs. Ability to do this has enabled significant inroads to be made into established hard wheat markets firmly held in the past by Canada and the United States.

A peak production of approximately 550 million bushels of wheat which is very close to the 1968/69 figure, gives a ratio of export to domestic needs of something better than 5 to 1 - 16% for home, and 85% for export. With quota restrictions limiting total production to 350 million bushels, the ratio is closer to 3 to 1 - 27% for home and 73% for export. It is logical, therefore, that our wheat should be classified and recognized in terms of generally accepted world standards. A broad classification which is generally recognized in establishing price differentials is given in Table V.

TABLE V

A CLASSIFICATION OF WORLD WHEAT

HARD		SOFT			
Prime Hard	Average Hard	Medium Protein	General Purpose	Biscuit	Club
Manitoba 1, 2 & 3	U.S. Hard Winters (Ordinary)	Sth NSW f.a.q.	U.S. Western White	French	U.S.
U.S. Dark Northern Spring 14%	Manitoba 4 & 5	Vic f.a.q.	W.A., Vic., Sth N.S.W. & S.A. f.a.q's	German	
U.S. Dark Hard Winters 13.5%	Argentine	S.A. f.a.q.		English	
Russian SKS 14%	N.S.W. Hard	European	European	Aust. Pinnacle/Summit	
Australian Prime Hard 14%	S.A. Hard				
	European Hard				

While wheat which is grown in Australia can be fitted to most of these categories, the problem which faces us today is to grow those types of wheats in amounts - and this is limited to a great extent by environment, the availability of suitable varieties, and the practicability of effective segregation - which will improve the overall saleability of the crop.

With highly competitive conditions favouring the buyer, and with competent and technically progressive milling and baking industries, the quality objective must be to grow wheats which fit into a recognized class and to improve those quality factors which contribute to milling value.

Without detracting in any way from the urgent need to maintain quality standards one should not be carried away by over glib statements such as the tailor making of wheats to suit the needs of all buyers. In this we run the risk of not seeing the wood for the trees. It is important that the needs of buyers are met as well as possible, and that our wheat should be attractive compared with that of our competitors. However, changes in some current practices particularly in relation to the production and control of new varieties and the system of classifying and

presenting wheat to buyers will greatly strengthen our position and are basic to any quality improvement programme. Steps are now being taken to implement changes along these lines but the urgency of the situation requires that we move faster.

PROTEIN CONTENT - A LIMITING FACTOR

Protein content is a major limiting factor governing the commercial acceptability of most classes of wheat. In the wheat growing areas of Australia those regions which produce consistently high protein levels are situated mainly in Queensland and northern N.S.W., in the latter State extending down through some of the western areas. Acceptable protein levels for hard wheat also exist in some areas of South Australia and to a very limited extent in Victoria.

An improvement in the nitrogen status of areas in southern and western districts of N.S.W. and in Victoria due to the growth of soil improving crops and better farming practices has encouraged the belief that they might be converted successfully to hard wheat production. Also one must consider the practical and economic feasibility of applying nitrogen fertilizers in the light of current costs and the price differentials obtainable for wheat of specified protein content.

The extension of hard wheat production in what were previously soft wheat areas has received an impetus in recent years in Victoria with the variety Emblem and in N.S.W. with the varieties Falcon and Eagle. These varieties although representing a significant break through in production still leave room for improvement in comparison with the quality standards of the hard wheats of northern N.S.W., South Australia and Queensland.

At present hard wheat production in southern N.S.W. and Victoria is an uncertain quantity. In a high protein year acceptable wheat can be produced; in a year of low protein the value of the wheat is depreciated greatly. The protein level of a marketable class of hard wheat should be maintained with a fair degree of certainty, between 12 to 13%.

Western Australia presents a particular problem in terms of protein status, and having regard to the size of the industry in that State, and its dependence upon export markets, it is a subject which should be given high priority in any wheat research programme.

The fact that some of our markets are themselves striving to improve the quality of their domestic wheat and thus to reduce, and make even more selective, their purchases of imported wheat should spur us on to greater effort. In the U.K., West Germany and France distinct advances are being made in lifting quality

standards by varietal improvement despite the handicaps of climatic and general environmental conditions which create considerable difficulty in maintaining quality standards on a reasonably consistent basis. Research which is being actively undertaken into grain dormancy could improve this situation.

The use of nitrogen fertilizers is proving a practical and economic means of raising protein levels in some countries. In West Germany nitrogen is being applied by growers to improve both the yield and the protein content of wheat. It is claimed that by making the application at three stages of growth the improvement in grain yield and protein content can result in a significant monetary benefit to the grower.

The Germans are now endeavouring to implement a wheat classification system, based on protein content, in which millers are to pay premiums for domestic wheat of higher protein content. The implication of improved wheat quality in West Germany to exporters is illustrated by the fact that the usage of imported hard wheats in Germany has decreased from 26% in 1968 to 17% in 1970 and is anticipated to stabilize in the future at a figure of approximately 15%.

While an increase in the production of hard wheat at high protein levels is needed to satisfy market demands, it is a fact that a large part of the wheat growing areas of Australia normally will produce wheat at a protein content less than 12%. The growing of improved quality soft wheats in these areas and their classification will further improve the saleability of the wheat crop as a whole.

THE NEW CANADIAN GRADING SYSTEM

The need to improve the quality, presentation and marketing of wheat, is recognized by our main competitors. Most recently Canada, which for many years maintained the highest quality standards of any exporting country, has drastically changed its grading system to provide for segregation on the basis of protein content.

The re-structuring of the grades is to be phased in over a two year period. In August, 1971, a new grade, No. 1 Canada Western Red Spring wheat, came into effect and comprises what were formerly No. 1 and No. 2 Manitoba Northern. This grade is segregated into protein levels of 13%, 14% and at higher and lower levels when sufficient quantities at these levels are produced. Beginning in August, 1972, No. 2 and No. 3 Canada Western Spring wheat grades will be introduced and segregated on the same protein basis as No. 1 grade. These will be composed of the present No. 3 Manitoba and the best of No. 4 Manitoba. No. 3 Canada Western Spring will be

the lowest grade of milling wheat.

The Canada Grain Act has been completely revised to provide for these new grades and generally to bring it into line with modern requirements. Most importantly, the built in safeguards for the maintenance of quality standards and variety control remain - no new variety can be released and accepted into the top grades of Hard Red Spring wheat unless it is equal to Marquis in milling and baking. The procedure for altering or modifying the grades has been made subject to regulations thus enabling it to be amended to suit changing market needs without the undue delay which would be involved in amending the Act.

It is fair to say that Australia played a role in determining Canadian action by the successful marketing of a prime hard class segregated on the basis of variety and protein content.

FUTURE TRENDS AND ACTIONS

It is a brave man who today is prepared to look into the crystal ball and to prescribe in precise terms future market trends and specific quality requirements to suit them. However, without going so far, and without making any unduly rash predictions, I believe that we have sufficient guidelines to enable us to improve on present quality standards the better to meet present and future demands.

The fact that Canada, a country which is in a much stronger position than we are to supply quality wheats and one which has always placed a high value on quality standards, has felt it necessary to revise and re-structure its whole system of grain handling and marketing, should be sufficient to spur us on to an active and critical reassessment of our own position.

While the Australian Wheat Board has many achievements to its credit and has done an excellent job in marketing wheat under difficult conditions one must guard against the complacency which can arise when, from time to time, substantial sales are made of what is generally regarded as wheat which is not readily saleable. Such situations will continue to arise due to crop failures in various parts of the world and to sales based on favourable credit terms. Good fortune is very much a part of the game but stability for the wheat industry in the long term must be built on a proper appreciation of quality in relation to the buyers' requirements.

A recapitulation of some of the factors which affect or are likely to affect the wheat industry will establish a background for action to improve future quality standards.

In the more highly developed countries the per capita consumption of

staple wheaten foods is decreasing while in many developing countries, where the primary aim is to achieve an adequacy of food, there is an increase in per capita consumption. A diminishing per capita consumption of wheat products as living standards rise will be compensated for by population growth and thus one can expect, in the foreseeable future, a continuing and expanding demand for wheat.

Of considerable importance to Australia's exports is the development of viable and strong milling and baking industries in South East Asia and other parts of the world. Improvements in the quality and quantity of wheat produced in many wheat importing countries also influence the quality and quantity of our exports.

A future development which is likely to concern us is the greater utilization of indigenous crops in developing countries. With a concerted technological effort one might expect a significant breakthrough in the utilization of "composite flours" in these countries; it is a sensible approach to easing the world's food crisis and it also has the added advantages of encouraging agriculture and of providing economic savings where they are most needed.

For some time we must be concerned with the differing conditions in those markets which have highly sophisticated milling and baking industries and those which are developing. To some extent there will be an overlapping of requirements but we must be aware of the changing situation in each area.

We have considered the effect of a developing technology on wheat quality requirements. Many food technologists maintain that our eating patterns will change spectacularly in the coming years, and that people will look for their convenience foods perhaps in a different form from today's. However, for our present consideration we must be concerned primarily with the conventional flour milling, baking and pasta industries.

The growing of high yielding varieties as feed grains and the industrial utilization of wheat are other factors which must be taken into account in any consideration of future trends in wheat production and marketing.

A plan for the future should involve decisive action in the following areas:

- * A critical re-appraisal of our methods of receiving, handling and marketing wheat. We should be prepared to make changes, if necessary, in some basic structures so that the Australian Wheat Board and grain handling authorities are able to make, and effectively implement, decisions which will further improve the acceptability of Australian wheat.

- * The rather hesitant steps which are now being taken in evolving a classification and segregation system for Australian wheat should be directed firmly to a complete review of the f.a.q. system. The re-naming and classification of the wheats comprising our current f.a.q.'s from which much of the hard wheat has already been segregated might well be made under the general descriptions of Australian Standard and Soft Whites with suitable protein and variety segregations. Few countries grow the same range of hard and soft wheats as Australia. We should exploit this to the utmost.
- * Protein is a major factor today in determining the acceptability of wheat for many markets. High protein hard wheat will be the main requirement in the future for markets in the United Kingdom and Europe which are self sufficient in soft wheat. It must be a decided advantage if we can utilize to the full those wheat growing areas which are capable of producing this class of wheat. It should be an objective to grow hard wheat in greater quantity over a wider area to give protection against crop failure. To achieve this we must have a better understanding of the protein potential of many of our wheat growing areas and of the factors controlling grain protein accumulation.
- * Increased hard wheat production will give a broader range of hard and prime hard qualities than we have now; it will require a more rigorous application of protein classification over a range of protein levels.
- * Adequate control over the varieties which are grown is needed for the maintenance and improvement of quality standards. Action that is now being taken to improve the current position must be pushed to an early conclusion.
- * Effective segregation of wheat requires the ready identification of variety and protein content at the point of receipt. Grain appearance as an aid to identification is an important factor to be considered in breeding new varieties. A competent grain inspection authority could well be established, initially in New South Wales, with respect to segregations of prime hard and hard classes.

It has been said of Farrer that his objective was to aim high and to achieve perfection. This is the challenging objective which we must carry forward into the future and the extent of our achievement will be determined by the degree to which we utilize all the resources which are at our disposal.