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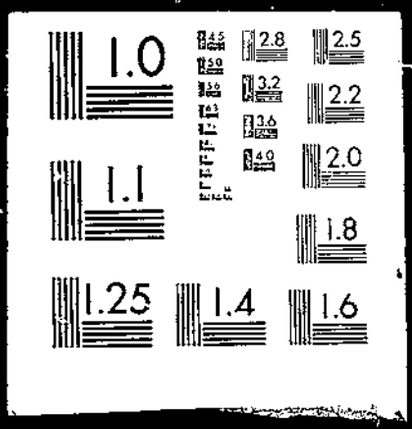

AUSTRALIA: GROWTH POTENTIAL OF THE GRAIN AND LIVESTOCK SECTORS

FOREIGN AGRICULTURAL ECONOMIC REPORT NO. 80
ECONOMIC RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE

ABSTRACT

The potential growth of Australia's grain-livestock sector is projected to 1975 under three main assumptions and on the basis of recent production patterns and trends, farm costs and returns, agricultural technology, marketing patterns and Government assistance, and price supply elasticities. Under assumption 1--constant prices (average of 1966/67-1968/69) and an elastic export demand--development of new lands and upgrading of cleared land would continue to 1975 and facilitate general expansion in agricultural production, especially in wheat. Under assumption 2--a 15-percent decline in grain prices and an elastic export demand--the decline in prices would cause some resources to be diverted from grain to livestock and hence increase production in beef, mutton, lamb, and wool. Delivery constraints on wheat and price changes under assumption 3--continuation of wheat quotas and selected price adjustments--would lead to significant increases in the production and export availability of feed grains, oilseeds, beef, and lamb.

Key Words: Australia, Grain, Livestock, Agricultural technology, Marketing, Price and supply elasticities, Projections.

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FOREWORD

This study evaluates the probable production potential of Australia's grain and livestock sectors by 1975. Similar studies have been made on Argentina and Canada. The three studies were conducted by teams of economists under the leadership of William R. Gasser, Chief of the Developed Countries Branch, Foreign Demand and Competition Division, ERS. They present a picture of trends and changes (both past and projected) in the production and trade of three of the world's major agricultural exporters and identify the major causes of the changes.

Joseph W. Willett
Director
Foreign Demand and
Competition Division
Economic Research Service

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States in Australia are New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania. However, for ease of discussion and presentation of data, the Northern Territory and the Australian Capitol Territory (A.C.T.) are referred to as States in this report.

Unless otherwise specified, all data presented in this report are in terms of Australian currency and weights and measures.

Monetary units: 1 Australian dollar = 1.12 U.S. dollars.

Weights: 1 long ton = 2,240 pounds (compared with a short ton which equals 2,000 pounds and a metric ton which equals 2,204.6 pounds).

Weight of commodities (pounds per bushel):

Wheat	60
Oats	40
Barley	50
Corn	56
Sorghum	60

A diagonal slash (for example, 1969/70) refers to a July 1 to June 30 year. Any exceptions will be noted.

Crops

Data relating to area sown, yield, and production are, in general, for the season ending March 31 (that is, including crops which are sown and harvested or harvested during the 12 months ending with March). For summer grains (corn and sorghum) in New South Wales and Queensland, the data shown for the year ending March 31 refer to crops sown prior to the preceding April and harvested principally during the year under review.

When two crops are grown successively on the same land during the one season, the land is included twice in area of crops. However, when two crops are grown together, the area is counted only once and allocated on the basis of the proportion of each crop grown.

Yield per acre is calculated on the basis of sown or planted area.

Livestock

Numbers are reported as of March 31 in all States and the A.C.T. and as of June 30 in the Northern Territory. Prior to 1964, cattle were classified as beef or dairy, but this caused confusion with dual-purpose animals. Since 1964, cattle have been classified according to their main use--milk or meat production. Thus, time series data for these separate periods are not strictly comparable.

Production and utilization of livestock products have, in general, been shown for 12 months ending June 30. Meat production and utilization are in terms of carcass

(bone-in) weight. Edible offals other than kidneys and pig tongues are not included; neither are livestock slaughtered for human consumption but subsequently condemned.

Pasture requirements are expressed in dry sheep equivalent (one dry ewe equals one dry sheep equivalent) with eight dry sheep equal to one beef steer.

Wool production is for the year ending June 30 in all States except South Australia (March 31) and Western Australia (March 31 through 1964/65, but June 30 since then).

SUMMARY

Projections of Australia's grain-livestock sector to 1975 indicate a general expansion of agricultural production--with some shifting from wheat and wool to beef, feed grains, and oilseeds. Extremely low wool prices and the imposition of wheat delivery quotas are responsible for the anticipated shift in output.

A significant portion of Australia is undeveloped or underdeveloped. Poor transportation facilities, limited rainfall, and low soil fertility continue to restrict better utilization of the land. Drought--a recurring and ever-present danger in Australia--causes substantial year-to-year fluctuations in crop production and large cuts in livestock numbers.

Despite these limitations, Australia has achieved major technological advances, which influence the 1975 projections. A landmark achievement in lessening pasture and crop losses was the introduction of myxomatosis, a rabbit-killing virus. Development of annual legumes for pasture has permitted a higher stock-carrying capacity as well as contributing to soil fertility beneficial to grain crops. New varieties of grains and new breeds of cattle also have increased output. In addition, expanded uses of large, modern machinery and of chemical fertilizers represent major technological improvements.

Within the framework of these technological advances as well as recent production patterns and trends, farm costs and returns, marketing patterns and Government assistance, and price supply elasticities, the potential growth of Australia's grain-livestock sector was projected to 1975 under the following main assumptions:

Assumption 1--Constant prices (average of 1966/67-1968/69) and an elastic demand.--Under this assumption, development and upgrading of cleared land would continue to 1975, facilitating general expansion in agricultural production. The assumption of an absorptive world market at existing prices would be important in terms of easing general concern about availability of export markets.

The assumption of constant prices and elastic demand would have its greatest impact on wheat production. The projected level of output would exceed 500 million bushels, compared with an average of 429 million bushels in the base period, 1966/67-1968/69. Since the profitability of wheat at the assumed constant prices is relatively high, producers would tend to take advantage of the elastic demand. Only a modest expansion in coarse grain production is expected because of the greater relative profitability of wheat.

Beef cattle numbers are expected to increase at 3.0 percent annually to 1975, which would result in production of 1.2 million tons of beef and veal, compared with 0.9 million tons in the base period. Dairying would continue to decline because of its general unprofitability.

An assumed wool price of 41 cents a pound--with costs constant--was considered sufficiently remunerative to encourage a buildup in sheep numbers. The projection for 1975 was 187 million head--a 1.5-percent annual rate of increase. Coupled with a slight increase in fleece weights, this increase resulted in a projection of 2.1 billion pounds of wool in 1975, compared with 1.8 billion pounds in the base period.

Assumption 2--Fifteen percent decline in grain prices and an elastic demand.--The assumption of a 15-percent decline in grain prices from an average of those in the 1966/67-1968/69 base period and elastic demand resulted in a grain area projection of 3 million acres below that sown under the constant price assumption. Of the 3 million, 2.1 million acres are expected to be used for sheep production, 0.6 million for beef production, and 0.3 million for oilseed production.

Wheat production was projected to total nearly 460 million bushels in 1975--about 40 million bushels less than under the constant price assumption. Feed grain production would also be 8-10 percent below the output projected under the constant price assumption.

The shifting of some resources from grains to livestock under this assumption would lead to higher levels of meat and wool production. Output of beef and veal would be only slightly higher than under the constant price assumption, while mutton, lamb, and wool would be about 3 percent higher.

Assumption 3--Continuation of wheat quotas and selected price adjustments.--This set of projections assumes a 5-percent rise in wheat quotas between 1971/72 and 1975; wheat, oats, and barley prices near to base period levels; and sorghum and corn prices 5 to 10 cents per bushel higher than base period levels. Beef, mutton, and lamb prices were assumed to show some decline by 1975, as a larger proportion of shipments to lower priced markets is required to absorb Australia's increased export availability.

Wheat production is projected at 375 million bushels in 1975--about 125 million bushels below the constant price assumption. However, a decision to produce feed wheat could substantially alter this projection. Coarse grain production would be much higher than under the constant price assumption. Barley output is projected to exceed 144 million bushels and grain sorghum is expected to reach 54 million bushels. The increased output would mean added competition for the United States in world markets.

Output of beef and veal is expected to reach 1.4 million tons, with beef herd numbers increasing at the rate of 5.5 percent annually over the base period--placing more pressure on the United States to liberalize its beef import quota. Lamb production also is expected to be higher than that projected under the other two assumptions, while output of mutton and wool is projected at approximately the same levels indicated under assumption 1.

AUSTRALIA: GROWTH POTENTIAL OF THE GRAIN AND LIVESTOCK SECTORS

by

Read E. Friend, E. Wayne Denney,
Mary E. Long, and Thomas A. Twomey

I. INTRODUCTION

Australia's agricultural sector is dominated by the grain-livestock complex. Since livestock is mainly grass-fed, however, grain-livestock links in the Australian feed sector have been less strong than those in the United States or in Western Europe. Nevertheless, the close relationship between grain and livestock--from a production-export point of view--favors their joint consideration.

Purpose of Study

The purpose of this study is to determine the growth potential of Australia's grain and livestock industries through 1975. In addition to relevant background information, the study (1) identifies recent changes in the volume and patterns of agricultural production; (2) determines causes behind these changes, including analyses of relative costs and returns of alternative agricultural enterprises and the impact of technological changes; (3) examines the influence of government and major marketing institutions on production; (4) determines supply response to price relationships; and (5) estimates potential production and export availabilities through 1975, under alternative price assumptions.

Background Information

Australia, preceded only by the United States, France, and the Netherlands, 1/ now ranks fourth among all nations as an exporter of agricultural commodities. With a population of only 12.7 million as of December 31, 1970, Australia's sizable agricultural production depends heavily on export markets. Wool, Australia's major export, accounts for about half the volume of total world wool exports. Australia also supplies over one-eighth of the world's wheat exports and 15 percent of the world's beef and veal exports.

U.S. Interest in Australian Agriculture

U.S. interest in Australian agriculture stems in part from competition in third country markets. Japan and Western Europe, for example, are major markets for both U.S. and Australian commodities. Commodities in which U.S.-Australian competition is most pronounced at this time include wheat, feed grains, dried and canned fruits, and hides and skins.

1/ International trade sources often rank the Netherlands as number three, but this includes substantial transshipments.

The United States is also interested in agricultural imports from Australia. Several commodities--beef, veal, mutton, and sugar--are imported under quota arrangements. Wool is also a major U.S. import from Australia.

U.S. agricultural exports to Australia total about $35 million annually, one-tenth as great as U.S. agricultural imports from that country. Tobacco is the major U.S. export item. Fruits and vegetables (primarily grapefruit and grapefruit juices, and pulses), animal feed (primarily soybean oilcake and meal), crude animal and vegetable materials (primarily sausage casings and grass seeds), and vegetable oil (primarily soybean) were the other major U.S. commodities exported to Australia in 1970.

Prominent Features of Australia

Knowledge of Australia--her weather, terrain, soil conditions, population, industry, and export markets--is essential to the objectives of this study. The following paragraphs highlight the more significant features of Australia.

Frequent severe droughts.--During the past 100 years, Australia has been hit by at least seven widespread droughts. These major droughts have lasted 1 to 10 years. The last extensive drought began in 1965, was severe until 1967, and finally ceased in 1970. In addition, several other droughts have caused severe local losses.

Flattest and driest continent.--Much of central Australia is arid or semiarid and not suitable for agricultural use. 2/ A high rate of evaporation in most of Australia contributes to the aridity problem.

Three-quarters of Australia's land area comprises a great central plateau (fig. 1). Most of this area lies between 600 and 1,500 feet above sea level, but extensive areas in the central eastern section are at or below sea level. The Great Dividing Range, closely paralleling the eastern seaboard, provides the only significant relief to the flat terrain of Australia.

Infertility of soils.--Soils in Australia are of low natural fertility for two major reasons. First, the dry or strongly seasonal nature of the climate restricts the supply of soil moisture available to plants. Second, soils frequently have a low nutrient content.

Inadequate river systems.--Few of Australia's rivers in the coastal plains are navigable from the sea. Many rivers originate in the Great Dividing Range and are short and fast-flowing to the east. The largest river system in Australia is made up of the Murray and Darling Rivers, which together drain part of Queensland, the major part of New South Wales, and a large part of Victoria.

Sparsity of population.--Australia, with a density of slightly over 4 persons per square mile, is one of the most sparsely populated countries of the world. The comparable figure for North America is 26 and for Europe, 238 (excluding the U.S.S.R.). A majority of the population is located in a few coastal cities.

Developing industrial country.--Although Australia has a Western style economy--with one of the highest levels of living in the world--it can still be considered a developing industrial country. Population is growing at the fairly rapid rate of 2 percent annually (due in part to immigration). The resource base is expanding through the development of more agricultural land, mineral deposits, and industry.

Dependence on agricultural exports.--Agricultural products account for an unusually large proportion of Australia's exports--nearly 55 percent in 1969/70. Although this

2/ See p. 6 for more detailed information on Australia's rainfall pattern.

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Figure 1

proportion is declining (80 percent in 1959/60), it is still large compared with other industrialized countries (for example, in 1969/70, 16 percent for the United States; and in 1970, 10 percent for Canada, and 18 percent for France).

Distant export markets.--Most of Australia's agricultural exports go to distant markets: Peoples Republic of China, Japan, Europe (primarily the United Kingdom, Federal Republic of Germany, Italy, and France), and the United States. The nautical shipping distance from Australia to Mainland China and Japan is approximately 8,000 miles. The shipment of meat from Australia to the United States requires about 2 months, involving a nautical distance of 7,000-10,000 miles.

II. MAJOR PRODUCTION PATTERNS AND TRENDS

Farming and grazing zones constitute an integral part of Australia's agricultural production process. This chapter identifies these zones and discusses factors hampering full land use. Production and distribution patterns for grain and livestock are then described, followed by a discussion of shifts in grain and livestock production.

Farming and Grazing Zones

As shown in figure 2, Australia has six farming and grazing zones: Pastoral, Wheat-Sheep, Beef-Sheep, Dairying, Sugarcane, and Irrigation. The delineation of these zones is largely determined by the availability of moisture, the period of the year when rainfall occurs, and the length of the growing season.

The vast Pastoral Zone can be divided into two subzones--Northern Pastoral and Southern Pastoral. Practically all the used land north of the Tropic of Capricorn is in the Northern Pastoral Subzone. In addition, this subzone dips below the Tropic to include areas of Queensland, the Northern Territory, a large segment of northern South Australia, and the extreme northwestern corner of New South Wales. Cattle predominate over sheep in this area, particularly in the tropical North.

The Southern Pastoral Subzone is mostly located south of the Tropic of Capricorn. Areas of this zone extending north of the Tropic are located in central Queensland and the western part of Australia. Low rainfall and variability in rainfall characterize this area.

About one-tenth of Australia's land area falls in the Wheat-Sheep Zone (appendix table 1). Most of this zone is located in four States--New South Wales, Victoria, South Australia, and Western Australia. The terrain is suitable for crop production and the major crop, grown largely in conjunction with sheep, is wheat. Other crops include feed grains (mainly barley and oats) and oilseeds. Beef cattle raising, done on a minor scale, is expanding.

The Beef-Sheep Zone 3/ tends to parallel the outside perimeter of the Wheat-Sheep Zone. Only slightly over 1 out of 16 acres falls in this zone. The area has a growing season of 5-7 months, but the topography frequently makes cultivation difficult. However, the incidence and severity of droughts in this zone are considerably less than in the Pastoral or Wheat-Sheep Zone.

3/ The Beef-Sheep Zone outlined in figure 2 is slightly smaller than the nearly comparable High Rainfall Zone used by the Bureau of Agricultural Economics (138, p. 39). Underscored numbers in parentheses refer to entry listed in the Bibliography.

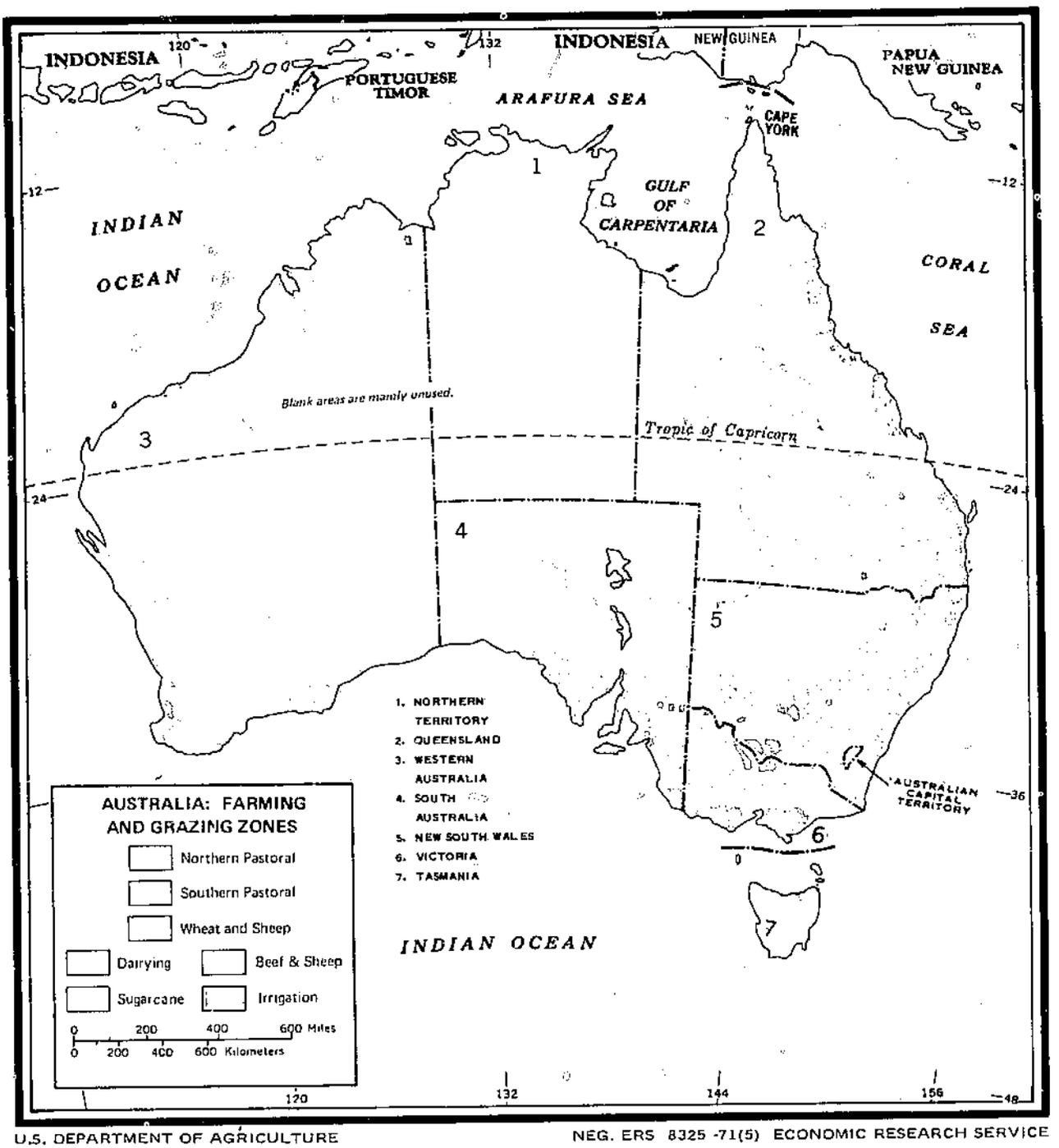

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Figure 2

Ecological Limitations to Land Use

Rainfall for the whole of Australia averages about 16.5 inches annually. Eleven percent of the country receives over 40 inches, 22 percent receives 20-40 inches, and 67 percent gets under 20 inches. The amount of rainfall, as well as the reliability of rainfall, generally decreases rapidly as one moves inland. Practically all of Australia's moisture is received as rain. The only significant exception is some snowfall in the higher elevations of the southeast and in western Tasmania.

Two distinct weather patterns determine Australia's rainfall. In the southern half of the country, rains occur mainly in the fall and winter (March to August) as climatic depressions move across the country from west to east. North and northwest parts of the country receive spring and summer rains (September to February) from the northwest monsoon, while the southeast trade winds bring summer rains to the northeast coast. These two major weather systems overlap in southern Queensland and northern New South Wales so that the rainfall tends to be evenly distributed throughout the years. Annual mean temperatures in Australia tend to be relatively high so that moisture either evaporates or is transpired by plants at a fairly rapid rate.

Australia has a great variety of soils and soil-forming environments over its 3 million square miles. Some 43 groups of soils have been recognized and it is not uncommon to find several soil types within one field. Soils are generally low in nutrients with severe deficiencies of phosphorous and nitrogen. A widespread deficiency of trace elements also exists, particularly for copper, zinc, and molybdenum.

Many soils in Australia are also highly vulnerable to wind erosion, moisture loss, and fertility depletion. These circumstances necessitate judicious use of rotations and severely limit flexible land use. The adoption of better grazing practices and use of legume pastures to improve soil fertility and soil structure have gradually given producers more latitude in alternative land uses.

Grain Production and Distribution

Australia's major grain crop is wheat, which accounts for approximately three-fourths of total grain area. Plantings, concentrated in the Wheat-Sheep Zone 4/, are limited to areas where soils are suitable for cultivation and rainfall in the growing season (May to October) generally ranges from 8 to 15 inches. Wheat growing in areas of lesser rainfall would be climatically marginal.

In some areas of Australia, it is necessary to fallow land to obtain adequate soil moisture for wheat production. Some areas need summer fallows while others require longer fallow periods. There is a general tendency for land in fallow to be reduced as use of pasture becomes more important in rotation patterns and as soil structure and fertility are improved.

Figure 3 shows the approximate dispersion of wheat acreage in Australia in 1969/70. Time series data on wheat acreage, yields, and production are shown in appendix tables

4/ In 1966/67, the Wheat-Sheep Zone accounted for 92 percent of Australia's wheat acreage (21).

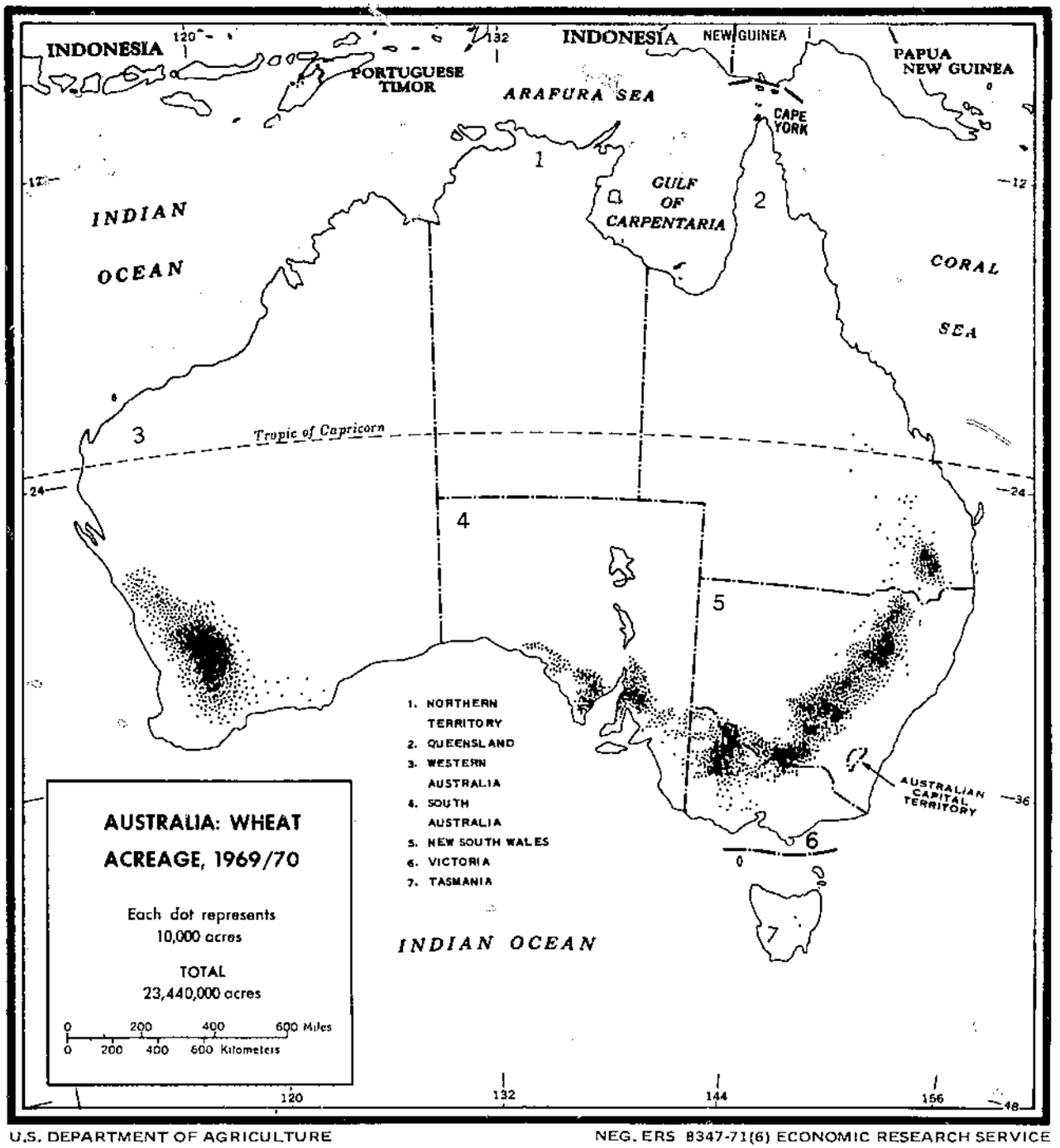

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Figure 3

2, 3, and 4. Production of wheat reached a record level of 544 million bushels in 1968/69 as large areas of pasture were diverted to wheat. 5/ In the following year, Australia introduced quotas on wheat deliveries (appendix table 5), and by 1970/71 the area planted to wheat had dropped to 16.3 million acres. 6/

Most of the wheat produced in Australia is soft and classed as f.a.q. (fair average quality). However, in northern New South Wales and southern Queensland, soils are more fertile and weather conditions better suited for production of prime hard or hard wheat. Some hard wheat has also been produced in South Australia.

The major wheat-producing State in Australia is New South Wales, followed by Western Australia, Victoria, South Australia, and Queensland. Annual increases in wheat production for the whole of Australia during the 1960's 7/ were nearly 5 percent (table 1). States showing the fastest yearly rate of increase were Queensland (nearly 10 percent), Western Australia (9 percent), and New South Wales (slightly over 5 percent). Expansion has been due almost entirely to area increases.

Oats has traditionally been Australia's most important feed grain, accounting for slightly over half the total area planted to feed grains. 8/ Oats is used extensively as a supplementary feed for livestock, particularly during drought periods. It also is used to some extent in achieving a better finish for market lambs. The record oats area--4.3 million acres in 1966/67--was only slightly above the 1970/71 area (appendix table 6). Good yields (appendix table 7), however, combined with the record area, produced 107 million bushels in 1966/67--substantially above the 87 million bushels of 1970/71 (appendix table 8).

Victoria is the leading producer of oats followed by New South Wales and Western Australia. General areas of production are the same as for wheat (figure 4). Annual oat output increased most rapidly in the 1960's in Queensland (9 percent), New South Wales (3 percent), and Western Australia (2.3 percent). Area expansion accounted for the increased output in all States except Western Australia.

The barley area rose sharply in 1970/71 to nearly 5 million acres as producers diverted from wheat (appendix table 9). Although average yields were essentially unchanged (appendix table 10), total production rose to nearly 100 million bushels, a 25-million bushel increase over output in any previous year. Between 1969/70 and 1970/71, output increased in all major producing States except Queensland which suffered a major setback through adverse weather (appendix table 11). Western Australia's output was up nearly one and one-half times because of a rise in both area and yield. The rate of increase was around 25 percent for New South Wales, Victoria, and South Australia.

The most rapid annual increases in barley production in the 1960's were in Queensland, New South Wales, and Western Australia. However, all major producing States except South Australia showed a significant annual increase in production. Area increases accounted for the greater output. Barley production is concentrated in South Australia, particularly around Adelaide on the south coast (figure 5). Western Australia had the second largest area in barley during 1965/66-1969/70, but higher yields in Queensland and New South Wales pushed these States into second and third position, respectively.

5/ Farmers experienced a severe drought in 1967/68 and were looking for a quick cash crop in 1968/69.

6/ Part of the decline in area and production, particularly in Queensland, must be attributed to unfavorable weather.

7/ Computed by comparing the 1960/61-1964/65 average with the 1965/66-1969/70 average.

8/ In addition to production of oats for grain, significant acreage is devoted to production of green crop (for grazing) and oaten hay. Farmers have the option of using oats for forage, if needed, or letting the crop mature for harvesting of grain.

Table 1.--Australia's total grain production, by type, 1960/61-1970/71

Year	Wheat	Oats	Barley	Corn	Sorghum	Total grains	Total coarse grains
	1,000 bushels					1,000 long tons	
1960/61	273,716	76,107	67,970	6,245	5,996	10,524	3,193
1961/62	247,178	55,130	41,504	7,307	9,361	8,965	2,344
1962/63	306,912	68,809	39,579	7,457	10,252	10,794	2,573
1963/64	327,912	68,234	43,395	6,722	7,891	11,349	2,566
1964/65	368,789	70,043	49,315	6,879	7,164	12,594	2,716
5-year average	304,901	67,665	48,353	6,922	8,133	10,845	2,678
1965/66	259,666	60,739	41,835	4,918	7,149	9,288	2,333
1966/67	466,610	107,106	61,588	7,491	11,711	16,287	3,789
1967/68	277,289	39,628	36,798	7,132	10,582	9,417	1,990
1968/69	543,950	94,250	72,587	6,826	15,831	18,468	3,898
1969/70	387,512	68,723	74,901	6,787	12,940	13,796	3,416
5-year average	387,005	74,089	57,541	6,630	11,643	13,451	3,085
1970/71	293,457	86,930	99,800	8,885	28,000	12,612	4,737
	Percent						
Annual rate of increase 1/	4.9	1.8	3.6	0.9	7.5	4.4	2.9

1/ 1960/61-1964/65 average to 1965/66-1969/70 average.
Source: Appendix tables 4, 7, 10, 13, and 16.

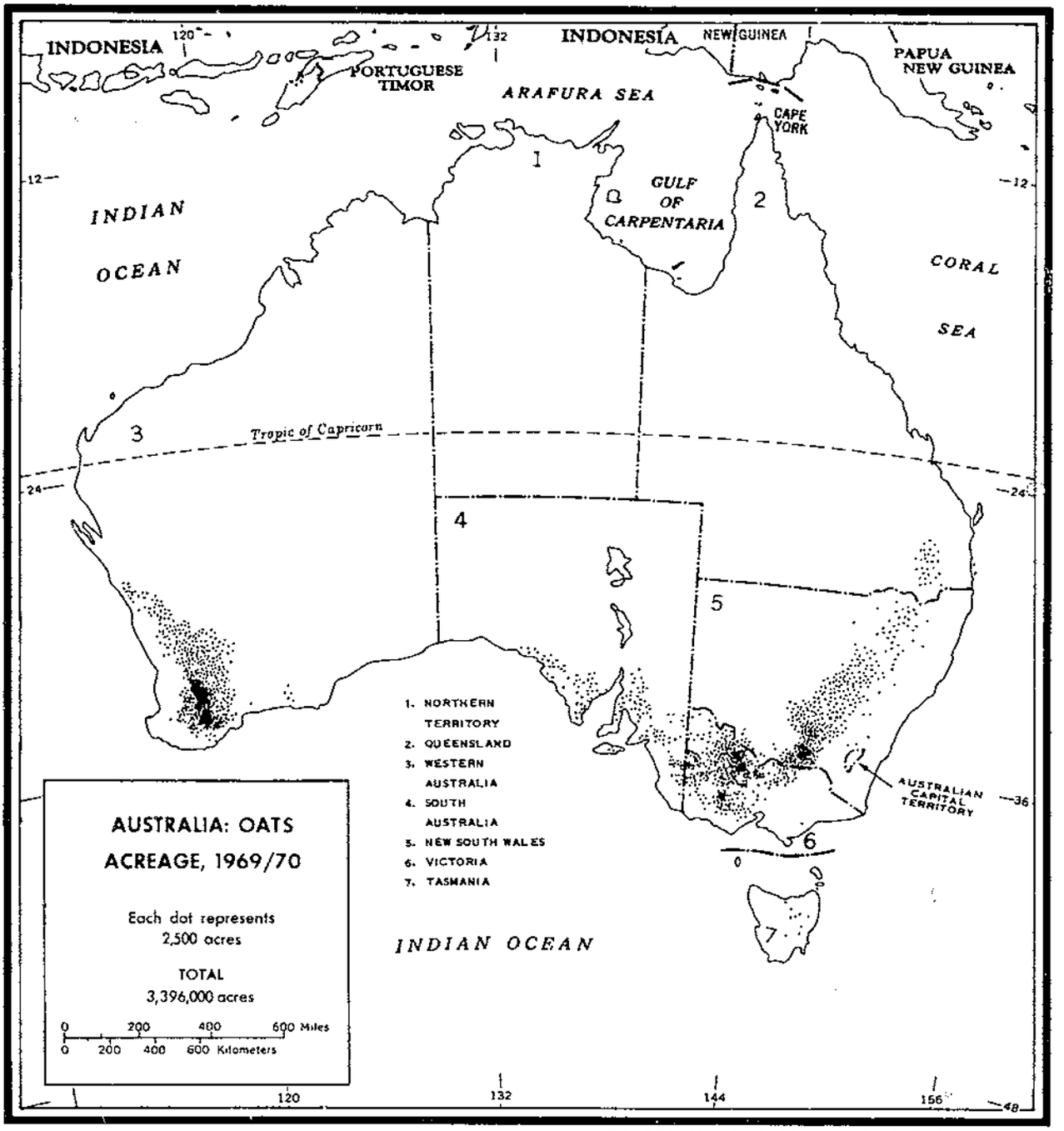

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Figure 4

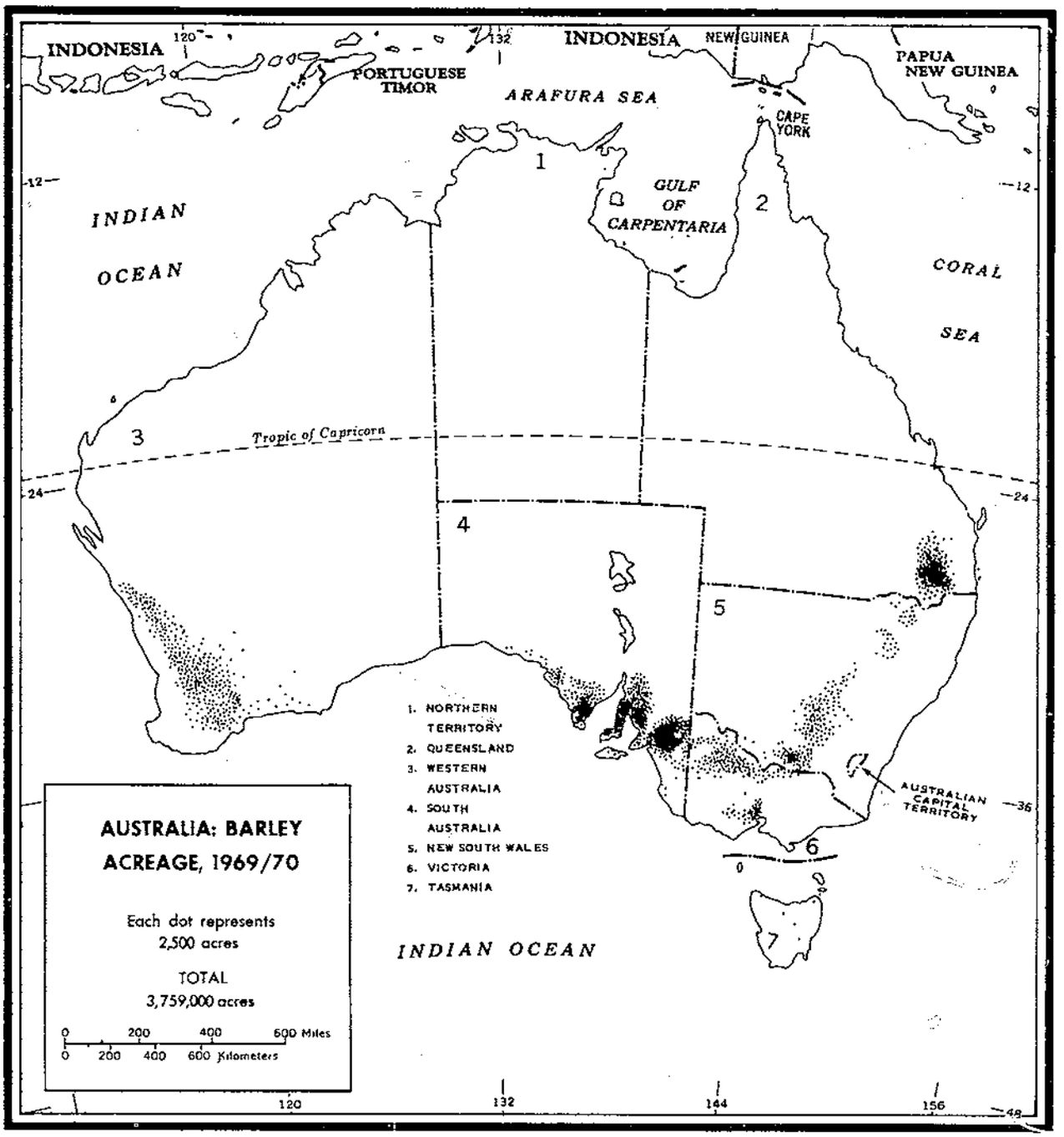

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Figure 5

Barley and oats are grown in many of the same areas as wheat, but wheat is more drought-resistant. Barley can be grown without fallow or on fallowed land. It will not tolerate waterlogged soils, but tends to do better than other grains when sown late. Oats has a greater resistance to root rot than other grains in the wetter areas.

Most of the barley produced in Australia, except in Western Australia, is two-row malting. About 50 percent is used for malting while the rest is fed. Six-row--known as feed barley--is also used in malting.

Corn is produced on an extremely small scale in Australia. Planted area from 1960/61 to 1970/71 ranged from 170,000 to 215,000 acres (appendix table 12). Both increased area and higher yields (appendix table 13) contributed to greater production, which ranged from about 6 million bushels in 1960/61 to a record crop of nearly 9 million bushels in 1970/71 (appendix table 14). The upsurge in corn production in 1970/71 took place in New South Wales and Queensland where output was up nearly one-third--the result of more area and higher yields. Although relatively insignificant, Victoria's corn output in 1970/71 was also greater because of higher yields.

Production of corn in Queensland, which accounts for about three-fifths of total production, is almost entirely in the southeast and Atherton tablelands. The remaining corn production occurs largely on the northeast coast and northern tablelands area of New South Wales. Australia made no progress in expanding corn production in the 1960's. Average annual decline in area in Victoria and Queensland more than offset annual rates of increase in New South Wales.

Corn is a summer grain demanding specific soil and climatic conditions. Yields in Australia tend to average less than half those in the United States. Although production of corn for grain is very localized, corn is grown to some extent for green fodder and silage in all States except South Australia.

The growing of sorghum for grain is a comparatively recent development in Australia. Queensland and New South Wales are the only States with significant grain sorghum production, while Western Australia, Victoria, and the Northern Territory produce minor amounts. 9/ Production in Queensland is concentrated in the central highlands, Burnett, and the Dawson-Callide areas. In New South Wales, major sorghum production areas are the northwestern slopes and the Murrumbidgee irrigation areas.

Grain sorghum, like corn, is a summer crop requiring a frost-free growing period of about 5 months. Although sorghum is relatively drought resistant, prolonged moisture stress leads to loss of yields. Thus, southern Queensland and parts of New South Wales are the only areas south of the Tropic of Capricorn where sorghum can be successfully grown without irrigation. In the past, grain sorghum has frequently been used as an insurance crop when weather conditions were not conducive to wheat planting.

Area planted to grain sorghum averaged about 500,000 acres annually during the last half of the 1960's (appendix table 15). However, estimates for 1970/71 and 1971/72 show the area increased to 1.1 million acres and nearly 1.4 million acres, respectively.

In addition to increased area, grain sorghum yields in 1971/72 were substantially above those of prior years (appendix table 16). Dryland yields averaged 2 tons per acre--more than double the normal 1/2 to 2/3 ton yield. Yields were high because southern Queensland and northern New South Wales had their best rains since 1956. The annual rate of expansion in grain sorghum production in the 1960's was about three times as high for New South Wales as for Queensland--nearly 17 percent, compared with 5 percent.

9/ The growing of dryland sorghum in the Northern Territory is still unimportant, and frequent unfavorable weather creates harvesting and storing problems.

Production of grain sorghum increased from a yearly average of over 12.7 million bushels in 1966/67-1968/69 to 28 million bushels in 1970/71 (appendix table 17), and an estimated 40.5 million bushels in 1971/72. In addition to better yields, the following factors account for the rapid increase in grain sorghum production:

(1) Imposition of wheat quotas
(2) Poor winter rains in New South Wales and Queensland with land ordinarily planted to wheat diverted to summer crops such as sorghum
(3) Increased area under irrigation in central and northern New South Wales
(4) Rice acreage restrictions in New South Wales.

Livestock Production and Distribution

Cattle numbers in Australia averaged 19.6 million head in the 5-year period 1966-70 (appendix table 18). Numbers followed a consistent yearly uptrend--from a low of 17.9 million in 1966 to a record 22.2 million head in 1970. This progress was achieved despite a substantial drought in Queensland--the major production area.

The proportion of the cattle herd used for beef averaged 76 percent during 1966-70. The proportion classified as beef consistently rose each year in the 5-year period, reaching more than 80 percent in 1970.

Four out of five beef cattle (average of 1966-70) are located in three eastern States--Queensland (42 percent), New South Wales (24 percent), and Victoria (12 percent) (appendix table 19). A dot map of the distribution of beef cattle numbers is shown in figure 6. Dairying is concentrated in Victoria, which accounts for more than two-fifths of the 4.4 million dairy cattle (average of 1966-70).

Beef cattle numbers in major producing States increased at the fastest annual rate during the 1960's in South Australia (7 percent), Victoria (6 percent), and Western Australia (4.7 percent). Queensland showed an annual increase of only 1 percent. Low rates of increase in both Queensland and New South Wales are closely related to the effect of drought, particularly in the Pastoral Zone.

The rate of increase in beef cattle numbers from 1969 to 1970 showed a sharp increase over that in the 1960's (table 2). 10/ Numbers increased by one-tenth for the whole of Australia. New South Wales, Victoria, and South Australia showed an increase of 20-30 percent, while Queensland, with persistent drought, actually had less cattle numbers in 1970 than in 1969.

Beef cattle numbers increased even more rapidly--13 percent--between 1970 and 1971. Numbers in New South Wales, Victoria, South Australia, and Tasmania were up 20-24 percent. They rose 7 percent in Western Australia and Queensland (restocking from the drought), and decreased 3 percent in the Northern Territory.

Australia's beef and veal output exceeded 1 million tons in 1970/71--slightly above the earlier record achieved in 1964/65 (appendix tables 20 and 21). The proportion of veal is currently low--about 3.5 percent--and declining. Victoria becomes a relatively more important beef producing State when beef and veal output is considered rather than beef cattle numbers. The converse is true for Queensland and the Northern Territory. These conditions may result from the following:

(1) Contribution of the dairy sector, located mainly in Victoria, to beef and veal production

10/ The rate of increase in beef cattle numbers began to gain in momentum even before 1969.

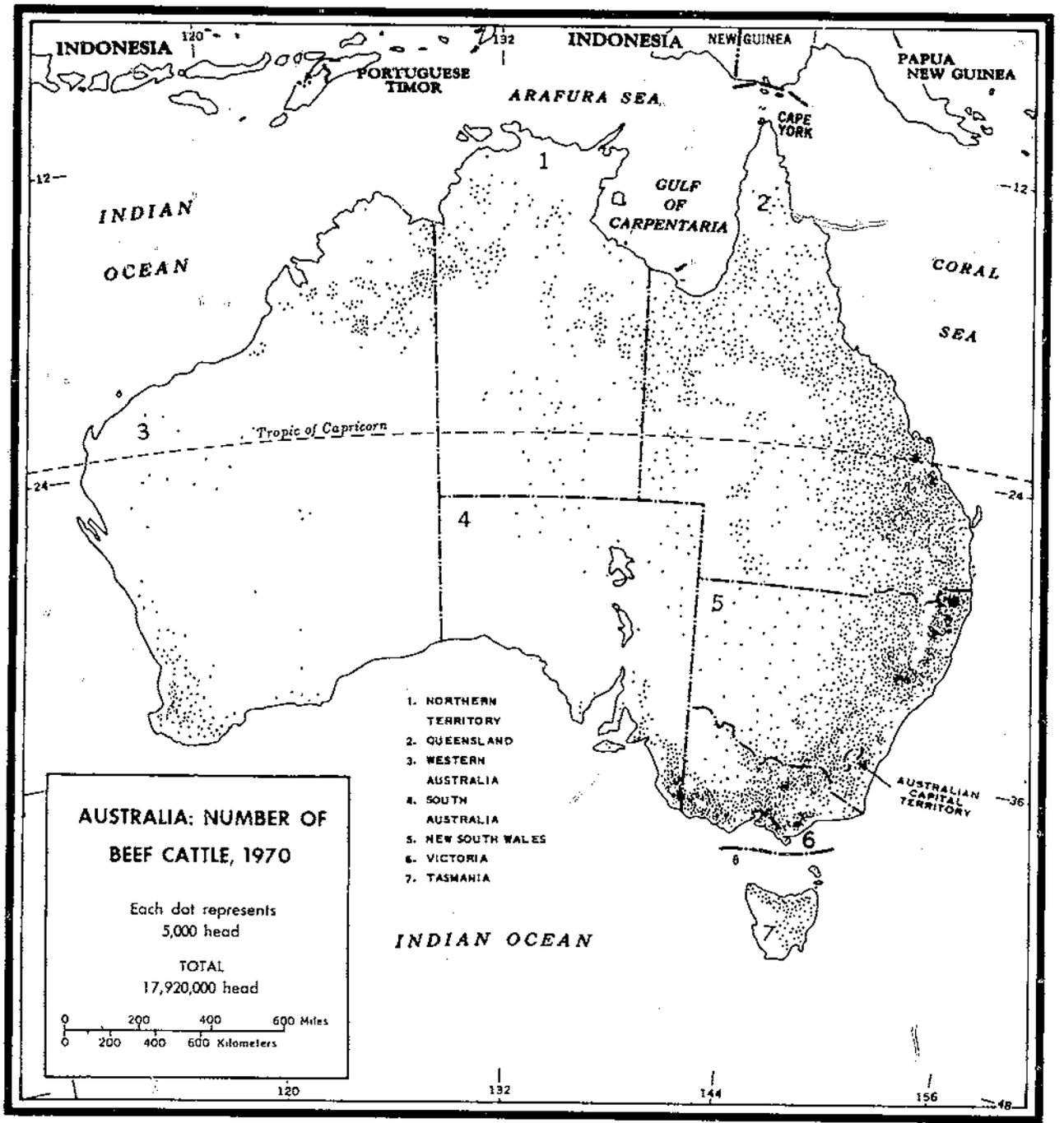

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Figure 6

Table 2.--Numbers of beef cattle, adult sheep, and lambs, and associated production, Australia, 1960/61-1970/71

Year	Number			Production			
	Beef cattle	Adult sheep	Lambs	Beef	Mutton	Lamb	Wool
	1,000 head			1,000 tons			
1960/61...	12,431	123,458	29,220	593.0	367.6	206.8	725.5
1961/62...	12,987	124,399	33,313	747.3	368.0	218.7	758.3
1962/63...	13,473	126,060	32,567	864.8	362.7	230.8	746.7
1963/64...	14,120	129,682	35,298	932.7	360.7	225.0	796.7
1964/65...	13,973	135,863	34,758	952.8	361.3	223.5	796.4
5-year average.	13,397	127,893	33,031	818.1	364.0	221.0	764.7
1965/66...	13,248	128,673	28,890	880.7	389.5	209.3	742.3
1966/67...	13,654	129,935	34,302	820.5	349.6	237.1	786.8
1967/68...	14,730	129,162	37,350	842.8	412.3	241.8	790.0
1968/69...	16,271	137,393	37,209	879.2	366.0	303.3	869.6
1969/70...	17,920	139,598	40,481	959.5	434.5	309.6	913.5
5-year average.	15,165	132,952	35,726	876.7	390.5	260.2	820.4
1970/71...	20,261	139,730	38,557	980.8	447.8	342.5	890.3
	Percent						
Annual rate of increase 1/	2.5	0.8	1.6	1.4	1.4	3.3	1.4

1/ 1960/61-1964/65 average to 1965/66-1969/70 average.
Source: Appendix tables 19,21, 22, 23, and 25-27.

(2) Transfer of live cattle among States (for example, movement of cattle from the north to the south) for fattening and slaughter
(3) Movement of cattle from northern drought areas
(4) Greater productivity in some areas.

Rates of change in beef production (appendix table 21) paralleled rates of change in beef cattle numbers but generally at a lower level (notable exceptions were the Northern Territory and New South Wales).

Distinct "wet" and "dry" periods, which characterize most of Australia, affect livestock production and land use potentials. Lush native pasture during the wet period deteriorates into rather unpalatable low-quality feed in the dry season. In some areas of the north, this situation may cause much of the weight gain in the wet season to be lost by the end of the dry season. While improved pastures have lessened the problem, their quality can also deteriorate in the dry season if moisture is sufficient to cause molding and rotting.

Tick fever poses a difficult problem for cattle in the hot, humid areas and requires selective breeding for its control. Mortality rates also tend to be high because uncontrolled breeding can cause calves to be born during hot, dry periods. The monsoonal climate of the north also limits the movement of cattle and vehicles during the summer because of high temperatures and flooded access roads.

In some areas of the Pastoral Zone, vegetation is so sparse that it is inadequate for cattle and must be used solely for sheep. The low level of rainfall in pastoral areas limits the planting of higher yielding pasture varieties. For example, Townsville stylo (a self-seeding annual legume) requires 25-30 inches of annual rainfall. Lucerne reportedly has a greater adaptability to adverse climatic conditions and can be grown in areas of 10-12 inches of annual rainfall (84). However, there are serious limitations to pasture improvement in low rainfall areas. These limitations adversely affect efforts to increase stock-carrying capacity and the substitution of cattle for sheep because of sparse vegetation.

The unavailability of drinking water also limits stocking rates in pastoral areas. Cattle that have to walk more than 3 miles to water seldom gain weight (3, p. 5). However, more reservoirs and wells for cattle and sheep have been constructed. During severe drought periods in Australia, the standard policy has been to dispose of cattle before sheep.

Sheep and lamb numbers reached a record level of 180 million head in 1970 (appendix table 22). Severe drought conditions in 1965/66 caused numbers to fall from 171 million in 1965 to 158 million head in 1966.

Nearly 40 percent of Australia's sheep are in New South Wales. Victoria, and Western Australia have about equal amounts--18 percent--as do Queensland and South Australia--10 percent. A dot map of the distribution of sheep numbers is shown in figure 7. Production of wool among the States is about in line with the distribution of sheep numbers. However, the degree of correlation between mutton production, lamb production, and sheep numbers--on a State basis--is substantially less. Possible explanatory factors include:

(1) Variation in mortality rates
(2) Transfer of live animals for slaughter among States
(3) Variation in carcass weight because of production of a meat versus a wool-type animal; and production of young lambs versus production of heavier lambs
(4) Emphasis on herd expansion, including both ewes and wethers.

During the 1960's, sheep numbers increased at a much more rapid annual rate in Western Australia than elsewhere (appendix table 23). The rate was 9 percent, compared

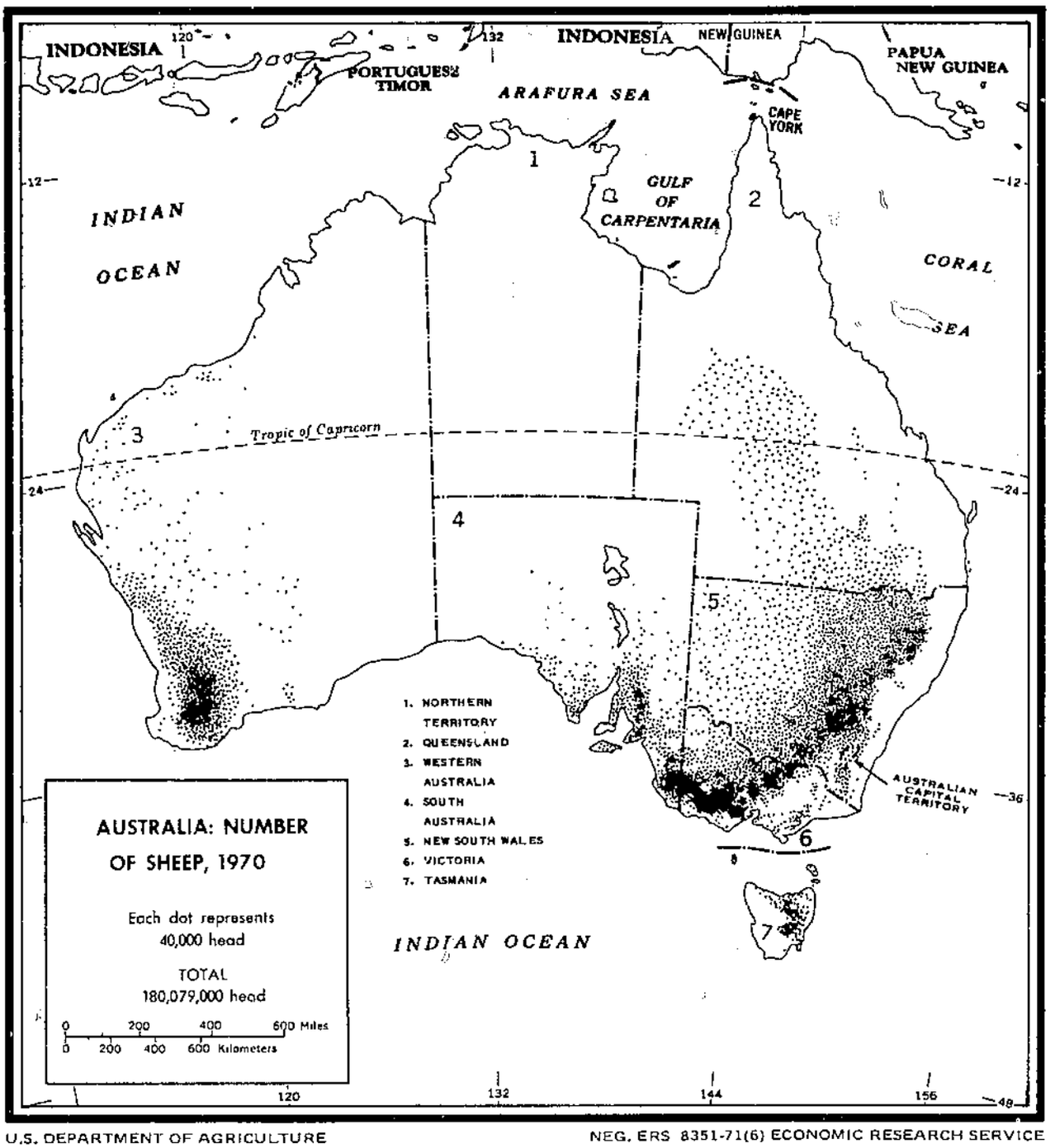

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Figure 7

with 4 percent for Tasmania--a minor producer--and 2.3 percent for South Australia. Declines in sheep numbers were recorded in New South Wales and Queensland, which ranked first and fourth, respectively, among other States.

Sheep are not raised to any extent in high-temperature, high-rainfall areas (3, p. 2), where breeding can be a problem. The proportion of sheep produced in the Pastoral Zone has also declined (appendix table 24).

Sheep numbers in Australia increased 3 percent between 1969 and 1970--a rate substantially above the average annual rate increase (0.8 percent) registered during the 1960's. All major producing States except Queensland showed increases, but Victoria's increase (10 percent) was the most notable. In the 2-year period, prolonged drought led to a nearly 20-percent depletion of the herd in Queensland. The general upturn in sheep numbers evidenced between 1969 and 1970 had actually begun in 1967.

Despite declining wool prices, output of wool in Australia averaged a 1.4-percent annual increase during the 1960's (appendix table 25). 11/ Western Australia led the increase (9 percent), followed by South Australia (3.4 percent). Production in New South Wales fell by more than 1 percent annually during this period.

Wool production increased 5 percent between 1968/69 and 1969/70--a result of the buildup in sheep numbers to record levels. It evidenced a sharp rate of decline in Queensland and Western Australia, but these were more than offset by large rates of increase in New South Wales, Victoria, and South Australia.

Lamb production, an alternative to wool production within the sheep enterprise system, expanded at an average annual rate of 3.3 percent during the 1960's (appendix table 27). The rate of increase was highest in Queensland (7.6 percent) and Western Australia (5.5 percent). Between 1968/69 and 1969/70, lamb output in Western Australia and Victoria dropped sharply, while production in South Australia increased by one-fourth. A 5-percent increase also was registered in New South Wales, the major sheep-producing State.

Shifts in Location of Grain and Livestock Production

During the 1960's, the relative proportion of grain and livestock production shifted among States in Australia (appendix table 28). New South Wales increased its relative share of grains but lost ground in the livestock sector. Barley, corn, and sorghum had the major share of increases in production, while wool and mutton experienced the greatest declines. Victoria generally moved in the opposite direction to New South Wales. A decreased share of grain output was largest in wheat, while an increased share of livestock production was greatest for beef. A very minor increase was shown in the relative share of barley and sorghum production. Queensland showed an increasing share of the production of the major grains--wheat, oats, and barley--and a general decline in share of livestock products. Wool was the livestock commodity with the sharpest decline. South Australia experienced a declining share of grain production, but showed a minor increase in the relative share of beef, mutton, and wool production. The reduced share of barley output was quite significant at 15 percent. Western Australia increased her relative share of both grain and livestock production during the 1960's. Wheat, barley, wool, and mutton had the greatest increases.

11/ Mutton production, essentially a byproduct of the wool industry, also increased about 1.4 percent annually during the 1960's (appendix table 26).

III. COSTS AND RETURNS

This chapter presents cost and return information collected by the Australian Bureau of Agricultural Economics (BAE) surveys of the grain-livestock sectors in Australia as well as our conclusions of these surveys. In addition to the BAE studies, the chapter includes a brief discussion of local studies using gross margin analysis and a review of the economic feasibility of lot feeding of cattle.

BAE Industry Surveys

BAE has conducted detailed surveys of Australia's wheat, sheep, and beef industries (29, 31, 34). The surveys are of limited value, however, since they are not up-to-date. In addition, BAE conducted the surveys on an industry basis. No interindustry comparison was made, although BAE did consider the impact of secondary enterprise on multienterprise operations. Despite these limitations, the surveys provide a comprehensive picture of Australia's grain and livestock sectors.

BAE has conducted five wheat surveys beginning with 1947/48, but only three reports have been published (1957, 1962, and 1967). The 1967 report, the primary source of information for this discussion, covered the years 1964/65-1966/67. Data were used from a random sample of 384 farms. These farms were distributed throughout 13 survey regions with no region having less than 25 sample properties. The main criteria for classifying a property as a wheat enterprise in the 1967 report were:

> "Wheat must have been delivered to the Australian Wheat Board's No. 28 pool (1964-65 season) and No. 30 (or 30A) pool (1966-67 season); because drought reduced production severely on some bona fide wheat farms in 1965-66, delivery to the Board in that year was not a requirement for inclusion in the sample;
>
> Wheat area sown for grains in 1964-65 must have been at least 100 acres;
>
> No irrigation water was to have been applied for growing wheat during the survey period." (31, pp. 7-8).

The only beef survey to be conducted for the whole of Australia covered the period 1962/63 - 1964/65 and used a total of 342 beef cattle properties in the sample. The collection of data was restricted to producers who:

> "Had more than 50 cattle for meat over each of the three survey years;
>
> Had more than $2,000 gross cash property receipts in each survey year;
>
> Obtained in the survey period, more than 20% of gross income from beef cattle; (see footnote a)
>
> Obtained less than 10% of gross income from stud activities;
>
> Were not primarily dealers in beef cattle, i.e., one who purchases beef cattle with a view to holding them for a short period until prices rise, or profits from the price differences between markets;
>
> Had complete financial records covering the three survey years" (34, p. 3).
>
> "a/ However, some properties in the southern states are shown to have received somewhat less than 20% gross income from beef cattle because the estimates made by producers of their income proved incorrect and also because of the method used in calculating returns, particularly the calculation of inventory gain" (34, p. 3).

The sheep industry survey has been carried out continuously since 1954. Information on more than 600 sheep and wool-growing properties is contained in the last survey which covered the 1964/65-1966/67 period. For purposes of the survey, a woolgrowing property was defined as:

> "One which runs 200 sheep or more, provides full time occupation for at least one person, and is not principally a stud, part of multiple holding or used mainly for dealing" (29, p. 5).

The BAE approach to the survey zones in the sheep industries differed substantially from that used in the wheat and beef cattle surveys. In the sheep survey, the Pastoral, Wheat-Sheep, and High Rainfall Zones were the major divisions for comparison and the States were secondary. In the wheat and beef surveys, the States were major zones and selected regions within the States were the subzones.

Although all surveys were well organized and relatively comprehensive, the use of the data in making a comparative analysis of the various regions and industries had serious limitations. All studies were at least 4 years old so they excluded recent changes, although some significant changes were in process prior to the last surveys. In addition, each survey only described a situation in a given time period. Also, the beef industry had no prior national survey so many comparable earlier figures were unobtainable. The problem was further complicated because 1965/66 was a serious drought year which would affect the last 2 years of the most recent wheat-sheep survey. In addition, in areas where industries compete for resources, it was difficult to compare the profitability of individual industries because all properties essentially have dual or multiple operations.

Wheat Industry

Wheat has commanded relatively high and stable prices, mostly because institutional arrangements set the price of wheat in accordance with the cost of production. Consequently, wheat farms have expanded both in area and wheat acreage planted. With this expansion, farm management has tended to shift from labor to more purchased inputs, particularly fertilizer and machinery, which in turn have increased labor productivity and land values.

Wheat farms averaged slightly over 2,500 acres in the 1964/65-1966/67 period, ranging from about 1,500 in Queensland to 3,600 acres in Western Australia (appendix table 29). Nearly all farms were multienterprise operations. Over 86 percent of area on wheat farms is estimated to be suitable for cropping, but only 35 percent was cropped or fallowed at the time of the 1967 survey. The remainder of the area was used primarily to pasture sheep, except in Queensland where cattle and hogs were prominent.

The 3-year average net farm income 12/ for wheat in the Mainland States in 1964/65-1966/67 was $9,398, a 50-percent increase from the average for 1959/60-1961/62 (appendix table 30). Wheat farms in Western Australia had the highest average net farm income ($11,736), but their 30 percent increase was the smallest of any State. The largest surge in net farm incomes came in South Australia where it more than doubled between the 1962 and 1967 surveys. Wheat-growing farms in New South Wales, Victoria, and Queensland increased their net farm incomes by 30-70 percent during the period.

Net farm incomes per acre also recorded substantial increases in all States except Queensland, where incomes declined from $5.10 per acre to $4.50. For all of the Mainland States, net farm incomes averaged $4.60 per acre for the 1964/65-1966/67 period--a 53-percent increase from the 1959/60-1961/62 period.

12/ Net farm income is defined as excess of gross farm returns over total costs.

The rate of return to capital and management, including land, decreased in all States since the 1959/60-1961/62 period (appendix table 30). 13/ The average rate of return for the Mainland States decreased from 9.4 percent to 5.9 percent. In the 1964/65-1966/67 period, the rate of return ranged from 7.0 percent in Western Australia to 5.0 percent in Victoria. The declines experienced in Queensland and South Australia were much less severe than in the other three States.

The rate of return is obviously much higher when land values are excluded, but different patterns also emerge. Wheat-growing farms in Victoria have by far the highest rate of return (26.3 percent) and those in New South Wales the lowest (18.7 percent). Only the farms in New South Wales and Western Australia showed a decline in rate of return (excluding land) during the two survey periods.

Beef Cattle Industry

An outstanding feature of the beef cattle industry in Australia is its diversity between regions. 14/ In general, moving north and inland from the coast and major population centers, the climate is drier and the industry more specialized in extensive grazing operations. Properties are larger and cattle numbers and cattle equivalent per man are greater. Capital invested, average total returns, and average total costs per property increase.

The northern region of the beef survey area, which includes the Northern Territory and the Kimberley region of Western Australia, consisted of extensive farm operations that specialized in breeding and fattening of beef cattle. For the survey period 1962/63-1964/65, properties in these two areas averaged about 1 million acres and carried approximately 9,000 cattle for an average stocking rate of approximately 100 acres per head (appendix table 31). Cattle grazed largely on native grasses and shrubs as climatic conditions were too severe for economic use of fertilizers and improved crop species.

Queensland, the second major survey region, has a mixture of both extensive and intensive farm operations. The Queensland beef industry is a microcosm of the beef industry for all of Australia. 15/ Slightly over 1 percent of pasture in Queensland was improved. However, better natural conditions permit stocking rates three times heavier than in the northern region. Approximately 65 percent of the properties specialized in beef only, and the State was involved in nearly all types of beef cattle enterprises. The most popular enterprise was breeding and fattening which was done in nearly 50 percent of the farm operations.

In the southern region, 16/ most properties averaged 1,000 to 2,000 acres, most pasture was improved, and an average of less than 5 acres was required per cattle

13/ The rate of return to capital and management (net farm income minus operator's labor) is shown in two ways in appendix table 30: One includes all capital employed on the farm; the other excludes the capital invested in land.

14/ The brief discussion in this report divides the BAE information into three major areas--northern region, Queensland, and southern region.

15/ The smaller properties in the Queensland subregions were about double the average property size in the southern region. In contrast, the subregions with larger properties were about half the size of those in the northern region.

16/ Southern region includes southwest Western Australia, New South Wales, Victoria, southeast South Australia, and Tasmania.

equivalent. 17/ In further contrast with the northern region, diversified farming dominated in the southern region. Breeding and selling stores was by far the most popular type of beef cattle enterprise, and a beef-sheep combination was the preferred mix.

The great diversity of the beef cattle industry is further emphasized by the use of capital investment. Extensive areas have most of their capital in cattle--as much as 80 percent--while intensive areas have a corresponding 80 percent in land.

Beef properties in the survey had an average rate of return to capital and management, including land, of 5.0 percent and a net income of nearly $8,500 (appendix table 32). However, there was a wide range among areas, particularly in the northern regions which provided both extremes in net incomes. The Kimberley had the highest net income of nearly $21,000 with a rate of return of 5.2 percent. On the bottom of the scale, the Northern Territory suffered a net loss of over $3,000. This difference in net income can be accounted for almost equally by greater returns received and the lower cost incurred in the Kimberley. Major cost items--labor, material, and depreciation 18/ (in order)--were significantly greater in the Northern Territory. On the return side, the difference between Kimberley and the Northern Territory was explained nearly equally by a higher turnoff and a higher price received in the Kimberley. A significant portion of these differences was the result of Kimberley's herd containing 30 percent steers, while Northern Territory carried only 20 percent steers.

The average net income of beef producers in Queensland was about $8,000 with a rate of return to capital and management of 6.3 percent. This rate of return, the same as that in New South Wales, was the highest State average rate of return for the survey period. In the more intensive farming areas of Queensland--the Coastal North--the 8.4 percent rate of return to capital was well above State and national averages. A large proportion of returns from cropping accounted for this higher rate of return.

In the southern region, only New South Wales and Tasmania achieved net incomes and rate of return to capital and management in excess of the national average. The other areas were well below the average even though their unit returns (that is, per acre or cattle equivalent) were above Queensland and the northern region. Land, however, comprised a large proportion of the total capital in these areas, and the real profitability from the owner's point of view may be significantly higher than the data indicate.

Sheep Industry

This section discusses the characteristics and financial returns of the sheep industry on the basis of the last comprehensive survey (1964/65-1966/67). Past changes and the present structure of the State subzones within the three major climatic zones--Pastoral, Wheat-Sheep, and High Rainfall (fig. 2)--are described and then compared with the major zones (appendix tables 33 through 40). Unless otherwise specified, intertemporal changes are those taking place between the last two comprehensive surveys--1960/61-1962/63 and 1964/65-1966/67. 19/

Pastoral Zone.--The Pastoral Zone is the largest in area, but it ran fewer sheep than the other two zones because of low stocking rates. The zone was mostly involved in extensive grazing of livestock on unimproved pasture, but a small number of properties

17/ Eight sheep equal one beef or dairy animal.

18/ Since depreciation was such an important cost item for the Northern Territory, a lower rate could have a significant impact on net income. The rate of depreciation is determined by BAE.

19/ In some comparisons, only single year data are used since a severe drought was experienced in some areas in 1965/66.

in New South Wales and South Australia combined cereal production with their sheep enterprise. All properties in the zone were Merino woolgrowing--75 percent specialized in sheep only; 15 percent combined sheep with cattle; and 6 percent combined sheep and grain (appendix table 33).

Localized droughts characterize the Pastoral Zone, but during 1964/65-1965/66 a widespread and severe drought greatly affected agriculture in this zone. Queensland and New South Wales, which ran more than 80 percent of the sheep in this zone, were most severely affected by the drought. Consequently, sheep numbers in the Pastoral Zone fell nearly 25 percent from 1964/65 to 1965/66 and showed only a small recovery in 1966/67 (appendix table 24).

Property sizes in the zone averaged over 51,000 acres, ranging from about 28,000 acres in New South Wales to nearly 450,000 acres in Western Australia. Average herd numbers ranged from 10,000 head in Western Australia to 3,800 in South Australia.

Sheep properties in the Pastoral Zone had a lower rate of return to capital and management and a lower net farm income in 1966/67 (1-year figures) than they averaged in 1960/61-1962/63. Average net farm income declined from slightly over $12,000 in 1960/61-1962/63 to about $10,750 in 1966/67. The rate of return to capital and management dropped 1.1 percentage points to 5.7 percent. Weather conditions partly account for these declines since New South Wales and Queensland had not made a full recovery from their substantial losses in 1965/66. Of the four States with areas in the Pastoral Zone, Western Australia and South Australia tended to have the highest average net farm incomes and highest rate of return to capital (appendix table 36).

Comparison of the least successful 25 percent of properties and most successful 25 percent of properties, as measured by rate of return to capital (excluding land and rent), revealed some characteristics that affect profitability. For 1964/65 and 1965/66, the rate of return to capital was negative or very low for the properties in the bottom quartile. The rates of return on properties in the upper quartile ranged from 8 to 47 percent. In general, the lambing percentage on the more successful farms was 30 percent higher and flock size greater (by 3,000 to 5,000 sheep) than the least successful properties. In addition, heavier fleece weights and a higher price raised the return per sheep equivalent, while cost per sheep equivalent dropped. These findings imply that there are economies of size and a payoff for good management (29, p. 22).

Wheat-Sheep Zone.--The Wheat-Sheep Zone was not as severely affected by the drought as the Pastoral Zone, but sheep numbers still declined in 1965/66 (appendix table 24). The drought was most severe in New South Wales, but the loss of sheep there was compensated in part by gains in Western Australia.

The most common types of sheep enterprises in the Wheat-Sheep Zone were Merino woolgrowing and fat lamb production (appendix table 34). However, since 1962 there has been a shift away from the sheep enterprise--more specifically wool production--in favor of crop production. The average farm size for the zone was 2,340 acres with 41 percent of the area under improved pasture, 37 percent in native pasture, and 19 percent in crops. The area under improved pasture had increased from 27 percent in 1960/61-1962/63 and, by 1964/65, stocking rates had increased from 58 to 80 sheep equivalents per hundred acres.

Western Australia and New South Wales had the highest rates of return to capital in 1966/67--approximately 11 and 9 percent, respectively. Western Australia tended to rank high in size of operation, capital use, costs, and returns. These conditions suggest that a reasonably high positive relationship exists between farm size and profitability in the Wheat-Sheep Zone.

A comparison of the most successful and least successful properties further reveals the importance of farm size to profitability (29, p. 46). In general, the top 25 percent of the properties, in terms of rate of return to capital (excluding land and rent), were largest both in area and sheep equivalents carried. In fact, in most cases the characteristics of properties in the upper quartile were nearly double those in the lower quartile. Although these relationships were also evidenced in the Pastoral Zone, they are more pronounced in the Wheat-Sheep Zone.

The more successful properties in the Wheat-Sheep Zone also reflect better management. Fleece weight averaged 1 pound heavier, lambing percentages were 10-15 points higher; wheat yields were double; and a higher proportion of the land received larger applications of superphosphate.

High Rainfall Zone.--The High Rainfall Zone, although the smallest zone in area, accounted for over one-third of the nation's sheep numbers in 1966/67. Although sheep numbers have increased in this zone, cattle numbers have risen at a faster rate since 1960. In 1964/65, slightly less than 50 percent of properties specialized in sheep only (appendix table 35). Sheep-cattle combinations accounted for 22 percent of the total. Farm size averaged about 1,250 acres, with 70 percent of the area in improved pastures. As with the other two zones, Merino woolgrowing was the favored sheep enterprise. However, fat lamb production was also popular and accounted for over one-fourth of the enterprise mix in the zone.

Net farm income for the zone as a whole increased by one-half from 1960/61-1962/63 and 1966/67, and the rate of return to capital rose from 3.4 to 5.8 percent. In 1966/67, Western Australia had an average net farm income in excess of $9,000, compared with about $6,000-$6,500 for other States. Western Australia, with the lowest capital investment, below average costs, and highest total returns had a rate of return to capital nearly double that of other States.

Comparison of the upper and lower quartiles of properties, determined by the rate of return to capital (excluding land and rent) for 1964/65 and 1965/66, yielded the same general results obtained for the other two zones. However, there were more exceptions to the general pattern. Properties in the upper quartile tended to be larger in area, carry more livestock, and maintain more stock per given area. The more successful properties also had higher lambing percentage, received higher wool prices, and produced fleece a pound heavier (29, p. 70).

Zonal Comparisons of the Sheep Industry.--Sheep properties in the Pastoral Zone averaged 20 times the land area of properties in the Wheat-Sheep Zone and 40 times the land area of properties in the High Rainfall Zone during 1964/65-1966/67 (appendix table 37). The sheep properties in the Pastoral Zone carried an average four times the number of sheep in the Wheat-Sheep or High Rainfall Zones. Sheep numbers declined in the Pastoral Zone, but increased in the other two zones, particularly the High Rainfall Zone. Cattle numbers per sheep property were low for all zones, exceeding 100 in the Pastoral Zone and averaging about 50 in the other two zones.

Sheep numbers--with cattle numbers converted to sheep equivalents--yielded per acre sheep equivalency figures of 0.10 in the Pastoral Zone in 1966/67, 0.71 in the Wheat-Sheep Zone, and 1.87 in the High Rainfall Zone. Since 1960/61-1962/63, this value had declined in the Pastoral Zone, remained the same in the Wheat-Sheep Zone, and increased by over 20 percent in the High Rainfall Zone. Part of this development can be attributed to the more severe effect of droughts in the Pastoral and Wheat-Sheep Zones.

Total capital use per sheep property in the Pastoral Zone was about double that of the other two zones--roughly $150,000-$165,000, compared with $75,000-$90,000. The amount of investment has increased in each zone, but increases were largest in the Wheat-Sheep and High Rainfall Zones. Share of capital used for land in the Pastoral Zone in 1967 was substantially below that of the other two zones, 45 percent compared with 55 percent (appendix table 38). The share of capital use on improvements and livestock purchases was higher in the Pastoral Zone than in the other zones, while investment in plant was below that in other zones.

Average total returns to sheep properties in the Pastoral Zone during 1960/61-1962/63 more than doubled those received in either the Wheat-Sheep Zone or High Rainfall Zone (appendix table 39). However, returns to the Pastoral Zone nearly stood still between the first survey period and 1966/67, whereas returns in the Wheat-Sheep Zone in-

creased over 40 percent and those in the High Rainfall Zone by 55 percent. The drought, which reduced returns for the Pastoral Zone in 1965/66 by 33 percent, undoubtedly had a detrimental effect on returns in 1966/67. The most marked change in the composition of returns during 1960/61-1962/63 and 1966/67 was the decline in the share of wool returns for sheep properties. 20/

Sheep properties in all zones encountered rising costs from 1960/61-1962/63 to 1966/67 (appendix table 40). However, costs in the Pastoral Zone increased less than 10 percent, compared with 40 percent in the Wheat-Sheep Zone and 47 percent in the High Rainfall Zone. These percentage increases in costs exceeded increases in returns in the Pastoral Zone, but not in the other two zones. For all three zones, composition of costs showed a slight shift away from the share spent on labor in favor of greater shares spent on materials (particularly fertilizer) and services.

Because of drought-induced losses in 1965/66, the Pastoral Zone suffered a significant decline in average net farm income between 1960/61-1962/63 and 1964/65-1966/67 (appendix table 37). Average net incomes in the other two zones were higher, despite the Pastoral Zone's larger operations in terms of area, number of livestock, and total capital investment.

Rate of return to capital--including or excluding land and rent--was at a higher level for the Wheat-Sheep and High Rainfall Zones than for the Pastoral Zone for each year of the 1964/65-1966/67 survey. Rates of return on capital have increased relative to 1960/61-1962/63 except in the Pastoral Zone, and in the Wheat-Sheep Zone in 1965/66 because of short-term drought effects.

Conclusions From the BAE Surveys

As previously mentioned, the BAE surveys of grain and livestock sectors are limited by their lack of standard time periods. Furthermore, the performance of individual enterprises is clouded by the pre-eminence of the multienterprise type of farm operation common to Australia. However. the following significant aspects of the agricultural sector emerge:

(1) Output per farm has increased while labor inputs have decreased, resulting in a rise in labor productivity.
(2) Farm size has generally expanded, leading to more capital investment and more sheep equivalents carried or crops grown per farm.
(3) Fertilizer use has increased rapidly so that both productivity per acre and the value of land have risen substantially.
(4) Rapidly increasing costs and low wool prices have caused wool producers to shift more into wheat, beef, and fat lamb production.
(5) Sheep raising and wheat production are complementary enterprises and compete for resources on the same farm.
(6) Rate of return to capital for any of the three industries--wheat, beef, or sheep--shows such a degree of variation by region and year that no generalized conclusion concerning relative profitability of these enterprises can be drawn from the BAE survey data.

It must be emphasized, however, that the BAE surveys did not identify serious problems that are currently confronting Australia's sheep industry. These problems can substantially affect developments in wool, mutton, and lamb production by 1975. A third of the industry is facing significant economic and/or financial problems. In

20/ Actual returns for wool and skins increased in the Wheat-Sheep and High Rainfall Zones.

some areas--particularly Queensland and Western Australia--many woolgrowers have reached or are close to insolvency (40, p. 39).

The sheep industry's difficulties stem from both short-term and long-term causes. Recent declines in the price of wool and prolonged droughts are short-term problems. The imposition of wheat quotas since 1969/70 has also added to the financial difficulties of the wheat-sheep farmer. Longer term factors affecting the sheep industry are the increasing difficulty of marketing wool and continued increases in domestic costs (40, p. 39).

Government policies will determine, in large part, the nature, degree, and rate of structural adjustments in the sheep sector. Undoubtedly, adjustments will be made. However, the Government's decision to support the price of wool at 30 cents per pound and provide $100 million for reconstruction and development of the sheep sector will tend to slow the rate of change.

Selected Studies on Gross Margin Analysis

Significant changes have taken place in Australia since the most recent wheat, beef, and sheep industry studies conducted by BAE. Many of these changes have resulted from prolonged drought, declining wool prices, and a world market oversupplied with wheat. The imposition of wheat delivery quotas, owing to surplus production, has significantly reduced the net income of farmers as wheat had been their most profitable enterprise. Because of restrictions on wheat production and declining wool prices, farmers have had to seek alternative enterprises.

The movement into alternative crops is evidenced by the sharp upswing in the planting of barley, sunflower, and rapeseed beginning in 1969/70. A shift to fat lamb and beef production was already in progress. The continuation of these trends depends on how profitable the alternatives are relative to other opportunities.

In deciding on alternative enterprises, farmers must consider market prospects, their managerial ability and technical knowledge, and the technical and economic feasibility of producing the alternatives. The following discussion relates only to the last consideration. Information on a gross margin analysis 21/ was used to compare the profitability of alternative enterprises. Feasible alternatives to wheat considered here are crops that can be produced on a wide scale without irrigation and use the same basic equipment as the wheat crop. The alternatives to wool production discussed here are lamb and beef.

Data shown in table 3 were obtained from studies by the State Departments of Agriculture in Victoria, New South Wales, and Western Australia. Much more detailed information is available in the original sources. 22/ The data for Victoria are for the Wimmera which is located in the Victorian wheat belt. Information on New South Wales is for the entire State. The budgetary analysis of Western Australia is confined to the high rainfall area within 40 miles of Albany (located on the southern coast). The gross margin analysis in the studies is on a per acre basis only and does not consider risk.

The information available indicated that wheat yields the highest gross margins per acre (within each region) among crops. However, with the quota on wheat, other

21/ Gross margin measures relative profitability instead of actual "profits" to the producer and is defined as the income less the varible costs of any enterprise. Gross margin analysis can be used in comparing the profitability of alternative enterprises and the profitability of different practices for the same enterprise.

22/ The studies (73, 109, 127) were conducted during 1969 and 1970.

Table 3.--Gross margin analysis for selected commodities, Australia, from selected studies, 1969/70

Commodity	Victoria (Wimmera area)			New South Wales			Western Australia		
	Yield	Price 1/	Gross margin	Yield	Price 1/	Gross margin	Yield	Price 1/	Gross margin
	bu./acre	A$/bu.	A$/acre	bu./acre	A$/bu.	A$/acre	bu./acre	A$/bu.	A$/acre
Crops:									
Wheat	—	—	—	24	1.10	16.73	18	1.01	11.51
Barley (malting)	30	0.60	7.95	—	—	—	25	.49	5.74
Barley (feed)	—	—	—	24	.40	3.23	—	—	—
Oats	20	.40	2.80	27	.40	4.55	33	.35	5.21
Rye corn	18	.80	6.05	—	—	—	—	—	—
Field peas	21	.90	4.25	—	—	—	—	—	—
Sorghum	--	—	—	20	.86	8.58	—	—	—
Millets	—	—	—	18	1.08	6.87	—	—	—
Linseed (flax)	9	2.50	9.35	12	1.98	14.22	11	1.91	9.18
Safflower	15	1.75	12.95	14	1.70	10.44	—	—	—
Rapeseed	10	2.00	12.80	—	—	—	10	1.97	8.48
Canaryseed	—	—	—	6	2.46	4.66	—	—	—
Sunflower	—	—	—	—	.95	5.01	—	—	—
Lupins	—	—	—	—	—	—	12	1.40	3.38
	Stocking rate	Price	Gross margin	Stocking rate	Price	Gross margin	Stocking rate	Price	Gross margin
				dse 2/	A$	A$/acre	dse 2/	A$/lb.	A$/acre
Livestock:									
Cattle, baby beef	--	—	—	0.75	96.00/hd	3.24	4	0.22	14.3
Cattle, steer beef	--	—	—	—	—	—	4	.22	16.0
Cattle, vealers	—	—	—	.75	75.00/hd	2.70	—	—	—
Sheep, Merino, fat lamb	—	—	—	—	—	—	4	.14	8.7
Sheep, crossbreed, fat lambs	—	—	—	2.00	.43/lb	5.62	4	.14	9.2
Sheep, Merino, breeding 2 tooth	—	—	—	2.00	5.00/hd	6.28	—	—	—
Sheep, Merino, breeding weaners	—	—	—	2.00	4.50/hd	6.14	—	—	—
Sheep, all wether	—	—	—	2.00	.46/lb	6.74	—	3/.32	6.6
Sheep, Merino, ewe flock	--	—	—	—	—	—	4	3/.32	6.6

-- Means negligible or none.

1/ Price is net to the farmer.

2/ dse = dry sheep equivalent
1 cow = 15 dse, 1 beef steer = 1.5 dse, 1 Merino ewe = 1.5 dse, 1 Crossbreed ewe = 1.7 dse, 1 Merino wether = 1 dse.

3/ Net wool price.

Source: (73, 109, 127).

alternatives must be sought. In terms of relative profftability, several oilseeds appear to be close competitors with wheat and are well ahead of other crop alternatives.

The study on Western Australia showed per acre gross margins from beef cattle at a much higher level than for crop or other livestock enterprises. Fat lamb production was more profitable than wool production.

Lot Feeding of Beef Cattle

The practice of fattening beef cattle on grains has been very limited in Australia, but changing economic conditions may make it more popular in the near future. Although lot feeding produces better quality beef, the Australian consumer has not been willing to pay a premium for the higher quality (27, p. 1). Lot feeding normally costs more than pasture feeding, necessitating some form of additional compensation to the farmer.

BAE has estimated the total cost of establishing facilities for a 400-head capacity dry lot feeding operation to be about $17,000 (27, p. 23). Major costs include watering facilities ($3,800), feed troughs ($3,200), grain shed ($2,300), and hay shed ($1,800). The initial cash outlay appears large, but when each item is depreciated, the cost per head per year is only $2.77. Thus, the cost of setting up a feedlot operation is merely a fraction of the feed and operating costs required to implement it.

Cattle prices are at their most depressed level at the end of the pasture season. As a result, the farmer can get a higher price for cattle taken into the feedlot and sold at a later date. In addition, price trends in recent years have tended to lessen the risk of loss in the lot feeding of cattle; that is, cattle prices have been strong while feed grain prices have generally declined.

In its comprehensive study of lot feeding in 1969, the BAE concluded that the practice was generally unprofitable at the existing grain/beef price ratios (27, p. 30). Some costs and returns data collected in the study are presented in table 4. Only the 550- and 600-pound groups of cattle yielded positive net returns. In general, the smaller cattle gained weight more rapidly so that both feed costs per pound of grain and total feed costs were less than those for the larger cattle. The live weight price of the 550-pound cattle was $3.00 per hundredweight higher than for the 750-pound cattle, but the price per 100 pounds dressed weight was also $3.00 more for the smallest cattle.

The cattle brought into the feedlot varied in live weight from 550 to 750 pounds, but they remained in the feedlot for 90 days, regardless of their initial weight. Dry matter feed conversion ratios ranged from 6.8 for the 550-pound cattle to 8.2 for the 750-pound cattle. The average daily intake of total digestible nutrients (TDN) ranged from 14.6 pounds for the 550-pound cattle to 17.6 pounds for the 750-pound cattle.

Feeding cattle for 90 days would theoretically enable four lots to be fattened in a 12-month period. However, the budgets assumed only one lot of cattle fed from May to August in an attempt to sell the cattle at their peak seasonal prices. Also, all grains fed the cattle were assumed to be grown on the farm property, keeping freight costs minimal. Each feedlot contained 400 head of cattle, an amount which sufficiently reduced the fixed cost per head but still was considered a manageable size herd without incurring substantially greater labor costs.

The BAE study went further and attempted to reveal the relationship among fat cattle prices, feed prices, and the weight of cattle to be fattened (fig. 8). Figure 8 can be used to determine the maximum price that can be paid for feeds (per pound TDN) at selected weights of live feeder cattle and cattle prices. Conversely, the graph also

shows the beef price needed to break even when feed prices are at given levels. 23/ The dotted lines D-E and A-C indicate beef and feed prices, respectively, which the BAE assumed in constructing their budget. 24/ The intercept (point B) is between the break-even lines for feeder cattle of 550 pounds and 600 pounds live weight. However, if the 550-pound cattle are fattened and cattle prices drop to 28 cents per pound dressed weight (rather than near 29 cents), point B would fall below the break-even line and there would be no return to management at the assumed feed price. 25/

Table 4.--Estimated average returns and costs per animal for a 400-head capacity beef feedlot operation, Australia, 1969 1/

Item	Live weight (pounds) of animal at start of feeding				
	550	600	650	700	750
	A dollars				
Gross returns:					
Appreciation in value of store carcass	6.33	6.60	7.15	7.35	7.50
Weight gain	46.24	45.44	43.84	42.08	41.28
Total returns	52.57	52.04	50.99	49.43	48.78
Cost:					
Feed	34.83	37.47	38.56	39.61	42.09
Commission	4.40	4.57	4.65	4.69	4.83
Operating costs	5.12	5.12	5.12	5.12	5.12
Depreciation, repairs, and maintenance	2.77	2.77	2.77	2.77	2.77
Total costs (excluding interest)	47.12	47.93	51.10	52.19	54.81
Net returns	5.45	2.11	-.11	-2.76	-6.03

1/ Data are based on one lot of cattle yearly with a fattening period of 90 days commencing in May.
Source: (27, p. 30).

The comparative profitability of using sorghum, barley, oats or wheat for feed is shown in table 5. Oats represented the cheapest feed and wheat the most costly, based on average producer prices for 1969/70 (the price of oats was much lower in 1969/70 than

23/ The price relationships shown in figure 8 provide a return of 6.5 percent interest on total outlay but no return to management. Further details are contained in the BAE study (27).
24/ These feed and beef prices are the same as those used in constructing table 4.
25/ The return to management could be positive if the interest rate were somewhat less than 6.5 percent.

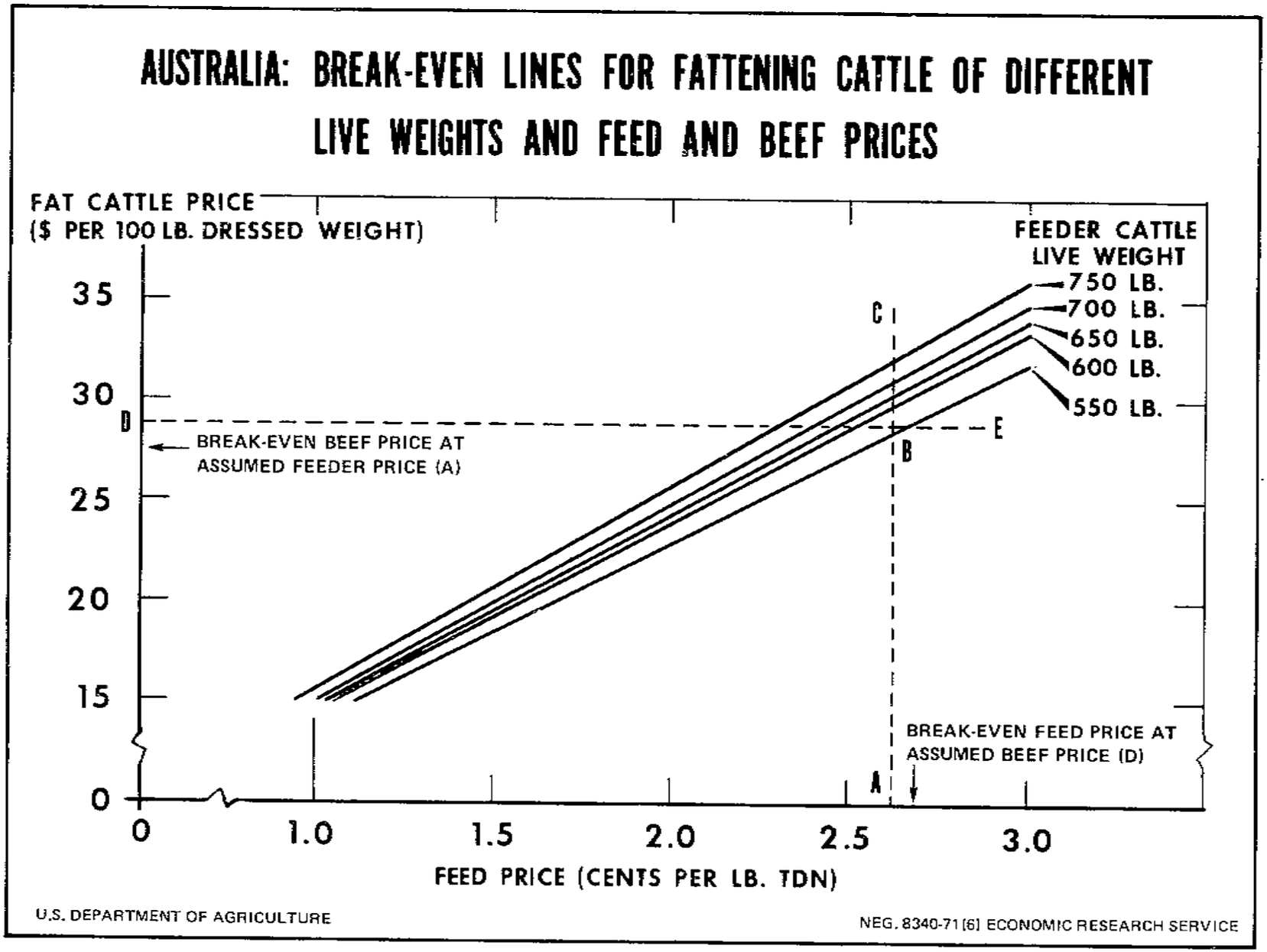
AUSTRALIA: BREAK-EVEN LINES FOR FATTENING CATTLE OF DIFFERENT LIVE WEIGHTS AND FEED AND BEEF PRICES
FAT CATTLE PRICE
($ PER 100 LB. DRESSED WEIGHT)
FEEDER CATTLE LIVE WEIGHT
750 LB.
700 LB.
650 LB.
600 LB.
550 LB.
35
30
25
20
15
0
C
D
E
B
A
BREAK-EVEN BEEF PRICE AT ASSUMED FEEDER PRICE (A)
BREAK-EVEN FEED PRICE AT ASSUMED BEEF PRICE (D)
0
1.0
1.5
2.0
2.5
3.0
FEED PRICE (CENTS PER LB. TDN)
U.S. DEPARTMENT OF AGRICULTURE
NEG. 8340-71 (6) ECONOMIC RESEARCH SERVICE

Figure 8

it was in 1967/68). If beef prices ranging from $24 to $28 per 100 pounds carcass weight prevail, lot feeding of some of the cheaper grains could yield substantial profits. However, certain limitations are apparent. Note that the budget imposed numerous assumptions such as farm production of feed, 400-head lot size, maximum seasonal movement in beef prices, and a skilled operator.

Table 5.--Calculation of TDN cost for selected grains, Australia, 1969/70 1/

Grain	Amount per bushel	Percentage TDN	Amount TDN per bushel	Producer price per bushel 1/	Price per pound TDN
	Pounds	Percent	Pounds	A dollars	Cents
Sorghum	60	80	48	0.99	2.06
Barley	50	78	39	.73	1.87
Oats	40	70	28	.36	1.29
Wheat	60	80	48	1.06	2.21

1/ 1969/70 estimated prices.
Source: Based on (27, p. 13) and ERS calculations.

Most of the literature on lot feeding concludes that lot feeding cannot be adopted successfully in Australia on a large scale. However, the use of feed lots to prevent the forced sale of cattle (because of droughts) and to take advantage of seasonal price movements is becoming more profitable because of recent shifts in beef and feed prices. A recent study by the South Australia Department of Agriculture (126, p. 11) recognized the uncertainty associated with establishing large-scale feedlots, but cited conditions under which the practice should yield profits. The study also stressed the profitability of turning off fat cattle during winter months (July and August).

The increased profitability from lot feeding was recognized in 1969 in a study conducted by the Pastoral Research Station in Victoria (134, p. 5-1):

> "For the first time in Australia, in 1969, cereal grains and beef prices reached levels at which it was profitable to feed grains for beef production. It is difficult to foresee how long such prices will continue but this should not deter the gathering of more information on the use of grains in beef production, for dissemination to interested cattle producers."

IV. TECHNOLOGICAL CHANGES IN AGRICULTURE

In recent years, Australia has allocated a larger share of its resources to agriculture to take advantage of technological changes (137, p. 81). These changes can be broken down into those in the grain sector, livestock, and other developments such as improved practices of land clearing.

Many technological changes have substantially reduced unit costs, but large capital outlays are frequently required to incorporate these new technologies. The purchase of new machinery, use of new pesticides, and the application of more modern techniques of

land development involve additional investment. However, other innovations (for example, rotational and strip grazing of pasture, progeny testing of livestock, and weekly versus daily feeding of sheep during drought) improve management efficiency without necessitating an increase in the resource base.

Pasture improvement has received extensive coverage in the literature and is generally regarded as the single, most recent important development in agriculture. These improvements include new plant varieties, increased fertilization, more irrigation, and low-cost techniques for clearing land. Pasture improvement, in turn, has substantially increased the productivity of the livestock sector as well as crop yields.

Following the general pattern established by other newly developed economies, Australia's agriculture uses a high proportion of purchased inputs, while the role of labor is declining.

Changes in Grain Technology

Mechanization

While labor input per farm has declined in recent years, the use of capital equipment per farm rose by almost 5 percent a year in the 1960's (33, p. 12). Bulk deliveries of wheat to the Australian Wheat Board (AWB) increased from 80 percent in 1955 to nearly 100 percent in 1970 (96, p. 37). The total bulk wheat storage capacity was expanded to 750 million bushels.

A parallel development has been a wider acceptance of the wheat harvester-combine. The use of this machine enables farmers to haul their wheat in trucks directly from the harvester - combine to the elevator--a procedure similar to that used in the United States. Rail is mainly used to transport bulk wheat from local elevators to port facilities.

The use of light aircraft for agricultural purposes rapidly increased during the early 1960's, but has leveled off in more recent years (table 6). Airplanes are mainly used for fertilizing and seeding pastures, but also are used to a limited extent for weed and pest control. When new pastures are established, seed and fertilizer are usually dropped at the same time.

For Australia's large farms, aircraft are often used for transportation between properties and for stock spotting. The use of aircraft increases the speed of the operation, affords accessibility to isolated areas, and does not cause the crop damage often associated with surface vehicles.

Aircraft use for agricultural purposes is greatest in New South Wales where, in 1968/69, about 45 percent of Australia's flying time was recorded. In that year, less than 12 percent of the total superphosphate used in Australia was dropped by aircraft, but in New South Wales nearly 40 percent was distributed by aircraft.

Aerial spraying and dusting of crops have also gained wider acceptance since 1960. The total acreage sprayed reached a record 4.6 million acres in 1968/69, nearly four times the area recorded in 1960/61. Aerial spraying, however, has declined slightly in recent years.

All types of farm machinery increased in numbers between 1960 and 1968 (table 7). Of the major types of equipment, forage harvesters have shown the biggest percentage increase and tractors have recorded the largest absolute change. The average tractor size has also increased substantially in recent years. Increased numbers and size of tractors have enabled the farmer to be more precise in timing his field operations.

Table 6.--Aerial agriculture, Australia, 1960/61-1968/69

Year	Area treated by airplanes			
	Total	Topdressing and seeding	Spraying and dusting	Other treatment
	1,000 acres			
1960/61	6,240	5,031	1,174	35
1961/62	7,163	5,722	1,374	70
1962/63	8,763	6,965	1,739	59
1963/64	12,788	10,666	2,041	90
1964/65	16,640	14,147	2,416	144
1965/66	15,010	11,314	3,469	227
1966/67	15,237	11,646	3,192	399
1967/68	14,348	10,495	n.a.	n.a.
1968/69	14,416	9,415	4,580	362

n.a. = Not available.
Source: (51, 55).

Table 7.--Trend in use of selected agricultural machinery, Australia, 1960 and 1968

Type of machinery	March 31 1960	March 31 1968	Percentage increase
	Number		Percent
Tractors:			
Wheel and crawler	221,886	323,982	46
Seeding and planting:			
Grain drills	111,189	123,728	11
Fertilizer distributors and broadcasters	78,181	95,853	23
Harvesting:			
Grain and seed headers and harvesters	64,070	67,882	6
Mowers	1/ 84,240	88,939	6
Pickup balers	22,946	38,211	70
Forage harvesters	1,807	7,545	318
Hammer mills	10,591	27,211	157

1/ March 31, 1959.
Source: (51).

New Plant Varieties

Before 1960, plant breeders were primarily concerned with developing varieties of wheat and other crops that were disease resistant, particularly wheat varieties that were resistant to rust. Yield response was constrained by the disease resistance trait of the plant. Varieties were bred for performance at a relatively low level of fertility which meant that their response to added nutrients was minimal. A substantial effort was made during the 1960's to improve these varieties so that higher yields could be obtained after fertilizing.

One of the highest yielding wheat varieties to be developed thus far in Australia is Gamenya, which yields 70 bushels per acre recorded under irrigation when an adequate amount of nitrogen fertilizer is added (64, p. 31). Gamenya is a semihard variety adapted primarily for the Ord region of Western Australia, but it has also been used to a limited extent in other irrigated areas in Australia. Even higher yields--up to 80 bushels per acre--have been obtained from Mexican semidwarf varieties, but the quality of their flour is low. The reluctance of the Australian Wheat Grower Federation (AWGF) to accept the introduction of high-yielding dwarf wheat varieties in Australia has tended to keep wheat yields at a lower level. 26/ AWGF is concerned about the relatively low level of protein content in the dwarf wheats and the possible erosion of Australia's status as a producer and exporter of bread wheat. Insignia, a soft wheat, remains the most popular variety in Australia.

Early in 1971, Dr. A.T. Pugsley, Director of the Agricultural Research Institute at Wagga Wagga, announced that wheat breeders at the institute had developed a new crossbred variety of wheat. 27/ Yields were reported up to 100 bushels per acre under irrigation. Flour yields were 5 percent higher than currently produced wheats and exhibited excellent baking qualities. Multiplication of seed is in progress, but the new variety is not expected to be commercially available to growers until 1974. Information on how the new dwarf wheat variety performs under low rainfall conditions--the critical question for producers since practically no wheat is now grown under irrigation--is unavailable.

One issue affecting the use of improved varieties of wheat--which could result in higher average yields as well as increased acreage--would be the deliberate attempt by Australia to produce and export feed wheat. In view of the long-term export prospects which are favorable to feed grains and unfavorable for wheat as food, Gruen argues that it is:

> "more sensible...to sell wheat (denatured if necessary) on the market which has the greatest long-term prospects for growth--the feed grain market" (76, p. 15).

A statement by A.R. Callaghan, former Chairman of the Australian Wheat Board, is representative of the other side of the issue:

> "It would be unwise for Australia to change its policy of growing wheat for human consumption and deliberately grow low quality wheat for animal feeding.... In my own opinion it would be infinitely better for Australia to concentrate on coarse grain production and not purposely set about producing wheat for

26/ Past trends in wheat yield have shown only limited improvement (appendix table 3). This may be partly due to expansion of wheat production into more marginal areas. Wheat is typically grown in relatively low rainfall areas (10-20 inches annually) where a somewhat limited response to improved soil fertility (in terms of yield) might be expected.
27/ Foreign Agricultural Service, TOFAS AL-1038, March 30, 1971.

overseas livestock markets. This, however, does not preclude Australia from selling weather damaged wheat not suitable for human consumption on the world feed grain market, when such wheat is available as a result of unfavorable seasonal conditions" (44, p. 42).

Wheat geneticists in Australia have conducted research to develop a naturally pigmented wheat (wheat with a different color). Presumably, the objective is to have a clearly differentiated high-yielding, low-cost product which would take its own return from the marketplace separate from milling wheat.

Yield increases of barley and oats are mainly the result of cultural practices such as increased pasture rotations. However, the imposition of wheat quotas in Australia is stimulating additional research on increasing the yield of barley and oats. Clipper, a two-row barley 28/ planted commercially for the first time in 1970/71, is said to increase yields by 10-20 percent. Over 80 percent of the barley area in South Australia--the major producing area--is expected to be planted to Clipper in 1971/72. Barley yields have shown little increase in the past (appendix table 10). Practically all research effort has been placed on malting barley. Oat yields have remained stable during the 1960's (appendix table 7).

The introduction of dwarf sorghum in 1949 led to the commercial production of grain sorghum in Australia. Part of the increased production of grain sorghum can be attributed to the use of higher yielding hybrid seeds (11, p. 94). U.S. varieties of sorghum (for example, F64, Texas 610, Pioneer 846) are frequently planted. Grain sorghum is also being used somewhat more extensively in double-cropping systems, normally following the wheat harvest. The emergence of grain sorghum as an important alternative to wheat has been significant in southern Queensland and northern New South Wales. Dryland sorghum yields usually are 1/2 to 2/3 ton but can go much higher (see p. 12). Areas grown under irrigation normally yield 3 to 3½ tons per acre. Experimental work on irrigated land in the Ord River area of Western Australia has shown that when nitrogen and water are adequate, it is possible to harvest up to three successive grain crops from one planting (64, p. 29).

One of the biggest advances in Australian agriculture was the development of annual legumes for pasture. The most notable of these, subterranean clover, is adaptable to the dry summer and winter growing season which characterizes the southern part of Australia. The widespread use of subterranean clover as an improved pasture has vastly increased stock-carrying capacity and has improved the texture and fertility of the soil for grain production. However, a high estrogenic content in subterranean clover has resulted in some problems of infertility, particularly for sheep in Western Australia. Further agronomic testing and the development of new strains have lessened the magnitude of this problem.

Barrel medic is also an important clover used in pasture improvement. Its production tends to be concentrated on alkaline soils where annual rainfall is less than 15 inches. Heavy-textured soils in the wheat belt are well suited to barrel medic.

Townsville stylo is the most important legume grown in the tropical areas of northern Australia (101, pp. 16, 51). It was never used as a sown pasture in the Mediterranean region where it originated, but has been adopted successfully in the summer rainfall zones of Queensland and the Northern Territory. Although Townsville stylo is a self-seeding annual legume, it can be crowded out by grasses (from shading) if undergrazed. Attempts are being made to develop a perennial variety of Townsville stylo to help control this problem. Production of Townsville stylo can occur down to 30-inch rainfall areas.

28/ Two-row barley is considered a malting barley and six-row barley a feed barley.

Fertilizers

Types of fertilizers and their use are expanding in Australia. Superphosphate continues to be the major type of fertilizer used, followed by nitrogen. Trace elements such as sulphur, copper, zinc, and molybdenum are being used in increasing amounts.

The soils of Queensland and northern New South Wales are not deficient in phosphorous, but farms in Western Australia require large amounts (table 8). Trace elements, which are used in varying amounts in both heavy and light soils, promote not only pastures and crop production, but also reduce livestock diseases.

Table 8.--Sales of superphosphate, Australia, 1960/61-1969/70

Year	Total	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania
				1,000 long tons			
1960/61	2,252	459	682	20	388	600	98
1961/62	2,331	473	709	21	391	628	103
1962/63	2,836	490	971	86	443	727	119
1963/64	3,413	645	1,170	90	552	821	134
1964/65	3,744	763	1,215	107	585	938	136
1965/66	4,239	769	1,459	136	643	1,076	155
1966/67	4,328	738	1,454	135	663	1,184	154
1967/68	3,938	645	1,110	173	593	1,273	145
1968/69	4,104	648	1,241	171	604	1,304	135
1969/70	3,731	781	875	78	557	1,300	132

Source: (51; 60, p. 3).

An important development in recent years has been experimental work to determine rates of superphosphate which are normally needed on newly cleared land. A study in Western Australia revealed that the superphosphate requirement on new cropland is about 200 pounds per acre, while new pastures require 170 pounds per acre (129, p. 487). After the phosphorous level is built up to desired levels, about 50 pounds per acre are needed to maintain the soil fertility. Superphosphate also contains several trace elements, including various forms of sulphur, which are extremely important to plant growth but usually are not credited with contributing to larger yields. Because of this, the rate of superphosphate needed depends on the type of superphosphate being applied. Trace minerals frequently are applied in addition to superphosphate.

Nitrogenous fertilizers--next in importance after superphosphate--are commonly applied to the first crop planted on newly cleared land to ensure good yields. They also are used on successive crops to offset depleted nitrogen. Until 1962, sulphate of ammonia was the only nitrogenous fertilizer produced in Australia while all other supplies were imported. Urea, containing 45 percent nitrogen, now is being produced in Australia, but production figures are not available (60, p. 80).

Pasture fertilization has assumed a major role in the pasture improvement program. About 60 percent of the total area fertilized is pasture land. The area of pasture fertilized increased rapidly from 1960/61 to 1966/67, but has leveled off in more recent years (table 9). The most rapid increase took place in Western Australia, where the fertilized pasture area nearly doubled during this 6-year period.

Table 9.--Area of pasture fertilized, by State, Australia, 1960/61-1969/70

Year	Total 1/	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania
			1,000 acres				
1960/61...	26,572	6,577	9,408	21	3,300	6,125	1,080
1961/62...	27,572	6,594	9,661	30	3,583	6,471	1,154
1962/63...	29,351	7,381	9,940	33	3,750	7,002	1,165
1963/64...	32,499	9,108	10,525	44	3,993	7,447	1,291
1964/65...	37,627	10,967	11,495	88	4,714	8,888	1,380
1965/66...	39,156	10,604	11,730	131	5,093	10,051	1,475
1966/67...	41,107	9,927	12,502	180	5,237	11,601	1,588
1967/68...	40,693	9,697	11,359	259	5,130	12,587	1,561
1968/69...	36,257	7,867	9,233	299	4,270	13,037	1,481
1969/70...	40,058	8,428	10,408	360	4,062	14,295	1,473

1/ Includes A.C.T. and Northern Territory.
Source: (51, 55).

Use of fertilizers in Australia will continue to expand if export markets are available for crop and livestock products at the price levels of recent years. However, efforts to curtail farm production (such as delivery quotas on wheat) or serious price declines (such as the drop in wool prices) would tend to curtail fertilizer use through reduced costs and a lower requirement for newly cleared land.

Irrigation

Irregular rainfall and river flow in Australia have resulted in construction of large irrigation projects throughout the country. In 1968/69, over 3.3 million acres were irrigated, a 50-percent increase since 1960/61 (appendix table 41). 29/ About 90 percent of this irrigated area is in southeastern Australia (75, p. 28), 30/ with water supplied mainly from the Murray and Murrumbidgee River systems. The most important project in this region is the Snowy Mountains Scheme which will not be fully completed until the mid-1970's. This project will increase irrigated area in the region by over 30 percent, providing additional irrigation for pastures and horticultural crops.

Most of the irrigated land in Australia is used for pasture. Irrigated pastures--nearly 3.3 percent of total pasture areas in 1969/70--require irrigation throughout the year and must be stocked heavily to make irrigation profitable. Despite its widespread use, irrigated pasture generally yields lower returns than horticultural crops for the quantity of water used.

Northern Australia has a much smaller portion of irrigated land than does southern Australia. Although large quantities of water are available in Northern Australia, the costs of developing such an isolated area are high. The major irrigation project in the north is on the Ord River, where efforts are being made to develop a viable agriculture.

29/ Despite this rapid increase, only 0.3 percent of agricultural land was irrigated.
30/ Includes all of New South Wales and Victoria and parts of South Australia and Queensland.

Cotton is the major crop currently grown in the area, but production of grain sorghum and beef cattle is increasing. Some increase in both corn and sorghum production in irrigated areas is expected by 1975. Irrigated sorghum production is being expanded to make Australia a more reliable world supplier.

The average surface runoff of water over all of Australia is only one-third that of the world average, which imposes severe limitations on further large-scale irrigation projects. The severe droughts common to Australia place farmers on irrigated land in a very favored position.

Changes in Livestock Technology

New Breeds

Historically, European breeds of beef cattle--Hereford, Shorthorn, and Aberdeen Angus--have formed the backbone of the Australian beef industry. These breeds were introduced in Australia by farmers migrating from Europe. More recently, and particularly in northern Australia, there is a strong trend toward the use of tropical beef breeds and their crosses. The European breeds are frequently crossed with the Zebu and Brahman cattle from Asia for the heat tolerance and tick resistance characteristics of the latter. In addition, the added factor of hybrid vigor is achieved. Several crosses, especially the Droughtmaster and Santa Gertrudis, 31/ have also exhibited considerable heat tolerance, tick resistance, and hybrid vigor. However, low fertility is a problem in some strains of Santa Gertrudis (3, p. 2).

The use of two newer breeds--Charolais and Murray Grey 32/ --reflects a trend toward producing larger animals. Both breeds have shown ability to gain weight rapidly and are being used in crossbreeding programs, particularly in the intensive beef areas of Queensland. Although the Australian Government has prohibited imports of cattle since 1958, it now permits the importation of semen under a 2-year quarantine. The impact of this more liberal policy and of newly developed tropical breeds and their crosses will be noticed only to a limited extent through 1975.

The Merino breed has dominated the sheep industry since its inception in Australia because priority has been given to the production of wool--not lamb or mutton. However, with declining wool prices, the production of meat-type lambs is receiving more emphasis, resulting in increased mating of meat-type rams, such as the Dorset, Border Leicester, and Romney Marsh (141, pp. 15-16), to Merino ewes. The outcome is coarser wool but an improvement in the quality of the lamb carcass.

Pasture Improvement and Feeding Practices

An important result of the pasture improvement program has been the increased stock-carrying capacity of the new pasture species. Extreme caution should be used in generalizing what this rate should be because of such factors as variation in soil condition and fertility, climatic conditions, time of year, and size of animals. However, it is not uncommon for a well-managed improved pasture to show a two- or threefold increase in its stock-carrying capacity.

An experiment in Queensland revealed that native pastures oversown with Townsville stylo could carry a ratio of one adult cow to 3 acres. A more important finding was a

31/ Both the Droughtmaster and Santa Gertrudis are essentially Brahman-Shorthorn crosses, but the Santa Gertrudis is a U.S. breed and the Droughtmaster was developed in Australia.

32/ The Murray Grey is a cross between a white Shorthorn male and an Aberdeen Angus.

fivefold increase in livestock gains per acre (61, p. 11), which was partially attributable to greater stock-carrying capacity. A more significant result, however, was the rapidity with which the cattle gained weight.

Indications are that Australian farmers have not fully utilized the technology afforded them by pasture improvement. Experiments have shown that up to 10 sheep per acre can be carried on improved pastures under adverse conditions (131, p. 23). Under similar conditions, however, Australian farmers normally carry only two or three sheep per acre. Shortage of livestock, labor, and capital are cited as reasons for this difference. Probably equally important is the farmer's hesitation to carry more sheep per acre simply because he is not used to having such high stock concentrations and his fear of losing large numbers of livestock due to disease or severe drought.

Significant progress has been achieved in the supplementary feeding of livestock during periods of drought. This process can take the form of supplementing standard pastures with grain crops (green or mature) or the direct hand feeding of grain, roughage, urea block, or other feeds. The objectives are to reduce animal mortality, improve fertility, and avoid weight losses. Where livestock are under reasonably close control, supplementary feeding appears feasible. However, getting supplemental feeds to the animals under open-range conditions poses a logistics problem.

Although most livestock producers continue to pasture cattle and sheep until they are marketed, crop fattening and lot feeding, though still small undertakings, have gained in importance. Crop fattening is relatively popular in Queensland, where nearly 40 percent of Australia's beef cattle are located. By allowing cattle to crop graze, they can be marketed at a more desired finish and at a higher weight. Crop fattening does not require any large additional investment, but pasture land is normally diverted for this purpose. Lot feeding requires construction of some type of enclosed facility, but it can be moderate in cost (see p. 28).

Pest and Disease Control

Australia has adopted very tight quarantine measures to exclude pests and diseases that are prevalent in other countries. While such efforts have kept Australia from incurring many animal health problems, they have also restricted the introduction of new cattle and sheep breeds.

The control of rabbits through myxomatosis 33/ has curtailed substantial pasture and crop losses in Australia. The sheep industry has profited immensely from these advances. In areas where rabbits have developed a partial immunity to the virus, new vectors--such as rabbit flea--or new methods of control--such as poisoning--have been introduced.

The cattle areas of northern Australia have suffered large losses each year from cattle tick (93, pp. 356-368). While farmers have not been able to eradicate this disease, it is being controlled more effectively by spraying or dipping. These compounds are limited by their need to be administered on a regular basis and ticks become resistant to them. Tick control is also possible through use of controlled grazing, that is, rotation of pastures. Efforts to build up cattle resistance to ticks are continuing through the use of the Brahman breed which is inherently tick-resistant.

The cattle industry also has benefited from control of bovine pleuro-pneumonia. The disease still exists in parts of Queensland and the Northern Territory, but continued vaccination of cattle has largely eliminated it in other sections of the country (2).

33/ Myxomatosis is a virus disease spread rapidly by innoculated mosquitoes. It has killed about 1 billion rabbits (138, pp. 28-29).

In the past, large amounts of range feed were consumed by kangaroos and wallabies, but hunters now keep these animals in check. The construction of dingo-proof fences has lessened the threat of dingoes (wild dogs) to the sheep industry.

Improved Transport Facilities

Australia's transportation network made rapid progress during the late 1960's. Sea 34/, rail, and road transport are now geared to bulk handling of agricultural products, particularly wheat and fertilizer. In addition, the meat shipping industry is almost entirely containerized; cargoes consist of a consolidated package of like goods in uniform shapes and sizes. Containerization allows a substantial reduction in handling costs prior to shipping.

The railway system has adopted a uniform gauge system for interstate transport, which facilitates long-distance rail transport. 35/ The shift to diesel traction has resulted in substantial economies in railway operations, particularly in long-distance haulage. However, construction of additional rail facilities in remote areas is considered far too costly when compared with the other possibilities for expanding the transportation network (128, p. 1). Railways are used fairly widely for cattle in New South Wales and Victoria since they are readily accessible to many producers. The guiding principle in moving livestock by rail is the time needed to freight live animals from rural areas to packing plants. In moving livestock by trains, freight cars are allocated in the following order: (1) fat and finished stock, (2) feeder cattle, and (3) animals for resale for restocking of herds.

Construction of cattle roads in northern Australia is the most important development in transport technology. Less than 20 years ago, droving--moving cattle overland to railroads or to packing plants--was the common means of transport (128, p. iii). A survey of the beef cattle industry as of 1965, however, indicated that road transport of live animals to market was far more prevalent than droving (34). These new roads are built in conjunction with existing railroads, facilitating a combined movement of beef cattle by road and rail. Many of the planned roads are scheduled for completion in 1974 (fig. 9). As of June 1970, a total of 2,847 miles of roads had been built including (4, p. 11; 128, pp. 7 and 9):

Queensland --- 950 miles
Western Australia --- 272 miles
Northern Territory --- 1,170 miles

Transport by cattle trains 36/ began in the late 1940's and has been expanding in areas where road construction is adequate to permit this method of transport. The actual number of animals moved from cattle stations to market by truck varies by States. In New South Wales, 75 percent of the cattle are marketed by truck; in Victoria, 74 percent; in South Australia, 98 percent; in Western Australia, 95 percent; and in Queensland, 45 percent (34).

A direct result of the improved transportation system is the increase in turnoff and quality of beef cattle in these areas. Better access is now possible to fattening

34/ In the past, ocean export was entirely under flagships of other countries. Australia's cargo ships serviced only the ports of Australia.

35/ Nevertheless, railroads remain under individual State control and different gauge railroads still exist. Rates tend to be high and competition from trucks is effectively regulated by road taxes.

36/ Usually two to three truck trailers hooked together and pulled by a large tractor truck.

U.S. DEPARTMENT OF AGRICULTURE NEG. ERS 8323-71(5) ECONOMIC RESEARCH SERVICE

Figure 9

and feed-growing areas 37/ in other parts of Australia and to the in-movement of breeding stock. Farmers are now able to haul cattle longer distances to markets without the loss of weight which was incurred by droving. Both younger and older cattle can be moved to the market, since the trip is less rigorous.

Other Developments

Several other important but less dramatic changes in management practices and farming techniques have taken place in Australia in recent years. Experiments have been done with cloud-seeding to get more land into agricultural use. They indicate that cloud-seeding can increase rainfall 10-20 percent above the normal amount (115, p. 39). Areas in southern Australia that are near the Murray and Murrumbidgee river systems would benefit most from this technique. Apparently, rainfall can be artificially increased in relatively high rainfall areas, but little success is expected where natural annual rainfall is below 20 inches.

Modern practices of land clearing are used in Australia. Timber is felled by a heavy cable stretched between two large tractors, burned when dry, and new pasture species sown directly into the ashes. Most land clearing is done under contract, and the process is much more efficient and less costly than it used to be. Oversowing of new pasture varieties has become a common practice since the early 1960's. Generally, new pasture varieties are sown in strips directly into native pasture. These strips cover about one-third of the total area and allow the new pasture to spread over the unsown portion of the field (80, p. 115). This is usually done after the pastures either are close grazed or the area is burned off. This technique permits the elimination of cultivation, and the pasture is often fully developed in 3 years.

V. MARKETING AND GOVERNMENT ASSISTANCE

Various aspects of marketing and Government assistance have an impact--both direct and indirect--on the growth of Australia's grain-livestock economy. This chapter highlights some important considerations.

Marketing of Grains, Livestock, and Livestock Products

Australia depends heavily on export markets to dispose of surplus agricultural production (table 10), 38/ and the Government's agricultural policies reflect this dependence. All major agricultural commodities are subject to some form of State or Commonwealth Government control, but arrangements vary by commodities. The following paragraphs discuss marketing of important grains and livestock products.

Grains

Wheat.--The Australian Wheat Board (AWB) has historically taken title to all wheat except that retained on farms for seed and feed. However, since 1969/70, small percentages of the crop have been sold for feed and milling by farmers outside AWB's regulated

37/ Agistment, the process of hiring out the feeding of one's livestock on another property, is relatively common in places in Australia because of frequent local droughts.

38/ However, the share of agricultural exports in total exports declined from nearly 80 percent in 1960 to 55 percent in 1970, despite the fact that the volume of major agricultural exports has increased (appendix table 42).

marketing schemes. These sales have been made in what is known as the "grey market" under Section 92 of the Constitution, 39/ which permits uncontrolled movements of grain across State borders. Grey market sales occur generally if AWB has no storage facilities to handle the wheat or if transport facilities are not readily available to the farmer.

Table 10.--Percentage distribution of selected Australian agricultural commodities exported, 1960-70

Year	Commodity							
	Wheat	Barley	Oats	Corn	Grain sorghum	Beef and veal	Mutton and lamb	Wool
	Percent							
1960	33.3	36.8	15.7	0.6	33.2	40.4	17.6	96.2
1961	61.9	81.7	34.5	--	3.7	33.5	17.9	96.1
1962	66.2	79.4	27.7	--	16.9	42.1	19.8	94.9
1963	46.3	23.8	26.0	5.3	19.7	43.6	23.7	86.7
1964	68.8	36.0	23.8	--	6.0	45.6	23.9	91.5
1965	80.9	38.9	33.2	.6	7.2	48.0	25.2	94.3
1966	40.6	16.2	12.9	--	3.6	46.8	27.6	88.9
1967	86.2	50.9	55.9	1.1	20.1	46.6	26.7	89.9
1968	43.9	7.8	10.6	1.6	10.4	44.5	29.9	84.0
1969	45.1	25.2	19.8	--	38.6	43.2	26.4	84.3
1970	82.0	26.4	12.9	.4	11.9	49.1	36.3	92.3

-- Means negligible or none.
Source: (53; 66, p. 33; 130).

The AWB is the only commodity board directly controlled by the Commonwealth Government. 40/ It has broad powers in trading and is technically responsible for the marketing of all wheat and flour--both domestic and foreign. Although the AWB takes title to wheat purchased from farmers, it does not assume actual possession of the grain. Wheat deliveries are made by farmers to local elevators, where grain elevator boards or bulk-handling authorities--acting as agents of the AWB--receive, weigh, grade, store, and fumigate the wheat.

Foreign sales of wheat, which nearly tripled in value between 1960 and 1970 (fig. 10), are handled in various ways by the AWB. Export contracts may be negotiated directly with overseas buyers representing foreign governments, with government purchasing agents, or with private traders. European and Middle East sales are consummated by the AWB's Australian Wheat Committee in London. Wheat for export is sold both on a c.i.f. and f.o.b. basis. The Australian Government, as signatory to the International Grains Arrangement, is committed to supply 225,000 metric tons of wheat annually under the Food Aid Convention.

39/ Sec. 92 states, "The imposition of uniform duties or customs, trade, commerce and intercourse among the States, whether by means of internal carriage or ocean navigation, shall be absolutely free."

40/ Other Commonwealth marketing boards exist for dairy products, apples and pears, dried fruits, canned fruits, meat, eggs, honey, tobacco, and wine. These boards are monopolistic in the exporting of their respective commodities, but have little, if any, control over domestic marketing of their products. Aside from commodity boards at the Federal and State levels, some commodities in some localitites are marketed through cooperatives, grain pools, or, more recently in the case of wool, a commission.

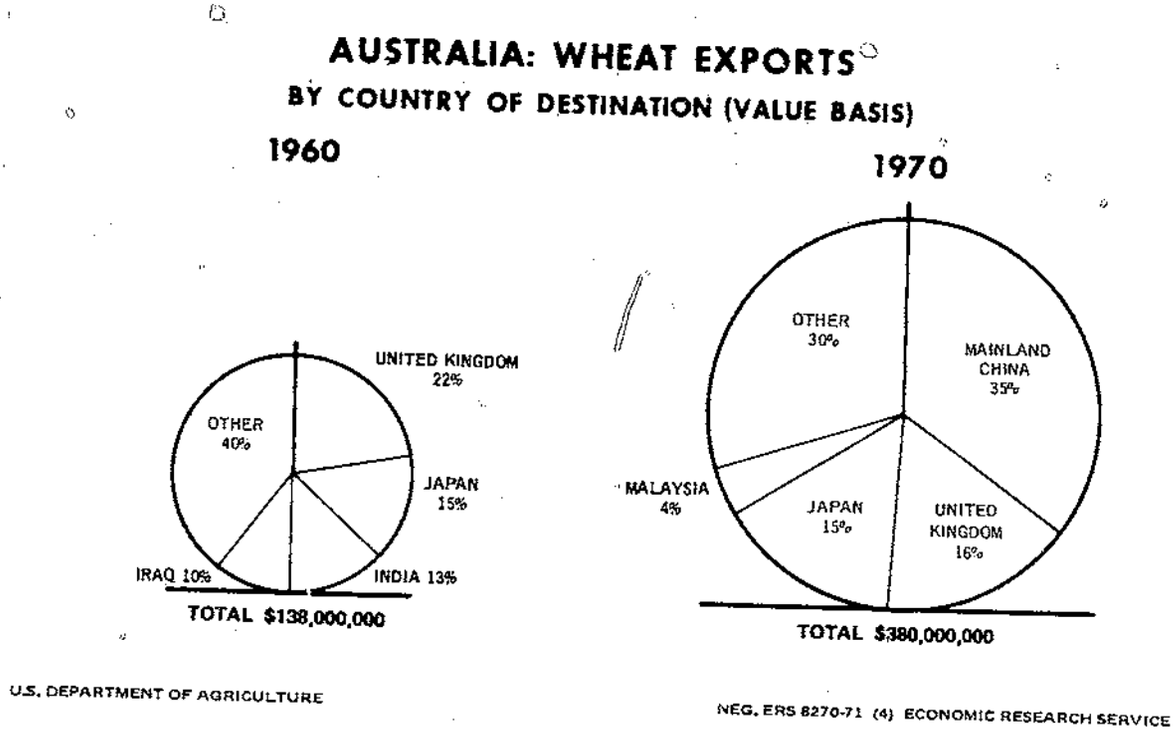

Figure 10

Because of a large accumulation of wheat stocks, delivery quotas were introduced with the beginning of the 1969/70 crop. The national quota for wheat deliveries to the AWB for that year was set at 9.6 million metric tons. In the following year, the quota was reduced to 8.5 million metric tons. The reduced harvest of 7.9 million metric tons of wheat in 1970/71, plus a favorable export period during the 1969/70 marketing year, resulted in a 9.1-million ton delivery quota for 1971/72. Much of the increased quota is for prime hard varieties of wheat in short supply during the 1970/71 season.

Price differentiation is an integral part of Australia's wheat marketing system. The current Wheat Stabilization Plan provides three prices, subject to an annual review, which are payable to producers. Prices announced for the 1970/71 season were:

(1) $1.74 per bushel for all wheat sold and consumed domestically for food
(2) $1.475 per bushel on 200 million bushels of fair average quality (f.a.q.) bulk wheat exported
(3) $1.45 per bushel for feed wheat and wheat used in starch manufacture.

Proceeds from all sales of wheat, after allowing for payments into or from the Wheat Stabilization Fund, are pooled and growers are paid uniform prices 41/ subject to pre-

41/ The only exception is the 2.5 cents per bushel freight rebate paid to Western Australia producers since their grain shipment costs are lower.

miums or deductions for quality. The AWB gives an advance payment to growers soon after the wheat is delivered. Since 1957/58, the advance payment has been set at $1.10 per bushel. The guaranteed price on exports (applicable only to 200 million bushels) is funded partially by an export charge on wheat deliveries. The export levy is assessed only when the average export exceeds the guaranteed price by 5 cents a bushel and is limited to 15 cents a bushel. These export charges are payable to the Wheat Stabilization Fund which, by the terms of the current plan, is limited to $80 million. In seasons when the export price is less than the guaranteed price, the difference in price--up to 200 million bushels of exported wheat from any season's crop--is paid from the Wheat Stabilization Fund, which--in some years--is subsidized by the Commonwealth Treasury.

Marketing standards for wheat are established annually in each State, but most wheat is graded fair average quality (f.a.q.). To qualify for f.a.q., the grain must be: (1) 60-pound bushel weight, (2) not more than 12 percent moisture, and (3) not more than 5 percent unmillable material (including cracked and broken kernels). Wheat that does not measure up to these specifications is sold as "off-grade" at lower prices. The AWB is trying to improve the wheat grading system. 42/ In addition, attention has been given to the needs of importers and millers by establishing a Market Servicing and Research Unit within AWB.

Feed Grains.--Feed grain marketing varies from State to State, depending on the crops produced and the importance of the crops in the export field. The Commonwealth Government has only a minor role in the operation of the State Legislated Boards engaged in the marketing of feed grains. However, the Minister of Primary Industry endeavors to ensure that adequate supplies of feed and malting grains are retained for domestic needs. In most years, this does not present a problem since domestic barley prices are above prices in export markets.

Three barley boards--Australian Barley Board (ABB), Queensland Barley Board, and Western Australian Barley Marketing Board--function as trading authorities. The boards conduct their own pooling arrangements for each year's crop and pay the growers according to the variety and grade of barley marketed. In the 1950's, about 90 percent of the barley produced was marketed through marketing boards, but by the mid-1960's the percentage had dropped to about 50. The bulk of barley exports, which totaled about 25 percent of total production in 1968/69, is now channeled through the ABB. 43/

Australia has two voluntary oat pools--one in Western Australia and the other in Victoria. These pools chiefly are engaged in the sale of oats on export markets. They pool the receipts and make equal payments to grower-members as sales are made. Members of the Western Australian pool receive advance payments.

The Atherton Tableland Maize Board controls the marketing of all corn (maize) produced in northern Queensland. 44/ The major portion of the corn production is marketed domestically for use as pig and poultry feed. In some years, when pasture conditions are extremely poor for cattle in northern and western Queensland, farmers purchase corn

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42/ For example, in the 1970/71 season, hard types of wheat produced in New South Wales were broken down into finer designations, such as Northern Prime Hard, Nos. 1 and 2; Northern Hard; Off-grade; Special off-grade; Soft biscuit and Falcon Hard.

43/ Legislation enacted by South Australia and Victoria in 1947 empowers the ABB to "purchase, acquire, sell, dispose of, treat, store, protect, transport and handle barley and barley products." The ABB may perform its own sales and shipping functions or license persons or organizations to perform as its agents. Farmers are required to sell all their grain to the ABB except quantities needed for on-farm use.

44/ Corn production in Victoria had become so stabilized--about 5,000 tons per annum--that the Victorian Maize Marketing Board ceased to function with the 1969/70 crop.

for cattle feed. Payment to growers is based on the net returns realized from the operations for a given crop year.

Provisions were made in 1970 for the establishment of an Australian Coarse Grain Growers Association to export both corn and grain sorghum. The first act of the association was to create a pool for export sales of surplus New South Wales corn. A first payment of 70 cents per bushel for corn delivered to the pool is followed by a final payment made after export sales have been completed for the season. The New South Wales Grain Elevator Board is responsible for the actual physical handling of the grain through wheat silos designated for corn.

The Central Queensland Grain Sorghum Marketing Board buys sorghum from farmers in designated areas of central Queensland, arranges storage, and markets sorghum in Australia as well as overseas. 45/ Growers receive an advance payment upon delivery of the grain to the board. Final payments are made when all grain from a season's pool is sold and all storage and marketing costs are deducted.

Livestock and Livestock Products

Live Animals (Cattle, Sheep, Lambs).--The livestock auction is the principal method of marketing live animals in Australia. Auctions or saleyards exist in all State capitals as well as in major rural livestock centers. Livestock sold at auctions go either to farms for stocking or to slaughtering plants. The largest auctions--Homebush and New Market--are located in the vicinity of Sydney and Melbourne. Larger cattle producers are represented by agents at these auctions. Agents sort the animals in the saleyards into salable lots, conduct auctions, record proceeds, and make payments to producers. The producers pay the agents on a fee basis for their services.

Sometimes farmers sell directly to butchers for the local retail market or to other producers for breeding or further feeding. Some slaughtering and meat packing plants purchase cattle at the farm (from producers or agents representing the producer) for fattening to ensure regular supplies of animals for processing. Producers may also decide to sell their livestock at saleyards directly to agents or to other producers.

Most cattle, calves, sheep, and lambs marketed at auctions are sold on a per head basis, that is, without being weighed. However, since 1968, the Homebush auction has marketed cattle and calves on a carcass-weight basis.

Payments to producers for livestock sales depend on the method of sale. Most sales at the farm, or direct sale by producers at saleyards, are believed to be in cash. In some States, agents report their sales as consignment sales, and settlement probably is made to producers on a periodic basis after commission and other related costs have been deducted.

A livestock slaughter levy of not more than 75 cents per head is charged producers on cattle sold for slaughter that exceeds 200-pound deadweight. A similar levy (not to exceed 7.5 cents per head) is charged producers on sheep sold for slaughter. Funds from these charges are used to finance the operations of the Australian Meat Board (AMB), including the Australian Meat Board Research Committee programs and cooperative investigations as well as projects with the Commonwealth Scientific Industrial Research Organization (CSIRO). 46/

45/ The Queensland Grain Growers Association handles marketings from southern Queensland.
46/ The actual amount of the levy set for 1970 was 33 cents per cow and 3.33 cents per sheep. Twenty cents of the 33 cents was allocated to research and the remainder to operational costs of the AMB. Of the 1970 levy collected on sheep, 1.75 cents was for research and the remainder for board financing.

Producers are responsible for freight costs incurred in the transfer of livestock to saleyards or slaughtering plants. If livestock are transported by truck, producers contract with truckers for an entire season. Some large holdings maintain their own trucking facilities, particularly for long hauls in Queensland or the Northern Territory.

Beef, Mutton, and Lamb.--All of Australia's slaughtering plants are subject to the Federal Department of Primary Industry's sanitary and inspection requirements, coordinated through State Departments of Agriculture. As of July 1, 1970, over 100 private slaughtering plants had licenses to process and export meat. Not all these plants, however, were certified to ship meats to the United States--Australia's major market (see figs. 11 and 12). Some plants were removed from certification in the second half of 1970 because of a U.S. ban on Australian mutton from packing plants that did not meet sanitary regulations of the U.S. Wholesome Meat Act of 1967.

Meat grading, for the most part, is confined to meat exports. Set specifications exist, however, for branding of lamb carcasses that are channeled into domestic consumption. A limited beef-grading scheme also operates in Queensland.

Meat markets or butcher shops are the main retail marketing outlets for fresh meats in Australia. As of 1967, about 75 percent of meat purchases in retail channels were made through butcher shops--a drop of 23 points from the 98 percent made in the late 1950's. About 20 percent of retail sales of fresh meats are currently made through grocery stores. The amount of sales made through supermarkets is not known but is believed to be expanding.

Promoting the sale of meat and meat products in Australia and in foreign markets is the principal responsibility of the AMB. Under the Meat Industry Act of 1964, the AMB may purchase and sell meat in its own right when markets for the meat must be developed. AMB has representatives in principal foreign marketing areas and is active in domestic market promotion. It also has liaison programs with industry and coordinates meat research projects with CSIRO, universities, and the Commonwealth Department of Primary Industry.

AMB uses a diversification scheme to ensure that beef, veal, and mutton exports to the United States are maintained within the voluntary quota limits set by the U.S. Government. The main provision of the scheme is that meat exporters must ship specified amounts of beef and mutton to markets other than the United States to qualify for the U.S. market. The AMB reviews the performance of exporters monthly and, since May 1970, all exporters must be approved before making shipments to the United States. The AMB gives approval to exporters holding a diversification credit at the time of making application to ship. 47/

Wool.--Until the 1969/70 season, wool--one of Australia's major exports (fig. 13)--was the only major agricultural commodity marketed freely in Australia. However, a sharp decline in prices since the mid-1960's resulted in two actions by the Australian Government, with the approval of the wool industry. The first, in late 1969, provided for the creation of a nonstatutory authority, the Wool Marketing Corporation. The second, in late 1970, was the passage of the Australian Wool Commission Act of 1970, which authorized the formation of a Wool Commission.

The Wool Marketing Corporation was established to provide financial assistance to woolgrowers. The principal function of the corporation was the administration of a price-averaging plan operating under the auction system to stabilize prices to small woolgrowers with sales of less than four bales. With the adoption of legislation authorizing the establishment of the Wool Commission in 1970, the Wool Marketing Corporation

47/ Export certificates (or options) to the U.S. market are negotiable among meat exporters.

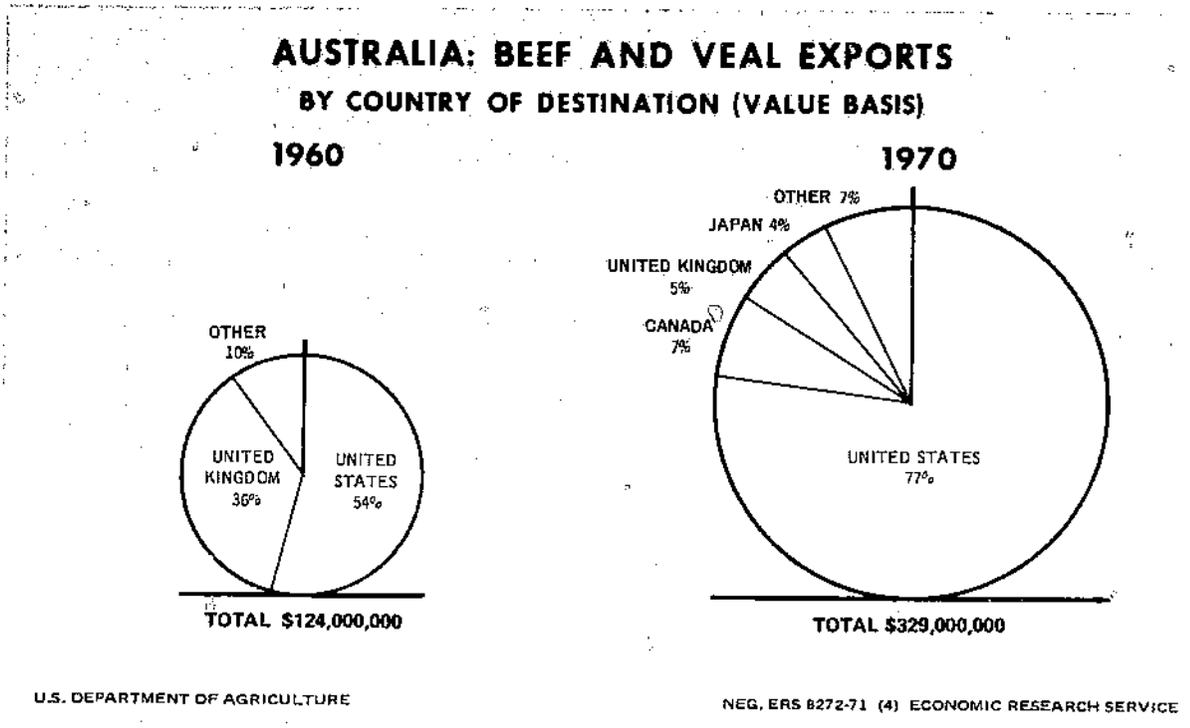

Figure 11

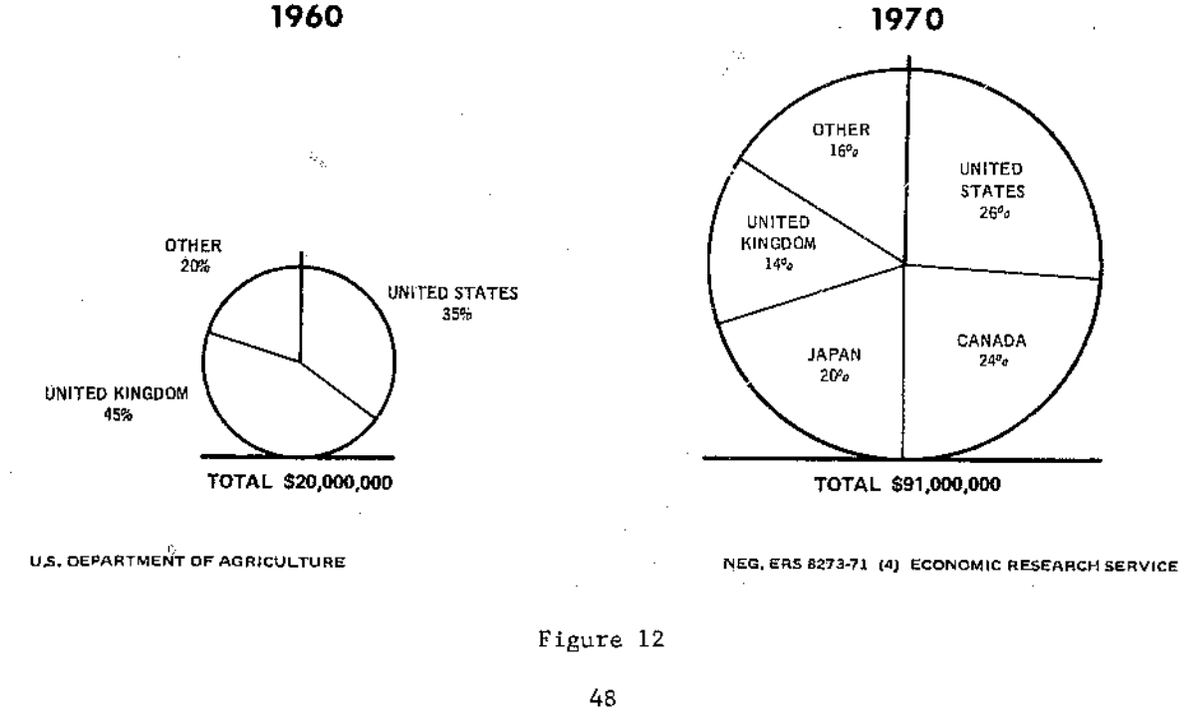

Figure 12

ceased to exist and all its functions were transferred to the Wool Commission. The Commission's principal functions are to:

(1) Administer a flexible price reserve scheme for all wool sold at auction
(2) Formulate standards for preparing and classifying wool for auction or other sales
(3) Formulate and coordinate sales procedures for wool auctions, such as small lot sales, price schedules, and provisions for advanced payments to producers
(4) Set criteria for sales of wool outside auctions, if the wool cannot qualify for auction marketing
(5) Advise the Minister of Primary Industry of price trends and marketing practices relative to wool on a biweekly basis
( ) ...ticipate, with approval of the Ministry of Primary Industry, in negotiations affecting wool marketing such as freight rates, and in appraisal of recommendations for improved marketing schemes
(7) Cooperate with the Wool Board and other organizations in solving problems related to market promotion, research, and methods of marketing wool
(8) Cooperate with foreign wool organizations in the adoption of worldwide procedures for wool marketing.

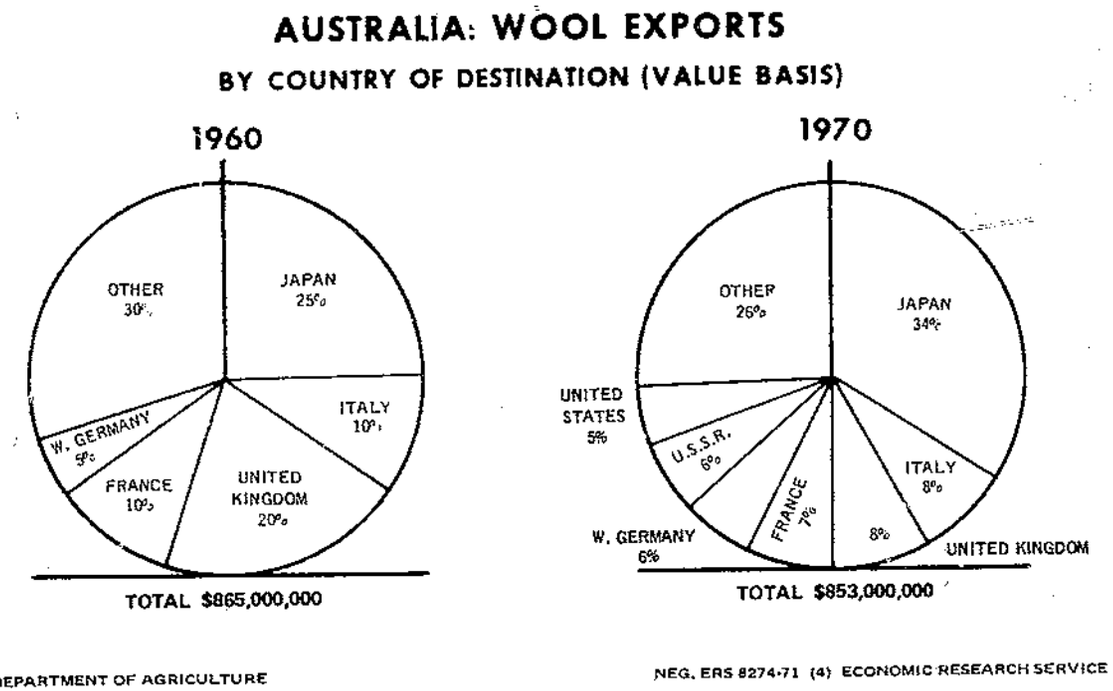

Figure 13

In addition, certain general marketing functions have been performed for a number of years by the Australian Wool Board. The present board, established in 1962, evolved from an earlier organization set up in the 1930's. In general, the Wool Boards' functions include: (1) market promotion, (2) coordination of research, (3) operation of a wool-testing service, (4) investigation of marketing arrangements, and (5) an advisory board on marketing.

Ninety percent of the wool marketed in Australia is sold by auction. Wool now offered for auction must be in amounts exceeding 3 bales and be of a class or quality to qualify for the flexible reserve price bid set by the Wool Commission. When offerings of wool by growers do not meet the above standards, the commission has the authority, with the consent of the grower, to purchase the wool. The wool is then processed until it does meet the minimum auction standards. On occasions when the Wool Commission purchases from growers, it pays the grower a price equivalent to the most recent reserve price set for that particular type of wool, or such higher price as the commission may elect. When wool offered at auctions does not receive a bid equivalent to the reserve price set by the Wool Commission for any given period, the commission may bid the wool in at the resreve price and hold the wool for future sale at auction or other method of disposal.

The extent of private sale of wool by growers to brokers or country dealers varies from State to State. About 30 percent of the wool marketed in Western Australia is transacted by private sale. The country dealers or brokers, as a rule, resell wool at auction at a higher price. Under the new system of marketing control inaugurated in 1970, private selling of wool is expected to decline and possibly eventually cease. This expectation is especially true if present low prices for wool continue.

Growers receive payments for their wool from brokers who handle the producer's wool at auction, from country dealers or agents who buy directly from the grower, and, more recently, from transactions of the Australian Wool Commission. Brokers charge a State-fixed rate of commission to the grower. The grower is responsible for handling, storing, advertising, and cataloging costs, and for miscellaneous selling costs. These charges vary by auction center in each State. The producer must also pay the costs of interlotting, reclassing, repacking, or reconditioning wool, should these steps be necessary for orderly marketing. 48/

A new wool marketing "complex" is under construction near Sydney. It combines huge wool stores and receiving and grading rooms with closeby railway and port terminals to facilitate lower costs of handling and transporting wool. This new marketing structure is scheduled to operate in the 1971/72 season. A rail freight concession of 65 cents per bale will be given to all New South Wales woolgrowers shipping their wool to the new complex.

Government Assistance

The Commonwealth Treasury provides assistance to agriculture in the form of grants, subsidies, and contributions to research. 49/ Direct Government payments on agricultural commodities, excluding fertilizer and other input subsidies, were $128 million in 1970/71, compared with $60 million in 1969/70 and $110 million in 1968/69. The amount for 1970/71 included $30 million for emergency assistance to woolgrowers.

48/ Small producers' wool, classed and baled at the farm level and then matched with other growers' baled wool for marketing is known as interlotting. Pooling or bulk-classing is the process of classing a small producer's wool in the shearing sheds and then resorting or classing it by brokers and matching it with wool of other growers.

49/ No attempt is made here to account for all forms of Government assistance to agriculture. A comprehensive accounting would be complicated by the allocation of assistance benefiting both nonagricultural and agricultural sectors. Only subsidies on commodities and inputs are discussed in the following paragraphs.

Subsidies on Commodities

Grains.--Much of the Government's assistance to the grains sector has been limited to wheat. Support prices, administered by the AWB under the Wheat Stabilization Program, date back to 1947/48. The Government has made payments to the Stabilization Fund each year since the finalization of payments for the 1959/60 crop (Pool No. 23), totaling $156 million through the 1967/68 crop pool.

Government import policies can also provide indirect assistance to agriculture. Grain imports in Australia legally are not restricted other than by quarantine regulations and tariffs. From an actual trade standpoint, however, wheat trade is controlled by the AWB, and imports have not been permitted except in 1957/58 when stocks were low because of drought. Quarantine regulations are rigid and currently, Canada, New Zealand, and the United States are the only areas from which grains or grain products are admitted.

Livestock and Meats.--The 15-year meat agreement with the United Kingdom--1952 through 1967--provided for deficiency payments to exporters and producers when prices for Australian beef, veal, and lamb dropped below guaranteed minimum levels. Sometimes, mutton was also included. The United Kingdom discontinued all price guarantees on beef and veal with the termination of the meat agreement at the end of the 1966/67 marketing period. However, the Australian legislation canceling deficiency payments on most meat shipments to the United Kingdom was not effective until after the 1968/69 marketing season.

In addition to the long-term meat agreement with the United Kingdom, Australia negotiated special arrangements (known as the Lamb Export Scheme) in 1962 for lamb shipments to the United Kingdom. The agreement contains price incentives to encourage processors to ship lamb to the United Kingdom in peak supply months--September through February--rather than holding for later periods in the chance that prices in the United Kingdom would be higher. In the 1969/70 and 1970/71 marketing years, exporters who shipped lightweight lamb (36-pound carcasses) to the United Kingdom during September to November of each year were guaranteed a minimum f.o.b. price of 18 cents per pound by the Australian Government. On shipments of lamb to the United Kingdom during December to February, the guaranteed minimum price was set at 16.5 cents per pound.

Aside from tariffs, imports of livestock and livestock products are strictly controlled under quarantine acts of the Commonwealth Government. Imports are limited to "disease free" countries--chiefly New Zealand and the United States, depending on the commodity. An import ban is in effect on breeding stock (cattle) from the United States because the Australian Government contends that U.S. cattle are susceptible to "bluetongue" disease. All frozen meats are prohibited entry into Australia unless originating from New Zealand.

In the late 1950's and early 1960's, Australia and some foreign nations negotiated a number of bilateral arrangements which provided Australia with export market assurances for fresh (chilled and frozen) and canned meats. In addition to the long-term agreement with the United Kingdom, bilateral negotiations took place with West Germany, Canada, Poland, Hungary, Bulgaria, and Czechoslovakia. Since 1964, Australian frozen beef, veal, and mutton exports to the United States have been subject to import limitations under U.S. Meat Import Law (P.L. 88-482). As a major supplier of exports to the United States, Australia's share of the market is just under 50 percent. In 1970, the AMB negotiated substantial sales of beef and mutton to the U.S.S.R.

Subsidies on Inputs

Fertilizer.--Total subsidy payments on all fertilizers used by farmers were estimated at $56.5 million for 1970/71, or about the same level as the $56 million paid in

1969/70. Subsidies on both superphosphate (including trace elements) and nitrogenous fertilizers are payable directly to farmers.

Subsidies on superphosphate, the most important fertilizer used on both crops and pastures, were introduced in 1963 to encourage development of virgin farmland, chiefly in the northern and western areas. Aside from Western Australia, the main increases in the use of phosphate fertilizer have taken place in New South Wales and Victoria. The first subsidy, effective through 1966, provided for a $5 per long ton payment to users of superphosphate and $30 per ton payment on the phosphorous pentoxide content of other phosphate fertilizers. In 1966, legislation extended the subsidies for another 3 years. In 1968, the Government increased the subsidy on superphosphate to $8 per ton and to $40 per ton for other phosphate fertilizers. In 1969, the Government again increased the subsidy payments by 50 percent on superphosphates--from $8 to $12 per ton--with corresponding increases in subsidies on other phosphatic fertilizers. Justification for increasing the subsidies was twofold: (1) reduce fertilizer costs to all farmers and thus encourage production for export; and (2) reduce costs of production in the wheat and sheep industries. The cost of the subsidy to the Commonwealth Government ranged from $21 million in 1963/64 to $46 million in 1969/70, and approximately $200 million since the phosphate subsidy program began in 1963.

Since 1966, the Commonwealth Government has given farmers a subsidy of $80 per long ton on the nitrogen content of fertilizers. These payments apply to both domestic and imported products, if domestic production is not adequate to meet farmers' needs. The subsidy payments on nitrogen products were extended in 1969 for a second 3-year period ending in October 1972. In the 1966-69 period, nitrogenous fertilizer subsidy payments to farmers totaled $28 million. In the first year (1970) of the second 3-year period, subsidy payments to farmers amounted to $10 million. In addition to the subsidy paid to farmers, a Government subsidy of $80 per ton was paid to manufacturers ($36.80 per ton on urea, 46 percent nitrogen; and $16.80 per ton on sulphate of ammonia, 21 percent nitrogen).

Irrigation.--Under the provisions of a National Water Resources Program adopted in 1966, the Commonwealth Government has engaged in a 10-year program of assistance to States, totaling $150 million, for the development of irrigation, water conservation, and flood control projects. By 1970, half these funds had been allocated to projects to assist agricultural irrigation. Some projects being constructed include:

(1) Ord River project in northeast Western Australia (Irrigation of 180,000 acres at an estimated cost of $48 million; area now irrigated being used for cotton production, but also suitable for grain sorghum and oilseeds)
(2) Copeton Dam in New South Wales (Irrigation of 50,000 acres with planned use for grains, oilseeds, and fodder crops; Commonwealth Government grants total about $20 million)
(3) Tailem Bend--Keith Pipeline Project--South Australia (Irrigation of 2 million acres suited for sown pastures)
(4) Comprehensive Water Supply Scheme for southwest Western Australia (Irrigation of 3.7 million acres for promotion of livestock and feed crops)
(5) Emerald Irrigation Project in central Queensland (Irrigation of about 60,000 acres for production of cotton, grains, oilseeds, pastures, and fodder crops; Commonwealth Government has allocated $20 million to the Fairburn Dam for this project)
(6) Coleambally Project in southern New South Wales (Irrigation of about 500,000 acres upon completion of the Snowy Mountain Scheme in the mid-1970's).

Davidson (68) has argued that no irrigation scheme in Australia can be justified on economic grounds and that the resources used to construct irrigation works would have been better used in expanding dryland farm area.

Petroleum.--In 1965, the Commonwealth Government introduced a price equalization scheme for gasoline used by farmers. The objective of the scheme is to bring prices of gasoline in farm localities in line with prices applying in urban localities. Subsidy payments by the Government to farmers ranged from $9.9 million in 1965/66 to $25 million in 1970/71.

Tractors.--Manufacturers have received from the Commonwealth Government subsidy payments to lower prices of farm tractors. This indirect policy of assistance to farmers prevailed throughout the 1960's. The subsidy is based on the horsepower of the engine and the degree to which the machine is manufactured and assembled locally. Subsidies under the Agricultural Tractors Bounty Act of 1966 were provided through June 1971.

Land.--One of the major programs connected with this input is the Brigalow Land Development Program. A 1962 agreement between the Commonwealth and Queensland Governments gives financial assistance for the development of "brigalow" 50/ country in Queensland. Original funding provided for the development of virgin lands in the Fitzroy River Basin, which was originally intended for cropping and dairying. Since 1965, the area to be developed has been extended to 5 million acres with emphasis on beef cattle production. The Commonwealth Government also agreed in 1966 to provide additional financial assistance to Queensland for the development of 6 million acres of brigalow land in the Mackenzie-Isaac River area. Commonwealth financial assistance for the development of all brigalow land in Queensland is limited to $23 million in the form of interest-bearing loans over a 13-year period beginning July 1, 1962. As of June 30, 1970, amounts made available under terms of the agreement totaled $13.1 million.

Although the Commonwealth Government is limited by its Constitution in regard to land settlement, it has assumed the responsibility of a War Service Land Settlement Program for veterans from World War I, World War II, and Korean War. This activity has had an impact on the structure of Australian agriculture by tending to encourage development of smaller type holdings. The current program was legislated in 1952/53 and provides for allocation of both farm and grazing properties to eligible veterans. The scheme operates in conjunction with the State Governments, each of which has its own program of purchasing, developing, and subdividing the land for settlement. The States also contribute ancillary services such as roads, schools, and electricity. Any losses from the operation of the program are shared jointly by the State and Commonwealth Governments. Federal funds expended for the scheme to all States through June 1970 totaled $226.5 million.

Transportation

In the past 20 years, the Commonwealth Government has provided substantial funds to the States for development and improvement of transport facilities. The Commonwealth Aid Roads Acts of 1959 and 1964 together provided $1.3 billion for construction of transport facilities during the 10-year period ending in 1968/69. Another $1.2 billion of Government funds was allocated for the 5-year period beginning in 1969/70. Of the total Government fund allocation for roads, 40 percent had to be spent on construction in rural areas.

The largest portion of the transportation expenditure was used to extend the standard gauge railway system, particularly to complete the intercapital city links. Of direct benefit to cattle producers was the modernization of the Mt. Isa-Townsville line in Queensland which, in conjunction with beef roads in the area, provided improved facilities for transport of beef from Western Queensland and the Gulf of Carpentaria regions to coastal fattening areas and packing plants. This project, which was completed in 1965, cost the Commonwealth Government $34 million.

50/ Brigalow refers to a quick-growing "weed" tree-type bush found only in Australia, mainly in Queensland.

Rail freight rebates of 50 percent are payable to graziers when they ship store cattle to agents or packing houses for fattening and slaughtering. The Commonwealth Government gives producers a 20-percent freight rebate on breeding stock or cattle to be used for rebuilding of herds. These rebates are applicable if the number of cattle shipped is sufficient to provide the equivalent of 25 or more freight cars for trains. If the cattle shipped are in smaller numbers, the amount of freight rebate is reduced by one-half.

The Commonwealth and State Governments provide regular financing of beef roads in the form of grants and loans. Commonwealth expenditures on beef roads in Queensland, Western Australia, and South Australia from 1961 through mid-1970 totaled about $70 million. During the same period, State expenditures accounted for an additional $15 million. With the completion of scheduled projects in 1975, the Commonwealth and State Governments are expected to invest a total of $109 million in grants and loans for beef roads construction--over $100 million in the form of grants and the remainder for long-term loans for road construction in Queensland. All road construction in the Northern Territory is financed by nonrepayable grants made by the Commonwealth Government.

Credit and Tax Incentives

Much of the credit used by Australian farmers is obtained through the private loan sector, that is, through trading banks, pastoral finance companies, life insurance societies, hire-purchase companies, 51/ and noninstitutional loans 52/. Some farmers, unable to borrow from private lending organizations, can obtain both long-term and short-term loans from the Commonwealth Development Bank. This bank, financed initially by the Government, bases its lending policy on farm development prospects rather than on the philosophy of private banks' concern for current prospects.

For many years, farmers have enjoyed income tax concessions designed to stimulate investment in agriculture. Most farm equipment, machinery, houses, and buildings are allowed complete depreciation within a 5-year period. An additional 20 percent depreciation charge is allowable on the cost of new buildings and equipment, other than road vehicles, in the year of the purchase. Some types of capital expenditures may be depreciated 100 percent in the year in which the investment is made. Land clearance and reclamation, water conservation, installation of dams and underground water pipes for irrigation, soil conservation projects, and erection of fences for control of animal pests are examples.

A long-standing tax provision permits farmers and graziers to average their income over a 5-year period, which greatly reduces their tax burden when their income fluctuates widely from year to year. This income-averaging provision has been in effect since 1950/51, but is now limited to taxpayers whose average annual incomes do not exceed $16,000. On incomes over $16,000, the method of computing farmers' income taxes is the same as for other taxpayers.

In 1969/70, farmers were granted a 20-percent exemption in payment of inheritance taxes. Other benefits were granted for inheritance of land and other farm assets to discourage breaking up of economic holdings to satisfy inheritance tax payments.

Federal land taxes were abolished in Australia in 1951, but land taxes are still imposed by some States.

51/ Private commercial firms providing vehicles or equipment on installment payments.
52/ Consists mainly of interfamily borrowing, use of moneys from estates, credit extended by private storekeepers, and private funds made available by lawyers or accountants.

Agricultural Research and Extension

The Commonwealth Government has a policy of developing research schemes, which are jointly financed by public funds and rural industries, to expand the amount of research undertaken for some commodities. Projects (including research on sheep, wool, meat, dairy products, wheat, and tobacco) were valued at $16 million in 1969/70. This research was in addition to regularly approved programs of the CSIRO, 53/ State Departments of Agriculture, universities, and other appropriate research authorities or institutions.

Legislation for wheat research dates back to 1957. A levy of 0.25 cent a bushel is charged growers on all wheat delivered to the AWB. These funds, evenly matched by the Commonwealth Government, totaled about $1.8 million in 1969/70.

The Commonwealth Government has contributed to barley research since 1956. The bulk of the research has been conducted through the ABB. The Commonwealth Government's share of this research--on a dollar-to-dollar basis--totaled $48,000 in 1969/70. Since 1962, the Commonwealth Government has contributed an additional $10,000 per year to Western Australian barley research on a dollar-to-dollar basis.

The Commonwealth Government now expends about $3 million annually on programs to improve meat quality. Research on meat is financed by a levy on cattle, sheep, and lamb slaughterings, and by matching expenditures from the Commonwealth Government. For some years, the Federal Government has financed programs for the eradication and control of cattle tick in New South Wales with payments averaging about $350,000 annually in the late 1960's. In 1969/70, financial assistance was provided on a countrywide basis for research in eradication of pests and diseases of sheep and cattle.

The Commonwealth Government, during the 3-year period July 1, 1970 through June 30, 1973, plans to reduce the wool levy of growers from 2 to 1 percent of the gross value of all wool marketed. During the same period the Government has agreed to increase its contribution for research on wool to an average of $27 million per year.

Agricultural extension in Australia is primarily the responsibility of State Governments, but the share of Federal grants is trending upward. The allocation of Federal funds to the States for extension services amounted to $33.6 million from 1948/49 through 1969/70. Of this total, $21.2 million was allocated in the 5-year period 1966/67-1970/71. The larger allocation of Federal grants to State Governments since 1966/67 has resulted in more training of staff and a strengthening of regional research activities, particularly in the fields of farm management, agricultural engineering, and soil conservation.

Export Promotion

Market development programs in Australia are under the direction of the Overseas Trade Publicity Committee and the major commodity boards. The Overseas Trade Publicity Committee consists of representatives of the Commonwealth Government's Departments of Trade and Industry and Primary Industry, as well as chairmen of the major commodity boards. This committee coordinates the various overseas publicity programs with the boards. In 1969/70, approximately $3.7 million was spent in direct overseas market promotion activities in conjunction with promotional campaigns of the various boards. The Government assumes 75 percent of the administrative costs of the Overseas Trade Publicity Committee.

53/ Agricultural research at the Federal level is carried out by the CSIRO. Some of the discoveries of CSIRO, such as trace-element deficiencies in the soils and new grasses and legumes, have made significant contributions to the advancement of cropping and livestock production.

The AWB emphasizes personal contacts in the development of export sales. It provides funds to finance trade missions to foreign countries as well as visiting delegates from foreign areas. The budget for this type of promotion averages about 1 percent of the total value of export sales and, in recent years, has ranged from about $100,000 to $125,000.

Recently, the AMB has increased its expenditures on foreign market promotion activities. In 1969/70, it spent $520,000 on overseas representations and advertising and other market development programs to increase exports to a number of countries. The AMB's promotional activities have been financed not only by the board's revenues but by matching funds of the Commonwealth Government channeled through the Overseas Trade Publicity Committee. In the late 1960's, Australia--through the AMB and other organizations--spent an average of $300,000 annually to promote meat exports. Much of these expenditures were made in the United Kingdom, EC, Japan, and other Asian countries in an effort to increase exports of beef, mutton, and lamb to these areas.

The Australian Wool Board carries out the largest export market promotion program. It coordinates wool market promotion programs with the Australian Wool Commission and with organizations in other major wool-producing countries, as well as with the International Wool Secretariat (IWS). In 1969/70, the Wool Board contributed $11.8 million to the International Wool Secretariat for overseas promotion and publicity, 54/ compared with $23 million in 1968/69 and $20.4 million in 1967/68.

Other Assistance

Following devaluation of the British currency in November 1967, the Australian Government provided a subsidy to certain commodity boards to offset any losses in exports to sterling area countries. Payments to the AWB for fiscal year 1967/68 (July-June) totaled $28.6 million, but were discontinued after 1 year. In fiscal years 1967/68 and 1968/69, payments were made to wool exporters to offset losses arising from the devaluation of sterling currencies, but they totaled only $54,000.

Since 1965/66, the Commonwealth Government has provided financial assistance to States to cushion farmers' losses suffered from drought. This aid totaled $119 million as of mid-1970. The States receiving the bulk of the grants were New South Wales, Queensland, and Victoria. The assistance embodied three main categories of relief: (1) Loans to farmers for restocking of herds; (2) freight rebates for transport of water and feed supplies for livestock and for transport of stock from the drought area and movement of stock into recovered areas; and (3) grants to rural areas for relief projects during periods of drought.

In late 1969, the Commonwealth Government set up a savings program for graziers. The program of savings bonds is designed to encourage producers to accumulate funds to offset losses incurred during drought periods. Designated as drought bonds, they are issued to qualified graziers up to a limit of $50,000. The bonds draw interest at 3 percent per annum, and 20 percent of the cost of the bonds may be deducted annually from the individual's tax return during the first 5 years. The Taxation Department determines the eligibility of the grazier based on 90 percent of the producer's returns accruing from sales of wool, sheep, or cattle. Wheat and dairy farmers are excluded from this program. Maturity date of the bonds extends over 10 years, but the bonds may be redeemed earlier in cases of disasters such as drought, fire, and flood.

54/ The Commonwealth Government's Department of Trade and Industry also contributed $9.6 million to the IWS for wool promotion. Direct Government contributions were also made in earlier years. The Australian contribution to the IWS for wool promotion has represented about 60 percent of that organization's total budget in some years.

In January 1971, the Commonwealth Government and State Ministers announced a rural reconstruction program which provides financing for farmers during periods of depressed prices or other unfavorable marketing conditions. Under this program, the Commonwealth Government assists farmers by providing $100 million of financing over a 4-year period, 1970/71 through 1974/75. These funds are made available to farmers through State Governments for debt reconstruction, adjustments in management practices or production programs, and farm rehabilitation. The program will be subject to review in 1972 for any adjustments the Commonwealth or State Governments believe necessary.

VI. SUPPLY RESPONSE TO PRICE CHANGES

Price is the major economic variable influencing the type and quantity of farm commodities produced. 55/ This chapter discusses the impact of price on Australian grain and livestock production by looking at farm price trends, commodity price relationships, and supply elasticities. The influence of exports on supply response is also included in the discussion.

Farm Price Trends

Grains

Trends in the average producer prices of individual grains in Australia during the 1960's are depicted in figure 14.

The estimated "farm-gate" price of wheat ranged from $1.18 to $1.30 per bushel during the first 8 years of the 1960's, evidencing a high degree of year-to-year stability. In 1968/69 and 1969/70, however, the price slumped to $1.06 per bushel, which reflects the impact of a record wheat crop in 1968/69 and large carryover stocks into 1969/70 (table 11). The dropoff in average wheat prices per bushel demonstrates that the producer was not completely protected from the operation of market forces, despite a considerable degree of Government price support.

Prior to 1969/70, support prices for wheat were based mainly on cost of production determined by wheat surveys conducted by the BAE. Beginning with the 1969/70 production year, however, guaranteed wheat prices were based more on world trading conditions and prospects, taking into consideration the minimum prices set by the International Grains Agreement.

Oat prices, like most other feed grain prices, showed a greater year-to-year fluctuation during the 1960's than did wheat prices. Figure 14 shows a general uptrend in prices through 1965/66, a dip in prices followed by a recovery, and then a general erosion of prices in 1968/69 and 1969/70. The price of 36 cents per bushel in 1969/70 represented over a 50-percent reduction from prices received 2 years previously. 56/

Barley prices showed less annual fluctuation during the 1960's than did prices of other grains. In addition, prices in the last few years did not drop as severely as those of oats. Both characteristics of barley prices are related to the fact that over 30 percent of barley production in recent years has been used for malting.

55/ Gruen and others (138, pp. 152-153) identified four groupings of conditions that influence the level and pattern of farm output. Two groupings which relate to price are: (1) relative prices of farm products, and (2) overall level of farm prices. The other groupings are: (1) technological changes, and (2) seasonal effects (that is, changes over which the farmer has little or no control in the short run such as variation in weather and diseases).

56/ Feedgrain prices in 1970/71, although not shown in figure 14, were relatively high owing to strong world demand and reduced U.S. export availability of corn because of blight.

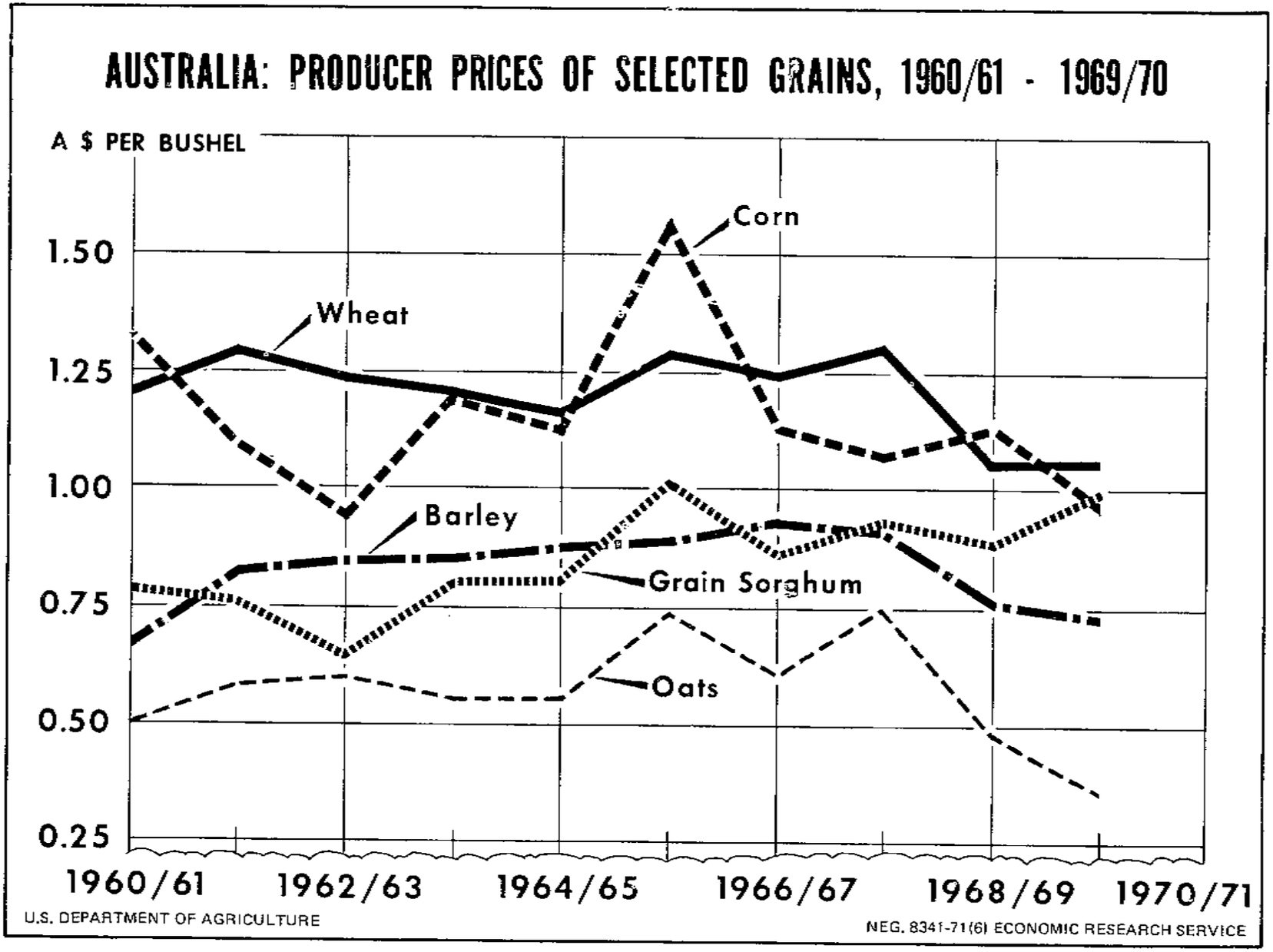
AUSTRALIA: PRODUCER PRICES OF SELECTED GRAINS, 1960/61 - 1969/70
A $ PER BUSHEL
1.50
1.25
1.00
0.75
0.50
0.25
Corn
Wheat
Barley
Grain Sorghum
Oats
1960/61
1962/63
1964/65
1966/67
1968/69
1970/71
U.S. DEPARTMENT OF AGRICULTURE
NEG. 8341-71(6) ECONOMIC RESEARCH SERVICE

Figure 14

Table 11.--Farm gate prices 1/ of selected Australian farm products, 1960/61-1969/70

Year	Wheat	Oats	Barley	Corn	Sorghum	Beef cattle 2/		Sheep and lambs 2/		Wool 3/
	A$ per bushel					A$ per head	Cents per pound	A$ per head	Cents per pound	Cents per pound
1960/61	1.21	0.50	0.67	1.33	0.78	79.65	(19.3)	3.59	(8.8)	0.40
1961/62	1.29	.58	.82	1.09	.76	64.92	(18.5)	3.46	(8.7)	.41
1962/63	1.24	.60	.85	.94	.64	66.39	(16.3)	3.77	(9.4)	.45
1963/64	1.21	.56	.85	1.20	.80	68.27	(16.8)	4.16	(10.6)	.54
1964/65	1.18	.56	.87	1.12	.80	75.87	(19.0)	4.60	(11.7)	.44
1965/66	1.27	.75	.89	1.57	1.01	86.97	(22.3)	4.77	(12.1)	.46
1966/67	1.24	.61	.93	1.13	.86	90.78	(23.2)	5.05	(12.4)	.44
1967/68	1.30	.75	.91	1.07	.93	92.62	(22.6)	4.50	(11.6)	.38
1968/69	1.06	.48	.76	1.13	.88	99.62	(23.0)	4.42	(10.5)	.41
1969/70	1.06	.36	.73	.96	.99	102.58	(n.a.)	4.30	(n.a.)	.34

n.a. = Not available.

1/ Prices are estimated by dividing the local value of production by quantity produced or slaughtered. Beef, sheep, and lamb slaughter numbers were calculated by dividing total gross values by gross unit values as provided by the Commonwealth Bureau of Census and Statistics.

2/ Carcass price (bone-in).

3/ Greasy basis.

Source: (51, 58, 140); and ERS calculations.

Corn prices were characterized by a high degree of instability during the sixties, although no wide fluctuations have been recorded since 1966/67. Corn prices were strong in 1960/61, dropped to a low of 94 cents per bushel in 1962/63, and then climbed to $1.57 during the drought year of 1965/66. Corn prices averaged higher than wheat prices (on a bushel-to-bushel comparison) in several of the years under review.

The expansion of grain sorghum production since 1960/61 was aided considerably by upward-moving prices. During the early 1960's, grain sorghum prices topped only the price of oats. In recent years, the producer price of grain sorghum frequently has exceeded that of barley as grain sorghum exports to Japan increased. Of all grains, only the farm-gate price of grain sorghum in 1969/70 was above the 1960/61-1962/63 average.

Livestock and Wool

Average producer prices for beef cattle, sheep, and wool are presented in figure 15. Beef cattle and sheep prices are given on a per head carcass basis, while wool prices are shown on a greasy basis.

In the sixties, beef cattle prices declined in only 1 year--1961/62. Since that time, they have shown a strong upward momentum, recording a 58-percent increase during this 8-year period.

Sheep and lamb prices 57/ increased at about the same rate as beef through 1966/67, but have skidded since then. In 1966/67, prices were 40 percent above the 1960/61-1962/63 average, compared with only about 20 percent in 1969/70.

Increased supply and competition from synthetic fibers kept the price of wool at relative low levels throughout the 1960's. Wool prices climbed to 54 cents per pound in 1963/64, but the increase was short lived. Since that year, the price has slumped to levels below those experienced earlier in the 1960's, dropping to 34 cents per pound in 1969/70. Evidence indicates that wool prices have now declined to substantially lower levels. In April 1971, market prices of wool fell to 23 cents per pound, prompting intervention buying by the Government.

Commodity Price Relationships

The net effect of the multiplicity of price movements can be described more fully by comparing the price ratios 58/ of major competitive enterprises. Depicting price ratios among important alternative commodities suggests which enterprises have become less desirable and offers some insights to possible future developments. Seven price ratios are presented in table 12.

The position of beef relative to sheep has improved substantially since the mid-1960's. An indexed ratio of the beef cattle:sheep price moved from 85 in 1963/64 to 123 in 1969/70. The comparable beef cattle:wool price ratio change was even more pronounced--76 to 180. Evidence of the deteriorating position of wool relative to lamb--within the sheep enterprise--is shown in the wool:lamb indexed ratio of prices which declined from 116 in 1963/64 to 78 in 1969/70.

57/ Insufficient data are available for individually estimating the farm-gate price of mature sheep and lambs. However, based on the Index of Prices Received by Farmers, computed by BAE, sheep prices rose to a high of 141 in 1966/67 (1960/61-1962/63=100) but fell to 114 in 1967/68. The high for lambs was 133 in 1965/66 with a fall to 117 in 1966/67 and a recovery to 123 in 1967/68 (25).

58/ Calculated by using index numbers with 1960/61-1962/63 = 100.

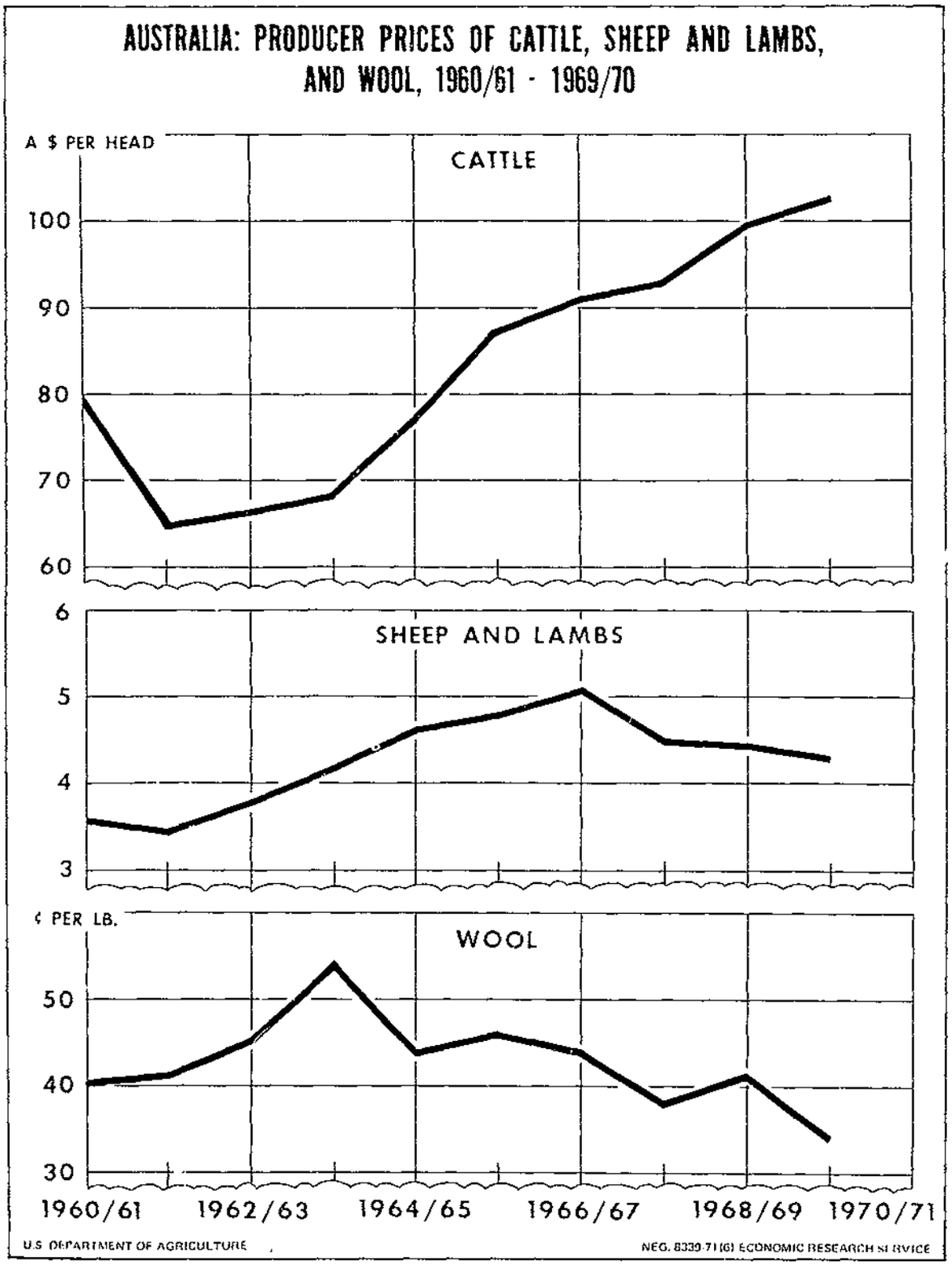
AUSTRALIA: PRODUCER PRICES OF CATTLE, SHEEP AND LAMBS, AND WOOL, 1960/61 - 1969/70
A $ PER HEAD
CATTLE
100
90
80
70
60
6
SHEEP AND LAMBS
5
4
3
¢ PER LB.
WOOL
50
40
30
1960/61
1962/63
1964/65
1966/67
1968/69
1970/71
U.S. DEPARTMENT OF AGRICULTURE
NEG. 8339-71(6) ECONOMIC RESEARCH SERVICE

Figure 15

No significant trend was revealed by the wool:wheat price ratio. The ratio favored wheat production in the very early 1960's, but moved more in favor of wool in the mid-1960's. Ratios toward the end of the decade vacillated.

The trend in the beef cattle:wheat price ratio was significant and in favor of beef cattle. This trend was particularly strong in the latter part of the 1960's when the beef cattle:wheat farm-gate price ratio shot to 172.

Table 12.--Ratio of prices received by farmers, selected Australian products, 1960/61-1969/70 (1960/61-1962/63 = 100)

Year	Beef cattle:sheep	Beef cattle:wool	Wool: lamb 1/	Wool: wheat	Beef cattle:wheat	Wheat: barley	Wheat: sorghum
1960/61...	116	121	85	98	119	110	88
1961/62...	97	95	108	95	90	95	96
1962/63...	92	90	109	108	97	88	110
1963/64...	85	76	116	133	101	87	86
1964/65...	86	104	86	112	116	82	83
1965/66...	95	114	81	108	123	87	72
1966/67...	94	125	89	106	132	81	82
1967/68...	106	148	74	87	128	87	79
1968/69...	117	147	98	115	168	85	69
1969/70...	123	180	78	95	172	89	61

1/ Based on BAE index of price received by farmers.
Source: Computed from data in table 11.

The wheat:barley price ratio moved in favor of barley during the first part of the sixties when barley prices rose and wheat prices deteriorated. The relative position of wheat improved in the latter part of the decade.

Commencing in 1963/64, the indexed ratio of wheat:sorghum prices moved strongly in favor of sorghum. This trend reflects the relatively strong foreign demand for feed grains, particularly corn and sorghum, and the softening of foreign demand for wheat.

Prices Farmers Use in Decisionmaking

Empirical research on the determination of prices to which Australian farmers respond in their production plans is rather limited. Historical evidence, however, indicates that commodity price ratios affect farm production decisions in Australia. For example, McLennan (95) showed that with increased relative profitability of sheep raising, the area sown to wheat in Australia dropped by 40 percent in 1945-55. Conversely, the near doubling of wheat area between 1957/58 and 1962/63 was attributed to the improved relative profitability of wheat.

BAE, in a recent review of the agricultural situation in Australia, points to the importance of relative prices in production patterns (33). Past trends in coarse grain production were seen as largely related to wheat prices. Consistently high prices for cattle, in combination with low wool prices, were viewed as having attracted resources to beef and away from wool and wheat.

The Wheat Stabilization Scheme has been cited as a definite factor affecting producer decisions in those areas where wheat is a viable alternative enterprise. Support

prices--similar to those provided for wheat--have not been available for feed grains, meat, or wool. Thus, these commodities were more susceptible to the vagaries of the market than was wheat. The first payment for wheat is considered of major importance in the decisionmaking process with little weight given to subsequent minor payments involving considerable time lags.

Price expectations undoubtedly have an important role in farm management decisions. According to Malecky, "Price expectations ... are probably more important in determining the quantity of any commodity produced, bought and sold than are current prices" (41, p. 28). Malecky, however, states that it is not fully understood "...how the expectations themselves are formulated, though it is generally agreed that past experience must to a large extent govern the expectations held about the future" (41, p. 29).

The incorporation of price expectations into supply analysis generally leads to the application of some form of a distributed lag model. 59/ Hence, the influence of price on supply occurs through a series of scheduled lags in time. 60/

Influence of Export Demand on Supply Response

Wheat

Export demand for wheat currently influences producer prices (and thus supply response) in two ways: (1) Guaranteed prices for 200 million bushels of wheat; and (2) prices at which wheat, not under a guaranteed price, is sold in export markets.

Wheat consumed at home is supported at a higher level than exports (appendix table 43). Beginning in 1969/70, the Australian Government decided that the higher home consumption price would no longer be limited just to increases needed to cover wheat shipping costs to Tasmania (30, p. 2). This development could lessen the tie-in between export prices and home consumption prices.

During the 1960's, about 75 percent of Australia's wheat output was exported. Consequently, world demand has a major role in determining the supply response of Australian wheat growers. Per capita domestic demand for wheat has weakened in recent years 61/ as in other high income countries. Also, domestic prices, which are institutionally determined, have steadily increased since 1963/64.

Australia had a favorable export market for wheat from 1960/61 through 1967/68--average export returns were never below $1.34 per bushel. The wheat stabilization program was maintained with little difficulty, and guaranteed prices for exports rose to a record $1.64 per bushel in 1967/68. Favorable wheat prices throughout the 1960's encouraged wheat production, and the area sown to wheat expanded rapidly.

Other countries also expanded wheat production, including some of the developing countries that had traditionally been markets--although largely noncommercial--for wheat exports. After the record world export volume of 61.2 million metric tons in 1965/66, trade in wheat declined steadily to 43.4 million metric tons in 1968/69 (a slight recovery was made in 1969/70). Concomitant with the decline in trade, world stocks increased steadily to a level nearly double the 1965/66 figure (appendix table 44).

59/ The problem is knowing the proper length of time and the relative importance to attach to segments of the time span.

60/ Some supply elasticities presented in the latter part of this chapter were calculated from analysis using distributed lags.

61/ Per capita consumption of flour in Australia declined from 177.3 pounds in 1959/60 to 169.7 pounds in 1968/69 (54, p. 48).

For Australia, the worsening market situation came to a climax when 1968/69 production soared to 544 million bushels. Wheat stocks on November 30, 1969 were five times those of a year earlier. Average export returns, after peaking at $1.45 per bushel in 1966/67, declined to $1.35 in 1967/68, and to $1.25 in 1968/69 (appendix table 43). Producer prices also fell to significantly lower levels as a result of increased storage and handling costs and lower export prices as the minimum price set in the International Grains Arrangement was brought under pressure. Australia's concern over the availability of export markets in the face of mounting world surpluses led to the use of wheat delivery quotas beginning with the 1969/70 crop.

Beef

The effect of Australia's buoyant export market for beef in recent years is reflected in beef prices rising domestically and beef consumption per capita declining despite increased beef production. Consumption of beef and veal dropped from 124 pounds per person in 1956/57-1958/59 to only 88 pounds in 1969/70 (appendix table 45). The decline in per capita beef consumption, however, was offset by increased use of lamb, pork, and poultry which were relatively less expensive. 62/

Exports of beef and veal have become progressively more important for Australia. In 1956/57-1958/59, 33 percent of beef and veal production was exported, but this proportion increased to a range of 43 to 48 percent in the last half of the 1960's (table 10). The United States--Australia's major beef market--has had the greatest influence on export prices. Quantities of beef and veal exported to the United States from Australia rose from 78,000 metric tons in 1960/61 to 205,000 in 1968/69. During the same time, the U.S. c.i.f. price of Australian boneless cow beef rose from less than 33 cents per pound to over 45 cents. Australia's saleyard prices of beef cattle increased over 50 percent between 1961/62 and 1969/70, while substantially lower rates of increase occurred for sheep, lamb, and hogs (appendix table 46).

Wool

Australia exports about 90 percent of its wool clip and provides nearly one-third of world wool needs. Consequently, the supply of wool depends heavily on the strength of world demand. Although prices in world markets have trended downward, the volume of Australia's wool exports remained relatively constant from 1961 to 1968 and rose sharply in 1969 and 1970. The price of wool declined from a very high level of about 60 cents per pound in the mid-1950's to a low of 37.6 cents per pound at auction in 1969/70. Prices have declined to even lower levels in more recent periods.

Wool occupies a small and declining share of the world consumption of apparel fibers (appendix table 47). In 1969, it constituted 7.5 percent of total apparel fiber used, compared with 10 percent in 1960. The use of noncellulosic fiber increased fivefold during this period, while use of wool increased only 6 percent. Despite declining prices in world markets, production of synthetic fibers and wool has continued to expand--mainly because of the introduction of new technology and better management techniques. In the woolgrowing industry, there appears to be a 3 to 5-year lag in supply response to price changes because of resource fixities.

Supply Elasticities

The only attempt at an integrated quantification of the responsiveness of the major agricultural industries in Australia to price changes was made by F. H. Gruen and others

62/ The decline in consumption of mutton per capita is seen more as a shift in consumer preference rather than as the result of price increases (38, p. E-9).

(78, 112, 138). This section presents data of the Gruen research as well as information from studies of more limited scope.

Gruen and colleagues produced a number of price elasticities of supply for the short, intermediate, and long run. In some instances, both own and cross price elasticities were calculated. Time series data for 1947/48 to 1964/65 were used. The major thrust was directed to development of a six-sector supply analysis, which involved the construction of a group of simultaneous equations for wheat, wool, dairy products, lamb, coarse grains, and beef and veal. 63/ Shortrun own and cross price elasticities of supply for this model are presented in table 13. Increased output in one sector is balanced against reduced output in other sectors. For example, a 10-percent increase in the expected price of wheat would induce a 1.8-percent increase in wheat production the first year after the price change. Expansion would be achieved by pulling resources from wool and coarse grains and reducing their output by 1.1 percent and 0.7 percent, respectively. All the 1-year own price elasticities are relatively small since, in the short run, little time is available for responding to expected price changes.

Estimated own price elasticities of supply for the intermediate term (5-year adjustment period) were (138, p. 109):

Wool	0.3347
Lamb	1.3849
Wheat	0.8541
Coarse grains	0.8131
Dairy products	0.4223

The longer period permits a greater response to expected price changes. For example, if the expected price of wheat increased 10 percent and was maintained at this higher level (with other prices held constant), the planned wheat acreage would be expected to rise by over 8 percent after 5 years.

Watson and Duloy (132) analyzed price elasticities of supply in homogeneous wheat regions of Australia. 64/ Four regression models were used--two for well-established wheat areas and two for new wheat areas. In the new areas, no reliable price elasticities could be determined because of the impact of structural changes. For the well established wheat areas, price elasticities were calculated by using both static and dynamic models. The R^2 achieved with the static model was low in all cases. For the dynamic model, there was a high correlation between wheat acreage and price--the only independent variable.

The shortrun price elasticities of supply for different homogeneous areas of the well established wheat areas ranged between 0.133 and 0.473. Longrun elasticities ranged between 0.218 and 1.067. 65/ No medium run elasticities were calculated. In all cases, the areas with the longest history of wheat growing--northern Victoria and all regions in New South Wales--had the highest shortrun elasticities.

63/ The model specified that planned output depended on: (1) shift variables--which were not immediately affected by price changes, (2) relative expected prices, and (3) random shock. Part of the influence of weather and autonomous trends in productivity was avoided by expressing the response variables in terms of units such as planned acreage, sheep shorn, and dairy cows kept (138, p. 166).

64/ New South Wales, Victoria, South Australia, and Western Australia were included in the survey. However, price elasticities of supply were not presented for South Australia in the report. Data were for 1947/48 to 1962/63.

65/ Elasticities are at the mean. The length of the long run is not specified.

Table 13.--Estimated shortrun 1/ own and cross price elasticities 2/ of supply, 3/ Australia, 1947/48-1964/65

Commodity	Elasticity with respect to the expected price of:						
	Wool	Lamb	Wheat	Coarse grains	Beef and veal	Dairy	Sum
Wool 4/	0.0698	-0.0177	-0.0521	0	0	0	0
Lamb 5/	-0.1171	0.3167	0	0	0	-0.1996	0
Wheat 6/	-0.1071	0	0.1808	-0.0737	0	0	0
Coarse grains 6/	0	0	-0.2167	0.2167	0	0	0
Beef and veal 5/	0	0	0	0	0.1600	-0.1600	0
Dairy products 7/	0	-0.0606	0	0	-0.1319	0.1925	0

1/ A year.
2/ Elasticities are evaluated at sample mean outputs and expected prices. Time series data from 1947/48 to 1964/65 are used.
3/ All estimates of price elasticities are conditional on an assumed coefficient of expectation (p) of 0.6 for wool (see 112, p. 78 for additional details).
4/ Wool output measured by number of adult sheep shorn.
5/ Meat output measured by tonnage slaughtered (carcass weight).
6/ Grain output measured by intended acreage.
7/ Output of dairy products measured by number of dairy cattle.
Source: (112, p. 78).

Dahlberg's supply study (67) of South Australia's wool industry covered the 1949-61 period. In the analysis, a single equation model was used for each production zone with shorn wool as the dependent variable. The explanatory variables were areas of improved pasture and the prices of wool, wheat, lamb, and barley.

For the High Rainfall Zone and the Pastoral Zone, pasture improvements superseded any price effect. However, some reliable price elasticities of supply were estimated for wool in the Wheat-Sheep Zone. The best coefficients were obtained when the wool-wheat price ratio was lagged 1 and 2 years and the acreage of improved pasture was used as the explanatory variable. This regression produced an own elasticity of 0.05 for the first year and 0.08 for the second year after the price change (table 14). The only cross price elasticity produced by Dahlberg indicated that a 10-percent increase in the price of wool would reduce wheat production by 4.2 percent in the short run.

Witherell (139) made a comprehensive study of the world wool market, using time series data from 1948/49 to 1964/65. For Australia, the independent variables regressed on wool production were lagged wool production, superphosphate fertilizer used, and the prices of wool, wheat, and lamb. Witherell's best model produced a short-run (2 years) own elasticity of 0.084 and cross price elasticities for lamb and wheat of 0.185 and -0.046, respectively. The model also yielded longrun cross price elasticities of 0.351 for lamb and -0.150 for wheat and a longrun own elasticity of 0.276.

In a recent study of Australia's sheep and wool industry (41), Malecky fitted data from 1926/27 through 1964/65 to both a conventional single equation model and a single equation distributed lag model. Although a number of explanantory variables were used, various combinations of variables representing improved pasture, wheat prices, and wool prices explained 91 to 98 percent of the variations in numbers of sheep shorn. A number of price elasticities were produced depending on the combination of the variables and the structure of the model used. However, the author concluded that a 10-percent increase in the wool price could be expected to increase the number of sheep shorn by 0.5 percent the first year after the price increase and by 1.6 percent if the price increase were maintained for 7 years.

Several of the foregoing studies also dealt with the response of wool production to pasture improvement. Witherell (139) found that 1,000 metric tons of superphosphate could be expected to increase wool production by 381,000 to 583,000 pounds (clean basis). Malecky (41), using data from the post-World War II period, estimated that an acre of improved pasture would increase its carrying load by two sheep--an increase of about 18 pounds of wool per acre.

We conclude from the foregoing studies that Australian farmers do respond to commodity price changes through shifts and adjustments of resources. In the shortrun, resource shifts resulting from price changes are particularly well documented for wheat and wool. The price elasticity of supply in the intermediate period is relatively high for lamb, wheat, and coarse grains but relatively low for wool, that is, 10-percent change in wool prices would lead to a 2- to 3-percent change in wool production.

VII. PROJECTIONS TO 1975

The first secton of this chapter presents a review of several studies projecting Australia's agricultural production, consumption, and trade to 1975. 66/ The next three sections give estimations of Australia's growth potential in grain, beef, mutton, lamb, and wool. "Constant" prices for 1975 are assumed in the first estimation; a 15-percent decline in the relative price of grains in the second; and a continuation of wheat quotas with selected price changes in the third.

66/ Average of 1974/75 and 1975/76.

Table 14.--Comparison of price elasticities of supply for wool, Australia, by selected studies

Study	Own price elasticites					Long run	Cross price elasticities			
	Short run		Intermediate run				With wheat		With lamb	
	1 yr.	2 yrs.	5 yrs.	7 yrs.	8 yrs.		Short run	Long run	Short run	Long run
Gruen (78, 138)	0.05	—	0.25	—	—	3.59	-0.006	—	-0.045	—
Powell and Gruen (112)	.07	—	.33	—	—	3.59	-.05	—	.02	—
Malecky (41)	.05	—	—	0.16	—	2.96	-.27	—	—	—
Dahlberg (67)	1/-.05	0.08	—	—	—	—	-.42	—	—	—
Witherell (139)	—	.084	—	—	0.276	—	-.046	-0.150	.185	0.351

-- Means negligible or none.

1/ Dahlberg does not explain the negative coefficient.

Supply projections provided in tables 20 and 21, which relate to the last three sections of this chapter, should be viewed as indicative of relative magnitudes. Undue emphasis should not be placed on the quantitative figures. The projections are based, in part, on modification of existing projections and on costs and returns data and other information contained in this report.

Demand projections contained in the last three sectons of this chapter were derived from existing projection studies and modified when necessary. Export availability is the difference between production and domestic utilization.

Review of Projection Studies

A number of medium-term projections of Australia's agricultural supply and demand have been made using methods varying from simple trends--tempered by professional judgment--to sophisticated multiequation models. This section reviews the projection studies of Monash, Organization for Economic Cooperation and Development (OECD), BAE, and Malecky.

Monash Study

The only major econometric attempt to quantify future levels of Australia's agricultural production, consumption, and trade is a study conducted by Gruen and others at Monash University (78). Major objectives of the Monash study were to project Australia's exportable supplies of selected agricultural products and import requirements for cotton and tobacco during 1970, 1975, and 1980. To meet these objectives, population, income, domestic supply and demand, and foreign demand for Australian agricultural products were projected. Supply and demand equilibrium was computed under assumptions of constant prices and most probable prices.

Demand.--Domestic demand was first projected by applying an elaborate econometric model of consumer demand prepared for the Vernon Committee. 67/ Products were sorted into six broad food groups (that is, bread and cereals, meat and fish, etc.) and projected in terms of per capita consumption and total consumption. Demand equations--using per capita expenditure and prices as independent variables--were also developed for a number of commodities. The final projections on consumption of selected grains and livestock products (tables 15 and 16) reflect modifications thought necessary.

Supply.--The Monash study was the first major effort to quantify supply projections of Australia's agriculture. Since the construction of a production function for the whole of Australia proved unsuccessful, the Monash team decided to build a simultaneous equation model for six commodities--wool, wheat, coarse grains, beef, lamb, and dairy products. 68/ Although the statistical procedure of this model is intricate and involved, it basically contained a price inelastic element (measured by lagged production) 69/ and a price elastic element which included own price elasticities and cross price elasticities of the competing and complementary products contained in the model.

Three sets of supply projections were made using the six-sector model. Two used "most likely" prices and one used "constant" prices. Since the model used prices expressed in "decision" rather than "natural" units (for example, dollar return per acre rather than dollar return per bushel), resources could be shifted into more productive sectors despite the assumption of constant prices. In this model, productivity is included in the price elastic element.

67/ The Vernon Committee was appointed by the Prime Minister of Australia in 1963 to make a comprehensive economic study of Australia (49).

68/ Various single equation models were used in projecting the supply of other commodities.

69/ Technically, lagged production may reflect price behavior of previous periods.

Table 15.--Per capita direct consumption of selected Australian grains and livestock products, selected studies and years

Item	Wheat	Oats	Barley	Corn	Beef and veal	Mutton	Lamb	Pork 1/	Poultry
					Pounds per capita				
Gruen (78)									
1970...(low)	212.1	5.6	2/	4.5	99.0	48.3	40.6	22.6	16.0
(high)	235.2	7.6	2/	7.1	104.0	50.5	42.3	24.4	20.0
1975...(low)	195.7	5.6	2/	4.5	99.0	44.0	42.2	23.4	18.0
(high)	229.4	7.6	2/	7.1	109.4	48.2	45.9	26.9	24.0
1980...(low)	180.6	5.6	2/	4.5	99.0	40.1	43.9	24.3	20.0
(high)	224.4	7.6	2/	7.1	115.0	46.0	49.8	29.7	28.0
OECD (108)									
1975.....	208.3	3/ 3.0	4/	6.1	96.1	71.6		27.2	20.0
1985.....	191.8	3/ 3.0	4/	6.1	92.4	60.6		32.9	26.0
Actual									
1970.....	217.0	5/ 2.0	10.0	7.0	87.7	38.1	48.7	25.1	22.8

1/ Gruen (78) includes pork and bacon and ham (carcass weight equivalent); OECD (108) includes fresh and cured pork.
2/ Per capita estimates not given but total use of barley based on constant beer consumption of 63 (low) and 67 (high) gallons per consumption unit.
3/ Oatmeal.
4/ Grain for alcoholic beverages not included in per capita consumption data.
5/ Includes only oatmeal and rolled oats, 1968-69.

Table 16.--Projection of domestic disappearance of selected Australian grain and livestock products, selected studies and years

Item	Unit	Gruen (78) 1/			OECD (108)		Actual
		1970	1975	1980	1975	1985	1970
Wheat	Mil. bu.	96	104	113	94	110	100
Oats	do.	56	61	67	n.a.	n.a.	57
Barley	do.	33	38	44	n.a.	n.a.	45
Corn	do.	n.a.	n.a.	n.a.	n.a.	n.a.	6
Sorghum	do.	n.a.	n.a.	n.a.	n.a.	n.a.	10
Beef and veal 1/	1,000 tons	588	633	681	616	730	499
Mutton 1/	do.	285	297	309)	452	465	217
Lamb 1/	do.	219	255	297)			277
Wool	Mil. lb.	2/ 73	2/ 81	2/ 91	n.a.	n.a.	77

n.a. = Not available.
1/ Meat is in terms of carcass weight equivalent.
2/ Clean basis (consumption derived from "most likely" projections of production and exports).

The supply projections selected as most likely are a combination of the projections attained using probable prices with and without a trend variable. Projections with the time trend seemed unreasonably high so Gruen and his team (78) decided to weight the projections without a trend by two-thirds and add them to the projections with a trend weighted by one-third to obtain the most realistic final projection. These projections are presented in tables 17 and 18.

Exports.--The most likely set of export projections are given in table 19. 70/

OECD Study

OECD, using a 3-year base period centered on 1962, projected the food supply and demand for 1975 and 1985 in the OECD area and Oceania. The study assumed no major policy changes in any of the countries included in the analysis. A composite income elasticity was developed for each commodity, based on population trends and per capita income trends from analyses that did not allow for price effects. Demand projections were made on the assumption that relative prices and costs would continue at the same levels as they had in recent years (tables 15 and 16).

The continuation of recent trends in land use and yields per acre is the basis for the projections of future crop production. However, in the case of wheat, an upper limit on the area that could regularly be sown to wheat was assumed. A limitation of 18.2 million acres had been assumed earlier, but this figure was exceeded in 1966/67 and 1967/68. Thus, new developments in pasture improvement, crop rotation, land development, and the wool:wheat price ratio had to be considered and new limits estimated. OECD estimated the area limits on wheat to be 21 million acres in 1975 and 23 million acres in 1985.

70/ Under the constant price assumption, the Monash team synchronized supply and demand models and projected a world demand, supply, and trade balance for a number of major commodities in 12 major regions.

Table 17.--Australia's agricultural supply projections for selected grains, by area, yield, and production, selected studies and years

Item	Year	Wheat	Oats	Barley	Corn	Sorghum
		1,000 acres				
Area:						
Gruen (78) 1/	1970	20,540	3,167	2,168	n.a.	n.a.
	1975	23,401	3,094	2,030	n.a.	n.a.
	1980	26,253	3,051	1,952	n.a.	n.a.
OECD (108)	1975	21,000	3,700	2,800	300	600
	1985	23,000	3,800	3,000	350	800
BAE (40)	1974/75	n.a.	n.a.	n.a.	n.a.	n.a.
Actual	2/ 1970/71	16,518	4,131	4,990	212	955
		Bushels per acre				
Yield:						
Gruen (78) 1/	1970	20.2	21.7	23.4	n.a.	n.a.
	1975	21.4	23.6	24.6	n.a.	n.a.
	1980	22.5	25.4	25.7	n.a.	n.a.
OECD (108)	1975	20.5	21.5	22.5	34.7	25.0
	1985	21.5	23.0	23.7	37.4	29.0
BAE (40)	1974/75	n.a.	n.a.	n.a.	n.a.	n.a.
Actual	2/ 1970/71	17.3	21.0	20.0	41.9	20.2
		Million bushels				
Production:						
Gruen (78) 1/	1970	415.1	70.2	57.1	n.a.	n.a.
	1975	501.3	77.0	63.0	n.a.	n.a.
	1980	591.0	85.4	71.0	n.a.	n.a.
OECD (108)	1975	430.5	79.6	63.0	10.4	15.0
	1985	494.5	87.4	71.1	13.1	23.2
BAE (40)	1974/75	350.0	99.0	80.0	10.0	27.0
Actual	2/ 1970/71	286.5	86.9	99.8	8.9	19.3

n.a. = Not available.
1/ Gruen's most likely estimate (78).
2/ Preliminary.

Table 18.--Australia's agricultural supply projections for selected livestock and livestock products, selected studies and years

Item	Year	Number slaughtered: Number	Number slaughtered: Adults	Number slaughtered: Calves (or lambs)	Average carcass weight: Adults	Average carcass weight: Calves (or lambs)	Meat production: Total	Meat production: Beef (or mutton)	Meat production: Veal (or lamb)	Wool: Sheep shorn	Wool: Production 1/
		1,000 head			Pounds		1,000 tons			Mil. head	Mil. lb.
Cattle:											
Gruen (78) 2/	1970	n.a.	n.a.	n.a.	n.a.	n.a.	935	n.a.	n.a.		
	1975	n.a.	n.a.	n.a.	n.a.	n.a.	1,082	n.a.	n.a.		
	1980	n.a.	n.a.	n.a.	n.a.	n.a.	1,177	n.a.	n.a.		
OECD (108)	1975	21,350	5,966	2,151	430	66	1,209	1,145	64		
	1985	25,050	7,702	2,679	430	66	1,557	1,478	79		
BAE (40)	1974/75	n.a.	n.a.	n.a.	n.a.	n.a.	1,200	n.a.	n.a.		
Actual	3/ 1969/70	22,162	4,783	1,125	450	71	996	961	35		
		Mil. head									
Sheep:											
Gruen (78) 2/	1970	n.a.	n.a.	n.a.	n.a.	n.a.	614	395	219	n.a.	1,919
	1975	n.a.	n.a.	n.a.	n.a.	n.a.	648	420	228	n.a.	2,022
	1980	n.a.	n.a.	n.a.	n.a.	n.a.	681	434	247	n.a.	2,092
OECD (108)	1975	180.0	23.8	18.8	44	35	765	468	296	n.a.	n.a.
	1985	200.0	26.1	22.8	44	35	873	514	359	n.a.	n.a.
BAE (40)	1974/75	n.a.	n.a.	n.a.	n.a.	n.a.	805	n.a.	n.a.	n.a.	2,325
Malecky (41)	1974/75	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4/ 210	2,210
Actual	3/ 1969/70	180.1	22.3	20.0	44.6	34.8	755	445	310	n.a.	2,046

n.a. = Not available.
1/ Sheep and lambs.
2/ Gruen's most likely estimate (78).
3/ Preliminary.
4/ Projections include shorn wool, wool exported on skins, and dead and fellmongered wool.

OECD's projection of livestock production also is based primarily on past trends. OECD deviated slightly in its projection of beef cattle numbers in that the trend line was from 1960 onward because of favorable prices and improved management practices. Although OECD noted that the average carcass weight of cattle was trending downward, it assumed that average weight would not fall below 430 pounds.

OECD's estimates of exports for Australia are the residuals between Net Production and Total Requirements (table 19).

BAE Debt Reconstruction Study

BAE used 1969/70 as a base year in estimating probable levels of agricultural production in Australia for 1974/75 (40). 71/ Although past trends in output were used as a basis, BAE adjusted its figures substantially to reflect professional judgment on expected movements in demand, prices, productivity, and farm costs. The expected rates of population and income growth for developed countries were included in estimating demand. BAE assumed that there would be no major policy changes--domestically or internationally.

Assumptions for the supply projections varied with the product considered. One general assumption was that farm costs would continue to increase at the 3-percent rate of recent years, while the rate of productivity increase was expected to decline. BAE also made the following price assumptions for major products:

(1) Since Government policy would keep supply and demand for wheat in balance, a slight increase in wheat price was expected while coarse grain prices would hold steady.
(2) Wool prices would recover to slightly above 40 cents per pound (greasy basis).
(3) Prices of meats (beef, veal, mutton, and lamb) would decline slightly as excess production moved into less lucrative markets (assuming there would be no liberalization in U.S. meat import policy).

The major conclusions of the BAE study were:

(1) Aggregate rural production and value of production would increase at about 1 percent per year, compared with 3 3/4 percent per year during the 1960's. However, net farm income will decline because of rising farm costs.
(2) Because of the nature of their industries and institutional arrangements, the production of wheat and coarse grains was assumed to be mainly a function of demand and was expected to decline slightly.
(3) Rising output of livestock products was expected to account for most of the increase in aggregate farm output. 72/ Increases were projected for: (a) Wool--about 15 percent above the 1969/70 level; and (b) mutton and lamb and beef and veal--about 6 percent and 18 percent, respectively, above the 1969/70 level.

Malecky Study

Using 1968/69 as the base period, Malecky (41) attempted to quantify Australian production of wool for 1974/75 with a single equation model. Values of the explanatory variables in the analysis were:

71/ BAE also estimated gross returns, costs, and farm income.
72/ In contrast to the 1960's when most production increases were the result of an expanding wheat industry.

Table 19.--Export projections for selected Australian grains and livestock products, selected studies and years

Item	Unit	Gruen (78) 1/			OECD (108) 2/		Actual 1970
		1970	1975	1980	1975	1985	
Wheat	Mil. bu.	319	397	478	336	384	286
Oats	do.	14	16	19	n.a.	n.a.	12
Barley	do.	24	25	28	n.a.	n.a.	28
Corn	do.	n.a.	n.a.	n.a.	n.a.	n.a.	0
Sorghum	do.	n.a.	n.a.	n.a.	n.a.	n.a.	2
Beef and veal	1,000 tons	347	449	496	592	827	500
Mutton	do.	110	123	125	313	408	230
Lamb	do.	nil	-27	-50			47
Wool	Mil. lb.	1,850	1,950	2,020	n.a.	n.a.	1,929

n.a. = Not available.
1/ Most likely estimates.
2/ Calculated as the difference between net production and total requirements.

(1) Wool price at three levels: (a) 37.6 cents per pound, (b) 41.4 cents per pound (37.6 cents plus 10 percent), (c) 33.8 cents per pound (37.6 cents less 10 percent)
(2) Wheat prices expressed as an index assumed to be constant (average of 1966/67-1968/69) throughout the estimation period
(3) Extent of pasture improvement assumed to be 60 million acres by 1974/75.

Malecky concluded that Australia would produce 2.2 billion pounds of wool in 1974/75.

Projections Assuming Elastic Export Demand and Constant Prices

By averaging the 1966/67-1968/69 producer prices, we computed the following constant prices to be used in this analysis. Costs also were assumed to be constant.

Commodity	Unit	Price
Wheat	Bushels	A$ 1.20
Oats	do.	.61
Barley	do.	.87
Corn	do.	1.11
Sorghum	do.	.89
Beef cattle	Head	94.34
Sheep and lamb	do.	4.66
Wool	Pound	.41

We assumed that the policies pursued by the Australian Government during the base period would remain essentially unchanged to 1975. Major points of this assumption include continuation of guaranteed prices for wheat (but not other grains), fertilizer subsidies, and tax writeoffs for land improvements, machinery purchases, etc. Furthermore, no major drought is assumed to 1975.

Production

The development of new lands and the upgrading of cleared land would be expected to continue through 1975.

Agricultural land use for crops in Australia increased from 29.6 million acres in 1960/61 to 46.9 million acres in 1968/69 (appendix table 48). Wheat acreage during this period increased from 13.4 to 26.8 million acres. Thus, wheat accounted for nearly 80 percent of the increase in crop area.

A linear extrapolation to 1975 of the 1960/61-1969/70 trends in wheat area and yield results in a production level of 558 million bushels (32.1 million acres x 17.4 bushels). This first extrapolated linear trend for area is considered too heavily influenced by the unusually high wheat acreage in 1968/69, while the yield trend is influenced by the unusually low yields in 1965/66, 1967/68, and 1969/70. Modification of both area (lowered to 26.5 million acres) 73/ and yield (increased to 19 bushels) would result in a projected wheat output of 504 million bushels in 1975 (table 20).

The assumed yield of 19 bushels of wheat per acre in 1975 is 1.5 to 2 bushels below that of the OECD projection of 20.5 bushels and of Gruen's estimate of 21 bushels. The projected area increase--3.1 million acres above Gruen's estimate and 5.5 million above that of OECD--would tend to dampen yield increases as more marginal land was used.

Consistent year-to-year production of wheat on approximately 26.5 million acres of land by 1975 would be feasible. Development of new lands, possibilities for more intensive grazing (which would make more land available for crops), and improved farm management (including better rotations to build soil fertility and conserve moisture) would facilitate increased cropping of wheat.

Oats, barley, corn, and sorghum accounted for slightly under 27 percent of Australia's total grain area during 1966/67-1968/69. This proportion would be expected to decline under the assumption of an unlimited export demand and constant prices. The relatively greater profitability of wheat versus feed grains (see pp. 26-28) would relegate feed grains to even more of a secondary role under the assumption of an elastic export demand.

Projected 1975 yields of all feed grains show varying increases above base period levels (table 20). The projected yields also are all above trend values. Oats and barley yields are below those assumed by Gruen for 1975 but above those used by OECD. The corn yield is about 3 bushels above the OECD figure, while the sorghum yield is the same.

Area planted to all feed grains by 1975 would be expected to show only moderate increases above base period levels (well below 1960/61-1969/70 trends for all grain except corn). Only a minor increase would be expected in oats area as any expansion in supplementary feeding would be largely met by higher yields. Expansion in barley area would be mainly limited to traditional producing areas, such as the Adelaide peninsula in South Australia. Corn would probably be quite profitable relative to other grains even though irrigation would raise production costs. 74/ However, climatic limitations and problems of infrastructure, such as transportation and handling, would be expected to curtail area increases. Sorghum, although facing some of the same infrastructure problems as corn, is produced in large part on unirrigated land. Its rate of expansion

73/ The 26.5 million acres of wheat are assumed to be built up over time and maintainable within a rational rotation plan (unlike the sudden rise of wheat from 22.4 to 26.8 million acres between 1967/68 and 1968/69).

74/ Corn on irrigated land is in competition with such crops as vegetables, horticultural crops, cotton, sugar, and rice, rather than other feed grains, which probably yield a higher return.

Table 20.--Projections of grain production, domestic utilization, and export availability, Australia, selected assumptions, 1975

Item	Unit	Base period 1966/67-1968/69	Elastic export demand and constant prices	Elastic export demand and 15% reduction in grain prices	Wheat quotas and selected price adjustments
Wheat:					
Area	1,000 acres	23,354	26,500	24,175	18,750
Yield	Bu. per acre	18.4	19.0	19.0	20.0
Production	1,000 bu.	429,283	503,500	459,325	375,000
Domestic utilization	do.	91,000	108,000	109,000	110,000
Export availability	do.	338,283	395,500	350,325	265,000
Oats:					
Area	1,000 acres	3,836	3,900	3,555	4,300
Yield	Bu. per acre	20.9	22.5	22.5	23.0
Production	1,000 bu.	80,828	87,750	79,988	98,900
Domestic utilization	do.	57,200	62,700	63,700	63,700
Export availability	do.	23,128	25,050	16,288	35,200
Barley:					
Area	1,000 acres	2,807	2,900	2,643	6,042
Yield	Bu. per acre	20.3	23.0	23.0	23.5
Production	1,000 bu.	56,991	66,700	60,789	142,000
Domestic utilization	do.	37,800	49,500	50,000	50,000
Export availability	do.	19,191	17,200	10,789	92,000
Corn:					
Area	1,000 acres	193	220	202	265
Yield	Bu. per acre	37.1	38.0	38.0	38.0
Production	1,000 bu.	7,150	8,860	7,676	10,070
Domestic utilization	do.	6,500	6,600	6,850	6,600
Export availability	do.	650	1,760	826	3,470
Sorghum:					
Area	1,000 acres	516	600	546	1,800
Yield	Bu. per acre	24.6	25.0	25.0	30.0
Production	1,000 bu.	12,709	15,000	13,650	54,000
Domestic utilization	do.	8,800	11,000	11,250	11,000
Export availability	do.	3,909	4,000	2,400	43,000

in area has been much greater than that of corn and could approximate 600 million acres by 1975 under the given assumptions.

Except for setbacks due to drought, cattle and sheep numbers in Australia have continued to expand since the founding of the country. The expansion in cattle numbers has been extremely rapid in the last few years. This expansion is being encouraged by the increase in beef prices relative to other products (see table 12). Also, the price assumptions of this study--average of 1966/67-1968/69 prices--are less favorable to beef cattle vis-a-vis wool than under the real circumstances of the more recent years.

Beef cattle numbers are projected to increase at 3.0 percent per year to 1975 under the assumption of an elastic export demand and constant prices. At the same time, dairy cattle numbers would be expected to continue their decrease in view of the general unprofitability of dairying.

Until recently, calf numbers constituted 20-22 percent of total cattle numbers as of March each year (appendix table 49). This percentage had risen to 24.5 percent by March 1970. For the current assumption, a 22-percent ratio of calves was accepted, with the assumption that 30 percent of these would be slaughtered for veal in 1975. 75/ Calf carcass weight was estimated at 70 pounds--the same as in recent years (appendix table 50). We also assumed that 33 percent of the adult cattle would be slaughtered (an increase from the base period), 76/ but that the average carcass weight would drop slightly (to 450 pounds) from the base period. The projection of beef and veal production--1.2 billion tons--is somewhat above that provided by Gruen (1.1 billion tons) but equal to the OECD projection.

Sheep numbers are projected to total 187 million head in 1975--a 1.5-percent annual rate of increase above the base period. This rate of increase is about midway between longer term and intermediate trend rates of increase.

Given the close relationship between wheat and sheep, the expected expansion in agricultural area would promote increased sheep numbers. Also, an assumed wool price of 41 cents per pound--with costs constant--was considered sufficiently remunerative to encourage flock buildups. Land was not seen as a limiting factor owing to the continued development of new land and the potential for higher stock-carrying capacity.

Slaughter rates of both adult sheep (17 percent) and lambs (47 percent) were assumed to increase from the base period. During the 1960's, slaughter rates for adult sheep ranged from 13.3 to 16.3 percent (average of 15), while those for lambs ranged from 41.3 to 49.7 percent (average of 45). The average carcass weights were assumed to be 44 pounds for adult sheep and 36 pounds for lambs. These values are essentially unchanged from the base period (a 1-pound increase for adult sheep). Average carcass weights in the 1960's ranged from 42 to 45 pounds for adult sheep and from 34 to 37 pounds for lambs.

The number of adult sheep shorn throughout the year has typically exceeded March 31 inventory numbers. Numbers shorn ranged from 10.7 to 14.9 percent above inventory numbers during the 1960's and averaged 12.7 percent higher in the base period. With the price of wool holding constant at 41 cents per pound, there is little reason for believing that numbers shorn would exceed 113 percent of inventory numbers by 1975. The number of lambs shorn has historically been below March 31 inventory numbers, and in 1975 is projected to approximate the base period average of 87 percent.

75/ One-third of the calves were slaughtered for veal in 1966/67-1968/69. With the projected 9 percent reduction in dairy cows by 1975 (see table 21), and with dairy cows expected to constitute about one-fifth of herd numbers, it was decided to reduce the percent of calves slaughtered to 30 percent.

76/ The higher slaughter rates for both cattle and sheep are expected to result from generally improved management practices, improved transportation, and the shifting of production more toward areas of relatively high rates of turnoff. Not only would animals tend to be ready for market at an earlier age, but also a larger proportion of the older animals would be marketed.

Table 21.--Projections of beef and veal, mutton and lamb, and wool production, domestic utilization, and export availability, Australia, selected assumptions, 1975

Item	Unit	Base period 1966/67-1968/69	Elastic export demand and constant prices	Elastic export demand and 15% reduction in grain prices	Wheat quotas and selected price adjustments
Cattle:					
Number of beef cattle	1,000 head	14,885	18,307	18,443	21,653
Number of dairy cattle	do.	4,479	4,100	4,100	4,000
Total	do.	19,364	22,407	22,543	25,653
Adult cattle slaughtered	do.	4,179	5,768	5,803	6,603
Average carcass weight	Pounds	454	450	450	450
Beef production	1,000 tons	847.5	1,159	1,166	1,326
Calves slaughtered	1,000 head	1,460	1,479	1,488	1,693
Average carcass weight	Pounds	68	70	70	70
Veal production	1,000 tons	44.0	46.2	46.5	52.9
Beef and veal--					
Domestic utilization	do.	471	594	594	625
Export availability	do.	420.5	611	618	754
Sheep and lambs:					
Number of adult sheep	1,000 head	132,163	146,680	150,918	146,680
Number slaughtered	do.	19,415	24,936	25,656	24,936
Average carcass weight	Pounds	43	44	44	44
Mutton production	1,000 tons	376.0	489.8	504	489.8
Mutton consumption	do.	220	230	230	218
Export availability	do.	156.0	259.8	274	271.8
Number of lambs	1,000 head	36,420	40,420	41,578	40,420
Number slaughtered	do.	16,324	18,997	19,542	20,210
Average carcass weight	Pounds	36	36	36	36
Lamb production	1,000 tons	260.7	305.3	314.1	324.8
Lamb consumption	do.	240	300	300	315
Export availability	do.	20.7	5.3	14.1	9.8
Total number of sheep	1,000 head	168,583	187,100	192,496	187,100
Number shorn	do.	180,576	200,913	206,710	200,913
Average weight of fleece	Pounds	10.1	10.3	10.3	10.3
Wool production	Mil. lb	1,826.6	2,069.4	2,129.1	2,069.4
Wool consumption	do.	74.1	80.0	80.0	80.0
Export availability	do.	1,752.5	1,989.4	2,049.1	1,989.4

Average fleece weights--adult sheep and lambs combined--ranged from 8.5 to 9.6 pounds during the 1960's. The average was 9.2 pounds during the base period. Adding dead and fellmongered wool and wool exported on skins to wool shorn--and then dividing by the number of sheep shorn--gave an average fleece weight of 10.1 pounds. This average is assumed to rise slightly--perhaps to 10.3 pounds--by 1975. 77/

These figures result in an estimated production of 490,000 tons of mutton, 305,000 tons of lamb, and 2,069 million pounds of wool in 1975. Comparable figures for Gruen's most likely projections and OECD's projections (mutton and lamb only) are shown in table 18.

Domestic Utilization

The domestic use of selected grain and livestock products to 1975 was estimated by first appraising and then modifying projections contained in other studies.

Gruen's 1970 population projection of 12.6 million was slightly over the recorded 12.55 million (appendix table 51). All projections reviewed agree that Australia's 1975 population will reach 14 million, an increase of 2 percent annually. This projection appears realistic.

Australia's mineral developments during the 1960's have enabled the Gross National Product (GNP) to move upward at a faster pace than was anticipated by Gruen. The GNP in 1970, measured in 1959/60 constant prices, was $1 billion higher than Gruen projected. Based on the 5 percent annual GNP growth rate recorded over the past 5 years, the GNP should reach $28.5 billion by 1975. This would result in a per capita GNP of $2,035, compared with $1,776 in 1970.

Grains.--Total wheat utilization in 1970 was higher than the Gruen projection for 1970 or the OECD projection for 1975 (table 16). A moderate rise in wheat use will continue through 1975 although direct per capita consumption will decline (the income elasticity for wheat as food has been estimated at 0.11 for Australia (78, p. 12). Growth in population, expanded use of wheat for feed, and larger seed requirements would more than offset per capita consumption declines and possibly push total wheat use to about 108 million bushels in 1975.

Coarse grain use would also increase by 1975. Direct per capita consumption of oats, barley, and corn--already at a relatively low level--should show little change. Gruen's 1970 projection of total oat use matched actual developments, but the barley projection was 12 million bushels low (table 16). In addition, Gruen made no projection of the 6 million bushels of corn and 10 million bushels of sorghum actually used. With increased numbers of cattle and sheep--along with continued expansion of the poultry and hog industries--feed use should rise. More seed would also be required with increased acreage. Domestic utilization of feed grains should expand by 10 percent by 1975.

Livestock Products.--The consumption of beef and veal in Australia is well below the levels projected by both Gruen and OECD (table 16). Per capita beef and veal consumption has remained relatively stable since 1965/66. Failure of beef and veal consumption to increase substantially in recent years is attributed mainly to the effect of rising beef prices. Although a constant price assumption should allow consumption of beef and veal to rise moderately by 1975 (because of rising income), it would not reach the levels projected by Gruen or OECD. With an estimated population of 14 million and per capita consumption of 95 pounds, total consumption of beef and veal would equal 594,000 tons in 1975.

77/ The average increased from 9.9 to 10.1 pounds between 1960/61-1962/63 and 1966/67-1968/69.

The combined consumption of mutton and lamb in 1970 was near the level projected by Gruen but substantially higher than the OECD projection. Although Gruen projected consumption of lamb to increase faster than mutton, he did not expect lamb to exceed mutton. Lamb consumption per capita, however, has expanded rapidly in recent years, reflecting a switch from beef to lamb because of high beef prices. Mutton consumption has shown a slight downtrend on a per capita basis, but total domestic utilization has risen steadily. Consumption of lamb and mutton, with lamb increasing at the fastest rate, would be expected to total 530,000 tons (85 pounds per person) in 1975.

Projected 1975 per capita consumption of 95 pounds of beef and veal and of 85 pounds of mutton and lamb is close to Gruen's low projection (table 15). These projections, as those of Gruen, assume continued increases in the per capita consumption of pork and poultry.

Australia's wool consumption totaled 77.2 million pounds in 1970--substantially above Gruen's projection of 73 million pounds. Consumption from 1965 to 1970 showed substantial year-by-year variability within a range of 72-78 million pounds. Under an assumption of constant price (both wool and synthetics), requirements of soft fibers would tend to expand with rising population and income. However, wool might tend to be displaced by synthetics--with some manufacturers contending that synthetics offered preferred properties and greater possibilities of technological innovations. An estimated consumption of 80 million pounds of wool--close to Gruen's 81-million-pound projection--was selected for 1975.

Export Availability

We projected the export availability of wheat under the constant price assumption to be 395 million bushels by 1975. This figure approximates the 397 million bushels projected in the Monash study. It is well in excess of the OECD projection of 336 million bushels, which is less than the 1966/67-1968/69 base period average used in this study.

A moderate increase over the base period in the export availability of oats and sorghum was projected for 1975. Barley exports were projected to decline, while corn exports were projected to almost triple over the 7-year period. However, this increase would be from a small base, and corn would remain by far the least important Australian coarse grain export.

Beef and veal export availability in 1975 was projected to expand 45 percent above the base period. The projected export of 611,000 tons of beef and veal is above the Gruen and OECD projections (table 19). However, given the perspective that 500,000 tons of beef and veal were exported in 1970, compared with Gruen's projection of 347,000, the projections of Gruen seem particularly low.

Mutton export availability was calculated at 260,000 tons--67 percent above the base period--under the assumption of constant prices. Gruen's projection for 1975 was 120,000 tons. However, actual mutton exports in 1970 already totaled 230,000 tons. Fat lamb export availability by 1975 would approximate 5,000 tons, compared with Gruen's estimate of 27,000 tons of lamb being imported by 1975. Wool export availability shows an upward trend to 1,989.4 million pounds by 1975. This projection represents a slightly higher rate of expansion than Gruen anticipated, but seems more consistent with recent trends.

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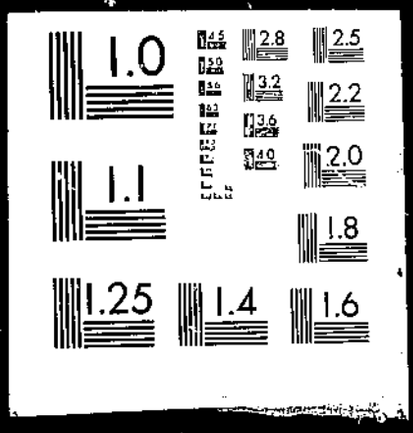
(NAL Call No. A281.9/Ag8F)



Projections Assuming an Elastic Export Demand and a 15-Percent Decline in Grain Prices

With the exception of the assumed gradual grain price declines, which accumulate to 15 percent by 1975, the assumptions here are identical to those outlined in the previous section.

The assumed producer prices for 1975, after a 15-percent reduction in grain prices, are as follows:

Commodity	Unit	Price
Wheat	Bushel	A$ 1.02
Oats	do.	.52
Barley	do.	.74
Corn	do.	.94
Sorghum	do.	.76
Beef cattle	Head	94.34
Sheep and lamb	do.	4.66
Wool	Pound	.41

Production

The effects of a gradual 15-percent decline in grain prices are difficult to determine. Calculated coefficients of elasticities refer to a change in production that occurs in response to a given price change while holding all other conditions constant. In addition, no supply response data are available on a number of crops which may be substituted for grains (for example, oilseeds).

The intermediate elasticities generated in the Monash study (78) were used as a guideline to judge the acreage released from grain production under a 15-percent price decline. 78/ Subsequently, this land was allocated to the production of wool, beef, and oilseed. Allocation was based partly on the cross elasticities developed in the Monash study and partly on other aspects of Australia's presumed supply response.

The projected decline in wheat and coarse grain acreage for 1975, using the supply price elasticities generated in the Monash study, is shown in table 22. The 4.3 million acres can be considered an upper limit on the area that would move from grain production to alternatives under a 15-percent decline in grain prices.

78/ A study by Gruen and Powell has shown that, with the exception of lamb, there was little difference in the price elasticity under assumed increases and decreases in price (77).

Table 22.--Reduction of Australia's grain acreage, with a 15-percent grain price decline, using the intermediate elasticities of the Monash study, 1975

Commodity	Constant price projections for 1975	Monash intermediate elasticity	Projected acreage decrease for 1975	Projected acreage with 15% price decline by 1975
	1,000 acres	Price coefficient	1,000 acres	1,000 acres
Wheat	26,500,000	0.8541	3,395,000	23,105,000
Coarse grains	7,620,000	0.8131	929,373	6,691,000
Total	34,120,000	—	4,324,373	29,796,000

Cross elasticities in the Gruen study (78) indicate that wheat production increases, resulting from higher wheat prices, would pull 60 percent of the resources from the wool sector and 40 percent from the coarse grain sector. Increased coarse grain production, through a higher price, was seen as pulling resources entirely from the wheat sector. With declines in both wheat and coarse grain prices, other types of adjustments from those mentioned would be required. Wheat at $1.02 per bushel would still tend to be more profitable than oilseeds (see p. 27), although increased attention would be given to oilseeds as an alternative crop. In view of the lower profitability of oilseeds, vis-a-vis wheat, and the need to maintain a proper balance between crop and livestock land use, the estimated number of acres moving out of grains was reduced by 30 percent, that is, from 4.3 to 3.0 million acres.

As indicated, the Monash study estimated that 60 percent of the wheat acreage would be taken up in wool production. However, with wool at 41 cents per pound, which is a reasonably good price and a high capital requirement for movement into cattle, we estimated that 70 percent, or 2.1 million acres, of the area taken out of grain production would go into wool production.

Of the remaining areas, 0.6 million acres are estimated to shift into beef and 0.3 million acres into oilseed production. Most of the expansion in oilseed production would come from such recently introduced crops as rapeseed and sunflower.

The land freed from wheat production and used for sheep and cattle would be improved pastures with an assumed stocking rate of two dry sheep equivalents per acre. At this stocking rate, beef and veal production would increase to 1.212 million tons and wool production would move to 2.129 billion pounds, compared with 1.205 million tons and 2.069 billion pounds, respectively, at the constant price assumption (table 21).

Domestic Utilization

Other than the 15 percent decline in grain prices, the assumption of the previous section still applies. The population and GNP projections also remain the same under this assumption.

Grains.--Direct per capita consumption of wheat would not be significantly affected by the price decline because of the low price elasticity of wheat.

The wheat content of a wheat product represents a very small proportion of the product's total cost. Thus, a change in the price of wheat per se is only one component influencing the price of the retail product.

More wheat would probably be channeled through livestock with a 15-percent decline in price. However, the magnitude of this shift would be limited. Since all grains would experience the same percentage price decline, wheat would not receive any relative price advantage. Nevertheless, farmers accustomed to growing wheat would be expected to divert a larger amount to livestock. Increased feeding, coupled with smaller seed requirements owing to lower planted acreage, might result in total domestic utilization in 1975 of 1 million bushels above utilization expected at constant prices (see table 20).

The direct per capita consumption of coarse grains would not be significantly affected by a 15-percent price decline. As with wheat, more coarse grains would be channeled through livestock. As indicated in table 5, coarse grains appear to be a cheaper source of TDN than wheat. Under the assumed price decline--although greater for wheat than coarse grains in absolute terms--the coarse grains would retain their relative price advantage.

Since lot feeding of cattle has shown profits with the beef:feed grain price ratio exhibited in 1969/70, a decline in feed grain prices would make the practice of lot feeding more profitable. Thus, the incentive to increase grain feeding would come from reduced grain prices rather than higher meat prices (which are assumed constant). However, developments in lot feeding to 1975--even with a 15-percent reduction in feed grain prices--would be expected to be modest.

Increased sheep and cattle numbers would tend to boost supplementary feed requirements above amounts needed under the constant price assumption. However, year-to-year variations in grain requirements are substantial, depending on the weather (appendix table 52). As with wheat, expanding hog and poultry numbers would also raise coarse grain requirements.

Among the various feed grains, oats should show the greatest absolute expansion because of supplementary feeding. Total use might expand by 1 million bushels (feed use less reduced seeding requirements). Barley use would also tend to expand--perhaps by 500,000 bushels. Use of corn and sorghum might each expand by 250,000 bushels. Increased use of barley, sorghum, and corn would be encouraged by their local availability when lower cost oats are not available as well as through the reduction or elimination of transportation costs incurred by hauling in oats.

Livestock.--Despite the fact that a lower grain price would lead to increased production of livestock and livestock products, domestic utilization would not increase above the earlier projected levels due to the assumption of an elastic export demand. Hence, livestock prices are assumed to remain the same since the increased export availability will be absorbed in the world market without materially affecting world prices.

Export Availability

The assumed 15-percent decline in all grain prices had the general effect of reducing the export availability of grains and increasing the export availability of meat. World prices for livestock products are assumed to remain the same as in earlier projections.

Projected export availability of wheat, which is large in absolute quantity, was 11 percent below the constant price projection (see table 20). However, the residual available for export in the case of coarse grains is relatively small. Consequently, projected export for each type of coarse grain under the present assumption was at least 35 percent below the projection with the constant price assumption.

Beef and veal export availability was projected to increase only slightly--1 percent--with the decline in grain prices, while mutton exports would be 5 percent greater

than expected with the constant price projection. Increased lamb production, associated with rising sheep numbers, would be expected to push lamb exports to 14,000 tons. Wool exports would be expected to increase 3 percent over the 7-year period.

Projections Assuming Wheat Quotas and Changing Prices

This section highlights problems facing Australian farmers and the agricultural economy and discusses expected developments in the country's agricultural production, consumption, and trade to 1975, assuming continuation of wheat quotas and price changes.

Many Australian farmers are currently in a difficult financial plight. The decline in wool prices and the application of wheat quotas, in combination with serious drought, is causing considerable hardship--especially for many farmers in the Wheat-Sheep Zone and the Pastoral Zone.

Historically, many Australian farmers have depended almost completely on wheat and wool for their income. Any changes in the wheat:wool price ratio led to some production shifts between these two commodities. Incomes on the two commodities were maintained at a resonably high level and on a par with nonfarm incomes. Generally satisfactory incomes associated with the production of wheat and wool led to a self-sufficiency attitude of "I'm all right, Jack." In addition, the structure of commodity boards, with associated matching funds from the Commonwealth Government (see p. 55), curtailed research on alternative forms of production.

Today, Australia's agriculture is undergoing transitions which complicate realistic projections. A search is on for substitute crops for wheat because of wheat quotas. As a result, feed grain and oilseed areas have expanded. However, genuine concern exists about markets for the increased production. Farmers are generally advised to "go slow" and "not to produce unless there is a market." Oilseed production is recommended only if done under contract.

Falling wool prices, combined with rising costs, have encouraged substitution of beef cattle for sheep. However, many sheep or wheat-sheep producers are already deeply in debt and unable to afford the higher capital costs associated with beef production. Concern is also being expressed about: (1) Availability of markets needed for future increases in beef production, (2) competition from other suppliers and (3) impact of simulated meats.

Production

Wheat.--Major uncertainties regarding future wheat production in Australia include world market conditions and the policies pursued by the Australian Government regarding wheat pricing and the production of wheat for feed.

A pessimistic view of world trade in wheat through 1980 exists (83, p. 104), owing to the introduction of new high-yielding varieties of wheat and rice in numerous developing countries and the expansion of wheat production in those developed countries which have historically imported wheat.

The future of Australia's wheat market in Mainland China is questionable because of the lack of wheat exports to China in 1970/71. We assume, however, that wheat exports to China will be resumed to some degree by 1975. 79/ Despite the loss of the

79/ The failure of Mainland China to import any wheat from Australia in 1970/71 is considered the result of a political dispute in combination with a good crop in China in 1970.

Mainland China market, Australia maintained a high level of wheat exports in 1970/71 because of the emergence of new markets in the Middle East.

Australia's current policy of not promoting the production of feed wheat is assumed to be unchanged through 1975 (see pp. 34 and 35). Some factors and uncertainties that may affect the validity of this assumption are:

(1) Termination of the International Grains Arrangement as a formal agreement and of the pricing or production restraints attached to the formal agreement.
(2) Arguments that it is to Australia's long-term advantage to produce feed wheat.
(3) Belief that feed wheat competes more effectively with corn (in nutritional terms) than does barley or oats.
(4) Better facilities for the storage, handling, and marketing of wheat than for feed grains.
(5) Potential for the development of wheat varieties that can be clearly differentiated as feed wheat.

It is important to note that farmers produce overquota wheat which is used for feed on the farm, sold across State lines for feed, or (possibly) delivered to the AWB to be charged against next year's quota. Thus, quota restrictions, in and of themselves, do not control wheat area or production.

We assume that wheat quotas will not be transferable to 1975. A situation in which wheat quotas were transferable would have implications for other crops as well as for wheat. We also assume that wheat prices will stay at the same level as that of the 1966/67-1968/69 base period.

The AWB has not more actively pursued the sale of wheat for feed for several reasons. Other wheat exporters could implement the same policy, forcing down the price of milling wheat in export markets and causing Australia to be no better off than previously.

Some increases in wheat quotas over those in 1971/72--perhaps 5 percent--are assumed likely by 1975. This increase would raise quota restrictions to about 356 million bushels--nearly equal to the 1969/70 quota. 80/ Some overquota production would push this figure to an estimated 375 million bushels. BAE (40) projected 350 million bushels for 1974/75. Wheat yields, estimated at 20 bushels per acre, would be slightly higher than under the previous two assumptions. 81/ Acreage in wheat production would approximate 18.7 million acres (table 20).

The imposition of wheat quotas has sparked the Australian farmers' interest in alternative crops. Area planted to wheat dropped from 26.8 million acres in 1968/69 to 16.5 million acres in 1970/71 82/ (appendix table 2). Although a large part of this area reverted to pasture, barley, sorghum, and oilseed acreage increased significantly

Feed grains.--A major question mark in Australia's expansion of feed grain production is the availability of export markets. Corn is apparently viewed as the feed grain par excellence and as a yardstick against which other grains must be measured. Nevertheless, it is surprising--in view of the generally assumed favorable market for feed grains (117, p. xi)--that production of barley in Australia has not increased at a more rapid pace.

80/ The 1969/70 quota of 357 million bushels decreased by 11 percent to 318 million bushels in 1970/71, and increased by 6.6 percent to 339 million bushels in 1971/72.
81/ Presumably some of the more marginal land would be removed from wheat production.
82/ The decrease in wheat area also was caused, in part, by unfavorable weather.

The marketing system appears to be a major factor in the expansion of feed grain production. Wheat receives priority in both transport and storage. Bulk-handling facilities--except possibly in Western Australia--are much more limited for feed grains than for wheat. Aggressive sales efforts have been constrained, and organized marketing boards are segmented and to some degree competitive with each other.

Rapid development in oilseed production is providing an important alternative crop for some farmers. Gross returns appear to be very competitive with feed grains (see p. 27) but less profitable than wheat. Risks associated with weather are probably greater than those of grains. Although relatively small in terms of total area (see appendix table 48), oilseed production should continue to expand. Australia is likely to achieve self-sufficiency in vegetable oils and meal before 1975, and then search out export markets. However, the world market outlook for vegetable oils is not particularly promising (100, p. ix). Australia's liberalization of regulations controlling the domestic sale of margarine could lead to increased domestic demand and lessen the need for exports.

Serious efforts are expected to be made to improve the marketing of feed grains. Improvements are needed in every area--from the farm to the port--but major improvements will require time. However, possibilities may exist for better coordination of wheat and feed grain marketing in terms of transportation and joint use of storage facilities. The AWB may be assigned responsibility for the promotion and marketing of feed grains.

Outside investment is promoting the production of grain sorghum. Japan is particularly interested in Australia's sorghum potential and is contracting for growing sorghum in Australia. American capital is also involved in expanding Australia's grain sorghum output.

Adoption of barley quotas is being considered in Australia. Established barley producers are said to be supporting a quota system in the fear that the switch to barley--from wheat--will flood the market and ruin barley prices. The projection discussed here does not assume barley quotas in 1975.

In view of the generally favorable outlook for feed grains, we assume that producer prices of oats and barley will remain close to the 1966/67-1968/69 average. Corn and grain sorghum prices are assumed to strengthen 5 to 10 cents per bushel above the base period averages.

Despite its relatively low price, area planted in oats is expected to expand by 1975. Some land is more suitable to the production of oats than of barley. Oats is used extensively as a supplementary feed for livestock and some expansion in requirements can be expected in this area. Oats production--planted on 4.3 million acres and yielding 23 bushels per acre--is projected to total nearly 99 million bushels in 1975, about the same as the BAE projection for 1974/75.

Barley is generally a more profitable crop than oats (see table 3). Export possibilities for barley should also be better than those for oats. In recent years, barley production has risen much more rapidly than oats production. Consequently, it is projected that barley production in 1975 will approximate 142 million bushels, compared with BAE projections of 80 million bushels for 1974/75. Our figure assumes 6 million acres at a yield of 23.5 bushels per acre. Barley production in 1970/71 was about 100 million bushels.

An assumed relative increase in the price of corn and sorghum--in combination with good export potential for these two feed grains--is expected to lead to increased production by 1975. The BAE study (40) projected 10 million bushels of corn output for 1974/75. This figure seems realistic for 1975, based on 265,000 acres at a yield of 38 bushels per acre.

The BAE projection of 27 million bushels of sorghum for 1974/75 looked extremely optimistic until viewed within the context of the unusually high levels of sorghum area and yield experienced during recent harvests. Quality grades of wheat compete with sorghum in the area where much of Australia's sorghum is currently grown (see p. 12). Significant harvesting and storage problems have inhibited expansion of sorghum production in the Northern Territory, while infrastructure problems--either in terms of getting the grain to cattle or exporting it--are of substantial magnitude in irrigated areas of northwestern Australia. However, an output of 54 million bushels is projected for 1975 in view of the following: (1) Assumed relative increase in the sorghum:wheat price, (2) expansion in irrigation, (3) inflow of outside investment, and (4) presumed favorable export market. A yield of 30 bushels per acre--due to the planting of a larger proportion of sorghum under irrigation--would require 1.8 million acres to achieve a production of 54 million bushels.

Beef and Veal.--The continued uptrend in beef prices, in combination with a less favorable price situation in some other sectors (particularly sheep), has promoted rapid expansion in beef cattle numbers in Australia.

A critical issue affecting beef herd expansion is the biological rate of increase of beef cattle. BAE officials maintain that the maximum biological rate of increase in the medium term for beef cattle is 3½ to 4 percent. Others have indicated that, theoretically, a rate of about 7 percent a year is possible over a number of years (47). 83/ The rate of increase for the whole of Australia has been much higher in recent years than in the early 1960's, and higher in the southeastern States than in the northern States. Beef cattle numbers for the whole of Australia increased 10 percent between 1969 and 1970, and 13 percent between 1970 and 1971. Certainly, a significant part of this expansion was the result of acquiring animals from the dairy sector. The potential for further contributions from the dairy sector--in combination with relatively high beef prices--is judged sufficient to permit beef cattle numbers to show an average annual increase of 5.5 percent between the base period (1966/67-1968/69) and 1975.

Although farmers are expanding their beef herds--or going into beef--at a rapid rate, limitations other than biological ones are involved. Capital has already been cited as a limiting factor. Cattle are high in price and some new plant facilities may also be required. The lack of management skills can also act as a constraint since some farmers have not had experience in raising cattle. In addition, in some sections of the Pastoral Zone, cattle are not considered a reliable alternative to sheep because of limited feed.

Some decline in beef cattle prices from the current level may occur in Australia by 1975 as a result of increasing supply. The rationale for this statement is that a larger proportion of Australia's beef exports may be forced into lower priced markets (appendix table 53) as production expands. 84/ Nor can the domestic market absorb the increased supplies to a sufficient degree to prevent price declines. In any event, due to the production lag, increased supplies will be forthcoming in 1975.

Dairy cattle numbers are estimated to decline to 4 million in 1975--a sharper drop than projected under the two preceding assumptions. All the other coefficients used in

83/ This model assumes that the industry would suffer no setbacks such as drought and no change in traditional marketing and management practices (47).

84/ It is not suggested that world demand for beef and veal will weaken or that world prices will "break", but only that the higher priced export markets will not be available to absorb a sufficient amount of the increased production to keep prices at current levels. In the most significant higher priced market--the United States--the quota is presumed to increase at 2 percent annually (paralleling the expected growth in domestic production) (123). Australian beef and veal production between the base period and 1975 is projected to increase at nearly 6.5 percent annually.

estimating beef and veal production (for example, percentage of adult cattle slaughtered, ratio of calves to total cattle numbers, carcass weight, etc.) are assumed the same as in the two previous projections. As a result, total beef and veal production in 1975 is estimated to be 1.4 million tons, about 200,000 tons above the BAE estimate (40).

Mutton, Lamb, and Wool.--As indicated earlier, future developments in this economically depressed sector depend to a considerable extent on the level of Government intervention (see p. 26). The 1975 projection assumes a significant degree of restructuring in the sheep sector. It also assumes, however, that the Government--in conjunction with financial institutions--will adopt policies to prevent a widescale financial collapse of the sheep sector. Economies of size exist (see pp. 23, 24) and will foster larger sheep operations. Some owners are already amalgamating their holdings to cut costs and consolidate debts. The fact that many of Australia's farmers became engaged in farming at the end of World War II and are nearing retirement age also will tend to facilitate farm enlargement. Land values in the sheep sector, particularly, have suffered a substantial decline, but to date, few properties have changed hands as current owners fight to maintain possession and avoid capital losses. In time, more land is likely to change ownership at a value in line with its earning capacity.

The opportunity costs of sheep production approach zero in some areas of the Pastoral Zone so these areas will tend to continue producing wool so long as variable costs are covered. The marginal cost of wool production in Australia is believed to be within the range of 25-35 cents per pound. In some more adverse pastoral areas, flocks consisted entirely of wethers because of the difficult nutritional and breeding problems associated with ewes in these areas.

By 1975, wool prices are assumed to show some improvement from current levels--perhaps achieving a level within the range of 38-40 cents per pound. 85/ The rate of increase in costs is expected to decline as farmers more closely scrutinize their expenditures and more efficient marketing techniques are introduced. It is assumed that wool production quotas, which have been under discussion in Australia, will not be applied.

Ewes currently are selling at $2-$3 per head in Australia. Prices have usually ranged around $5-$6. Although sheep prices are expected to improve by 1975 from the currently depressed level, mutton prices will depend heavily on developments in the export market and on lamb prices in competition with other meats in the domestic market.

There is considerable economic rationale for the individual with adequate pasture and capital to expand sheep numbers at this time. One shearing yielding 10 pounds and priced at 30 cents per pound would recover the cost of the sheep. Assuming an average compound annual rate of increase of 1.5 percent between the base period and 1975, sheep numbers would total 187 million (the rate of increase was 3.1 percent between 1969 and 1970). Some temporary decline in numbers from 1970 levels may occur while a restructuring of the sheep industry is in progress. Coefficients on slaughtering percentages, average carcass weight, percentage shorn, and average fleece weight are the same as for the previous two assumptions with one exception: The slaughtering rate for lambs is increased from 48 to 50 percent in view of the greater emphasis and concern given to lamb production at a lower wool price.

85/ In a February 1971 report, the BAE stated: "Wool prices are particularly low at present and there should be some recovery when the two short-term depressing factors, the disposal of New Zealand stocks and the currency problem in Europe, have passed... The probability is that in 1974-75 the trend level of wool prices will not be any better than the 1958-59 level of just over 40 cents....(40, p. 4)."

Mutton and lamb production in 1975 is projected at 815,000 tons, somewhat above the BAE projection of 805,000 tons for 1974/75. Our projection for wool is 2.1 billion pounds, compared with the BAE projection of 2.3 billion pounds.

Domestic Utilization

The population and GNP projections under this assumption are assumed to remain the same as for the preceding assumptions.

Grains.--The assumption of continued wheat quota restrictions should enable wheat prices to remain steady through 1975. With milling wheat prices remaining essentially unchanged, the domestic demand for food wheat should be stable with declining per capita consumption offset by population increases.

Some increase in domestic utilization of wheat could come from channeling more wheat through livestock. The assumption of continuation of the quota system--as presently designed--should lead to some overquota production. In both 1969/70 and 1970/71, production exceeded the quota by 30 million bushels. While part of the overquota production may be applied to next year's quota, substantial quantities may be sold domestically by the AWB as feed wheat, fed by the producer, or channeled into the "grey" market for feed.

Anticipated expansion of the beef sector to 1975 would afford the opportunity for more supplementary feeding of wheat than projected under the preceding two assumptions. Absence of an assumed elastic export demand could also be an important factor. Consequently, the total domestic utilization of wheat in 1975 is projected at 110 million bushels (see table 20).

Because of rising cattle and sheep number, utilization of coarse grains would exceed the projection under the constant price assumption. Expected price rises for corn and sorghum would curtail their increased use, while more or less stable prices for oats and barley would lead to their increased use. The overall projected rise in coarse grain use, relative to use under the constant price assumption, is 1 million bushels of oats and 500,000 bushels of barley. Direct per capita consumption would be unchanged from preceding projections.

Livestock.--Per capita consumption of beef and veal has remained relatively stable during the past 5 years, despite an uptrend in prices caused by exports. With anticipated production increases in beef and veal, a price decline of 5 percent below current prices might be expected. In determining the effect on consumption of the assumed price decline, Gruen's price elasticity of demand was considered. 86/ The result would be about a 5-percent increase in domestic utilization from projections under the previous assumptions, or a total of 625,000 tons.

Lamb consumption by 1975 should follow the same general pattern as that described for beef and veal. Sheep numbers are not expected to expand as rapidly as beef numbers by 1975, but the anticipated price decline--perhaps 7 to 8 percent--is expected to be greater for lamb than for beef. The price elasticity of demand generated by Gruen indicates that a price decline of 8 percent would be associated with a 12-percent increase in consumption of lamb. 87/ This is true, however, only if other prices remain constant.

86/ Gruen estimated the price elasticity of demand for beef and veal at -0.96 and the income elasticity at 0.25 (78, pp. 81, 129).

87/ Gruen estimated the price elasticity of demand for lamb at -1.5 and the income elasticity at 0.65.

Since it has already been projected that beef prices will show some decline, the expected net increase in lamb consumption is less than direct application of the elasticities would indicate. Thus, lamb consumption is projected to increase by about the same as beef--5 percent--so that total utilization of lamb will increase to 315,000 tons by 1975. Per capita consumption of lamb is already at a record level. In addition, beef is preferred to lamb as evidenced in the early 1960's when per capita beef consumption was much higher than lamb and prices were nearly identical.

Retail prices for mutton are also expected to show some decline. Nevertheless, per capita consumption is projected to decline below that projected under the constant prices due to substitutions of beef and lamb for mutton. 88/ The decline is projected to be 5 percent from the constant price assumption, which results in a projected total consumption level of 218,000 tons.

Wool consumption is not expected to change from projections made under the two previous assumptions.

Export Availability

The assumed wheat quotas and price adjustments--relative to the constant price assumption--are projected to cause a marked decrease in the export availability of wheat and concomitant increases in the availability of coarse grains and meats by 1975. Wheat export availability is projected to decline by 33 percent--from 395 to 265 million bushels--while coarse grains exports would quadruple--from less than 1 million tons to 3.9 million tons. Most of the expansion in the export availability of coarse grains would come from barley and sorghum.

Over 750,000 tons of beef and veal are projected to be available for export by 1975--a 23-percent increase from export availability assuming constant prices. The projected increase in lamb production would cause Australia's export availability to nearly double, despite increased consumption. 89/ Reduced mutton consumption, in combination with stable production, would be expected to cause mutton export availability to be 5 percent above the constant price assumption. Wool export availability is the same under these assumptions as it was under constant prices--nearly 2 billion pounds.

88/ Gruen (78) estimated a price elasticity of demand for mutton of -1.4 and an income elasticity of -0.75. The fact that beef and lamb prices are also projected to decline and that mutton has become a less preferred meat more than offsets the influence of the decline in mutton prices.

89/ If projected declines in domestic prices of beef and lamb do not occur and there is no increase in per capita consumption, an even larger export availability of beef and lamb would result.

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APPENDIX TABLES

Table 1.--Data on area in farming and grazing zones, Australia, 1962

Zone	Total area		Area used		Area used as percentage of total area
	Million acres	Percent	Million acres	Percent	Percent
Pastoral...	1,500.0	78.8	941.7	79.5	62.8
Northern..	n.a.	n.a.	654.3	55.2	n.a.
Southern..	n.a.	n.a.	287.4	24.3	n.a.
Wheat-sheep	175.3	9.2	132.0	11.2	75.3
Beef-sheep.	126.2	6.6	75.0	6.3	59.4
Dairy.....	98.5	5.2	32.2	2.7	32.7
Sugar.....	1.0	.1	1.0	.1	100.0
Irrigation.	2.6	.1	2.6	.2	100.0
Total.....	1,903.6	100.0	1,184.5	100.0	62.2

n.a. = Not available.
Source: (138, p. 40).

Table 2.--Australia's wheat area, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 acres	13,439	4,076	2,672	693	1,969	4,021	7	1
1961/62	do.	14,723	4,498	2,849	750	2,229	4,380	16	1
1962/63	do.	16,469	5,008	3,125	919	2,595	4,804	15	2
1963/64	do.	16,474	4,964	3,109	938	2,802	4,640	18	3
1964/65	do.	17,919	5,760	3,236	1,026	2,727	5,151	17	2
5-year average	do.	15,805	4,861	2,998	865	2,464	4,599	15	2
Distribution by State	Percent	100.0	30.8	19.0	5.5	15.6	29.1	0.1	0.1
1965/66	1,000 acres	17,515	4,577	3,074	954	2,745	6,150	14	1
1966/67	do.	20,823	7,135	3,138	1,227	2,960	6,347	13	3
1967/68	do.	22,441	8,215	3,224	1,477	2,864	6,647	12	2
1968/69	do.	26,797	9,959	3,984	1,789	3,748	7,295	17	4
1969/70	do.	23,440	8,623	3,298	1,504	3,210	6,788	15	3
5-year average	do.	22,203	7,708	3,343	1,390	3,105	6,645	14	3
Distribution by State	Percent	100.0	34.7	15.0	6.3	14.0	29.9	0.1	0
1970/71 1/	1,000 acres	16,322	5,600	1,840	810	1,960	6,100	11	1

1/ Preliminary.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 3.--Australia's wheat yield, by State, 1960/61-1970/71

Year	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
	Bushels per acre							
1960/61	20.4	20.8	25.3	15.9	23.6	15.9	21.4	28.5
1961/62	16.8	17.4	20.0	16.0	15.2	15.0	22.2	22.7
1962/63	18.6	21.8	21.7	20.3	14.8	15.1	27.3	29.3
1963/64	19.9	24.7	24.5	23.8	19.3	11.3	27.5	24.6
1964/65	20.6	26.3	24.2	22.3	19.4	12.2	21.7	27.6
5-year average	19.3	22.2	23.1	19.7	18.5	13.9	24.0	26.5
1965/66	14.8	8.5	19.7	18.3	14.6	16.6	26.1	20.8
1966/67	22.4	28.4	22.6	29.1	18.2	16.3	30.2	32.5
1967/68	12.4	10.6	8.8	18.6	9.4	16.1	26.3	17.8
1968/69	20.3	21.6	22.8	23.5	22.2	15.4	23.6	20.1
1969/70	16.5	18.9	25.3	9.9	18.4	9.8	23.9	27.0
5-year average	17.3	17.6	19.8	19.9	16.6	14.8	25.9	23.1
1970/71 1/	18.0	20.4	19.8	5.8	15.8	17.5	25.0	17.9

1/ Preliminary.
Source: (51, various issues; 55; 59); and Foreign Agricultural Service, USDA.

Table 4.--Australia's wheat production, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 bu.	273,716	84,657	67,587	10,999	46,396	63,900	148	30
1961/62	do.	247,178	78,350	56,878	12,018	33,854	65,700	345	32
1962/63	do.	306,912	109,002	67,899	18,683	38,339	72,500	419	70
1963/64	do.	327,912	122,472	76,302	22,274	53,971	52,340	483	69
1964/65	do.	368,789	151,483	78,166	22,830	52,817	63,071	364	58
5-year average	do.	304,901	109,193	69,366	17,361	45,075	63,502	352	52
Distribution by State	Percent	100.0	35.8	22.8	5.7	14.8	20.8	0.1	0
1965/66	1,000 bu.	259,666	39,116	60,591	17,429	39,976	102,156	368	28
1966/67	do.	466,610	202,501	70,896	35,730	53,816	103,195	385	87
1967/68	do.	277,289	87,323	28,317	27,417	26,899	106,975	316	42
1968/69	do.	543,950	215,119	90,728	42,000	83,160	112,450	410	84
1969/70	do.	387,512	162,786	83,544	14,898	59,159	66,700	353	73
5-year average	do.	387,005	141,369	66,815	27,495	52,602	98,295	366	63
Distribution by State	Percent	100.0	36.5	17.3	7.1	13.6	25.4	0.1	0
1970/71 1/	1,000 bu.	293,457	114,000	36,400	4,680	31,070	107,000	275	32

1/ Preliminary.
Source: (39, 51, 55, 59); and Foreign Agricultural Service, USDA.

Table 5.--Australia's wheat delivery quotas, 1969/70-1971/72

Item	1969/70	1970/71	1971/72
	Million bushels		
Basic wheat quotas:			
New South Wales	123	99	114
Victoria	65	52	57
Queensland	25	25	27
South Australia	45	36	40
Western Australia	86	83	76
Total	344	295	314
Additional wheat quotas:			
New South Wales --			
Prime hard	7	12	12
Durum	--	--	2
Queensland--			
Prime hard	6	11	11
Total	13	23	25
Grand total	357	318	339

-- Means negligible or none.
Source: (56, No. 118, p. 118).

Table 6.--Australia's oats area, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 acres	3,637	918	835	19	512	1,330	23	1
1961/62	do.	3,097	713	774	27	324	1,231	27	1
1962/63	do.	3,292	708	932	27	416	1,177	31	1
1963/64	do.	3,392	794	910	31	501	1,125	30	1
1964/65	do.	3,497	850	966	55	444	1,152	28	1
5-year average	do.	3,383	797	883	32	439	1,203	28	1
Distribution by State	Percent	100.0	23.6	26.1	0.9	13.0	35.6	0.8	0
1965/66	1,000 acres	3,768	1,033	966	45	455	1,240	28	1
1966/67	do.	4,258	1,363	1,079	66	509	1,204	36	2
1967/68	do.	3,380	907	723	31	525	1,158	35	1
1968/69	do.	3,872	1,185	991	55	516	1,092	31	1
1969/70	do.	3,396	903	884	75	372	1,139	22	1
5-year average	do.	3,734	1,078	928	54	475	1,166	30	1
Distribution by State	Percent	100.0	28.9	24.9	1.5	12.7	31.2	0.8	0
1970/71 1/	1,000 acres	4,131	950	1,000	50	700	1,400	30	1

1/ Preliminary.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 7.--Australia's oats yield, by State, 1960/61-1970/71

Year	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
	Bushels per acre							
1960/61	20.9	23.5	24.7	15.0	22.4	16.4	16.8	20.9
1961/62	17.8	18.5	21.1	15.4	13.6	16.4	21.8	18.7
1962/63	20.9	22.7	29.0	20.0	13.9	15.8	26.6	25.6
1963/64	20.1	24.9	21.8	21.7	18.3	15.9	27.8	19.8
1964/65	20.0	26.9	23.2	21.1	20.2	12.2	18.5	21.6
5-year average	19.9	23.3	24.0	18.6	17.7	15.3	22.3	21.3
1965/66	16.1	12.2	18.4	16.3	12.4	18.8	23.9	25.6
1966/67	25.2	30.1	29.0	22.1	20.2	18.4	26.4	26.2
1967/68	11.7	9.1	9.5	14.6	6.3	17.1	28.7	20.3
1968/69	24.3	23.2	30.5	20.3	23.1	21.0	18.5	22.4
1969/70	20.2	21.3	29.3	12.7	17.9	13.6	20.7	25.0
5-year average	19.5	19.2	23.3	17.2	16.0	17.8	23.6	23.9
1970/71 1/	21.0	21.1	29.0	8.0	15.7	18.6	16.7	30.0

1/ Preliminary.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 8.--Australia's oats production, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 bu.	76,107	21,466	20,666	286	11,478	21,810	391	11
1961/62	do.	55,130	13,225	16,312	412	4,391	20,186	587	16
1962/63	do.	68,809	16,035	27,042	545	5,770	18,572	828	17
1963/64	do.	68,234	19,812	19,885	673	9,149	17,850	844	22
1964/65	do.	70,043	22,885	22,446	1,177	8,977	14,011	520	32
5-year average	do.	67,665	18,685	21,270	617	7,593	18,486	634	20
Distribution by State	Percent	100.0	27.6	31.4	0.9	11.8	27.3	1.0	0
1965/66	1,000 bu.	60,739	12,607	17,784	735	5,622	23,279	677	37
1966/67	do.	107,106	41,003	31,248	1,467	10,276	22,117	948	47
1967/68	do.	39,628	8,235	6,859	450	3,299	19,759	1,014	12
1968/69	do.	94,250	27,454	30,230	1,119	11,895	22,942	583	27
1969/70	do.	68,723	19,238	25,927	950	6,665	15,463	455	25
5-year average	do.	74,089	21,707	22,409	944	7,551	20,712	735	29
Distribution by State	Percent	100.0	29.3	30.2	1.3	10.2	28.0	1.0	0
1970/71 1/	1,000 bu.	86,930	20,000	29,000	400	11,000	26,000	500	30

1/ Preliminary.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 9.--Australia's barley area, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 acres	2,830	189	309	219	1,556	541	15	--
1961/62	do.	2,383	201	225	177	1,270	391	19	--
1962/63	do.	2,027	220	194	150	1,053	390	20	--
1963/64	do.	2,013	212	190	176	1,123	299	14	--
1964/65	do.	2,064	239	187	225	1,095	303	15	--
5-year average	do.	2,263	212	221	189	1,219	405	17	--
Distribution by State	Percent	100.0	9.3	9.8	8.4	53.9	17.9	0.8	--
1965/66	1,000 acres	2,298	236	192	338	1,098	413	20	--
1966/67	do.	2,498	385	228	384	1,107	373	21	--
1967/68	do.	2,611	367	305	342	1,157	416	24	--
1968/69	do.	3,313	485	409	427	1,411	553	26	--
1969/70	do.	3,759	542	487	417	1,384	900	30	--
5-year average	do.	2,895	403	324	381	1,231	531	24	--
Distribution by State	Percent	100.0	13.9	11.2	13.2	42.6	18.3	0.8	--
1970/71 1/	1,000 acres	4,990	680	650	230	1,800	1,600	30	--

1/ Preliminary.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 10.--Australia's barley yield, by State, 1960/61-1970/71

Year	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
	Bushels per acre							
1960/61	24.0	25.3	25.0	20.0	27.1	15.7	22.5	--
1961/62	17.4	20.6	20.6	20.0	16.8	14.8	32.4	--
1962/63	19.5	24.2	28.1	27.3	17.1	15.5	31.9	--
1963/64	21.6	25.3	21.2	29.5	21.7	36.6	30.0	--
1964/65	23.9	28.1	23.2	31.6	24.6	12.2	34.2	--
5-year average	21.3	24.7	23.6	25.7	21.5	19.0	30.2	--
1965/66	18.2	16.1	16.7	27.0	16.9	15.7	34.4	--
1966/67	24.7	30.6	23.8	34.4	21.4	18.0	36.7	--
1967/68	14.1	13.2	8.9	26.2	10.7	16.9	36.8	--
1968/69	21.9	23.1	22.7	30.1	20.9	16.6	33.7	--
1969/70	19.9	22.8	23.4	18.2	22.0	13.4	36.5	--
5-year average	19.8	21.2	19.1	27.2	18.4	16.1	35.6	--
1970/71 1/	20.0	23.2	22.3	8.7	20.8	18.1	33.3	--

1/ Preliminary.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 11--Australia's barley production, by State, 1960/61-1970/71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 bu.	67,970	4,786	7,718	4,392	42,233	8,496	344	--
1961/62	do.	41,504	4,137	4,654	3,532	21,292	7,282	607	--
1962/63	do.	39,579	5,331	5,468	4,087	18,005	6,056	631	--
1963/64	do.	43,395	5,351	4,026	5,191	24,337	4,077	414	--
1964/65	do.	49,313	6,707	4,334	7,111	26,932	3,701	529	--
5-year average	do.	48,353	5,262	5,240	4,863	26,560	5,922	505	--
Distribution by State	Percent	100.0	10.9	10.8	10.1	54.9	12.2	1.0	--
1965/66	1,000 bu.	41,835	3,801	3,218	9,137	18,514	6,481	684	--
1966/67	do.	61,588	11,796	5,421	13,194	23,698	6,707	772	--
1967/68	do.	36,798	4,834	2,709	8,965	12,380	7,027	884	--
1968/69	do.	72,587	11,211	8,885	12,870	29,551	9,187	884	--
1969/70	do.	74,901	12,335	11,373	7,587	30,454	12,058	1,095	--
5-year average	do.	57,541	8,795	6,321	10,350	22,919	8,292	863	--
Distribution by State	Percent	100.0	15.3	11.0	18.0	39.8	14.4	1.5	--
1970/71 1/	1,000 bu.	99,800	15,800	14,500	2,000	37,500	29,000	1,000	--

1/ Preliminary.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 12--Australia's corn area, by State, 1960/61-1970/71

Year	Unit	Australia 1/	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 acres	185	49	3	132	n.a.	--	--	--
1961/62	do.	211	51	3	156	--	--	--	--
1962/63	do.	209	47	4	159	n.a.	--	--	--
1963/64	do.	215	45	3	167	n.a.	--	--	--
1964/65	do.	212	42	2	168	--	--	--	--
5-year average	do.	206	47	3	156	--	--	--	--
Distribution by State	Percent	100.0	22.8	1.5	75.7	--	--	--	--
1965/66	1,000 acres	197	42	2	153	--	--	--	--
1966/67	do.	201	49	1	151	--	--	--	--
1967/68	do.	200	52	1	148	--	--	--	--
1968/69	do.	176	54	1	120	--	--	--	--
1969/70	do.	191	81	1	109	--	1	--	--
5-year average	do.	193	55	1	136	--	--	--	--
Distribution by State	Percent	100.0	28.5	0.5	70.5	--	--	--	--
1970/71 2/	1,000 acres	212	85	1	125	--	1	--	--

1/ Data for Australia incomplete for some years.
2/ Preliminary.
n.a. = Not available.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 13.--Australia's corn yield, by State, 1960/61-1970/71

Year	Australia 1/	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
	Bushels per acre							
1960/61	33.8	45.2	57.3	29.1	n.a.	1.0	--	--
1961/62	34.7	45.7	58.0	30.6	--	21.9	--	--
1962/63	35.6	46.1	59.5	32.0	n.a.	12.2	--	--
1963/64	31.3	46.8	59.8	26.6	n.a.	18.5	--	--
1964/65	32.4	45.1	48.5	29.0	--	15.6	--	--
5-year average	33.6	45.8	56.6	29.5	n.a.	13.8	--	--
1965/66	25.0	38.3	60.3	21.0	--	60.0	--	n.a.
1966/67	37.2	50.4	51.3	32.8	--	12.8	--	n.a.
1967/68	35.6	45.0	34.9	32.3	--	11.4	--	n.a.
1968/69	38.8	56.6	62.2	30.5	--	17.0	--	--
1969/70	35.3	49.3	72.0	24.9	--	5.0	--	--
5-year average	34.4	47.9	56.1	28.3	--	21.2	--	--
1970/71 2/	41.9	62.4	80.0	28.0	--	5.0	--	--

1/ Data for Australia incomplete for some years.
2/ Preliminary.
n.a. = Not available.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 14.--Australia's corn production, by State, 1960/61-1970/71

Year	Unit	Australia 1/	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	A.C.T.
1960/61	1,000 bu.	6,245	2,227	171	3,847	n.a.	--	--	--
1961/62	do.	7,307	2,349	192	4,766	--	--	--	--
1962/63	do.	7,457	2,145	216	5,096	n.a.	--	--	--
1963/64	do.	6,722	2,089	203	4,427	n.a.	--	--	--
1964/65	do.	6,879	1,878	114	4,887	--	--	--	--
5-year average	do.	6,922	2,138	179	4,605	n.a.	--	--	--
Distribution by State	Percent	100.0	30.9	2.6	66.5	--	--	--	--
1965/66	1,000 bu.	4,918	1,607	101	3,209	--	--	--	--
1966/67	do.	7,491	2,471	72	4,948	--	--	n.a.	--
1967/68	do.	7,132	2,320	32	4,778	--	2	--	--
1968/69	do.	6,826	3,083	72	3,670	--	1	--	--
1969/70	do.	6,787	3,997	72	2,713	--	5	--	--
5-year average	do.	6,630	2,695	69	3,863	--	2/ 2.7	n.a.	--
Distribution by State	Percent	100.0	40.7	1.0	58.3	--	0	--	--
1970/71 3/	1,000 bu.	8,885	5,300	80	3,500	--	5	--	--

-- Means negligible or none.
1/ Data for Australia incomplete for some years.
2/ Less than 5-year average.
3/ Preliminary.
n.a. = Not available.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 15.--Australia's grain sorghum area, by State, 1960/61-1970/71

Year	Unit	Australia 1/	New South Wales 2/	Victoria	Queensland 2/	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Acre	255,109	41,145	--	213,761	--	108	--	95	--
1961/62	do.	362,666	70,134	--	292,397	--	135	--	n.a.	--
1962/63	do.	391,334	80,255	n.a.	311,068	--	11	--	n.a.	--
1963/64	do.	365,708	61,203	121	303,857	--	--	--	527	--
1964/65	do.	345,737	51,699	--	292,769	--	--	--	1,269	--
5-year average	do.	3/ 344,113	60,887	4/ 121	282,771	--	4/ 85	--	4/ 630	--
Distribution by State	Percent	100.0	17.7	0	82.2	--	0	--	0.1	--
1965/66	Acre	433,437	99,576	--	332,768	--	--	--	1,093	--
1966/67	do.	502,349	98,161	123	403,500	--	38	--	527	--
1967/68	do.	461,834	78,165	598	382,192	--	879	--	n.a.	--
1968/69	do.	583,409	136,945	1,306	436,479	--	8,679	--	n.a.	--
1969/70	do.	620,056	245,038	893	371,234	--	2,891	--	n.a.	--
5-year average	do.	3/ 520,217	131,577	4/ 730	385,235	--	4/ 3,122	--	4/ 810	--
Distribution by State	Percent	100.0	25.3	0.1	74.0	--	0.6	--	0.1	--
1970/71 5/	Acre	1,100,000	n.a.	n.a.	n.a.	--	n.a.	--	n.a.	--

1/ Data for Australia incomplete for some years.
2/ Planted in the preceding year but harvested in the current year.
3/ State averages do not total to this figure because of less than 5-year averages for some individual States.
4/ Less than 5-year average. 5/ Preliminary. n.a. = Not available. -- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 16.--Australia's grain sorghum yield, by State, 1960/61-1970/71

Year	Australia 1/	New South Wales 2/	Victoria	Queensland 2/	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
	Bushels per acre								
1960/61	23.5	14.0	--	25.3	--	1.5	--	9.4	--
1961/62	25.8	18.6	--	27.5	--	1.1	--	--	--
1962/63	26.2	23.6	--	26.9	--	1.2	--	--	--
1963/64	21.6	20.7	15.5	21.8	--	--	--	11.8	--
1964/65	20.7	32.5	--	20.1	--	--	--	8.4	--
5-year average	23.6	21.9	3/ 15.5	24.3	--	3/ 1.3	--	3/ 9.9	--
1965/66	16.5	6.1	--	19.6	--	--	--	11.0	--
1966/67	23.3	15.6	35.9	25.2	--	6.1	--	14.3	--
1967/68	22.9	20.2	30.1	23.4	--	51.7	--	n.a.	--
1968/69	27.1	28.7	35.0	27.0	--	6.6	--	n.a.	--
1969/70	20.8	24.8	14.5	18.3	--	23.9	--	n.a.	--
5-year average	22.1	19.1	3/ 28.9	22.7	--	3/ 22.1	--	3/ 12.7	--
1970/71 4/	25.5	34.0	n.a.	15.0	--	n.a.	--	n.a.	--

1/ Data for Australia incomplete for some years.
2/ Based on crop planted in the preceding year but harvested in the current year.
3/ Less than 5-year average.
4/ Preliminary.
n.a. = Not available.
-- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 17.--Australia's grain sorghum production, by State, 1960/61-1970/71

Year	Unit	Australia 1/	New South Wales 2/	Victoria	Queensland 2/	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Bushel	5,996,101	577,473	--	5,417,571	--	164	--	893	--
1961/62	do.	9,361,344	1,307,508	--	8,053,590	--	146	--	n.a.	--
1962/63	do.	10,251,577	1,890,489	n.a.	8,360,715	--	13	--	n.a.	--
1963/64	do.	7,891,000	1,266,902	--	6,624,083	--	--	--	n.a.	--
1964/65	do.	7,163,722	1,269,726	--	5,883,303	--	--	--	10,693	--
5-year average	do.	3/ 8,132,748	1,262,420	n.a.	6,867,852	--	4/ 108	--	4/ 5,793	--
Distribution by State	Percent	100.0	15.5	--	84.4	--	0	--	0.1	--
1965/66	Bushel	7,149,372	604,533	--	6,532,821	--	--	--	12,018	--
1966/67	do.	11,710,576	1,526,685	4,421	10,171,707	--	230	--	7,533	--
1967/68	do.	10,582,251	1,580,019	17,983	8,938,816	--	45,433	--	n.a.	--
1968/69	do.	15,831,000	3,927,000	46,000	11,800,000	--	58,000	--	n.a.	--
1969/70	do.	12,939,970	6,069,000	12,970	6,789,000	--	69,000	--	n.a.	--
5-year average	do.	3/ 11,642,633	2,741,447	4/ 16,274	8,846,468	--	4/ 34,532	--	4/ 9,775	--
Distribution by State	Percent	100.0	23.5	0.1	76.0	--	0.3	--	0.1	--
1970/71 5/	Bushel	28,000,000	n.a.	n.a.	n.a.	--	n.a.	--	--	--

1/ Data for Australia incomplete for some years.
2/ Planted in the preceding year but harvested in the current year.
3/ State averages do not total to this figure because of less than 5-year averages for some individual States.
4/ Less than 5-year average. 5/ Preliminary. n.a. = Not available. -- Means negligible or none.
Source: (51, 55, 59); and Foreign Agricultural Service, USDA.

Table 18.--Australia's cattle numbers, by State, 1961-71

Year 1/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1961	1,000 head	17,332	4,242	2,864	7,004	561	1,100	394	1,555	13
1962	do.	18,033	4,399	3,156	7,098	659	1,218	425	1,064	14
1963	do.	18,549	4,569	3,225	7,234	679	1,298	444	1,087	14
1964	do.	19,055	4,789	3,301	7,402	694	1,299	450	1,105	14
1965	do.	18,816	4,619	3,316	7,392	697	1,258	451	1,067	14
5-year average	do.	18,357	4,524	3,172	7,226	658	1,235	432	1,096	14
Distribution by State	Percent	100.0	24.5	17.3	39.4	3.6	6.7	2.4	6.0	0.1
1966	1,000 head	17,936	4,153	3,397	6,888	690	1,271	492	1,032	13
1967	do.	18,270	4,146	3,528	6,919	687	1,357	522	1,097	14
1968	do.	19,218	4,554	3,474	7,361	695	1,427	564	1,130	13
1969	do.	20,606	4,864	3,878	7,668	865	1,546	586	1,185	14
1970	do.	22,162	5,636	4,462	7,515	1,026	1,681	646	1,179	15
5-year average	do.	19,638	4,670	3,747	7,270	792	1,456	562	1,124	13
Distribution by State	Percent	100.0	23.8	19.1	37.0	4.1	7.4	2.9	5.7	0
1971 2/	1,000 head	24,372	6,494	5,061	7,944	1,196	1,781	733	1,145	18

1/ As of March 31.
2/ Preliminary.
Source: (51); and Foreign Agricultural Service, USDA.

Table 19.--Australia's beef cattle numbers, by State, 1961-71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory 1/	A.C.T.
1961	1,000 head	12,431	2,961	1,147	5,791	313	876	180	1,155	9
1962	do.	12,987	3,127	1,332	5,890	385	983	197	1,064	11
1963	do.	13,473	3,307	1,367	6,040	398	1,057	206	1,086	11
1964	do.	14,120	3,565	1,435	6,289	426	1,072	216	1,105	12
1965	do.	13,973	3,439	1,429	6,338	437	1,040	212	1,067	12
5-year average	do.	13,397	3,280	1,342	6,070	392	1,006	202	1,095	11
Distribution by State	Percent	100.0	24.5	10.0	45.3	2.9	7.5	1.5	8.2	0.1
1966	1,000 head	13,248	3,036	1,491	5,934	438	1,063	244	1,031	11
1967	do.	13,654	3,075	1,575	6,024	442	1,160	271	1,096	12
1968	do.	14,730	3,518	1,526	6,529	466	1,236	314	1,129	10
1969	do.	16,271	3,892	1,931	6,913	633	1,364	342	1,183	11
1970	do.	17,989	4,718	2,501	6,812	792	1,500	406	1,177	13
5-year average	do.	15,165	3,648	1,805	6,442	554	1,265	315	1,123	11
Distribution by State	Percent	100.0	24.1	11.9	42.4	3.7	8.3	2.1	7.4	0.1
1971 2/	1,000 head	20,261	5,654	3,100	7,281	966	1,603	496	1,145	16

1/ January 1 prior to 1957; June 30 thereafter. Other States are March 31.
2/ Preliminary.
Source: (51); and Foreign Agricultural Service, USDA.

Table 20.--Australia's beef and veal production, 1/ by State, 1960/61-1970/71

Year 2/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Ton	632,767	168,045	125,626	246,860	26,647	41,972	16,894	5,506	1,217
1961/62	do.	791,056	233,582	176,058	278,115	30,061	47,406	19,674	4,523	1,637
1962/63	do.	913,937	263,054	213,908	313,786	36,420	55,934	23,694	5,061	2,080
1963/64	do.	985,498	286,417	227,877	327,481	39,759	66,025	25,909	9,872	2,158
1964/65	do.	1,010,075	303,419	246,129	326,128	37,268	56,983	26,270	11,690	2,179
5-year average	do.	866,667	250,904	197,920	298,474	34,031	53,664	22,488	7,332	1,854
Distribution by State	Percent	100.0	29.0	22.8	34.4	3.9	6.2	2.6	0.9	0.2
1965/66	Ton	931,384	244,527	238,904	313,747	36,513	58,089	23,011	14,798	1,795
1966/67	do.	864,739	209,403	224,983	295,810	38,754	54,811	24,695	14,572	1,711
1967/68	do.	889,642	220,879	223,307	310,478	33,074	59,249	25,084	15,879	1,692
1968/69	do.	920,048	217,011	212,859	340,744	35,617	67,751	27,936	16,530	1,600
1969/70	do.	994,505	273,358	249,574	309,771	40,059	71,902	32,058	18,783	1,700
5-year average	do.	920,263	233,035	229,925	314,110	36,803	62,360	26,556	16,112	1,699
Distribution by State	Percent	100.0	25.3	25.0	34.1	4.0	6.8	2.9	1.7	0.2
1970/71 3/	Ton	1,023,013	275,673	296,630	300,077	42,976	61,589	28,987	14,092	3,129

1/ Carcass weight (bone-in). Edible offals other than kidneys are excluded. Canned and cured meat have been converted to a fresh carcass (bone-in) equivalent.
2/ Year ending June 30.
3/ Preliminary.
Source: (39, 51); and Foreign Agricultural Service, USDA.

Table 21.--Australia's beef production, 1/ by State, 1960/61-1970/71

Year	Unit	Australia 2/	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Ton	593,002	151,898	115,860	236,757	24,447	41,204	16,129	n.a.	n.a.
1961/62	do.	747,301	214,819	165,895	267,608	27,522	46,561	18,778	n.a.	n.a.
1962/63	do.	864,796	242,459	202,200	302,315	33,250	54,804	22,711	n.a.	n.a.
1963/64	do.	932,735	265,529	213,768	315,785	36,497	64,593	24,593	n.a.	n.a.
1964/65	do.	952,832	280,285	232,267	311,366	34,012	55,765	25,334	n.a.	n.a.
5-year average	do.	818,133	230,999	185,998	286,766	31,146	52,585	21,509	n.a.	n.a.
Distribution by State	Percent	100.0	28.2	22.7	35.1	3.8	6.4	2.6	n.a.	n.a.
1965/66	Ton	880,723	223,963	225,557	301,870	33,307	57,411	22,075	n.a.	n.a.
1966/67	do.	820,459	193,514	211,713	285,106	36,010	54,122	23,743	n.a.	n.a.
1967/68	do.	842,774	203,137	209,279	300,412	30,252	58,066	24,122	n.a.	n.a.
1968/69	do.	879,182	200,567	203,030	329,485	33,951	66,893	27,147	n.a.	n.a.
1969/70	do.	959,528	261,254	240,828	299,183	38,215	70,848	31,458	n.a.	n.a.
5-year average	do.	876,741	216,487	218,081	303,211	34,347	61,468	25,709	n.a.	n.a.
Distribution by State	Percent	100.0	24.7	24.9	34.6	3.9	7.0	2.9	n.a.	n.a.
1970/71 3/	Ton	980,760	263,108	279,848	289,823	41,279	60,973	28,559	n.a.	n.a.

1/ See footnotes 1 and 2 of table 20.
2/ Includes Northern Territory and A.C.T.
3/ Preliminary.
n.a. = Not available.
Source: (51); and Foreign Agricultural Service, USDA.

Table 22.--Australia's sheep and lamb numbers, by State, 1961-71

Year 1/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1961	1,000 head	152,679	68,087	26,620	22,135	14,952	17,151	3,439	16	278
1962	do.	157,713	69,498	27,533	22,125	16,415	18,314	3,532	10	286
1963	do.	158,626	70,021	27,472	22,811	15,737	18,727	3,570	9	279
1964	do.	164,981	71,764	28,413	24,337	16,402	20,165	3,600	10	289
1965	do.	170,621	72,396	30,437	24,016	17,289	22,392	3,793	9	290
5-year average	do.	160,924	70,353	28,095	23,085	16,159	19,350	3,587	11	284
Distribution by State	Percent	100.0	43.7	17.5	14.4	10.0	12.0	2.2	0	0.2
1966	1,000 head	157,563	61,396	30,968	18,384	17,993	24,427	4,127	9	258
1967	do.	164,237	63,848	31,239	19,305	17,864	27,370	4,321	8	281
1968	do.	166,912	67,786	27,909	19,948	16,405	30,161	4,428	9	267
1969	do.	174,602	68,153	30,185	20,324	18,392	32,901	4,395	7	246
1970	do.	180,079	72,284	33,156	16,446	19,747	33,634	4,560	8	244
5-year average	do.	168,678	66,693	30,691	18,881	18,080	29,698	4,366	8	259
Distribution by State	Percent	100.0	39.5	18.2	11.2	10.7	17.6	2.6	0	0.2
1971 2/	1,000 head	178,287	71,100	33,761	14,774	19,166	34,709	4,517	9	251

1/ As of March 31.
2/ Preliminary.
Source: (51); and Foreign Agricultural Service, USDA.

Table 23.--Australia's adult sheep numbers, 1 year and over, by State, 1961-71

Year	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory 1/	A.C.T.
1961	1,000 head	123,458	54,612	21,402	18,664	12,128	13,756	2,644	15	237
1962	do.	124,399	54,242	21,690	18,282	12,616	14,677	2,646	10	235
1963	do.	126,060	54,666	21,941	18,791	12,409	15,276	2,731	8	237
1964	do.	129,682	55,754	22,356	19,681	12,794	16,160	2,691	9	237
1965	do.	135,863	56,896	24,294	20,155	13,747	17,913	2,882	8	242
5-year average	do.	127,893	55,234	22,337	19,115	12,684	15,556	2,719	10	238
Distribution by State	Percent	100.0	43.2	17.5	14.9	9.9	12.2	2.1	0	0.2
1966	1,000 head	128,673	50,955	24,075	16,951	13,908	19,560	2,994	8	222
1967	do.	129,935	50,314	24,586	15,871	14,084	21,615	3,231	7	227
1968	do.	129,162	51,020	21,812	16,170	12,872	23,787	3,278	8	216
1969	do.	137,393	52,944	24,473	16,289	14,454	25,723	3,290	7	214
1970	do.	139,598	55,069	25,664	13,747	15,063	26,520	3,335	6	194
5-year average	do.	132,952	52,060	24,122	15,805	14,076	23,441	3,226	7	215
Distribution by State	Percent	100.0	39.2	18.1	11.9	10.6	17.6	2.4	0	0.2
1971 2/	1,000 head	139,730	54,769	26,516	12,309	15,141	27,447	3,346	5	197

1/ January 1 prior to 1957; June 30 thereafter. Other States are March 31.
2/ Preliminary.
Source: (51); and Foreign Agricultural Service, USDA.

Table 24.--Australia's sheep and lamb numbers, by zone, 1960/61-1966/67

Year	Total	Pastoral Zone	Wheat-Sheep Zone	High Rainfall Zone	Outside of zones
	1,000 head				
1960/61	152,679	39,922	66,759	45,074	924
1961/62	157,712	41,642	68,562	46,548	960
1962/63	158,626	43,471	67,101	47,396	658
1963/64	164,981	45,763	69,430	49,169	619
1964/65 1/	170,332	44,468	74,404	50,852	608
1965/66	157,653	33,712	69,645	53,588	618
1966/67	164 [illegible]	34,561	71,960	56,870	846

1/ Excludes A.C.T.
Source: (28).

Table 25.--Australia's wool production (greasy basis), 1/ by State, 1960/61-1970/71

Year 2/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	1,000 lb.	1,652,141	664,276	322,011	235,590	177,413	191,353	31,870	157	2,471
1961/62	do.	1,698,575	701,168	330,716	230,333	206,985	192,161	34,469	98	2,645
1962/63	do.	1,672,548	693,734	316,705	233,638	207,344	184,123	34,561	100	2,343
1963/64	do.	1,784,714	731,316	334,288	255,386	210,500	216,574	34,007	91	2,552
1964/65	do.	1,784,023	706,061	361,530	251,426	215,736	207,035	39,671	89	2,475
5-year average	do.	1,713,000	699,311	333,050	241,275	203,595	198,249	34,916	107	2,497
Distribution by State	Percent	100.0	40.8	19.5	14.1	11.9	11.6	2.0	0	0.1
1965/66	1,000 lb.	1,662,836	579,475	366,943	192,773	232,296	247,530	41,858	88	1,873
1966/67	do.	1,762,338	622,745	378,457	203,664	239,202	272,575	43,153	88	2,454
1967/68	do.	1,769,688	650,420	332,427	226,822	218,951	300,410	38,308	112	2,238
1968/69	do.	1,947,800	673,500	364,300	247,000	238,100	375,700	47,000	100	2,100
1969/70 3/	do.	2,046,300	749,800	437,800	196,400	275,000	336,500	48,200	100	2,500
5-year average	do.	1,837,792	655,188	373,985	213,331	240,709	306,543	43,703	97	2,233
Distribution by State	Percent	100.0	35.7	20.4	11.6	13.1	16.7	2.4	0	0.1
1970/71 3/	1,000 lb.	1,994,300	718,000	444,600	164,600	258,300	357,500	48,900	100	2,000

1/ Includes dead and fellmongered wool and wool exported on skins.
2/ Year ending June 30 in all States except South Australia and Western Australia. In these two States, year ending March 31 was used through 1964/65, and June 30 beginning in 1965/66.
3/ Preliminary.
Source: (39, 51); and Foreign Agricultural Service, USDA.

Table 26.--Australia's mutton production, 1/ by State, 1960/61-1970/71

Year 2/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Ton	367,556	115,155	132,280	42,863	33,680	32,934	9,363	98	720
1961/62	do.	367,984	107,821	152,117	35,287	33,587	28,248	10,066	65	793
1962/63	do.	362,659	103,687	153,328	30,656	34,947	29,399	9,462	68	1,112
1963/64	do.	360,684	107,199	149,341	35,077	32,475	24,519	10,926	72	1,078
1964/65	do.	361,306	105,678	146,243	41,859	32,916	24,411	9,079	88	1,032
5-year average	do.	364,038	107,908	146,754	37,149	33,521	27,902	9,779	78	947
Distribution by State	Percent	100.0	29.6	40.3	10.2	9.2	7.7	2.7	0	0.3
1965/66	Ton	389,531	104,691	160,280	40,509	39,459	32,153	11,512	46	881
1966/67	do.	349,565	82,194	148,878	31,997	41,584	32,831	11,232	45	804
1967/68	do.	412,269	105,045	172,535	35,970	48,135	38,123	11,482	9	970
1968/69	do.	366,046	105,734	129,492	38,300	33,122	46,793	11,516	1	1,088
1969/70	do.	434,497	109,353	166,099	40,503	47,910	57,898	12,565	2	167
5-year average	do.	390,762	101,403	155,456	37,455	42,042	41,559	11,951	26	777
Distribution by State	Percent	100.0	26.0	39.8	9.6	10.8	10.7	3.1	0	0
1970/71 3/	Ton	447,760	122,758	167,353	37,174	51,402	54,247	14,523	33	270

1/ Carcass weight (bone-in). Edible offals other than kidneys are excluded. Canned and cured meat have been converted to a fresh carcass (bone-in) equivalent.

2/ Year ending June 30.

3/ Preliminary.

Source: (39, 51); and Foreign Agricultural Service, USDA.

Table 27.--Australia's lamb production, 1/ by State, 1960/61-1970/71

Year 2/	Unit	Australia	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
1960/61	Ton	206,752	81,262	77,502	5,666	18,562	13,626	9,562	--	572
1961/62	do.	218,729	89,023	77,605	5,052	21,803	14,449	10,163	--	634
1962/63	do.	230,800	95,186	84,317	4,827	23,972	11,837	9,924	--	737
1963/64	do.	225,042	94,858	82,428	5,132	20,389	12,174	9,153	--	908
1964/65	do.	223,530	89,558	84,975	6,125	22,476	11,428	9,044	--	824
5-year average	do.	220,971	89,978	81,185	5,361	21,440	12,703	9,569	--	735
Distribution by State	Percent	100.0	40.0	36.8	2.4	9.7	5.8	4.3	--	0.3
1965/66	Ton	209,297	79,832	80,417	5,006	21,279	12,542	9,585	--	636
1966/67	do.	237,058	91,663	94,719	5,747	20,892	13,550	9,670	--	818
1967/68	do.	241,754	98,124	89,080	7,831	20,595	16,936	8,363	--	825
1968/69	do.	303,309	118,211	118,480	9,908	23,702	20,920	10,936	--	1,152
1969/70	do.	309,616	124,148	111,611	10,208	30,262	18,916	12,149	--	2,322
5-year average	do.	260,206	102,395	98,861	7,749	23,346	16,572	10,140	--	1,150
Distribution by State	Percent	100.0	39.3	38.0	3.0	9.0	6.4	3.9	--	0.4
1970/71 3/	Ton	342,458	129,501	126,400	11,593	39,828	21,164	11,080	--	2,892

1/ Carcass weight (bone-in). Edible offals other than kidneys are excluded. Canned and cured meat have been converted to a fresh carcass (bone-in) equivalent.

2/ Year ending June 30.

3/ Preliminary.

-- Means negligible or none.

Source: (39, 51); and Foreign Agricultural Service, USDA.

Table 28.--Shifts among Australian States in proportion of production of selected grains, livestock numbers, and livestock products, 1960/61-1964/65 average and 1965/66-1969/70 average 1/

Item	Unit	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
		Percentage points							
Grains:									
Wheat	Bushel	+0.7	-5.5	+1.4	-1.2	+4.6	N.C.	--	N.C.
	Area	+3.9	-4.0	+0.8	-1.6	+0.8	N.C.	--	-0.1
Oats	Bushel	+1.7	-1.2	+0.4	-1.6	+0.7	N.C.	--	N.C.
	Area	+5.3	-1.2	+0.6	-0.3	-4.4	N.C.	--	N.C.
Barley	Bushel	+4.4	+0.2	+7.9	-15.1	+2.2	+0.5	--	--
	Area	+4.6	+1.4	+4.8	-11.3	+0.4	N.C.	--	--
Corn	Bushel	+9.8	-1.6	-8.2	--	N.C.	--	--	--
	Area	+5.7	-1.0	-5.2	--	+0.5	--	--	--
Sorghum	Bushel	+8.3	+0.1	-8.4	--	+0.3	--	-0.2	--
	Area	+2.6	+0.1	-3.2	--	+0.6	--	-0.1	--
Livestock and livestock products:									
Cattle	Head	-0.7	+1.8	-2.4	+0.5	+0.7	+0.5	-0.3	-0.1
Beef cattle	do.	-0.4	+1.9	-2.9	+0.7	+0.8	-0.6	-0.7	N.C.
Sheep	do.	-4.2	+0.7	-3.2	+0.7	+5.6	+0.4	N.C.	N.C.
Beef	Ton	-3.5	+2.2	-0.5	+0.1	+0.6	+0.3	2/+0.8	N.C.
Mutton	do.	-3.6	-0.5	-0.6	+0.6	+3.0	+0.4	N.C.	-0.3
Lamb	do.	-1.4	+1.2	+0.6	-0.7	+0.6	-0.4	--	+0.1
Wool	1,000 lb.	-5.1	+0.9	-2.5	+1.2	+5.1	+0.4	N.C.	N.C.

1/ 1961-65 average to 1966-70 average for cattle, beef cattle, and sheep.
2/ Beef and veal.
-- Means negligible or not applicable. N.C. = No change.
Source: Computed from appendix tables.

Table 29.--Selected characteristics of Australian wheat farms, by State, 1964/65-1966/67 average

Item	Unit	Mainland States	New South Wales	Victoria	Queensland	South Australia	Western Australia
Crops for grain:							
Wheat	Percent	18.7	17.3	23.5	22.8	14.1	20.8
Barley	do.	1.5	.9	.8	2.3	3.4	1.1
Oats	do.	3.0	2.8	6.7	.1	1.4	3.0
Other	do.	.4	.5	.1	5.2	.1	.1
Crops for fodder, grazing or hay	do.	2.2	2.0	1.5	5.7	3.6	1.5
Other crops	do.	.1	--	.1	1.0	.3	.1
Fallowed land	do.	8.5	7.5	20.8	6.4	6.1	5.7
Lucerne, sown grasses, clover pastures	do.	23.1	18.3	16.2	6.1	32.2	27.8
Native pasture, wasteland	do.	42.6	50.8	31.1	51.2	39.0	40.0
Total 1/	do.	100.0	100.0	100.0	100.0	100.0	100.0
Total area	Acre	2,503	2,325	1,684	1,532	2,855	3,659
Livestock:							
Sheep	Number	1,394	1,759	652	346	1,206	1,980
Cattle	do.	27	42	21	67	8	11

1/ May not add to totals because of rounding.
-- Means negligible or none.
Source: (31, pp. 19, 20).

Table 30.--Costs and returns on Australian wheat farms, by State, per farm and per acre basis, and rate of return to capital and management, selected years

Item	Gross returns		Operating costs 1/		Net farm income		Rate of return to capital and management	
	Per farm	Per acre	Per farm	Per acre	Per farm	Per acre	Including land	Excluding land
	A dollars						Percent	
3-year average 1959/60-1961/62:								
Mainland States....	16,250	7.9	10,026	4.9	6,224	3.0	9.4	21.4
New South Wales..	15,694	8.4	9,262	5.0	6,432	3.4	10.2	21.4
Victoria.....	15,100	9.7	9,324	6.0	5,776	3.7	9.4	22.6
Queensland.....	14,576	17.3	10,252	12.2	4,324	5.1	6.9	18.4
South Australia.....	12,848	7.0	9,020	4.9	3,828	2.1	6.4	16.2
Western Australia.....	22,016	6.5	12,986	3.8	9,030	2.7	11.2	23.8
3-year average 1964/65-1966/67:								
Mainland States....	22,531	9.0	13,133	5.3	9,398	4.6	5.9	20.9
New South Wales..	23,964	10.3	14,296	6.1	9,668	4.1	6.0	18.7
Victoria.....	19,029	11.3	10,663	6.3	8,366	4.9	5.0	26.3
Queensland.....	19,238	12.6	11,863	7.7	7,375	4.5	5.7	19.8
South Australia.....	19,492	6.8	11,371	4.0	8,121	2.8	5.5	20.8
Western Australia.....	27,227	7.4	15,491	4.3	11,736	3.2	7.0	21.8

1/ Operating costs include total cash costs, depreciation, and unpaid family labor.

Source: (13, 31).

Table 31.--Selected characteristics of sample beef properties, Australia, by State, 1962/63-1964/65 average

Item	Unit	Australia 1/	Queensland	Northern Territory	Western Australia		New South Wales	Victoria	South Australia (southeast)
					Kimberley	Southwest			
Area of property:									
Under 1,000 acres	Percent	24.3	0	0	0	61.8	29.4	45.3	22.8
1,001 - 5,000	do.	47.5	45.4	0	0	38.2	47.9	54.1	63.7
5,001 - 50,000	do.	25.0	46.7	0	0	0	22.8	--	13.5
50,001 - 500,000	do.	2.2	6.5	10.7	6.9	0	0	--	0
Over 500,000	do.	1.1	1.3	89.2	93.1	0	0	--	0
Total 2/	do.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average area per property	Acre	19,445	31,433	1,108,238	947,553	1,062	3,479	1,262	2,270
Enterprise combination:									
Beef only	Percent	31.1	64.5	100.0	100.0	16.7	19.6	4.5	0
Beef-sheep	do.	36.7	10.8	0	0	50.0	39.3	65.9	100.0
Beef-dairy	do.	6.6	0	0	0	5.6	12.5	6.8	0
Beef-other	do.	25.6	24.7	0	0	27.8	28.6	22.7	0
Total 2/	do.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Type of beef cattle enterprise:									
Breeding and fattening	do.	34.4	47.6	n.a.	100.0	4.2	24.4	40.9	23.8
Fattening purchased stores	do.	15.7	11.9	n.a.	0	26.6	17.6	15.0	.8
Breeding and selling stores	do.	34.3	16.1	n.a.	0	69.2	45.9	23.1	75.4
Other	do.	15.5	24.4	n.a.	0	0	8.5	21.1	0
Total 2/	do.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Livestock numbers:									
Total beef cattle	Number	487	862	8,901	9,811	216	236	164	154
Total dairy cattle	do.	6	6	0	0	16	4	9	3
Total sheep	do.	1,219	379	0	0	599	1,907	1,162	2,604
Stocking rate:									
Acres per cattle equivalent	Acre	30.1	35.0	124.5	96.6	3.5	7.3	4.0	4.7

1/ Includes Tasmania.
2/ May not add to totals because of rounding.
-- Means negligible or none.
Source: (34).

Table 32.--Cost and returns on beef properties, Australia, by State, on a per farm, per acre, and per cattle equivalent basis, and rate of return to capital and management, 1962/63-1964/65 average

Item	Australia 1/	Queensland	Northern Territory	Western Australia: Kimberley	Western Australia: Southwest	New South Wales	Victoria	South Australia (southeast)
				A dollars				
Total returns:								
Per farm	21,068	18,138	52,142	63,724	15,479	24,584	17,530	24,686
Per acre	1.08	0.58	0.05	0.07	14.57	7.07	13.89	10.86
Per cattle equivalent	32.70	19.80	5.90	6.50	50.40	51.40	55.10	51.20
Total costs:								
Per farm	12,620	10,104	55,327	42,925	10,755	14,704	10,352	19,154
Per acre	0.65	0.32	0.047	0.05	10.13	4.23	8.20	8.43
Per cattle equivalent	19.60	11.00	6.20	4.40	35.00	30.80	32.50	39.70
Net farm income:								
Per farm	8,448	8,038	-3,185	20,799	4,724	9,880	7,178	5,532
Per acre	0.43	0.25	-0.003	0.02	4.45	2.84	5.69	2.43
Per cattle equivalent	13.10	8.80	- 0.30	2.10	15.40	20.70	22.60	11.50
Rate of return to capital and management:					Percent			
Including land	5.0	6.3	-1.2	5.2	3.2	6.3	2.7	2.4
Excluding land	10.0	8.9	-1.2	5.2	7.6	13.6	13.1	5.9

1/ Includes Tasmania. Source: (34, p. 115).

Table 33.--Selected property characteristics of sheep enterprises in the Pastoral Zone, Australia, by State, 1964/65-1965/66 average

Item	Pastoral Zone	New South Wales	Queens-land	South Australia	Western Australia
			Acres		
Average farm size 1/	51,483	28,370	32,456	55,750	449,654
			Percent		
Land use:					
Crops	0.2	0.3	0.1	0.1	0
Improved pasture	.9	.3	.2	.1	2.0
Native pasture	98.6	99.0	99.4	99.0	97.8
Area not used	.3	.4	.3	.8	.2
Total	100.0	100.0	100.0	100.0	100.0
Enterprise combination: 1/					
Sheep only	75.5	72.7	77.0	80.0	82.9
Sheep-cattle	15.1	14.7	18.7	2.0	17.1
Sheep-cereal (mixed)	6.2	10.4	0	12.4	0
Sheep-other	3.2	2.2	4.3	5.6	0
Total	100.0	100.0	100.0	100.0	100.0
			Million head		
Sheep numbers 2/	49.8	19.6	23.7	2.5	4.0

1/ 1964/65 only.
2/ March 1964. Source: (29, pp. 8, 10).

Table 34.--Selected characteristics of sheep enterprises in the Wheat-Sheep Zone, Australia, by State, 1964/65-1965/66 average

Item	Wheat-Sheep Zone	New South Wales	Victoria	Queensland	South Australia	Western Australia
			Acres			
Average farm size	2,340	2,043	2,117	4,141	2,272	3,566
			Percent			
Land use:						
Wheat	12.9	14.2	12.6	2.9	11.4	14.8
Barley	1.2	.9	.4	.4	3.7	.8
Oats	4.4	3.0	7.8	2.2	3.8	5.0
Other crops	.6	.9	.2	.8	1.0	.1
Improved pasture	40.7	44.0	44.9	1.1	29.9	51.3
Native pasture	37.0	36.6	32.4	92.5	45.9	16.8
Area not used	3.2	.4	1.9	.1	4.3	11.2
Total 1/	100.0	100.0	100.0	100.0	100.0	100.0
Enterprise combination:						
Sheep only	9.8	10.6	8.2	25.2	2.3	11.2
Sheep-cattle	4.8	4.3	7.1	28.5	0	2.4
Sheep-cereal (mixed)	62.6	58.0	71.8	17.8	62.4	77.4
Sheep-other	23.3	27.1	12.9	28.5	35.3	9.0
Total 1/	100.0	100.0	100.0	100.0	100.0	100.0
Enterprise type: 2/						
Merino wool-growing	75.0	68.8	56.1	78.7	100.0	100.0
Non-Merino wool-growing	7.0	10.0	10.3	0	0	0
Fat lambs	18.0	21.2	33.6	21.3	0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
			Million head			
Sheep numbers 3/	64.0	36.5	20.3	0.6	7.8	8.8

1/ May not add to total because of rounding. 2/ 1964/65 only. 3/ 1964. Source: (29, pp. 25, 28).

Table 35.--Selected property characteristics of sheep enterprises in the High Rainfall Zone, Australia, by State, 1964/65-1965/66 average

Item	High Rainfall Zone	New South Wales	Victoria	South Australia	Western Australia	Tasmania
			Acres			
Average farm size	1,245	1,790	868	910	1,518	1,673
			Percent			
Land use:						
Wheat	1.5	0.7	0.7	2.5	4.9	0.3
Barley	.3	0	.2	.8	.6	.4
Oats	3.2	1.5	3.0	3.8	8.0	2.0
Other crops	.8	.6	1.0	.8	.7	1.2
Improved pasture	70.2	63.3	91.0	82.4	66.6	29.3
Native pasture	20.6	33.0	3.6	8.0	7.6	58.4
Area not used	3.4	.9	.7	1.7	11.6	8.5
Total 1/	100.0	100.0	100.0	100.0	100.0	100.0
Enterprise combination: 2/						
Sheep only	49.0	66.6	40.8	49.7	54.8	28.0
Sheep-cattle	22.0	21.1	30.1	15.0	9.8	11.4
Sheep-cereal (mixed)	3.9	0	1.6	10.8	14.7	0
Sheep-other	25.1	12.3	27.5	24.5	20.7	59.9
Total 1/	100.0	100.0	100.0	100.0	100.0	100.0
Enterprise type:						
Merino wool-growing	56.4	66.2	51.9	54.1	87.5	2.2
Non-Merino wool-growing	17.5	6.3	15.8	32.9	3.2	60.8
Fat lambs	26.1	27.5	32.3	13.0	9.3	37.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
			Million head			
Sheep numbers	51.2	16.0	18.2	6.1	7.3	3.6

1/ May not add to total because of rounding. 2/ 1964/65 only. Source: (29, pp. 50, 53).

Table 36.--Net farm income and rate of return to capital for sheep properties, Australia, by zone and area, 1964/65-1966/67

Zone and area	Net farm income			Rate of return to capital 1/		
	1964/65	1965/66	1966/67	1964/65	1965/66	1966/67
	A dollars			Percent		
Pastoral Zone	7,313	-3,323	10,749	3.3	--	5.7
New South Wales	10,597	-6,301	11,549	4.9	--	5.7
Queensland	2,624	-7,876	9,458	.5	--	5.2
South Australia	9,582	12,087	11,230	6.0	7.8	7.1
Western Australia	7,097	33,204	12,128	3.9	23.1	6.5
Wheat-Sheep Zone	7,997	5,135	9,160	7.3	3.7	8.0
New South Wales	9,192	3,388	11,394	7.5	1.4	9.2
Victoria	7,065	5,582	5,218	6.9	4.6	3.8
Queensland	5,390	4,524	9,185	3.7	2.7	7.5
South Australia	6,419	4,415	6,270	8.0	4.2	7.1
Western Australia	7,800	12,679	11,486	7.4	13.0	10.8
High Rainfall Zone	5,530	5,815	6,772	4.7	4.8	5.8
New South Wales	3,739	2,035	6,312	2.0	.1	4.5
Victoria	6,422	6,914	6,561	5.8	6.2	5.5
South Australia	5,811	6,527	6,071	5.7	6.3	5.3
Western Australia	5,976	7,804	9,290	6.5	9.3	10.9
Tasmania	5,976	7,006	6,189	6.5	7.4	5.8

1/ Including land and rent.
-- Means negligible or none.
Source: (21, p. 183).

Table 37.--Comparison of selected variables, Australia, by zone, average 1960/61-1962/63, annual 1964/65-1966/67

Item	Unit	Pastoral Zone				Wheat-Sheep Zone				High Rainfall Zone			
		Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67
Total farm size	Acre	53,099	51,468	51,498	52,785	2,377	2,332	2,347	2,437	1,188	1,244	1,245	1,256
Sheep carried	No.	5,760	5,671	4,833	4,603	1,365	1,449	1,440	1,476	1,385	1,699	1,751	1,838
Cattle carried	do.	122	142	112	94	41	39	34	33	51	62	62	64
Sheep equivalent per acre	do.	0.13	0.13	0.11	0.10	0.71	0.76	0.73	0.71	1.51	1.76	1.80	1.87
Wool produced	Lb.	58,184	56,223	42,252	48,370	13,385	14,554	13,486	14,983	13,202	16,476	15,804	17,187
Price per pound	Cent	45.3	45.2	46.8	44.5	43.8	46.7	48.1	45.6	50.2	51.6	55.7	51.9
Total returns	A $	33,080	32,331	20,575	33,609	15,487	19,160	16,315	22,142	11,144	15,015	15,595	17,240
Total costs	do.	21,034	25,018	23,898	22,860	9,274	11,163	11,180	12,982	7,108	9,485	9,780	10,468
Net farm income	do.	12,046	7,313	-3,323	10,749	6,204	7,997	5,135	9,160	4,036	5,530	5,815	6,772
Total capital	do.	152,274	165,254	161,102	154,991	75,545	84,476	87,836	89,679	68,364	78,684	80,409	82,835
Rate of return to capital	Pct.	6.8	3.3	--	5.7	6.0	7.3	3.7	8.0	3.4	4.7	4.8	5.8
Rate of return to capital excluding the value of land and rent	do.	11.9	6.5	--	11.1	13.8	16.8	8.4	18.2	8.8	11.6	11.5	13.5

-- Means negligible or none.
Source: (21, p. 187)

Table 38.--Capital use of sheep properties, Australia, by zone, average 1960/61-1962/63, annual 1964 and 1967

Item	Pastoral Zone			Wheat-Sheep Zone			High Rainfall Zone		
	Average 1960/61-1962/63	1964 1/	1967 2/	Average 1960/61-1962/63	1964 1/	1967 2/	Average 1960/61-1962/63	1964 1/	1967 2/
	A dollars								
Total capital	152,274	165,254	157,569	76,582	84,476	92,165	69,846	78,684	86,308
Percentage distribution:	Percent								
Improvements	27.5	24.7	25.5	17.2	15.8	15.7	15.2	14.5	14.2
Land	39.9	42.9	45.4	55.0	56.0	54.2	58.9	57.7	55.5
Plant	7.1	7.6	8.5	13.5	14.8	16.2	9.1	10.0	10.2
Livestock	25.5	24.8	20.6	14.4	13.4	13.9	16.8	17.8	20.1
Total 3/	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ As of July 1.
2/ As of June 30.
3/ May not add to total because of rounding.
Note: Some of the data differ slightly from information presented in table 37.
Source: (21, p. 178).

Table 39.--Returns of sheep properties, Australia, by zone, average 1960/61-1962/63, annual 1964/65-1966/67

Item	Pastoral Zone				Wheat-Sheep Zone				High Rainfall Zone			
	Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67
	Dollars											
Wools and skins	26,420	25,458	19,860	21,601	5,892	6,818	6,517	6,849	6,654	8,527	8,832	8,948
Sheep trading	3,584	3,849	-1,216	7,058	2,056	2,919	2,475	3,487	1,586	2,970	2,709	3,463
Sheep enterprise	30,004	29,307	18,644	28,659	7,948	9,737	8,993	10,336	8,240	11,497	11,541	12,411
Total crops	260	794	154	1,433	5,720	7,732	5,501	9,685	632	1,210	1,326	1,510
Cattle trading	2,694	2,098	1,569	3,152	1,132	1,080	1,141	1,428	1,610	1,731	2,106	2,639
Other returns	122	132	208	365	682	611	680	693	662	577	622	680
Total returns	33,080	32,331	20,575	33,609	15,482	19,160	16,315	22,142	11,144	15,015	15,595	17,240
	Percent											
Sheep enterprise returns as percentage of total returns	90.7	90.7	90.6	85.3	51.3	50.8	55.1	46.7	73.9	76.6	74.0	72.0
Total crops as percentage of total returns	.8	2.5	.8	4.3	36.9	40.4	33.7	43.7	5.7	8.1	8.5	8.8
Cattle trading as percentage of total return	8.1	6.5	7.6	9.4	7.3	5.6	7.0	6.5	14.4	11.5	13.5	15.3

Note: Some of the data differ slightly from information presented in table 37.

Source: (21, p. 179).

Table 40.--Costs of sheep properties, Australia, by zone, average 1960/61-1962/63, annual 1964/65-1966/67

Item	Pastoral Zone				Wheat-Sheep Zone				High Rainfall Zone			
	Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67	Average 1960/61-1962/63	1964/65	1965/66	1966/67
	A dollars											
Total costs	21,034	25,018	23,898	22,860	9,274	11,163	11,180	12,982	7,108	9,485	9,780	10,468
	Percent											
Labor	36.1	32.9	30.6	32.8	25.0	23.8	23.4	23.3	26.6	25.6	25.0	25.1
Materials	21.6	25.8	27.6	22.6	36.6	36.8	37.5	38.7	36.2	37.2	38.0	38.6
Services	25.8	26.9	26.8	28.8	20.7	22.1	20.4	21.8	20.4	22.3	22.4	22.1
Rent	3.0	2.5	2.3	2.6	.9	.6	.7	.4	1.2	1.5	1.2	1.2
Depreciation	13.5	11.9	12.7	13.2	16.8	16.7	18.0	15.8	15.6	13.4	13.4	13.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: (21, p. 182).

Table 41.--Area of land under irrigated culture, Australia, by comparison of selected uses, 1960/61 and 1968/69 1/

Crop	Year	Australia	New South Wales	Victoria	Queens-land	South Australia	Western Australia	Tasmania	Northern Territory	A.C.T.
		Acres								
Cotton	1960/61	2,675	--	--	2,675	--	--	--	--	--
	1968/69	63,524	45,122	--	10,075	--	8,327	--	--	--
Hops	1960/61	1,364	--	--	--	--	--	1,364	--	--
	1968/69	1,550	--	--	--	--	--	1,550	--	--
Orchards and vineyards	1960/61	182,607	30,350	85,091	5,758	48,777	9,232	3,311	80	8
	1968/69	242,315	52,022	514,073	10,487	63,678	13,808	8,157	84	6
Rice	1960/61	46,116	46,116	--	--	--	--	--	--	--
	1968/69	82,773	82,773	--	--	--	--	--	--	--
Sugarcane	1960/61	68,987	--	--	68,987	--	--	--	--	--
	1968/69	152,832	--	--	152,832	--	--	--	--	--
Vegetables	1960/61	76,834	3,362	21,698	29,698	10,643	9,076	2,103	103	114
	1968/69	135,174	20,449	27,362	45,844	14,414	9,740	17,013	243	109
Other crops fodder/fallow	1960/61	304,067	115,071	92,973	63,928	23,555	5,591	1,787	295	867
	1968/69	782,595	473,003	140,694	123,520	34,402	3,847	6,369	105	655
Total crops	1960/61	682,650	194,899	199,799	171,046	82,975	23,899	8,565	478	989
	1968/69	1,474,190	673,369	262,129	356,185	42,494	35,722	33,089	432	770
Pastures	1960/61	1,341,440	463,772	808,381	15,651	19,048	24,652	10,369	124	443
	1968/69	1,870,999	605,987	1,097,858	45,264	61,417	35,856	23,167	1,072	378
Total	1960/61	2,202,610	837,191	1,007,180	186,697	102,023	48,557	18,934	602	1,432
	1968/69	3,345,188	1,279,356	1,359,987	401,448	173,911	71,578	56,256	1,504	1,148

1/ Data for some crops are incomplete.

-- Means negligible or none.

Source: (51, 55).

Table 42.--Australia's exports of selected agricultural commodities, by volume, 1960-71

Year 1/	Wheat	Barley	Oats	Corn	Grain sorghum	Beef and veal	Mutton and lamb	Wool
	1,000 metric tons							
1960	2,484	567	217	1	73	100	59	709
1961	4,164	769	345	--	6	136	67	740
1962	5,529	713	346	--	43	204	66	720
1963	4,136	234	322	10	55	264	88	702
1964	6,095	403	303	--	13	286	87	740
1965	5,715	369	366	1	14	321	98	711
1966	5,157	227	251	--	7	278	96	710
1967	6,506	425	402	2	64	262	96	722
1968	6,499	129	182	3	30	256	115	743
1969	4,891	451	333	--	78	256	106	774
1970	6,918	629	222	1	65	331	179	875
1971 2/	9,490	1,123	555	--	517	329	176	745

1/ Year ending June 30.

2/ Preliminary.

-- Means negligible or none.

Source: (21).

Table 43.--Wheat 1/: Guaranteed price, home consumption price, and average export price, Australia, 1958/59-1969/70

	Wheat price		
	Guaranteed	Home consumption 2/	Average export
	A dollars per bushel		
1958/59	1.450	1.467	1.319
1959/60	1.483	1.500	1.323
1960/61	1.517	1.533	1.339
1961/62	1.575	1.583	1.429
1962/63	1.583	1.596	1.357
1963/64	1.442	1.458	1.429
1964/65	1.458	1.467	1.338
1965/66	1.517	1.530	3/ 1.409
1966/67	1.550	1.565	3/ 1.447
1967/68	1.640	1.655	3/ 1.352
1968/69	4/ 1.450	1.710	3/ 1.254
1969/70	4/ 1.459	5/ 1.725	n.a.

n.a. = Not available.

1/ F.a.q. bulk wheat, f.o.r. ports, except for guaranteed prices in 1968/69 and 1969/70 which are f.o.b. basis.

2/ Includes Tasmania freight loading; up to 1967/68 equals guaranteed price plus the loading.

3/ Estimated by BAE.

4/ F.o.b. basis.

5/ Applies to wheat for human consumption only.

Source: (16).

Table 44.--Wheat: Production, trade, and stocks for Australia and the world, 1960/61-1970/71 1/

Year	Australia				World		
	Production	Domestic consumption 2/	Exports 3/	Closing stocks 4/	Production	Trade (imports) 2/	Closing stocks 5/
	Million metric tons						
1960/61	7.4	2.1	6.5	0.7	237.5	40.8	62.9
1961/62	6.7	2.0	5.0	.5	228.1	45.7	53.7
1962/63	8.4	2.0	6.2	.6	256.5	42.6	55.1
1963/64	8.9	2.1	7.0	.6	238.5	54.6	45.9
1964/65	10.0	2.6	7.3	.7	273.5	49.5	45.8
1965/66	7.1	2.5	4.9	.4	260.8	61.2	33.4
1966/67	12.7	2.4	8.5	2.2	305.0	57.1	35.1
1967/68	7.5	2.7	5.7	1.4	294.0	51.9	42.8
1968/69	14.8	2.3	6.4	7.3	326.0	43.4	63.2
1969/70	10.8	2.3	8.0	7.2	6/ 310.0	6/ 50.0	6/ 64.3
1970/71	7.8	7/ 2.6	11.8	7/ .5	6/ 296.0	n.a.	n.a.

n.a. = Not available.

1/ Data for Australia are for year ended November 30; data for the world are for a June/July year.

2/ Includes wheat equivalent of flour, breakfast foods, etc., stock feed wheat and seed and wheat retained on farms.

3/ Includes wheat, wheat equivalent of flour, breakfast food, etc.

4/ Includes wheat equivalent of flour stocks.

5/ Closing stocks of five major stockholding countries (United States, Argentina, Australia, Canada, and EC).

6/ Estimated.

7/ Estimated by Commonwealth Bureau of Census and Statistics.

Source: (38, p. I 11, I 12).

Table 45.--Apparent consumption of meat per person, Australia, by selected commodities, 1956/57-1970/71

Year	Beef and veal	Mutton	Lamb	Pork	Poultry	Bacon and ham 1/	Total meat 2/
	Pounds per year						
1956/57	128.9	46.8	27.7	8.7	9.7	6.8	236.7
1957/58	126.1	50.7	28.4	10.9	9.7	7.0	242.5
1958/59	117.6	55.1	31.9	10.7	9.7	7.2	242.6
1959/60	98.4	63.8	39.0	10.3	9.5	7.1	236.5
1960/61	85.4	63.2	38.2	11.4	9.5	6.8	222.8
1961/62	93.3	55.3	42.8	13.6	9.5	7.0	230.1
1962/63	100.4	51.6	42.1	12.0	9.6	7.4	232.3
1963/64	104.8	48.1	41.5	11.5	9.5	7.3	231.5
1964/65	99.2	45.9	39.2	11.8	11.3	7.5	224.0
1965/66	92.6	46.0	36.8	13.3	13.7	7.6	218.6
1966/67	85.3	41.3	42.5	13.4	16.4	8.1	215.7
1967/68	89.8	41.7	43.2	14.7	18.6	7.7	224.6
1968/69	90.2	40.9	49.4	16.2	19.8	7.8	232.8
1969/70	3/ 87.7	3/ 38.1	3/ 48.7	3/ 17.4	22.8	7.7	226.3
1970/71	4/ 85.8	4/ 40.6	4/ 49.5	4/ 15.3	n.a.	n.a.	n.a.

n.a. = Not available.

1/ Bacon and ham are in terms of cured weight.

2/ Includes canned meat and bacon which have been converted to carcass weight equivalent.

3/ Preliminary.

4/ Estimated by AMB.

Source: (50, 66, p. 35).

Table 46.--Saleyard prices of beef cattle, sheep, lambs, and hogs, Australia, 1959/60-1969/70 1/

Year	Beef cattle 2/	Sheep 3/	Lambs 4/	Hogs 5/
	Cents per pound (carcass weight)			
1959/60	21.3	7.5	15.8	25.8
1960/61	22.9	9.6	20.2	23.5
1961/62	17.1	7.9	16.2	17.9
1962/63	18.1	8.2	16.4	24.4
1963/64	18.0	9.7	18.6	25.4
1964/65	20.7	10.1	21.0	26.7
1965/66	25.7	11.6	23.9	25.8
1966/67	25.8	12.1	20.8	27.3
1967/68	26.3	9.6	21.0	28.6
1968/69	26.7	8.9	17.5	24.7
1969/70	26.2	9.6	17.6	24.5

1/ Homebush market.
2/ Beef prices: ox and heifer, 650-700 pounds, first and second export quality.
3/ Mutton prices: wether and/or maiden ewe, 40-50 pounds, export quality.
4/ Lamb prices: 29-36 pounds, first and second export quality.
5/ Pig prices: 140-150 pounds, first and second export quality.

Source: (50).

Table 47.--Estimated world consumption of apparel fibers, 1960-69

Year	Total apparel fibers 1/	Natural fibers			Manmade fibers 3/	
		Wool 2/	Cotton	Rayon 4/	Noncellulosic	
	Million pounds actual weight					
1960	33,495	3,304	22,840	5,749	1,548	
1961	33,394	3,331	22,245	5,936	1,832	
1962	33,874	3,336	21,782	6,323	2,381	
1963	35,079	3,324	22,046	6,723	2,940	
1964	37,678	3,203	23,402	7,293	3,727	
1965	39,334	3,277	23,071	7,407	4,523	
1966	41,092	3,396	23,733	7,435	5,470	
1967	41,983	3,244	24,985	7,376	6,318	
1968	44,848	3,408	25,216	7,872	8,292	
1969 5/	46,447	3,510	25,300	7,983	9,589	
	Percent					
Percentage increase (1960-69)	38.7	6.2	10.8	38.9	519.4	
Percentage of annual growth rate	3.7	.7	1.2	3.7	22.5	

1/ Figures include estimated non-Communist consumption of silk.
2/ At clean basis.
3/ Production.
4/ Yarn and fiber.
5/ Preliminary.

Source: (38, p. D-22).

Table 48.--Australia's area of crops, 1960/61-1970/71

Item	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71 1/
	1,000 acres										
Grain:											
Wheat	13,439	14,723	16,469	16,474	17,919	17,515	20,823	22,441	26,797	23,440	16,322
Oats	3,637	3,097	3,292	3,292	3,497	3,768	4,258	3,380	3,872	3,396	4,131
Barley	2,830	2,383	2,027	2,013	2,064	2,298	2,498	2,611	3,313	3,759	4,990
Corn	185	210	209	215	212	197	201	200	176	191	212
Sorghum	255	363	391	366	346	433	502	462	583	620	1,100
Other	184	196	195	184	187	191	226	213	248	256	n.a.
Total	20,530	20,972	22,583	22,644	24,225	24,402	28,508	29,307	34,989	31,663	n.a.
Forage:											
Hay	2,973	2,274	2,720	2,602	2,793	2,780	3,496	2,800	3,955	3,192	n.a.
Green fodder	4,408	4,702	4,952	4,377	5,614	5,324	5,399	5,916	5,714	6,659	n.a.
Other stock fodder	104	118	127	119	98	107	112	105	105	117	n.a.
Total	7,485	7,094	7,799	7,598	8,505	8,211	9,007	8,821	9,774	9,968	n.a.
Industrial crops:											
Canary seed 2/	20	51	69	38	11	13	4	7	24	n.a.	n.a.
Flax (for linseed)	96	62	97	118	134	25	35	54	71	122	3/ 93
Rapeseed	0	0	0	0	0	0	0	0	0	3/ 5	3/122
Safflower 2/	5	9	6	19	48	60	95	105	46	27	3/ 75
Sunflower	0	0	0	0	0	0	0	15	34	54	3/272
Peanuts 2/	43	34	36	45	46	58	70	62	79	87	90
Cotton 2/	37	29	38	41	38	55	53	77	80	77	87
Tobacco	29	27	29	29	26	23	22	23	26	26	27
Sugarcane 2/	475	499	506	539	628	647	668	675	685	680	800
Other 2/	13	11	18	15	14	16	20	15	26	74	n.a.
Total	718	722	799	844	945	897	967	1,018	1,037	1,147	n.a.
Grass seed	150	138	162	219	258	227	304	248	343	326	320
Vegetables, vineyard, fruit	677	693	727	723	716	742	746	744	772	784	n.a.
All other crops	16	20	22	17	16	19	21	30	25	41	n.a.
Grand total	29,576	29,639	32,092	32,045	34,665	34,498	39,553	40,168	46,940	43,929	n.a.

n.a. = Not available.
1/ Preliminary.
2/ Data for some years may be incomplete.
3/ Estimated by Foreign Agricultural Service, USDA.

Source: (39, 51); and Foreign Agricultural Service, USDA.

Table 49.--Number of adult cattle and calves, Australia, 1960-70

Year	Total	Adult cattle	Calves	Calves as percentage of total
	Head			Percent
1960	16,503,270	13,173,835	3,329,435	20.2
1961	17,332,263	13,771,571	3,560,692	20.5
1962	18,033,162	14,161,134 1/	3,872,028	21.5
1963	18,548,838	14,470,206 1/	4,078,632	22.0
1964	19,054,708	[illegible]01,236	4,253,472	22.3
1965	18,815,799	14,747,746	4,068,053	21.6
1966	17,936,000	14,192,094	3,743,906	20.9
1967	18,269,744	14,206,141	4,063,603	22.2
1968	19,218,004	14,661,186	4,556,818	23.7
1969	20,606,000	15,766,000	4,840,000	23.5
1970 2/	22,162,000	16,727,000	5,435,000	24.5

1/ Excludes small number in the Northern Territory.
2/ Preliminary.

Source: (51).

Table 50.--Slaughter rate and average carcass weight of cattle and sheep, and average fleece weight, Australia, 1960/61-1969/70

Year	Slaughter rate 1/				Average carcass weight				Average fleece weight
	Adult cattle	Calves	Adult sheep	Lambs	Adult cattle	Calves	Adult sheep	Lambs	
	Percent				Pounds				Pounds
1960/61...	21.0	38.9	15.6	46.0	460	64	43	34	9.9
1961/62...	25.4	39.4	15.4	42.7	466	64	43	34	10.0
1962/63...	29.5	40.8	15.0	45.9	454	66	43	35	9.8
1963/64...	31.4	42.1	14.5	41.3	450	66	43	35	10.1
1964/65...	33.5	46.7	14.1	41.5	432	67	42	35	9.8
1965/66...	32.5	45.7	16.3	47.2	428	66	42	34	9.4
1966/67...	28.8	38.3	13.7	43.0	449	64	44	36	10.0
1967/68...	28.1	32.8	17.2	41.7	455	70	42	34	9.8
1968/69...	27.2	27.1	13.3	49.7	458	70	45	37	2/ 10.5
1969/70...	28.6	20.7	16.0	49.3	450	71	45	35	n.a.

n.a. = Not available
1/ Slaughter numbers (year ending June 30) as percentage of numbers on farms (March 31).
2/ Wool figures preliminary.

Source: (51).

Table 51.--Projections of Australia's population and Gross National Product, selected studies and selected years

Item	Unit	Gruen & others (78) 1/			OECD (108)		Vernon (49) 2/	Actual	USDA projections
		1970	1975	1980	1975	1985	1975	1970	1975
Population:									
Annual growth rate..	Percent	2.13	2.17	2.16	2.0	2.0	2.44	2.03	2.02
Total.....	Million	12.6	14.0	15.5	14.0	17.1	14.0	12.55	14.0
Gross National Product 3/:									
Per capita...	A$	1,690	1,902	2,141	--	--	1,790	1,776	2,035
Total.....	A$ billion	21.3	26.6	33.2	--	--	26.5	22.3	28.5

1/ Growth rate for 1970, 1975, and 1980 refers to periods 1965-70, 1970-75, 1975-80, respectively. Gruen gives a low and high estimate for each item shown, but the figure shown is the arithmetic mean of the two.

2/ Population growth rate assumes intermediate fertility level. Per capita GNP calculated based on total GNP and population projections.

3/ GNP shown in 1959/60 constant prices.

-- Means negligible or none.

Table 52.--Feed utilization of selected Australian commodities, 1960/61-1969/70

Year	Wheat		Oats		Barley		Corn		Sorghum		Total
	1,000 bushels	Long tons	1,000 bushels	Long tons	1,000 bushels	Long tons	1,000 bushels	Long tons	1,000 bushels	Long tons	Long tons
1960/61	21,648	530	46,132	824	11,084	247	5,372	134	n.a.	n.a.	1,785
1961/62	17,472	468	28,784	514	9,087	203	5,922	148	n.a.	n.a.	1,333
1962/63	14,883	399	40,835	729	12,507	279	5,628	141	n.a.	n.a.	1,548
1963/64	15,411	413	35,764	639	8,486	189	5,137	128	n.a.	n.a.	1,369
1964/65	34,643	928	42,435	758	16,934	378	5,031	126	n.a.	n.a.	2,190
1965/66	26,525	710	33,845	604	17,382	388	3,525	88	n.a.	n.a.	1,790
1966/67	22,067	591	71,761	1,281	12,320	275	5,851	146	6,063	162	2,455
1967/68	27,974	749	20,535	367	12,365	276	5,474	137	10,251	275	1,804
1968/69	21,973	589	33,096	591	15,411	344	5,960	149	8,745	235	1,907
1969/70	20,197	541	49,616	886	26,477	591	6,280	157	14,697	394	2,569

n.a. = Not available or none.
Source: (51).

Table 53.--Quantity and unit price of Australia's beef and veal 1/ exports, selected countries, 1969/70

Country	Quantity	Unit price 2/
	Metric tons	A$ per metric ton
Total	327,910	998
United States	234,802	1,076
United Kingdom	27,117	649
Canada	23,446	942
Japan	16,493	747
USSR	11,045	684
Singapore	2,040	873
Philippines	1,153	625
Papua and New Guinea	1,113	1,102
Malta	1,056	1,024
Malaysia	429	909
Greece	234	906
Hong Kong	225	876
Italy	66	727
France	45	1,178
Other	8,646	1,085

1/ Fresh, chilled, or frozen.
2/ Calculated by dividing value by quantity.

Source: (53).

END

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