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The Grain Marketing System and Wheat Quality in Australia

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THE GRAIN MARKETING SYSTEM AND WHEAT QUALITY IN AUSTRALIA

William W. Wilson and David Orr*

I. Introduction**

Australia is the fourth largest wheat exporting country following the United States, Canada, and the European Community. The market share for Australia in recent years has been between 11 and 18 percent. Production is quite volatile compared to other exporters. However, of particular importance is that a very large proportion of the wheat produced in Australia is exported--up to 80-90 percent in recent years--compared to other exporters. The wheat produced in Australia is exclusively white. It is generally considered a weaker wheat with protein in the area of 9-11 percent, but, some regions are capable of producing up to 14-15 percent. Wheat in Australia has a reputation for being very dry with harvest moisture about 9.5 percent and relatively superior "hygiene." The latter refers to both the general cleanliness and lack of infestation. Levels of impurities are generally less than .4 percent, and insect problems are virtually eliminated despite a climate being very conducive to insect proliferation.

There are a number of institutions and institutional relationships which influence the quality of wheat being produced, marketed and exported in Australia. These include the Australian Wheat Board (AWB), monopoly grain handling authorities in each state, variety release and control procedures, and a set of receival standards which are applied at the point of first sale. These are interrelated and have important impacts on the quality of wheat exported from Australia. The purpose of this study is to analyze the institutions, policies, and trading practices which have an influence on the quality of wheat exported from Australia. In the first section below, an overview is presented of wheat production and marketing. Data are presented on supply and demand, exports by volume and market share by destination. Historical data are presented for yields and quality. In addition, production practices and input utilization are described. The fulcrum of the marketing system in Australia is the AWB, which is described in detail in Section III.

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Receival standards, producer pricing policies, sale strategies and quality control procedures are major topics in this section. In addition, highlights from a recent government inquiry are presented. There is limited on-farm storage in Australia and each state has a monopoly grain handling authority for both origination and export. As the sole agent of the AWB, these handling authorities play an important role in quality control and maintenance. The characteristics and operating practices of the grain handling industry are described in Section IV. The procedures used for variety development and release are described in Section V. Finally, Section VI presents a summary.

II. Overview of Marketing and Production

The purpose of this section is to provide background information on wheat production in Australia. In the first sub-section below supply/demand data are described and Section B provides a detailed analysis of exports and market share by principal destination. Cross-sectional and time series data on yields and the quality of the wheat produced in Australia are presented in Sections C and D. The final subsection provides an overview of farm size and production practices.

A. Supply and Demand for Wheat

Wheat production in Australia is limited to the regions including the south and east coast, and in Western Australia (Figure 2.1). The largest wheat producing state is New South Wales (NSW) followed by Western Australia (WA), Victoria, South Australia, and Queensland (Table 2.1).[1] In the past 10 years production shares across the largest four wheat producing states were: New South Wales, 35 percent; Western Australia, 29 percent; Victoria, 16 percent; and South Australia, 11 percent. The distribution of wheat production across states has been relatively constant.

Total production of wheat and other fundamental data are shown in Table 2.2 and Figure 2.2. There has been a very slight increasing trend in production over the past 20 years. However, of particular importance is that production is quite volatile through time. Substantial reductions in production were observed at least four times in the past 25 years, and several of these are directly attributable to drought conditions (e.g., 82/83). In each case these were followed by above normal production in subsequent years.

Area planted to wheat in Australia has been increasing since the early 1960s (Table 2.3 and Figure 2.3). There was a sharp reduction in 1970, and since then area planted has increased gradually. After reaching a peak of 12.9 million hectares in 1983, area planted has decreased to an estimated 10.0 million hectares in 1987. This reduction has occurred because of the decreasing relative profitability of wheat caused by the simultaneous occurrence of lower wheat prices and a rapid escalation in wool prices, sheep being an alternative crop.

Domestic use of wheat in Australia comprises a small proportion of total disappearance (Table 2.2). In recent years domestic use has comprised only about 15 percent of total disappearance, a decline from earlier years. However, compared to other exporters, the relative importance of domestic wheat use in Australia is very small (Table 2.4) merely reinforcing the importance of exports as a source of demand. The principal source of domestic demand is for human consumption. Wheat used for feed ranged from 35-48 percent of domestic use in 1979/80-1982/83, but since has declined to 9 percent in 1985/86 (Australian Wheat Board Annual Report 1985/86). The data presented in Table 2.5 indicate that of the flour produced in the domestic

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[1]Tables referred to in this section are contained in Appendix A, and figures are at the end of each subsection.

industry about 45 percent is used by bread bakers and 22 percent by starch/gluten manufacturing. Australia is a major manufacturer and exporter of gluten.

Exports of wheat reached a peak of 16.1 MMT in 1985/86 but have since declined to a projection of 11.0 MMT in 1987/88. In the mid-1980s, 80-90 percent of the wheat produced in Australia was exported. This is very high compared to other exporting countries (Table 2.6), again indicating the relative importance of wheat exports in Australia. The decline in the recent year is largely due to the reduced production.

Traditionally, Australia carried minimal stocks between crop years. However, beginning in the late 1970s, ending stocks began to increase. Record stocks were held over in 1984/85 at 8.6 MMT, but have since decreased in 1987/88 to less than 4 MMT. Another way to evaluate stockholding is ending stocks relative to production (Table 2.7). In the mid-1970s ending stocks were about 14-22 percent of production, but since then the percentage increased to 47 percent in 1984/85. Compared to the U.S. and Canada, ending stocks as a percent of production is less in Australia. This suggests that despite the variability in production Australia is less willing or capable of holding stocks between years than the U.S. or Canada.

B. Exports

Australia typically comprises between 2.5 and 4.0 percent of world wheat production (Table 2.8). Exports of wheat from Australia increased to a peak of 16.1 MMT in 1985/86, but have since decreased due to reduced production (Table 2.2 and Figure 2.2). In fact, Argentina and Australia are the principal exporters which reduced exports in the past two years, offsetting the gains obtained from the U.S. (Table 2.9). The market share for Australia was in the area of 10 to 12 percent in the late 1970s, increasing to 18.5 percent in 1985/86 (Table 2.10 and Figure 2.4). Again, it was primarily the market shares of Australia and Argentina which have fallen in the past two years.

The largest six importers of Australia wheat include: USSR, Egypt, China, Japan, Iran, and Bangladesh. These are listed in approximate rank over the past three market years. In 1985/86 these countries imported 70 percent of the wheat exported from Australia. Historical data on exports to the largest 10 importing countries are reported in Table 2.11 by volume and Table 2.12 (and Figure 2.5) by market shares. The USSR is now the single largest importer, purchasing 20 percent of Australia's wheat in 1985/86. However, the USSR only recently became an important customer with a substantial increase beginning in 1979/80.

Australia has dominant positions in two markets--Iran and Malaysia. However, in several markets the Australian market shares have decreased substantially. The Australian market share in China decreased from 48.3 percent in 1969/70 to 19.6 percent in 1984/85. Decreases in market shares have also been observed in Egypt, Indonesia since 1979/80 and Malaysia since the mid-1970s. Market shares in the remaining countries do not illustrate trends but are sporadic. Australia and the U.S. compete in most of the markets with the exception of Iran. The U.S. and Australia are the principal

competitors (defined as the largest two suppliers) in a number of markets including China, Egypt, Iraq, and Indonesia.

The wheat exported from Australia is exclusively white and generally of medium protein level. Thus, the principal classes of competition from the U.S. are white and Hard Red Winter (HRW). Export data from Australia and these two classes are shown in Table 2.13 for volume, and Table 2.14 by market share and Figures 2.6 and 2.7.

The AWB publishes data on exports by class. Comparisons are made in Table 2.15 which demonstrate the relative importance of exports of the different classes. The dominant export class is ASW (Australian Standard White) which comprised 84 percent of the exports in 1980/81. Since then this has decreased to 77.1 percent in 1985/86. During this time period there has been a noticable increase in GP (General Purpose) which includes a small portion of feed wheat. New South Wales (NSW) is the domestic state which exports APH (Prime Hard) and AH (Hard Wheat) (Table 2.16). Hard wheat is also exported in minor amounts from South Australia, Western Australia, and Queensland. Each state exports ASW. Exports of GP have been increasing through time with generally the same increases across states.

C. Productivity

Yield comparisons between major wheat exporters are shown in Table 2.17, 2.18, and Figure 2.9. Yields in Australia are nearly always the lowest among the major exporters, ranging from 1.4-1.5 MT/Ha in recent years. This is in comparison to French wheat yields of up to 6.0 MT/Ha and U.S. wheat yields of 2.3-2.6 MT/HA in recent years. Another feature of yield behavior in Australia is the sharp reduction in 1972, 1977, and 1982, generally consistent with drought conditions. Yield behavior is very sporadic, an example being the increase from 0.7 MT/Ha in 1982 to 1.7 MT/Ha in 1983. This sporadic behavior has important implications for the grain handling storage system and export strategies.

Casual observation of the data in Figure 2.9 suggests there is not a trend to wheat yields in Australia. To evaluate the productivity growth between countries, a semi-log model was estimated over the time series 1962-86.[2] Results are shown in Table 2.19 along with the derived growth rate for each exporting country. This is strictly interpreted as the constant relative or proportional change in yields per year. Over the time series the fastest growth rate was that of France followed by the U.S. There was not a significant trend in the case of Australia suggesting a nil growth rate in productivity. Also of interest is the R^2, which is the percent of variability in yields explained by the trend. These values for Australia, and Argentina and Canada, are relatively low indicating both very little growth and substantial variability in yields. Actual yields and those predicted from the growth model are shown in Figure 2.10 There are a number of reasons for low yields in Australia including low prices, low rates of fertilization, and little rainfall.

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[2]The estimated model was $\log y = \gamma + \beta T$ where Y = yeild and T = trend, T = 1, 2, . . .

D. Quality

There are seven classes of wheat produced and marketed in Australia. These include Prime Hard (APH), Hard (AH), Australian Standard White (ASW), Soft, Durum, General Purpose (GP) and Feed. Each of these to some extent is further segregated by protein level or the level of non-millable materials.[3] The AWB publishes crop quality data for wheat received into the marketing system for APH, AH, ASW, and GP. Further detailed quality analysis is conducted on APH, AH, and ASW.

The percentage of receivals by class since 1976/77 are shown in Table 2.20. Generally, about 68 percent of the wheat received is classed as ASW and 15 percent AH with the other two classes about equal. Purusal of the data indicates there were spikes in 1983/84 and 1985/86 in the GP class. The magnitude of those spikes would suggest an increasing trend, but this conclusion would be preliminary given only two years data. In both 1983/84 and 1985/86 these crop quality problems developed because of rains during harvest resulting in increased weather damage. Also of interest is the apparent decrease in recent years of both APH and AH.

Detailed quality data of the 1986/87 crop are presented in Table 2.21. Only selected quality data are presented in this table. Data for "typical" Australian wheat classes are shown in Table 2.22. As indicated there are slight differences in quality among ports, even within a class. The principal difference between classes is the protein level and the end use performance associated with protein (e.g., water absorption). The protein level for APH is nearly 1 percent over the required amount. ASW protein levels are generally about 10 percent. For comparison, selected data on U.S. Hard Red Winter (HRW) and Western White (WW) are shown in Table 2.23. Noticeable differences exist between test weight and extraction rates, those for Australia wheats being greater. Protein levels for HRW are similar to AH and those of white are similar to ASW. Water absorption for AH is similar to HRW, but WW is substantially less than that of ASW.

Time series data for selected Australian wheat quality parameters were collected for 1970/71 -1986/87. Simple averages for each class are listed by state in Table 2.24. Test weight is relatively high and does vary across states. The average for ASW, for example, ranged from 76.5 for Western Australia and New South Wales to a high of 81.4 in Queensland. Protein levels also varied not only across classes, as expected, but also across states. The average protein level for ASW ranged from 10.4 in Victoria to 11.3 in Queensland; that for AH ranged from 12.1 in Western Australia to 13.5 in Victoria.

To examine the time series behavior of the protein level, the data were averaged across states using weights in proportion to receivals. Thus, for each class a weighted average protein level was derived. These results are shown in Figure 2.11 and the statistical results in Table 2.25. The results indicate that there is not a significant trend (at the 10 percent level) in

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[3]Detailed description of these segregations are presented in later sections of this report.

the average protein level for any of the classes. However, the trend coefficients for ASW and APH are negative and the latter is significant at the 12 percent level. Examination of Figure 2.11 illustrates the behavior of actual protein levels through time. Though not substantially significant, the major concern in Australia is that during the last four years the actual protein levels were less than trend, and that preliminary estimates for the 1987 crop were 9.1 percent.

E. Farm Sector

The farm sector in Australia is going through a transition just like that of most of the other exporting countries. The purpose of this section is to briefly describe selected statistics of the farm sector.

The structural characteristics of the farming industry are changing toward larger and fewer farms. Table 2.26 indicates the area sown to wheat in NSW for a number of years. The important structural shift is toward a reduction in the total number of farms. In addition, there is a decrease in the total number of farms less than 500 hectares and an increase in those greater than 500 hectares.

A more detailed profile of farms in the wheat-sheep zone is provided in Table 2.27. The wheat-sheep zone is that in which most of the wheat is produced and is shown here for demonstration purposes. (Similar data for other zones and states are also available in the Bureau of Agricultural Economics "Farm Surveys Reports.") There are a number of points of interest:

1) Wheat is the dominant crop comprising nearly twice the cash receipts and three times the area harvested compared to other grains

2) Sheep and income related to sheep are very important to wheat farms in Australia. In 1985/86 cash receipts from sheep and wool nearly equalled that of wheat, and apparently are becoming proportionately more important. In fact the projected increase in total cash receipts in 1986/87 is nearly all due to higher current sheep and wool prices.

3) Returns declined between 1984/85 and 1985/86 and are expected to increase in 1986/87--though they are still negative.

Wheat farming in Australia involves extended rotations with clover and sheep. Casual conversations with producers indicated they used to plant four years of wheat and two years of pasture. However, due to reduced wheat prices and increased sheep/wool prices, they are now following a rotation of two years wheat and four years pasture. One purpose of this is to increase the soil nitogren. Superphosphate is a dominant fertilizer used in Australia wheat. Table 2.28 shows the amount applied to wheat and the crop area fertilized. While this is very aggregate data, it is clear there has been a sharp reduction in fertilizer use since the peak in 1981/82, both in total and per hectare of crop land.

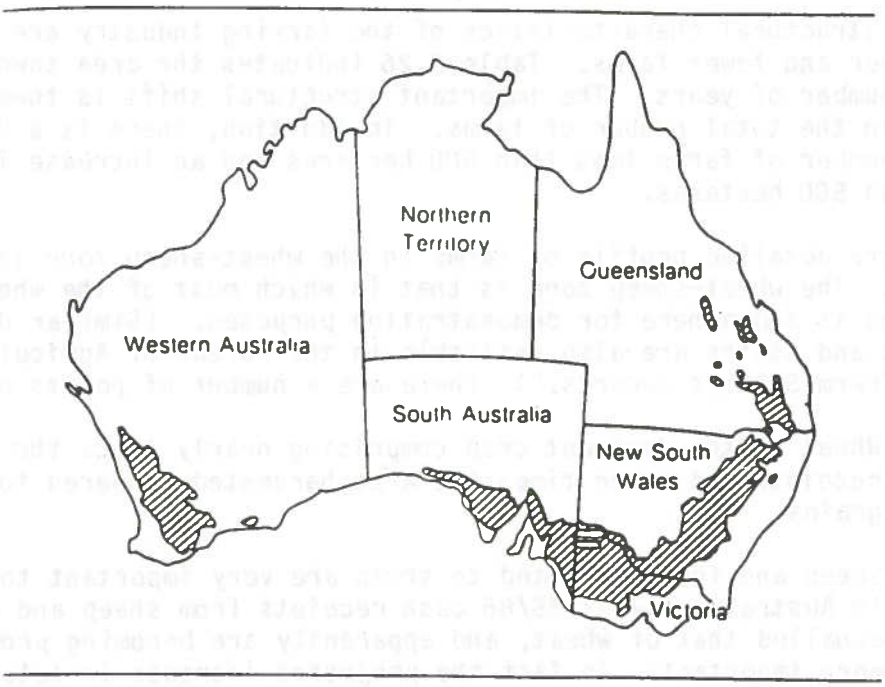

Figure 2.1. Wheat Growing Regions of Australia.

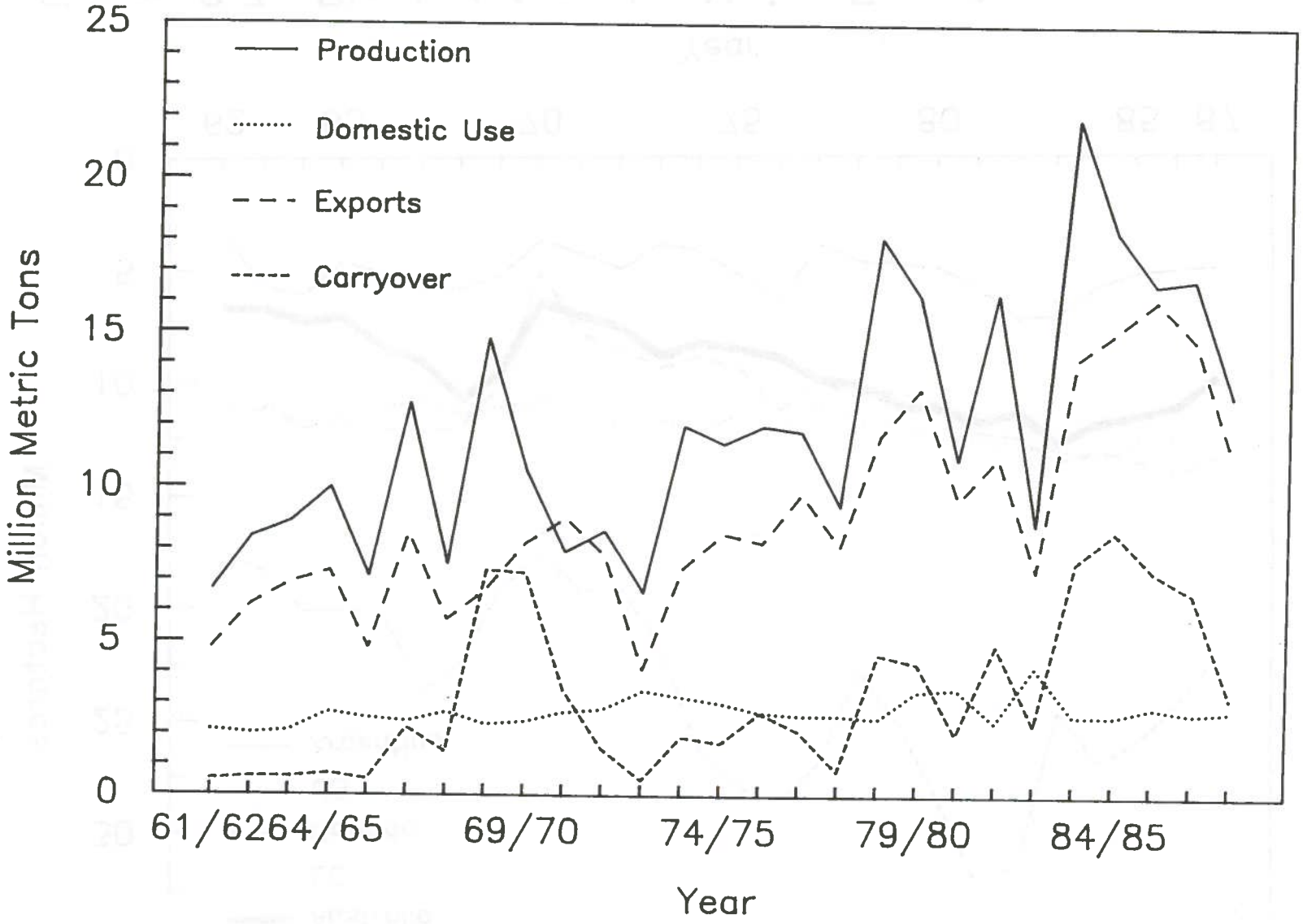

Figure 2.2 Wheat Supply and Disappearance for Australia

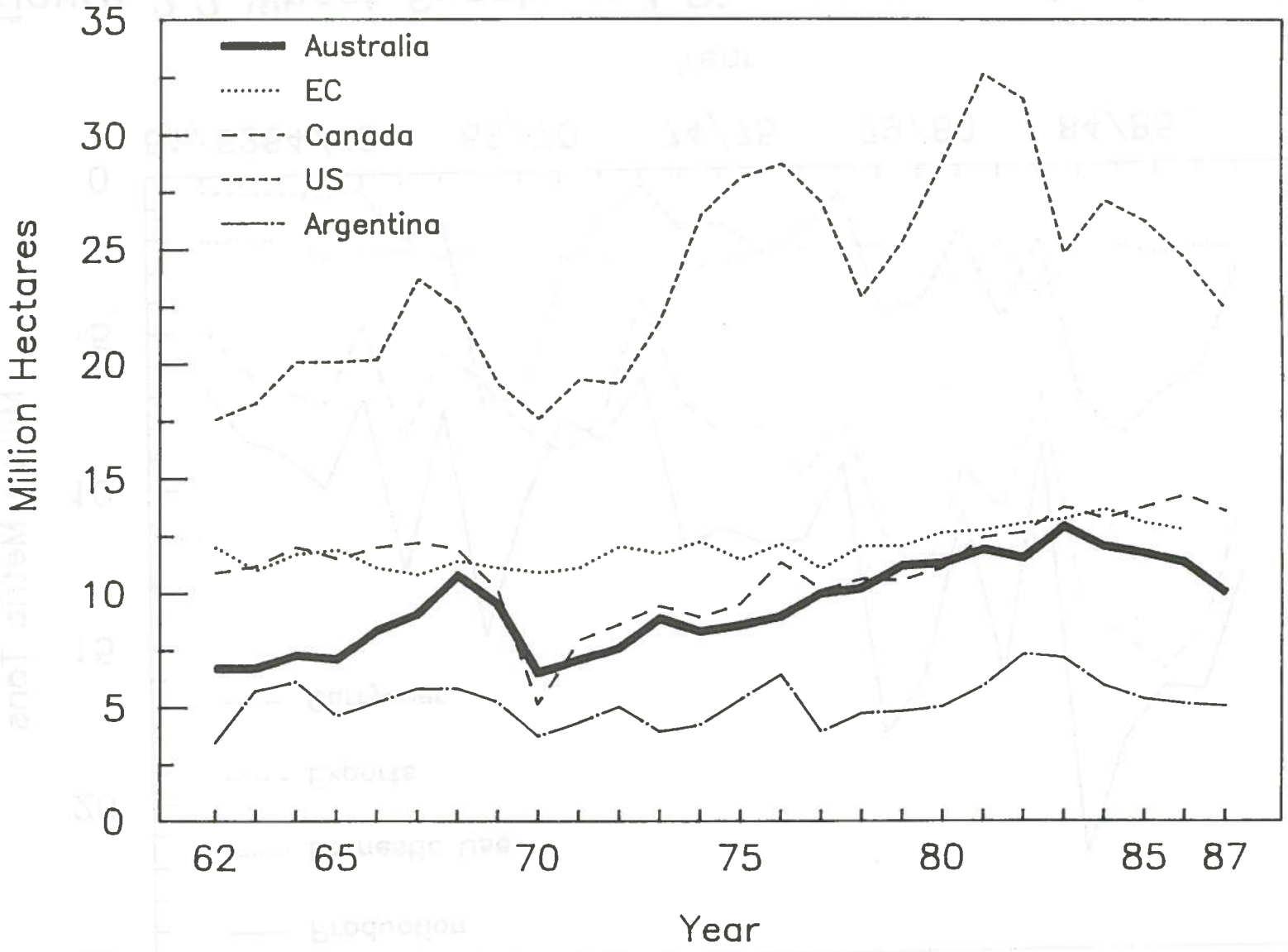

Figure 2.3 Planted Area by Major Exportors in Million Hectares

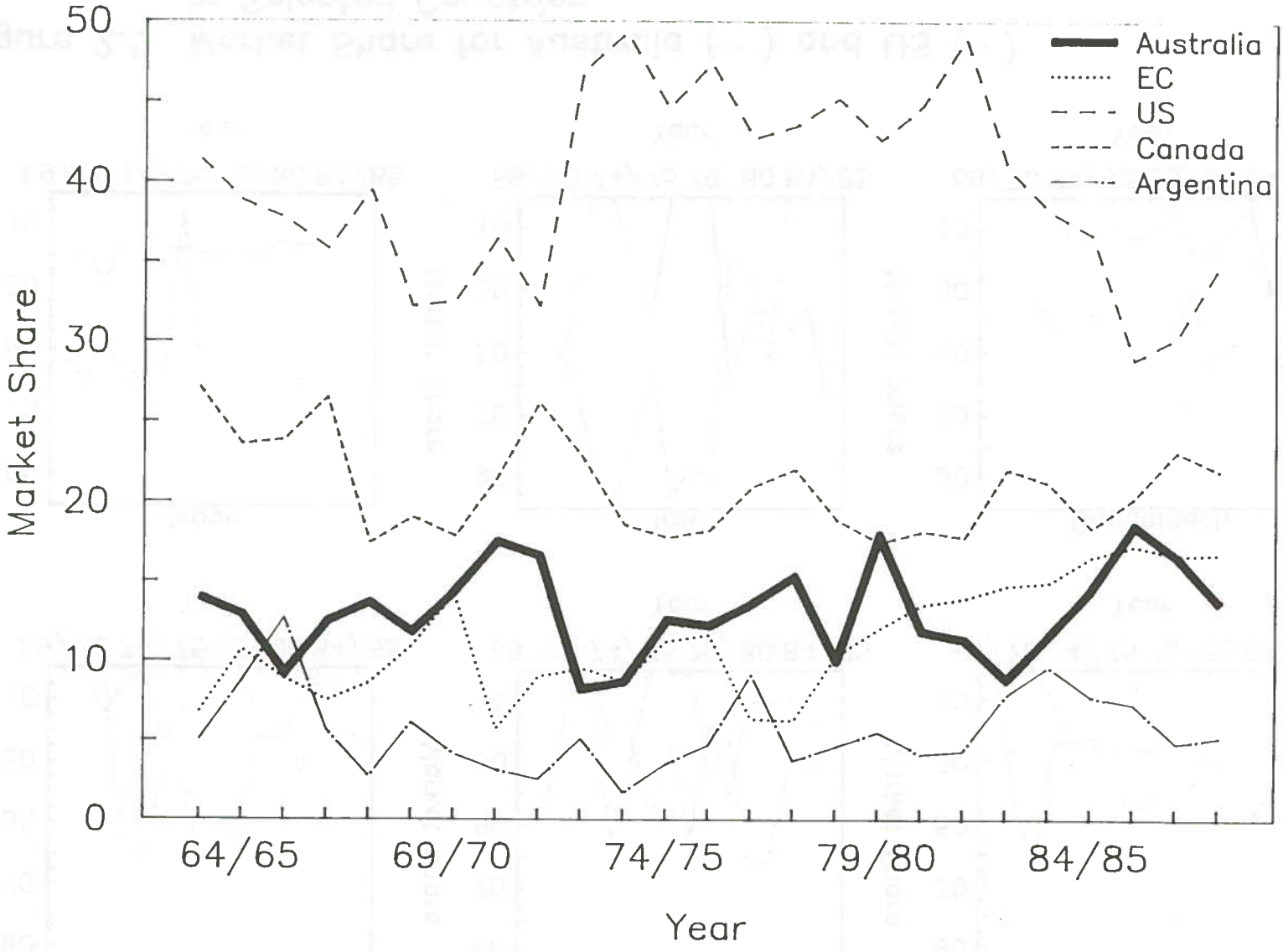

Figure 2.4 Market Share of Exports by Major Exportors

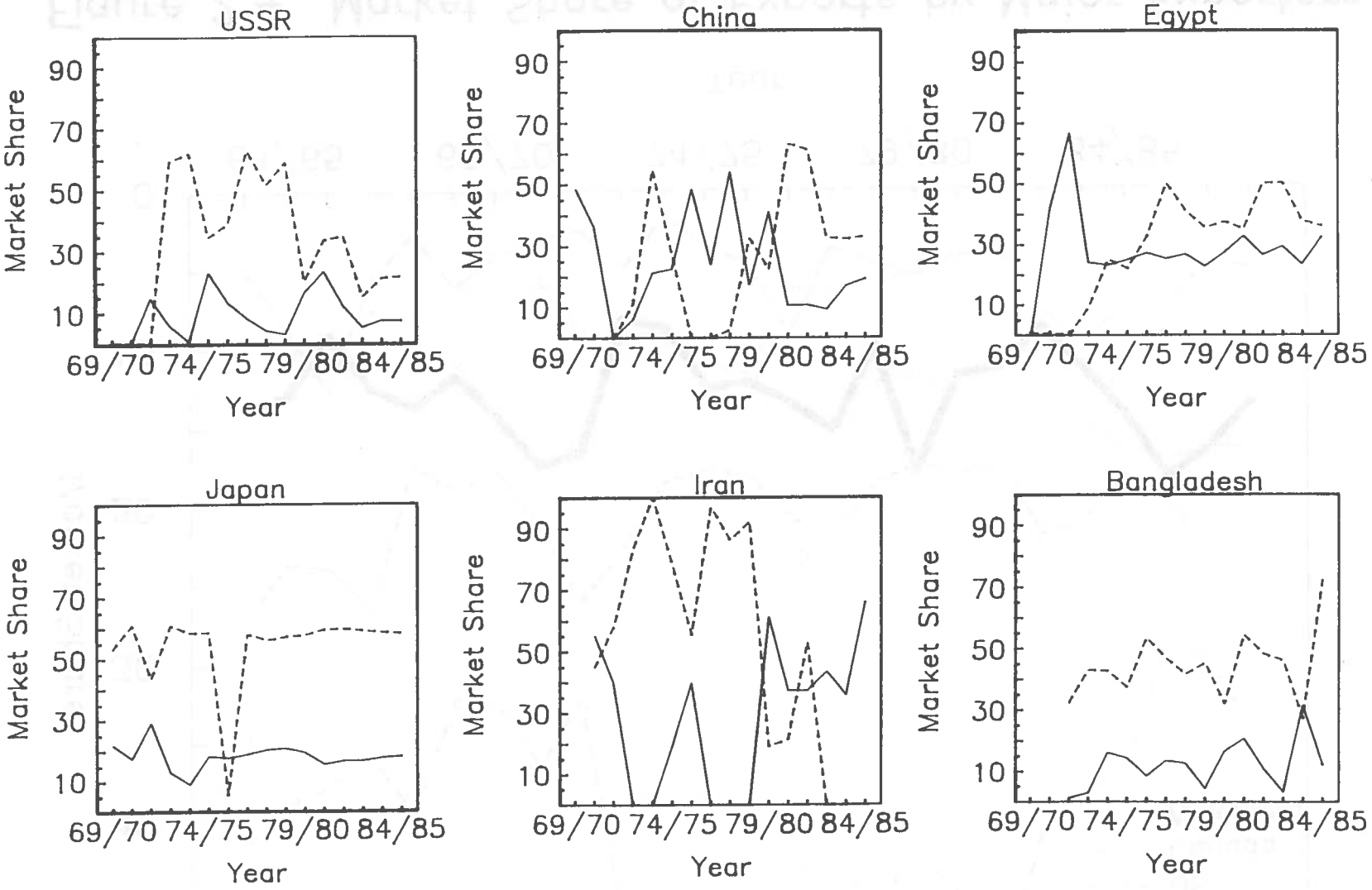

Figure 2.5 Market Share for Australia (—) and US (---) to Selected Countries

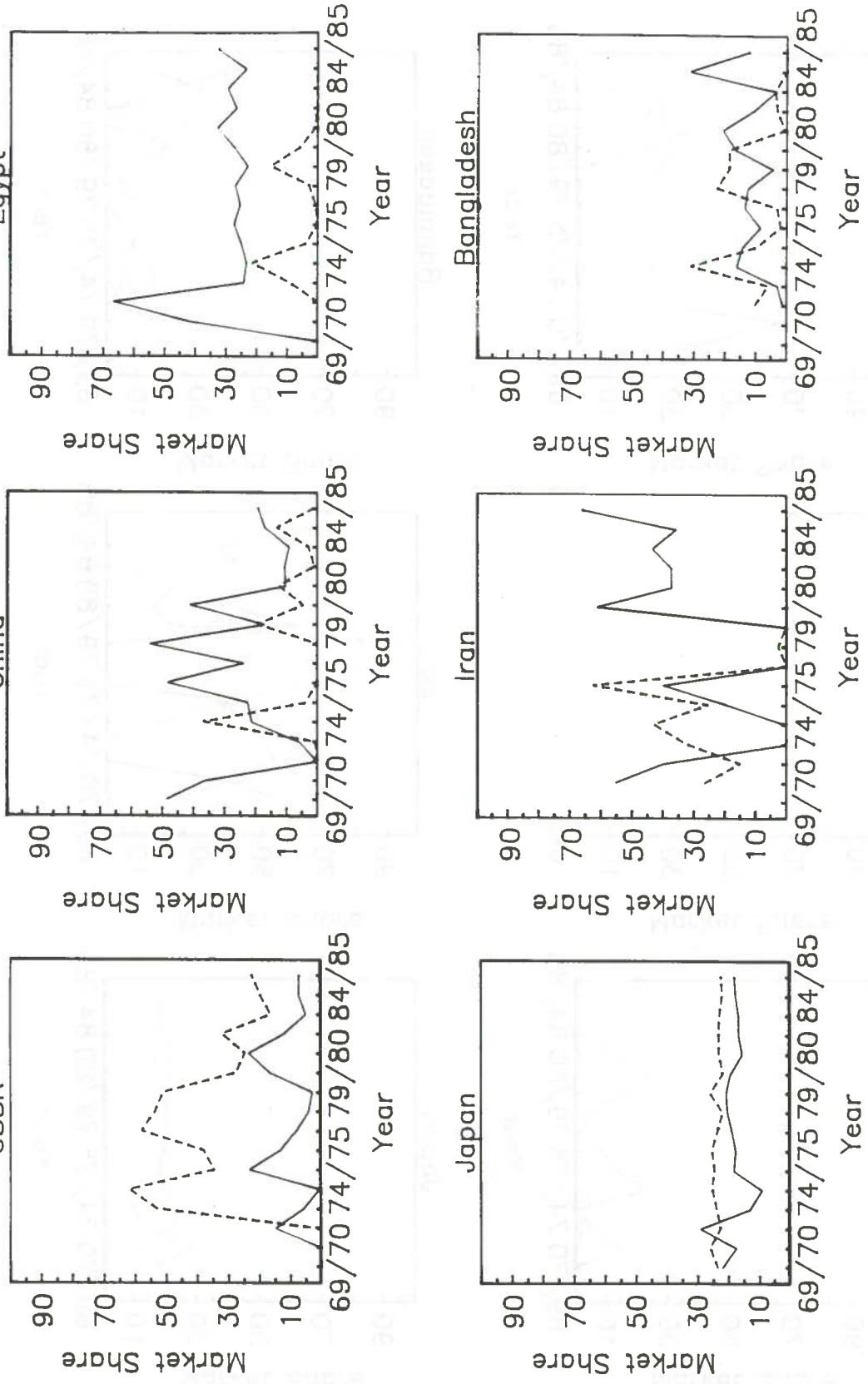

Figure 2.6 Market Share for Australia (—) and US HRW (---) to Selected Countries

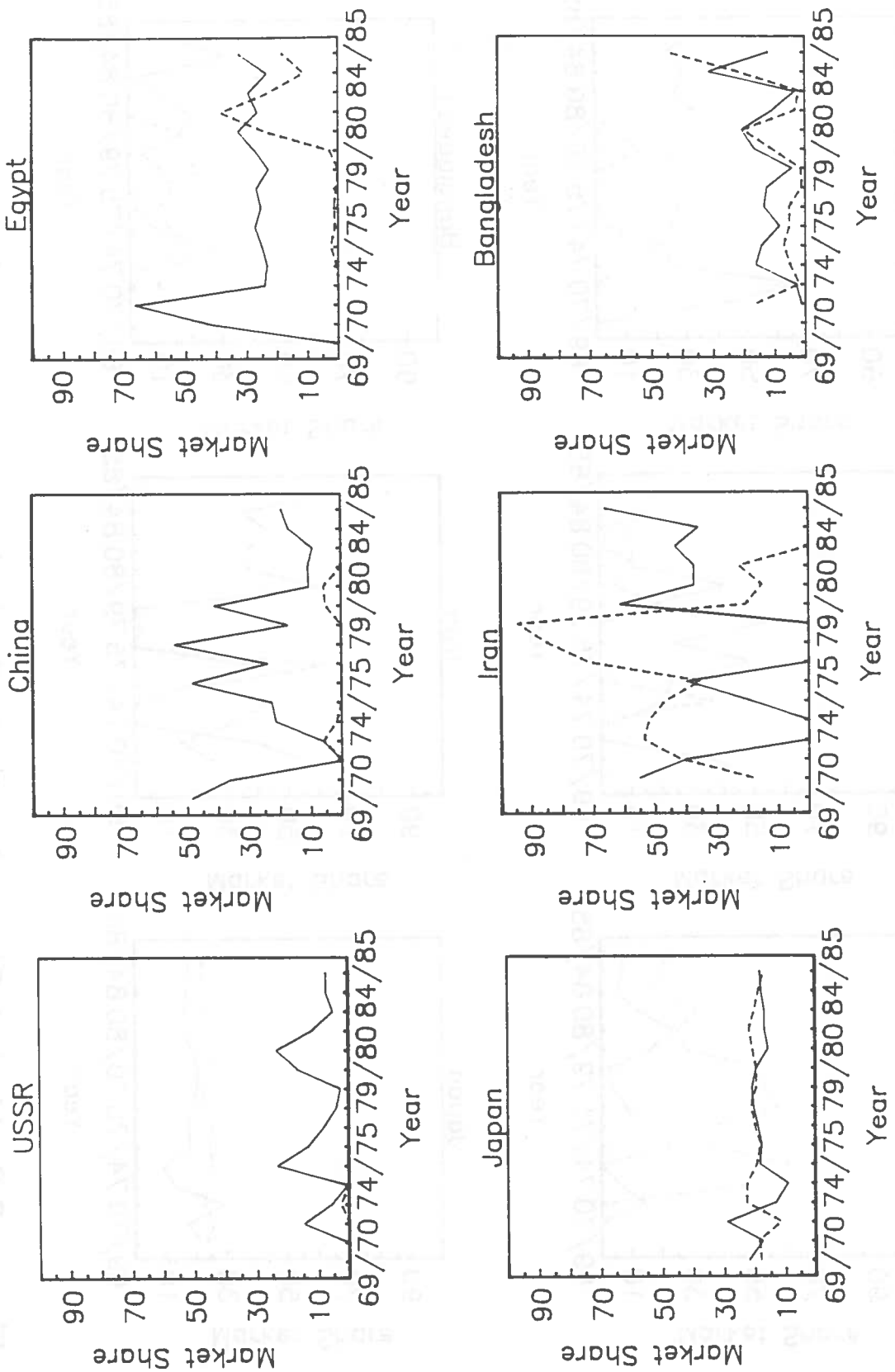

Figure 2.7 Market Share for Australia (—) and US White (---) to Selected Countries

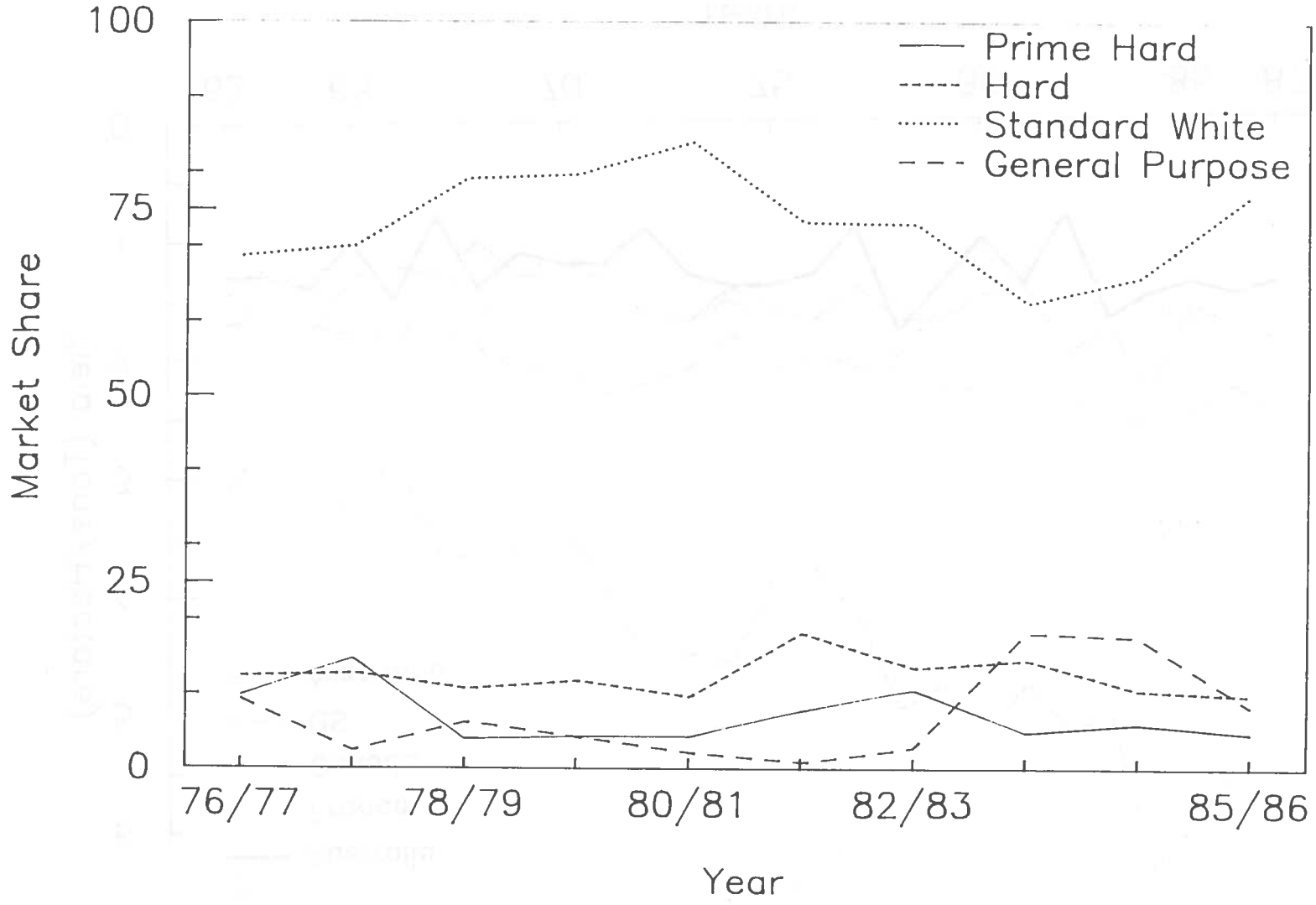

Figure 2.8 Market Share by Class of Australian Wheat Exports

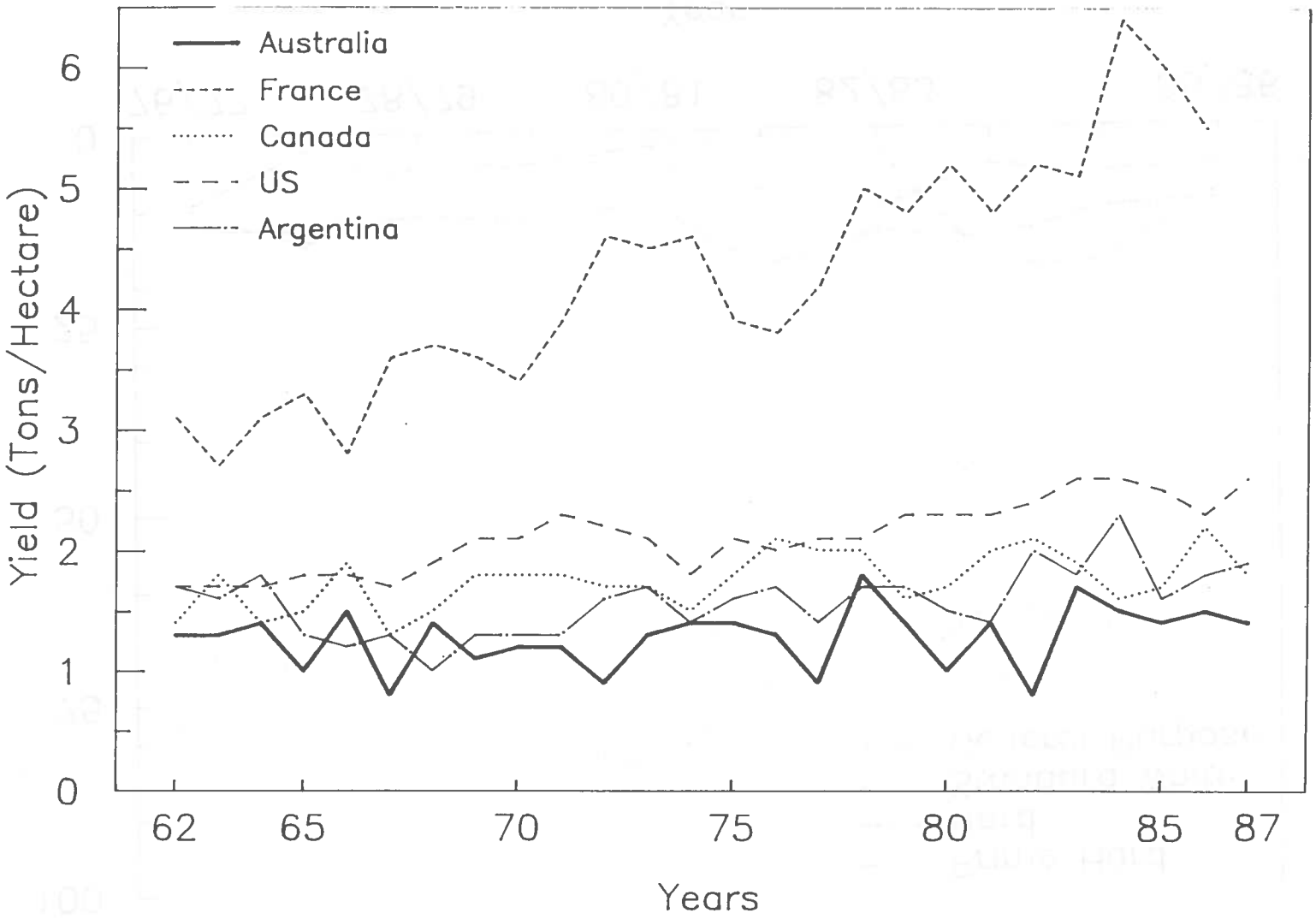

Figure 2.9 Yield by Major Exportors in Tons/Hectare

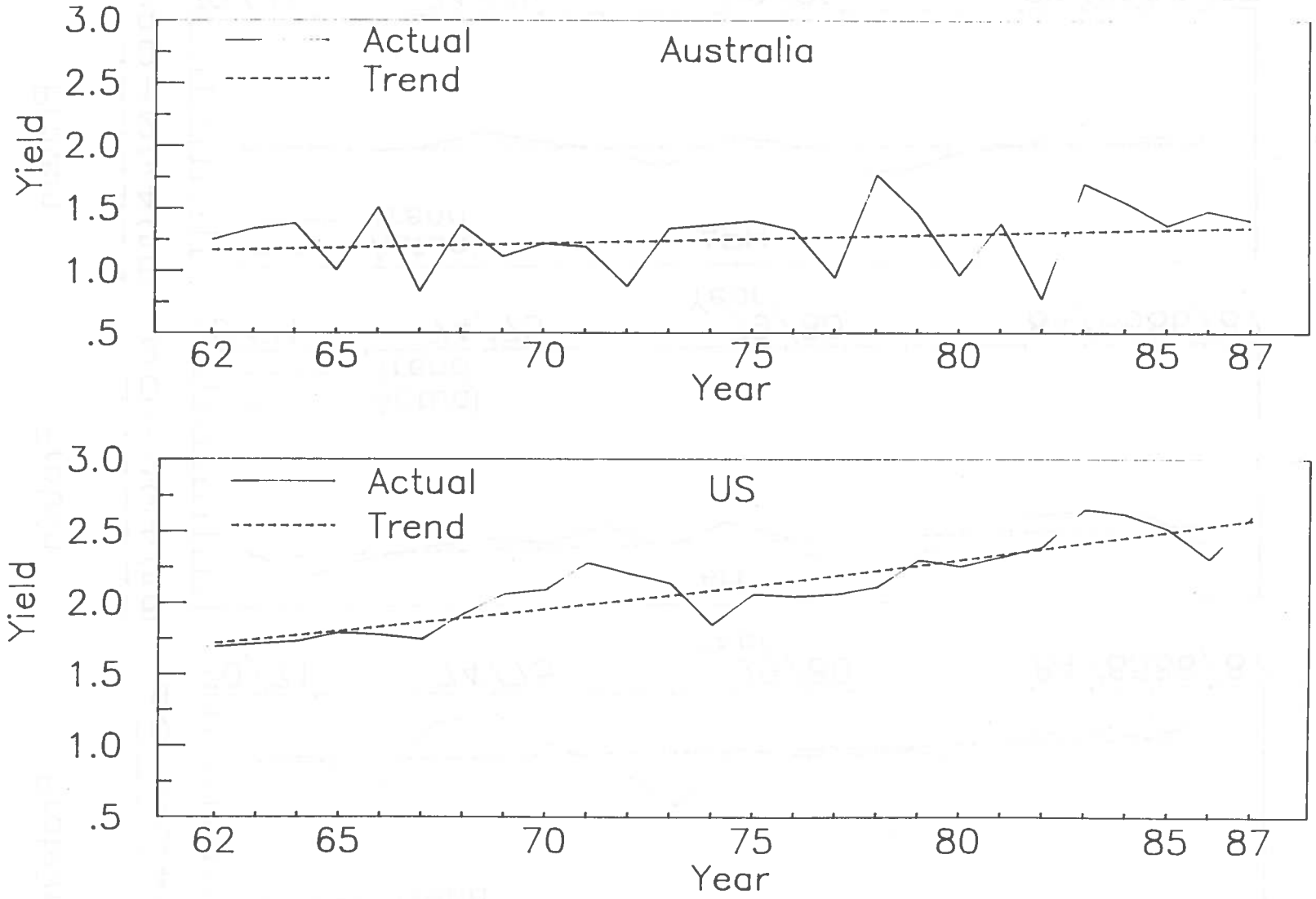

Figure 2.10 Australia and US Yield Trends

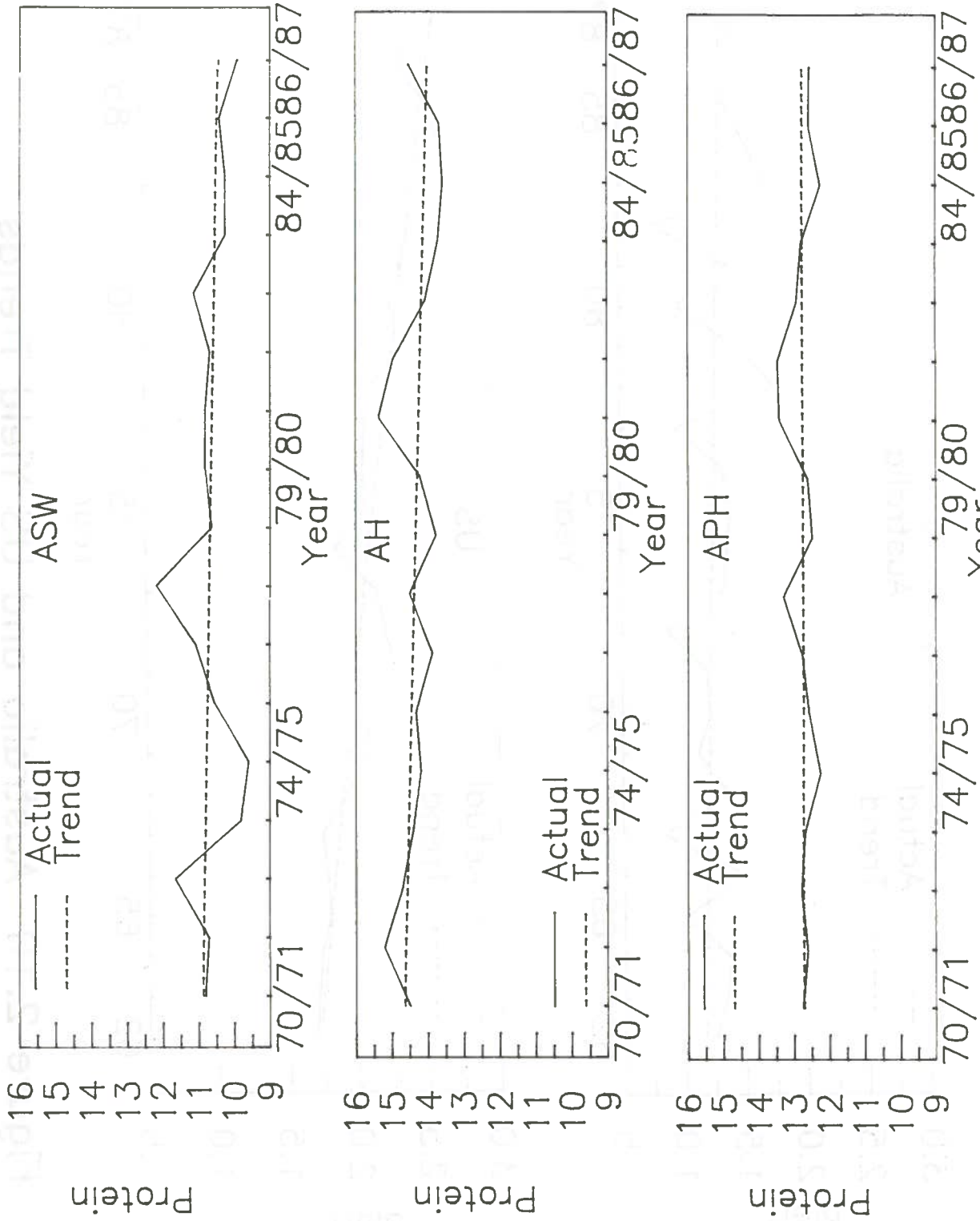

Figure 2.11 Average Crop Protein, 1970/71–1986/87

III. The Roles and Functions of the Australian Wheat Board (AWB)

The single most important institution in the Australian wheat industry is the AWB. The AWB is involved in variety control, establishment of grade standards, administering producer price policy, and domestic and export sales. In addition, the AWB has established procedures for resolving many potential problems associated with quality. The purpose of this section is to describe the activities of the AWB. In the first section below the history of the AWB is briefly described as well as its current objective and acitivites. One of the important functions of the AWB is that of setting receival standards, which essentially form the basis of the grading system in Australia. Government producer price policies are administered by the AWB and these are described in a subsequent section. Sales procedures and trading practices are discussed in the following section. In the final section highlights from a recent public inquiry into the wheat industry are described.

A. Historical Background and Current Objectives

The origins of the AWB began in 1939 as a war time defense organization. Prior to that wheat marketing was conducted by private traders and exporters. The 1939 legislation gave the AWB the authority to receive, handle, and market Australia's wheat crop. The AWB became the sole buyer and seller of Australian wheat, and storage, handling, and transportation were provided by each state's bulk handling authority (BHA).

Operations of the current AWB stem from legislation established in 1948. Beginning at that time the AWB would be subject to legislation spanning five years with a sunset clause. Thus, a review would be conducted every five years to evaluate the performance of the AWB. Legislation was under the auspices of the "Wheat Industry Stablilization Acts" of 1954, 1958, 1963, 1968 and 1974, and the Wheat Marketing Acts of 1979 and 1984. The current legislation expires with the 1988/89 crop marketing year. Thus, there is currently an Industries Assistance Committee (IAC) investigation reviewing the performance of the wheat industry (highlights of this IAC are discussed at the end of this section). A new wheat marketing act will have to be legislated prior to the 1989/90 marketing year. Complementary legislation in each state is also required for the AWB to operate on a national basis.

The current AWB has a broad objective and a number of statutory functions (AWB submission to IAC). The broad objective of the AWB is to:

> perform its functions with the objects of securing, developing, and maintaining markets for Australian wheat and maximizing the return to growers from the marketing of Australian wheat.

This objective should be made in consultation with the Grains Council of Australia (an organization representing growers). Specific statutory functions of the AWB are:

(a) to control: (1) the marketing of Australian wheat within the States and Territories, (2) the interstate marketing of Australian wheat, (3) the overseas marketing of Australian wheat, and (4) the export of wheat from Australia

(b) in appropriate circumstances, to import and market overseas wheat within Australia;

(c) to encourage and promote the sale and use of Australian wheat, both within Australia and overseas;

(d) to cooperate, consult and enter into agreements with, and make recommendations to, the bulk handling authorities (BHAs) authorized to receive wheat on behalf of the AWB;

(e) after consulting the BHAs, to determine standards: (1) for the receival and classification into grades of wheat delivered to the AWB, (2) for categories of wheat containing one or more classes and grades of wheat, and (3) for the condition and quality of wheat outturned to buyers by the BHAs;

(f) to encourage, fund and arrange the conduct of research relevant to the marketing of wheat; and

(g) to provide advice and recommendations to the Commonwealth and States relating to the marketing of wheat.

In meeting the objective and functions, the AWB has a number of powers. Selected powers of interest include:

(1) to enter into tripartite barter arrangements;

(2) to arrange for third parties to provide finance to wheat buyers;

(3) to contract for, or charter vessels for the carriage of wheat by sea;

(4) to arrange for, or establish, maintain and operate facilities for, the overseas storage and handling of wheat;

(5) subject to the approval of the Minister, borrow to raise moneys; and

(6) subject to the guidelines determined by the Minister--enter into a deal with; corn and wheat commodity futures contracts, currency futures contracts, forward exchange contracts, interest swaps and combined currency and interest swaps; for hedging purposes.

The board is comprised of a full-time chairman, a part-time commonwealth government representative, five wheat growers, and four specialists (one of whom is a wheat grower). The important points are that the AWB has a statutory objective to maximize returns for growers, the board itself is controlled by growers, important functions are given to the AWB for purpose of meeting the objective, and a number of powers are given the AWB to facilitate its operation.

Operationally the AWB virtually controls all aspects of wheat marketing. With the exception of domestic stockfeed sales, all wheat must be delivered by growers to the AWB. The AWB authorizes a sole Bulk Handling Authority (BHA) in each state for purposes of handling and storage and negotiates rail rates for purpose of transport. The BHAs essentially provide the physical functions of storage and handling at country and export terminals for the AWB. The AWB is the sole seller of wheat to both the processing industry (non-stockfeed) and exports. Most of the exports are made directly by the AWB, but in some years up to 30 percent may be made to private traders for re-export. The AWB also operates a price pool for purposes of facilitating purchases from producers.

B. Quality Control by the AWB

One of the important functions of the AWB is the establishment of standards for receival and classification of wheat into grades (see Section D in the previous section). Through the receival standards, variety control and marketing arrangements the AWB virtually controls the quality of wheat throughout the marketing system. This control has an influence on variety development, release, and selection.[4] Indeed, Australia has developed a reputation for wheat which is dry, clean, insect free, and uniform, and promotion materials exploit these points.

The receival standards have the potential to change through time, but in recent years there has been minimal change. There are five dominant classes of wheat produced in Australia including: Australian Prime Hard (APH), Hard (AH), Australian Standard White (ASW), General Purpose (GP), and Feed. In addition, classes exist for durum and soft, but due to limited production and export are not discussed further in this report. APH and AH are bread making wheats segregated primarily by protein level--APH is 13-15 percent, AH is 11-14 percent depending on variety. ASW is a multi-purpose wheat with intermediate hardness and protein--normally 9-11.5 percent. GP comprises the same varieties as the other classes but is inadequate in terms of test weight, weather damage, or unmillable material. GP wheats can be used as lower grade milling wheats. Feed wheat is a default class and is only suited for feed purposes. In addition to classes, locations (by state) can be specified to account for the fact that the same class produced in different states may have different performance characteristics.

Receival Standards

One of the tools used by the AWB for quality control is the "Receival Standard." These essentially comprise what may be referred to as grade standards in other countries. However, a slight difference is that all wheat is inspected and an official grade determined at the point of first sale, which forms the basis of the financial transaction between the AWB and grower. An underlying idea in the Australian marketing system is that if tight

[4]Greater detail on this topic is provided in Section V.

standards are applied at the first sale, most problems associated with quality are mitigated. Having rigid unmillable material standards at the point of first sale, for example, gives incentive for harvesting clean wheat and precludes problems further downstream in the marketing system.

The same receival standards apply to all states, but end-use performance of a class may vary by point of export. Thus, state may be referenced as a quality descriptor in export transactions. The receival standards for 1987/88 are shown in Table 3.1. There are two categories each for AH and GP, depending on protein level, falling number and the level of defects. It is of interest to note, however, that the tolerance levels for some factors are the same across classes. For example, the level of unmillable material is the same across the top four grades. The tolerance for moisture, insects and contaminants are the same across all classes and categories. Important grade determining factors include protein, vareity (discussed below) and the extent of damage (e.g., falling number, defects). Wheat with excessive damage is classed as GP or Feed. Given the classes listed in Table 3.1, wheat is further segregated by protein within the classes APH and AH (and there is a proposal to do so within ASW as discussed below). These segregations include 13, 14, and 15 percent protein in APH and 12 and 13 percent in AH.

Should a load of wheat not meet these standards it cannot enter the marketing system. As a result, combined with the wide price differentials below, there is tremendous incentive to minimize at least the level of unmillable material at the farm level. It is not uncommon for growers to have a "second" screen (or double header) installed on their combines equal to that of the receival standards (2 mm) to be certain there are not excessive levels of nonmillable materials.

The AWB has the ability and responsibility to make changes in the standards through time as deemed necessary by production and market conditions. Traditionally the ASW class was sold as FAQ (Fair Average Quality) in the early 1970s. Since then the grading system has evolved to reflect increased segregation. There are a number of changes which have occurred in recent years. First, the list of approved varieties (discussed below) changes through time to reflect variety availability and experience with marketing particular varieties. A variety may change classes between years. There were several differences which existed in the administration of the standards in 1984/85 and 1985/86 (see Appendix B for standards from crop years 1984/85-1987/88). In those years discounts were built directly into the standards for excessive unmillable material, other foreign seed, ergot and sprout damage. However, these discounts only applied to the GP class.

Price Differentials

The receival standards described above facilitate segregation into relatively homogeneous categories and therefore aid the AWB in its sales and marketing programs. An important tool of the AWB in quality control is the use of price differentials for different classes and categories of wheat. This is the mechanism used to reflect market signals to producers. A detailed description of the pricing mechanism is provided in the section below.

However, of particular importance here are the differentials between classes. The interim advance payment (90 percent of the Preliminary Guaranteed Price) for the different classes in 1987/88 are:

	$/A	Percentage of ASW
APH	137.87	113
AH No. 1	126.15	104
No. 2	121.59	100
ASW	121.59	100
GP No. 1	115.07	95
No. 2	92.93	76
Feed	89.03	73

These are the prices received by producers at the time of first sale. Final payments, and payments for protein within APH and AH, are a result of pooling and discussed in the following section. The point is that there are premiums for qualities above ASW and fairly substantial discounts for grades less than ASW. This is ultimately the mechanism of the AWB which reflects incentives for improving quality or precluding quality deterioration.

Variety Control

An important aspect of quality control in the Australian wheat industry is the Variety Control Scheme (VCS) which is administered by the AWB. The VCS is discussed here as it applied to the receival standards and pricing, and Section V provides a complete discussion of the variety development and release mechanisms. The receival standards applied by the AWB are essentially physical characteristics which are easily measured and, with the exception of protein, do not directly reflect end use characteristics. There are at least three end use characteristics--grain hardness, flour milling, and dough processing characteristics--which are important and vary by variety and region of production. Since these cannot be measured easily, the VCS was implemented to facilitate segregation. The VCS essentially is used to provide incentives/disincentives to producers and for variety identification. The latter is a prerequisite for segregation and marketing.

The VCS is not regulatory but is used to identify variety, which is then used, in conjunction with protein and physical characteristics, for classification and pricing. Each year prior to planting the AWB lists varieties by region (silo groups within each state) which will be eligible for each class. Where appropriate, discounts for certain varieties grown in certain silo groups are listed. A separate list is published for each state. Producers then choose varieties for seeding based on agronomic and price differences.

An example of the variety discount list for 1988/89 in NSW is shown in Table 3.2. Several points are of interest. Only certain varieties in specified silo groups are eligible for APH or AH. Some varieties may be AH or ASW in the same silo group, depending on the protein level, but ASW in other silo groups regardless of protein. Some varieties may have discounts ($3 or

$5/mt) if grown in some silo groups. For example, Hartog would receive a $3/MT discount for ASW if grown in silo group 4, 5, or 6. Unregistered varieties, in addition to any red wheat, are classed as feed wheat. In Victoria, only certain varieties grown in silo group A are eligible for AH. All others are ASW, feed and/or subject to discounts.

Enforcement of the VCS requires some mechanism of variety identification at the point of first-sale. However, most varieties are not easily visually distinguishable. To resolve this problem the AWB uses an affidavit system. Upon delivery to the country elevator producers must declare the variety and sign an affidavit indicating the name of the variety. Based on this declaration wheat is classed and segregated. There are three mechanisms used to enforce the integrity of the affidavit mechanism. First, penalties (including financial and prison) could be imposed if the AWB could prove a false declaration.[5] Second, the AWB conducts spot checks using electrophoresis, and these have a high profile--at least the intent. Third, there is peer pressure (at least alleged) among producers that violation would eventually degregate the reputation of Australian wheat, thereby resulting in longer-term negative consequences.

Other Quality Control Mechanisms

Of foremost importance in quality control are the receival standards, the associated variety control scheme, and the use of price differentials. However, there are several other complementary functions and institutional relationships used by the AWB for quality control which are described here briefly.

In each state there is one Bulk Handling Authority (BHA) which is authorized to receive, share and handle wheat for the AWB. These BHAs are fully integrated from the country elevator and include the export terminal (greater detail of the operations is provided in Section IV). Once received into the BHA, wheat is the property of the AWB, which contracts for standards of operations which influence grain quality. In addition, most of the wheat is sold and delivered at harvest with very little being stored on-farm with post-harvest delivery. An important institutional relationship between the AWB and the BHAs which facilitates quality control is that of logistical coordination of quality requirements. Each BHA submits a weekly composite sample of wheat by location (and silo) to the AWB. This is then subjected to more extensive quality evaluation. Through this process the AWB knows the physical and end-use characteristics of wheat throughout the marketing systems. In addition, the AWB knows quality requirements at least for the principal buyers. Through this process the AWB is capable of coordinating shipping and loading orders to meet buyer specification. At the extreme this could entail segregations within a class for particular buyer needs.

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[5]However, prosecution is difficult because under current rules the AWB would prove the producers "had intended" to produce and deliver another variety.

Essentially there are only two transactions in the Australian wheat market--one between the grower and AWB, the other between the AWB and importer. In the middle of this transaction is the AWB which through coordination with the BHAs has tremendous control over quality. As a result the benefits of restrictive quality control can be directly captured. For these reasons there is generally limited blending between grades and loading to factor limits as would be the case if there were multiple transactions, each of which would require quality evaluation subject to grade limits.

The AWB is responsive to market needs in setting receival standards and relative prices. As an example, the AWB is currently in the process of experimenting with further segregation. Wheat received as ASW in the past has not been segregated on the basis of protein. Payments to producers of ASW were an average price thereby masking any implicit values associated with protein, and consequently provided a disincentive to maintain or increase protein levels. In addition, lack of protein segregation in ASW created problems in marketing. During the same time period there have been declining levels of average protein in ASW, and the world market has placed greater importance on protein level. As an example, the USSR has become the most important market, and they have indicated to the AWB that "we are not interested in low protein ASW." In fact, in early December 1987 the USSR apprently told the AWB that 12 percent would be the minimum acceptable protein level, but only 20 to 30 percent of the ASW crop is above 12 percent protein, thereby limiting market growth in this now very important market (Financial Review, December 9, 1987).

In an attempt to rectify this long-term trend the AWB has introduced a "Quality Testing Pilot Scheme." The purpose of this is essentially to try to avert the apparent long-term decline in protein and encourage production of high protein wheat. To that end, the AWB eventually wants to segregate by protein within the ASW class and make payments reflect the protein level. Following is the timetable of planned implementation:

1987/88 - pilot testing system to collect data and experiment with equipment (they plan to use whole grain analysis)

1988/89 - payment incentives could be introduced as early as 1988/89 depending on success of the trials in 1987/88

1989/90 - implement a complete data testing system and payments for protein within ASW

The purpose of this scheme is to transmit market values of protein to growers. In addition, in a recent letter to growers from the AWB strongly suggested that differential payments may also be introduced for moisture and foreign material.

C. Producer Pricing and Policy

Prices received by producers are pooled across the returns from sales and are net of all costs associated with handling, transport, finance, and

sales. The principal policy regarding price and income in Australia is the Guaranteed Minimum Price (GMP). Operations of the GMP and pooling are integrally related and do have an impact on the signals transmitted in the marketing system regarding quality. Those topics as well as the derivation of local prices and a description of producer marketing alternatives are described in this section.

Guaranteed Minimum Prices

Current operations of the GMP began in 1979, but similar price stabilization schemes have existed since 1948. The GMP essentially is a mechanism which provides a price floor for producers during a particular marketing season. In general the GMP reflects returns from past marketing seasons and those expected during the current marketing season. Specifically, the GMP is defined as the higher of the two amounts (Industries Assistance Commission p. 28):

- 90 percent of the preliminary estimates of the GMP, or
- 95 percent of the average of the estimated growers pool return of the two lowest of the previous three seasons.

In practice, the second procedure is used and deductions are made for estimated interest and administration costs. The GMP then basically reflects a three-term moving average of returns, including those estimated for the current season. The purpose of the GMP is to provide some degree of temporal stability in growers' incomes. However, by definition the GMP typically would be biased downward, given that only 95 percent of the average is taken and two out of three terms in the avearge reflect low price years.

Operationally, separate GMPs are specified for each of the five categories of wheat, thus allowing a mechanism of transmitting marketing signals regarding quality. By October of each year (just before harvest) preliminary GMP (PGMP) is announced for producers (thus new crop signals are not directly transmitted until after planting decisions had been made). This PGMP is then revised by March of the following year (after harvest) and announced as the final GMP (FGMP). At the time of delivery, which normally occurs at harvest, an Interim Advance Payment (IAP), net of deductions, is made which is 90 percent of the PGMP.[6] Adjustments to the IAP are made at the time the FGMP is made and these are referred to as the Final Advance. For demonstration purposes Table 3.3 shows a brief history of the GMPs for ASW and individual classes in the recent two years. In addition, details of the 1986/87 Final GMP are presented in Table 3.4--a year in which the GMP was increased between October and March.

The GMP is underwritten by the Commonwealth. Payments for the Commonwealth are only necessary to the extent market prices fall sharply within or between years. Given that past years minimum prices are

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[6]At one time only 40 percent of the GMP was paid in advance.

incorporated in derivation of subsequent GMPs, then minimal assistance should be required in succeeding years if world prices continue to fall. The marketing season 1986/87 is the first year in which a payment will be required from the Commonwealth. During this time period there was a nearly 40 percent drop in ASW asking prices between April and July 1986, coinciding with reductions in the U.S. loan rate. As a result the government's contribution will likely be in the order of $220 million, which cannot be confirmed until after the pool is closed.

Underwriting of the GMP has one important purpose, but also a very important indirect result. The primary purpose of underwriting is to allow an advance payment scheme and price stabilization plan. An important result of this is that borrowing costs of the AWB are reduced by this government guarantee of the GMP. Without the payment guarantee, interest costs would be greater and/or inventories may have to be valued at a lower level. Given the AWB borrows large amounts of money to finance advance payments and inventories, underwriting of the GMP has important indirect benefits in terms of favorable borrowing costs.

Pooling. A fundamental principal of the AWB which has existed in some form since 1948 is that of price pooling (pooling of handling costs are discussed in Section IV). There are two objectives of price pooling. One is to increase returns by selling through a monopoly (i.e., the AWB). The second is to share risks across growers. Through the use of pooling and underwriting of the GMP, the AWB can easily make advance payments even though sales and pricing typical accrue over succeeding months.

Producers are paid 90 percent of the PGMP at delivery, net of direct costs of transport and handling. Thus, the PGMP is essentially basis an FOB ship position. In succeeding months wheat is priced and shipped. Receipts from credit sales are received over extended periods. From these revenues operating, interest and administration costs as well as the Interim Advance Payment are deducted. The balance is paid producers in the form of "Subsequent Payments." Table 3.5 shows the pool payments reported in the AWB 1985/86 Annual Report.

All producers receive the same average price regardless of the time of delivery. In fact, given the IAP is made within 21 days of delivery, there typically is a disincentive to not deliver concurrent with or as soon as possible after harvest. However, prices do vary to some extent by quality in several ways. First the IAP varies by class as indicated in the previous section. Higher quality wheats receive higher IAPs. In addition separate pools are maintained by grade, and protein level within APH and AH. Subsequent payments can vary across producers depending on the protein level or class--see "Pool Equities" in Table 3.5.

As with any price pooling scheme, problems necessarily develop and in the case of Australia are well documented in the recent IAC investigation. Two problems of particular interest are highlighted here. First, given that prices do not differentiate by time of sale, there is generally no incentive for post-harvesting delivery to the BHA. As a result, there is limited on-farm storage, but extensive storage and conditioning facilities at the country and export elevators. Second, even though there are payment

differences across classes, 70 percent of the wheat is ASW in which at least currently within class segregations and price differentials do not exist. As a result price signals across protein are disguised within this grade. The AWB has recognized this problem and is in the process of initiating procedures to resolve it.

Producer Prices and Marketing Alternatives

Actual prices to producers are comprised of the net price at the time of delivery plus all subsequent payments as discussed above. The net price at the time of delivery is derived as the Interim Advance Payment which varies by class, net of a number of charges associated with grain handling, storage, transport, and miscellaneous charges. As an example, the figures below show the typical derivation for the net price to producer in ASW for the delivery of ASW.

Interim Advance Payment ASW		126.15
Freight	23.00	
Storage and handling	16.20	
Research levy	.50	
Carry-over cert.	.40	
Outward Wharfage	1.78	
Ceres house	.30	
	42.68	
		$ 83.47/MT

A brief description of each component is given here, but greater detail is provided in Section IV.

The freight charge is the average in 1987 for NSW shipping point. However, prices vary by location. Storage and handling costs include both country and export terminal storage and handling. These are pooled costs and are the same across growers regardless of incidence. The research levy is a contribution to a research fund which is administered through the Ministry of Primary Industries. Carryover costs are associated with financing storage between crop years. Outward wharfage is for maritime pilots. The Ceres House charge is to finance the AWB building.

With the exception of freight, all these costs are the same across users within a state. Differences between states do exist reflecting differences in freight and storage and handling costs. In addition subsequent payments usually occur, the size of which varies across crop years, as well as to some extent by class and protein level.

Producers basically have four marketing alternatives including: (1) immediate delivery to the BHA; (2) deferred delivery to the BHA; (3) on-farm use for stock feed; and (4) grower-to-buyer sale for domestic stock feed. By far the most common alternative is that of immediate delivery to the BHA, normally concurrent with harvest. In this case extensive on-farm storage is not required and payment is normally received within 3 weeks. One constraint

to this option is that of waiting time at receival points, which if excessive may justify at least minimal use of temporary on-farm or field storage.[7]

The deferred delivery option was introduced to facilitate the needs of some producers who don't deliver immediately at harvest. Under this scheme delivery can occur between 2 and 14 weeks after a prescribed date for various delivery points. These dates may be as far forward as May of the marketing season. Accrued interest on the Initial Advance Payment is paid producers, but storage and other opportunity costs are not.

Producers may store wheat on-farm for use as feed. An alternative exists to bypass the AWB and BHAs and make direct grower-to-buyer sales to the domestic stockfeed industry. This market is essentially a nonboard market and often is facilitated by the private traders.

The options above are general but do illustrate the alternatives for growers. To put these into perspective, though growers may store for feed or sell directly for domestic feed, these are extremely small markets (prior to introduction of the grower-to-buyer option for domestic stock feed the AWB sold 800,000 MT into this market). The disposition of the crop is ultimately determined by the underlying economics which encompass quality and storage cost and availability. Given that producers are implicitly charged a storage cost by the BHA, regardless of time of delivery, inevitably delivery at harvest is preferable unless there are other anomolistic circumstances. As a result relatively little on-farm storage capacity has developed in Australia compared to other countries. In turn, extensive storage takes place primarily at country elevators and to a lesser extent at export elevators.

D. Export and Domestic Marketing

As indicated, an overall objective of the AWB is to maximize returns of growers. To that end other procedures used for domestic sales differ from those of export sales. In addition there are a number of longer term strategic tools used by the AWB. Critical to pricing is the "Card Price," at least for the domestic market and to some extent the export market. Each of these topics is discussed in this section.

Card Price

The AWB allegedly prices its wheat in competition with comparable wheats produced by other exporters. In the absence of a local cash market the AWB derives and publishes a "Card Price" on a daily basis. These are ultimately related to a formula (though likely variable) relative to competitor prices. The card prices are quoted for each of the four principal qualities, for nearby as well as deferred shipment.

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[7]In the state of Victoria elevator system during 1986/87, as an example, harvest deliveries into the system reached a peak of 200,000 MT/day in December, decreased to 10,000 MT/day in January, and nil after the middle of February.

An example of the card prices for nearby shipment in early December is shown in Table 3.6. Price differences quoted for each class are approximately proportionately equal to relative advance payment prices, which is effectively the purchase price. Also for comparison purposes, annual average card prices are shown in Figure 3.1 with comparison to that of U.S. HRW.

The card prices are apparently tied to those of competitors, but primarily those of the U.S. Discussions in December 1987 indicated that APH prices were $5-8/MT over those of U.S. Hard Red Winter at the Pacific Northwest. Those for AH were $3/MT over. The price of ASW was 50-80¢/MT over a combination of US Gulf and PNW prices. In 1986/87 the AWB estimated that 15 percent would be sold at full card price but in 1987/88 up to 25 percent would be priced at the card price. This increase allegedly reflects the reduced export availability in 1987/88.[8]

Domestic Sales

Sales mechanisms of wheat into the domestic market vary depending on end-use. Stockfeed sales currently are dominanted by direct grower-to-buyer transactions. These are often facilitated by the privte traders. However, in total this market is typically less than 1 MMT per year. Domestic sales of wheat used for individual purchases are negotiated and priced directly by the AWB. Sales of domestic wheat for human consumption are controlled completely by the AWB. However, in this case a pricing formula based on the card price is used. The formula price uses the average of the forward price in the two preceeding quarters. To this value is added a $16/MT service charge and $1.10/MT levy for shipment to Tasmania. The $16/MT service charge is to account for the special services provided by the BHAs over and above these provided by international customers. These include: (1) selection of the best quality--exclusivity; (2) stocks can be reserved for up to 13 months by quantity, quality, and location; (3) storage, and (4) credit--an average of 45 days. Thus, each domestic user pays the same price regardless of intraclass quality and costs incurred. Also, as in other countries the best quality wheat is used domestically. Examples of export and domestic prices for various uses are shown in Table 3.7.

Export Marketing

The AWB has the responsibility of marketing all of the wheat from Australia with the exception of domestic stock feed. Sales can be made directly by the AWB or the private trade. However, most of the sales are direct cash sales negotiated by the AWB and a number of institutional relationships (strategic tools) are used as part of the marketing mix. First, the AWB has a number of long-term bilateral agreements (LTAs) as shown in Table 3.8. These typically comprise about 3.5-4.0 MMT per year. Second, credit is extended under EFIC (Export Finance Insurance Corporation) which is a credit guarantee of 95 percent of the term for up to three years. The AWB

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[8]Private traders indicated that Japan is one of the few markets in which the full card price is realized.

pays the insurance premiums for this arrangement. In 1986/87 credit sales accounted for 27 percent of the total wheat exports. A third direct form of aid is that provided to Egypt. In 1985/86 the AWB in conjunction with other Australian agencies assisted Egypt in construction of a 20,000 MT storage facility to aid in the transition to bulk receival and handling. In 1985/86 Egypt accounted for 14-1/2 percent of total sales. Food aid from Australia comprises a relatively small amount as shown in Table 3.9. In recent years up to 98 percent of total sales were commercial. The AWB does not directly participate in countertrade. However, they have indirectly supported its use in at least one transaction through the private traders. The AWB has indicated to the IAC that a change in legislation would facilitate increased use of countertrade.

The AWB maintains an integrated sales and marketing strategy. For each customer this encompasses pre-sales, sales, and post-sales service. These are promotional as well as technical and emphasize the quality advantage of Australian wheat. A five-year marketing plan concurrent with AWB legislation is maintained with 40 countries. These are categorized with respect to quality needs and price and form the basis of the marketing plan.

Export quality specifications generally coincide with the class structure of the receival standards. However, as recent as the mid-1970s an FAQ system was used. Since then increased class specificity has allowed greater specification with respect to quality. A standard AWB contract is used typically with reference to classes and grades (See Figure 3.2). In addition, minimum protein levels are specified for APH, AH, and at least 50 percent of the ASW contracts. The port, or state, is also specified/ negotiated in many cases to account for transport cost differentials, availability of quantity and quality, and inherent quality differences at each port. However, though capable, the AWB is reluctant to export on specifications other than those typically included in the receival standards. The underlying idea of the Australian marketing system is that if stringent quality standards are met at receival, the possibilities for degradation throughout the marketing system would be limited. In practice the AWB knows the quality and quantity of wheat by location. In addition, it knows the quality needs of larger specific buyers. Thus, coordination of shipments is intended to match the quality needs of the buyer.[9]

Most of the wheat is sold and negotiated directly by the AWB. This is normally done on an FOB basis, but periodic C&F sales are made. Prices are negotiated either as flat prices or as basis contracts. The AWB normally reserves certain larger important markets for itself. These are typically markets with government buying agencies, and when the end-use is for nonfeed purposes. These markets include the USSR, China, Egypt, Iran, Iraq, and those in which LTAs are maintained.

The alternative means of direct sales is through the private trade. Typically up to 30 percent of the total exports are made by private

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[9]Indeed export terminals tended to receive and bin wheat corresponding to particular quality needs of specific buyers.

multinationals. However, due to the reduced crop in 1987/88, the preferred AWB markets and LTAs, only about 10 to 12 percent will be exported by the privates. Thus, the privates essentially service the residual. Japan comprises a large proportion of this residual with direct trade from private traders to Japanese trading companies for resale to the Japanese Food Agency. As production in Australia decreases, and/or as there is an increase in the "preferred" customers, the trading opportunities for private exporters diminishes.

The AWB sells directly to private traders for re-sale to a third country. The procedure is initiated by the trader who negotiates with the AWB on price, quality, shipping period, and market [declared as a specific third-country market, or to exclude certain market(s)]. These markets potentially include all those which are not preferred customers. In practice they typically include South America, the private importers of Southeast Asia (e.g., Malaysia, Indonesia, Thailand, Korea, Sri Lanka, Yerren) and New Zealand and Fiji. However, even though the AWB has a supply agreement with Japan this market is served by the private trade. In general, to the extent possible, the AWB has sought to limit exporter competition in the same third-country market on the idea that competition would reduce returns to sales. Purchases are made from the AWB on a FOB basis using AWB classes for quality specification.

Industry Assistance Commission

Currently there are two investigations into the grain marketing systems in Australia. One directly relates to export marketing and is referred to as the Industry Assistance Commission (IAC). This is a product of the sunset clause in which new legislation is required every five years for continuing operations of the AWB. This process requires analysis and hearings by the IAC. Selected highlights of the process particularly as they relate to quality are discussed in this section. At the time of this writing submissions have been made by the AWB and the Australian Grain Exporters Association (AGEA), and interim recommendations have been made by the IAC.

While the IAC encompasses many broad issues related to wheat marketing and the AWB, there are a number of crucial issues specifically related to wheat quality. The AWB cites a number of advantages of a single seller (Australia Wheat Board, submission to the IAC) including bargaining power associated with direct negotiation, coordination of logistics, research and others. In addition, specific mention is made that Australia has a reputation for "high quality wheat and meeting exacting quality specifications" (p. 15). Further, at least implicitly this reputation has been garnered and preserved only because the quality control procedures described in the previous section are administered by a single seller. Citation, of course, has been made to U.S. quality problems, which are in part attributed to a private trading system. Allegedly, centralized control over varieties and hygiene is essential for longer-term advantages, whereas a fragmented approach could lead to short-term trading profits.

The private traders under the auspices of AGEA have prescribed a five-year plan for deregulation of the wheat trading industry. In early years the export feed wheat market and domestic milling markets would be

deregulated, and in subsequent years the export wheat market would be deregulated. However, it is of interest that AGEA indicated that current quality standards would be inadequate in a competitive trading environment:

> Other changes would also need to take place to provide for the maintenance of strict quality control. This could be administered by the DPI (Department of Privacy Industries) in a similar fashion as occurs currently with other grains. However, we believe that, for example, a more specific grading system for what would need to be introduced as the current arrangements are considered to be too subjective and unprecise for the maintenance of a strict quality control in a deregulated export and domestic market (Australian Grain Exporters Association p. 10).

Most exporters recognize the hygiene reputation of wheat but generally claim these are market phenomena and the premiums can and should be market determined. Because the AWB has not specifically pursued feed wheat markets in longer term plans (including variety development), development of these markets has allegedly been precluded.

The challenge put forth by the IAC in its interim proposals was premised on the suspicion that the AWB likely cannot extract premiums. Also, if disbanded, many functions of the AWB would merely be absorbed by wheat boards at the state level. The IAC has placed lesser significance on the prerequisite of a single seller to control grain cleanliness and hygiene. Selected specific proposals in the interim report of the IAC are (Industries Assistance Commission, p. 11):

- the AWB sell wheat to private traders for export to any market, other than a small number of specified markets reserved for the AWB;
- the permit system for sales of feedwheat be extended to cover wheat for any domestic end-use;
- consideration by given to the further disaggregation of revenues and associated costs currently covered by the AWB's pooling arrangements, to enable payments to growers to reflect more closely actual market returns and costs;
- the price underwriting arrangement be terminated.

In addition, the IAC has sought comment on alternatives to the advance payment system, criteria for determining which markets should be reserved for the AWB, and all aspects of variety control (Industries Assistance Commission, p. 12). Though these recommendations may appear bold, they may be merely interpreted as challenges to participants (e.g., AWB, and AGEA) in the next stage of submissions and hearings. To put the IAC into perspective, these are merely proposed recommendations and do not constitute policy. The next step in the process is political. In past IAC inquiries, only minimal recommendations have been accepted in the political process.

TABLE 3.1. RECEIVAL STANDARDS FOR AUSTRALIA WHEAT, 1987/88

Factors	APH	Hard		ASW	General Purpose		Feed
		No. 1	No. 2		No. 1	No. 2	
Test weight (kg/hl)	74	74	74	74	71	68	62
Moisture content % max.	12	12	12	12	12	12	12
Protein min. (11% moisture basis)	12.8	11.5	11.0	NA	--	--	--
Falling no. min.	350	300	250	NA	300	200	--
Unmillable material[1] max %							
Total	7	7	7	7	15	25	50
Below screen	5	5	5	5	10	15	30
Small foreign seeds Below screen	1	1	1	1	5	10	20
Defective Grains							
Sprouted grains max.%	2	2	5	nil	nil	1	--
Fungal strained grains max.%	5	5	10	5	10	50	50
of which fusarium	2	2	2	2	5	5	5
Dry green, sappy green, and frost affected grains affected by disease or drying	1	1	2	1	10	20	--
Heat damage	nil	nil	nil	nil	nil	nil	--
Ball smut	nil	nil	nil	nil	nil	nil	--
Insect damage	1	1	1	1	2	2	4
Grain contaminents[2]							
Sticks, stones, earth and sand	nil	nil	nil	nil	nil	nil	nil
hive insects	nil	nil	nil	nil	nil	nil	nil
Dead insects max. per 1/2 litre	5	5	5	5	5	5	5

[1]Materials passing through a 2 mm screen and/or material other than wheat wheat kernels remaining on top of screen after serving.
[2]Other units exist specifically for chemicals, ergots, and seed.

Table 3.2. New South Wales, Varietal Discount List 1988/89

NOTE:

1. Varieties marked in **bold** are those approved by the New South Wales Standing Advisory Committee on Wheat for sowing in each particular Silo Group. For detailed information on approved varieties, including the disease resistance of varieties, growers should consult the Department of Agriculture.
2. All deliveries are subject to normal receival standards. Varieties discounted at $3 and $5 per tonne will be received into the ASW Class, if the sample satisfies the ASW standard.
3. Only varieties listed for Prime Hard (PH), Australian Hard (AH) and Durum (DR) will be received into these Classes.
4. Registered varieties are those which are entered in a register maintained by the Registrar of Cereal Cultivars in Australia.

WHEAT VARIETY	SILO GROUP				
	1 & 2	**3**	**4**	**5**	**6**
Banks	**PH/AH/ASW**	**PH/AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**
Comet	**AH/ASW**	**AH/ASW**	ASW	ASW	ASW
Condor	AH/ASW	AH/ASW	AH/ASW	AH/ASW	AH/ASW
Corella	$3	$3	ASW	**ASW**	ASW
Diaz	AH/ASW	AH/ASW	ASW	ASW	ASW
Eagle	$3	$3	**$3**	$3	$3
Egret	$5	$5	$5	$5	$5
Gatcher	**PH/AH/ASW**	**PH/AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Grebe	GP2	GP2	GP2	GP2	GP2
Harrier	AH/ASW	**AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Hartog	**PH/AH/ASW**	**PH/AH/ASW**	$3	$3	$3
Kamilaroi	**DR**/FEED	FEED	FEED	FEED	FEED
Kite	**AH/ASW**	**AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Millewa	$3	$3	ASW	ASW	ASW
Olympic	$3	ASW	**ASW**	**ASW**	ASW
Osprey	AH/ASW	**AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**
Quarrion	$3	ASW	ASW	ASW	ASW
Rosella	$3	ASW	**ASW**	**ASW**	**ASW**
Skua	AH/ASW	AH/ASW	**AH/ASW**	AH/ASW	**AH/ASW**
Sunbird	ASW	**AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**
Sunco	**PH/AH/ASW**	**PH/AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Sundor	AH/ASW	**AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**
Suneca	**PH/AH/ASW**	**PH/AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Sunelg	**AH/ASW**	**AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Sunkota	**PH/AH/ASW**	**PH/AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Sunstar	**PH/AH/ASW**	**PH/AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**
Takari	**AH/ASW**	**AH/ASW**	AH/ASW	AH/ASW	AH/ASW
Vasco	**AH/ASW**	**AH/ASW**	ASW	ASW	ASW
Vulcan	AH/ASW	**AH/ASW**	**AH/ASW**	**AH/ASW**	**AH/ASW**

Enquiries regarding the status of varieties not listed above should be directed to the Board's State Manager or growers may consult a Master Variety List at their normal receival point.

SOURCE: AWB "Chairman's Letter, No. 46, October 1987.

TABLE 3.3. GUARANTEED MINIMUM PRICES, 1976/77-1987/88

Year	ASW	APH	AH No. 1	AH No. 2	GP No. 1	GP No. 2	Feed
	$A/MT						
1976/77	66.0						
1977/78	66.0						
1978/79	75.00						
1979/80	114.71						
1980/81	131.92						
1981/82	141.55						
1982/83	141.32						
1983/84	150.00						
1984/85	145.35						
1985/86	149.87						
1986/87	139.83	157.62	142.69	--	128.21	117.79	105.77
1987/88*	135.10	153.19	140.17	135.10	127.86	103.76	98.92

*PGMP

TABLE 3.4. DERIVATION OF FINAL GUARANTEED MINIMUM PRICES, 1986/87

Category	Final GMP	Preliminary GMP	Interim Advance*	Final Advance**
	($/MT)			
Prime hard	157.62	148.62	133.76	23.86
Hard	147.69	135.62	122.06	25.63
ASW	139.83	130.62	117.56	22.27
GP1	138.21	119.62	107.66	30.55
GP2	117.79	100.62	90.56	27.23
Feed	105.77	85.62	77.06	28.71

*Interim advance = 90 percent of preliminary GMP.
**Final advance = final GMP - interim advance.

TABLE 3.5. POOL PAYMENTS AND DATES OF PAYMENT[1]

	80-81 Pool	81-82 Pool	82-83 Pool	83-84 Pool[2]	84-85 Pool[2]	85-86 Pool[2]
GMP	11/30/80	12/1/81	12/1/82	10/1/83	10/1/84	10/1/85
	131.92	141.50	141.32	150.00	145.35	149.87
Subsequent Payments						
First	1/25/83	4/16/84	1/18/84			
	4.50	6.00	4.00			
Second	3/31/83	6/7/84	3/30/84			
	2.50	2.37	2.50			
Third	6/16/83		5/18/84			
	2.50		5.00			
Fourth	9/27/83		7/10/84			
	2.50		5.00			
Fifth	4/16/84		9/28/84			
	3.50		2.50			
Sixth			3/29/85			
			2.50			
Seventh			9/17/85			
			7.50			
Eighth			4/9/86			
			3.50			
Ninth			7/31/86			
			4.48			
Pool payments to date[3]	147.42	149.92	178.23	150.00	145.35	149.87
	148.56	151.44	179.53	150.00	145.35	149.87

SOURCE: Australian Wheat Board, Annual Reports, various issues.

[1]ASW basis; prior to deductions for bulk handling, freight, dockages, wheat tax, and wheat levies.
[2]Not finalized at September 30, 1986.
[3]All states except Western Australia.
[4]Western Australia (this difference reflects a WA freight advantage to certain markets).
Pool Equities (AWB Chairmen'sletter, October 1987).
1983/84 equity estimated at $5.00/MT for APH, AH, and ASW.
1984/85 equity estimated at $10.00/MT.
1985/86 equity estimated at $7.00 for ASW, APH, and AH, $3/MT for GP and feed.
1986/87 unlikely to have estimated pool payments.

TABLE 3.6. CARD PRICES FOR SELECTED DATES FOR DECEMBER 1987 SHIPMENT (U.S. $/MT FOB EASTERN AUSTRALIA)

			APH	
	ASW	AH	13% Protein	14% Protein
December 1	124.50	133.00	142.00	143.50
2	124.00	132.50	141.50	143.50
4	125.00	133.00	141.00	143.50
7	125.50	134.00	140.50	143.50
8	125.00	133.50	139.50	143.50
10	125.00	133.50	139.50	141.00

TABLE 3.7. EXPORT AND DOMESTIC WHEAT PRICES

Year[1]	Export[2]	Human Consumption	Stockfeed	Industrial
	A$/MT			
1976/77	96.54		105.40[4]	
1977/78	116.48		111.16[4]	
1978/79	137.63		116.61[4]	
1979/80	153.18	130.78	140.50	133.08
1980/81	152.05	156.12	151.37	151.67
1981/82[6]	152.50	187.20	149.78	151.15
1982/83[7]	179.20	203.46	184.11	174.16
1983/84[7]	152.16[5]	219.41	175.24	170.34
1984/85[7]	145.32[5]	210.73	204.36	199.09
1985/86[7]	127.29[5]	213.89	193.82	188.39

SOURCE: Australian Wheat Board Annual Report, Various Issues.

[1]December 1 to November 30.
[2]Simple averages of daily asking prices for ASW.
[3]Stockfeed and industrial prices do not include the Tasmanian Freight Levy from 1979-80 to 1983-84 inclusive.
[4]Prior to 1978-79, domestic prices were the same across domestic uses.
[5]From December 1983 prices quoted in U.S. $.
[6]December 1, 1981 to September 30, 1982.
[7]October 1 to September 30.

TABLE 3.8. LONG TERM AGREEMENTS

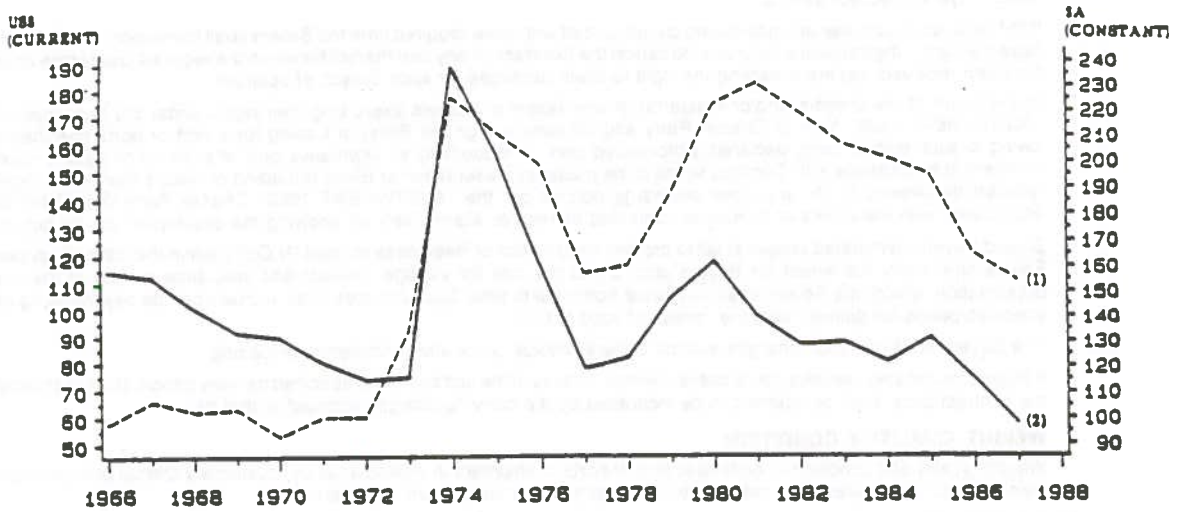
Country	Annual Quanity	Supply Period
Abu Dhabi	Minimum 70,000 tonnes	Jan. 1985-Dec. 1987
Egypt	Minimum 1.5 million tonnes (Minimum 10 million tonnes over 5 years)	Jan. 1985-Dec. 1989
Iraq	Minimum 800,000 tonnes (Minimum 6 million tonnes over 5 years)	Jan. 1986-Dec. 1990
Republic of Korea	Minimum 35,000 tonnes	May 1986-Dec. 1986
Yemen AR	Up to 400,000 tonnes	Jan. 1986-Dec. 1986
Japan (Supply Agreement)	900,000 tonnes	Jan. 1986-Dec. 1986

TABLE 3.9. EXPORTS OF COMMERCIAL AND FOOD AID WHEAT AND FLOUR (000 MT)

Year[1]	Commercial Wheat	Food Aid Wheat	Commercial Flour[2]	Food Aid Flour[2]	Total
1976/77	9,355	147	224	37	9,763
1977/78	7,726	192	129	51	8,098
1978/79	11,199	327	134	33	11,693
1979/80	12,828	221	124	24	13,197
1980/81	9,123	328	110	53	9,614
1981/82[3]	10,445	445	118	60	11,068
1982/83[4]	7,057	100	73	50	7,280
1983/84[4]	13,741	328	49	34	14,152
1984/85[4]	14,263	307	84	25	14,679
1985/86[4]	15,709	253	51	13	16,026

SOURCE: Australian Wheat Board Annual Report, Various Issues.

[1]December 1 to November 30.
[2]Wheat equivalent. (Conversion factor ÷ 1.29 prior to 1984-85; ÷ 1.27 from 1984-85). Wheat products are included in commercial flour.
[3]December 1, 1981 to September 30, 1982.
[4]October 1 to September 30.



1)U.S. No. 2 HRW, FOB U.S. Gulf.
2)Export price (FOB) for ASW, Deflated by Australian Consumer Price Index (Base 1980).

Figure 3.1. International Wheat Prices: 1973-1986 ($US/Tonne).

SOURCE: Industries Assistance Commission.

Figure 3.2. AWB Contract

05 01

AUSTRALIAN WHEAT BOARD

STANDARD F.O.B. CONTRACT TERMS AND CONDITIONS FOR AUSTRALIAN WHEAT (FIXED PRICE)

Effective 1st October, 1983

1 PAYMENT

No obviously clerical error in the shipping documents shall entitle the Buyers to reject or delay them or delay payment, but Sellers shall be responsible for all loss or expense caused to Buyers, by reason of such error, and Sellers shall on request of Buyers furnish an approved guarantee in respect thereto.

In the event of the vessel and/or cargo being lost before completion of loading or if loading be stopped for any reason beyond Sellers' control, Buyers to pay Sellers for any quantity loaded, on presentation of Bill(s) of Lading or Mate's Receipt(s) or other proof of shipment which Buyers to accept as final.

If the required Guarantee or Undertaking be not lodged within the required time the Sellers shall thereupon, and at any time thereafter, have the right in their absolute discretion to cancel the Contract, or any part thereof for which the required Guarantee or Undertaking has not been received, Sellers reserving the right to claim damages for such breach of contract.

In the event of the Owners and/or Master(s) of any vessel or vessels exercising their rights under the War Risks Clauses of the "AUSTWHEAT 1983" form of Charter Party and refusing to sign the Bill(s) of Lading for a port or ports specified in the contract owing to such port(s) being declared a blockaded port, or requesting an alternative port after Bill(s) of Lading have been signed, payment in accordance with Contract terms to be made on presentation of Bill(s) of Lading or Mate's Receipt(s) together with other relevant documents (i) for any other discharge port as per the "AUSTWHEAT 1983" Charter Party War Risks Clauses and in accordance with the orders or directions contained therein, or alternatively (ii) showing the destination as "for orders".

Should Buyers' nominated vessel(s) fail to present valid Notice of Readiness to Load (N.O.R.) within the contractual period of delivery, Sellers shall carry the wheat for Buyers' account at the rate for storage, interest and insurance current at the time of vessel(s) presentation, which rate Sellers shall announce from time to time. Such charges shall accrue from the day following expiration of the specified period for delivery until the receipt of valid N.O.R.

The Buyers shall pay such charges against Sellers' invoice on or after completion of loading.

If Buyers' nominated vessel(s) fail to present within 30 days of the last day of the specified delivery period, Buyers shall be in default and the contract price shall be deemed to be increased by the carrying charges accrued to that day.

2. WEIGHT, QUALITY & CONDITION

Weight, quality and condition to be final at port or ports of shipment in Australia, as per customary Official or Australian Wheat Board Certificate or Certificates. The cost of Certificate(s) shall be for account of Sellers.

3. INSURANCE

Buyers' care.

Wheat to be at Buyers' risk upon delivery over the ship's rail, and the Buyers shall insure the Wheat placed on board, or in the custody of the Master, from the commencement of loading until payment in accordance with the contract.

Any general average to be for Buyers' account.

4. FORCE MAJEURE CLAUSE

If any strikes, bans, lock-outs, riots, differences with or between work-men, accidents to or break-down of machinery plant or equipment, delays en route, policies or restrictions of governments, including restrictions of export and other licences, or any other contingency whatsoever beyond Sellers' control, including war, delay the shipment of the wheat or the forwarding of the wheat to the loading point, the Sellers shall not be responsible in any manner whatsoever to the Buyers for any such delay or non-fulfilment traceable to any of these causes, but subject to clause 6 (c).

5. PROHIBITION

In case of prohibition of export, blockade or hostilities or in case of any executive or legislative act done by or on behalf of the government of the country of origin or of the territory where the port or ports of shipment named in the contract is/are situate, restricting export, whether partially or otherwise, any such restriction shall be deemed by both parties to apply to the contract and to the extent of such total or partial restriction to prevent fulfilment whether by shipment or by any other means whatsoever and to that extent the contract or any unfulfilled portion thereof shall be cancelled. Sellers shall advise Buyers without delay with the reasons therefore and, if required, Sellers must produce proof to justify the cancellation.

6. FREIGHT

(a) Buyers undertake to provide the freight, which is to be mutually agreed, to permit shipment to be made in accordance with the Contract

on Liner terms (for quantities less than 5,000 tonnes)

or (for quantities in excess of 5,000 tonnes)

on the terms of the Australian Wheat Charter 1983 — codename "AUSTWHEAT 1983".

Buyers to endeavour to ensure that a copy of the Charter Party is mailed to the Australian Wheat Board, Melbourne, in time to arrive before presentation of performing vessel(s) for loading.

Brief details of each Charter Party, including (a) Place and date of Charter Party, (b) Names of owners or disponent owners, and of charterers (refer lines 2 and 8 of "Austwheat 1983" Charter Party form), (c) Capacity, minimum and maximum in tonnes of 1,000 kilos (refer Clause 5), (d) Loading and cancelling dates (refer Clause 13), (e) Demurrage/despatch rates at loading port (refer Clause 16) to be telexed to Sellers at the time of nominating each vessel.

Amendments to "Austwheat 1983" Charter Party terms affecting loading and loading port(s), including amendments to Clauses

(b) SHIP'S CLASSIFICATION

To be first-class steamer or power-engined ship (excluding Tankers and Vessels which are either classified in Lloyd's Register or described in Lloyd's Shipping Index as "Ore/Oil Vessels") classed not lower than 100 A.1. or British Corporation B.S. or top classification in American, French, Italian, Norwegian or other equal Register, or ships not inferior to these classifications.

(c) WITH RESPECT TO CARGO AND PART-CARGO QUANTITIES

Despatch or Demurrage at loading port(s) as per Charter Party to be for Seller's account.

The rate of demurrage provided in the Charter Party shall be within the minimum and maximum rates for the relevant cargo quantity current at the date of the Contract, such rates Sellers shall announce from time to time.

Despatch shall be at half the rate of demurrage.

(d) OIL POLLUTION CLAUSE

The Buyers warrant that the following clause will be included in the charter party/freight engagement of the vessel(s) tendered to load hereunder —

"The Owner agrees to indemnify the Charterer his agents or any other party against any liability which may be imposed on them or which they may incur under any statute regarding liability for pollution of navigable waters by oil, by reason of any contravention of such statute by the ship, the Master or any servant or agent of the Owners provided that such contravention shall not have been caused or contributed to by the party seeking to be indemnified under this Charter and provided that the facts and matters giving rise to the contravention do not constitute a defence under Article 3 Section 2 of the International Convention on Civil Liability for Oil Pollution Damage 1969. The Owners total aggregate liability in respect of any oil pollution incident shall under no circumstances exceed U.S. Dollars 300,000,000 and the extent of the indemnity under this clause shall be limited to the difference between any cost and expenses incurred directly by the Owners and U.S. Dollars 300,000,000 . The Owner warrants that the ship is entered in a P and I Association with cover for liabilities arising out of any contravention as aforesaid.

No liability for demurrage shall arise from any delay or loss of time to the vessel at the port(s) of loading and/or discharge caused by any such contravention nor shall any time lost by any such contravention count when calculating despatch".

Furthermore, Buyers shall indemnify Sellers to the extent that Sellers are not so indemnified by the Owners of the said vessel(s), or against any liability for demurrage, or against any loss of despatch, which Sellers may suffer as a result of proceedings or measures undertaken as aforesaid.

(e) I.T.F. CLAUSE

Buyers to include the following clause in (or as an addendum to) the charter party/freight engagement —

"The Owners of the vessel guarantee that the minimum terms and conditions of employment of the crew of the vessel are now or will be prior to presentation of the vessel for loading and will remain for the period of this Charter Party covered by an I.T.F. Agreement or a bona fide trade union agreement acceptable to the I.T.F."

(f) WAR RISK CLAUSE

Should the Owners and/or Master(s) exercise their rights under the War Risks Clauses of the "AUSTWHEAT 1983" Charter Party, Buyers must immediately nominate an alternative port of discharge if and when requested, but such port is to be subject to the approval of any authority, committee or person having rights under and in accordance with the "AUSTWHEAT 1983" Charter Party War Risks Clauses.

7. **SPECIAL CLAUSES**

(i) All costs of stowing and trimming cargo to be for Buyers' account.
(ii) Consular charges, if any, on the cargo to be for Buyers' account.
(iii) If Buyers require any of the documents visaed in Australia, the cost involved to be for Buyers' account.
(iv) Buyers agree to accept documents containing the Chamber of Shipping War Deviation Clause and/or any other recognised official war-risk clauses.
(v) The Charge imposed by the Grain (Export Inspection Charge) Act 1979 shall be for Buyers' account.
(vi) Each shipment to be deemed a separate contract.

8. **CONTRACT MADE AND GOVERNING LAW IN VICTORIA**

In all respects the contract shall be deemed to have been made in the State of Victoria, Australia and governed by and construed in accordance with the laws of that State.

9. **TIME OF ESSENCE**

Time shall in all respects be of the essence of this contract.

10. **ARBITRATION**

All disputes from time to time arising out of this Contract shall be referred to two Arbitrators, one to be appointed by each party. In the event of a difference of opinion between the Arbitrators, such difference shall be referred to an Umpire nominated by the Arbitrators. The Arbitrators shall be commercial men of Melbourne and the Arbitration shall be held in Melbourne.

Any claim by the party alleging such dispute must be made in writing within three (3) months from the date of the relevant bill of lading and the claimant's arbitrator must be appointed within three (3) months from the date of such written notice. In the event of failure to comply within the time prescribed for the giving of the written notice or the appointment of the claimant's arbitrator, the claim shall be deemed to be waived and absolutely barred.

11. **ULIS CLAUSE**

The uniform law on sales and the uniform law on formation to which effect is given by the Uniform Laws on International Sales Act 1967, will not apply to this contract.

IV. Grain Handling in Australia

There are a number of unique attributes in the grain handling and transport system which affect the quality of wheat being exported. These include: (1) limited on-farm storage but extensive storage throughout the market system, (2) state monopolies generally in both grain handling and transportation, and (3) the AWB takes ownership at the point of first sale and retains ownership until the point of export. The organizational and operating practices of the grain handling and transport industries are discussed in this section, with particular attention to the attributes which impact quality. In the first section an overview is provided. The remaining section provide a detailed description of the grain handling and transportation industries. In the final section, highlights of the recent Royal Commission on Grain Handling and Transportation are discussed.

A. Overview

There are a number of unique attributes which override the grain marketing system in Australia and have important impacts on the quality of grain exported. First, each state has a single Bulk Handling Authority (BHA) which acts as the authorized receiver on behalf of the AWB. These BHAs are charged with the responsibility of storage and country and port elevation. Second, though conceptually possible there is limited trade or transportation between states. This is primarily due to tradition, geography, and logistical constraints. As a result, in general wheat produced in each state is destined to be handled by the state BHA and marketed by the AWB. Third, there is very limited on-farm storage. The primary reason for this is that given the operation of the Guaranteed Minimum Price (GMP) which does not (in general) differentiate by month of delivery, there is a financial disincentive for deferred delivery.[10] As a result, a very large proportion of the wheat is delivered to the BHAs at harvest or within several weeks of harvest. The BHAs therefore have constructed extensive handling capacity to meet the harvest peak demands. Also, extensive storage capacity has been developed throughout the handling system compared to other exporters. Given that for the most part storage is provided by handlers allegedly more experienced and knowledgeable about grain storage, the wheat is less likely to deteriorate or be subjected to infestation.[11]

The wheat marketing system in Australia is described as in Figure 4.1. The marketing system is very simple and comprised of typically harvest sales by growers to the AWB, storage within the handling system, and delivery by the BHA on behalf of the AWB to the customer. Of particular importance here is the role of the AWB. There are a number of implications of the fact that the AWB takes ownership at the point of first sale and retains it throughout.

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[10]However, as discussed in Section III, there have been attempts to encourage deferred delivery.

[11]Extensive analyses have been conducted by the NSW Department of Agriculture on on-farm versus off-farm storage and the implications of infestation. See Johnston for discussion.

First, the AWB has tremendous control over quality evaluation, preservation and enhancement, which is exercised through the state BHAs. This specifically is the case in infestation but also applies to other parameters of quality (e.g., segregation, cleanliness, etc.) An important fundamental characteristic of wheat marketing which underlies the system is that of applying stringent quality requirements at the point of first sale. This generally precludes problems downstream in the marketing system. Second, being there are basically only two financial transactions in the marketing sytem, each of which requires sampling and inspection, there is limited (or nil) incentive for blending to meet specifications or limits.[12]

B. Bulk Handling Authorities (BHAs)

Organizational Structure. In each state a monopoly exists which is authorized to handle wheat on behalf of the AWB. In general these are state-owned monopolies or farmer-owned cooperatives but the statutory or organizational structure may vary across states. Table 4.1 shows the authorized handlers in each state.

The BHAs are in general charged with the responsibility of receival, handling, and storage. In these activities, they are responsible for sampling and inspection and application of receival standards at the country elevator, as well as preserving the quality while in the marketing system. An extensive storage and handling agreement exists between each individual BHA and the AWB. This agreement provides detail regarding services provided and remuneration. The clauses specifically related to "Care of Wheat" are as follows (Royal Commission into Grain Handling and Transport, Institutional Arrangements, pp. 36-37).

> Care of wheat - the bulk handler is required to "take all proper and reasonable precautions and do all things necessary to preserve and safeguard the wheat...against contamination, damage, destruction, deterioration, infestation, loss, theft, and unauthorized admixture" (clause 12.1). Where a problem arises the bulk handler must inform the AWB and "at their own cost take all reasonable steps to minimize the loss to the Board [clause 12.2 (d)].

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[12]In contrast the U.S. marketing system is characterized by a number of financial transactions within the marketing system. Each requires a contract specification and generally incentives exist to blend to the limits of a contract.

The agreement also provides for penalties to be imposed on the bulk handler in such cases. In the case of defective outturn (excluding insects) the penalty is set at whatever the AWB had to compensate the buyer up to a maximum of 10 percent of the value of the shipment (GMP x shipment tonnage). For example, if 4000 tonnes out of a shipment of 20,000 tonnes was refused by a buyer for admixture reasons and the AWB had to compensate the buyer for the bad parcel (4000 tonnes x GMP) the bulk handler would only pay the AWB an amount equal to 2000 tonnes x GMP.

Where defective out-turn is caused by insect infestation the compensation payable by the bulk handler can vary from nothing to 80 percent of the amount payable for other types of defective outturn (see above). The level of compensation depends on the seriousness of the infestation and varies in accordance with a formula based on rejection rates. Hence, in this case the bulk handler will incur a penalty from the AWB which does not meet the penalty imposed upon the AWB by the buyer.

In the case of excessive shipping outturn (that is, loading more than they should) the bulk handler is permitted a 5 percent error margin. If it loads an amount in excess of this margin and the AWB does not receive payment from the buyer for this extra amount then the bulk handler must pay the AWB an amount equal to the GMP value of the excess. For example, if the bulk handler loads 54,000 tonnes instead of the required 50,000 tonnes the error margin on 50,000 tonnesis 2500 tonnes and so the bulk handler would pay the AWB an amount equal to (4,000 - 2,500) x GMP.

Penalties for defective or excessive outturn contained in the agreement relate to only to export shipments.

A responsibility of the BHA is to preserve the condition of the wheat, and if problems arise penalties may be applied. Thus, an important activity, and cost, of the BHAs is related to conditioning as discussed below.

In general each BHA operates a centralized system and logistics are closely coordinated with the AWB. The system is centralized in the sense that laboratories and quality evaluation as well as logistical planning is closely coordinated with the AWB.

Pricing of Handling and Storage Services. Prices for handling and storage of wheat are essentially determined by the cost structure of the state BHAs. Formally, the Grain Storage and Handling Agreement is the document which specifies the price charged for these services. On an annual basis the BHA for each state assesses its costs and anticipated output and determines a price for handling and storage. Presumably, the AWB doesn't or cannot negotiate these fees and strictly relies on cost evidence of the BHA (Royal Commission, no. 2, p. 36).

The agreement allows for differential pricing of services to growers but in practice there have only been a few attempts to do so (Spriggs et al., p. 11). The BHAs usually pool their costs and charge an equal rate to each grower. As a result there is limited incentive for participants to necessarily choose the most efficient services (e.g., delivery location, time) and likely has resulted in excessive handling and storage throughout the system. Indeed, cost pooling is a principal issue in the Royal Commission and a potential solution to rationalization of the system.

The various components of handling and storage costs for 1986-87 are shown in Table 4.2. Besides "Handling and Storage" there are a number of other costs which are deducted in determination of producer prices. Of interest here is the cost of handling and storage which varies from $12.44/MT in South Australia to $17/MT in Queensland.[13] The costs of handling and transport have increased substantially through time (Table 4.3). These costs increased by 51 percent in nominal terms between 1979/80 and 1985/86.

The issue of handling and storage costs are critical to the Royal Commission. In fact, at least part of the impetus for the Royal Commission was the apparent high costs of handling and transportation in Australia. Several submissions to the Royal Commission (e.g., AGEA, Spriggs et al.) have attempted to make comparisons to other exporters. Any international comparisons are questionnable for a number of reasons, particularly because the handling and storage systems serve different purposes in different countries. In the case of Australia more extensive storage is required and the cost of conditioning (e.g., infestation) would exceed that of other exporting countries. Nevertheless, the submissions have raised the issue that the costs of handling and storage in Australia exceed those in exporting countries, and that the rate of increase in handling and storage costs has exceeded those of other exporters. Spriggs et al. shows that these costs increased 11 percent in real terms in Australia in the past 10 years, compared to a 7 percent decrease in Canada. Whether these cost levels are due to the lack of competition or the peculiar handling tasks in Australia is central to the Royal Commission. The point is that it appears the marketing system has been unresponsive to market fundamentals and international competition.

C. Transportation

Grain is delivered from the farmer by truck to country receiving points, subterminals or central receiving points, and in some cases directly to export terminals. Each state and BHA has established a grain flow to their export terminals. In some cases, grain is moved by rail from the country receiving point to a subterminal, unloaded and stored, and reloaded into railcars for shipment to the port. In other cases, grain is loaded into railcars at the country receiving point and railcars from several points are sent to a central point for shipment as a unit to the port. Each state regulates transportation modes between country and export points within it.

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[13]For comparison on this coverts to 23.7 to 32.4¢/bushel U.S.

In New South Wales, transportaion has been deregulated. However, until Port Kembla comes online, the existing port terminals do not have the capability to unload trucks, so all grain is moved by rail. Transportation modes are regulated more in Victoria and the rail line must be used to transport grain more than 60 kilometers. In Queensland, grain movement from country to export locations is regulated and grain is only moved by rail. South Australia does not have its own railroad so grain moves by truck to port locations or on the Australian National Railway. Western Australia regulates the amount of grain moving by rail from country to export locations. This rail system serves approximately 70 percent of the state with the remaining 30 percent serviced by truck. This state has a peculiar situation in that both narrow and standard gauge tracks exist. Several port locations are equipped to receive grain on both gauges while others are dedicated to only one. In areas serviced by rail, grain can be hauled to the port in only farmer-owned trucks.

Some grain moves across state lines by truck and rail. However, in some cases rail movements between states is hindered by the fact that both narrow and standard gauge tracks exist between some states and in the case of Western Australia within the state. The condition of the track and equipment used to move railcars limits the number of railcars that can be moved at one time. In Victoria, for example, a maximum of 39 railcars can be moved as a unit to the port.

D. Storage Types, Capacities, and Design

The Royal Commission has reported that at least 75 percent of the wheat harvested is handled by BHAs. The rest is handled by private firms or remains on-farm. Each BHA owns and operates country receiving points, subterminals or central receiving points, and export facilities. These facilities consist of vertical concrete or metal silos, flat (horizontal) warehouses, and bunkers. At any one particular facility there may be a combination of any of these storage types. These facilities are linked together to one or more export facilities within the state by road and rail.

The type of storage facility varies by state. Tables 4.4 and 4.5 depict storage capacities, by state, for vertical, horizontal, and bunker. These figures show that several states have significant amounts of storage at their port locations. Port storage ranges from approximately 7 percent of total storage in Queensland to 50 percent in South Australia. It is interesting to note the differences in storage types. For example, in Western Australia the bulk of their storage is in horizontal warehouses while in South Australia vertical storage predominates. This fact produces distinctly different handling and storage problems for each BHA and has resulted in differing strategies for similar problems, i.e., fumigation practices.

Total storage capacities by state, as compared to production, is shown in Figure 4.2. According to the Royal Commission, total storage, which includes vertical, horizontal, and bunker, exceeds grain production for a five-year production average to 1985-86 and the record year of 1983-84.

On-farm storage has been increasing. Table 4.6 shows the on-farm capacities as of 1984-85. These figures represent wheat, barley, oats, and sorghum, and provide an indication of the extent of on-farm storage. On-farm storage in Western Australia is regulated in that only sealed, metal upright silos can be installed. These silos are usually 5 MT capacities that can be pressure tested prior to fumigation.

There is a move to require that all on-farm silos be painted white. Those interviewed believe this helps deflect heat buildup and reduces the incidence of infestation. In Victoria and New South Wales, these types of on-farm silos are being installed even though there is no regulation covering the types that can be installed.

Port storage capacities and maximum load out rates are shown in Table 4.7. The port locations by state are as follows:

Queensland:	Mackay, Gladstone, and Brisbane (Brisbane has three elevators; Fisherman Island and Pinkenba 1 and 2)
New South Wales:	Newcastle and Sydney (Port Kembla is scheduled to open in 1989 and Sydney will be closed)
Victoria:	Geelong and Portland
South Australia:	Adelaide, Ardrossan, Wallaroo, Port Pirie, Port Giles, Port Lincoln, and Thevenard
Western Australia:	Esperance, Albany, Kwinana, and Geraldton

This table indicates that not all of the ports can accommodate a "Panamax" type vessel [60,000 deadweight tonnes (dwt.)] Twelve ports can handle these vessels but only six can fully load the required tonnage because of limited draft in the port. At these six ports, "Panamax" type vessels must be "topped off" at another port. The load out rates reported in the table are maximum rates that are rarely achieved on a continuing basis. Vessel loading does not take place around the clock. Extended and/or double shifts are used predominately at port locations.

The mixture of storage and handling facilities is linked to increased production. Initially several upright concrete silos with one leg, one unloading pit for trucks using belts feeding the leg, and a rail and sometimes truck load out capabilities were constructed. This configuration is similar to country elevators in the United States. In Victoria and New South Wales these country receiving points were positioned along rail lines at approximately 5 kilometer intervals. As production increased, large flat warehouses were integrated into these facilities.

Warehouses are fed from an inbound leg to an overhead belt in the warehouse. At the warehouses visited, several channels with augers in the floor ran the length of the warehouse. Aeration ducts installed on the floors running across the width had also been installed. Unloading takes place by the augers in the channels feeding belts that in turn feed a leg. In some locations, incline belts had been installed to connect the warehouse with

existing structures. Front-end loaders are used to push the grain pile into the channels on the floor.

As production increased further, bunker type storage was introduced. These plactic covered bunkers provide large volume storage at reasonable cost. A bunker consists of three retaining walls which are lined with a plastic sheet, filled with grain, and then covered with plastic. They are aligned so that the length runs north to south. This prevents one side of the cover from deteriorating faster. The bunkers are filled by unloading trucks at the bunker opening and augering the grain into a pile. Special augering equipment with directional chutes has been designed to aid in this process. This procedure produces a very smooth grain surface that can then be covered with polyethylene film or woven and coated PVC fabrics. These covers are water tight, resistant to puncturing, and sealable since bunkers are fumigated on a regular basis. Unloading takes place by progressively rolling back the cover to expose a portion of the pile. Front-end loaders and augers are used to load grain into trucks that are then unloaded at the elevator for loading into railcars. This procedure allows the bunker to be resealed since an entire bunker is not usually unloaded at one time.

As more storage and handling capabilities were required at subterminals and central receiving points, 5,000 to 10,000 mt sealed upright metal silos fitted with recirculation for fumigation where integrated into the system. At the same time, incline belts were installed in some locations to replace existing legs or provide additional elevation capacity. In addition, multiple truck unloading pits were also being installed.

A major project was also undertaken to seal and retrofit existing upright concrete silos with recirculation for fumigation. The new export facility being built at Port Kembla in New South Wales consists of sealed metal silos filled with recirculation for fumigation and incline belts. These improvements to the system provide BHAs with the capability to dedicate truck unloading by grade (each unloading pit is designated a grade) and carry out effective fumigation in silos and bunkers.

E. General Handling Practices[14]

BHAs are required to store grades separately. In addition, grain designated for special customers is also kept separate. Accomplishing this task is difficult in some states based on the type of storage and handling facilities available. In Victoria, five segregations must be maintained, in Queensland seven, and in South Australia four. These segregations are based on grade and do not include segregation by customer or the effects that weather damage may have on a crop in any particular year.

The design of storage systems using large upright concrete and metal silos, large flat warehouses, and large bunkers makes it difficult to segregate these qualities and still provide flexibility for loading out

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[14]A detailed description of policies and procedures related to infestation are contained in Appendix C.

specific qualities. In upright silos, facilities often have a limited number of bins each having very large capacity. The flat warehouses and bunkers are large enough for several segregations to be made. However, loading out specific qualities from this type of facility is difficult since the grain must be unloaded from one end. This means if the quality desired is not at the unloading end then the grain desired cannot be loaded out. To compensate for this, some BHAs are considering designating certain facilities for receiving specific qualities.

The size and limited number of bins available, plus the size of the flat warehouses and bunkers, makes segregating differing qualities difficult. Fortunately for the BHAs, the quality as determined by grade, i.e., Prime Hard, Hard, and Australian Soft White (ASW) is mostly confined to certain growing areas. For example, wheat grown in northern New South Wales is predominately of the Prime Hard and Hard grades, whereas in the southern portion of this state ASW is the predominate grade. In the case of ASW, differing qualities within the grade are kept separate, but in most cases are commingled.

Unless commingling of different qualities takes place on grain received from the farmer, i.e., ASW commingled in the same bin with General Purpose, blending of differing qualities at the country and subterminal level for shipment to a port is difficult. Facility design at the subterminal facilities visited is such that grain can be drawn from multiple bins for loading into railcars. However, blending grain from flat warehouses and bunkers with grain being drawn from bins would be nearly impossible. In the case of the export facilities visited, Port of Sydney and Geelong, blending of differing qualities can and is done to some degree.

These port facilities contain a number of smaller bins and are basically of a design similar to the older export facilities in the United States. The one main difference is that each facility is divided in distinctly separate sections based on the number of loadout spouts. Both facilities have four separate delivery systems that are fed from four separate sets of bins. Grain from each delivery system is loaded into a separate hold of the vessel.

In the case of Port Sydney, there is no way for one delivery system to cross over to another so blending can only take place within each system. There is a section in both facilities that can be used for holding out-of-condition grain and then reconditioning it to move it to another part of the facility for shipment. At Geelong each delivery system feeds into 18 small shipping bins. These shipping bins are, to a limited degree, dedicated to a particular delivery system but can be directed across systems at this point. Facility managers at both locations indicated that they do blend on a continuing basis. However, blending is limited to a very few factors drawn from only a couple of bins and is not undertaken to the degree that it is in the United States.

The design of these facilities and the procedure of dedicating bins and delivery systems to particular loadout spouts creates a unique problem for facility managers. In order to assure efficient loading, exact qualities for each shipment in sufficient quantities must be located in each part of the

facility or the loading spouts for that system cannot be used. If one or more of the delivery systems cannot be used, the vessel has to be shifted at berth several times in order to complete loading. This is time consuming and very costly.

The bin boards in the export elevators suggest that equal quantities were stored in each system. What this does, in fact, is reduce the number of bins available for binning different qualities by four. The manager of the new Port Kembla facility indicated that once that facility opens, a change in attitudes regarding receipt of out-of-condition grain must be made since this facility does not have small bins for segregating and reconditioning the grain.

The overall design of the BHA country and subterminal facilities in New South Wales and Victoria provides an excellent source for blending once particular facilities are dedicated to receive specific qualities. Origination of rail shipments from the country could be made so that differing qualities in the correct proportions arrive at the port and are commingled or set aside in the appropriate locations within the facility for delivery to the vessel.

Grain cleaners and grain dryers are not maintained at BHA facilities. If the grain received does not meet specifications, the grain is rejected. Commercial grain cleaning is available and must be used before acceptance by the BHA. The export elevators and subterminals visited all had dust removal equipment. Dust is not reintroduced into the grain stream; it is collected and trucked to land fill sites. Each facility had installed equipment for applying grain protectants to the grain at the time of receiving. In the facilities visited, this equipment was located on the inbound belts running from the unloading pit to the inbound leg.

Facility cleanliness is a major concern as well as maintaining grain free of infestation. Empty storage space is swept out and sprayed with a insecticide prior to receiving grain. Dust accumulation and grain spills are cleaned on a continuing basis since the Department of Primary Industry (DOPI) inspects each facility yearly and conducts random unannounced inspections throughout the year. During these inspections DOPI reviews the physical structures as well as the records kept by each facility on their cleaning program. Every month grain in storage is inspected for the presence of infestation. In facilities where bins can be turned, a portion of the bin is unloaded (cored), sampled for the presence of insects, re-elevated, and placed into the same bin. In flat warehouses and bunkers, the grain is probe sampled. If the grain is infested it must be fumigated. In addition to general day-to-day housekeeping, every two months residual insecticide is applied to all handling equipment.

F. Royal Commission into Grain Storage, Handling, and Transportation

A commission was established in light of the current problems in the grain handling and transport system in Australia. The impetus for the Royal Commission came from concerns regarding the efficiency and cost effectiveness of the existing grain distribution network. This is the first comprehensive examination into the grain handling and transport system in Australia in many (at least 50) years, despite five-year reviews of the AWB by the Industries

Assistance Commission (IAC). The general approach of the Royal Commission has been to conduct their own analysis and to receive submission on various topics by interested parties. However, an important point is that the scope of the Royal Commission does not include marketing, which is concurrently being addressed by the IAC. There are numerous issues being addressed by the Royal Commission, ranging from land transport, to work practices to ownership of the grain handling system. Only selected issues related tangentially to the issues of quality are discussed below. A comprehensive discussion of the issues is contained in various working and discussion papers of the Royal Commission. In addition, the Royal Commission is expected to present its findings and recommendations in early 1988.

There are three issues generally related to the handling and storage industry. These include the increased use of on-farm storage (including private storage), grain insect control, the cost of storage, and handling and segregation. Underlying these issues are various perceptions related to grain quality and insect control. First, the AWB places significant emphasis on cleanliness and hygiene standards (hygiene standards refers to both cleanliness and the insect control program) in marketing, which may be jeopardized in a more commercial environment. There is a common belief that increased use of on-farm storage would result in increased infestation and/or residue. Also, deregulation of the markting system would add difficulties in controlling insects. Second, a perception exists that a monopoly handler, who doesn't take ownership of the grain, is necessary to administer the hygiene standards traditionally practiced in Australia. Private handlers would have less incentive to exercise control and private traders would have incentives in blend to factor limits.[15] A third perception is that segregation of wheat into many categories assists the AWB in marketing efforts. Indeed, recent efforts may result in increased segregation. This has the potential effect of requiring more extensive storage facilities and likely underutilization throughout the system.

There is much sympathy to the notion that current hygiene standards are appropriate in Australia. Thus, a major problem for the Royal Commission is how to get the benefits of increased competition (i.e., lower handling costs) without jeopardizing grain quality. Extensive modelling was conducted to analyze the impacts of alternative competitive environments. Results indicated that elimination of the state monopoly BHAs and transport as well as pooling of port service costs would lower the average cost of distribution from $58/MT to $50/MT, or a 10 percent decrease. An issue haunting the Royal Commission, however, is whether sufficient competition would exist to realize these savings. An overriding consideration of these alternatives is that increased competition or increased use of farm storage would result in a deterioration in the quality of wheat. In recognition of these savings and potential costs of increased infestation and pesticide residues the Royal Commission made several points (discussion paper no. 5, p. 51). In general,

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[15]Private traders contend that by not blending to limits, the AWB is in fact "giving away" a quality factor and not receiving a premium. On the other hand the AWB contends it sometimes intentionally ships more of a preferred quality attribute for purposes of reputation.

the Royal Commission had indicated that alternatives exist for administering current hygiene standards and the costs of doing so likely are less than the benefits of increased competition (discussion paper no. 5, p. 72).

TABLE 4.1. AUTHORIZED HANDLERS OF WHEAT IN EACH STATE

State	Organization
Queensland	State Wheat Board
New South Wales	Grain Handling Authority
Victoria	Grain Elevator Board
South Australia	South Australian Cooperative Bulk Handling Board Ltd.
Western Australia	Cooperative Bulk Handling Ltd.

SOURCE: Australian Wheat Board, Wheat Industry Guide.

TABLE 4.2. HANDLING, TRANSPORT, AND OTHER DEDUCTIONS, 1986/87

	New South Wales	Victoria	South Australia	Western Australia	Queensland
	($/Tonne)				
Handling and storage	16.70	14.63	12.44	13.05	17.00
Freight	24.44	21.71	6.69	14.37	15.70
Wharfage	1.76	0.88	1.05	0.50	1.40
Carryover	0.82	0.85	1.27	1.50	0.61
Two port loading	--	0.47	1.11	0.30	--
Other levies	0.50	0.50	1.59	2.34	2.00
TOTAL	44.24	39.04	24.15	32.06	37.61

SOURCE: Australian Wheat Board Annual Report, Various Issues.

TABLE 4.3. PRINCIPAL GROWERS' DEDUCTIONS FOR HANDLING, STORAGE, AND FREIGHT[3]

Year	Handling and Storage							Freight[2]							Total						
	NSW[1]	VIC.[1]	SA	WA	Qld	Tas	Australia	NSW[1]	VIC.[1]	SA	WA	Qld	Tas	Australia	NSW[1]	VIC.[1]	SA	WA	Qld	Tas	Australia
1979-80	12.00	7.00	7.00	11.90	10.50	10.24	9.96	15.71	12.38	5.09	9.23	11.98	--	11.67	27.71	19.38	12.09	21.13	22.48	10.24	21.63
1980-81	12.00	8.00	10.00	12.63	16.00	11.23	10.92	15.86	14.08	5.62	9.31	11.90	--	11.62	27.86	22.08	15.62	21.94	27.90	11.23	22.54
1981-82	14.40	10.35	11.35	11.67	16.00	12.44	12.73	19.38	16.21	6.27	12.18	12.87	--	14.80	33.78	26.56	17.62	23.85	28.87	12.44	27.53
1982-83	14.90	12.00	11.95	12.00	16.50	13.07	12.77	19.94	17.21	5.02	13.51	13.08	--	13.83	34.84	29.21	16.97	25.51	29.58	13.07	26.60
1983-84	16.50	12.95	12.43	13.42	21.00	14.58	14.73	22.05	19.98	6.87	14.32	14.87	--	17.56	38.55	32.93	19.30	26.75	35.87	14.58	32.29
1984-85	17.20	13.75	12.74	13.05	20.00	15.00	15.29	23.63	20.09	6.50	14.79	16.20	--	17.39	40.83	33.84	19.24	27.84	36.20	15.00	32.68
1985-86	16.70	13.80	11.93	13.05	19.00	16.00	15.08	24.50	20.76	7.08	13.56	15.70	--	17.88	41.20	34.56	19.01	26.61	34.70	16.00	32.96

[1]The principal deductions shown for NSW and Victoria are the standard charge deducted from growers at receival sites. In both states, growers are offered discounts to encourage deliveries at a particular site or during a specified period.
[2]Freight figures shown for each state have been calculated by dividing the total dollar amount deducted.
[3]Calculated for indicative purposes only.

SOURCE: Australian Wheat Board, Annual Report, Various Issues.

TABLE 4.4. TOTAL STORAGE CAPACITY[1]

State	Country Storages	Seaboard Storages	Total
	----------000 MT----------		
New South Wales	5,887	309	6,196
Victoria	3,027	991	4,018
South Australia	2,379	1,976	4,355
Western Australia	4,724	2,064	6,788
Queensland	1,586	266	1,852
Tasmania	11	20	31
Australia	17,614	5,626	23,240

SOURCE: Australian Wheat Board.

[1]At September 30, 1986; excludes bunker and open bulkhead stores.

TABLE 4.5. COUNTRY AND PORT STORAGE PROFILE (kt)

	Vertical	Horizontal	Bunker	Total
QUEENSLAND				
Port	265	--	--	265
Country	895	629	2020	3544
Total	1160	629	2020	3809
NEW SOUTH WALES				
Port	297	--	--	297
Country	2007	3799	5848	11654
Total	2307	3799	5848	11951
VICTORIA				
Port	290	720	--	1010
Country	1983	922	1652	4557
Total	2273	1642	1652	5567
SOUTH AUSTRALIA				
Port	1581	320	478	2379
Country	1915	464	--	2379
Total	3496	784	478	4758
WESTERN AUSTRALIA				
Port	587	1123	106	1816
Country	242	5296	2458	7996
Total	829	6419	2564	9812
AUSTRALIA (TOTAL)				
Port	3020	2163	584	5767
Country	7042	11110	11978	30130
Total	10062	13273	12562	35897

SOURCE: SACBH, 1986; GHA, 1986; GEB pers. comm; CBHAW pers. comm; BGQ submission.

TABLE 4.6. ON-FARM STORAGE CAPACITY, 1984-85

	New South Wales	Victorld	Queens-land	Western Aust.	South Aust.	Australia
Average tonnes per farm	292	167	251	186	81	209
No. of farms	15,886	8,556	5,750	8,157	7,739	46,088
Estimated total on-farm storage (mt)	4.64	1.43	1.44	1.52	0.63	9.66
Storage capacity as a percentage of harvested winter cereal and sorghum production	59	37	46	17	17	35
Increase in storage capacity since 1978-79 (percent)	24	56	97	39	64	40

SOURCE: Howard and Lawrence (1986).

TABLE 4.7. PORT CAPACITIES AND MAXIMUM OUTLOAD RATES

Port	Ship Capacity[a]		Maximum Outload Rate
	Partly Loaded	Fully Loaded	
	(dwt)		(tph)
Pinkenba No. 1	50,000	35,000	1,200
Pinkenba No. 2	50,000	35,000	1,000
Fisherman Islands	60,000	60,000	2,400
Mackay	35,000	35,000	300
Gladstone	50,000	50,000	1,600
Newcastle	60,000	60,000	3,400
Sydney	60,000	60,000	2,000
Port Kembla	120,000	120,000	5,000
Geelong	60,000	55,000	1,000
Portland	60,000	55,000	1,000
Port Adelaide	40,000	40,000	800
Ardrossan	45,000	30,000	800
Port Giles	60,000	45,000	3,000
Wallaroo	60,000	35,000	3,500
Port Pirie	40,000	40,000	1,750
Port Lincoln	80,000	80,000	3,600
Thevenard	30,000	15,000	350
Albany	60,000	50,000	1,000
Geraldton	60,000	20,000	800
Esperance	45,000	30,000	600
Kwinana	80,000	70,000	5,000

[a]Rounded to nearest 5,000 dwt.

SOURCE: Hetherington Wesfarmers Shipping Agency (1987).

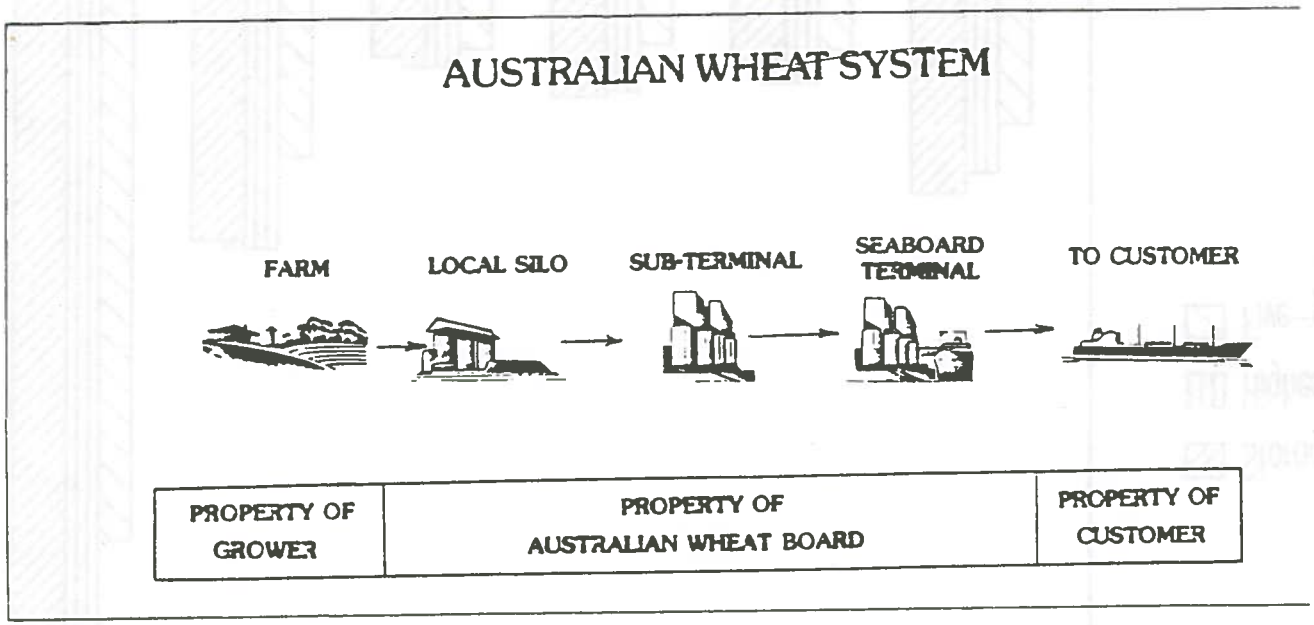
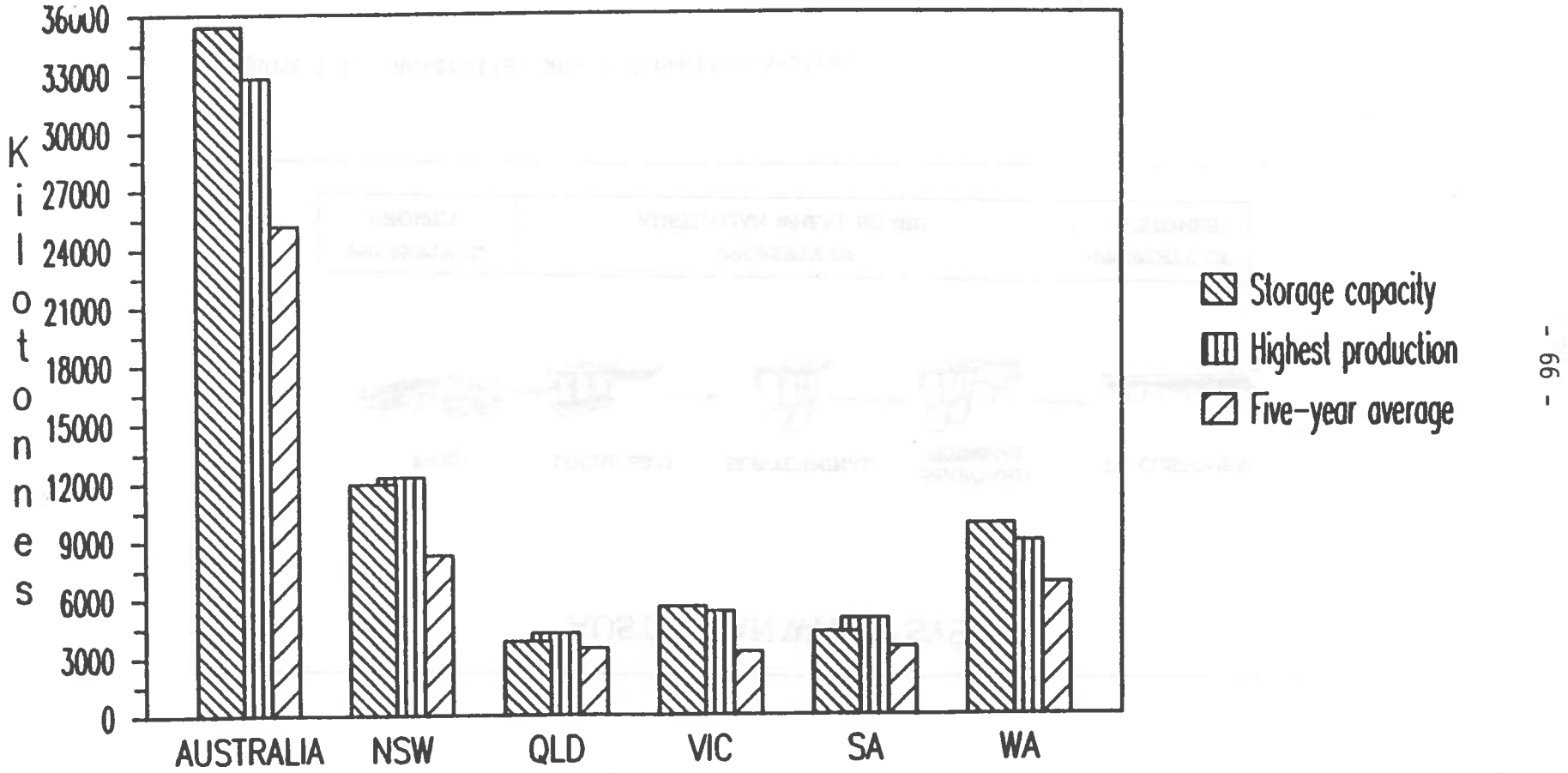


Figure 4.1. Australian Wheat Marketing System.

Figure 4.2. Grain Storage and Production



Sources: BAE 1986, BHA submissions.

V. Variety Development and Release

The purpose of this section is to discuss the development and release of wheat varieties in Australia. In the first sub-section a brief overview of the industry is provided and subsequent sub-sections explain the role of the Australian Wheat Board (AWB) and the procedures for release.

A. Overview.

Wheat is planted in Australia during their winter (May-July), grows during the spring months, and harvest commences from September/October to January. The varieties are spring type, in the North American sense, but are planted during the winter. All of the wheat is white, and any red varieties would be classed as feed. All varieties have to meet certain milling criteria and there is no active program to develop feed varieties. The GP and Feed grades are simply milling varieties, typically with excessive weather damage.

The plant breeding industry is predominately public. Each state's Department of Agriculture includes public expenditures on breeding. Producers pay a checkoff (40¢/MT) which is matched by the Commonwealth and distributed on the competitive basis. Cargill is one of the few (or the only) private breeders and recently released a hybrid which has gained 30 percent of the sales in NSW. Producers typically buy a new variety when released and use it for many years before replacing it with a newer variety.

B. Role of the AWB

The AWB has two important roles to play in the development, release and production of varieties. First, it administers a Variety Control Scheme (VSC) which was discussed in detail in Section III and is complementary to the activities of variety release. The VCS is used for classification and segregation at the country elevator level. In addition, through the VCS and explicit premiums for APH and AH, or discounts for ASW, the AWB essentially provides the incentives/disincentives for production of certain varieties in particular locations (silo groups). The incentive/disincentive mechanism of the VCS is complementary to the release procedures discussed below. Producers are not regulated in marketing varieties they produce, nor are breeders formally regulated in the release of varieties, but if a variety is not prescribed it may be subjected to discount from ASW or classified as Feed, which entails a substantial discount.

The second role of the AWB is that it is a voting member on the quality evaluation committee in the release process of each state. This is a very important committee which conducts quality tests on advanced lines. To give guidance to wheat breeders on quality the AWB provided a broad set of guidelines in 1976. These are general guidelines regarding quality but each variety must stand on its own in the review process. In 1987 the AWB proposed

minor revisions in the guidelines. These are shown in Table 5.1 The underlying idea is that all varieties conform to certain physical criteria as reflected in the receival standards. These guidelines relate to milling criteria for each grade and are intended to provide uniformity with respect to end-use criteria. The guidelines are designed to reflect the values that customers feel are appropriate for each grade given price differentials and minimum end-use requirements. There were slight changes in the guidelines proposed for 1987, generally reflecting increased uniformity. Further, minor requirements were also proposed with respect to measurement standards. These guidelines are implemented by the AWB (presumably) in its role on the quality committee discussed below.

C. Procedures for Release

Release of varieties ultimately is the discretion of each individual state. While each state may have a slightly different committee structure, the general procedures are similar. The procedures and committee structure for New South Wales (NSW) are described below.[16] Conformity with the review process is essential for endorsement of a variety by the committee and AWB.

In NSW there are three committees involved in the variety release decision. These include the Uniform Quality Testing (UQT), State Wheat Improvement Committee (SWIC), and the Standing Advisory Committee on Wheat (SACW). The UQT and SWIC make recommendations to the SACW, which makes recommendations to the State Minister of Agriculture, who ultimately gives the final approval for lines to be released.

The UQT is a quality evaluation committee. Voting members include the AWB, end-users, the Bread Research Institute (BRI), and State Agriculture Department Laboratories. In addition, observers may attend meetings. Extensive analyses of end-use performance is conducted at multiple laboratories on advanced lines which have been submitted. Tests include (but are not limited to): test weight, particle size index, flour yield, grain protein, falling number, color, loaf score and volume, and measures from the farinograph, extensograph, resistograph, and visograph. These tests are compared to control varieties which vary with respect to the criterion. Table 5.2 shows the control varieties used in NSW which differ from those in other states.

The SWIC evaluates the agronomic characteristics of submitted varieties. Tests included are primarily yield and disease resistence but also include other production-related criteria. Though not specific, a variety is expected to have a yield greater than or equal to the variety it intends to replace.

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[16] Formally, varieties don't have to go through the release procedure--it is only a gentleman's agreement for a breeder to submit a variety for review. In practice, in the past, all released varieties have been subjected to the review process described.

The Standing Advisory Committee on Wheat receives data and recommendations from each of the UQT and SWIC committees. Members on this committee include representatives from the state farm associations, the registered seed growers association, and in the case of NSW, the Hard and Soft Wheat Growers Association and the Prime Wheat Association. Formally, this committee evaluates the information and makes a recommendation to the State Minister of Agriculture, who in turn makes the official decision on whether a variety is released (or prescribed). In evaluating the information the SACW is much more judgemental than the other two committees. The criteria are not completely rigid and are somewhat responsive to the perceived needs of the market. For example, in recent years more emphasis has been placed on quality, particularly the protein level, in response to apparently declining levels of protein.

Given the recommendations of the SACW, the Minister of Agriculture in each state formally releases a variety. In particular, he prescribes a variety, and if produced in a specified Silo group, it would not be subject to varietal discounts by the AWB. However, if produced in nonspecified Silo Groups, it would be subjected to possible discounts. Thus, the State Minister of Agriculture has the capability of overriding the intents of varietal discounts applied by the AWB.[17]

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[17]In the recent IAC inquiry the AWB indicated that the release procedure of each state may preclude them from fully reflecting appropriate market values to producers. Discounts can be applied only if the variety is prescribed as such by the individual State Minister of Agriculture.

TABLE 5.1. QUALITY GUIDELINES FOR WHEAT BREEDERS, 1976, AND PROPOSED FOR 1987

	Protein[1]	Hardness	Extensogram		Viscograph
			Height	Extensibility	
	%	PSI	BU	CM	BU
1976 Guidelines					
Soft	less than 10	Over 22	200 ± 50	Over 17	--
ASW	9.5-12.0	16-24	350 ± 50	Over 18	--
AH	11.5-13.0+	10-17	450 ± 50	Over 20	--
APH	12.5+	10-14	550 ± 50	Over 22	--
1987 Guidelines					
Soft	Below 9.5	Over 22	200 ± 50	Over 17	480+
ASW					
Soft grained	9.5-11.0	20-24	350 ± 50	Over 18	450+
Hard grained	10.0-11.5	16-20	350 ± 50	Over 19	450+
AH	11.5-13.0+	14-17	450 ± 50	Over 20	450+
APH	13.0+	14-16	550 ± 50	Over 22	450+

SOURCE: Australian Wheat Board.

[1]1987 Proposal to measure protein on 11 percent moisture basis.

TABLE 5.2. CONTROL VARIETIES BY GRADE AND PARAMETER FOR NEW SOUTH WALES

Parameter	APH	AH	ASW
Milling quality	Hartog	Kites	Kites
Grain size	Banks	Banks	Millewa
Extensibility	Hartog	Kites	Kites
Dough strength	Banks	Banks	Banks
Stability	Sunkota	Banks	Banks
Development time	Sunkota	Banks	Banks/Condor
Starch viscograph	Banks	Banks	Banks

SOURCE: Australia Wheat Board.

VI. Summary and Conclusions

Australia is the fourth largest exporter of wheat with market share ranging from 11 to 18 percent. Compared to other exporters, production is quite volatile, and a relatively large proportion of the wheat produced is exported. Yields are quite low due to a number of reasons including lack of precipitation, soil fertility, and low producer prices, each of these resulting in less intensive production practices than other exporting countries. In recent years there have been sharp reductions in production primarily due to the economics of sheep production, which is a very important alternative for Australian wheat producers.

There are several unique characteristics of the quality of wheat produced in Australia. It is exclusively white, with protein levels in the area of 9 to 11 percent. Higher levels of protein exist for other classes, but these comprise a relatively small proportion of the exports. In recent years there has been a growing concern about the apparent reduction in crop average protein levels. The wheat is abnormally dry (9.5 percent) and has superior hygiene characteristics (low levels of impurities and nil insects). The climate in Australia is conducive to infestation problems, but these have diminished to nil due to procedures implemented over the last 10 to 15 years.

There are a number of important institutions and institutional relationships in Australia which affect the operation of the marketing system. The Australian Wheat Board is the key, acting as virtually the sole buyer and seller of wheat (with a few exceptions discussed below). In addition the AWB has direct influence on the quality of wheat in a number of capacities. All wheat is handled and stored for the AWB by monopoly grain handling organizations in each state. As a result the AWB retains ownership throughout the marketing system.

In this section a summary is provided on important aspects of the marketing system and its impact on quality. Following these summary points conclusions are drawn on the major influences affecting quality. Major issues/recommendations faced by two concurrent investigations are also summarized:

1. Farm Sector. Wheat is by far the dominant crop produced in Australia. It is produced generally in a rotation including pasture and sheep. In recent years an increase in sheep and wool prices combined with lower wheat prices has resulted in a diversion away from wheat production. This has taken the form of extending the pasture component of the rotation. Climatic conditions are very dry, and combined with low prices, there is limited use of fertilizers.

2. Guaranteed Minimum Price (GMP) is the key agricultural policy in Australia and is administered by the AWB. The GMP provides a price support mechanism and is underwritten by the Commonwealth. Of particular importance is that it is through the differentials in the GMP, and also the pooling mechanism, that the AWB provides incentives and disincentives in the marketing system. In addition, given there are minor to no differentials for delivery in the post-harvest period, most of the wheat is delivered at harvest or shortly after. As a result there is minimal use of on-farm storage.

3. Australian Wheat Board. The AWB is the single most important institution affecting the marketing system and quality of wheat. It is the sole buyer of wheat with the exception of that used for stock feed. It is also virtually the sole seller to both the domestic milling and export markets. However, it sells from 10 to 30 percent of the wheat to the private exporters who arrange export transactions to specific markets.

4. Australian Wheat Board and Wheat Quality. There are a number of mechanisms used or administered by the AWB which influence quality of wheat produced and exported. First, development and administration of "Receival Standards" are the responsibilities of the AWB. Wheat has to meet these standards at the point of first receival, if not it is precluded and destined to the feed market. An important underlying principal of the marketing system is that applying stringent standards at the point of first sale generally mitigates problems downstream in the marketing system. This is in contrast to the U.S., where in general the standards are normally applied only at export.

   Price differentials for different quality parameters are established by the AWB through the GMP mechanism discussed above, and/or the pooling mechanism. There are price differences for class and grade, and variety in some cases. This is the key mechanism used by the AWB to provide incentives to improve or maintain the quality of wheat. The discount on excessive unmillable material, for example, is generally sufficient to induce harvesting wheat with a lower level of unmillable material. Wheat with excessive unmillable material is either: (1) accepted into the system, valued and marketed as GP or Feed; or (2) used on-farm or sold domestically as feed.

The "Variety Control Scheme" (VCS) is also administered to facilitate segregation by classes and to provide incentives via price differentials. The VCS is not regulatory but is used to identify variety at the point of delivery, which then is used for segregation into classes. Administration of the VCS is dependent on producers declaring the variety at delivery.

In addition to the above, an important characteristic of marketing in Australia is that wheat, once received into the Bulk Handling Authority (BHA) system, is the property of the AWB. These BHAs operate under contract with the AWB in part to maintain quality, but they do not take ownership. As a result there are only two transactions in the marketing system, one between grower and AWB, the other between the AWB and importer. Thus, the benefits of restrictive quality control can be internalized. For these reasons there is limited blending between grades or loading to factor limits.

5. Quality. There are seven classes of wheat produced and marketed in Australia including Prime Hard (APH), Hard (AH), Australia Standard White (ASW), Soft, Durum, General Purpose (GP), and Feed. Some of these are further segregated by protein level or the level of non-millable materials. Protein is an important distinguishing characteristic between classes, and APH and AH are further segregated by protein. Recently the AWB is investigating protein segregations within ASW in response to the apparent reduced protein levels in recent years. Wheat in Australia is exclusively white and generally heavier than that of other exporters, resulting in higher extraction rates.

Wheat in Australia is noted for its high standard of "hygiene"--i.e., cleanliness and lack of infestations. Unmillable material levels are generally less than 4/10 percent. This degree of cleanliness is assured by the combined effects of the receival standards, substantial price differentials, and harvesting technology which has adapted. These result in incentives to use "second screens" (2mm) on combines during harvest. The differentials are also great enough to clean commercially if needed.

The climate in Australia is compatible to proliferation of insects. However, infestation problems have virtually been eliminated in recent years, allegedly due to: (1) nil tolerances at first sale; (2) integrated procedures used throughout the marketing system, and (3) limited use of on-farm storage.

6. Grain Handling. Australia has an important institutional relationship in which a monopoly exists in each state charged with the responsibility of grain handling and storage (BHA). The institutional relationship is that the AWB contracts with the BHA in each state exclusively to provide services, part of which is to preserve the condition of wheat. However, as indicated above the AWB retains ownership throughout the system. Thus, any benefits from quality preservation or conditioning are internalized.

   Due to pricing policies and tradition, the storage system has developed to comprise relatively little on-farm storage. However, extensive storage and handling capacity exists within the marketing system. As a result most wheat is delivered into the marketing system at or near harvest, conditioned by the BHAs and stored within the BHAs.

   Wheat is segregated at the country elevator level by grade/class, which in part are reflective of variety. However, design of the marketing system which includes high volume storage generally precludes increased segregations, even though increased segregations within ASW have been proposed. Blending is very limited at the country elevator due to lack of incentive (i.e., the BHA doesn't own the wheat and could not benefit from doing so) and possibly due to infrastructure. Export elevators do blend, but it is limited to a few factors and because of the inbound segregation. Wheat is not cleaned within the BHAs due to administration of standards and price differentials discussed above. Dust is removed but not re-introduced into the stream.

7. Variety Development and Release. Plant breeding is predominately by the public sector. A formal mechanism is followed as a prerequisite for release of varieties. Ultimately the Minister of Agriculture in each state prescribes varieties which can be marketed (not necessarily produced) from each region. The AWB is involved in several ways: (1) it is on the committee which recommends varieties to the Minister of Agriculture; (2) it has provided broad guidelines for breeders to achieve uniformity, and (3) it prescribes discounts which can apply for varieties in particular locations.

The quality of wheat exported from Australia is the result of a multi-faceted approach to marketing and regulations. Important factors influencing the quality of wheat exported include (but are not limited to): (1) variety development and release, (2) variety identification in marketing; (3) stringent receival standards administered at the point of first sale; (4) administered price differentials to provide incentives; (5) an institutional relationship which allows ownership of wheat to be divorced from handling; (6) nil tolerances for insects throughout the system; and (7) limited on-farm storage. These factors have directly or indirectly influenced the marketing practices which affect the quality of wheat being exported. However, at least some of these have created problems for the marketing system which are the subject of two concurrent investigations in Australia. There are a multitude of issues being addressed by these commissions, two of which are of particular concern. One is whether, or the extent, that the AWB is capable of commanding premiums for the quality of wheat being exported from Australia (Industry Assistance Commission). The other is an investigation into factors contributing to the relatively high and escalating costs of grain handling and transportaion in Australia (Royal Commission). At least a part of these costs can be attributable to the constraints imposed on the system due to the quality control measures.

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APPENDIX A

STATISTICAL TABLES

TABLE 2.1. PRODUCTION OF WHEAT (000 MT)

Season[1]	New South Wales[2]	Victoria	South Australia	Western Australia	Queensland	Tasmania	Australia
1976-77	5,142	1,789	832	3,249	794	4	11,800
1977-78	3,946	1,497	511	2,945	569	2	9,370
1978-79	6,640	2,998	2,086	4,400	1,962	3	18,090
1979-80	6,001	3,250	2,349	3,739	846	4	16,188
1980-81	2,865	2,538	1,650	3,315	485	3	10,856
1981-82	5,910	2,467	1,695	4,803	1,482	3	16,360
1982-83	1,500	394	692	5,534	755	1	8,876
1983-84	8,961	3,971	2,843	4,316	1,922	3	22,016
1984-85	5,805	2,666	2,031	6,580	1,579	4	18,666
1985-86	5,911	2,225	1,879	4,377	1,730	4	16,127
Ten Season Average	5,258	2,380	1,657	4,326	1,212	3	14,835

[1]October 1 to September 30.
[2]Including A.C.T.

SOURCE: Australian Wheat Board, Annual Report 1985/86.

Table 2.2. Australia Wheat Supplies and Dissappearance for Crop Years 1961/62 - 1987/88 (million metric tons)

	Supply			Disappearance			
Year	Beginning Stocks	Production	Total	Domestic	Exports	Total	End-of-Year Carryover
1961/62	0.7	6.7	7.4	2.1	4.8	6.9	0.5
1962/63	0.5	8.4	8.8	2.0	6.2	8.2	0.6
1963/64	0.6	8.9	9.6	2.1	6.9	9.0	0.6
1964/65	0.6	10.0	10.6	2.7	7.3	9.9	0.7
1965/66	0.7	7.1	7.7	2.5	4.8	7.3	0.5
1966/67	0.5	12.7	13.2	2.4	8.5	11.0	2.2
1967/68	2.2	7.5	9.7	2.7	5.7	8.3	1.4
1968/69	1.4	14.8	16.2	2.3	6.7	8.9	7.3
1969/70	7.3	10.5	17.8	2.4	8.2	10.6	7.2
1970/71	7.2	7.9	15.1	2.7	9.0	11.7	3.4
1971/72	3.4	8.6	12.0	2.8	7.8	10.6	1.5
1972/73	1.5	6.6	8.0	3.4	4.1	7.6	0.5
1973/74	0.5	12.0	12.5	3.2	7.4	10.6	1.9
1974/75	1.9	11.4	13.2	3.0	8.5	11.6	1.7
1975/76	1.7	12.0	13.6	2.7	8.2	11.0	2.7
1976/77	2.7	11.8	14.5	2.6	9.8	12.3	2.1
1977/78	2.1	9.4	11.5	2.6	8.1	10.7	0.8
1978/79	0.8	18.1	18.9	2.5	11.7	14.2	4.6
1979/80	4.6	16.2	20.8	3.4	13.2	16.6	4.3
1980/81	4.3	10.9	15.1	3.5	9.6	13.1	2.0
1981/82	2.0	16.3	18.4	2.4	11.0	13.4	4.9
1982/83	4.9	8.8	13.8	4.2	7.3	11.5	2.3
1983/84	2.3	22.0	24.3	2.6	14.2	16.7	7.6
1984/85	7.6	18.3	25.9	2.6	15.1	17.3	8.6
1985/86	8.6	16.6	25.1	2.9	16.1	17.9	7.3
1986/87	7.3	16.8	24.1	2.7	14.8	17.5	6.6
1987/88	4.0	13.0	17.0	2.8	11.0	13.8	3.2

1987/88 data is preliminary.

Source: World Wheat Statistics, various years, London for 1961/62 - 1985/86, 1986/87 - 1987/88 from IWC Market Report and FAS FG13-87, World Grain Situation Outlook.

Table 2.3. Area Planted by Major Exportors (in Million Hectares)

Year	EC10	France	Canada	US	Argentina	Australia
1962	12.0	4.6	10.9	17.6	3.4	6.7
1963	11.0	3.8	11.2	18.3	5.7	6.7
1964	11.7	4.4	12.0	20.1	6.1	7.3
1965	11.9	4.5	11.5	20.1	4.6	7.1
1966	11.1	4.0	12.0	20.2	5.2	8.4
1967	10.8	3.9	12.2	23.7	5.8	9.1
1968	11.4	4.1	11.9	22.4	5.8	10.8
1969	11.1	4.0	10.1	19.1	5.2	9.5
1970	10.9	3.7	5.1	17.6	3.7	6.5
1971	11.1	4.0	7.9	19.3	4.3	7.1
1972	12.0	3.9	8.6	19.1	5.0	7.6
1973	11.7	4.0	9.4	21.9	3.9	8.9
1974	12.2	4.1	8.9	26.5	4.2	8.3
1975	11.4	3.9	9.5	28.1	5.3	8.6
1976	12.1	4.3	11.3	28.7	6.4	9.0
1977	11.0	4.1	10.1	27.0	3.9	10.0
1978	12.0	4.2	10.6	22.9	4.7	10.2
1979	12.0	4.1	10.5	25.3	4.8	11.2
1980	12.6	4.6	11.1	28.8	5.0	11.3
1981	12.7	4.7	12.4	32.6	5.9	11.9
1982	13.0	4.8	12.6	31.5	7.3	11.5
1983	13.2	4.8	13.7	24.8	7.1	12.9
1984	13.6	5.1	13.2	27.1	5.9	12.0
1985	13.0	4.8	13.7	26.2	5.3	11.7
1986	12.7	4.7	14.2	24.6	5.1	11.3
1987	.	.	13.5	22.4	5.0	10.0

Source: World Wheat Statistics, various years, London.
Data for 1986 and 1987 from FAS and Toepfer.

Table 2.4. Domestic Disappearance Expressed as a Percent of Total Disappearance

Year	EC10	US	Canada	Australia	Argentina
1961/62	89.4	45.8	28.4	29.8	56.3
1962/63	86.9	47.5	29.4	24.3	65.9
1963/64	87.6	40.7	20.9	23.4	51.8
1964/65	83.0	47.0	26.9	26.8	36.8
1965/66	82.6	45.7	21.2	34.7	40.1
1966/67	86.1	47.5	23.7	22.2	59.1
1967/68	85.3	45.4	31.7	32.1	65.5
1968/69	86.7	57.5	35.0	25.2	65.0
1969/70	84.7	56.0	32.6	22.7	64.6
1970/71	91.9	51.0	28.2	22.7	81.5
1971/72	88.4	57.5	25.9	26.5	75.2
1972/73	86.6	39.9	23.3	45.3	63.9
1973/74	88.3	39.5	28.7	29.9	72.1
1974/75	83.6	39.5	29.8	26.2	72.7
1975/76	79.8	38.1	28.0	25.0	64.5
1976/77	88.7	44.1	26.4	20.8	40.7
1977/78	87.5	43.3	23.8	24.5	73.4
1978/79	81.9	41.2	28.7	17.8	48.1
1979/80	79.3	36.3	25.7	20.3	45.7
1980/81	74.8	34.1	24.2	26.5	55.7
1981/82	74.2	32.4	22.0	18.1	56.3
1982/83	74.7	37.6	19.3	36.6	33.8
1983/84	74.6	43.7	20.3	15.4	38.4
1984/85	73.6	44.7	23.5	15.0	34.6
1985/86	77.3	54.4	24.4	16.0	50.0
1986/87	.	.	.	15.4	.
1987/88	.	.	.	20.3	.

Source: World Wheat Statistics, various years, London.

TABLE 2.5 DOMESTIC USES OF WHEAT BY TYPE OF FLOUR, 1982-87[a]

Uses	1982	1983	1984	1985	1986	1987
	percent					
Industrial						
Starch/Gluten Mfg.	20.1	18.6	20.6	22.7	24.0	22.3
Other	1.3	0.8	.3	.2	.1	.2
Human Consumption						
Bread Bakers	54.3	55.0	48.6	47.4	45.8	44.8
Pasts Cooks	NA	NA	9.1	8.8	7.8	7.5
Biscuit	7.0	7.3	6.7	16.4	6.7	7.1
Pasta	3.3	3.1	3.3	3.1	3.3	3.4
Packeted Flour & Mixes	8.8	8.3	6.5	7.4	6.4	6.8
Food	4.2	5.8	5.0	4.0	5.9	7.9
Total (000 MT)	1,043	1,036	1,123	1,139	1,144	1,208
Export (000 MT)	102	91	63	61	61	73
Grand Total (MMT)	1,145	1,126	1,187	1,200	1,205	1,281

[a]Crop year ending June 30.

SOURCE: Survey conducted by Bread Research Institute, Sydney.

Table 2.6. Exports as Percent of Production for Major Exportors

Year	EC10	US	Canada	Australia	Argentina
1961/62	13.7	58.4	126.3	72.0	47.7
1962/63	13.5	58.8	58.6	74.5	32.6
1963/64	15.4	74.7	82.2	77.3	39.0
1964/65	19.4	56.5	66.6	72.4	56.9
1965/66	19.1	65.9	90.1	67.3	91.1
1966/67	16.9	57.0	62.3	67.1	35.2
1967/68	15.3	50.5	56.7	75.0	30.7
1968/69	15.8	35.0	47.1	45.2	43.1
1969/70	20.5	42.0	51.6	77.7	32.6
1970/71	10.3	54.6	131.3	114.7	17.2
1971/72	13.2	39.1	95.1	90.2	28.5
1972/73	16.4	76.6	108.1	62.8	39.2
1973/74	13.0	67.4	70.6	61.9	22.8
1974/75	17.5	57.9	81.0	75.3	28.7
1975/76	25.2	55.3	72.2	68.7	36.1
1976/77	12.4	44.4	57.0	82.7	53.0
1977/78	14.7	54.9	80.8	86.4	31.6
1978/79	19.0	67.2	61.9	64.6	49.3
1979/80	23.6	64.4	92.4	81.5	58.3
1980/81	27.4	63.6	84.3	88.6	45.0
1981/82	29.1	63.6	74.4	67.4	45.8
1982/83	25.4	54.6	79.9	82.5	65.3
1983/84	27.7	59.0	82.1	64.3	59.7
1984/85	24.7	54.9	82.7	82.5	68.4
1985/86	24.1	37.5	75.3	97.3	50.6
1986/87	.	.	.	88.1	.
1987/88	.	.	.	84.6	.

Source: World Wheat Statistics, various years, London.

Table 2.7. End-of-Year Carryover Expressed as a Percent of Production

Year	EC10	US	Canada	Australia	Argentina
1961/62	27.5	107.3	138.0	7.4	4.2
1962/63	27.7	109.5	86.2	7.5	8.8
1963/64	25.0	78.6	63.5	6.2	24.8
1964/65	19.1	63.7	85.4	6.6	29.7
1965/66	22.2	40.7	64.7	6.4	2.9
1966/67	20.5	32.5	69.1	17.3	10.0
1967/68	24.3	35.7	113.4	18.6	20.1
1968/69	24.6	52.5	131.1	49.0	9.3
1969/70	15.3	61.3	150.3	68.4	15.6
1970/71	17.3	54.1	221.4	43.1	29.5
1971/72	18.6	53.3	110.2	16.9	11.6
1972/73	11.8	28.3	68.5	7.3	3.8
1973/74	14.3	14.5	62.4	15.7	22.8
1974/75	23.2	18.2	60.4	14.6	19.7
1975/76	21.9	31.3	46.7	22.2	12.1
1976/77	21.7	51.9	56.5	18.1	20.2
1977/78	18.9	57.6	61.0	8.3	23.0
1978/79	20.8	52.0	70.5	25.7	19.9
1979/80	17.7	42.3	62.3	26.4	12.6
1980/81	15.8	41.5	44.4	18.8	11.6
1981/82	13.5	41.6	39.2	30.2	6.0
1982/83	18.1	54.8	37.3	25.9	4.6
1983/84	14.5	57.8	34.7	34.3	8.5
1984/85	20.8	54.9	35.2	47.0	3.4
1985/86	22.2	77.1	31.6	44.0	4.3
1986/87	.	.	.	39.3	.
1987/88	.	.	.	24.6	.

Source: World Wheat Statistics, various years, London.

Table 2.8. Percent of Total Wheat Production by Major Exporters for Calander Year (in MMT)

Year	EC10	Canada	US	Argentina	Australia
1946	12.99	7.85	21.81	3.89	2.22
1947	8.52	6.55	26.06	4.58	4.23
1948	12.82	6.63	22.29	3.28	3.28
1949	14.66	6.29	18.82	3.21	3.71
1950	13.87	7.62	16.45	3.48	3.00
1951	12.65	8.85	15.76	1.23	2.58
1952	11.95	9.35	17.43	3.72	2.60
1953	13.13	8.51	15.68	3.05	2.65
1954	13.64	4.62	13.74	3.95	2.36
1955	14.04	6.83	12.35	2.57	2.57
1956	10.42	6.89	12.10	3.13	1.59
1957	13.46	4.83	11.74	2.62	1.22
1958	11.66	4.27	15.69	2.65	2.33
1959	12.88	4.98	12.51	2.39	2.22
1960	12.33	5.85	15.32	1.66	3.07
1961	12.51	3.39	14.76	2.51	2.95
1962	14.08	5.97	11.52	2.21	3.26
1963	12.55	8.19	12.97	3.70	3.57
1964	12.75	5.91	12.64	4.09	3.62
1965	14.17	6.67	13.49	2.30	2.68
1966	10.51	7.23	11.48	1.99	4.08
1967	12.67	5.37	13.80	2.43	2.50
1968	11.61	5.32	12.91	1.71	4.45
1969	11.80	5.81	12.47	2.22	3.33
1970	11.48	2.82	11.54	1.54	2.48
1971	11.86	4.07	12.45	1.52	2.43
1972	12.44	4.17	12.09	2.27	1.90
1973	11.47	4.31	12.40	1.76	3.19
1974	13.06	3.66	13.33	1.65	3.13
1975	11.14	4.76	16.12	2.39	3.34
1976	9.76	5.55	13.76	2.59	2.78
1977	10.38	5.15	14.42	1.37	2.43
1978	11.15	4.68	10.71	1.80	4.01
1979	11.38	4.01	13.55	1.89	3.78
1980	12.37	4.31	14.55	1.75	2.45
1981	11.95	5.46	16.68	1.83	3.61
1982	12.45	5.54	15.62	3.11	1.85
1983	12.04	5.36	13.33	2.63	4.43
1984	14.71	4.10	13.66	2.63	3.60
1985	13.07	4.75	13.11	1.69	3.20

Source: World Wheat Statistics, various years, London.

Table 2.9. Total Wheat Exports by Major Exportors (MMT)

Year	EC*	US	Canada	Australia	Argentina	Total
1963/64	3.8	23.1	15.1	7.8	2.8	55.8
1964/65	5.4	19.6	11.9	6.5	4.4	50.5
1965/66	5.5	23.4	14.8	5.7	7.9	62.0
1966/67	4.2	20.0	14.8	7.0	3.1	55.8
1967/68	4.4	20.2	8.9	7.0	1.4	51.2
1968/69	5.0	14.7	8.7	5.4	2.8	45.7
1969/70	7.2	16.5	9.0	7.3	2.1	50.7
1970/71	3.1	19.8	11.6	9.5	1.7	54.3
1971/72	4.7	16.9	13.7	8.7	1.3	52.5
1972/73	6.5	32.0	15.6	5.6	3.5	68.3
1973/74	5.5	31.1	11.7	5.5	1.1	63.1
1974/75	7.1	28.3	11.2	8.0	2.2	63.4
1975/76	7.7	31.5	12.1	8.1	3.1	66.5
1976/77	3.9	26.4	12.9	8.4	5.6	61.8
1977/78	4.5	31.5	15.9	11.1	2.7	72.4
1978/79	7.4	32.4	13.5	7.2	3.3	71.7
1979/80	10.3	36.6	15.0	15.4	4.7	86.0
1980/81	12.7	42.1	17.0	11.1	3.9	94.0
1981/82	14.0	49.3	17.8	11.4	4.3	100.7
1982/83	14.1	39.3	21.1	8.5	7.5	96.1
1983/84	14.9	38.3	21.2	11.6	9.6	100.3
1984/85	17.2	38.2	19.1	15.1	8.0	104.1
1985/86	15.0	25.1	17.6	16.1	6.3	87.0
1986/87	15.0	27.3	20.8	14.9	4.3	90.1
1987/88	16.0	33.3	21.0	13.0	5.0	95.8

*Six original member states to 1967/68, nine member states to 1980/81, ten member states to December 1985, thereafter 12 members.

Source: World Wheat Statistics, various years, London, 1986/87 From FAS(FG-9-87)

Table 2.10. Market Shares of Total Wheat Exports by Major Exportors

Year	EC*	US	Canada	Australia	Argentina
1963/64	6.8	41.4	27.1	14.0	5.0
1964/65	10.7	38.8	23.6	12.9	8.7
1965/66	8.9	37.7	23.9	9.2	12.7
1966/67	7.5	35.8	26.5	12.5	5.6
1967/68	8.6	39.5	17.4	13.7	2.7
1968/69	10.9	32.2	19.0	11.8	6.1
1969/70	14.2	32.5	17.8	14.4	4.1
1970/71	5.7	36.5	21.4	17.5	3.1
1971/72	9.0	32.2	26.1	16.6	2.5
1972/73	9.5	46.9	22.8	8.2	5.1
1973/74	8.7	49.3	18.5	8.7	1.7
1974/75	11.2	44.6	17.7	12.6	3.5
1975/76	11.6	47.4	18.2	12.2	4.7
1976/77	6.3	42.7	20.9	13.6	9.1
1977/78	6.2	43.5	22.0	15.3	3.7
1978/79	10.3	45.2	18.8	10.0	4.6
1979/80	12.0	42.6	17.4	17.9	5.5
1980/81	13.5	44.8	18.1	11.8	4.1
1981/82	13.9	49.0	17.7	11.3	4.3
1982/83	14.7	40.9	22.0	8.8	7.8
1983/84	14.9	38.2	21.1	11.6	9.6
1984/85	16.5	36.7	18.3	14.5	7.7
1985/86	17.2	28.9	20.2	18.5	7.2
1986/87	16.6	30.3	23.1	16.5	4.8
1987/88	16.7	34.8	21.9	13.6	5.2

*Six original member states to 1967/68, nine member states to 1980/81, ten member states to December 1985, thereafter 12 members.

Source: World Wheat Statistics, various years, London.
1986/87 From FAS(FG-9-87)

Table 2.11. Exports of Wheat to Major Australia Destinations (000 MT)

Country = USSR

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	.	.	.	1,105	.	1,105
1970/71	.	.	.	315	.	315
1971/72	18	.	502	2,821	.	3,409
1972/73	704	9,468	908	4,168	.	15,899
1973/74	1	2,725	17	1,596	29	4,389
1974/75	.	978	656	313	680	2,828
1975/76	.	3,966	1,328	3,151	1,155	10,153
1976/77	.	2,869	368	1,183	139	4,559
1977/78	.	3,274	255	1,688	1,123	6,340
1978/79	5	2,967	136	1,892	.	5,024
1979/80	717	3,000	2,465	4,464	2,975	14,911
1980/81	685	3,920	2,741	1,806	2,021	11,686
1981/82	1,727	6,876	2,348	4,779	3,104	19,645
1982/83	3,396	3,036	1,004	6,953	4,218	20,140
1983/84	4,274	4,357	1,535	5,762	3,605	20,560
1984/85	6,078	6,123	2,040	7,633	4,057	28,156

Country = CHINA

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	764	.	2,446	1,830	.	5,040
1970/71	4	.	1,310	2,346	.	3,660
1971/72	.	.	.	2,967	.	2,967
1972/73	.	591	324	4,374	.	5,289
1973/74	26	3,190	1,239	1,367	.	5,831
1974/75	180	1,496	1,244	2,366	210	5,496
1975/76	.	.	1,126	1,204	.	2,330
1976/77	.	.	750	1,929	477	3,156
1977/78	.	225	4,603	3,321	373	8,522
1978/79	.	2,610	1,382	3,181	885	8,058
1979/80	90	1,929	3,575	2,647	465	8,706
1980/81	607	8,662	1,397	2,911	200	13,776
1981/82	116	8,054	1,413	2,991	199	13,223
1982/83	1,410	4,186	1,170	4,242	1,956	12,936
1983/84	137	3,131	1,660	3,848	1,010	9,786
1984/85	82	2,455	1,426	2,792	675	7,429

Country = EGYPT

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	1,717	14	.	57	.	2,401
1970/71	857	16	1,275	441	.	3,013
1971/72	599	5	1,801	64	.	2,698
1972/73	1,643	283	729	30	.	3,048
1973/74	1,230	798	736	.	.	3,189
1974/75	1,601	750	848	.	15	3,394
1975/76	1,482	1,225	1,025	.	.	3,759
1976/77	686	2,059	1,034	211	64	4,109
1977/78	754	1,902	1,246	540	.	4,637
1978/79	1,513	1,967	1,253	154	.	5,541
1979/80	2,362	2,531	1,846	12	.	6,755
1980/81	1,619	1,808	1,689	37	.	5,156
1981/82	1,050	3,020	1,587	352	.	6,012
1982/83	1,063	3,120	1,819	22	24	6,188
1983/84	2,182	2,767	1,704	596	50	7,331

1984/85	1,628	2,453	2,208	461		6,819

Country = JAPAN

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	34	2,382	980	1,068	8	4,470
1970/71	.	2,878	821	1,025	.	4,728
1971/72	.	2,195	1,466	1,388	.	5,049
1972/73	.	3,377	717	1,364	80	5,562
1973/74	.	3,067	472	1,692	32	5,266
1974/75	.	3,079	963	1,187	37	5,262
1975/76	4	334	1,052	1,601	.	6,001
1976/77	.	3,280	1,076	1,321	.	5,677
1977/78	.	3,180	1,158	1,352	.	5,690
1978/79	.	3,187	1,161	1,236	.	5,584
1979/80	.	3,204	1,068	1,290	.	5,562
1980/81	.	3,525	914	1,463	28	5,930
1981/82	1	3,358	943	1,335	.	5,637
1982/83	12	3,294	934	1,357	.	5,597
1983/84	.	3,441	1,043	1,416	.	5,901
1984/85	.	3,324	1,039	1,385	.	5,748

Country = REP OF KOREA

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	6	1,098	.	37	.	1,141
1970/71	.	1,684	27	.	.	1,711
1971/72	3	1,754	361	.	.	2,123
1972/73	12	1,621	.	.	.	1,633
1973/74	6	158	2	.	.	1,596
1974/75	.	1,733	.	.	.	1,733
1975/76	.	1,476	.	19	.	1,495
1976/77	.	1,984	21	55	.	2,067
1977/78	.	1,717	21	48	.	1,786
1978/79	.	1,671	.	31	.	1,702
1979/80	.	1,791	.	3	.	1,794
1980/81	.	2,055	.	17	.	2,072
1981/82	.	1,881	25	.	.	1,907
1982/83	.	1,750	.	53	.	1,804
1983/84	53	1,986	418	6	.	2,510
1984/85	.	2,070	973	.	.	3,043

Country = IRAQ

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	.	.	55	28	.	85
1970/71	.	8	436	322	.	828
1971/72	7	.	192	44	.	298
1972/73	.	.	.	.	.	.
1973/74	.	459	116	1	.	576
1974/75	1	.	255	183	.	439
1975/76	.	107	340	133	.	580
1976/77	.	58	529	200	92	969
1977/78	17	532	537	245	.	1,681
1978/79	.	488	481	3	.	1,467
1979/80	40	138	575	467	94	1,366
1980/81	30	472	1,187	488	.	2,300
1981/82	181	49	816	230	277	1,577
1982/83	205	925	403	310	50	1,900
1983/84	296	1,171	859	632	.	2,960

1984/85	189	868	1,216	367	.	2,836

Country = IRAN

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	.	.	.	.	.	.
1970/71	.	240	295	.	.	535
1971/72	2	588	397	.	.	1,009
1972/73	.	503	.	.	.	603
1973/74	.	584	.	.	.	584
1974/75	57	1,735	424	.	.	2,217
1975/76	13	150	108	.	.	271
1976/77	43	1,207	.	.	.	1,250
1977/78	.	1,100	.	.	.	1,278
1978/79	4	977	.	.	1	1,061
1979/80	52	223	718	42	88	1,173
1980/81	335	405	701	163	.	1,896
1981/82	66	728	510	73	.	1,377
1982/83	.	.	848	63	504	1,959
1983/84	26	.	1,291	440	1,498	3,639
1984/85	143	.	1,740	24	565	2,643

Country = BANGLADESH

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	.	.	.	.	.	.
1970/71	.	.	.	.	.	.
1971/72	3	362	14	86	.	1,115
1972/73	157	745	53	224	555	1,734
1973/74	245	730	277	341	73	1,716
1974/75	632	790	299	332	18	2,121
1975/76	232	533	83	152	.	1,000
1976/77	230	376	109	90	.	805
1977/78	241	491	147	297	.	1,183
1978/79	197	552	52	365	.	1,221
1979/80	191	210	109	136	.	659
1980/81	145	1,178	448	396	.	2,172
1981/82	301	560	123	179	.	1,165
1982/83	368	718	49	428	.	1,564
1983/84	206	443	510	451	.	1,632
1984/85	239	1,576	262	56	7	2,189

Country = INDONESIA

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	120	426	74	18	.	655
1970/71	82	416	71	34	28	634
1971/72	117	182	116	38	.	456
1972/73	76	495	75	49	.	699
1973/74	75	315	135	75	.	618
1974/75	55	98	598	75	.	829
1975/76	47	537	316	21	.	921
1976/77	.	390	543	151	.	1,084
1977/78	32	417	569	3	.	1,021
1978/79	15	705	518	.	.	1,238
1979/80	7	715	772	24	.	1,518
1980/81	7	737	551	.	.	1,295
1981/82	12	927	558	32	.	1,529
1982/83	182	801	368	156	26	1,534
1983/84	25	1,094	440	.	25	1,583

1984/85	16	625	502	200	74	1,416

Country = MALAYSIA

Year	EC	US	Australia	Canada	Argentina	Total
1969/70	67	14	492	24	.	599
1970/71	.	24	590	17	.	637
1971/72	.	.	310	14	.	327
1972/73	1	12	346	19	.	382
1973/74	3	16	291	16	.	336
1974/75	2	.	289	.	.	296
1975/76	.	.	323	.	.	331
1976/77	.	17	393	7	.	426
1977/78	.	59	377	3	.	439
1978/79	.	62	406	20	.	488
1979/80	.	41	371	.	.	412
1980/81	.	79	403	19	.	501
1981/82	.	132	407	.	.	540
1982/83	14	116	329	5	.	464
1983/84	.	117	428	.	.	545
1984/85	.	72	347	72	64	555

Source: World Wheat Statistics, various years, London.

Table 2.12. Market Share of Wheat to Major Australia Destinations

Country = USSR

Year	EC	US	Australia	Canada	Argentina
1969/70	.	.	.	100.0	.
1970/71	.	.	.	100.0	.
1971/72	0.5	.	14.7	82.8	.
1972/73	4.4	59.6	5.7	26.2	.
1973/74	0.0	62.1	0.4	36.4	0.7
1974/75	.	34.6	23.2	11.1	24.0
1975/76	.	39.1	13.1	31.0	11.4
1976/77	.	62.9	8.1	25.9	3.0
1977/78	.	51.6	4.0	26.6	17.7
1978/79	0.1	59.1	2.7	37.7	.
1979/80	4.8	20.1	16.5	29.9	20.0
1980/81	5.9	33.5	23.5	15.5	17.3
1981/82	8.8	35.0	12.0	24.3	15.8
1982/83	16.9	15.1	5.0	34.5	20.9
1983/84	20.8	21.2	7.5	28.0	17.5
1984/85	21.6	21.7	7.2	27.1	14.4

Country = CHINA

Year	EC	US	Australia	Canada	Argentina
1969/70	15.2	.	48.5	36.3	.
1970/71	0.1	.	35.8	64.1	.
1971/72	.	.	.	100.0	.
1972/73	.	11.2	6.1	82.7	.
1973/74	0.4	54.7	21.2	23.4	.
1974/75	3.3	27.2	22.6	43.0	3.8
1975/76	.	.	48.3	51.7	.
1976/77	.	.	23.8	61.1	15.1
1977/78	.	2.6	54.0	39.0	4.4
1978/79	.	32.4	17.2	39.5	11.0
1979/80	1.0	22.2	41.1	30.4	5.3
1980/81	4.4	62.9	10.1	21.1	1.5
1981/82	0.9	60.9	10.7	22.6	1.5
1982/83	10.9	32.4	9.0	32.8	15.1
1983/84	1.4	32.0	17.0	39.3	10.3
1984/85	1.1	33.0	19.2	37.6	9.1

Country = EGYPT

Year	EC	US	Australia	Canada	Argentina
1969/70	71.5	0.6	.	2.4	.
1970/71	28.4	0.5	42.3	14.6	.
1971/72	22.2	0.2	66.8	2.4	.
1972/73	53.9	9.3	23.9	1.0	.
1973/74	38.6	25.0	23.1	.	.
1974/75	47.2	22.1	25.0	.	0.4
1975/76	39.4	32.6	27.3	.	.
1976/77	16.7	50.1	25.2	5.1	1.6
1977/78	16.3	41.0	26.9	11.6	.
1978/79	27.3	35.5	22.6	2.8	.
1979/80	35.0	37.5	27.3	0.2	.
1980/81	31.4	35.1	32.8	0.7	.
1981/82	17.5	50.2	26.4	5.9	.
1982/83	17.2	50.4	29.4	0.4	0.4
1983/84	29.8	37.7	23.2	8.1	0.7

1984/85	23.9	36.0	32.4	6.8	

Country = JAPAN

Year	EC	US	Australia	Canada	Argentina
1969/70	0.8	53.3	21.9	23.9	0.2
1970/71	.	60.9	17.4	21.7	.
1971/72	.	43.5	29.0	27.5	.
1972/73	.	60.7	12.9	24.5	1.4
1973/74	.	58.2	9.0	32.1	0.6
1974/75	.	58.5	18.3	22.6	0.7
1975/76	0.1	5.6	17.5	26.7	.
1976/77	.	57.8	19.0	23.3	.
1977/78	.	55.9	20.4	23.8	.
1978/79	.	57.1	20.8	22.1	.
1979/80	.	57.6	19.2	23.2	.
1980/81	.	59.4	15.4	24.7	0.5
1981/82	0.0	59.6	16.7	23.7	.
1982/83	0.2	58.9	16.7	24.2	.
1983/84	.	58.3	17.7	24.0	.
1984/85	.	57.8	18.1	24.1	.

Country = REP OF KOREA

Year	EC	US	Australia	Canada	Argentina
1969/70	0.5	96.2	.	3.2	.
1970/71	.	98.4	1.6	.	.
1971/72	0.1	82.6	17.0	.	.
1972/73	0.7	99.3	.	.	.
1973/74	0.4	9.9	0.1	.	.
1974/75	.	100.0	.	.	.
1975/76	.	98.7	.	1.3	.
1976/77	.	96.0	1.0	2.7	.
1977/78	.	96.1	1.2	2.7	.
1978/79	.	98.2	.	1.8	.
1979/80	.	99.8	.	0.2	.
1980/81	.	99.2	.	0.8	.
1981/82	.	98.6	1.3	.	.
1982/83	.	97.0	.	2.9	.
1983/84	2.1	79.1	16.7	0.2	.
1984/85	.	68.0	32.0	.	.

Country = IRAQ

Year	EC	US	Australia	Canada	Argentina
1969/70	.	.	64.7	32.9	.
1970/71	.	1.0	52.7	38.9	.
1971/72	2.3	.	64.4	14.8	.
1972/73	.	.	.	.	.
1973/74	.	79.7	20.1	0.2	.
1974/75	0.2	.	58.1	41.7	.
1975/76	.	18.4	58.6	22.9	.
1976/77	.	6.0	54.6	20.6	9.5
1977/78	1.0	31.6	31.9	14.6	.
1978/79	.	33.3	32.8	0.2	.
1979/80	2.9	10.1	42.1	34.2	6.9
1980/81	1.3	20.5	51.6	21.2	.
1981/82	11.5	3.1	51.7	14.6	17.6
1982/83	10.8	48.7	21.2	16.3	2.6
1983/84	10.0	39.6	29.0	21.4	.

1984/85	6.7	30.6	42.9	12.9	

Country = IRAN

Year	EC	US	Australia	Canada	Argentina
1969/70	.	.	.	.	.
1970/71	.	44.9	55.1	.	.
1971/72	0.2	58.3	39.3	.	.
1972/73	.	83.4	.	.	.
1973/74	.	100.0	.	.	.
1974/75	2.6	78.3	19.1	.	.
1975/76	4.8	55.4	39.9	.	.
1976/77	3.4	96.6	.	.	.
1977/78	.	86.1	.	.	.
1978/79	0.4	92.1	.	.	0.1
1979/80	4.4	19.0	61.2	3.6	7.5
1980/81	17.7	21.4	37.0	8.6	.
1981/82	4.8	52.9	37.0	5.3	.
1982/83	.	.	43.3	3.2	25.7
1983/84	0.7	.	35.5	12.1	41.2
1984/85	5.4	.	65.8	0.9	21.4

Country = BANGLADESH

Year	EC	US	Australia	Canada	Argentina
1969/70	.	.	.	.	.
1970/71	.	.	.	.	.
1971/72	0.3	32.5	1.3	7.7	.
1972/73	9.1	43.0	3.1	12.9	32.0
1973/74	14.3	42.5	16.1	19.9	4.3
1974/75	29.8	37.2	14.1	15.7	0.8
1975/76	23.2	53.3	8.3	15.2	.
1976/77	28.6	46.7	13.5	11.2	.
1977/78	20.4	41.5	12.4	25.1	.
1978/79	16.1	45.2	4.3	29.9	.
1979/80	29.0	31.9	16.5	20.6	.
1980/81	6.7	54.2	20.6	18.2	.
1981/82	25.8	48.1	10.6	15.4	.
1982/83	23.5	45.9	3.1	27.4	.
1983/84	12.6	27.1	31.3	27.6	.
1984/85	10.9	72.0	12.0	2.6	0.3

Country = INDONESIA

Year	EC	US	Australia	Canada	Argentina
1969/70	18.3	65.0	11.3	2.7	.
1970/71	12.9	65.6	11.2	5.4	4.4
1971/72	25.7	39.9	25.4	8.3	.
1972/73	10.9	70.8	10.7	7.0	.
1973/74	12.1	51.0	21.8	12.1	.
1974/75	6.6	11.8	72.1	9.0	.
1975/76	5.1	58.3	34.3	2.3	.
1976/77	.	36.0	50.1	13.9	.
1977/78	3.1	40.8	55.7	0.3	.
1978/79	1.2	56.9	41.8	.	.
1979/80	0.5	47.1	50.9	1.6	.
1980/81	0.5	56.9	42.5	.	.
1981/82	0.8	60.6	36.5	2.1	.
1982/83	11.9	52.2	24.0	10.2	1.7
1983/84	1.6	69.1	27.8	.	1.6

1984/85	1.1	44.1	35.5	14.1	5.2

Country = MALAYSIA

Year	EC	US	Australia	Canada	Argentina
1969/70	11.2	2.3	82.1	4.0	.
1970/71	.	3.8	92.6	2.7	.
1971/72	.	.	94.8	4.3	.
1972/73	0.3	3.1	90.6	5.0	.
1973/74	0.9	4.8	86.6	4.8	.
1974/75	0.7	.	97.6	.	.
1975/76	.	.	97.6	.	.
1976/77	.	4.0	92.3	1.6	.
1977/78	.	13.4	85.9	0.7	.
1978/79	.	12.7	83.2	4.1	.
1979/80	.	10.0	90.0	.	.
1980/81	.	15.8	80.4	3.8	.
1981/82	.	24.4	75.4	.	.
1982/83	3.0	25.0	70.9	1.1	.
1983/84	.	21.5	78.5	.	.
1984/85	.	13.0	62.5	13.0	11.5

Source: World Wheat Statistics, Various Years, London.

Table 2.13. Exports of Wheat to Major Australia Destinations with Comparison to US HRW and White (000 MT)

Country = USSR

Year	Australia	US		
		Total	HRW	White
1969/70	.	.	.	.
1970/71	.	.	.	.
1971/72	502	.	.	.
1972/73	908	9,468	8,441	439
1973/74	17	2,725	2,722	.
1974/75	656	978	980	.
1975/76	1,328	3,966	3,859	.
1976/77	368	2,869	2,639	.
1977/78	255	3,274	3,387	.
1978/79	136	2,967	2,559	.
1979/80	2,465	3,000	4,094	.
1980/81	2,741	3,920	2,881	.
1981/82	2,348	6,876	6,285	.
1982/83	1,004	3,036	3,295	.
1983/84	1,535	4,357	4,048	.
1984/85	2,040	6,123	6,298	.

Country = CHINA

Year	Australia	US		
		Total	HRW	White
1969/70	2,446	.	.	.
1970/71	1,310	.	.	.
1971/72	.	.	.	.
1972/73	324	591	36	313
1973/74	1,239	3,190	2,134	86
1974/75	1,244	1,496	210	.
1975/76	1,126	.	.	.
1976/77	750	.	.	.
1977/78	4,603	225	.	.
1978/79	1,382	2,610	1,548	.
1979/80	3,575	1,929	410	453
1980/81	1,397	8,662	1,719	792
1981/82	1,413	8,054	143	.
1982/83	1,170	4,186	386	.
1983/84	1,660	3,131	1,289	.
1984/85	1,426	2,455	105	.

Country = EGYPT

Year	Australia	US		
		Total	HRW	White
1969/70	.	14	.	.
1970/71	1,275	16	.	.
1971/72	1,801	5	.	.
1972/73	729	283	283	.
1973/74	736	798	683	16
1974/75	848	750	134	83
1975/76	1,025	1,225	.	35
1976/77	1,034	2,059	26	58
1977/78	1,246	1,902	133	25
1978/79	1,253	1,967	846	.
1979/80	1,846	2,531	375	192

1980/81	1,689	1,808	39	1,248
1981/82	1,587	3,020	5	2,306
1982/83	1,819	3,120	.	1,406
1983/84	1,704	2,767	.	816
1984/85	2,208	2,453	.	1,246

Country = JAPAN

		US		
Year	Australia	Total	HRW	White
1969/70	980	2,382	1,053	799
1970/71	821	2,878	1,227	880
1971/72	1,466	2,195	1,136	569
1972/73	717	3,377	1,329	1,259
1973/74	472	3,067	1,331	1,174
1974/75	963	3,079	1,287	1,003
1975/76	1,052	334	1,526	1,077
1976/77	1,076	3,280	1,338	1,128
1977/78	1,158	3,180	1,241	1,197
1978/79	1,161	3,187	1,449	1,077
1979/80	1,068	3,204	1,213	1,085
1980/81	914	3,525	1,371	1,228
1981/82	943	3,358	1,310	1,222
1982/83	934	3,294	1,274	1,107
1983/84	1,043	3,441	1,293	1,087
1984/85	1,039	3,324	1,290	966

Country = REP OF KOREA

		US		
Year	Australia	Total	HRW	White
1969/70	.	1,098	341	586
1970/71	27	1,684	644	824
1971/72	361	1,754	702	925
1972/73	.	1,621	463	793
1973/74	2	158	548	717
1974/75	.	1,733	573	1,029
1975/76	.	1,476	500	910
1976/77	21	1,984	732	1,205
1977/78	21	1,717	564	1,145
1978/79	.	1,671	521	975
1979/80	.	1,791	589	1,098
1980/81	.	2,055	607	1,299
1981/82	25	1,881	623	1,011
1982/83	.	1,750	645	1,045
1983/84	418	1,986	642	1,146
1984/85	973	2,070	644	1,122

Country = IRAQ

		US		
Year	Australia	Total	HRW	White
1969/70	55	.	.	.
1970/71	436	8	.	.
1971/72	192	.	8	.
1972/73	.	.	.	.
1973/74	116	459	90	.
1974/75	255	.	342	105
1975/76	340	107	71	.
1976/77	529	58	86	.

1977/78	537	532	355	1
1978/79	481	488	276	41
1979/80	575	138	435	.
1980/81	1,187	472	.	.
1981/82	816	49	.	.
1982/83	403	925	571	.
1983/84	859	1,171	1,140	.
1984/85	1,216	868	852	.

Country = IRAN

		US		
Year	Australia	Total	HRW	White
1969/70	.	.	.	.
1970/71	295	240	140	98
1971/72	397	588	151	424
1972/73	.	503	195	323
1973/74	.	584	250	302
1974/75	424	1,735	562	1,030
1975/76	108	150	169	95
1976/77	.	1,207	.	892
1977/78	.	1,100	34	1,082
1978/79	.	977	.	1,001
1979/80	718	223	.	240
1980/81	701	405	.	286
1981/82	510	728	.	311
1982/83	848	.	.	.
1983/84	1,291	.	.	.
1984/85	1,740	.	.	.

Country = BANGLADESH

		US		
Year	Australia	Total	HRW	White
1969/70	.	.	.	.
1970/71	.	.	.	.
1971/72	14	362	113	177
1972/73	53	745	100	34
1973/74	277	730	533	86
1974/75	299	790	202	148
1975/76	83	533	19	51
1976/77	109	376	26	43
1977/78	147	491	265	13
1978/79	52	552	224	19
1979/80	109	210	121	935
1980/81	448	1,178	15	441
1981/82	123	560	36	38
1982/83	49	718	58	27
1983/84	510	443	.	363
1984/85	262	1,576	.	984

Country = INDONESIA

		US		
Year	Australia	Total	HRW	White
1969/70	74	426	.	.
1970/71	71	416	14	.
1971/72	116	182	10	70
1972/73	75	495	.	223
1973/74	135	315	137	144

1974/75	598	98	5	.
1975/76	316	537	204	133
1976/77	543	390	.	156
1977/78	569	417	97	45
1978/79	518	705	209	55
1979/80	772	715	185	95
1980/81	551	737	398	309
1981/82	558	927	211	273
1982/83	368	801	482	.
1983/84	440	1,094	146	394
1984/85	502	625	228	179

Country = MALAYSIA

		US		
Year	Australia	Total	HRW	White
1969/70	492	14	.	.
1970/71	590	24	.	.
1971/72	310	.	.	.
1972/73	346	12	7	2
1973/74	291	16	22	34
1974/75	289	.	.	4
1975/76	323	.	15	4
1976/77	393	17	13	.
1977/78	377	59	12	6
1978/79	406	62	3	60
1979/80	371	41	3	94
1980/81	403	79	5	97
1981/82	407	132	51	10
1982/83	329	116	21	15
1983/84	428	117	9	30
1984/85	347	72	.	46

Source: World Wheat Statistics, various years, London.

Table 2.14. Market Share of Wheat to Major Australia Destinations with Comparison to US HRW and White

Country = USSR

Year	Australia	US Total	US HRW	US White
1969/70	.	.	.	.
1970/71	.	.	.	.
1971/72	14.7	.	.	.
1972/73	5.7	59.6	53.1	2.8
1973/74	0.4	62.1	62.0	.
1974/75	23.2	34.6	34.7	.
1975/76	13.1	39.1	38.0	.
1976/77	8.1	62.9	57.9	.
1977/78	4.0	51.6	53.4	.
1978/79	2.7	59.1	50.9	.
1979/80	16.5	20.1	27.5	.
1980/81	23.5	33.5	24.6	.
1981/82	12.0	35.0	32.0	.
1982/83	5.0	15.1	16.4	.
1983/84	7.5	21.2	19.7	.
1984/85	7.2	21.7	22.4	.

Country = CHINA

Year	Australia	US Total	US HRW	US White
1969/70	48.5	.	.	.
1970/71	35.8	.	.	.
1971/72	.	.	.	.
1972/73	6.1	11.2	0.7	5.9
1973/74	21.2	54.7	36.6	1.5
1974/75	22.6	27.2	3.8	.
1975/76	48.3	.	.	.
1976/77	23.8	.	.	.
1977/78	54.0	2.6	.	.
1978/79	17.2	32.4	19.2	.
1979/80	41.1	22.2	4.7	5.2
1980/81	10.1	62.9	12.5	5.7
1981/82	10.7	60.9	1.1	.
1982/83	9.0	32.4	3.0	.
1983/84	17.0	32.0	13.2	.
1984/85	19.2	33.0	1.4	.

Country = EGYPT

Year	Australia	US Total	US HRW	US White
1969/70	.	0.6	.	.
1970/71	42.3	0.5	.	.
1971/72	66.8	0.2	.	.
1972/73	23.9	9.3	9.3	.
1973/74	23.1	25.0	21.4	0.5
1974/75	25.0	22.1	4.0	2.4
1975/76	27.3	32.6	.	0.9
1976/77	25.2	50.1	0.6	1.4
1977/78	26.9	41.0	2.9	0.5
1978/79	22.6	35.5	15.3	.
1979/80	27.3	37.5	5.6	2.8

1980/81	32.8	35.1	0.8	24.2
1981/82	26.4	50.2	0.1	38.4
1982/83	29.4	50.4	.	22.7
1983/84	23.2	37.7	.	11.1
1984/85	32.4	36.0	.	18.3

Country = JAPAN

		US		
Year	Australia	Total	HRW	White
1969/70	21.9	53.3	23.6	17.9
1970/71	17.4	60.9	25.9	18.6
1971/72	29.0	43.5	22.5	11.3
1972/73	12.9	60.7	23.9	22.6
1973/74	9.0	58.2	25.3	22.3
1974/75	18.3	58.5	24.5	19.1
1975/76	17.5	5.6	25.4	18.0
1976/77	19.0	57.8	23.6	19.9
1977/78	20.4	55.9	21.8	21.0
1978/79	20.8	57.1	25.9	19.3
1979/80	19.2	57.6	21.8	19.5
1980/81	15.4	59.4	23.1	20.7
1981/82	16.7	59.6	23.2	21.7
1982/83	16.7	58.9	22.8	19.8
1983/84	17.7	58.3	21.9	18.4
1984/85	18.1	57.8	22.4	16.8

Country = REP OF KOREA

		US		
Year	Australia	Total	HRW	White
1969/70	.	96.2	29.9	51.4
1970/71	1.6	98.4	37.7	48.1
1971/72	17.0	82.6	33.1	43.6
1972/73	.	99.3	28.3	48.6
1973/74	0.1	9.9	34.3	44.9
1974/75	.	100.0	33.1	59.4
1975/76	.	98.7	33.5	60.8
1976/77	1.0	96.0	35.4	58.3
1977/78	1.2	96.1	31.6	64.1
1978/79	.	98.2	30.6	57.3
1979/80	.	99.8	32.8	61.2
1980/81	.	99.2	29.3	62.7
1981/82	1.3	98.6	32.7	53.0
1982/83	.	97.0	35.8	57.9
1983/84	16.7	79.1	25.6	45.7
1984/85	32.0	68.0	21.2	36.9

Country = IRAQ

		US		
Year	Australia	Total	HRW	White
1969/70	64.7	.	.	.
1970/71	52.7	1.0	.	.
1971/72	64.4	.	2.5	.
1972/73	.	.	.	.
1973/74	20.1	79.7	15.6	.
1974/75	58.1	.	78.0	23.9
1975/76	58.6	18.4	12.3	.
1976/77	54.6	6.0	8.8	.

1977/78	31.9	31.6	21.1	0.0
1978/79	32.8	33.3	18.8	2.8
1979/80	42.1	10.1	31.9	.
1980/81	51.6	20.5	.	.
1981/82	51.7	3.1	.	.
1982/83	21.2	48.7	30.1	.
1983/84	29.0	39.6	38.5	.
1984/85	42.9	30.6	30.0	.

Country = IRAN

		US		
Year	Australia	Total	HRW	White
1969/70	.	.	.	.
1970/71	55.1	44.9	26.2	18.4
1971/72	39.3	58.3	14.9	42.0
1972/73	.	83.4	32.4	53.6
1973/74	.	100.0	42.8	51.8
1974/75	19.1	78.3	25.3	46.5
1975/76	39.9	55.4	62.5	35.0
1976/77	.	96.6	.	71.4
1977/78	.	86.1	2.6	84.6
1978/79	.	92.1	.	94.3
1979/80	61.2	19.0	.	20.4
1980/81	37.0	21.4	.	15.1
1981/82	37.0	52.9	.	22.6
1982/83	43.3	.	.	.
1983/84	35.5	.	.	.
1984/85	65.8	.	.	.

Country = BANGLADESH

		US		
Year	Australia	Total	HRW	White
1969/70	.	.	.	.
1970/71	.	.	.	.
1971/72	1.3	32.5	10.2	15.9
1972/73	3.1	43.0	5.8	1.9
1973/74	16.1	42.5	31.1	5.0
1974/75	14.1	37.2	9.5	7.0
1975/76	8.3	53.3	1.9	5.1
1976/77	13.5	46.7	3.3	5.3
1977/78	12.4	41.5	22.4	1.1
1978/79	4.3	45.2	18.4	1.6
1979/80	16.5	31.9	18.3	141.9
1980/81	20.6	54.2	0.7	20.3
1981/82	10.6	48.1	3.1	3.2
1982/83	3.1	45.9	3.7	1.7
1983/84	31.3	27.1	.	22.2
1984/85	12.0	72.0	.	45.0

Country = INDONESIA

		US		
Year	Australia	Total	HRW	White
1969/70	11.3	65.0	.	.
1970/71	11.2	65.6	2.3	.
1971/72	25.4	39.9	2.1	15.3
1972/73	10.7	70.8	.	31.9
1973/74	21.8	51.0	22.1	23.3

1974/75	72.1	11.8	0.6	.
1975/76	34.3	58.3	22.1	14.4
1976/77	50.1	36.0	.	14.4
1977/78	55.7	40.8	9.5	4.4
1978/79	41.8	56.9	16.9	4.4
1979/80	50.9	47.1	12.2	6.3
1980/81	42.5	56.9	30.8	23.8
1981/82	36.5	60.6	13.8	17.9
1982/83	24.0	52.2	31.4	.
1983/84	27.8	69.1	9.2	24.9
1984/85	35.5	44.1	16.1	12.6

Country = MALAYSIA

		US		
Year	Australia	Total	HRW	White
1969/70	82.1	2.3	.	.
1970/71	92.6	3.8	.	.
1971/72	94.8	.	.	.
1972/73	90.6	3.1	1.9	0.4
1973/74	86.6	4.8	6.6	10.1
1974/75	97.6	.	.	1.4
1975/76	97.6	.	4.6	1.3
1976/77	92.3	4.0	3.0	.
1977/78	85.9	13.4	2.7	1.4
1978/79	83.2	12.7	0.7	12.3
1979/80	90.0	10.0	0.7	22.8
1980/81	80.4	15.8	1.0	19.4
1981/82	75.4	24.4	9.4	1.8
1982/83	70.9	25.0	4.6	3.3
1983/84	78.5	21.5	1.7	5.6
1984/85	62.5	13.0	.	8.2

Source: World Wheat Statistics, Various Years, London.

Table 2.15. Market Share of Australian Wheat Exports by Class.

Year	Prime Hard	Hard	Standard White	General Purpose
1976/77	9.8	12.4	68.7	9.2
1977/78	14.8	12.8	70.0	2.4
1978/79	3.9	10.7	79.1	6.2
1979/80	4.3	11.8	79.7	4.2
1980/81	4.3	9.6	84.0	2.1
1981/82	7.8	18.2	73.2	0.8
1982/83	10.6	13.5	73.0	2.8
1983/84	4.8	14.6	62.4	18.2
1984/85	6.0	10.5	65.9	17.6
1985/86	4.7	9.8	77.1	8.3

Source: Australian Wheat Board.

Table 2.16. Market Share of Australian Wheat Exports by Class. and State.

Year	New South Wales	Victoria	South Australia	Western Australia	Queensland
Australian Prine Hard					
1976/77	99.2	.	.	.	0.8
1977/78	78.1	.	.	.	21.9
1978/79	83.0	.	.	.	17.0
1979/80	71.3	.	.	.	28.7
1980/81	72.7	.	.	.	27.3
1981/82	43.7	.	.	.	56.3
1982/83	38.1	.	.	.	61.9
1983/84	48.9	.	.	.	51.3
1984/85	80.5	.	.	.	19.5
1985/86	72.0	.	.	.	28.0
Australian Hard					
1976/77	61.1	.	20.9	0.3	17.7
1977/78	81.1	3.1	10.3	4.3	1.1
1978/79	32.2	.	18.2	14.8	34.8
1979/80	70.8	2.8	16.4	3.8	6.2
1980/81	29.7	.	35.5	33.8	1.0
1981/82	57.8	1.7	19.8	17.3	3.4
1982/83	31.6	0.1	22.6	38.1	7.5
1983/84	52.1	.	14.6	10.2	23.1
1984/85	32.1	2.6	25.6	8.8	30.8
1985/86	36.4	1.4	13.2	16.8	32.3
Australian Standard White					
1976/77	27.5	21.0	4.9	45.1	1.6
1977/78	17.5	25.7	5.8	49.3	1.7
1978/79	13.4	29.6	16.2	35.8	4.9
1979/80	18.5	32.3	16.4	30.6	2.2
1980/81	23.2	30.6	13.8	32.1	0.2
1981/82	16.5	28.4	11.6	42.0	1.4
1982/83	4.3	3.9	4.6	86.2	1.0
1983/84	14.0	28.5	20.4	33.3	3.8
1984/85	17.0	25.2	13.4	40.8	3.5
1985/86	22.0	21.4	11.4	39.1	6.1
Australian General Purpose					
1976/77	31.8	31.5	1.7	15.3	19.7
1977/78	24.0	7.8	2.6	64.6	1.0
1978/79	39.9	.	.	14.3	45.8
1979/80	23.4	.	5.4	16.2	55.0
1980/81	3.6	4.6	.	91.8	.
1981/82	14.1	1.2	.	22.4	62.4
1982/83	.	.	.	65.8	34.2
1983/84	30.9	12.2	1.8	46.9	8.2
1984/85	63.7	19.4	.	12.3	4.6
1985/86	70.5	20.7	3.8	0.4	4.5

Source: Australian Wheat Board.

Table 2.17. Yield by Major Exporters (MT/ha)

Year	France	Canada	US	Argentina	Australia
1962	3.1	1.4	1.7	1.7	1.3
1963	2.7	1.8	1.7	1.6	1.3
1964	3.1	1.4	1.7	1.8	1.4
1965	3.3	1.5	1.8	1.3	1.0
1966	2.8	1.9	1.8	1.2	1.5
1967	3.6	1.3	1.7	1.3	0.8
1968	3.7	1.5	1.9	1.0	1.4
1969	3.6	1.8	2.1	1.3	1.1
1970	3.4	1.8	2.1	1.3	1.2
1971	3.9	1.8	2.3	1.3	1.2
1972	4.6	1.7	2.2	1.6	0.9
1973	4.5	1.7	2.1	1.7	1.3
1974	4.6	1.5	1.8	1.4	1.4
1975	3.9	1.8	2.1	1.6	1.4
1976	3.8	2.1	2.0	1.7	1.3
1977	4.2	2.0	2.1	1.4	0.9
1978	5.0	2.0	2.1	1.7	1.8
1979	4.8	1.6	2.3	1.7	1.4
1980	5.2	1.7	2.3	1.5	1.0
1981	4.8	2.0	2.3	1.4	1.4
1982	5.2	2.1	2.4	2.0	0.8
1983	5.1	1.9	2.6	1.8	1.7
1984	6.4	1.6	2.6	2.3	1.5
1985	6.0	1.7	2.5	1.6	1.4
1986	5.5	2.2	2.3	1.8	1.5
1987	.	1.8	2.6	1.9	1.4

Source: World Wheat Statistics, various years, London.
1986 and 1987 from FAS (FG-9-97).

Table 2.18 Yield by Australia and US Total and Classes (in Tons per Hectares)

Year	Australia	US		
		Total	HRW	White
1978	1.8	2.1	2.0	3.1
1979	1.4	2.3	2.3	3.1
1980	1.0	2.3	2.2	3.6
1981	1.4	2.3	2.0	3.9
1982	0.8	2.4	2.3	3.5
1983	1.7	2.6	2.7	4.1
1984	1.5	2.6	2.5	3.8
1985	1.4	2.5	2.4	3.5
1986	1.5	2.3	2.2	3.5
1987	1.4	2.6	2.5	.

Source: World Wheat Statistics, various years, London.
Wheat Situation and Outlook Report, ERS, WS-278, May 1987

TABLE 2.19 GROWTH RATES IN YIELDS FOR MAJOR EXPORTERS

	γ	β	R^2	Growth Rate %/Year
France	1.45 (88.46)	0.0133* (11.60)	.86	1.32
Canada	1.18* (56.24)	0.0043* (2.90)	.28	0.42
U.S.	1.22* (109.28)	0.0075* (9.54)	.81	0.75
Argentina	1.11* (37.05)	0.0055* (2.60)	.23	0.55
Australia	1.07* (25.97)	0.0019 (0.65)	.02	0.19
World	1.07* (131.56)	0.01146* (20.15)	.95	1.14

NOTE: Figures in ( ) are t-ratios and * indicates significantly different from zero at the 10 percent level.

TABLE 2.20. PERCENTAGE OF RECEIVALS BY CLASS

Years	Australia Prime Hard (APH)	Australia Hard (HH)	Australia Standard White[1] (ASW)	General Purpose[2] (GP)
1976/77	8.7	18.4	64.5	8.4
1977/78	14.2	17.2	62.8	5.8
1978/79	4.3	15.6	69.2	10.9
1979/80	4.7	16.1	74.3	4.9
1980/81	3.8	14.5	77.6	4.1
1981/82	7.7	19.9	68.1	4.3
1982/83	10.1	13.8	72.3	3.8
1983/84	6.6	12.4	51.5	29.5
1984/85	6.4	13.0	77.5	3.1
1985/86	4.5	13.0	64.7	17.8
Ten Year Averages				
Australia	7.1	15.4	68.3	9.2
New South Wales	15.9	25.7	45.2	13.2
Victoria	--	3.6	90.7	5.7
South Australia	--	24.1	72.7	3.2
Western Australia	--	5.1	87.3	7.6
Queensland	28.6	29.9	26.0	15.5
Tasmania	--	--	--	--

[1]Includes minor quantities of durum and soft wheat.
[2]Includes Australian feed wheat.

SOURCE: Australian Wheat Board Annual Reports.

TABLE 2.21. AUSTRALIAN WHEAT SAMPLES 1986-87, CROP ANALYTICAL DATA

State	Australian Prime Hard			Australian Hard No. 1			
	Queensland	New South Wales PH 14%	New South Wales PH 13%	Queensland	New South Wales	South Australia	Western Australia
WHEAT							
Test weight (kg/hl)	81.1	79.0	80.5	81.8	80.8	80.5	81.2
Grain hardness (P.S.I.)	14	13	13	14	13	13	14
Protein, % (11% moisture basis)	14.8	14.9	13.8	12.7	12.6	12.8	12.6
Falling number (sec.)	430	463	434	435	433	440	470
Flour extraction(%)	75	75	75	75	75	73	73
SCREENINGS (%)							
Foreign material	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Total screenings	4.3	4.5	3.8	2.9	4.4	3.3	2.3
FLOUR							
Protein (%)	13.7	14.0	12.8	11.4	11.5	11.4	11.0
Wet gluten (%)	36	39	36	31	30	33	31
FARINOGRAM							
Water absorption (%)	64.6	64.4	63.2	62.6		62.9	65.8

	Australian Standard White				
	Queensland	New South Wales	Victoria	South Australia	Western Australia
WHEAT					
Test weight (kg/hl)	82.7	80.9	80.2	81.5	82.5
Grain hardness (P.S.I.)	15	18	18	14	17
Protein, % (11% moisture basis)	10.6	10.1	9.7	10.4	9.5
Falling number (sec.)	420	420	390	430	420
Flour extraction(%)	75	73	74	73	73
SCREENINGS (%)					
Foreign material	0.3	0.2	0.2	0.2	0.2
Total screenings	3.5	3.6	2.8	3.3	2.7
FLOUR					
Protein (%)	9.4	8.9	8.5	9.2	8.5
Wet gluten (%)	27	25	23	25	21
FARINOGRAM					
Water absorption (%)	60.5	58.1	56.9	61.4	61.5

SOURCE: Australian Wheat Board.

TABLE 2.22. TYPICAL ANALYSIS FOR THE AUSTRALIAN MILLING WHEAT CLASSES

	Australian Prime Hard 14%	Australian Hard	Australian Standard White	Australian Soft
WHEAT				
Test weight (kg/hl)	79.4	80.0	80.5	78.0
1000 kernel weight (g)	35.2	37.2	35.2	34.8
Grain hardness (P.S.I)	15	14	17	27
Protein % (11% moisture)	14.2	12.2	10.8	8.5
Ash %	1.50	1.50	1.38	1.38
Falling number (sec)	494	460	422	325
Flour extraction %	75	74	75	74
SCREENINGS				
Total screenings % (2 mm screen)	2.5	2.6	3.1	3.2
FLOUR	13.1	11.0	9.6	7.5
Protein % (13.5% moisture)	40.0	33.7	28.8	2.2
Wet gluten %	192	237	195	116
Diastatic activity (mg)	0.50	0.48	0.47	0.45
Ash %				
FARINOGRAM				
Water absorption %	65.6	65.8	60.8	52.4
Development time (min)	6.0	4.7	3.4	1.9
EXTENSOGRAPH				
Extensibility (cm)	23.2	22.8	20.1	19.6
Maximum height (B.U.)	460	365	320	190
Area (cm^2)	140	112	95	43

SOURCE: Australian Wheat Board, Australian Wheat Industry Guide.

TABLE 2.23. SELECTED U.S. WHEAT CROP QUALITY DATA

	Hard Red Winter (3-year composite averages)	Western White Wheat (85 and 86 average)
Test wt. (kg/hl)	77.5	76.2
Protein (11% moisture)[2]	12.2	10.3
Falling number	388	400
Flow Yield	71.8	71.7
Total defects	2.6[1]	1.4
Dockage	.9[1]	.8
Farigraph Winter absorption	62.0	54.3

[1]1986 only.
[2]Concentrated to 11 percent moisture basis.

SOURCE: U.S. Wheat, 1986 Crop Quality Report.

TABLE 2.24 AVERAGE QUALITY BY STATE AND CLASS, 1970/71 - 86/87

	Test Weight Kg/hl	Protein[1] %	Foreign Material %
		Australian Standard White	
New South Wales	76.5	11.2	.25
Queensland	81.4	11.3	.39
South Australia	77.0	11.1	.29
Victoria	78.6	10.4	.29
Western Australia	76.5	10.7	.52
		Australian Hard	
New South Wales	78.1	12.9	.28
Queensland	78.1	13.2	.39
South Australia	77.1	12.4	.31
Victoria	82.8	13.5	.20
Western Australia	77.7	12.1	.35
		Australian Prime Hard	
New South Wales	77.2	14.3	.20
Queensland	77.4	14.3	.28

[1]11 percent moisture basis.

TABLE 2.25 REGRESSION OF PROTEIN LEVEL AND TREND[1], 1970/71 - 86/87

			R^2
Australian Standard White	10.89* (32.89)	-.0273 (.84)	.05
Australian Hard	12.71* (68.01)	+.0028 (.155)	.002
Australian Prime Hard	14.68* (56.95)	-.04 (1.64)	.15

[1]Trend is T = 1,2, ... 7 for 1970/71, 1971/72, ... 1986/87.

TABLE 2.26. PROFILE OF NUMBER OF ESTABLISHMENTS BY AREA OF WHEAT SOWN NEW SOUTH WALES, 1973-86

Year	Area of Wheat Sown (Hectares)						Total Number of Establishments
	0-99	100-249	250-499	500-999	1000-1499	1500 and over	
1972-73	9307	6438	1946	464	66	39	18260
1973-74	8613	6447	2387	615	97	49	18208
1974-75	7608	5526	2252	669	83	41	16179
1975-76	8298	6147	2138	620	90	59	17352
1976-77	7834	5788	2668	876	151	70	17387
1977-78	7397	6548	2776	975	168	75	17838
1978-79	7450	5868	2476	905	206	71	16976
1979-80	6802	6293	2716	1074	192	87	17164
1980-81	6321	5825	2635	1056	209	99	16145
1981-82	6087	5677	2718	1218	258	143	16096
1982-83	5992	5477	2439	967	214	121	15210
1983-84	5708	5430	3104	1350	331	200	16123
1984-85	5647	5417	2656	1209	276	175	15380
1985-86	5385	5198	2675	1224	297	209	14988

SOURCE: New South Wales Farmers, Address presented by D. Wilkinson, November 17, 1987.

TABLE 2.27. FARM PROFILE OF PRODUCERS IN THE WHEAT-SHEEP ZONE

ITEM	Unit	1984-85	1985-86
Total farm area[a]	ha	1,804	1,934
Wheat sown	ha	227	216
Sheep carried[a]	no.	1,696	1,725
Beef cattle carried[a]	no.	134	142
Area harvested			
wheat	ha	224	209
other grains	ha	91	86
Wheat harvested	t	359	309
Sheep sold	no.	576	577
CASH RECEIPTS			
Sales			
Sheep	$	10,717	8,950
Beef cattle	$	15,634	15,680
Other livestock	$	1,277	930
Wool	$	23,726	25,130
Wheat	$	42,031	36,200
Other crops	$	20,903	18,010
Total cash receipts	$	120,712	110,860
Farm cash operating surplus	$	31,889	22,740
Components of investment eturns			
Total cash receipts	$	120,712	110,860
Total cash costs	$	88,822	88,120
Farm cash operating surplus	$	31,889	22,740
Buildup in trading stocks	$	4,191	3,850
Depreciation	$	20,245	21,080
Operator and family labor	$	19,472	18,870
Return to capital & management	$	-3,637	-13,360
Return adjusted to full equity	$	7,875	1,730
Capital appreciation	$	9,175	-67,120
Full equity return, incl. capital appreciation	$	17,050	-65,400
Rate of return, excl. capital appreciation	%	1.0	0.2
Rate of return, inc. capital appreciation	%	2.3	-8.8
Real rate of return, inc. capital appreciation	%	-2.0	-17.2
OTHER FINANCIAL ITEMS			
Farm capital at 30 June	$	764,939	679,070

SOURCE: Farm Survey Report (March 1987), Bureau of Agricultural Economics.

TABLE 2.28. SUPERPHOSPHATE USED ON WHEAT

Year	Superphosphate on Wheat (Quintals Used) KE	Crop Area Fertilized 000 Ha Crops
1978/79	634	12,945
1979/80	716	--
1980/81	756	--
1981/82	801	14,432
1982/83	770	--
1983/84	720	--
1984/85	618	15,721
1985/86P	499	14,416
1986/87		

SOURCE: Quarterly Review of Agricultural Economics, Various Issues.

P = preliminary.

APPENDIX B

WHEAT QUALITY STANDARDS

1984/85 - 1987/88

Wheat Quality Standards and Dockage Rates for 1984-1985 Season

WHEAT QUALITY STANDARDS

GENERAL:

SOUNDNESS AND MATURITY: Only sound, mature wheat of the current season is acceptable. Old season's wheat may be received by special arrangement provided the condition is satisfactory.

RED WHEATS: Red wheat (e.g. Canadian Selkirk) may be accepted under category 4 [illegible] subject to varietal discount as an unregistered variety.

DURUM WHEATS: Dural, Duramba, Durati or Kamilaroi is to be received only at nominated stations. Acceptability will be determined by the PWA. Lower grade Durum as per instructions.

TEST WEIGHT: For acceptance as ASW or a higher grade, wheat must weigh at least 74 kg/hl. Wheat weighing less than 62 kg/hl must not be received without special instruction.

MOISTURE LIMIT: Not more than 12%.

DOCKAGE RATES FOR GENERAL PURPOSE:

Any acceptable wheat which does not qualify for ASW or higher grades provided that the Chondrometer Weight is at least 62 kg/hl. Dockages may only be applied on wheat received into the general purpose category. These are cumulative up to the maximum of $15 per tonne.

HOW TO USE THE CALCULATION TABLE:—

A. Refer to the Standards under ASW and find the defects applicable to the sample.
B. Follow this line across to the right and ensure that the correct line is selected under Dockage Details.
C. Go to that column to which the Chondrometer Weight refers and apply the dockage as shown.

NOTE: 1. Dockages are cumulative unless stated otherwise.
2. Observe the maximum dockage allowable for Category 3 — (i.e. $10).

	AUSTRALIAN STANDARD WHITE		GENERAL PURPOSE				FEED WHEAT
CATEGORY	DETAILS	TOLERANCE	DOCKAGE DETAILS	74 kg/hl & OVER	71-73½ Kg/hl	68-70½ Kg/hl	ABOVE 62 Kg/hl
1	CHONDROMETER WEIGHT	At least 74 kg/hl		NIL	$1	$6	No Dockage
2	MOISTURE	Not more than 12%					
3	UNMILLABLE MATERIAL [illegible]						UNLIMITED
(i)	Whiteheads, chaff, straw [illegible]	Not more than 2% By Volume	Over 2% to 5% / Over 5%	$5 / STA	$5 / STA	$5 / STA	No Dockage
(ii)	Small Foreign Seeds [illegible]	Not more than 1% By Volume	Over 1% to 3% / Over 3%	[illegible] / STA	[illegible] / STA	[illegible] / STA	No Dockage
(iii)	Screenings	Not more than 5% By Volume [illegible]	Over 5% to 10% / Over 10% to 20% / Over 20%	[illegible] / $10 / STA	[illegible] / $10 / STA	[illegible] / $10 / STA	No Dockage
	MAXIMUM OF $10 CAT. 3						
4	WEED SEEDS & OTHER FOREIGN SEEDS						
(i)	[illegible]	Not more than 50 in total per ½ litre	51-100 seeds / 101-150 seeds / 151-200 seeds / Over 200 seeds	$1 / $6 / $9 / STA	$1 / $6 / $9 / STA	$1 / $6 / $9 / STA	No Dockage / No Dockage / No Dockage / STA
(ii)	[illegible]	Not more than [illegible] total per ½ litre	[illegible] 10 seeds / 11-20 seeds / Over 20 seeds	$1 / $6 / STA	$1 / $6 / STA	$1 / $6 / STA	No Dockage / No Dockage / STA
(iii)	[illegible] Spiny burr (American Burr, Bohemian Beauty)	Not more than [illegible] total per ½ litre	[illegible] 10 seeds / 11-20 seeds / Over 20 seeds	$1 / $6 / STA	$1 / $6 / STA	$1 / $6 / STA	No Dockage / No Dockage / STA
(iv)	[illegible] Bathurst & Noogoora burr	Not more than 1 in total per ½ litre	Not applicable	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre
(v)	Yellow burr, skeleton weed seed, cotton seed & Parthenium Weed	NIL	Not applicable	NIL TOLERANCE	NIL TOLERANCE	NIL TOLERANCE	NIL TOLERANCE
5	ERGOT OF WHEAT OR RYE GRASS	Not more than 1 piece in total per ½ litre	4-5 pieces / 6-10 pieces / Over 10 pieces	$1 / $6 / STA	$1 / $6 / STA	$1 / $6 / STA	No Dockage / No Dockage / STA
6	SPROUTED GRAIN [illegible]	There is a NIL TOLERANCE for SPROUTED GRAIN in Australian Standard White and General Purpose categories					UNLIMITED
7	WEATHER STAINED BLACK POINT OR FUNGUS AFFECTED PINK GRAINS	Not more than 10% By Count	Over 10% to 25% / Over 25%	$6 / STA	$6 / STA	$6 / STA	No Dockage
8	DRY GREEN OR SAPPY GREEN GRAINS	Not more than 1% By Count	Over 1% to 10% / Over 10%	$6 / STA	$6 / STA	$6 / STA	No Dockage
9	OTHER OBJECTIONABLE FOREIGN MATTER [illegible]	NIL	Growers tendering wheat containing excessive unmillable material, foreign seeds or other objectionable matter [illegible] State Manager of the Australian Wheat Board. [illegible] will not be received in any circumstances.				
			MAXIMUM TOTAL DOCKAGE	$15	$15	$15	Not Applicable

S.T.A. Means "Subject to Assessment" by the State Manager of the Australian Wheat Board. If so requested, samples of S.T.A. wheat should be sent to the Head Office of the [illegible] for his attention, and the wheat must not be received pending advice as to classification and dockage.

UNLESS WITH THE APPROVAL OF THE STATE MANAGER GP WHEAT MUST NOT BE BINNED WITH ASW WHEAT, AND STA WHEAT MUST NOT BE BINNED WITH GP.

G. V. DOBBIN
MANAGING DIRECTOR
OCTOBER 1984

The above Quality Standards and Dockage Rates have been determined by the Australian Wheat Board for the 1984/85 season, the Standards apply to individual loads and must not be averaged over a number of loads.

OTHER GRADES

PRIME HARD

1. At least equal to Australian Standard White specifications except for:
 a) PROTEIN MINIMUM: At least 12.5% protein on 11% moisture basis.
 b) SPROUTED GRAIN: May contain up to 2% sprouted grain (by count) provided individual load samples have a falling number of not less than [illegible] seconds.
2. VARIETIES: The only acceptable varieties are: BANKS, [illegible]
NOTE: The P.W.A. are responsible for the objective measurement of protein and falling numbers.

NORTHERN HARD No. 1

1. At least equal to Australian Standard White specifications except for:
 a) PROTEIN MINIMUM: At least 11.5% protein on 11% moisture basis. [illegible]
 b) SPROUTED GRAIN: May contain up to 2% sprouted grain (by count) provided individual load samples have a falling number of not less than [illegible] seconds.
2. VARIETIES: The only acceptable varieties are as:
Silo Group 1 & 2: BANKS [illegible] SUNSTAR, HARTOG.
Silo Group 3: BANKS [illegible] SUNSTAR, HARTOG*
NOTE: HARTOG* will be acceptable into the PH [illegible] only at nominated sites where [illegible] by the P.W.A.

NORTHERN HARD No. 2.

1. At least equal to Australian Standard White specifications except for:
2. SCREENINGS: Up to [illegible] (by volume)
3. SPROUTED GRAIN: Up to [illegible] (by count). [illegible]
4. WEATHER STAINED BLACK POINT OR FUNGUS AFFECTED PINK GRAINS: Up to [illegible] (by Count)
5. DRY GREEN OR SAPPY GREEN GRAINS: Up to [illegible]
6. VARIETIES: As per Northern Hard No. 1

SOUTHERN HARD No. 1

1. At least equal to Australian Standard White specifications except for:
 a) PROTEIN MINIMUM: At least 11.5% [illegible]
2. VARIETIES: The only acceptable varieties are as:
Silo Group 3: BANKS, BASS, [illegible]
Silo Group 4 & 5: BANKS, BASS, [illegible]
Silo Group 6: BANKS, BASS, [illegible] OXLEY, TAKARI

SOFT BISCUIT WHEAT

1. [illegible]
2. [illegible]

FEED WHEAT

[illegible]

FEED WHEAT IS TO BE BINNED SEPARATELY FROM GP UNDER ALL CIRCUMSTANCES. UNLESS WITH THE APPROVAL OF THE STATE MANAGER, STA WHEAT MUST NOT BE BINNED WITH FEED WHEAT.

Wheat Varieties Approved for Sowing in 1985

Lindsay Cook
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NSW Department of Agriculture Sydney

The Minister for Agriculture & Fisheries, Mr Jack Hallam has made two significant changes to the system of official variety recommendations to apply for the 1985 wheat season.

The major change is that the Minister's official list from now on will be called "approved varieties" rather than "recommended varieties". The reason for this is that calling them recommended has caused some confusion among farmers, as they expect that a recommended variety should be the best that they can grow. However there are up to 12 varieties approved for some silo groups, which do not all perform equally as well in all areas of the silo group, and they usually also cover a wide range of maturities. So farmers have generally looked to their district agronomist to recommend the best variety or varieties from within this official list of recommended varieties for their particular location and requirements. There has been some dissatisfaction and confusion over Departmental officers making "recommendations" from within the list of "recommended" varieties.

To avoid this situation it has been decided to call the Minister's official list of varieties "approved" and to leave the term "recommended" varieties for district agronomists or other advisers to apply to the local situation or for the individual farmer.

The second significant change is to no longer make specific mention of varieties suitable for irrigation. There has been a trend for irrigation farmers in the Murray and Murrumbidgee Valley to grow hard as well as soft varieties in recent years, and there has been a shortage of satisfactory soft varieties. In addition there has never been a special mention of varieties suitable for irrigation in the central and northern inland river valleys. The result of these two decisions is that there will be three categories of wheat varieties for 1985 sowings. They are "approved", "provisionally approved", and "approved but outclassed".

Growers should consult their district agronomist for more specific recommendations within those categories.

New lines released

Five new varieties were approved for release in 1985. They are:

- CH7, a hybrid variety from the Cargill breeding programme, approved for receival as northern hard in silo groups 1, 2 and 3.
- SUN 69A, bred by Sydney University and approved for silo groups 1, 2 and 3 for receival as northern hard.
- SUN 64G also from Sydney University approved for southern hard and ASW for silo groups 3, 4, 5 and 6.
- M 2636, from the Department of Agriculture's breeding programme at Temora, approved for southern hard and ASW for silo groups 4, 5 and 6.
- WW 246, a soft variety from the Department's breeding programme at Wagga, approved for growing in silo group 5 and receival into the ASW grade.

It is expected that all of these lines will be named during the spring.

Changes

There were a number of other changes to the 1984 list of varieties.

- Durati has been deleted from list of approved durum varieties, as Kamilaroi is superior to it in both yield and quality.
- Songlen has been placed in the list of "approved but outclassed" varieties for silo groups 1 and 2 as it is now substantially inferior in yield to more recent varieties.
- Hybrid Titan has been deleted from the "approved" varieties in silo groups 1 and 2 as there is little or no seed available for sowing in 1985.
- Shortim has been deleted from the list of "approved but outclassed" varieties in silo group 3 on the basis of yield and its very low acceptance in that area.
- Hartog has been made "provisionally approved" for silo group 3 and there will be a strong extension campaign to encourage farmers to only grow it in situations where high protein levels are achieved.
- Sunstar has been added to the list of "approved" varieties for silo groups 4, 5 and 6.
- Both Kite and Olympic have been placed on the "approved but outclassed" list for silo group 6 on the basis of inferior yield.
- Suneca has been moved from "provisionally approved" to "approved" for silo group 3.

New lines rejected

The cross bred M2369 was considered by the Standing Advisory Committee on wheat and unanimously rejected on the basis of both inferior quality and susceptibility to stripe rust.

The Queensland variety King was also rejected by the Committee for release in New South Wales as it also is too susceptible to stripe rust.

Australian Durum Wheat No. 1 (New South Wales)

The Durum wheat class is restricted to approved durum varieties at nominated sites. The varieties for the 1984/85 season are:

Dural, Duramba, Durati, Kamilaroi

Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Protein minimum: At least 12% on an 11% moisture basis.
2. Up to 2% sprouted grains (by count) provided that individual load samples have a falling number of not less than 300 seconds.
3. Weather stained, blackpoint or fungus affected pink grains: up to 5% (by count).
4. Dry green, sappy, discoloured or distorted grains: up to 1% (by count).
5. Bread wheats: up to 3% (by count).

Australian Durum Wheat No. 2 (New South Wales)

The Durum No. 2 wheat class is restricted to approved durum varieties (according to Durum wheat No. 1) at nominated sites. Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Minimum test weight — 74 kg/hl
2. Up to 40% mottled grains (by count).
3. Up to 5% sprouted grains (by count) provided that individual load samples have a falling number of not less than 200 seconds.
4. Weather stained, black point or fungus affected pink grains, up to 10% (by count).
5. Dry green, sappy, discoloured or distorted grains, up to 2% (by count)
6. Unmillable material: up to 7½% (by volume)
7. Bread wheats: up to 5% (by count)

NOTICE

GRAIN HANDLING AUTHORITY OF N.S.W.

THE QUALITY STANDARDS AND DOCKAGE RATES HAVE BEEN DETERMINED BY THE AUSTRALIAN WHEAT BOARD FOR THE 1985/86 SEASON. THE STANDARDS APPLY TO INDIVIDUAL LOADS AND MUST NOT BE AVERAGED OVER A NUMBER OF LOADS.

PAYMENT ENQUIRIES AND TOLL FREE NUMBER 008 112413

WHEAT QUALITY STANDARDS

GENERAL

SOUNDNESS AND MATURITY: Only sound mature wheat is acceptable

RED WHEATS: Red Wheats (e.g. Canadian Selkirk) may be tendered for delivery and will be received into the **FEED WHEAT** category. There is a nil tolerance into all other categories.

DURUM WHEATS: Durat, Durumba, Durati or Kamilaroi is to be received only at nominated stations. Acceptability will be determined by the PWA. Lower grade Durums as per instructions.

TEST WEIGHT: For acceptance as ASW or a higher grade, wheat must weigh at least 74 kg/hl. Wheat weighing less than 62kg/hl must not be received without special instruction.

MOISTURE LIMIT: Not more than 12%

DOCKAGE RATES FOR

GENERAL PURPOSE: Any acceptable wheat which does not qualify for ASW or higher grades provided that the Chondrometer Weight is at least 68 kg/hl. Dockages may only be applied on wheat received into the general purpose category. These are cumulative up to the maximum of $12 per tonne.

SPROUTED GRAIN: May contain up to 10 sprouted grains per ½ litre provided the falling numbers is at least 200 seconds.

HOW TO USE THE CALCULATION TABLE:

A Refer to the Standards under ASW and find the defect/s applicable to the sample.

B Follow that line across to the right and ensure that the correct box is selected under Dockage Details.

C Go to that column to which the Chondrometer Weight relates and apply the dockage as shown.

NOTE:

1. Dockages are cumulative for each category up to a maximum of $12 per tonne (STA wheat is excluded from this category).

CATEGORY	AUSTRALIAN STANDARD WHITE — DETAILS	TOLERANCE	GENERAL PURPOSE — DOCKAGE DETAILS	74kg/hl & OVER	71-73½ Kg/hl	68-70½ Kg/hl	FEED WHEAT ABOVE 62 Kg/hl
1	CHONDROMETER WEIGHT	At least 74kg/hl		NIL	$3	$6	No Dockage
2	MOISTURE	Not more than 12%					
3	UNMILLABLE MATERIAL — material passing through a 2mm screen and/or material other than wheat kernels, remaining on top of the screen after sieving						UNLIMITED
a)	Wheatheads, chaff, straw, hackbone, wild radish and its cerealings	Not more than 7% By Volume (of which not more than 1% is small foreign seeds)	Over 7% to 15% Over 15% to 25% Over 25%	$3 $6 STA	$3 $6 STA	$3 $6 STA	No Dockage
b)	Small Foreign Seeds, that is any seed passing through a 2mm screen except those mentioned in any other category. Rape seed is classed as a small foreign seed	Not more than 1% By Volume	Over 1% to 3% Over 3% to 5% Over 5% to 10% Over 10%	$3 $6 $9 STA	$3 $6 $9 STA	$3 $6 $9 STA	No Dockage
4	WEED SEEDS & OTHER FOREIGN SEEDS	Not more than 50 in total per ½ litre	51 100 seeds 101 150 seeds 151 200 seeds Over 200 seeds	$3 $6 $9 STA	$3 $6 $9 STA	$3 $6 $9 STA	No Dockage No Dockage No Dockage STA
a)	All other cereal grains and any oil seeds and weed seeds not specified in other categories, black oats, seeds of lucerne, insect damaged wheat. "Small foreign seeds" (3b) are excluded from this category						
b)	Saffron thistle, variegated thistle, Mexican poppy, mertwood (Fitzherbert Scent is only acceptable if there is no discernible tainting odour imparted to wheat)	Not more than 5 in total per ½ litre	6 10 seeds 11 20 seeds 21 50 seeds Over 50 seeds	$3 $6 $9 STA	$3 $6 $9 STA	$3 $6 $9 STA	No Dockage No Dockage No Dockage STA
c)	Sunflower seed, maize, soybean, lupins, field peas, double gees & safflower, Spiny Burr (American Burr, Bohemium Beauty)	Not more than 1 in total per ½ litre	2 10 seeds 11 20 seeds 21 50 seeds Over 50 seeds	$3 $6 $9 STA	$3 $6 $9 STA	$3 $6 $9 STA	No Dockage No Dockage No Dockage STA
d)	Thornapple (Datura spp.), Bathurst, Noogoora burr, and cottonseed	Not more than 1 in total per ½ litre	Not applicable	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre
5	ERGOT OF WHEAT ERGOT OF RYE GRASS	Not more than 3 pieces in total per ½ litre	4 5 pieces 6 10 pieces Over 10 pieces	$3 $6 STA	$3 $6 STA	$3 $6 STA	No Dockage No Dockage STA
6	SPROUTED GRAIN — Sprouted kernels are those in which the covering of the germ is split open, and any further advanced stage of growth to the extent of the germ having grown or shot	NIL	1 to 10 sprouted grains per ½ litre	$12	$12	$12	UNLIMITED
			SITE FALLING NUMBER MUST BE AT LEAST 200 SECONDS				
7	FUNGAL STAINED GRAINS (includes blackpoint black tip, pink grains and grains discoloured by field fungi)	Not more than 10% By Count	Over 10% to 25% Over 25% to 50% Over 50%	$3 $6 STA	$3 $6 STA	$3 $6 STA	No Dockage
8	DRY GREEN OR SAPPY GREEN GRAINS, FROST AFFECTED, DISEASE OR DRYING OPERATIONS	Not more than 1% By Count	Over 1% to 10% Over 10% to 20% Over 20%	$3 $6 STA	$3 $6 STA	$3 $6 STA	No Dockage
9	OTHER OBJECTIONABLE FOREIGN MATTER — Wheat which has been treated with a pickling compound which contains live insects or which has been treated with any chemical not approved for grains. Tainting agents liable to impart an objectionable smell or taste to wheat including plants parts and seeds of Eucalyptus and Wild Garlic. Grains infested with Bull Smut fungus, heat damaged, fan burnt or mouldy grain, general rubbish comprising of stalks, stones, earth, sand and/or any other objectionable contaminant not otherwise stated in these standards	NIL	Growers tendering wheat containing excessive unmillable material, foreign seeds or other objectionable matter for which a nil tolerance has been set, are advised to have the wheat cleaned. Any grower unable or unwilling to do so may have his wheat received at a later convenient to the Board and at a dockage to be determined by the State Manager of the Australian Wheat Board. However, wheat which contains live insects or which has been treated with a pickling compound to any chemical not approved for application to grain will not be received in any circumstances.				
	MAXIMUM TOTAL DOCKAGE		$12	$12	$12	Not Applicable	

ALL GRADES MUST BE STORED SEPARATELY IN DEPOTS AND BUNKERS EACH GRADE MUST BE KEPT AS A SEPARATE PARCEL. IF THIS IS NOT POSSIBLE THE APPROVAL OF THE REGIONAL MANAGER MUST BE OBTAINED BEFORE ANY ACTION IS TAKEN.

STA Means "Subject to Assessment" by the State Manager of the Australian Wheat Board. If so requested, samples of STA wheat should be sent to the Head Office of the GHA for his attention, and the wheat must not be removed pending advice as to classification and dockage. This includes assessment as to whether or not wheat is suitable for receival into Feed Category.

G Y DOBBIN
MANAGING DIRECTOR
OCTOBER 1985

OTHER GRADES

PRIME HARD

1. At least equal to Australian Standard White specifications except for
   a) **PROTEIN MINIMUM:** At least 12.0% protein on 11% moisture basis
   b) **SPROUTED GRAIN:** May contain up to 2% sprouted grain (by count) provided individual load samples have a falling number of not less than 350 seconds.
2. **VARIETIES:** The only acceptable varieties are BANKS, COOK, GATCHER, HYBRID TITAN, SHORTIM, SONGLEN, SUNECA, SUNKOTA, SUNSTAR, TIMGALEN, HARTOG*
   NOTE: 1 The PWA are responsible for the objective assessment of protein and falling numbers

NORTHERN HARD NO. 1

1. At least equal to Australian Standard White specifications except for
   a) **PROTEIN MINIMUM:** At least 11.5% protein on 11% moisture basis. At sites where protein testing is unavailable up to 25% mottled grains (by count) are permitted
   b) **SPROUTED GRAIN:** May contain up to 2% sprouted grain (by count) provided individual load samples have a falling number of not less than 300 seconds
2. **VARIETIES:** The only acceptable varieties are in
   SILO GROUP 1 & 2: BANKS, BASS, CONDOR, COOK, FLINDERS, GATCHER, HARRIER, HARTOG, HYBRID TITAN, KITE, OSPREY, SHORTIM, SKUA, SONGLEN, SUNDOR, SUNECA, SUNELG, SUNKOTA, SUNSTAR, TAKARI, TERRA, TIMGALEN, TIMSON, VULCAN
   SILO GROUP 3: BANKS, BASS, CONDOR, COOK, EAGLE, FLINDERS, GATCHER, HARRIER, HYBRID TITAN, KITE, OSPREY, SHORTIM, SKUA, SONGLEN, SUNDOR, SUNECA, SUNELG, SUNKOTA, SUNSTAR, TAKARI, TERRA, TIMGALEN, TIMSON, VULCAN, HARTOG*
   NOTE: HARTOG* will be acceptable into the PH/AH Wheat Classes in Silo Group 3 at receival sites where PH/AH is received and the sites have protein testing available

AUSTRALIAN HARD NO. 2

1. At least equal to Australian Standard White specifications except for
   a) **PROTEIN MINIMUM:** At least 11.5% protein on 11% moisture basis. At sites where protein testing is unavailable up to 25% mottled grains (by count) are permitted
   b) **SCREENINGS:** Up to 7% (by volume)
   c) **SPROUTED GRAIN:** Up to 10% (by count). Station falling number must be at least 250 seconds
   d) **WEATHER STAINED/BLACK POINT OR FUNGUS AFFECTED PINK GRAINS:** Up to 20% (By Count)
   e) **DRY GREEN, SAPPY, DISCOLOURED OR DISTORTED GRAINS:** Up to 2% (By Count)
2. **VARIETIES:** As per Northern Hard No. 1 and Southern Hard No. 1

SOUTHERN HARD NO. 1

1. At least equal to Australian Standard White specifications except for
   a) **PROTEIN MINIMUM:** At least 11.5% protein on 11% moisture basis. At sites where protein testing is unavailable up to 10% mottled grains (by count) are permitted
2. **VARIETIES:** The only acceptable varieties are in
   SILO GROUP 3: BANKS, BASS, CONDOR, COOK, EAGLE, FLINDERS, GATCHER, HARRIER, HYBRID TITAN, KITE, OSPREY, SHORTIM, SKUA, SONGLEN, SUNDOR, SUNECA, SUNELG, SUNKOTA, SUNSTAR, TAKARI, TERRA, TIMGALEN, TIMSON, VULCAN
   SILO GROUPS 4, 5 & 6: BANKS, BASS, CONDOR, COOK, FLINDERS, GATCHER, HARRIER, HYBRID TITAN, KITE, OSPREY, SHORTIM, SKUA, SONGLEN, SUNDOR, SUNECA, SUNELG, SUNKOTA, SUNSTAR, TAKARI, TERRA, TIMGALEN, TIMSON, VULCAN

SOFT BISCUIT WHEAT

1. Nominated stations in N.I.A.
2. Variety, quality etc. as determined by flour millers

FEED WHEAT

Includes all sprouted wheat except for other grade specifications e.g. Prime Hard, Northern Hard No. 1 and Australian Hard No. 2. Feed wheat also includes Wheat with a test weight under 60 kg/hl and down to 62 kg/hl. Wheat received into this category may not attract dockages for other cleanliness.

FEED WHEAT IS TO BE BINNED SEPARATELY FROM UP UNDER ALL CIRCUMSTANCES.

Wheat Varieties Approved for the 1986 Season

Dr. L. J. Cook
Principal Agronomist (Cereals)
NSW Department of Agriculture

The Minister for Agriculture and Fisheries, Mr. Jack Hallam, has issued the list of approved varieties for the 1986 season.

Only one new variety has been released. It is currently code-numbered MJ3265 and it will be named at the annual field day at Temora Agricultural Research and Advisory Station. It is a soft winter wheat of good ASW quality, with a cold requirement slightly longer than the other winter wheats Osprey and Quarrion. This means it can be sown perhaps 7-10 days earlier than those varieties. It is approved for receival in silo groups 4, 5 and 6 but will be received in silo group 3 without a varietal discount. In Departmental trials MJ3265 has outyielded Quarrion by about 14%, and it has also outyielded Osprey by about 5% in early sowings.

There should be substantial quantities of registered seed of the new variety available from this harvest.

While it is not strictly a new variety, Vulcan (formerly called DK2139) now appears on the approved list for silo groups 3, 4, 5 and 6.

This variety was actually approved for release some years ago, but it did not appear on the Minister's list as no seed was available until early in the 1985 season. It is expected there will be substantial quantities of seed available for the 1986 season, but growers should make sure that what they buy is actually Vulcan seed.

There are a number of other changes from the 1985 approved list.

- Hartog has been transferred from provisionally approved to approved in silo group 3, with emphasis that it be grown in high protein areas only.
- Cook is deleted from silo group 4 on the basis of poorer yield in that area than other approved varieties.
- Kite is deleted from silo group 6 on the same basis.
- Songlen has been deleted from the approved but outclassed category for silo groups 1, 2 and 3 because of much poorer yield than other approved varieties.
- Millewa is now in the approved but outclassed category for silo group 6 on the basis of susceptibility to stripe rust.
- Harrier has been deleted from approval for silo group 6 because of susceptibility to stripe rust.
- Olympic is in the approved but outclassed category for silo groups 4 and 5 on the basis of susceptibility to stripe rust, and also in group 6 because of poorer yield and susceptibility to stripe rust.
- The Cargill hybrid CH7 has been deleted from approval for silo groups 1, 2 and 3 because there will be no seed available for the 1986 season.
- Gatcher is in the approved but outclassed category for silo groups 1, 2 and 3 because of poorer yield compared to other approved varieties.

Australian Durum No. 1 Wheat (New South Wales)

The Durum wheat Class is restricted to approved durum varieties at nominated sites. The varieties for the 1985/86 season are:

Durat, Durumba, Durati, Kamilaroi

Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Protein minimum: At least 12% on an 11% moisture basis.
2. Up to 2% sprouted grains (by count) provided that individual load samples have a falling number of not less than 300 seconds.
3. Weather stained, blackpoint or fungus affected pink grains: up to 5% (by count).
4. Dry green, sappy, discoloured or distorted grains: up to 1% (by count).
5. Bread wheats: up to 3% (by count).

Australian Durum No. 2 Wheat (New South Wales)

The Durum No. 2 wheat grade is restricted to approved durum varieties (according to Durum wheat No. 1) at nominated sites. Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Up to 40% mottled grains (by count).
2. Up to 5% sprouted grains (by count) provided that individual load samples have a falling number of not less than 200 seconds.
3. Weather stained, black point or fungus affected pink grains: up to 10% (by count).
4. Dry green, sappy, discoloured or distorted grains: up to 2% (by count).
5. Bread wheats: up to 5% (by count).

NOTICE

GRAIN HANDLING AUTHORITY OF N.S.W.

THE QUALITY STANDARDS HAVE BEEN DETERMINED BY THE AUSTRALIAN WHEAT BOARD R THE 1986/87 SEASON. THE STANDARDS APPLY TO INDIVIDUAL LOADS AND MUST NOT BE AVERAGED OVER A NUMBER OF LOADS.

PAYMENT ENQUIRIES: AWB TOLL FREE NUMBER: 008 112413

WHEAT QUALITY STANDARDS

IERAL

NESS AND MATURITY: Only sound, mature wheat is acceptable.
HEATS: Red Wheats (e.g. Canadian Seilarki) may be tendered for delivery and ceived into the **FEED WHEAT** category. There is a nil tolerance into all other s.
WHEATS: Durat, Durumba, Durss or Kamilaroi is to be received only at ed seasons. Acceptability will be determined by the PWA. Lower grade Durum ructions.
EIGHT: For acceptance as ASW or a higher grade, wheat must weigh at least Wheat weighing less than 62 kg/hl must not be received without special n.
IRE LIMIT: Not more than 12%.
HARD WHEATS: The PWA are responsible for the objective assessment of nd falling number.

HOW TO USE THE CALCULATION TABLE

A. Refer to the Standards under Quality Details and find the defects applicable to the sample.
B. Follow this line across to the right and ensure the correct line is selected under GRADE details.
C. Go to the column to which the Chondrometer weight refers and apply the GRADE shown.

NOTE:
1. Dockages are not applicable to any GRADE.

VARIETIES

PRIME HARD: Banks, Cook, Gatcher, Hartog*, Hybrid Titan, Shortim, Songlen, Sunaca, Sunkota, Sunstar, Timgalen.
NORTHERN & SOUTHERN HARD No. 1 & 2: Banks, Bass, Condor, Cook, Flinders, Gatcher, Harmer, Hybrid Titan, Kite, Osprey, Shortim, Skua, Songlen, Sundor, Sunaca, Sunsly, Sunkota, Sunstar, Talaan, Terra, Timgalen, Timson, Vulcan.
Included in Silo Group 1 & 2: Hartog* and Comet
Included in Silo Group 3: Eagle, Hartog* and Comet
*HARTOG is only acceptable into the PHAH Categories at sites that have protein testing available.

SOFT BISCUIT WHEAT
1. Nominated Seasons in M.I.A.
2. Variety, quality etc. as determined by flour millers.

QUALITY DETAILS	AUSTRALIAN STANDARD WHITE	PRIME HARD	NORTHERN & SOUTHERN HARD No. 1	NORTHERN & SOUTHERN HARD No. 2	GENERAL PURPOSE No. 1	GENERAL PURPOSE No. 2	FEED WHEAT	SUBJECT TO ASSESSMENT
CHONDROMETER WEIGHT	At least 74 kg/hl	At least 74 kg/hl	At least 74 kg/hl	At least 74 kg/hl	71 kg/hl & over	68 kg/hl - 70¾ kg/hl	62 kg/hl - 67¾ kg/hl	Under 62 kg/hl
MOISTURE	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%
PROTEIN MINIMUM	No Minimum	12.8%	11.5%	11.0%	N/A	N/A	N/A	N/A
UNMILLABLE MATERIAL — material passing through a 2mm screen and/or material other than wheat kernels, remaining on top of the screen after sieving.								
Wheatheads, chaff, straw, backbone, weld radish and screenings.	Not more than 7% (Bly Volkmann) which not more than 1% is small foreign seeds	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	Over 7% up to 15% (Bly Volkmann)	Over 15% up to 25% (Bly Volkmann)	Over 25% up to 50% (Bly Volkmann)	Over 50% (Bly Volkmann)
Small Foreign Seeds, that is any seed passing through a 2mm screen except those mentioned in any other category. Rape seed is classified as a small foreign seed.	Not more than 1% (Bly Volkmann)	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	Over 1% up to 5% (Bly Volkmann)	Over 5% up to 10% (Bly Volkmann)	Up to 10% (Bly Volkmann)	Over 10% (Bly Volkmann)
WEED SEEDS & OTHER FOREIGN SEEDS All other cereal grains and any oil seeds and weed seeds not specified in other categories, black oats, seeds of lucerne, insect damaged wheat. "Small foreign seeds" (4lb) are excluded from this category.	Not more than 50 in total per ½ litre	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	51 to 150 Seeds per ½ litre	151 to 200 Seeds per ½ litre	201 to 500 Seeds per ½ litre	Over 500 Seeds per ½ litre
Saffron thistle, variegated thistle, Mexican poppy, Vetches & melaweed. (Heartsm Scent is only acceptable if there is no discernible tainting odour imparted to wheat.	Not more than 5 in total per ½ litre	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	6 to 10 Seeds per ½ litre	11 to 50 Seeds per ½ litre	Up to 50 Seeds per ½ litre	Over 50 Seeds per ½ litre
Sunflower seed, maize, soybean, lupins, field peas, double gees, safflower, faba beans, chickpeas & lentils. Spiny Burr (American Burr, Bohemian Beauty).	Not more than 1 in total per ½ litre	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	2 to 20 Seeds per ½ litre	21 to 50 Seeds per ½ litre	51 to 100 Seeds per ½ litre	Over 100 Seeds per ½ litre
Thornapple (Datura spp.), Bathurst, Noogoora burr, and cotonseed.	Not more than 1 in total per ½ litre	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	over 1 in total per ½ litre
ERGOT OF WHEAT ERGOT OF RYE GRASS	Not more than 5 pieces in total per ½ litre	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	ASW Tolerance to apply	over 5 pieces in total per ½ litre
SPROUTED GRAIN Sprouted kernels are those in which the covering of the germ is split open, and any further advanced stage of growth to the extent of the germ having grown or shot. (For the assessment of sprouted grains, counts should be made on a minimum sub-sample of 300 grains.)	NIL	Up to 2% (Bly Comist)	Up to 2% (Bly Comist)	Up to 5% (Bly Comist)	NIL (Wheat will be accepted providing the falling number is at least 300 seconds)	Up to 1% (Bly Comist) (Wheat will be accepted providing the falling number is at least 200 seconds)	Unlimited	N/A
FALLING NUMBER Minimum on individual Load Samples. (Except for Northern & Southern Hard No. 2 where Season Falling Number will apply.)	N/A	Not less than 350 seconds	Not less than 300 seconds	Not less than 250 seconds	Not less than 300 seconds	Not less than 200 seconds	N/A	N/A
FUNGAL STAINED GRAINS (includes blackpoint, black tip, pink grains and grains discoloured by field fungi).	Not more than 10% (Bly Comist)	ASW Tolerance to apply	ASW Tolerance to apply	Up to 20% (Bly Comist)	Over 10% up to 25% (Bly Comist)	Over 25% up to 50% (Bly Comist)	Up to 50% (Bly Comist)	Over 50% (Bly Comist)
DRY GREEN OR SAPPY GREEN GRAINS, FROST AFFECTED, DISEASE OR DRYING OPERATIONS	Not more than 1% (Bly Comist)	ASW Tolerance to apply	ASW Tolerance to apply	Not more than 2% (Bly Comist)	Over 1% up to 10% (Bly Comist)	Over 10% up to 20% (Bly Comist)	Over 20% (Bly Comist)	N/A
OTHER OBJECTIONABLE FOREIGN MATTER Wheat which has been treated with a pickling compound, which contains live insects or which has been treated with any chemical not approved for grains. Tainting agents liable to impart an objectionable smell or taste to wheat including plant parts and seeds of Eucalyptus and Wild Garlic. Grains infested with Bell Smut fungus, heat damaged, sun burnt or mouldy grain, general rubbish comprising of sticks, stones, earth, sand and/or any other objectionable contaminant not otherwise stated in these standards.	NIL IN ALL GRADES	Growers tendering wheat containing excessive unmillable material, foreign seeds or other objectionable matter for which a nil tolerance has been set, are advised to have the wheat cleaned. Any grower unable or unwilling to do so may have his wheat received at a time convenient to the Board and at a dockage to be determined by the Sites Manager of the Australian Wheat Board. However, wheat which contains live insects or which has been treated with a pickling compound or any chemical not approved for application to grain, will not be received in any circumstances.						
INTERIM PAYMENT (90% of THE PRELIMINARY GMP) per tonne less Freight Charges, Storage & Handling Charges, Research Levy, Carryover Costs, Outward Wharfage & Ferry House Deduction).	$117.56	$133.76	$122.06	$117.56	$107.66	$90.56	$77.06	N/A

...ame "Subject to Assessment" by the Sites Manager of the Australian Wheat Board. If so requested, samples ...wheat should be sent to the Head Office of the G.H.A. for his attention, and the wheat must not be received ...vance as to classification and dockage. This includes assessment as to whether or not wheat is suitable for ...he Feed Category.

Graham
...GING DIRECTOR
...BER 1986

ALL GRADES MUST BE STORED SEPARATELY IN DEPOTS AND BUNKERS EACH GRADE MUST BE KEPT AS A SEPARATE PARCEL. IF THIS IS NOT POSSIBLE THE APPROVAL OF THE REGIONAL MANAGER MUST BE OBTAINED BEFORE ANY ACTION IS TAKEN.

FEED WHEAT: IS TO BE BINNED SEPARATELY FROM GP No. 1 AND GP No. 2 UNDER ALL CIRCUMSTANCES.

Australian Durum No. 1 Wheat (New South Wales)

- The Durum wheat class is restricted to approved durum varieties at nominated sites. The varieties for the 1986/87 season are:
  Dural, Duramba, Durati, Kamilaroi
- Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Protein minimum: At least 12.8% on an 11% moisture basis.
2. Up to 2% initial tolerance for sprouted wheat (by count), provided that individual load samples have a falling number of not less than 300 seconds.
3. Weather stained, blackpoint or fungus affected pink grains: up to 5% (by count).
4. Dry green, sappy, discoloured or distorted grains: up to 1% (by count).
5. Bread wheats: up to 3% (by count).

Australian Durum No. 2 Wheat (New South Wales)

- The Durum No. 2 wheat grade is restricted to approved durum varieties (according to Durum Wheat No. 1) at nominated sites.
- Deliveries must be at least equal to Australian Standard White wheat standards, except for the following:

1. Protein minimum: At least 11.5% on an 11% moisture basis.
2. Up to 5% initial tolerance for sprouted wheat (by count), provided that individual load samples have a falling number of not less than 200 seconds.
3. Weather stained, blackpoint or fungus affected pink grains: up to 10% (by count).
4. Dry green, sappy, discoloured or distorted grains: up to 2% (by count).
5. Bread wheats: up to 5% (by count).

AUSTRALIAN WHEAT BOARD

WHEAT QUALITY STANDARDS 1987/88

THE STANDARDS APPLY TO INDIVIDUAL LOADS AND MUST NOT BE AVERAGED OVER A NUMBER OF LOADS.

	QUALITY DETAILS	AUSTRALIAN STANDARD WHITE	PRIME HARD	AUSTRALIAN HARD No. 1	AUSTRALIAN HARD No. 2	GENERAL PURPOSE No. 1	GENERAL PURPOSE No. 2	FEED-WHEAT	SUBJECT TO ASSESSMENT
1	CHONDROMETER WEIGHT	At least 74 kg/hl	At least 74 kg/hl	At least 74 kg/hl	At least 74 kg/hl	71 kg/hl & over	68 kg/hl 70% kg/hl	62 kg/hl 67% kg/hl	Under 62 kg/hl
2	MOISTURE	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%	Not more than 12%
3	PROTEIN MINIMUM	No Minimum	12.8%	11.5%	11.0%	No Minimum	No Minimum	No Minimum	N/A
4	FALLING NUMBER Minimum on individual Load Samples (Except for Northern & Southern Hard No. 2 where Station Falling Number will apply)	N/A	Not less than 350 seconds	Not less than 300 seconds	Not less than 250 seconds	Not less than 300 seconds	Not less than 300 seconds	300 seconds and below	N/A
5	UNMILLABLE MATERIAL — material passing through a 2 mm screen and/or material other than wheat kernels remaining on top of the screen after sieving								
a	TOTAL above and below screen (maximum % by volume)	Not more than 7% (By Volume)	Not more than 7% (By Volume)	Not more than 7% (By Volume)	Not more than 7% (By Volume)	Over 7% up to 15% (By Volume)	Over 15% up to 25% (By Volume)	Over 25% up to 50% (By Volume)	Over 50% (By Volume)
(b)	Below the screen (maximum % by volume)	Not more than 5% (By Volume)	Not more than 5% (By Volume)	Not more than 5% (By Volume)	Not more than 5% (By Volume)	Over 5% up to 10% (By Volume)	Over 10% up to 15% (By Volume)	Over 15% up to 30% (By Volume)	Over 30% (By Volume)
(bb)	OF WHICH Small Foreign Seeds, that is any seed passing through a 2 mm screen except those mentioned in any other category. [illegible]	Not more than 1% (By Volume)	Not more than 1% (By Volume)	Not more than 1% (By Volume)	Not more than 1% (By Volume)	Over 1% up to 5% (By Volume)	Over 5% up to 10% (By Volume)	Up to 20% (By Volume)	Over 20% (By Volume)
6	GRAIN DEFECTS	MAXIMUM TOLERANCES PER 300 GRAIN SAMPLE							
a	SPROUTED GRAIN [illegible] (For the assessment of sprouted grains, counts should be made on a minimum sub-sample of 300 grains)	NIL	Up to 2% (By Count)	Up to 2% (By Count)	Up to 5% (By Count)	NIL Wheat will be accepted providing the falling number is at least 300 seconds	Up to 1% (By Count) Wheat will be accepted providing the falling number is at least 200 seconds	Unlimited	Unlimited
(b)	FUNGAL STAINED GRAINS [illegible]	Not more than 5% (By Count)	Not more than 5% (By Count)	Not more than 5% (By Count)	Up to 10% (By Count)	Up to 10% (By Count)	Up to 50% (By Count)	Up to 50% (By Count)	Over 50% (By Count)
(bb)	OF WHICH Pink Grain affected by the fungus Fusarium	Not more than 2% (By Count)	Not more than 2% (By Count)	Not more than 2% (By Count)	Not more than 2% (By Count)	Up to 5% (By Count)	Up to 5% (By Count)	Up to 5% (By Count)	Over 5% (By Count)
c	DRY GREEN, SAPPY GREEN AND FROST AFFECTED GRAINS, AND THOSE AFFECTED BY DISEASE OR DRYING OPERATIONS	Not more than 1% (By Count)	Not more than 1% (By Count)	Not more than 1% (By Count)	Not more than 2% (By Count)	Up to 10% (By Count)	Up to 20% (By Count)	Over 20% (By Count)	Unlimited
d	HEAT DAMAGED, BIN BURNT AND MOULDY GRAINS	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Greater than NIL
e	GRAINS INFECTED WITH BALL SMUT	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Greater than NIL
f	INSECT DAMAGED GRAIN	Not more than 1% (By Count)	Not more than 1% (By Count)	Not more than 1% (By Count)	Not more than 1% (By Count)	Not more than 2% (By Count)	Not more than 2% (By Count)	Not more than 4% (By Count)	Over 4% (By Count)
7	GRAIN CONTAMINANTS	MAXIMUM TOLERANCES PER HALF LITRE							
A	SEED CONTAMINANTS. TOLERANCES APPLY TO WHOLE SEEDS OR THEIR EQUIVALENT IN PIECES								
(a)	Crow Garlic, Rattlepods, Coriander	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Greater than NIL
(b)	Thornapple (Datura spp.), Bathurst, Noogoora burr, and cottonseed	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Over 1 in total per ½ litre
(c)	Sunflower seed, maize, soybean, lupins, field peas, safflower [illegible]	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	Not more than 1 in total per ½ litre	2 to 15 Seeds per ½ litre	16 to 50 Seeds per ½ litre	51 to 100 Seeds per ½ litre	Over 100 Seeds per ½ litre
(d)	Saffron thistle, variegated thistle, Mexican poppy, Vetches & [illegible]	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 8 in total per ½ litre	Not more than 5 in total per ½ litre	6 to 10 Seeds per ½ litre	11 to 50 Seeds per ½ litre	11 to 50 Seeds per ½ litre	Over 50 Seeds per ½ litre
(e)	Lucerne, Clover, Rice, Barley, Cereal Rye, Triticale, Black Oats and other seed contaminants not specified in (a) to (d) which remain above the 2 mm screen	Not more than 50 in total per ½ litre	Not more than 50 in total per ½ litre	Not more than 50 in total per ½ litre	Not more than 50 in total per ½ litre	51 to 150 Seeds per ½ litre	151 to 200 Seeds per ½ litre	201 to 400 Seeds per ½ litre	Over 400 Seeds per ½ litre
B	ERGOT								
(a)	ERGOT OF RYE GRASS	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Not more than 5 pieces in total per ½ litre	Over 5 pieces per ½ litre
(b)	ERGOT OF WHEAT	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Not more than 1 piece in total per ½ litre	Over 1 piece per ½ litre
C	DEAD STORED GRAIN INSECTS	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Not more than 5 in total per ½ litre	Over 5 per ½ litre
D	OTHER OBJECTIONABLE FOREIGN MATTER [illegible]	NIL IN ALL GRADES	[illegible]						
8	INTERIM PAYMENT [illegible]								N/A

ALL GRADES MUST BE STORED SEPARATELY IN DEPOTS AND BUNKERS EACH GRADE MUST BE KEPT AS A SEPARATE PARCEL. IF THIS IS NOT POSSIBLE THE APPROVAL OF THE REGIONAL MANAGER MUST BE OBTAINED BEFORE ANY ACTION IS TAKEN.

FEED WHEAT IS TO BE BINNED SEPARATELY FROM GP No. 1 AND GP No. 2 UNDER ALL CIRCUMSTANCES.

Graham Lawrence
N.S.W. MANAGER

GENERAL

RED WHEATS: Red Wheats (e.g. Canadian Selkirk) may be tendered for delivery and will be received into the **FEED WHEAT** category. There is a nil tolerance into all other categories.

DURUM WHEATS: Dural, Duramba, Durati or Kamilaroi is to be received only at nominated stations. Acceptability will be determined by the PWA. Lower grade Durum as per instructions.

SOFT BISCUIT WHEAT
1. Nominated Stations in M.I.A.
2. Variety, quality etc. as determined by flour millers.

HOW TO USE THE CALCULATION TABLE

A. Refer to the table under Quality Details and find the defect/s applicable to the sample.
B. Follow this line across to the right and ensure the correct line is selected under GRADE details.
C. Go to the column to which the Chondrometer weight refers and apply the GRADE shown.

S.T.A. Means "Subject to Assessment" by the State Manager of the Australian Wheat Board. If so requested, samples of S.T.A. wheat should be sent to the Head Office of the G.H.A. for his attention, and the wheat must not be received pending advice as to classification and dockage. This includes assessment as to whether or not wheat is suitable for receival into Feed Category.

VARIETIES

PRIME HARD: Banks, Cook, Gatcher, Hartog, Hybrid Titan, Shortim, Songlen, Sunco, Suneca, Sunkota, Sunstar, Timgalen.

NORTHERN & SOUTHERN HARD No. 1 & 2: Banks, Bass, Condor, Cook, Flinders, Gatcher, Harrier, Hybrid Titan, Kite, Osprey, Shortim, Skua, Songlen, Sunco, Sundor, Suneca, Sunelg, Sunkota, Sunstar, Takari, Terra, Timgalen, Timson, Vulcan.

Included in Silo Group 1 & 2: Hartog*, Comet, Vasco
Included in Silo Group 3: Eagle, Hartog*, Comet, Vasco, Sunbird
Included in Silo Group 4, 5 & 6: Sunbird

* HARTOG is only acceptable into the PH/AH Categories at sites that have protein testing available.

PAYMENT ENQUIRIES:

AWB TOLL FREE NUMBER: (008) 11 2413

APPENDIX C

INFESTATION POLICIES AND PRACTICES

A. Overview

In the early 1960s Australia was threatened with the loss of major wheat exporting markets due to high incidence of insect infestation in export shipments. The Australian wheat industry, in response to this situation, requested the government to enact legislation that would ensure continued access to these markets. As a result, export grain regulations were promulgated in 1963.

These regulations require that wheat, barley, oats, and sorghum be free from live infestation and otherwise fit for export. Originally only wheat was covered. Barley and oats were included in 1968 and sorghum was added in 1970. The inclusion of these grains resulted from the fact that they were being handled in the same facilities with wheat and cross-infestation was occurring.

The export grain regulations state that wheat being exported as well as the vessels transporting the grain must be inspected. The Department of Primary Industry (DOPI) is responsible for inspecting export terminals, other facilities that store grain destined for export, empty vessels used for transporting grain, and the grain being exported.

Currently the Export Control Act of 1982 provides the legislative basis for DOPIs inspection responsibilities. This act took effect on January 1, 1983 and combined the inspection activities contained in the Customs Act of 1901, the Commerce (Trade Descriptions) Act of 1905, the Quarantine Act of 1905, and the Navigation Act of 1912.

B. Department of Primary Industry (DOPI)

The Export Control Act provides DOPI with inspection authority for a wide range of agricultural products. The Export Inspection Service (EIS) of DOPI is the single entity responsible for inspecting meat, fish, dairy products, eggs, honey, grain, fresh and processed fruits and vegetables, and other horticultural and plant crops. In 1984 DOPI published regulations entitled "Grain, Plants, and Product Orders" to implement these programs.

EISs primary role is to ensure exports meet acceptable quality and hygiene standards along with being correctly described in trade descriptions. Exporters are responsible for presenting commodities that meet the conditions and restrictions specified in the "Grain, Plants, and Product Orders." These requirements are applied to commodities for which phytosanitary and official certificates are required.

Authority for providing phytosanitary inspections for Australia under the International Plant Protection Convention (IPPC) has been delegated to EIS. This requires EIS to inspect and certify that "the plants or plant products described above (on the certificate) have been inspected according to appropriate procedures and are considered to be free from quarantine pests, and practically free from other injurious pests; and that they are considered to conform with the current phytosanitary regulations of the importing country." In order to carry out this responsibility, EIS has authorized individual state departments of agriculture to perform inspections on their behalf.

EIS interprets the terms "free from" and "practically free from" pests to mean nil. In other words, the tolerance for live insects and pests is zero. This interpretation is further expanded to include zero tolerances for rodent carcasses and excreta along with particular weed seeds and other pests that are subject to quarantine by importing countries.

The bases for EIS policies are outlined in a 1981 report by the Working Party on Infestation in Grain (Report of SCA Working Party on Infestation in Grain 1981). This group was set up by the Standing Committee on Agriculture to examine alternative pest control strategies and provide recommendations so that Australia could continue providing insect free grain. According to the report, 79 percent of Australian grain export shipments were accompanied by phytosanitary certificates in 1980.

The Working Party concluded that Australia should not issue phytosanitary certificates on grain that is known to contain live insects. This conclusion was based on the percentage of shipments requiring phytosanitary certification and a statistical analysis of their sampling systems. This analysis determined that, even when no insects are found, a high probability exists that shipments actually contain insects. The Working Party felt that in order to comply with the terms "free from" and "practically free" as spelled out by the IPPC, a zero tolerance had to be maintained.

Specific sampling rates, detection, and rejection procedures have been established by EIS. Their sampling rate is 2.25 litres per 33.3 tonnes. Each sample is examined for live insects, and when one live insect is found, the grain is rejected. The analysis of these rates and rejection levels is presented in the Working Party paper. For the purpose of this analysis, they assumed a random insect distribution in the grain being sampled. Based on this assumption, they concluded that their sampling rates would yield the following detection probabilities:

- 95 percent of 2,000 tonne bins containing 25 insects per tonne would be detected;
- 95 percent of 2,000 tonne bins containing three insects per tonne would <u>not</u> be detected;
- the chance of of detecting the only insect in a 2,000 tonne bin is 1 in 10,000.

They also examined the effect of increasing sample size and the current rejection levels. The results of these analyses follows:

Infestation Levels at Which One or More Insects Can Be Expected to be Found at Varying Sample Rates

Sample Size Kg/100 Tonnes	Infestation Level (Number Per Tonne) 90% Confidence	95% Confidence
1.25	77 or more	100 or more
2.50	38 or more	50 or more
5.00	19 or more	25 or more (current)
10.00	10 or more	12 or more
20.00	5 or more	6 or more
40.00	2.5 or more	3 or more

Infestation Levels at Various Sample Sizes When no Insects Will be Detected

Sample Size Kg/100 Tonnes	Insects Per Tonne
1.25	2 to 100
2.50	1 to 50
5.00	0.5 to 25 (current)
10.00	0.25 to 12

95 Percent Confidence of Detecting One or More Insects With An Infestation Level of "n" Insects/Tonne

Number of Insects/Tonne	Sample Size Kg/100 Tonnes
0.1	1,500
0.5	30
1.0	15
5.0	3
10.0	1.5

Rejections After the Detection of One or More Insects Per 2000 Tonne Bin

Rejection Level	95 Percent Confidence Number of Insects/Tonne
No insects found	0.5 to 25 (this is the current system)
1 insect found	3 to 40
2 insects found	7 to 52.5

After reviewing these analyses, the Working Party recommended that the current sampling rate and rejection level be maintained. They felt that changing the sampling rate would be costly and that relaxing the zero tolerance would run counter to the IPPC requirements that signatory countries should control insects and pests in exported products.

C. Inspection Procedures

EIS carries out its enforcement and inspection responsibilities in four distinct areas: (1) registering facilities handling export grain; (2) inspecting facilities handling export grain; (3) inspecting grain in storage and as it is being loaded for export; and (4) inspecting vessels used to transport exported grain.

Registration of Handling Facilities. The purpose of the registration process is to ensure that an effective sanction, deregistration, exists when handling facilities continually fail to maintain the standards of cleanliness and hygiene required by law. All facilities with export volume exceeding 10,000 tonnes a year or where inspectors are present for more than 30 working days are required to be registered. Registration is optional for facilities that do not meet these requirements.

All registered and unregistered facilities that handle export grain are required to maintain their facilities in a clean condition which will prevent infestation or contamination. The main requirements for registration are that the facilities be designed, equipped, and operated hygienically; that a program of hygiene and pest control be developed; and records regarding cleaning and pest control measures be maintained. Failure to comply with these requirements, as evidenced by periodic inspections, is cause for deregistration.

Facility Inspections fall into three categories: (1) registration and re-registration inspections; (2) randomly inspecting registered facilities; and (3) randomly inspecting unregistered export facilities.

Registration and Re-registration Inspections are conducted on a yearly basis. The inspection entails a thorough examination of the facilities and surrounding areas for live insects and rodent infestation. The following areas are examples of areas inspected during this process:

- Bins and bin valves
- Conveyor belts
- Road and rail receipt hoppers along with the track areas at these locations
- Distributors and trippers
- Dust removal equipment, storage bins, and loadout areas
- Areas immediately surrounding the facility
- Shipping gallery and load out spouting

Records maintained by each facility regarding their hygiene and pest control programs are also examined. These records consist of the cleaning and pest control measures taken and must include sufficient detail to enable the inspector to monitor the program's effectiveness. Areas that must be included in these reports are:

- The areas and equipment along with the dates that nonroutine cleaning occurred.
- Grain treatment for pest control for nonroutint treatement which includes identity or location of the grain treated, dates, chemical name and formulation, and application rates.
- Structural treatment for pest control identifying the areas treated, the dates, chemical name and formulation, and application rate.

Random Inspection of Registered Facilities are conducted periodically throughout the year. Inspection must be conducted every two months but can be extended for up to four months when inspection staff is not available. Facility managers are provided with 24-hour advance notice so records can be updated and facility staff can be available to accompany the inspectors. The inspection is confined to the grain path from the bin to the vessel or railcar and the required hygiene and pest-control records. Other specific areas can be examined if there have been problems noted in previous inspections.

Random Inspection of Unregistered Facilities consist of full inspection on a monthly basis if they have poor cleanliness histories, once every two-three months for marginal records, and once or twice a year for good records.

Inspecting Grain and Storage Facilities for Infestation. The Australian Wheat Board (AWB) and the Bulk Handling Authority (BHA) are responsible for delivering insect-free grain to the customer. EIS is responsible for inspecting the grain for inspection as the grain is being loaded on the vessel. Both groups have therefore developed sampling and inspection programs for detecting infestation.

EIS Inspection. EIS has established a zero tolerance for live insects based on a sampling rate of 2.25 litres per 33.3 tonnes. Inspectors employed by each State Department of Agriculture are present at export facilities and conduct onsite inspection as the grain is being loaded into the vessel.

Samples are drawn one of two ways depending on the facility. Where automatic sampling devices have been installed, they must be located in a position so that grain may be returned to the facility when infestation is detected. Automatic samplers are standardized to obtain the prescribed portion size for analysis. This is accomplished by standardizing each sampler to collect 2.25 litre every five minutes based on a grain flow rate of 400 tonnes/hour.

Where automatic samplers have not been installed, samples are drawn manually using a dipper or cup. These samples can be obtained either on a belt directly under a bin or in the gallery from the shipping belts. The cup size is 0.5 litre and is inserted into the grain stream with the opening facing the opposite direction of the grain flow. Several cup fulls are then drawn in order to obtain the correct portion size.

Grain is collected, sieved, and examined for live insects regardless of sampling method. The material passing through the sieve as well as the grain

remaining on the sieve is examined for live insects in all life stages (adult, larva, and pupae). Mechanical sieving devices have been installed in some locations. These devices consist of a screen positioned at the slight angle that moves in a side-to-side and top-to-bottom motion. Grain is placed on the top of the sieve and the sieving action works the grain down the incline. Samples obtained with an automatic sampling device are fed directly to this device by opening the valve in the bottom of the collection box. Each full cup is placed on the sieve when the sample is drawn manually.

The shipping belt is immediately stopped when one live insect is found. Two samples are then drawn from the grain remaining on the shipping belt. The samples are drawn between the sampling point and head of the belt. The grain on the shipping belt can be delivered to the vessel if no live insect is found. When one live insect is found, all the grain on the belt must be returned to the facility. Grain held in scales and garners must be returned to the facility regardless of whether insects are found on the shipping belt. All bins that were open and feeding the shipping belt at the time the insects were found are rejected and the grain must be treated before it can be used.

In an effort to reduce the possible levels of infestation that can be loaded and never detected, EIS applies what it calls the "Twenty Percent Rule." This procedure requires inspectors to calculate the amount of grain that is delivered to a vessel from bins prior to their rejection. When the total amount of grain loaded from these bins exceeds 20 percent of the total cargo, loading is stopped. The Chief Entomologist at EIS is then notified and, in conjunction with the local BHA, determines the course of action to be taken.

AWB and BHA Inspections. Both the AWB and BHA use the sampling rate and zero live insect tolerance established by EIS. BHA inspection takes place at a number of points throughout the handling and storage system. All grain received into BHA facilities from farmers is sampled and inspected for insects. At approximately one-month intervals, all grain being stored is inspected. Grain being loaded into railcars and trucks for shipment is also inspected. Grain shipped from one facility to another is inspected upon receipt and again as it is loaded out.

All grain received from the farmer by truck is probed and the sample sieved for infestation. The grain is rejected when one insect is found. The farmer is then responsible for treating the grain. Every month, grain being stored is surfaced probed, samples are examined for live insects, and grain temperature is determined. The grain is treated when one live insect is found. Grain stored in vertical silos is turned every two months and sampled for the presence of live insects. Again, grain is treated if it contains one live insect.

As grain is loaded into railcars and trucks, a sample is taken from the grain stream as it is discharged from the loading spout. When one live insect is found, the railcar can either be unloaded and treated or shipped to another facility unloaded and treated. Treatment of grain in railcars is prohibited. Sampling of railcars being unloaded is accomplished by placing a sieve under the railcar hopper. The sample is taken immediately after the hopper is opened. If one live insect is found, the bin where the grain is stored must be treated.

Vessel Inspection

Empty vessels used for transporting grain are required to be free from insects, pests, or contaminants and in such a condition that they will not otherwise affect the cargo. The inspections are generally carried out at the loading berth just prior to loading. In some states, the inspections can be harried out at anchorage. All vessel holds, regardless of whether they will stow grain, must pass inspection.

Inspection procedures require an inspector to enter each hold and examine it for cleanliness. In order for a hold to pass, it must meet the following standards of cleanliness:

- Zero live insects and rodents
- Substantially free from residue or previous cargoes
- Free of residue such as flaking paint or rust scale
- Dry and odor free
- Infestation in holds that will not carry grain must be controlled to the extent that cross-contamination will not take place
- Ship shore rooms must be free of infestation to the extent that cross contamination of grain in the hold will not occur
- Deck areas, mast houses, etc. must not present a cross-infestation risk

For each inspection a "Ship Inspection Report and Treatment Order" is issued (Document 1)[1]. When a hold is not in compliance, the inspector completes the treatment portion of the report. The report is used to inform the ship's master of the conditions that are not in compliance and the actions that must be taken to correct the problems. When chemical treatment is required, the inspector cannot dictate the chemicals to be used. Inspectors are required to provide a list of approved treatments based on whether the hold contains light or hevy infestation. Light infestation is defined as less than 50 live insects, excluding the Trogoderma spp., in any storge (adult, larvae, or purae). More than 50 live insects is considered heavy infestation. In the case of Trogoderma spp., light infestation is one or two live insects in any life stage with heavy being three or more.

Three types of chemical treatment have been approved for treating infested ship holds: fumigation, spraying, or fogging. Fumigation is defined as treatment with a poisonous gas that does not include insecticides propelled by carbon dioxide, smoke generators, fogging, or spraying. Spraying entails a high volume treatment using an oil-base or water base insecticide. Fogging is

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[1]Documents related to infestation are contained at the end of this appendix.

a high volume treatment using oil-based insecticides applied by equipment that breaks the insecticide droplets into minute particles. In holds that will carry grain, the type of treatment follows:

- Light infestation - spray the entire hold (except Trogoderma spp.) then fumigate

- Heavy infestation - fumigate

- After checking and fumigation fails - refumigate

The following insecticides have been approved for treating empty ship holds: Pyrethrins (with or without synergists such as piperonyl butoxide); Dichlorvos; Bromophos; Fenithrothion; Diazinon; Propoxur; and Azamethiphos.

Methyl bromide is the only fumigant approved for treating empty ship holds. The application rate by vessel type follows:

- Bulk carriers: not less than 24 oz./1,000 cubic feet for a minimum exposure period of 16 hours.

- Converted bulk carriers and 'tween deck ships: not less than 32 oz./ 1,000 cubic feet for a minimum exposure period of 16 hours.

- For high levels of infestation in these ships: not less than 32 oz./ 1,000 cubic feet for a minimum exposure period of 24 hours.

- In the case of Trogoderma spp.: not less than 80 oz./1,000 cubic feet for a miniumu exposure period fo 48 hours.

All holds are re-examined after they have been cleaned or treated to determine that the appropriate actions have taken place and the hold complies with the standards. A gas-free certificate is required when holds have been fumigated before inspectors can enter the hold. If insects are found in a hold after it has been sprayed or fogged, no further inspections can take place for four hours after further spraying or fogging.

D. Insecticide, Fumigation, and Other Insect Control Measures

All chemicals used to treat infested grain must be approved by the Australian government. In addition, each State has control over the chemicals and labeling requirements within its boundaries. (See Document 2, for an example of a phosphine label for New South Wales.) Furthermore, the AWB provides guidelines on chemical usage and application rates. This has resulted in some chemicals being approved for use on a national level while being banned in some states. In other instances, such as phosphine, each state has approved the chemical; however, each state may have different labeling requirements. In transit fumigation, either in vessels or railcars, is prohibited.

The BHAs require empty storage spaces be cleaned and sprayed with a contact insecticide prior to the receipt of grain. Grain that will be in storage more than a certain period must be treated with an insecticide upon

receipt. In the case of New South Wales, this period is four weeks. Insecticides have been approved for use on specific insect species in some states. When reviewing the New South Wales publication (Document 3), protectants are broken down into four categories: A, B, C, and D. Depending on the insect species present, chemicals from one or more of these categories may be required.

For the purpose of this section, the following Australian definitions for protectant type insecticides and fumigants are provided along with a listing of the approved chemicals.

Protectant Type Insecticides are insecticides which are applied to grain in an admixture and provide residual protection up to the point of consumption.

Approved Insecticides

- Chlorpyrifos-methyl
- Fenitrothion
- Pirimiphos-methyl
- Bioresmethrin
- Carbaryl
- Fenvalerate
- Permethrin
- Phenothrin
- Pyrethrins
- Methacrifos
- Dichlorvos

The following insecticides, by state, were being used in 1981 according to the Working Party Report. (Document 4 for recommended insecticides for New South Wales.)

Insecticide Use by State

- Fenitrothion and bioresmethrin (Queensland, New South Wales, and Victoria)
- Fenitrothion (only in South and Western Australia)
- Pyrethins on special shipments (New South Wales in place of bioresmethrin)
- Dichlorvos (South Australia and New South Wales on grain rejected for export)

Fumigants are gases or liquids which are toxic to all stages of insect life, penetrate the commodity readily, and which can be removed by airing the commodity.

Approved Fumigants, Including Controlled Atmosphere

- Methyl bromide
- Phosphine
- Hydrogen cyanide
- Carbon disulphide
- Carbon dioxide
- Nitrogen

The following fumigants, by state, were being used in 1981 according to the Working Party Report. (See Document 4 for recommended fumigants for New South Wales.)

Fumigant Use by State

- Methyl bromide (Queensland and New South Wales)
- Phosphine (South and Western Australia, New South Wales, and Queensland
- Hydrogen cyanide (Western Australia)
- Modified or controlled atmosphere using nitogen and carbon dioxide (Western Australia and to a limited degree in Queensland, New South Wales, and South Australia)

Aeration is being used in many location to control infestation. According to the Working Party Report, in 1981 25 percent of total Australian storage was aerated. This breaks down to 60 percent of the storage in New South Wales, 38 percent in Victoria, and 30 percent in South Australia. Queensland was planning on installing aeration in suitable facilities. Western Australia did not have aeration and no plans for installation were forthcoming.

Working Party Recommendation. The Working Pary's goal in 1981 was to recommend actions that could be taken to ensure insect-free grain. Any recommendation was to take into account the elimination of chemicals for insect control due to insect resistance and the problem of pesticide residue. The Working Party's recommendation was, "Institute a program to modify three quarters of the country storage system to methods of pest control which do not rely in any way on the use of chemical protectants. Until the program of modifying storages is complete all State Authorities should continue to develop strategies aimed at extending the useful life of protectants." This recommendation was to begin in 1982 and be completed in 10 years.

All indications are that this recommendation was adopted. Research began at CSIRO on technologies for sealing upright silos, flat warehouses, and bunkers so they could be fumigated. This technology was developed and implemented at facilities suitable for sealing. Upright silos were fitted with recirculation for methyl bromide fumigation. Metal silos which are gas tight, fitted with recirculation, and can be pressure tested prior to fumigation have been constructed and installed. Modified atmosphere technology was refined and implemented in some locations. Research continues on other technologies for controlling infestation (see research section of this appendix).

Residue Testing

There is a major concern on the part of the Australians regarding pesticide residue levels in grain. These concerns are generated from the continued use and dependence on protectant type chemicals which leave a residue and public, as well as importing countries, concerns regarding these residues. Great emphasis is being placed on marketing grain that meets importing countries specific residue level requirements and requirements adopted by the Codex Alimentarius Commission.

Two groups continually monitor grain for the presence of pesticide residue: the Australian Government Analytical Laboratory of EIS and the AWB Laboratory. Samples from each export cargo are collected by EIS and BHA inspectors. These samples are then forwarded to their respective laboratories for residue testing. As part of the BHAs ongoing infestation inspection, samples examined at country terminals are sent to the AWB laboratory for residue testing. In addition, the AWB has developed a random survey procedure for further identifying potential problems. Both laboratories use gas chromatography technology for testing residue and test for residues from all approved chemicals along with EDB and Carbon Tetracloride. Individuals at the AWB Laboratory indicated that approximately 17,000 residue tests were performed last year.

No data was collected on the acceptable residue levels for insecticides. Data on the acceptable fumigant residue levels for raw grain is as follows:

- Methyl bromide - 50 ppm bromide ions
- Phosphine - 0.1 ppm expressed as undecomposed PH3
- Hydrogen cyanide - 75 ppm
- Carbon disulphide - 10 ppm

E. Research Areas

The Stored Grain Research Laboratory funded by CSIRO, AWB, and the BHAs carries out research and development work aimed at ensuring that Australian grain is free from pests. This laboratory pioneered the development of PVC lined bunkers that can be fumigated with phosphine; assisted in the evaluation of 12 alternative chemicals to replace malathion; developed better techniques

for applying insecticides; played a key role in introducing aeration; refined methods for controlled atmosphers including development of a mobile generator for providing oxygen deficient atmosphere; and developed methods for sealing silos and warehouses.

Currently two major research areas are under investigation: flow-through phosphine fumigation and fluidized bed heating.

Flow-through phosphine fumigation is being examined for use in silos and warehouses that cannot be sealed and made gas tight. This research involves using aluminum phosphine generators to provide constant low level phosphine concentrations to unsealed silos or warehouses. According to CSIRO scientists, this technology has been tested in several unsealed silos and warehouses with great success. Work is continuing on this technology with the hope of full acceptance shortly.

Fluidized bed heating involves rapidly heating the grain to kill insects followed by rapid cooling to safe storage levels. The thrust of this research is to develop continuous flow in line systems compatible with handling rates for integration into existing facilities. A pilot plant has been built and tested with good results. The pilot plant was designed for a 100 tonne/hour capacity. CSIRO scientists stated that in test trials, this plant was able to successfully handled 200 tonne/hour. According to literature provided by CSIRO a 500 tonne/hour unit is the minimum capacity required for successful integration. Literature published in 1984 indicated that this size unit would cost $1 million (U.S.) to construct.

ORIGINAL

Export Control Act 1982

Document 1

SHIP INSPECTION REPORT AND TREATMENT ORDER

6276

A. REPORT

Name of ship: "KOOKABURRA" Registered Call Signal or Official Number: JBLT

Previous Names: None

De rat certificate, date and place of issue: Oriental Shipping Company

Details of loading: 1. Port of Sydney Expected Tonnage: 22,000 Destination: Japan

2. Port of Newcastle Expected Tonnage: 10,000

Details of last two cargoes:

1. Commodity: Iron Ore Origin: Peru Date: 10/84

2. Commodity: General cargo Origin: USA Date: 8/84

Details of last grain or oilseed cargo

(where applicable): Type of grain: Maize, Wheat, Sorghum Origin: South America Date: 2/84

Agent: Smith & Jones Ltd Marine Surveyor: B.Border

Inspectors: Capt. Hook Place of Inspection: 17/12/84

Site of Inspection	Hold 1 LH	Hold 1 TD	Hold 2		Hold 3		Hold 4		Hold 5	
Hatch covers	C	C	C	C	C	C	C	C	C	C
Deck beams	LG	LG	HG	HG	LG	LG	C	C	C	C
Cable casings	-	LG	-	LG	-	C	-	C	-	C
Pipe casings	G	G	G	G	G	C	C	C	C	C
Ventilation trunking	-	-	-	-	-	-	-	-	-	-
Steel bulkheads	C	C	C	C	S	S	C	C	C	C
Spar ceiling	-	-	-	-	-	-	-	-	-	-
Exposed metal surfaces	C	C	C	C	C	C	C	C	C	C
Steel tank-top ceilings	LG	-	HG	-	LG	-	C	-	C	-
Bilges	G	-	GW	-	G	-	C	-	W	-
Dunnage	-	C	-	C	-	-	-	-	-	-
Total infestation for space (L or H)										

Storerooms	L	Galley areas	-	Focsle lockers	LG	Mast houses	C	Weather deck	G	Other	-

Key: L Light infestation; H Heavy infestation; T Trogoderma sp; G Grain; M Mineral residues; R Rodents; S Scale; W Water; O Other; C clear (all defects)

NOTE: More than one letter indicates more than one condition present e.g. LS indicates light infestation of insects plus scale in inspected area.

Residue type: Maize, rice, wheat, sorghum, rust scale

B. TREATMENT ORDER

To the Master: You are advised that the ship is not to be used for the export of prescribed goods until the action indicated in the following ticked boxes has been taken, after which a further inspection will be required.

	Hold 1 LD	Hold 1 TD	Hold 2		Hold 3					
Clean*	✓1,2,4	✓1,2,4	✓1,3,4	✓1,3,4	✓1,2,4	✓1,2,4				
Descale	-	-	-	-	-	-				
Dismantle/Remove	-	-	-	-	-	-				
High Volume Spray	✓	✓	-	-	✓	✓				
Gas Fumigate			✓	✓						

Tick (✓) action required

Key*: 1. residues to be retained for further inspection: 2. residues to be removed prior to treatment: 3. residues to remain in hold during treatment: 4. on completion of action, residues to be handed to a Quarantine Officer/retained on board for disposal at sea.

Additional treatment and remarks (continue on continuation sheet if necessary): Marine Surveyor ordered descaling in No. 3 Hold and drying of No. 5 bilge wells. 20 bags of grain and scale removed under Quarantine Supervision.

Treatment ordered by Marine Surveyor (tick appropriate box): Clean ☐ Descale ☑ Other ☑

Date and time of issue: 10.15 am 17/12/84 Inspectors Signature: P. Piper

C. (Office Use Only)

DETAILS OF TREATMENT

Spray or Bait 1. Chemical used: Fenitrothion 2. % active ingredient: 1%

3. Treatment carried out by: Personalised Pest Control

Fumigation 1. Fumigant used: Methyl bromide 2. Dosage: 32 gm/m3

3. Exposure period: 24 hours 4. Fumigation carried out by: Personalised Pest Control

Times and dates for all inspections and reinspections: 6.30 - 10.15 am 17/12/84 8.00 - 11.00 am 19/12/84

Insect sample No. holds etc. 2016 Insect sample No. storerooms, galley areas etc. 2017

E248—8/84

Document 2

POISON

POISON

NOT TO BE TAKEN
KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS
BEFORE OPENING

Fumitoxin®

Coated Insecticide Tablets

ACTIVE CONSTITUENT:
550 g/kg ALUMINIUM PHOSPHIDE
yielding 330 g/kg phosphine

For control of pests which infest stored commodities, specified processed foods and animal foods as per Directions for Use Table.

Distributed by:
Nufarm Ltd.,
103-105 Pipe Road, Laverton North,
Victoria, 3028
For:
Pestcon Systems Inc.,
902/10 Martin Place
Sydney, NSW 2000

Contents: 100 Tablets

SPECIMEN LABEL

DIRECTIONS FOR USE: FOR ALL STATES

For control of eggs and/or larvae pupae, and/or adults of the following stored product pests.
Angoumois grain moth, bean weevil, cadelle, cigarette beetle, coffee bean weevil, confused flour beetle, dried fruit beetles, flat grain beetles, granary weevil, Indian meal moth, lesser grain borer, maize weevil, Mediterranean flour moth, merchant grain beetle, rice weevil, rust red flour beetle, sawtoothed grain beetle, skin & hide beetles, spider beetles, stored product mites, tobacco moth, tropical warehouse moth, warehouse beetle.
For control of the larger wax moth and the lesser wax moth in stored beehives, supers, and other beekeeping equipment. Treatment for the above pests at the specified rates will kill any cockroaches, rats and mice present.

COMMODITY	Structures/Enclosures	APPLICATION*** Basic Rate kg phosphine per m³:	Dosage	Minimum Exposure Periods §
Raw cereal grains (such as barley, maize, millets, oats, rice, rye, flint sorghum, triticale, wheat) and other food commodities (such as flour, and other milled cereal products, breakfast cereals, dried fruits, dried vegetables, other dried foods, peanuts, oilseeds, cocoa and coffee beans), and seeds for propagation, and bulk stockfeeds.	All well-sealed structures*	1.5	3 tablets/2m³	(a) 10 days when commodity temperature is 15°C to 25°C. 7 days when commodity temperature is above 25°C.
	Small structures/enclosures of less 300 tonnes (375 m³) capacity which cannot be well-sealed.			
	• bagged wood silos, farmyard sheds, bag stacks under plastic sheeting.	5	10 tablets/2m³	(b) 20 days for surface-only application in structures greater than 375m³ capacity (e.g. 300 tonnes grain).
	• open-topped concrete silos without plastic sheeting**	2.5	5 tablets/2m³	
Raw cereal grains (as above)	Well-sealed plastic-covered storages of not less than 1000 tonnes capacity.	0.8	3 tablets/5m³	20 days
Tobacco	Bales, hogsheads, cases in well-sealed fumigation enclosures.	1.5	3 tablets/2m³	7 days
	Well-sealed empty warehouses, elevators, stores, etc., stored beehives, supers, and equipment.	1.5	3 tablets/2m³	10 days when temperature is 15°C to 25°C. 7 days when temperature is above 25°C.

*Fumigation chambers, well-sealed silos or sheets or buildings, and other fumigation enclosures made gas-tight with gas-proof sheeting. Well-sealed stores sealing by approved methods (see SCA Ext. Committee "Storage Recommendations for the Fumigation of Grain with Phosphine" p.25 i.e. permanent sealing of porous surfaces, seams, cracks and temporary sealing of inlets and/or outlet, valves, doors, windows and hatches.
NOTE STRUCTURES GREATER THAN 375m³ (300 TONNES) CAPACITY ARE EXPECTED TO BE WELL-SEALED. IF THEY ARE NOT, FUMIGATION MAY GIVE INADEQUATE CONTROL.
**Structures which cannot be well-sealed should not be treated with products designed for surface-only application (such as strips pieces).
***Phosphine application rates are based on the internal volume of the structures to be fumigated, they apply equally to full or empty structures, and they apply to all commodities. Commodity expanded rates (grossed) should only be used when the commodity storage factor is known, they apply only when the storage structures are full or nearly full or when part-filled structures are dosed on the tonnage equivalents of their internal volumes. The calculated commodity equivalent dosage must be based on the rate per volume.
§ Minimum exposure periods should start from the time of completion of application, e.g. the time taken to fill a storage with grain dosed tablets is not part of the exposure period.

NOT TO BE USED FOR ANY PURPOSE OR IN ANY MANNER CONTRARY TO THIS LABEL UNLESS AUTHORIZED UNDER APPROPRIATE LEGISLATION

WITHHOLDING PERIOD: ALLOW A PERIOD OF 2 DAYS AFTER COMPLETION OFVENTILATION BEFORE USING TREATED COMMODITIES FOR HUMAN CONSUMPTION OR FOR STOCK FOOD. TREATED COMMODITIES MAY BE SAFELY

GENERAL INSTRUCTIONS

"DO NOT USE ON COMMODITIES IN TRANSIT."

Precautions
Fumitoxin should never be used for fumigation purposes in inhabited structures, when temperature of commodity is below 15°C, when grain moisture content is less than 9% or relative humidity within the structure is less than 25%.
Do not apply as surface-only treatment if the structure is not well-sealed or if the headspace of a structure whose height exceeds twice the width, is less than 10% of the internal volume and its temperature will exceed 45°C.
Fumitoxin tablets when used as directed will not adversely affect germination.
Fumitoxin tablets yield a residue of aluminium hydroxide (inert material).
Fumitoxin when applied to grain, gives a slow initial release of phosphine which will not exceed the safe level within 4 hours. Release is complete within 3 to 5 days. Do not use on grain which will be transported before completion of the exposure period recommended for exposure plus ventilation.

Fumigation of Packaged Products under Tarpaulins
Cover stack with polyethylene and place tablets on kraft paper in spaces to be fumigated so that polythene cannot cover them. Never pile tablets on top of each other, place them without touching each other. Ensure thorough sealing of edges of sheet on ground. Post warning signs on all four sides of stack. Ensure good cross ventilation around stacks during working hours.

Ventilation – On Completion of Exposure Period
Phosphine disperses rapidly. Minimum ventilation periods are as follows:
Structures containing treated commodities:
—with throughflow and forced draught from flush proof fan operated for two hours on and two hours off for 12-24 hours depending on size of structure.
—with throughflow and natural draught for structures of 300 tonnes or greater capacity, not less than 2 days depending on structure size openings and prevailing wind speed. For structures of less than 300 tonnes capacity not less than 5 days.
Tobacco in bales, not less than 2 days. In cases and hogsheads not less than 3 days.
Well sealed, plastic covered bunker storage at not less than 1,000 tonnes capacity, 2 hours after removal of covering.
Beehives, supers and other beekeeping equipment, not less than 2 days.

For Fumigation of Vertical Storage
Ascertain ventilation facilities for basement. Open containers in open air and apply tablets by hand or on belt in headhouse. Warning sign should be placed on the bench cover and discharge spout of each treated bin. Following application basement and headhouse should be checked before work starts.

For Fumigation of Bulkheads and Flat Storage
Check storage for tightness. Open containers in open air. Apply tablets using probes which should be inserted at 1-2m intervals horizontally in both directions. The tablets will be dropped into probes as they are withdrawn. Cross ventilation should be provided during application. Covering surface of commodity with plastic sheets, reduces conversion corrosion. Sheets must be removed after fumigation is completed.

KEEP AWAY FROM WATER AND OTHER LIQUIDS. WATER AND MANY LIQUIDS CAUSE QUICK RELEASE OF PHOSPHINE. KEEP AWAY FROM NAKED FLAME.
After fumigation remove tablets and ensure residual phosphine is destroyed before disposal e.g. by scavenging with dilute acid or soapy water until bubbling ceases. Carry out in open air.

Storage
Store in a cool, dry, well ventilated, locked area out of reach of children or irresponsible persons and away from all habitation.

Disposal of Containers
Containers should be collected, flushed several times with water, crushed and burned. DO NOT contaminate dams, waterways or drains with saturated dust residue or empty containers.

SAFETY DIRECTIONS

Warning: In moist air Fumitoxin tablets release dangerous phosphine gas slowly but when wet release phosphine quickly. Take top off container in open air. Use entire contents in one operation if possible. If not, reseal container tightly with gas-proof screw stopper. Wear rubber/neoprene or PVC gloves when handling Fumitoxin tablets to avoid contact with skin. Wash hands thoroughly after use and before eating, drinking or smoking. Avoid breathing the gas or any dust rising after treatment. If exposure cannot be avoided wear either a respirator with combined gas and dust cartridge or breathing apparatus with air supply. Protect by sealing or otherwise removing electrical and electronic equipment (motors, switches, fire alarm systems, etc.) containing copper/copper alloy components. Phosphine corrodes copper based materials.

FIRST AID

If poisoning occurs contact a doctor or Poisons Information Centre immediately. Symptoms of phosphine poisoning include nausea, tremor, a feeling of oppression in the chest, headaches and stomach pains. Affected person should be taken immediately into the open air and given oxygen treatment. Apply artificial respiration if not breathing. Place person in a flat position and give absolute rest. DO NOT administer any milk, butter, oils (castor oil) or alcohol.
NOTE TO DOCTORS

Document 3

Department of Agriculture
New South Wales

Agdex
100/615

Insect pests of stored grain

Insecticide and fumigant recommendations

Supplement to Agfact P1.AE.1 October 1987
Howard Greening, Senior Entomologist
Biological and Chemical Research Institute
Rydalmere

Insect control is essential for storing grain successfully. Clean and disinfest headers, grain handling equipment and storages, which should be sealable in case fumigation is necessary. Apply a protectant treatment to all grain when filling storages (except grain for delivery within 4 weeks to the Grain Handling Authority of N.S.W.). If the protectant treatment has been neglected and insects develop, destroy the infestation by fumigation.

Grain must be dry for safe storage. For wheat, barley, oats and triticale the grain moisture content should not exceed 12%; for sorghum the limit is 13.5% and for maize it is 14%.

The names of the insecticides and fumigants are given in terms of the standard common names of the active constituents in registered proprietary products. This name is given on the label, usually near the proprietary product name.

IMPORTANT: PESTICIDES AND ALLIED CHEMICALS ACT 1978.

Take not that you must use only a registered pesticide and it must not be used for any purpose or in any manner contrary to the directions on the label unless a permit hs been obtained under the Act.

Purpose	Insecticide	Mixing rate per litre of water	Notes
Disinfesting grain handling equipment (headers, augers, mobile bins) and grain storage areas. Clean thoroughly then apply the spray to wet all surfaces.	azamethiphos	5, 10 or 20 g of 500 g/kg wettable powder.	Azamethiphos is used at 5 g/L for grain handling equipment or at higher rates for storage areas, where 20 g/L is needed on concrete surfaces or for long control.
	OR pirimiphos-methyl plus carbaryl	11 mL of 900 g/L concentrate and 10 mL of 500 g/L concentrate.	Pirimiphos-methyl is used at 22 mL/L on unpainted concrete. Carbaryl is registered for treatment of grain storage areas only.
	OR dichlorvos	10 mL of 500 g/L concentrate.	Dichlorvos is used for rapid disinfestation, not long control. It is also applied by aerosol, for example as 5% dichlorvos in carbon dioxide. The Department of Industrial Relations classifies dichlorvos "moderately to highly hazardous" to the user. Product labels list precautions to be taken.
	OR fenitrothion 12 g/kg with carbaryl 8 g/kg dust product		Apply a light covering of dust to all surfaces. Surfaces must be thoroughly dry before treatment. Remove surplus dust before harvest by running the machinery with covers open.
	OR silica aerogel on diatomite (a sorptive mineral dust)		

Purpose	Insecticide	Mixing rate per litre of water	Notes
Grain protectant treatment applied to uninfested grain *to prevent insect development in storage.*	GROUP A		
	pirimiphos-methyl	4.5 mL of 900 g/L concentrate	Apply a spray treatment at 1 L of the diluted mixture per tonne, or a dust treatment as recommended below, to grain on intake to storage. Group A insecticides may be ineffective against lesser grain borer. For full protection, the required amount of a Group B insecticide should be added to the Group A mixture. Alternatively a Group C or Group D treatment may be used alone.
	OR chlorpyrifos-methyl	10 or 20 mL* of 500 g/L concentrate	
	OR fenitrothion	6 or 12 mL* of 1 kg/L concentrate	The continuing usefulness of this fenitrothion treatment may be in doubt in some areas because of fenitrothion resistance in saw-toothed grain beetle.
	GROUP B		
	bioresmethrin with piperonyl butoxide	10 or 20 mL* of 50 g/L concentrate	Beware of overdosing grain on intake to aerated storage. Refer to label.
	OR carbaryl	10 or 16mL* of 500 g/L concentrate	
	GROUP C		
	pyrethrins with piperonyl butoxide	53 mL of 60 g/L concentrate	This pyrethrin treatment prevents infestation largely by repelling grain insects. Pre-harvest cleaning and insect control in machinery and storages must be very thorough to ensure that the grain is insect-free initially. This is a particularly useful treatment for long-term, e.g. 2 years, protection of grain stored for farm use.
	GROUP D		
	fenitrothion 12 g/kg with carbaryl 8 g/kg dust product	—	Apply 0.5 kg dust per tonne to uninfested grain on intake to storage. Not suitable for sorghum seed.
	OR silica aerogel on diatomite (a sorptive mineral dust)	—	Apply 1 kg dust per tonne to uninfested grain on intake to storage. This is a useful treatment for long-term protection of dry farm-stored grain, but grain so treated is not acceptable to bulk handling authorities. Dust must be applied evenly to avoid auger chokes.

* The higher rate is for grain that will be stored for more than 3 months. The pirimiphos-methyl rate is not increased for long storage.

Purpose	Insecticide	Mixing rate per litre of water	Notes
Treating infested grain when fumigation is impracticable	dichlorvos	12 mL of 500 g/L concentrate OR 5.3 mL of 1.14 kg/L concentrate	Apply, at 1 L of the diluted spray per tonne, to infested grain as it is augered from one storage into another. Dichlorvos is vapour-active and kills insects within the grain kernels. It is toxic to man both as spray liquid and as vapour. The Department of Industrial Relations classifies dichlorvos "moderately to highly hazardous" to the user. Product labels list precautions to be taken. Leave the grain in storage for at least 7 days after treatment, before moving or using it. This dosage (6 ppm) is recommended for disinfesting grain destined for flour milling. If treatment for another purpose is necessary, at the higher dosage as per label directions, the grain should be held in store after treatment and should not be used for processing into food until the dichlorvos residue has declined to 2 ppm.
Grain fumigation (in storages that are as gas-tight as possible), *to destroy insect infestation in grain.* This is a salvage operation that should not be needed if a grain protectant treatment is used correctly.	phosphine, from tablets, pellets or sachets containing aluminium phosphide	5 g phosphine/m^3 (6 g/t) (for bolted steel silos and sheds or bag stacks under plastic sheeting; lower dosages are indicated on product labels for some other types of storages).	Add the fumigant tablets or pellets by probing or turning the grain. In bins designed for sealing and in well sealed bunker storages, sachets ("bag chains") or pellets in flat plastic/paper packs ("pre-pacs") may be laid on the grain surface. Fumigate for 10 days when the grain temperature is 15°C–25°C or 7 days if it is above 25°C. Ventilate for 5 days after unsealing the storage before moving the grain or entering the storage. For bunker storage where low dosages and very long fumigation periods are used, allow at least 2 hours' ventilation, after removing covers, before working with or moving the grain.
	OR carbon disulphide (not suitable if the temperature is less than 16° C).	120 mL/m^3 when the atmospheric temperature is in the range 16–21°C. Above 21°C use half the dose. Calculate dosage according to volume of the storage rather than the amount of grain in it.	Distribute the liquid carbon disulphide over the grain surface in storages or at the top of bag stacks covered with plastic sheeting. *This fumigant is highly flammable. No smoking. Liquid or vapour must not be exposed to fire, sparks (e.g. from electrical or welding equipment), embers or very hot metal (e.g. motor exhaust pipes).* Fumigate for 24 to 48 hours (not more than 24 hours for seed). Ventilate for 3 days after unsealing the storage.