
AGRICULTURAL INDUSTRIES

Introduction

The development of Australian agricultural industries has been determined by interacting factors such as profitable markets, the opening up of new land (including the development of transport facilities) and technical and scientific achievements. Subsistence farming, recurring gluts, low prices and losses to farmers were gradually overcome by the development of an export trade. Profitable overseas markets for merino wool and wheat, and the introduction of storage and refrigerated shipping for the dairying and meat industry, combined to make the agricultural sector Australia's main export earner. Until the late 1950s, agricultural products comprised more than 80 per cent of the value of Australia's exports. Since then, the proportion of Australia's exports from the agricultural sector has declined markedly.

However, this decline in importance has been due not to a decline in agricultural activity but rather to an increase in the quantity and values of the exports of the mining and manufacturing sectors. In fact, the agricultural sector experienced an increase in total output over that period. One interesting aspect of this increase in output is that it was accompanied by a large reduction in the size of the agricultural labour force, implying a large growth in productivity within the sector.

Sources of statistics and definitions of units

The major source of the statistics in this chapter is the Agricultural Census conducted at 31 March each year. A wide range of information is collected from agricultural establishments with agricultural activity covering the physical aspects of agriculture such as area and production of crops, fertilisers used, number of livestock disposed of, etc. In conjunction with the Census, certain supplementary collections are conducted in some States where this has proved expedient, e.g. where the harvesting of certain crops has not been completed by 31 March (apples, potatoes, etc.), special returns covering the crops concerned are collected after the completion of the harvest.

The ABS excludes from the Census those establishments which make only a small contribution to overall agricultural production. Since 1986-1987, the Census includes establishments with agricultural activity which have an estimated value of agricultural operations of \$20,000 or more. Prior to this (1982-83 to 1985-86) the cut-off value was \$2,500.

While these alterations have resulted in some changes in the counts of numbers of establishments appearing in publications, the effect on the statistics of production of major commodities is small. Statistics of minor commodities normally associated with small scale operations may be affected to a great extent.

Details of the method used in the calculation of the estimated value of agricultural operations are contained in the publication *Agricultural Industries: Structure of Operating Units, Australia* (7102.0).

Integrated Register Information System—IRIS

Agricultural units in scope of the Agricultural Census are stored on the ABS's central business register (IRIS). Details of the structure of economic units engaged in agriculture, in hierarchical order, are:

- **Management Unit:** This is the largest unit within an enterprise group which controls its productive activities and for which accounts are kept. From these accounts detailed annual and sub-annual (i.e. at least quarterly) revenue, expenses, stocks, capital expenditure and employment data must be available to the ABS. This will enable measures of industry performance, such as gross product (i.e. adjusted value added), to be calculated. It consists of one or more establishments.
- **Establishment:** This is the smallest accounting unit within a State or Territory of Australia which controls its productive activities and for which a specified range of detailed data is available, at least on an annual basis.

Other statistical collections

The ABS conducts a number of other collections to obtain agricultural statistics. These include collections from wool brokers and dealers, livestock slaughterers and other organisations involved in the marketing and selling of agricultural commodities.

For financial statistics from the Agricultural Finance Survey, conducted for 1988–89, see *Agricultural Industries Financial Statistics, Australia, 1988–89, Preliminary* (7508.0).

Structural Statistics

The following tables provide information relating to the structure of operating units during 1988–89. The following terminology is used in the tables:

- **Industry.** As set out in the *Australian Standard Industrial Classification (ASIC)* (1201.0 and 1202.0). These publications provide details of the methodology used in determining the industry class of an economic unit.
- **Estimated Value of Agricultural Operations (EVAO).** This is determined by valuing the physical crop and livestock information collected in the Agricultural Census.

A further explanation of this terminology and more detailed statistics are given in the publication *Agricultural Industries, Structure of Operating Units, Australia* (7102.0).

**ESTABLISHMENTS WITH AGRICULTURAL ACTIVITY, INDUSTRY AND ESTIMATED VALUE OF AGRICULTURAL OPERATIONS
AUSTRALIA, 31 MARCH 1989**

ASIC Code	Industry of establishment Description	Estimated value of agricultural operations (\$'000)										500 or more	Total establishments
		Less than 20	20-29	30-39	40-49	50-59	60-74	75-99	100-149	150-199	200-499		
0124	Poultry for meat	19	18	17	15	28	51	94	154	94	144	71	705
0125	Poultry for eggs	22	13	15	20	14	26	31	93	69	209	179	691
0134	Grapes	77	201	302	369	368	524	530	574	175	161	48	3,329
0135	Plantation fruit	102	165	187	172	145	166	184	200	115	138	49	1,623
0136	Orchard and other fruit	456	450	445	415	368	497	557	718	426	657	201	5,190
0143	Potatoes	15	28	39	55	56	96	134	215	147	404	105	1,294
0144	Vegetables (except potatoes)	192	289	254	231	183	264	314	416	292	634	310	3,379
0181	Cereal grains (incl. oilseeds n.e.c.)	265	349	405	392	354	527	788	1,211	713	1,570	497	7,071
0182	Sheep—cereal grains	95	350	586	767	840	1,427	2,568	4,373	3,029	5,749	1,125	20,909
0183	Meat cattle—cereal grains	95	170	225	221	194	224	357	461	276	481	106	2,810
0184	Sheep—meat cattle	170	389	631	621	609	771	1,080	1,441	812	1,330	330	8,184
0185	Sheep	674	1,047	1,672	1,748	1,605	2,160	3,265	4,610	2,830	4,774	821	25,206
0186	Meat cattle	1,865	2,616	2,530	1,810	1,372	1,443	1,447	1,498	852	1,283	395	17,111
0187	Milk cattle	172	335	570	705	1,042	1,925	3,423	4,072	1,535	1,079	54	14,912
0188	Pigs	58	78	104	98	100	149	193	315	216	387	146	1,844
0191	Sugar cane	53	99	163	252	369	663	1,018	1,283	635	746	59	5,340
0192	Peanuts	6	6	15	19	17	17	35	44	12	21	5	197
0193	Tobacco	—	4	8	14	13	34	81	189	75	69	4	491
0194	Cotton	—	1	4	7	5	6	8	18	29	121	277	469
0195	Nurseries	143	97	185	74	116	222	165	306	166	265	139	1,878
0196	Agriculture n.e.c.	434	548	480	299	244	246	237	230	121	185	51	3,075
	Total (ASIC code 01)	4,913	7,253	8,837	8,297	8,042	11,438	16,509	22,421	12,619	20,407	4,972	125,708
02	Services to agriculture	10	13	11	12	10	10	9	7	4	5	—	91
03	Forestry and logging	4	3	3	2	2	3	2	3	1	—	—	22
04	Fishing and hunting	1	1	—	2	—	3	—	—	—	—	—	—
	Total (ASIC Division A)	4,928	7,270	8,857	8,313	8,054	11,452	16,520	22,432	12,625	20,412	4,973	125,830
B	Mining	—	3	—	—	2	—	1	3	1	1	—	11
C	Manufacturing	12	12	13	12	15	9	10	20	7	13	17	140
D	Electricity, gas and water	—	—	—	—	—	—	—	—	—	—	—	2
E	Construction	18	16	16	12	7	5	8	8	6	4	1	101
F	Wholesale and retail trade	25	11	16	14	10	6	8	11	3	12	4	120
G	Transport and storage	26	23	22	13	15	15	11	12	4	5	1	147
H	Communication	—	—	—	—	—	—	—	—	—	—	—	—
I	Finance, property and business services	7	2	5	5	—	3	3	1	—	2	—	28
J	Public administration and defence	—	1	—	—	—	—	—	—	—	—	—	3
K	Community services	5	8	9	5	8	6	19	18	16	36	9	139
L	Recreation, personal and other services	7	4	2	3	—	4	3	3	3	1	—	30
	Total, all industries	5,028	7,350	8,934	8,378	8,111	11,500	16,585	22,508	12,665	20,487	5,005	126,551

ESTABLISHMENTS WITH AGRICULTURAL ACTIVITY, BY INDUSTRY OF ESTABLISHMENT, 31 March 1989

<i>Industry of establishment</i>										
<i>ASIC Code</i>	<i>Description</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>NT</i>	<i>ACT</i>	<i>Aust.</i>
0124	Poultry for meat	374	123	89	57	50	12	—	—	705
0125	Poultry for eggs	225	150	146	55	93	18	3	1	691
0134	Grapes	600	1,507	42	1,050	121	7	2	—	3,329
0135	Plantation fruit	679	—	816	—	121	—	7	—	1,623
0136	Orchard and other fruit	1,559	968	910	1,138	399	205	9	2	5,190
0143	Potatoes	141	463	225	103	147	215	—	—	1,294
0144	Vegetables (except potatoes)	618	558	1,086	456	423	215	22	1	3,379
0181	Cereal grains (incl. oilseeds n.e.c)	1,615	1,555	2,139	1,034	703	13	12	—	7,071
0182	Sheep—cereal grains	7,099	3,482	356	5,087	4,852	33	—	—	20,909
0183	Meat cattle—cereal grains	972	119	1,628	74	12	2	3	—	2,810
0184	Sheep—meat cattle	3,565	2,329	617	735	554	370	—	14	8,184
0185	Sheep	9,340	7,243	1,534	2,492	3,637	926	—	34	25,206
0186	Meat cattle	4,970	3,626	6,478	356	983	505	178	15	17,111
0187	Milk cattle	2,383	8,148	2,080	984	525	788	2	2	14,912
0188	Pigs	570	252	554	270	139	58	1	—	1,844
0191	Sugar cane	474	—	4,866	—	—	—	—	—	5,340
0192	Peanuts	1	—	194	—	2	—	—	—	197
0193	Tobacco	17	173	301	—	—	—	—	—	491
0194	Cotton	291	—	178	—	—	—	—	—	469
0195	Nurseries	677	320	405	192	211	56	15	2	1,878
0196	Agriculture n.e.c	1,129	627	679	303	230	95	11	1	3,075
<i>Total (ASIC code 01)</i>		<i>37,299</i>	<i>31,643</i>	<i>25,323</i>	<i>14,386</i>	<i>13,202</i>	<i>3,518</i>	<i>265</i>	<i>72</i>	<i>125,708</i>
02	Services to agriculture	3	23	25	12	26	2	—	—	91
03	Forestry and logging	3	1	8	—	2	8	—	—	22
04	Fishing and hunting	—	—	—	1	3	5	—	—	9
<i>Total (ASIC Division A)</i>		<i>37,305</i>	<i>31,667</i>	<i>25,356</i>	<i>14,399</i>	<i>13,233</i>	<i>3,533</i>	<i>265</i>	<i>72</i>	<i>125,830</i>
B	Mining	4	2	1	2	2	—	—	—	11
C	Manufacturing	18	28	9	36	41	7	—	1	140
D	Electricity, gas and water	—	2	—	—	—	—	—	—	2
E	Construction	11	40	17	15	11	7	—	—	101
F	Wholesale and retail trade	19	39	17	14	12	18	1	—	120
G	Transport and storage	34	34	22	20	21	16	—	—	147
H	Communication	—	—	—	—	—	—	—	—	—
I	Finance, property and business services	4	5	8	5	4	1	1	—	28
J	Public administration and defence	2	—	—	1	—	—	—	—	3
K	Community services	28	12	51	11	28	9	—	—	139
L	Recreation, personal and other services	6	12	2	2	7	1	—	—	30
Total, all industries		37,431	31,841	25,483	14,505	13,359	3,592	267	73	126,551

Gross Value of Agricultural Commodities Produced and Index of Values at Constant Prices

Definitions

Gross value of commodities produced: the value placed on recorded production at the wholesale prices realised in the market place.

Index of values at constant prices: the index of the gross value of commodities produced at constant prices, i.e. it is a measure of change in value after the direct effects of price changes have been eliminated.

Publications

Two preliminary estimates of value of commodities produced are published: *Value of Principal Agricultural Commodities Produced, Australia, Preliminary (7501.0)* and *Value of*

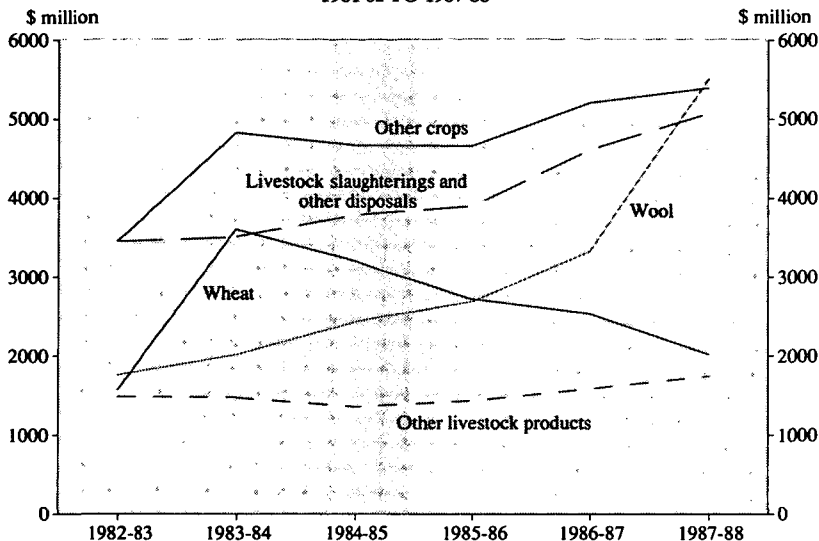
Selected Agricultural Commodities Produced, Australia, Preliminary (7502.0). A final publication, *Value of Agricultural Commodities Produced, Australia (7503.0)*, also contains Indexes of Values at Constant Prices.

Index of Agricultural Commodities Produced

The index is consistent in scope with those of previous years. The indexes are weighted by the average unit values for the year 1984-85 with a reference base of 1984-85=1,000.

For further details on how these and earlier series were calculated see *Year Book No. 61*, and *Value of Agricultural Commodities Produced, Australia (7503.0)*.

**GROSS VALUE OF SELECTED AGRICULTURAL COMMODITIES
1981-82 TO 1987-88**



**GROSS VALUE OF AGRICULTURAL COMMODITIES PRODUCED
(\$ million)**

	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Crops—						
Barley for grain	732.6	759.3	586.8	432.6	459.8	568.6
Oats for grain	203.8	129.6	138.3	164.8	195.0	236.5
Wheat for grain	3,605.6	3,202.9	2,693.7	2,410.3	2,015.7	2,975.9
Other cereal grains	408.7	400.8	346.4	322.5	402.2	419.6
Sugar cane cut for crushing	516.6	512.2	494.2	586.4	618.2	751.8
Fruit and nuts	552.5	670.9	678.6	837.2	885.9	1000.2
Grapes	217.0	259.4	270.0	272.2	353.7	462.4
Vegetables	738.6	628.8	713.6	885.4	952.9	1,197.3
All other crops(a)	1,451.1	1,303.5	1,430.4	1,706.7	1,928.6	2,293.8
Total crops	8,426.5	7,867.4	7,352.0	7,618.1	7,812.0	9,906.1

For footnotes see end of table.

GROSS VALUE OF AGRICULTURAL COMMODITIES PRODUCED—continued
(\$ million)

	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Livestock slaughtering and other disposals(b)—						
Cattle and calves(c)	2,118.0	2,253.2	2,393.9	2,833.3	3,057.0	3,197.6
Sheep and lambs	585.0	576.1	531.6	721.2	803.9	738.3
Pigs	375.5	438.1	(d)438.3	(d)468.5	(d)536.1	(d)628.7
Poultry	430.2	512.6	(d)559.1	(d)601.7	(d)671.2	(d)727.6
Total livestock slaughtering and other disposals(e)	3,508.6	(e)3,783.3	(d)3,923.0	(d)4,624.6	(d)(e)5,074.3	(d)5,292.2
Livestock products—						
Wool	2,016.1	2,434.4	2,693.4	3,333.6	5,516.6	5,906.0
Milk	1,153.2	1,035.4	1,106.7	1,257.4	1,390.9	1,635.1
Eggs	295.2	291.2	297.7	291.6	304.4	321.4
Total livestock products(f)	(g)3,489.8	(h)3,792.8	(i)4,125.3	(i)4,915.6	(h)7,256.2	(j)7,910.8
Total value of agricultural commodities produced	15,424.9	15,443.5	(k)15,406.9	(k)17,166.5	(k)20,151.8	(l)23,120.0

(a) Includes pastures and grasses. Excludes crops for green feed or silage. (b) Includes net exports of livestock. (c) Includes dairy cattle slaughtered. (d) Excludes Northern Territory pigs and poultry. (e) Includes goat slaughtering and exports. (f) Includes honey and beeswax. (g) Includes Australian Capital Territory milk and eggs. Excludes Northern Territory milk. (h) Includes cashmere, cashgora, mohair, liquid goat milk, honey and beeswax. Excludes Northern Territory and Australian Capital Territory milk and eggs. (i) Excludes Northern Territory and Australian Capital Territory milk and eggs. (j) Excludes Northern Territory milk and eggs. (k) Includes Northern Territory pigs, poultry, milk and eggs. (l) Includes Northern Territory pigs, poultry, milk and eggs and Australian Capital Territory milk and eggs.

INDEX OF VALUES AT CONSTANT PRICES OF AGRICULTURAL COMMODITIES PRODUCED(a)

(Base year: 1984-85 = 1,000)

	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Crops—						
Barley for grain	880	1,000	876	645	625	596
Oats for grain	1,630	1,000	943	1,171	1,275	1,325
Wheat for grain	1,179	1,000	865	880	652	750
Other cereal grains	1,107	1,000	974	924	970	899
Sugar cane(b)	917	1,000	987	967	978	1,035
Fruit and nuts	872	1,000	1,007	1,099	1,153	1,121
Grapes	927	1,000	1,018	936	921	1,002
Vegetables	865	1,000	988	1,046	1,172	1,163
All other crops(c)	884	1,000	1,019	1,056	1,087	1,143
Total	1,028	1,000	933	933	862	908
Livestock slaughtering and other disposals—						
Cattle and calves(d)	1,026	1,000	1,057	1,138	1,202	1,125
Sheep and lambs	949	1,000	1,065	1,107	1,077	983
Pigs	973	1,000	1,041	1,086	1,140	1,155
Poultry	863	1,000	1,062	1,112	1,167	1,195
Total(e)	986	1,000	1,057	1,124	1,171	1,116
Livestock products—						
Wool	877	1,000	1,002	1,070	1,109	1,156
Milk	981	1,000	996	1,019	1,015	1,038
Eggs	1,060	1,000	1,010	1,022	1,051	1,012
Total(f)	920	1,000	1,000	1,052	1,078	1,112
Total agricultural commodities produced	991	1,000	980	1,009	991	1,009

(a) Indexes of values at constant prices (weighted by average unit values of the year 1984-85). (b) Sugar cane cut for crushing and planting. (c) Includes pasture and grasses. Excludes crops for green feed or silage. (d) Includes dairy cattle slaughtered. (e) Component series based on carcass weight. (f) Includes honey and beeswax.

Apparent Consumption of Foodstuffs

Estimates of consumption in Australia are compiled by deducting net exports from the sum of production and imports and allowing for recorded movement in stocks of the respective commodities. The term 'consumption' is used in a specialised sense, since the quantities actually measured are broadly the quantities available for consumption at a particular level of distribution, i.e. ex-market, ex-store or ex-factory depending on the method of marketing and/or processing. Because consumption of foodstuffs is measured, in general, at 'producer' level no allowance is made for wastage before they are consumed. The effect of ignoring wastage is ultimately to overstate consumption but it is believed that more efficient distribution and storage methods in recent years have cut down wastage. Furthermore, it is likely that many of the foodstuffs are being supplemented by householders' self-supplies over and above the broad estimate already made.

The estimates of consumption per capita have been obtained by using the mean resident population for the period.

More detailed information on the consumption of foodstuffs is contained in the publication *Apparent Consumption of Foodstuffs and Nutrients, Australia* (4306.0). For some commodities, more timely information is contained in the publication *Apparent Consumption of Selected Foodstuffs, Australia, Preliminary* (4315.0).

APPARENT PER CAPITA CONSUMPTION OF FOODSTUFFS (Kg—unless otherwise indicated)

Commodity	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88
Meat and meat products—						
Meat (carcass equivalent weight)						
Beef	42.4	39.9	40.0	39.3	37.5	37.4
Veal	3.5	2.4	2.1	2.1	1.9	1.8
<i>Beef and veal</i>	45.9	42.3	42.1	41.4	39.4	39.3
Lamb	16.2	16.9	17.1	16.9	15.0	14.9
Mutton	4.5	5.2	6.6	7.1	7.4	8.0
Pigmeat(a)	15.3	16.4	16.4	17.0	16.8	17.6
Total	81.7	80.9	82.2	82.3	78.5	79.7
Offal and meat, n.e.i.	4.4	3.4	2.8	2.7	3.4	3.6
Total meat and meat products	86.1	84.3	85.0	85.0	82.0	83.3
Poultry—						
Poultry (dressed weight)	20.3	20.0	21.8	23.0	23.5	24.7
Milk and milk products—						
Market milk (fluid whole)(litres)	102.9	101.6	101.8	102.5	102.9	101.5
Cheese (natural equivalent weight)	7.4	7.7	8.1	7.9	8.1	8.3
Oils and fats—						
Butter	4.0	3.9	3.9	3.8	3.5	3.2
Margarine						
Table margarine	6.8	6.9	6.6	6.9	6.8	6.6
Other margarine	2.8	2.7	2.3	2.1	2.1	2.2
Total margarine	9.6	9.6	8.9	9.0	8.9	8.8
Beverages—						
Tea	1.4	1.5	1.4	1.4	1.3	1.2
Coffee(b)	2.0	2.1	2.0	1.6	1.8	2.1
Aerated and carbonated waters (litres)	65.7	63.0	67.3	73.0	73.6	80.0
Beer (litres)	121.6	117.8	114.5	115.5	111.3	110.8
Wine (litres)	19.7	20.4	21.3	21.6	21.0	20.6
Spirits (litres alcohol)	1.2	1.1	1.2	1.3	1.2	1.2

(a) Includes bacon and ham. (b) Coffee and coffee products in terms of roasted coffee.

Financial Statistics

Estimates of selected financial aggregates of enterprises predominantly engaged in agricultural activity are shown in the following tables. The estimates have been derived from the Agricultural Finance Survey (AFS), which was conducted on an irregular basis until 1986-87 when it was re-introduced as an annual survey. From 1986-87 the population for the AFS consisted of all management units classified to an industry class within Sub-division 01 'Agriculture' of the Australian Standard Industrial Classification (ASIC) and with an EVAO of \$20,000 or more. The notation 'S.E. %' stands for 'standard error %' which is a measure of the sampling error resulting from the use of sampling techniques as opposed to the results which would have been obtained from a comparable complete collection. A more detailed explanation of standard errors and other terms used in the tables, as well as more detailed statistics, is given in the publication *Agricultural Industries, Financial Statistics, Australia, 1987-88* (7507.0).

ESTIMATES OF SELECTED FINANCIAL AGGREGATES OF AGRICULTURAL ENTERPRISES(a), 1977-78, 1980-81 AND 1986-87 TO 1988-89p

	1977-78		1980-81		1986-87		1987-88		1988-89p	
	S.E.		S.E.		S.E.		S.E.		S.E.	
	\$m	%	\$m	%	\$m	%	\$m	%	\$m	%
Sales from crops	2,281.5	2	4,543.7	1	6,350.1	2	6,507.7	2	6,619.2	3
Sales from livestock	1,677.8	2	3,134.6	2	4,447.2	2	5,052.1	2	5,330.3	3
Sales from livestock products	1,682.0	1	2,422.2	2	4,261.5	2	6,024.1	2	6,445.5	2
Turnover	5,874.2	1	10,439.7	1	16,094.2	1	18,708.0	1	19,494.0	1
Purchases and selected expenses	2,838.7	1	5,283.5	1	8,731.6	1	9,852.5	1	10,201.4	2
Value added(b)	2,869.9	1	5,034.9	2	8,899.4	2	10,187.0	2	11,290.3	2
Adjusted value added(b)	2,472.6	2	4,471.7	2	7,886.1	2	9,108.5	2	10,167.8	3
Gross operating surplus(b)	1,896.4	2	3,669.1	2	6,508.6	2	7,511.1	2	8,449.	3
Interest paid	n.a.		n.a.		1,581.0	3	1,473.6	3	1,625.2	4
Cash operating surplus(c)	1,801.6	2	3,419.1	2	3,678.9	3	4,999.9	3	5,172.2	3
Total net capital expenditure	772.7	3	1,301.3	3	1,212.0	5	1,566.1	4	1,828.9	4
Gross indebtedness	3,395.8	3	4,941.0	3	11,152.4	3	11,425.6	4	12,277.0	5
Number of enterprises	169,560		169,158		113,764		114,315		107,747	

(a) Data for 1986-87 onwards are not strictly comparable with previous periods. See explanatory notes above. (b) Includes an estimate for the value of the increase in livestock. (c) Excludes an estimate for the value of the increase in livestock.

ESTIMATES OF SELECTED FINANCIAL AGGREGATES OF AGRICULTURAL ENTERPRISES, 1988-89p
(\$ million)

	NSW	S.E. %	Vic.	S.E. %	Qld	S.E. %	SA	S.E. %	WA	S.E. %	Tas.	S.E. %	Aust.(a)	S.E. %
Sales from crops	1,712.9	4	982.2	6	1,897.3	6	733.8	8	1,132.6	5	110.8	11	6,619.2	3
Sales from livestock	1,747.1	5	886.5	5	1,375.4	7	351.0	6	466.2	7	118.6	6	5,330.3	3
Sales from livestock products	2,153.1	4	1,532.3	5	710.4	6	618.7	7	1,144.2	4	2,327	6	6,445.5	2
Turnover	5,997.5	2	3,585.3	3	4,227.1	4	1,785.3	4	2,889.0	2	503.0	4	19,494.0	1
Purchases and selected expenses	3,240.6	3	1,844.0	4	2,267.6	5	824.0	4	1,516.4	3	262.8	5	10,201.4	2
Value added(b)	3,356.1	3	1,874.2	4	2,895.4	7	957.7	6	1,514.8	4	277.9	5	11,290.3	2
Adjusted value added(b)	2,989.2	3	1,658.1	5	2,667.1	8	856.3	6	1,367.2	4	250.5	6	10,167.8	3
Gross operating surplus(b)	2,445.9	4	1,321.4	6	2,288.5	9	688.9	8	1,203.3	5	193.3	6	8,449.6	3
Interest paid	516.7	7	294.2	11	399.6	11	157.6	12	192.2	8	39.7	10	1,625.2	4
Cash operating surplus(c)	1,388.4	7	936.3	7	1,038.9	8	591.6	9	935.7	6	121.2	11	5,172.2	3
Total net capital expenditure	486.6	8	383.5	9	443.3	11	164.2	11	295.2	7	37.2	14	1,828.9	4
Gross indebtedness	3,738.2	8	2,164.9	11	3,148.9	13	1,117.0	11	1,522.9	6	294.3	9	12,277.0	5
Number of enterprises	31,842	2	267,870	3	22,351	2	11,776	4	11,337	2	3,035	3	107,747	1

(a) Includes ACT, NT and estimates for multi-State enterprises. (b) Includes an estimate for the value of the increase in livestock. (c) Excludes an estimate for the value of the increase in livestock.

Land Utilisation in Australia

The total area under tenure differs from the total area of agricultural establishments (shown in the following table) by amounts which represent unused land or land held for non-agricultural purposes. In general, land in the more fertile regions tends to be mostly freehold, while the less productive land is held under Crown lease or licence.

AREA OF ESTABLISHMENTS WITH AGRICULTURAL ACTIVITY (million hectares)

<i>At 31 March</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>NT</i>	<i>Aust. (incl. ACT)</i>
1984	64.0	14.3	158.1	62.1	114.3	2.2	73.7	488.6
1985	63.7	14.2	157.2	62.7	114.0	2.1	74.0	488.0
1986	60.0	13.2	154.3	57.9	109.6	1.9	71.4	468.3
1987	60.8	13.1	151.7	59.5	112.7	1.9	71.2	471.0
1988	61.5	13.1	152.5	60.0	113.5	1.9	69.6	472.0
1989	61.6	13.1	151.3	58.0	112.6	1.9	68.3	466.9

LAND UTILISATION: AUSTRALIA (million hectares)

<i>Year</i>	<i>Area of—</i>			<i>Total</i>		<i>Percentage of Australian land area (768,284,000 hectares)</i>
	<i>Crops(a)</i>	<i>Sown pastures and grasses</i>	<i>Balance(b)</i>	<i>Area of establishments</i>		
1983–84	22.0	26.1	440.5	488.6	63.6	
1984–85	21.1	27.1	439.8	488.0	63.5	
1985–86	20.6	26.4	421.3	468.3	61.0	
1986–87	19.8	27.3	423.9	471.0	61.3	
1987–88	18.4	28.6	425.0	472.0	61.4	
1988–89	17.5	30.2	419.2	466.9	60.8	

(a) Excludes pastures and grasses harvested for hay and seed which have been included in 'sown pastures and grasses'.
(b) Used for grazing, lying idle, fallow, etc.

The total area of agricultural establishments in 1988–89 constituted 60.8 per cent of the Australian land area, the remainder being urban areas, State forests and mining leases, with an overwhelming proportion of unoccupied land (mainly desert). The balance data include large areas of arid or rugged land held under grazing licences but not always used for grazing. Balance data also include variable amounts of fallow land.

The crop area data represent up to 3.7 per cent of the area of agricultural establishments and emphasise the relative importance of the livestock industry in Australia.

Crops

For this section, statistics relating to crop areas and production have been obtained from the annual Agricultural Census. The Census returns are collected in all States and the two Territories at 31 March each year and relate mainly to crops sown in the previous twelve months.

Where harvests are not completed by March (e.g. potatoes), provision is made in some States for a supplementary collection after the harvest is completed. Additional statistics relating to value of agricultural commodities produced, manufactured production and overseas trade are also included. Agricultural Census data published in this section refer to the 'agricultural' year ended 31 March, while other data refer to the year ended 30 June; but for most purposes there will be little error involved in considering 'agricultural year' data as applying to the financial year.

The following table shows the area of crops in each of the States and Territories of Australia since 1870-71.

AREA OF CROPS(a)
(^{'000 hectares)}

<i>Year</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>NT</i>	<i>ACT</i>	<i>Aust.</i>
1870-71	156	280	21	325	22	64	—	—	868
1880-81	245	627	46	846	26	57	—	—	1,846
1890-91	345	822	91	847	28	64	—	—	2,197
1900-01	990	1,260	185	959	81	91	—	—	3,567
1910-11	1,370	1,599	270	1,112	346	116	—	—	4,813
1920-21	1,807	1,817	316	1,308	730	120	—	1	6,099
1930-31	2,756	2,718	463	2,196	1,939	108	1	2	10,184
1940-41	2,580	1,808	702	1,722	1,630	103	—	2	8,546
1949-50	2,295	1,881	832	1,518	1,780	114	—	4	8,424
1954-55	2,183	1,904	1,049	1,711	2,069	122	—	2	9,040
1959-60	2,888	1,949	1,184	1,780	2,628	130	1	3	10,564
1964-65	4,182	2,621	1,605	2,414	3,037	163	2	4	14,028
1969-70	4,999	2,212	2,208	2,290	3,912	98	6	2	15,728
1971-72	4,186	1,925	2,017	2,278	3,751	67	7	1	14,231
1972-73	4,329	1,943	1,963	2,122	3,814	80	12	1	14,265
1973-74	4,628	1,981	1,786	2,451	4,133	74	6	1	15,060
1974-75	4,089	1,772	1,898	2,257	3,754	67	7	1	13,845
1975-76	4,285	1,851	2,010	2,116	4,208	60	8	1	14,539
1976-77	4,520	1,943	2,026	2,036	4,417	65	2	1	15,010
1977-78	4,984	2,163	2,107	2,564	4,910	70	1	1	16,800
1978-79	5,020	2,209	2,307	2,827	4,993	80	2	1	17,438
1979-80	5,243	2,243	2,334	2,771	5,281	79	2	1	17,954
1980-81	5,208	2,180	2,481	2,772	5,547	84	1	1	18,273
1981-82	5,744	2,184	2,765	2,865	5,963	90	2	1	19,613
1982-83	5,200	2,234	2,648	2,856	6,380	98	3	1	19,420
1983-84	6,566	2,655	2,998	3,108	6,526	101	5	1	21,961
1984-85	5,789	2,569	3,047	2,902	6,723	99	6	1	21,136
1985-86	5,990	2,528	3,231	3,039	5,970	88	7	1	20,853
1986-87	5,325	2,317	3,036	3,066	5,930	78	12	—	19,764
1987-88	4,908	2,159	2,870	2,990	5,334	84	13	1	18,359
1988-89	4,560	1,990	2,842	2,961	5,082	82	11	1	17,527

(a) The classification of crops was revised in 1971-72 and adjustments made to statistics back to 1967-68. After 1966-67 lucerne for green feed, hay and seed, and pasture cut for hay and harvested for seed or green feed are excluded.

NOTE: From 1970-71 to 1980-81 figures related to area 'used for' crops, i.e. an area used for more than one purpose during the year was counted only once. From 1981-82, an area double cropped has been counted separately each time used.

The wide range of climatic and soil conditions over the agricultural regions of Australia has resulted in a diversity of crops being grown throughout the country. Generally, cereal crops (excluding rice, maize and sorghum) are grown in all mainland States over wide areas, while other crops are confined to specific locations in a few States. However, scanty or erratic rainfall, limited potential for irrigation and unsuitable soils or topography have restricted intensive agriculture. Despite this, agricultural production has increased over time to meet increased demands both in Australia and from overseas.

The following table provides a summary of the area, production and gross value of the principal crops in Australia.

CROPS: AREA, PRODUCTION AND GROSS VALUE

	1986-87			1987-88			1988-89		
	Area (^{'000} ha)	Prod- uction (^{'000} tonnes)	Gross value (\$m)	Area (^{'000} ha)	Prod- uction (^{'000} tonnes)	Gross value (\$m)	Area (^{'000} ha)	Prod- uction (^{'000} tonnes)	Gross value (\$m)
Cereals for grain—									
Barley	2,274	3,548	433	2,346	3,417	460	2,190	3,242	569
Grain sorghum	818	1,419	162	745	1,633	208	625	1,244	194
Maize	58	206	31	56	208	32	52	217	36
Oats	1,140	1,584	165	1,275	1,698	195	1,309	1,838	237
Rice	96	608	85	106	740	117	97	748	147
Wheat	11,135	16,119	2,410	9,005	12,287	2,016	8,827	13,935	2,976
Legumes for grain	1,244	1,315	294	1,615	1,342	330	1,473	1,444	371
Crops for hay—									
Oats	205	676	58	228	714	61	220	749	77
Wheat	67	186	15	76	200	17	71	198	19
Crops for green feed, silage—									
Barley	85	} n.a.	} n.a.	91	} n.a.	} n.a.	84	} n.a.	} n.a.
Forage sorghum	177			212			182		
Oats	645			759			684		
Wheat	71			60			35		
Sugar cane cut for crushing	300	24,742	586	307	24,832	618	314	27,146	752
Tobacco	5	12	65	5	13	73	5	11	67
Cotton	156	612	373	245	762	425	194	812	537
Peanuts (in shell)	34	48	42	32	37	33	22	25	26
Soy Beans	54	90	27	43	69	29	71	130	53
Rapeseed	65	76	18	58	66	18	43	58	21
Sunflower	193	137	34	200	216	66	185	172	56
Fruit (excl. grapes)	107	—	837	109	—	886	115	—	1,000
Fruit—									
Orchard	89	—	634	91	—	670	96	—	763
Oranges	n.a.	504	126	n.a.	479	146	n.a.	399	182
Apples	19	325	204	19	300	186	20	323	239
Pears	n.a.	145	77	n.a.	162	78	n.a.	142	66
Peaches	n.a.	61	41	n.a.	66	48	n.a.	52	45
Bananas	9	156	127	9	160	133	9	196	141
Pineapples	6	142	42	6	147	41	7	154	45
Grapes	57	783	272	57	799	354	58	859	462
Vegetables	111	—	885	117	—	953	119	—	1,197
Potatoes	37	1,015	272	40	1,082	270	38	1,048	326
Total, all crops (excluding pastures)	19,764	—	7,199	18,359	—	7,416	17,527	—	9,388

Cereal Grains

In Australia, cereals are conveniently divided into autumn-winter-spring growing ('winter' cereals) and spring-summer-autumn growing ('summer' cereals). Winter cereals such as wheat, oats, barley and rye are usually grown in rotation with some form of pasture such as grass, subterranean clover, medics or lucerne. In recent years, alternative winter crops such as rapeseed, field peas and lupins have been introduced to cereal rotation in areas where they had not previously been grown. Rice, maize, sorghum and the millets are summer cereals with the latter two being grown in association with winter cereals in some areas. In northern Queensland and Western Australia there are two rice growing seasons—a dry season winter crop and a wet season summer crop.

Cereals for grain form a significant percentage of both the value of Australia's agricultural commodities and of the country's export earnings.

Wheat

Industry Profile

Wheat is Australia's most important crop. It is produced in all States but primarily on the mainland in a narrow crescent known as the wheat-belt. Inland of the Great Dividing Range, the wheat-belt stretches in a curve from central Queensland through New South Wales, Victoria and southern South Australia. In Western Australia, the wheat-belt continues around the south west of the State and some way north up the western side of the continent. The main physical determinants of the location of wheat production in Australia are total rainfall, its seasonal distribution and reliability, topography, soil type and soil fertility.

Wheat growing in Australia continues to be essentially a family business. Around 90 per cent of farms are owned by either a sole proprietor or family partnership. Few farmers employ more than one full-time assistant although contractors may often be used on a seasonal basis. About thirty-two thousand, or one in four, Australian farms grow wheat, which may be only one of several complementary activities undertaken on the farm, including growing of other crops and raising of various livestock.

Wheat is by far the largest and most valuable crop produced in Australia. The average annual gross value of wheat production approaches \$3 billion, generating up to around \$2.5 billion in annual export revenue. This represents about 13 per cent of the total value of farm production, 17 per cent of the value of total farm exports and over five per cent of Australia's total exports of goods and services. The wheat industry makes a substantial contribution to rural income and the economies of hundreds of rural communities. It also contributes significantly to Australia's total economic welfare through its positive impact on export earnings and the current account balance.

Australia in the world environment

Australia is a relatively small producer of wheat by world standards. Average production of about 15 million tonnes represents less than 3 per cent of the world total. By comparison, annual production of each of the USSR and China, the world's largest producers, is approaching 100 million tonnes. However, Australia exports about 85 per cent of its wheat production and is therefore much more significant in world trade terms. Average exports of just under 13 million tonnes make a considerable contribution to the 100 million tonnes of wheat traded each year. Australia is the world's fourth largest wheat exporter.

Wheat industry arrangements

Current industry arrangements have evolved over fifty years through a process of negotiation between all interested industry participants. Wheat Acquisitions Regulations were made on 21 September 1939 under the *National Security Act 1939*. These Regulations constituted the Australian Wheat Board (AWB) to 'purchase, sell and dispose of wheat and wheat products, and handle, store and ship wheat'. They were replaced by the *Wheat Industry Stabilization Act 1948*, when growers and governments at Commonwealth and State levels agreed on the need for organised marketing and a wheat stabilisation plan to provide security to the industry. The Australian Constitution divides powers between the Commonwealth Government and the State Governments. Complementary State legislation was therefore required to give effect to the provisions of Commonwealth legislation within the states. The 1948 Act applied for five years, from and including the 1948-49 season. It has been succeeded by a further eight Acts, the latest of which, the *Wheat Marketing Act 1989*, applies from 1 July 1989 and does not have a predetermined life span.

There have been a number of constant elements of the legislation-based industry arrangements: The AWB has been maintained as the central marketing and operating arm of the industry; sales revenue and marketing costs have been pooled on a seasonal and quality basis; and the Commonwealth has provided contingent support under predetermined conditions to reduce grower's price risk. There have also been some underlying

evolutionary developments in these industry arrangements: legislative specification of operational procedures has been reduced in conjunction with greater accountability of the AWB to Parliament and industry; the structure and level of Commonwealth support has become increasingly conservative; and there have been progressive endeavours to improve the timeliness and accuracy of international market price signals reflected to Australian wheat growers.

Role of the Australian Wheat Board

The AWB's objectives under the 1989 legislation are:

- to maximise the net returns to Australian wheat growers who sell pool-return wheat to the AWB by securing, developing and maintaining markets for wheat and wheat products and by minimising costs as far as is practicable; and
- by participating, in a commercial manner, in the market for grain and grain products to provide Australian grain growers, and especially wheat growers, with a choice of marketing options.

These objectives represent an expansion of the AWB's responsibilities from previous arrangements. Firstly, the requirement to maximise net returns obliges the AWB to minimise storage, handling and transport costs and so increases its direct responsibilities in this area. Secondly, conditional participation in markets for grain and grain products imposes a broader commercial charter covering other grains and value adding activities. Thirdly, the AWB is empowered to market grains other than wheat and is required to provide Australian grain growers with a choice of marketing options. In respect of this requirement, the AWB has become involved in marketing a range of non-wheat grains and will continue to make its expertise and skills available for the marketing of other non-regulated grains.

Export marketing

The AWB retains sole responsibility for marketing all Australian wheat produced for export, although it may also provide written consent for others to export wheat. The AWB is one of many competitors in the international market and must compete on commercial terms with all other participants. The AWB's market share is too small to enable it to exert monopoly influences on world markets, but significant benefits can nevertheless be achieved for Australian wheat growers through the AWB's central export seller role. These benefits include promotion and sale of Australian wheat as a distinct product with known and reliable quality; allocation of stocks to maximise aggregate returns and long term market opportunities; coordinated management of commodity, credit, exchange, freight, interest and other risk exposures; negotiation of long term agreements and establishment of credentials as a reliable supplier; economies of scale; increased bargaining power; and the diversification of growers' risk across markets.

Australia's wheat is traditionally exported to more than fifty different countries although a substantial proportion is accounted for by a limited number of major markets including the USSR, China, Egypt, Iraq, Iran and Japan. Exports are geographically diverse but centred on an area spanning from Egypt and the Middle East through South Asia, South East Asia, North Asia and the Pacific region. The AWB has endeavoured to combine excellent relations with the largest importers and intimate concern for the requirements of even the smallest customers. That strategy has been supported by progressive development of marketing support, technical assistance and promotional activities to develop and maintain customer loyalty to the AWB and Australian wheat. Those activities have concentrated in particular on the quality features of Australian wheat, namely its white, clean, dry and insect free characteristics. Regardless of the international marketing environment, these are perceived to be fundamental to the continuing success of Australia's wheat marketing activities.

The AWB has coordinated industry development of a comprehensive wheat quality program to ensure that Australia's wheat maintains its excellent international quality reputation. That

program is based on classification and varietal control which takes account of physical criteria such as test weight, moisture content and the percentage of foreign material. The other main determinants of wheat quality are protein content, grain hardness, dough properties and milling qualities. Of these, protein content has the greatest influence on overall processing quality. Although wheat varieties differ in their capacity to accumulate protein, protein content is principally determined by the environment. The other three quality factors are mainly related to wheat variety although there may be some environmental influence.

Domestic marketing

Under the 1989 legislation, the domestic market (except in Queensland) was deregulated through the removal of the AWB's compulsory acquisition powers and the termination of administered domestic pricing arrangements. Wheat for domestic use can now be freely traded by any operator. Growers have the choice of either selling for cash to the AWB or another buyer, or delivering their wheat to an AWB pool. The AWB has established a separate trading division to operate independently of the pool, thus enabling it to compete with other traders on the domestic market. In Queensland, domestic marketing arrangements continue to be regulated by State legislation.

Grower payment arrangements

A small proportion of wheat is traded and paid for on a commercial basis in the deregulated domestic market. The majority of wheat produced in Australia is delivered for marketing and payment within the AWB's pooling system. Criteria for establishment of pools include the period in which the wheat is delivered, the quality of the wheat and the delivery location. The pools are established to facilitate the equitable and cooperative distribution of costs incurred and returns generated from the marketing of wheat. A number of category pools are established for each season and further segregations or grades may be defined within the pools on the basis of quality, variety or other characteristics.

Payments are made in instalments to growers who deliver into the AWB's pooling system. The first payment is known as the Harvest Payment and is usually paid during the November–January period, within three weeks of delivery by the grower. This is by far the largest payment, amounting to approximately 80 per cent of the anticipated total payment. Another payment, the Post-Harvest Payment is calculated shortly after completion of the national harvest and paid during March. There may then be one or more subsequent payments, including a Final Payment, as sales revenues are received in excess of borrowings. Finalisation or 'realisation' of a pool may take a number of years since not all the wheat is sold immediately and some may be sold on credit terms ranging up to three years. A number of payment options are available to growers from the AWB for all payments except the Final Payment. These options provide growers with flexibility to enhance their financial management, including cash flow and tax planning aspects.

Financing grower payments

Wheat growers who deliver wheat to the AWB pooling system receive Harvest and Post-Harvest Payments well in advance of the subsequent sale of most of that wheat. The AWB finances those payments through an extensive domestic and international borrowing program worth up to about \$A3 billion annually. These borrowings are raised at competitive market rates from commercial financial institutions. The borrowings are subsequently retired as revenues are generated by wheat sales. The AWB's borrowings are concentrated in short-term facilities because of the seasonal structure of grower payments and wheat sales. The AWB has become the biggest commercial short-term borrower in Australia and one of the biggest in the world.

Under the 1989 legislation, the Commonwealth has introduced a significant change to industry support arrangements. Whereas the Commonwealth previously guaranteed the payment of a minimum price to growers each season, it now provides a guarantee for a predetermined proportion of the AWB pool return borrowings. That proportion will be

phased down from 90 per cent for the 1989-90 season to 80 per cent by the 1993-94 season.

WHEAT: AREA, PRODUCTION AND RECEIVALS

Season	Area(a)		Production(a)		Australian Wheat Board receivals(b)
	For grain	All purposes	Grain	Gross value	
	'000 ha	'000 ha	'000 tonnes	\$m	'000 tonnes
1983-84	12,931	13,025	22,016	3,605.6	21,059
1984-85	12,078	12,150	18,666	3,202.9	17,544
1985-86	11,682	11,766	15,999	2,693.7	15,085
1986-87	11,135	11,274	16,119	2,410.3	15,288
1987-88	9,005	9,141	12,287	2,015.7	10,740
1988-89	8,827	8,932	13,935	2,975.9	12,954

(a) Area and production data relate to the year ending 31 March. (b) Due to amendments to the *Wheat Marketing Act 1979*, the AWB has changed from a December-November to an October-September crop year.

WHEAT FOR GRAIN: AREA AND PRODUCTION, BY STATE

Season	NSW	Vic.	Qld	SA	WA	Tas.	Aust.
	AREA ('000 hectares)						
1983-84	3,999	1,614	1,006	1,564	4,746	2	12,931
1984-85	3,603	1,523	921	1,378	4,652	2	12,078
1985-86	3,663	1,508	973	1,443	4,148	2	11,682
1986-87	3,099	1,364	795	1,616	4,260	2	11,135
1987-88	2,464	1,026	646	1,556	3,312	1	9,005
1988-89	2,309	931	768	1,520	3,297	1	8,827
PRODUCTION ('000 tonnes)							
1983-84	8,961	3,971	1,922	2,843	4,316	3	22,016
1984-85	5,805	2,666	1,579	2,031	6,580	4	18,666
1985-86	5,898	2,316	1,686	1,781	4,313	4	15,999
1986-87	4,855	2,795	833	2,255	5,377	5	16,119
1987-88	3,997	1,882	718	1,803	3,882	4	12,287
1988-89	4,105	1,691	1,550	1,361	5,225	2	13,935

Coarse grains

In the late sixties and early seventies, restrictions on wheat deliveries and low returns in the sheep industry caused a resurgence of interest in coarse grain crops and the newer oilseed crops. The resultant higher level of plantings and production has been maintained, despite the lifting of wheat delivery quotas and a general improvement in market prospects for wheat, wool and meat.

Oats

Oats are traditionally a cereal of moist temperate regions. However, improved varieties and management practices have enabled oats to be grown over a wide range of soil and climatic conditions. They have a high feed value and produce a greater bulk of growth than other winter cereals; they need less cultivation and respond well to superphosphate and nitrogen. Oats have two main uses: as a grain crop, or as a fodder crop, (following sowing or fallow or rough sowing into stubble or clover pastures). Fodder crops can either be grazed and then harvested for grain after removal of livestock or else mown and baled or cut for chaff. Oats produced in New South Wales are marketed through a statutory board while the Victorian Oatgrowers' Pool and Marketing Company Ltd and private merchants market the bulk of oats produced in Victoria. In South Australia the Barley Marketing Act was amended in 1977 to give the Australian Barley Board powers over oat marketing in that State. Under the legislation amendments, the Board controls export

sales and grain resold on the local market; however, direct sales between producers and consumers are outside the Board's supervision. In Western Australia, oats are marketed under a warehousing system operated by Co-operative Bulk Handling Ltd.

Oats are usually next in importance to wheat and barley among the grain crops. About three-quarters of the crop is used domestically as stockfeed or for human consumption.

Barley

This cereal contains two main groups of varieties, 2-row and 6-row. The former is generally, but not exclusively, preferred for malting purposes. Barley is grown principally as a grain crop although in some areas it is used as a fodder crop for grazing, with grain being subsequently harvested if conditions are suitable. It is often grown as a rotation crop with wheat, oats and pasture. When sown for fodder, sowing may take place either early or late in the season, as it has a short growing period. It may therefore provide grazing or fodder supplies when other sources are not available. Barley grain may be crushed to meal for stock or sold for malting.

Crops sown for malting purposes require a combination of light textured soil of moderate fertility, reliable rainfall, and mild weather during ripening. The main barley-growing areas in Australia are situated in South Australia, but considerable quantities are also grown in New South Wales, Western Australia, Victoria and Queensland. In December 1980, a joint Commonwealth-industry research scheme for the barley industry commenced operation. The scheme is financed by a levy on barley production and a Commonwealth contribution not exceeding the total of the levy.

Barley is marketed by statutory marketing authorities in each of the mainland States. The Australian Barley Board controls marketing in both South Australia and Victoria, while separate authorities operate in the three other States.

Grain sorghum

The sorghums are summer growing crops which are used in three ways: grain sorghum for grain; sweet or fodder sorghum, sudan grass and, more recently, columbus grass for silage, green feed and grazing; and broom millet for brooms and brushware.

Grain sorghum has been grown extensively only in the last two decades. Rapid increases in production have resulted in a substantial increase in exports over this period. The grain is used primarily as stockfeed and is an important source for supplementing other coarse grains for this purpose.

The climatic conditions of Queensland and northern New South Wales are particularly suited to the growing of sorghum. In Queensland, grain sorghum production is concentrated in the Darling Downs, Fitzroy and Wide Bay-Burnett Divisions. In New South Wales, the northern and north-western slopes and plains are the main areas.

In Queensland, a degree of orderly marketing is ensured by the operation of the Central Queensland Grain Sorghum Marketing Board (a statutory authority in a defined area in central Queensland). A State statutory marketing board handles sorghum grown in New South Wales.

Maize

Like sorghum, maize is a summer cereal demanding specific soil and climatic conditions. Maize for grain is almost entirely confined to the south-east regions and Atherton Tablelands of Queensland; and the north coast, northern slopes and tablelands and the Murrumbidgee Irrigation Area in New South Wales. Small amounts are grown in all States, except South Australia, for green feed and silage, particularly in association with the dairy industry.

A statutory board controls the marketing of maize in the Atherton Tablelands area of Queensland. A large proportion of the crop is sold directly to food processors.

Rice

In Australia, rice was first grown commercially in 1924–25 in the Murrumbidgee Irrigation Area, one of three irrigation areas in southern New South Wales where rice is now produced. Today, about 97 per cent of Australia's rice is grown in New South Wales. The remainder is grown in the Burdekin River basin and at Mareeba in northern Queensland.

Rice is a summer growing crop in New South Wales. The combination of irrigation water and the relatively cloudless days characteristic of summers in temperate regions of the world is the main contributing factor to the very high yields per hectare often achieved by New South Wales growers. In Queensland, a winter and a summer crop are grown.

State statutory marketing boards are responsible for the marketing of the New South Wales and Queensland crops.

Oilseeds

Specialised oilseeds

The oilseeds industry is a relatively young industry by Australian agricultural standards. Production has increased rapidly in recent years following changes in relative profitability and agronomic advances. The expected profitability of oilseeds relative to crops such as wheat and coarse grains will continue to influence future production levels in the industry. This profitability will be related to domestic and international markets for protein meals and vegetable fats and oils.

The specialist oilseed crops grown in Australia are sunflower, soybeans, rapeseed, safflower and linseed. Sunflower and soybeans are summer grown while the others are winter crops. In Australia, oilseeds are crushed for their oil, which is used for both edible and industrial purposes and protein meals for livestock feeds.

Oilseed crops are grown in all States but the largest producing regions are the grain growing areas of the eastern States.

For area, production and gross value of several oilseed crops, see Crops: area, production and gross value in the Crops section of this chapter.

Sunflower

When crushed, sunflower seed yields a high quality dual purpose oil used primarily to manufacture margarine, salad and cooking oils.

Queensland produces about two-thirds of the Australian crop with the Darling Downs and Central Highlands being the major regions. New South Wales is the next largest producer with the north-west of the State dominating production. Smaller amounts are produced in all other States except Tasmania.

Soybeans

The major uses of soybean oil are in salad and cooking oils and margarine. Small amounts are used in the production of paints, detergents and plastics. Soybeans also yield a high protein feed for livestock with a small proportion used to manufacture adhesives and synthetic fibres and meats.

Queensland and New South Wales produce virtually all of Australia's soybean crop. The main producing areas are the irrigation districts of the Darling Downs and northern New South Wales. Lesser areas include the Burnett and Lockyer regions of Queensland, while production of raingrown soybeans is expanding on the North Coast of New South Wales.

In irrigated areas, soybeans have increasingly been used as a rotational crop for cotton.

Rapeseed

The main use of rapeseed oil has been in salad and cooking oils and in margarine with a small amount being used for industrial purposes.

The major production areas are the tablelands and western slopes of New South Wales followed by the south-east of South Australia and the Western Districts of Victoria. Smaller levels of production occur in the South Coast region of Western Australia.

Following significant increases in the 1960s and 1970s, rapeseed production declined rapidly due to problems of blackleg disease and erucic acid content. Production has recovered in recent years with the development of varieties to overcome these problems and in response to the crop rotation benefits of rapeseed.

Safflower

The oil from safflower is used in the production of cooking oil, margarine, soaps, paints, varnishes, enamels and textiles. In recent years, New South Wales and Queensland together have produced around 90 per cent of Australian output. In Queensland, most production occurs in the Central Highlands with smaller amounts coming from the Dawson–Callide Valley and the Darling Downs. New South Wales production is centred on the Central West.

Wide fluctuations in safflower production since the mid 1960s have been due to variable seasonal conditions affecting yields and the profitability of other crops which has influenced plantings.

Linseed

The oil from crushed linseed is used in the manufacture of paints, varnishes, technical inks and linoleum.

The main producing areas are the wheat belt of New South Wales, the Darling Downs in Queensland, the Western Districts of Victoria and, to a lesser extent, the south-eastern districts of Victoria. Linseed production has been generally declining in recent years.

Other oilseeds

Peanuts and cottonseed are summer crops grown primarily for human consumption and fibre purposes respectively. The rapid expansion of the cotton industry in recent years has resulted in cottonseed becoming the major oilseed in Australia. Cottonseed oil is used mainly in the manufacture of compound cooking fats and margarine. The least important source of vegetable oils in Australia is peanuts as it is only the low quality kernels which are crushed for oil. Crushings may vary between 3,000 and 7,000 tonnes per annum depending on the quality of the crop. Peanut oil is a high quality oil which is used in the manufacture of margarine and in compound cooking fats and is also used as a cooking and salad oil.

Peanuts

The major peanut growing areas are around Kingaroy in south-east Queensland and the Atherton Tablelands in North Queensland, with smaller pockets of production around Tweed Heads in New South Wales and around Douglas in the Northern Territory.

About 80 per cent of peanuts grown in Australia are of Virginia variety, the remainder being of Spanish types.

Local demand for peanuts and peanut products is comparatively static with a limited potential for growth corresponding to population growth. The local growing industry normally supplies most of the domestic demand for edible peanuts in its major outlets: peanut butter, packaged trade and confectionery. Any surplus is sold on export markets. Exports vary according to the size of the crop.

Cotton

Cotton is grown primarily for its fibre (lint). When the cotton is matured, seed cotton is taken to a gin where it is separated (ginned) into lint, seed and thrash. Lint is used for yarn while seed is further processed at an oil mill. There the short fibres (linters) remaining on the seed after ginning are removed. They are too short to make into cloth but are used for wadding, upholstery and paper. The seeds are then separated into kernels and hulls. Hulls are used for stock feed and as fertiliser, while kernels are crushed to extract oil. The remaining cake is ground into meal which is protein roughage used as stock feed.

Over three-quarters of Australia's total production of cotton lint is grown in New South Wales, principally in the Namoi, Macquarie, Gwydir and McIntyre Valleys and the Bourke area. Irrigation water for these areas is provided from the Keepit, Burrendong, Copeton and Glenlyon Dams and the Darling River. The rest is grown in Queensland, in the Emerald, Biloela, St George, and Darling Downs areas. Most of these areas are also irrigated. Australian production has for some time satisfied most of the requirements of local mills for short and medium staple cotton. Since the mid 1970s there has been very strong investment growth in the cotton industry and the resultant surge in plantings has resulted in large amounts of cotton becoming available for export.

COTTON: AREA, PRODUCTION AND EXPORTS

Year	Area '000 ha	Seed cotton(a)		Cotton- seed(b) '000 tonnes	Lint '000 tonnes	Raw cotton export	
		Quantity '000 tonnes	Gross value \$m			Quantity '000 tonnes	Value f.o.b. \$m
1983-84	137	401	268.8	230	141	82	147.9
1984-85	183	679	330.2	410	248	140	259.6
1985-86	177	685	324.9	366	259	241	378.4
1986-87	156	612	372.5	418	214	251	344.7
1987-88	245	762	425.1	435	281	176	353.0
1988-89	194	813	565.8	449	286	286	460.0

(a) Before ginning. (b) Estimated by the Australian Bureau of Agricultural and Resource Economics.

Sugar

Sugar cane is grown commercially in Australia along the east coast over a distance of some 2,100 kilometres in a number of discontinuous areas from Maclean in northern New South Wales to Mossman in Queensland. The geographical spread contributes to the overall reliability of the sugar cane crop and to Australia's record as a reliable sugar supplier.

Approximately 95 per cent of production occurs in Queensland, with some 75 per cent of the crop grown north of the Tropic of Capricorn in areas where rainfall is reliable and the warm, moist and sunny conditions are ideal for the growing of sugar cane. Farm sizes range between 20 and 70 hectares.

Australian cane farmers are regarded as amongst the most efficient in the world and employ a high degree of mechanisation in ploughing, planting, harvesting, and transportation activities. The Australian industry was the first in the world to introduce mechanical cultivation and harvesting techniques and by 1964 the entire industry had converted to bulk handling.

The cane crop is generally planted in April-May and harvested from June to December the following year. The major proportion of each year's crop is from ratoons while in New South Wales most crops are allowed to grow for two seasons due to the slower growing conditions.

The organisation of the Australian sugar industry is complex. The Queensland Government controls the quantity of raw sugar produced through a system of mill peaks which is translated into cane quotas for growers. In addition the Queensland Government contracts with CSR Limited and Millaquin Sugar Company Pty Limited for the refining, marketing and distribution of home consumption needs, arranges through CSR Limited the export marketing of raw sugar, and regulates the division of industry proceeds between growers and millers.

There are 33 raw sugar mills located throughout the growing regions: 30 are located in Queensland and the remaining three in New South Wales. Fifteen of the mills are cooperatively owned by canegrowers and the remaining eighteen by proprietary companies. Refineries are located in each mainland capital city and at Bundaberg. The six bulk sugar export terminals located in Queensland are at present capable of storing 2.9 million tonnes. While raw sugar is the main product from mills, important by-products are bagasse (fibre), molasses, ash and filter mud.

In recent years sugar cane production has been around 24 million tonnes yielding between 2.8 and 3.3 million tonnes of sugar. Area, production and yield levels for sugar cane from 1983-84 to 1988-89 are provided in the following table.

SUGAR CANE: AREA, PRODUCTION AND YIELD

Year	New South Wales					Queensland				
	Sugar cane cut for crushing			Raw sugar(a)		Sugar cane cut for crushing			Raw sugar(a)	
	Area harvested	Production	Yield	Quantity	Yield	Area harvested	Production	Yield	Quantity	Yield
	'000 ha	'000 tonnes	t/ha	'000 tonnes	t/ha	'000 ha	'000 tonnes	t/ha	'000 tonnes	t/ha
1983-84	15	1,468	96.7	159	10.5	292	22,723	77.8	3,012	10.3
1984-85	15	1,540	103.6	199	13.4	298	23,910	80.3	3,349	11.2
1985-86	15	1,398	91.1	170	11.1	288	23,004	79.8	3,209	11.1
1986-87	24	1,276	93.2	168	7.0	287	23,466	81.8	3,202	11.2
1987-88	27	1,632	60.4	195	7.2	360	23,200	64.4	3,483	9.7
1988-89	15	1,560	104.0	196	13.1	302	25,586	85.9	3,483	11.5

(a) In terms of 94 net titre.

The domestic market is reserved entirely for sugar produced in Australia. This is achieved by an embargo on the import of sugar. The maximum price of refined sugar for sale to wholesalers and manufacturers is fixed each six months under a formula contained in the Commonwealth-Queensland Sugar Agreement.

Domestic sales account for about 760,000 tonnes annually or approximately 20 per cent of the total industry sales. Granulated sugars account for about 75 per cent of the total domestic sales with liquid sugars (15 per cent), castor sugar (5 per cent), and raw sugar taking up the bulk of the remainder. About two-thirds of the sales of refined sugar products go to processed food and drink manufacturers.

The Australian sugar industry exports about 75 per cent of its annual raw sugar production and is one of the world's largest sugar exporters.

Australia has regularly participated in arrangements to regulate the international sugar market and was a signatory to the 1984 International Sugar Agreement (ISA). The Agreement is an administrative pact only, and unlike previous Agreements contains no economic provisions. This means that member countries are not constrained in their sugar exports.

Vegetables

Vegetables for human consumption

The area sown to vegetables reached a peak of over 200,000 hectares in 1945, but has remained static at around 109,000 hectares since 1975-76. However, yields from most vegetable crops have increased due to variety breeding for increased yields, greater use of irrigation and better control of disease and insect pests.

Because of the wide climatic range in Australia, supplies for main city markets are drawn from widely different areas, depending on the times of maturity of the various crops. Historically, market gardens were located near urban centres and, while many small scale growers still produce crops close to city markets, urban expansion, rising urban land values, improvements in transport and irrigation, and developments in freezing, canning and drying have extended the industry far from the cities. Transport costs are reduced by the location of processing establishments in producing areas, although city markets still absorb the bulk of fresh and processed produce.

For further information on vegetables see *Year Book* No. 70.

VEGETABLES FOR HUMAN CONSUMPTION: AREA UNDER PRODUCTION

Year	French and runner beans	Cabb- ages	Carrots	Cauli- flowers	Onions	Green peas	Potatoes	Tomatoes	Total vege- tables
1983-84	6.7	2.5	4.3	3.4	3.8	12.2	37.9	9.1	109.9
1984-85	6.3	2.4	4.6	3.6	4.4	11.4	38.4	9.3	111.0
1985-86	5.9	2.3	4.3	3.6	4.5	11.2	36.1	9.5	110.7
1986-87	5.9	2.9	4.6	3.7	4.3	11.7	36.7	8.6	111.3
1987-88	6.0	2.8	4.6	3.4	5.0	11.2	39.8	8.9	116.7
1988-89	6.9	2.2	4.8	3.5	5.3	11.9	37.6	9.1	119.0

PRODUCTION OF VEGETABLES FOR HUMAN CONSUMPTION

Year	French and runner beans	Cabb- ages	Carrots	Cauli- flowers	Onions	Green peas		Potatoes	Tomatoes
						Process- ing (shelled weight)	Sold in pod (pod weight)		
PRODUCTION ('000 tonnes)									
1983-84	32.3	72.3	124.3	84.4	115.9	44.0	2.1	1,019.8	258.3
1984-85	31.1	69.5	130.6	101.1	151.7	41.8	2.1	992.1	270.5
1985-86	31.3	69.1	127.6	103.8	159.7	39.7	1.5	964.9	252.6
1986-87	29.4	82.9	146.0	91.6	164.7	33.4	1.2	1,015.2	266.0
1987-88	32.7	80.1	144.0	112.2	181.7	43.0	1.2	1,081.5	282.6
1988-89	35.5	87.8	148.7	79.6	196.3	46.0	1.1	1,048.0	318.6

For further information on vegetables see the following publications: *Crops and Pastures, Australia* (7321.0), (ceased 1986-87) *Summary of Crops, Australia* (7330.0) (first issue 1987-88). *Apparent Consumption of Foodstuffs and Nutrients, Australia* (4306.0) *Value of Agricultural Commodities Produced, Australia* (7503.0), and *Year Book* No. 70.

Fruit (Excluding Grapes)

A wide variety of fruit is grown in Australia ranging from pineapples, mangoes and papaws in the tropics to pome, stone and berry fruits in the temperate regions.

In recent years there has been rapid expansion in the cultivation of many relatively new fruit crops in Australia and there is considerable scope for continued growth in the future.

Avocado is perhaps the most commonly known of these crops and production has expanded considerably during the past decade to a current gross value of over \$10 million. Avocado production is mainly in Queensland and New South Wales with minor quantities produced in Western Australia, South Australia and Victoria.

Kiwi fruit is a relatively new temperate fruit crop to Australia. Production has been expanding rapidly mainly in Victoria and New South Wales and further expansion is expected. Of the berry fruits, strawberries are widely grown, with largest production in Victoria and Queensland. Interest in the production of blueberries in Australia has developed only recently and plantings of blueberries have increased rapidly mainly in Victoria and New South Wales. Other berries (currants and raspberries) are grown predominantly in Tasmania and production has been reasonably constant over the past five years.

Tropical fruit such as mangoes, papaws, passionfruit, custard apples and guavas, are grown mainly in Queensland. Smaller quantities of tropical fruit are produced in the north coast region of New South Wales, Western Australia and more recently the Northern Territory. The largest expansion has been of mango production which has more than doubled since 1979. Given the large number of non-bearing mango trees, production is expected to continue to increase dramatically. There is also considerable interest in many other exotic tropical and subtropical fruits. Production of lychees and persimmons has recently commenced and some plantings of rambutan, sapote and longans have been made, mainly in Queensland and the north coast region of New South Wales.

SELECTED FRUIT STATISTICS

Year	Orchard fruit: number of trees ('000)				Tropical and other fruits: area (ha)			Total area of fruit (ha)
	Apples	Oranges	Pears	Peaches	Bananas	Pineapples	Other fruit	
1983-84	6,066	6,397	1,584	1,646	9,282	6,011	2,085	107,534
1984-85	6,147	6,657	1,548	1,696	9,205	6,268	2,272	109,095
1985-86	6,397	6,777	1,592	1,793	9,640	6,325	2,432	112,655
1986-87	6,350	6,897	1,552	1,797	9,391	3,762	1,245	107,492
1987-88	6,555	6,873	1,779	1,867	9,195	6,269	2,024	166,100
1988-89	6,810	7,122	2,028	2,004	9,319	6,660	1,239	119,756

Year	Apples	Apricots	Bananas	Cherries	Oranges	Peaches	Pears	Pine- apples	Plums and prunes
PRODUCTION ('000 tonnes)									
1983-84	267.0	23.6	146.4	3.5	391.8	48.3	122.1	115.1	20.0
1984-85	352.0	24.5	144.8	3.8	445.0	59.8	138.5	124.5	20.6
1985-86	292.1	29.6	134.4	3.9	496.2	61.4	142.9	131.6	21.7
1986-87	325.0	27.0	157.7	4.0	504.0	61.1	145.0	142.3	22.0
1987-88	300.0	28.0	160.1	5.0	479.0	66.0	162.0	146.5	18.0
1988-89	323.0	27.9	195.8	4.0	399.2	51.9	142.1	154.4	19.9

GROSS VALUE OF PRODUCTION (\$ million)									
1983-84	134.1	17.6	86.8	8.7	105.3	25.4	45.9	26.2	17.5
1984-85	178.3	19.7	93.2	10.8	131.9	28.3	50.7	33.5	19.8
1985-86	139.0	24.5	101.7	9.5	132.5	29.3	63.7	32.6	23.5
1986-87	204.5	25.5	126.7	11.9	126.1	40.9	76.8	42.0	25.2
1987-88	185.8	31.7	132.6	16.2	146.4	48.1	77.7	41.4	22.9
1988-89	239.3	31.0	141.6	15.3	181.7	45.2	66.0	44.5	28.3

For further data on fruits and fruit products see the publications *Fruit, Australia* (7322.0) (ceased 1986-87), *Summary of Crops, Australia* (7330.0) (first issue 1987-88), *Production Bulletin No. 3: Food, Drink and Tobacco, Australia* (8359.0), *Apparent Consumption of Foodstuffs and Nutrients, Australia* (4306.0) and *Value of Agricultural Commodities Produced, Australia* (7503.0).

Grapes

Grapes are a temperate crop which require warm to hot summer conditions for ripening and predominantly winter rainfall. Freedom from late spring frosts is essential. They are grown for wine-making, drying and, to a lesser extent, for table use. Some of the better known wine producing areas are the Barossa, Clare, Riverland, Southern Districts and Coonawarra (SA); North-Eastern Victoria and Great Western (Vic.); Hunter and Riverina (NSW); Sunraysia (NSW and Vic.); Swan Valley and Margaret River (WA).

Nearly all the dried fruit is produced along the River Murray and its tributaries in Victoria and New South Wales with small localised areas in other States.

VITICULTURAL STATISTICS: AREA, PRODUCTION AND VALUE

Year	Area		Productions: grapes used for—			
	Bearing	Total	Winemaking	Drying	Total(a)	
					Quantity	Gross value
'000 ha	'000 ha	'000 tonnes fresh weight	'000 tonnes fresh weight	'000 tonnes fresh weight		\$m
1983-84	60	65	495	320	841	217.0
1984-85	60	64	559	297	890	259.4
1985-86	60	64	510	359	907	270.0
1986-87	54	57	477	262	783	272.2
1987-88	54	57	460	293	799	353.7
1988-89	54	57	563	248	859	462.4

(a) Includes grapes used for table and other purposes.

Multipurpose grapes are used predominantly for winemaking and drying, the latter process being particularly susceptible to adverse seasonal conditions. Australian exporters have made significant sales on international markets. The Australian Dried Fruits Corporation is the body responsible for the organisation of the export trade in dried vine fruits. The Corporation also administers the statutory Dried Vine Fruits Equalisation Scheme and the Dried Sultana Production Underwriting Scheme.

VITICULTURE: AREA AND PRODUCTION BY VARIETY, 1989 SEASON(a)

	Area of vines at harvest			Grubbings (actual and/or intended)	Production			
	Bearing	Not yet bearing	All vines		Grapes used for—			Total
					Wine- making	Drying	Other	
	—hectares—			—tonnes (fresh weight)—				
Red grapes—								
Cabernet								
Sauvignon	3,398	485	3,883	22	31,178	20	20	31,218
Currant (incl. Carina)	1,259	69	1,327	60	659	13,934	36	14,629
Grenache	2,195	26	2,221	51	33,640	—	116	33,756
Mataro	655	4	659	16	10,107	—	93	10,200
Pinot Noir	654	279	933	—	6,011	—	—	6,011
Shiraz	4,728	163	4,891	31	57,691	—	172	57,863
Other red grapes	3,127	596	3,724	96	15,330	122	11,898	27,350
Total red grapes	16,016	1,622	17,638	276	154,616	14,076	12,313	181,027

For footnotes see end of table.

VITICULTURE: AREA AND PRODUCTION BY VARIETY, 1989 SEASON(a)—*continued*

	Area of vines at harvest			Grubbings (actual and/or intended)	Production			Total
	Bearing	Not yet bearing	All vines		Grapes used for—			
					Wine- making	Drying	Other	
—hectares—				—tonnes (fresh weight)—				
White grapes—								
Chardonnay	2,788	954	3,742	12	28,419	—	6	28,425
Doradillo	964	4	967	56	23,126	—	39	23,165
Muscat Blanc	482	7	487	9	6,736	—	36	6,771
Muscat Gordo								
Blanco	3,753	91	3,844	83	82,550	7,102	183	89,836
Palomino and								
Pedro Ximenes	1,361	10	1,371	57	22,371	—	70	22,441
Rhine Riesling	3,555	51	3,606	21	41,176	—	32	41,208
Semillon	2,573	135	2,708	32	40,127	—	88	40,216
Sultana	15,296	543	15,839	226	75,468	220,866	26,686	323,020
Waltham Cross	1,058	15	1,073	56	4,093	6,111	2,550	12,734
Other white grapes	5,839	496	6,336	118	84,260	139	5,544	89,943
<i>Total white grapes</i>	<i>37,669</i>	<i>2,306</i>	<i>39,975</i>	<i>671</i>	<i>408,326</i>	<i>234,218</i>	<i>35,234</i>	<i>677,779</i>
Total grapes	53,686	3,925	57,613	947	562,922	248,294	47,549	858,785

(a) Varietal data not collected in Northern Territory and the Australian Capital Territory.

Wine industry

Australia produces a wide range of wine and brandy products. Over the past twenty years there has been a distinct trend towards greater production and consumption of unfortified or table wines. In the twelve months ending June 1989 sales of table wine accounted for nearly 77 per cent of all sales of Australian wine. The large growth in table wine sales has been principally due to the successful marketing of wine in 'casks' (usually fibreboard, box-shaped, 4 litre containers equipped with dispensing faucets).

While imports of wine are relatively insignificant (9.7 million litres in 1988–89), exports are becoming increasingly important and now account for 8.1 per cent of production. Legislation reconstructing the Australian Wine and Brandy Corporation as the body responsible for the control of the export trade in wine, brandy and grape spirit products was enacted in June 1986. The Corporation has the power to regulate exports as well as organise promotion and publicity functions in export markets and in Australia.

Fodder crops

As well as crops specifically for grain, considerable areas of Australia are devoted to fodder crops. These crops are utilised either for grazing (as green feed), or conserved as hay, ensilage, etc.

This development of fodder conservation as a means of supplementing pasture and natural sources of stockfeed is the result of the seasonal and comparatively unreliable nature of rainfall in Australian agricultural areas.

FODDER CROPS: AREA AND PRODUCTION

Year	Hay(a)				
	Area	Production		Green feed or silage(b)	
		'000 ha	Quantity '000 tonnes	Gross value \$m	Area '000 ha
1983-84	377	1,262	99.5	896	698
1984-85	258	846	60.3	876	502
1985-86	252	773	64.5	1,005	603
1986-87	306	942	79.1	1,190	679
1987-88	344	1,003	85.8	1,313	878
1988-89	323	1080	106.8	1,152	825

(a) Principally oaten and wheaten hay. (b) Principally from oats, barley, wheat and forage sorghum.

Lupins

Lupins are grown primarily as a grain crop, but grazing of standing crops and stubble is also an important use. Because of their high protein content, lupins are becoming increasingly important in livestock feed and for human consumption, particularly in some of the Asian countries.

There has been a significant expansion of lupin production in recent years, particularly in Western Australia which is the major producer and exporter of lupins. Smaller quantities are also grown in New South Wales, Victoria and South Australia mainly for domestic use.

FARMSTOCKS OF CEREAL GRAINS, HAY AND SILAGE ('000 tonnes)

At 31 March	Cereal grains				
	Barley	Oats	Wheat	Hay	Silage
1984	627	1,705	1,021	6,789	642
1985	684	1,479	910	5,872	697
1986	863	1,381	1,176	5,179	835
1987	729	1,406	1,045	5,783	817
1988	693	1,366	962	4,972	757
1989	702	1,550	1,028	5,550	975

Tobacco

Tobacco is a summer-growing annual which requires a temperate to tropical climate, adequate soil moisture and a frost-free period of approximately five months. In Australia, all tobacco is grown under irrigation. Because of specialised requirements, production is limited to areas with suitable soils and climate. The main centres of production are the Mareeba-Dimbulah districts of north Queensland and Myrtleford in north-eastern Victoria. Other areas where tobacco is grown include Bundaberg, Beerwah and Texas (Queensland) and Yetman and Coraki (New South Wales). All tobacco grown in Australia is of the flue-cured type except for small quantities of burley tobacco produced mainly in Victoria.

Livestock

Since 1861, annual enumerations of livestock have been made, based with few exceptions on actual collections made through the agency of the State police or by post. Particulars concerning the numbers of each of the principal kinds of livestock in Australia at ten-yearly intervals from 1861 to 1971, and then from 1981 on by single years, are given in the following table.

LIVESTOCK, AUSTRALIA
(^{'000})

<i>Year</i>	<i>Cattle</i>	<i>Sheep</i>	<i>Pigs</i>	<i>Year</i>	<i>Cattle</i>	<i>Sheep</i>	<i>Pigs</i>
1861	3,958	20,135	351	1961	17,332	152,579	1,615
1871	4,276	41,594	543	1971	24,373	177,792	2,590
1881	7,527	62,184	816	1981	25,168	134,407	2,430
1891	10,300	97,881	891	1982	24,553	137,976	2,373
1901	8,640	70,603	950	1983	22,478	133,237	2,490
1911	11,745	98,066	1,026	1984	22,161	139,242	2,527
1921	13,500	81,796	674	1985	22,784	149,747	2,512
1931	11,721	110,568	1,072	1986	21,820	146,776	2,512
1941	13,256	122,694	1,797	1987	21,915	149,157	2,611
1951	15,229	115,596	1,134	1988	21,851	152,443	2,706
				1989	22,434	161,603	2,671

While livestock numbers (particularly sheep) have increased substantially since 1861, marked fluctuations have taken place during the period, mainly on account of widespread droughts which have from time to time left their impressions on the pastoral history of Australia.

The years in which the numbers of livestock attained their peaks are as follows: cattle, 1976 (33,434,000); sheep, 1970 (180,080,000); and pigs, 1973 (3,259,000).

Cattle

Cattle-raising is carried out in all States, the main object in certain districts being the production of stock suitable for slaughtering purposes and in others the raising of dairy herds. While dairy cattle are restricted mainly to southern and to coastal districts, beef cattle are more widely distributed. Cattle numbers in Australia increased slowly during the 1960's and 1970s, despite seasonal changes and heavy slaughterings, to a peak of 33.4 million in 1976. There was a continuous decline, aggravated by drought conditions, to 22.2 million in 1984. Improved seasonal conditions and higher export prices in 1984 encouraged producers to commence rebuilding herds and numbers have since increased.

Beef cattle production is often combined with cropping, dairying and sheep. In the northern half of Australia, cattle properties and herd size are very large, pastures are generally unimproved, fodder crops are rare and beef is usually the only product. The industry is more intensive in the south because of the more favourable environment including more improved pasture.

For further details on cattle, see *Livestock and Livestock Products, Australia* (7221.0).

CATTLE NUMBERS, BY AGE, SEX, PURPOSE
(^{'000})

<i>Classification</i>	<i>31 March—</i>					
	<i>1984</i>	<i>1985</i>	<i>1986</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>
Milk cattle—						
Bulls used or intended for service	46	45	42	37	36	36
Cows, heifers and heifer calves	2,693	2,697	2,625	2,561	2,506	2,476
House cows and heifers	66	63	45	41	38	34
<i>Total</i>	<i>2,805</i>	<i>2,806</i>	<i>2,712</i>	<i>2,639</i>	<i>2,581</i>	<i>2,546</i>
Meat cattle—						
Bulls used or intended for service	498	524	512	513	528	551
Cows and heifers (1 year and over)	9,965	10,274	9,775	9,795	9,818	10,120
Calves under 1 year	4,455	4,897	4,598	4,738	4,716	4,816
Other cattle (1 year and over)	4,438	4,282	4,223	4,230	4,207	4,402
<i>Total</i>	<i>19,356</i>	<i>19,978</i>	<i>19,108</i>	<i>19,276</i>	<i>19,270</i>	<i>19,888</i>
Total, all cattle	22,161	22,784	21,820	21,915	21,851	22,434

CATTLE NUMBERS
(’000)

<i>31 March</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>NT</i>	<i>Aust. (incl. ACT)</i>
1984	5,036	3,487	9,154	813	1,730	542	1,390	22,161
1985	5,226	3,576	9,413	846	1,674	554	1,484	22,784
1986	4,790	3,383	9,208	854	1,608	509	1,456	21,820
1987	4,868	3,478	9,011	912	1,660	535	1,439	21,915
1988	4,962	3,474	8,825	947	1,705	542	1,385	21,851
1989	5,329	3,509	8,994	943	1,702	560	1,388	22,434

Sheep

With the exception of a short period in the early 1860s, when the flocks in Victoria outnumbered those of New South Wales, the latter State has occupied the premier position in sheep raising. Western Australia is the second largest sheep raising State, followed by Victoria. Sheep numbers reached a peak of 180.0 million in Australia in 1970. They then declined rapidly up to March 1973 as producers turned off large numbers for slaughter and moved from wool-growing towards grain and beef production. By 1975, the numbers had again increased to 151.7 million, but in March 1978 the numbers had fallen to 131.4 million, the lowest since 1955. The increase in flock numbers to 139.2 million in March 1984 reflects flock rebuilding by producers in response to favourable seasonal conditions beginning in the autumn of 1983, improved lambing rates, and a favourable outlook for wool and live sheep enterprises. This trend continued and, in March 1989, flock numbers reached 161.6 million. Poorer market prospects for both wool and live sheep exports are affecting the 1990-91 season.

SHEEP NUMBERS
(millions)

<i>31 March</i>	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>Aust. (incl. NT, ACT)</i>
1984	51.0	24.6	13.0	16.4	29.5	4.6	139.2
1985	55.5	26.5	14.0	17.3	31.6	4.8	149.7
1986	51.5	25.7	14.2	17.5	32.9	4.8	146.8
1987	52.2	26.6	14.6	17.2	33.5	5.0	149.2
1988	54.9	27.0	14.4	17.4	34.0	4.7	152.4
1989	59.1	28.1	14.9	17.4	37.1	4.9	161.6

SHEEP, BY AGE AND SEX
(millions)

<i>31 March</i>	<i>Sheep: 1 year and over</i>				<i>Lambs and hoggets (under 1 year)</i>	<i>Total, sheep and lambs</i>
	<i>Rams</i>	<i>Breeding ewes</i>	<i>Other ewes</i>	<i>Wethers</i>		
1984	1.7	70.3	4.9	30.5	31.8	139.2
1985	1.8	71.0	5.4	33.3	38.3	149.7
1986	1.8	72.1	6.6	38.7	36.3	155.6
1987	1.7	72.1	4.2	37.5	33.6	149.2
1988	1.7	71.6	4.3	39.1	35.7	152.4
1989	1.8	74.8	4.7	43.7	36.6	161.6

The combined value of wool and sheep slaughtered during 1988-89 is estimated at 31.4 per cent of the gross value of agricultural commodities. This proportion varies with wool and meat prices and seasonal conditions. Australia has about 14 per cent of the world's woolled sheep but produces around 30 per cent of the world's greasy wool. In

addition, in the year ended 30 June 1989 the sheep industry produced 768,718 tonnes of mutton and lamb. Exports of live sheep for slaughter during the same period totalled 6.9 million head, with Kuwait and Saudi Arabia accounting for 66 per cent of the total.

Pigs

Over the past 30 years there have been significant changes to the structure of the Australian pig industry. Initially, pigs were raised as part of a dairying operation where there were abundant supplies of liquid skim milk. Today, however, with introduction of factory separation of milk and cream, coupled with the low grain prices of the 1960s, pig raising has become more and more associated with grain production.

In addition there has been a major move away from the so called extensive method of pig raising to the intensive conditions that apply today. This has meant an increase in the capital investment in the industry and a greater degree of specialisation in pig raising. The average pig production unit today would be based on approximately 300 sows with feeds being almost exclusively grain based.

PIGS NUMBERS (*000)

31 March	NSW	Vic.	Qld	SA	WA	Tas.	Aust. (incl. NT, ACT)
1984	799	404	556	417	300	48	2,527
1985	814	410	563	402	274	47	2,512
1986	782	427	574	408	275	42	2,512
1987	830	432	579	422	295	46	2,611
1988	853	437	617	441	307	48	2,706
1989	855	423	611	450	285	45	2,671

Poultry

The commercial poultry industry comprising hatchery workers, egg producers and broiler growers is highly specialised, although a proportion of production comes from 'backyard' egg producers. There are separate research schemes, funded jointly by industry and government, for the egg and meat chicken industries. Both sectors are good examples of specialised, large scale, capital-intensive production.

POULTRY NUMBERS(a) (*000)

31 March	Chickens			Other poultry			Total all poultry
	Hens and pullets for egg production	Meat strain chickens (broilers)	Total chickens(b)	Ducks	Turkeys	Other poultry	
1984	14,075	31,318	47,529	370	535	239	48,673
1985	13,497	33,761	50,109	219	653	293	51,273
1986	13,646	35,497	51,565	282	579	365	52,791
1987	13,506	39,187	55,579	350	1,249	430	57,608
1988	13,463	47,988	64,201	663	1,585	365	66,813
1989	13,193	39,709	56,149	263	1,125	420	57,957

(a) Data are for numbers of poultry on agricultural establishments as reported in the annual Agricultural Census. (b) Includes breeding stock and data not available for separate publication.

For further details on pigs and poultry see publication *Livestock and Livestock Products, Australia* (7221.0).

Meat Production, Slaughterings and Other Disposals

The ABS collects details of slaughterings and meat production from abattoirs, commercial poultry and other slaughtering establishments and includes estimates of animals slaughtered on farms and by country butchers. The data relate only to slaughterings for human consumption and do not include animals condemned or those killed for boiling down.

PRODUCTION OF MEAT BY TYPE(a) (*000 tonnes)

Year	Carcass weight					Dressed weight(b)(c)		
	Beef	Veal	Mutton	Lamb	Pig meat	Total meat	Chickens	Total all poultry(d)
1983-84	1,303	42	169	296	253	2,064	272	298
1984-85	1,271	39	215	301	260	2,086	315	345
1985-86	1,344	41	258	320	271	2,234	334	367
1986-87	1,481	40	288	296	283	2,388	344	380
1987-88	1,549	39	293	293	297	2,471	(e)362	401
1988-89	1,459	32	254	290	308	2,343	(e)368	407

(a) Excludes offal. (b) Excludes the Northern Territory and the Australian Capital Territory. (c) Dressed weight of whole birds, pieces and giblets. (d) Includes other fowls, turkeys, ducks and drakes. (e) Excludes Tasmania.

NUMBERS OF LIVESTOCK AND POULTRY SLAUGHTERED FOR HUMAN CONSUMPTION (million head)

Year	Cattle	Calves	Sheep	Lambs	Pigs	Chickens (a)	Other fowls(b) and turkeys	Ducks and drakes
1983-84	6.0	1.3	8.4	17.1	4.4	216.2	10.2	1.7
1984-85	5.8	1.2	10.5	17.5	4.5	244.2	10.7	2.1
1985-86	6.2	1.2	13.0	19.1	4.5	258.3	11.6	2.3
1986-87	6.8	1.2	14.7	17.7	4.7	269.3	11.2	2.1
1987-88	6.9	1.2	14.9	17.2	4.9	(c)273.6	11.1	2.3
1988-89	6.3	1.0	12.4	16.5	5.0	(c)274.1	10.6	2.2

(a) Comprises broilers, fryers and roasters. (b) Comprises hens, roosters, etc. (c) Excludes Tasmania.

Mutton and lamb

Production of sheepmeats in Australia is closely associated with the wool industry. Sheep grazing often occurs on mixed farms in conjunction with beef and/or grain enterprises and in some areas producers specialise in lamb production. The supply of sheepmeat depends greatly on seasonal conditions, decisions to build up or reduce flock numbers, expectations of wool prices, live sheep exports and the pattern of domestic consumption of meat.

There was a movement out of sheep raising in Australia early in the 1970s, principally as a result of low wool prices, and many producers diversified into cattle and grains. Flock numbers declined from a peak of 180.0 million in 1970 to a low of 131.0 million by 1978. After 1978, wool and sheepmeat prices improved and the trade in live sheep for slaughter overseas continued to expand. As a result, the national flock size increased slightly to 136.0 million by March 1980. Since March 1980, flock numbers have fluctuated as a result of climatic and market conditions with a fairly steady growth from 1984 onwards. Total Australian sheep flock in March 1989 was 162 million head.

Sheepmeat production declined rapidly from the high levels of the early 1970s, which were associated with flock reduction, to annual levels of between 400,000 and 600,000 tonnes from 1973-74. Lamb production declined from a peak of 320,000 tonnes in 1985-86 to 293,000 in 1987-88, while mutton production has varied between 230,000 and 300,000 tonnes in recent years until 1983-84, when it declined to 169,000 tonnes. Production increased to 293,000 tonnes in 1987-88.

A high proportion of lamb is consumed in Australia with per capita consumption remaining steady at about 14–16 kilograms per year. A high proportion of mutton produced is exported. Australia is the world's largest exporter of mutton, with Japan and the Middle East being the main markets.

Beef and veal

The cattle industry is very dependent on international trade in beef and is subject to great fluctuations. Over half of Australia's beef and veal production is exported, with the United States and Japan the main outlets.

Beef and veal production in Australia rose markedly in the 1970s, reaching peak levels of over 2.0 million tonnes in 1977–78 and 1978–79, but declining to 1.3 million tonnes in 1984–85. The increase in production followed the rapid expansion of the beef herd that had occurred during the late 1960s and early 1970s mainly in response to relatively profitable beef prices and increased demand from overseas markets.

In the mid 1970s, poor economic conditions and heavy domestic supplies of beef in major importing countries led them to impose severe restrictions on their imports. With reduced international demand and heavy supplies in Australia, saleyard prices fell greatly and remained low for about four years. The depressed conditions were accompanied by a severe reduction in the national herd.

Improved seasonal conditions during 1983, accompanied by strengthening overseas demand, resulted in a move towards herd rebuilding. However, the high level of drought-induced slaughterings during 1982 had reduced the breeding herd base implying very slow herd expansion until 1986. Higher slaughtering in 1987–88 was due to record beef prices in the US and a larger than expected number of tenders in Japan. Current projections by the Australian Meat and Livestock Corporation (AMLC) indicate that cattle numbers will slowly increase over the next few years. While slaughtering and production will fall slightly in the short term during the rebuilding process, numbers should expand to 25.5 million by 1992 implying a production increase of over 100,000 tonnes on 1987–88.

Of historical significance to the beef industry in 1988 was the opening of the Japanese and Korean beef markets which will provide substantial opportunities to increase beef exports in the coming years. To cater for the type of beef required by the Japanese market, the number of feedlots is expected to increase.

Pigmeat

Significant changes have taken place in the pig producing industry in recent years. Capital investment and corporate takeovers have seen the emergence of a few large companies producing 30 per cent of all pigs sold in Australia. These moves on top of the trend to more intensive and efficient production techniques have seen pigmeat production rise steadily since 1982 to reach 317,000 tonnes in 1989–90. In addition, there has been an increase in the slaughter weights of pigs reflecting the demands of the fresh pork trade. It is believed that about 60 per cent of production is processed into bacon, hams and smallgoods, with the rest sold as fresh pork. Less than 2 per cent of the industry's output is exported. The increasing production of pigmeat therefore reflects a steady increase in per capita domestic consumption over the past eight years.

In recent years a small but useful market for the meat of feral pigs has been established in Europe.

Poultry meat

The poultry meat industry developed rapidly in the 1970s with both output and consumption rising steeply, although in recent years production has exceeded demand and excess production capacity in the industry continues. Genetic and technical improvements and the organisation of the industry into large-scale enterprises have raised efficiency and helped to reduce production costs relative to other meats.

EXPORTS OF FRESH, CHILLED OR FROZEN MEAT(a)
'000 tonnes

	<i>Beef(b)(c)</i>		<i>Veal(b)</i>		<i>Mutton(b)</i>		<i>Lamb</i>		<i>Pork</i>
	<i>Bone-in</i>	<i>Bone-out</i>	<i>Bone-in</i>	<i>Bone-out</i>	<i>Bone-in</i>	<i>Bone-out</i>	<i>Bone-in</i>	<i>Bone-out</i>	
1983-84	28.7	419.4	1.2	2.3	26.5	32.1	30.2	1.5	2.0
1984-85	10.5	395.8	1.6	3.6	21.6	38.1	26.3	1.4	3.2
1985-86	4.8	466.3	2.2	3.7	38.0	51.8	47.8	2.1	2.8
1986-87	4.6	555.3	2.1	3.5	49.9	57.9	53.7	1.5	3.9
1987-88	11.2	624.0	1.2	5.0	47.3	61.2	48.9	2.5	8.2
1988-89	47.4	493.6	1.0	5.3	32.6	53.7	34.9	2.7	6.6

(a) Excludes offal. (b) Factors can be applied to beef, veal, mutton and lamb bone-out figures to derive bone-in carcass weight which, when added to bone-in figures, shows total exports in carcass weight. The factor for beef and veal is 1.5 and that for mutton and lamb 2.0 (Source: Australian Meat and Livestock Corporation). (c) Includes buffalo meat.

GROSS VALUE OF LIVESTOCK SLAUGHTERINGS AND OTHER DISPOSALS(a)
(\$ million)

<i>Year</i>	<i>Cattle and calves</i>	<i>Sheep and lambs</i>	<i>Pigs</i>	<i>Poultry</i>	<i>Total</i>
1983-84	2,118.0	585.0	375.5	430.2	3,508.6
1984-85	2,253.2	576.1	438.1	512.6	(b)3,783.3
1985-86	2,367.3	531.6	438.3	559.1	3,896.4
1986-87	2,833.3	721.2	468.5	601.7	4,624.6
1987-88	3,057.0	803.9	536.1	671.2	(b)5,074.3
1988-89	3,197.6	738.3	628.7	727.6	5,292.2

(a) Includes adjustment for net exports of live animals. (b) Includes goats.

Consumption

The methodology for calculating meat consumption has been revised for the years 1975-76 to 1983-84 and is now shown purely in carcass weight equivalent terms. Canned meat as such is not available. Carcass weight is defined as ex-abattoir (i.e. bone-in). Owing to diverse cutting practices by butchers and the difficulty in clearly defining 'retail weight of meat' it is considered impractical to derive a factor for the purpose of expressing estimated meat consumption in terms of retail weight. (Estimates of retail weight as a percentage of carcass weight range from 70 per cent for beef, 80 to 85 per cent for lamb and 80 per cent for pork.)

Wool

The Australian Sheep Flock contains nearly 14 per cent of the world's sheep and produces around 30 per cent of the total annual production of wool. This is largely due to the composition of the Australian flock. In 1989 over 70 per cent of Australia's 162 million sheep were from the Merino breed, which are raised primarily for their heavy fleece of fine quality wool.

Wool production

Wool as shorn from the sheep ('greasy wool') contains an appreciable amount of grease, dirt, vegetable matter and other extraneous material. The exact quantities of these impurities in the fleece vary between differing climatic and pastoral conditions, with seasonal fluctuations and with the breed and condition of the sheep. It is, however, the clean wool fibre that is ultimately consumed by the textile industry and the term 'clean yield' is used to express the net wool fibre content present in greasy wool. In 1988-89 the yield of the Australian clip was 65.3 per cent.

SHEARING, WOOL PRODUCTION AND VALUE

Year	Sheep and lambs shorn	Average fleece weight	Wool production				Gross value (b)
			Shorn wool	Other wool(a)	Total wool		
					Quantity	Gross value	
million	kg	'000 tonnes	'000 tonnes	'000 tonnes	\$m		
1983-84	152.6	4.40	671.2	56.4	727.6	2,016	
1984-85	168.2	4.48	752.7	61.6	814.4	2,434	
1985-86	173.8	4.39	762.1	67.9	830.0	2,707	
1986-87	180.8	4.50	813.7	76.6	890.4	3,334	
1987-88	186.3	4.53	843.0	73.4	916.4	5,517	
1988-89	196.4	4.58	898.9	60.1	959.0	5,906	

(a) Comprises dead and fellmongered wool, and wool exported on skins. (b) Gross value is based, for shorn wool, upon the average price realised for greasy wool sold at auction and, for skin wools, on prices recorded by fellmongers and skin exporters.

The wool market

In Australia over 80 per cent of raw wool is offered at public auction. Prior to the sale, brokers receive growers wool into store and arrange sampling for measurement of the main variable physical characteristics. The wool is then offered for sale at a rostered auction. The balance of the clip is sold privately at prices agreed between the grower and buyer.

Wool receivals

The ABS collects details of the total amounts of taxable wool received by selling brokers and dealers each year. These figures exclude wool received by brokers on which tax had already been paid by other dealers (private buyers) or brokers.

TAXABLE WOOL RECEIVALS

Year	Receivals			Dealers as per cent of total receivals
	Brokers (NCWSB)	Dealers(a)	Brokers and dealers	
	—'000 tonnes—			
1983-84	535.5	152.9	688.4	22.2
1984-85	588.3	164.0	752.2	21.8
1985-86	599.0	167.6	766.4	21.9
1986-87	625.8	187.5	814.0	23.0
1987-88	707.3	185.5	842.4	22.0
1988-89	755.1	136.4	891.5	15.3

(a) Includes brokers who are not members of the National Council of Wool Selling Brokers of Australia (NCWSB).

The Australian Wool Corporation (AWC) is a Commonwealth statutory authority, established at the request of the nation's woolgrowers to undertake a number of functions on their behalf, principally to stimulate the demand for Australian wool. Most important among these functions are the Reserve Price Scheme in the raw wool market, comprehensive global wool promotion programs, and a program of research and development.

Under the terms of the Wool Tax Act, all growers pay a tax on the gross value of shorn wool sales to provide financial backing for the operations of the Corporation.

The Reserve Price Scheme was introduced in its current form in 1974 and seeks to provide a measure of wool price stability, in Australian dollar terms, to the benefit of the industry.

A minimum price for each wool type is established at the commencement of each wool selling season which runs from July to the following June. Any wool which fails to attract bids equal to or higher than this minimum is purchased by the Corporation at that price and held until demand improves. In addition, when the market is trading above these minimum price levels, the Corporation may intervene in the market with the aim of providing market stability. This may be needed, for instance, when there is exchange rate uncertainty or when the market enters a cycle of volatile price change.

In addition to the management of the Reserve Price Scheme, wool promotion and the research and development program the Australian Wool Corporation has a number of the other responsibilities. These include: establishing, monitoring and when necessary enforcing industry clip preparation standards; shearer training; and encouraging efficiency within the sphere of wool handling and transport. It also operates extensive commercial storage facilities on the industry's behalf.

Wool testing

The Australian Wool Testing Authority provides objective measurement for over 90 per cent of the clip. It came into existence in 1957 but its role became more prominent with the introduction, in 1971, of wool valuation techniques relying on objective specification of wool's main physical characteristics. From the first sales of wool in this manner in the early 1970s, this technique has achieved universal acceptance and now 99 per cent of all wool sold at auction is accompanied by certified measurements for average fibre diameter, yield, (i.e. the amount of clean wool fibre), and the percentage and type of vegetable fault.

During 1986-87, commercial testing commenced for the additional characteristics of staple length and strength. In 1988-89 almost 20 per cent of all combing wool sold at auction was accompanied by these measurements and this figure is expected to approach 50 per cent of the offering in 1989-90. To encourage the adoption of additional measurement by woolgrowers, the AWC paid a premium of 10 cents/kg clean for all wool purchased by the Corporation during the 1988-89 and 1989-90 seasons. The cost to the grower of the additional length and strength measurements was around 4 cents/kg clean in 1989-90.

At the direction of the Commonwealth Government, the Authority, which had operated as a division of the Corporation, was transferred to the private sector effective from the beginning of July 1982. The new company is known as AWTA Ltd.

Wool promotion

Since 99 per cent of the Australian wool clip is exported, a major activity of the AWC is demand stimulating activities carried out in manufacturing and consumer markets around the world. These programs, which are mostly conducted through the International Wool Secretariat (IWS), became more important in the 1960s because of the challenge to wool consumption posed by synthetic fibres. In more recent times these programs have again been increased in an effort to ensure wool's future as a preferred textile fibre in the world's major consumer markets. Growers have financed wool promotion since its inception; in the 1989-90 season grower support was through a levy of 3.5 per cent of gross wool sales revenue. This was boosted by a Commonwealth government contribution of \$25 million. The IWS operates actively in more than 50 countries around the world, and is also supported by the wool industries of New Zealand, South Africa and Uruguay.

Wool research

Australian woolgrowers have financed industry research programs since 1937. In recent times this was coordinated through the Wool Research Trust Fund to which both the woolgrowers and the Commonwealth Government contributed. The Fund was administered by the Commonwealth Department of Primary Industries and Energy.

From 1 July 1986, the task of determining industry research priorities and allocating funds was transferred to a new body, the Wool Research and Development Council which was constituted as a committee of the AWC.

Major recipients of wool industry research funds include the Commonwealth Scientific and Industrial Research Organisation (CSIRO)—especially in the fields of wool textiles and wool production; Bureau of Agricultural and Resource Economics; universities and State departments of agriculture/primary industry.

Stocks of raw and semi-processed wool are held by Australian wool processors, scourers, fellmongers, brokers, dealers and the AWC. They exclude wool on skins.

Wool processing

During the 1970s there was a trend to increased early stage processing of Australian wool before export. The last few years has seen a further wave of investment in this area, with some expansion of existing facilities and some new plants being built. There is now sufficient capacity in Australia to semi-process over 20 per cent of the Australian wool clip prior to export.

Export of wool

From its earliest days the Australian wool industry has been export oriented, and today approximately 99 per cent of total annual production of wool is exported.

Most of the Australian wool clip is exported in its natural 'greasy' state. Around 18 per cent of wool exported in 1988-89 was in semi-processed forms (i.e. scoured, carbonised, top and noil) with a significant quantity of wool also exported on sheep skins.

Dairying

Dairying is a major Australian rural industry, ranking fourth behind the wheat, wool and beef industries in terms of value of production. The gross value of dairy production at farm gate prices in 1988-89 was A\$1,600 million or approximately eight per cent of the gross value of rural production. The gross value of this industry at an ex-factory level is approximately A\$4,000 million per annum. The industry is also one of Australia's leading rural industries in terms of the proportion of down stream employment and processing it generates. Employment at manufacturing, processing and farm establishments is estimated to be in the vicinity of 50,000 people.

Production

Australian milk production in 1989-90 was 6,260 million litres, a reduction of 0.65 per cent compared to last year. This production was largely attributable to variable seasonal conditions in some major producing regions. Australia's dairy farmers continued to achieve productivity gains in 1989-90 through a combination of farm and herd management techniques. Average production per dairy cow has increased by 32 per cent to 3,768 litres per annum in 1989-90 compared to around 2,848 litres in 1979-80. The number of dairy farmers, however, continued to decline from 20,000 in the mid 1980's to under 16,000 presently.

Despite industry emphasis on improved yields the scope for increased milk production is constrained by the nature of the world market where subsidised competition by the EC severely restricts Australia's market opportunities.

Pasture based feed techniques allow operation of a large herd size by world standards. At 30 June 1989 the average number of milking cows per farm was estimated at around 110, (including cows in milk and dry, average dairy herd size was about 160 at 30 June 1989).

Production is destined for three separate markets: packaged fresh milk for direct consumption, manufacture of short shelf-life products for local markets and major dairy

products for both local and export destinations. Output, however, varies markedly between States with Victoria the dominant supplier of milk for manufacturing purposes. This reflects Victoria's position as the major dairy State in Australia producing over 60 per cent of the nation's milk supply. In the other States, particularly New South Wales, a far larger emphasis of production is to meet consumer demand for fresh milk.

Fluid milk consumption accounts for around 27 per cent of total production. Of the remainder half was used in manufactured products for domestic consumption, with the balance, around 25 per cent, export dedicated. Exports, therefore, accounted for about 35 per cent of manufactured products in 1989-90.

Reflecting the growing rationalisation and sophistication of the industry 1989-90 witnessed the widespread introduction of compositional methods of payment for milk. These systems allow manufacturers to more clearly identify to farmers the value of milk components (fat and protein). Over time it is expected to encourage farmers to tailor breeding and management strategies more acutely to demand in consumer markets serviced by their respective manufacturer.

Domestic market

Average annual per capita milk consumption has stabilised at around 100 litres during the 1980s. Growth in total demand has, therefore, become tied to population increase. Substantial changes, however, have arisen in the types of milk consumed, with sales of fat reduced and modified milks maintaining their rapid increase in overall market share.

During the past year sales of both Australian and imported cheese varieties rose by an estimated 7.4 per cent and 4.7 per cent respectively. Total sales rose by 7.1 per cent to 164,432 tonnes. The growth was predominantly a result of the increase in cheddar sales. Imports, mainly of specialty cheese brands are equivalent to 12 per cent of total domestic cheese sales.

Total sales of butter have been relatively static in recent years but there has been a compositional change with a concerted growth in sales of lower fat, salt reduced blends. A major growth market has been short shelf life products. This highlights consumer preferences for healthier and more natural foods.

**MILK CATTLE NUMBERS
('000)**

Cows and heifers used or intended for production of milk or cream for sale

<i>31 March</i>	<i>Bulls used or intended for service</i>	<i>Cows (in milk and dry)</i>	<i>Heifers</i>		<i>House cows and heifers(a)</i>
			<i>1 year and over</i>	<i>Under 1 year</i>	
1984	46	1,809	483	401	66
1985	45	1,809	475	413	63
1986	43	1,770	488	397	61
1987	37	1,716	464	381	41
1988	36	1,676	455	375	38
1989	36	1,663	443	370	34

(a) One year and over, kept for the establishment's own milk supply.

International market

Australia is one of the two most efficient suppliers of high quality dairy products on the world market, and has a long history of involvement in international trade. In recent years Australia has accounted for between six per cent and seven per cent of world trade though producing around one per cent of total world milk supply. Policies employed,

however, by EC and other northern hemisphere producers of heavily subsidised exports to dispose of domestic surpluses continue to distort the international trading sector, reducing returns to efficient Australian suppliers. Price cutting by East European countries also influenced market returns in the past year.

The total volume of Australia's export sales of 280,985 tonnes during 1989-90 was slightly below the preceding financial year's level. The export mix altered substantially, following a large rise in skim milk powder (SMP) sales. Exports of SMP and butter milk powder rose by 24 per cent to 91,639 tonnes. Total butter and butter oil sales of 48,977 tonnes were 6.6 per cent below the 1988-89 level. Cheese exports declined substantially by 24.4 per cent to 45,137 tonnes. Subsidised EC competition in the key Japanese market accounted for a large part of the decline. Trade was mainly concentrated in the Asian and Middle East regions with the earlier (including Japan) accounting for 60.5 per cent of the total value of dairy exports. The fob value of exports remained constant at A\$650 million compared to the preceding year.

Returns per tonne to Australian exporters in 1989-90, however, were favourable compared to previous financial years as exporters took advantage of the relatively high prices in the first six months when negotiating contracts. The general improvement in exchange rate convertibility, viz the US dollar, assisted exporters in increasing Australian dollar revenues.

Government assistance

In light of the distortion of the world dairy market the Australian Government has used various schemes to support the local industry. The current Commonwealth dairy marketing arrangements, commonly known as the Kerin Plan, were introduced on 1 July 1986 with the basic objective of developing a more efficient and profitable dairy industry able to respond to changing market conditions.

A major feature of the current arrangements are export support payments, funded by a levy imposed on all milk production, including milk used in the liquid milk market. This levy (the All Milk Levy) is levied on the fat component of milk and may not exceed a ceiling of 45 cents per kilogram of milkfat (or less than two cents per litre of milk) in any production season. The rate for 1990-91 was set at 43 cents per kilo of milkfat.

The money collected from this levy is placed in the Market Support Fund and used to provide a support payment to all exported dairy products (including the dairy product components of manufactured foods such as cakes). The level of support varies between 22.35 per cent for butter and 19.95 per cent for skim milk powder of the estimated average export price in 1990-91. The Fund is administered on behalf of the local industry by the Australian Dairy Corporation.

The payment of Market Support raises Australian export returns above the prevailing international export price. This means that in order for domestic market sales to be as profitable as export sales, domestic sales prices must rise to the level where they are equal to the supported export return (i.e. world price plus Market Support). In this way the current marketing arrangements support local prices above the distorted international prices while still ensuring that local manufacturers' returns reflect international price trends.

Assistance to industry is also offered via the Rural Adjustment Scheme which provides financial assistance, for example, to farm build-up, farm improvement and household support. Government funding of dairy research is provided on a dollar for dollar matching basis with industry funded contributions. Producers at present (1990-91) pay a 1.8 cent levy per kilogram of milkfat for research and a corresponding 4.95 cents to a promotion fund.

The Research Levy is used to finance research into all aspects of dairy production and consumption. Under the current arrangements the Commonwealth Government contributes funds for dairy research equal to those raised from the Research Levy. The allocation of research funds is administered through the Dairy Research and Development Corporation.

Supported research covers three broad areas: farm, manufacturing productivity and marketing. Examples of more specific research include cheese making technology, pasture improvement, animal nutrition and economic modelling.

PRODUCTION, UTILISATION AND GROSS VALUE OF WHOLE MILK

Year	Whole milk intake by factories(a)			Gross value
	Market milk sales by factories	Milk used in the manufacture of dairy products	Total intake	
	—million litres—			\$m
1983-84	1,572	4,351	5,923	1,153.2
1984-85	1,593	4,445	6,038	1,035.4
1985-86	1,625	4,412	6,038	1,106.7
1986-87	1,655	4,517	6,172	1,257.4
1987-88	1,667	4,462	6,129	1,390.9
1988-89	1,695	4,594	6,289	1,635.1

(a) These milk intake figures have been collected (from milk factories) by the Australian Dairy Corporation and replace statistics of whole milk production and utilisation previously compiled by the ABS.

Industry outlook

While there were some regional differences, 1989-90 was generally favourable in terms of the industry's financial performance. Farm gate prices were generally up compared to the previous year, as instanced by the 10 per cent rise in Victorian prices for manufacturing milk.

These higher returns were achieved despite a slide in export prices in the first half of 1990. Forward contracting early in the production year, i.e. spring of 1989, provided a buffer against this fall. Returns in 1990-91, however, are likely to fully reflect the change in the export market where recent increases in EC export subsidies and the continued determination of East European suppliers to dispose of product on the world market has weakened prices. Opening prices in Victoria, the main production State, were down by around 15 per cent on those of 1989-90. The implementation of Closer Economic Relations with New Zealand will add to the competitive pressures faced by the indigenous industry.

World minima prices for major dairy products, established under the GATT sanctioned International Dairy Agreement, are designed to place a floor under international dairy product prices. The minima are, however, coming under increasing pressure as the September review draws nearer because of supply imbalances on the world market.

On the international scene the conclusion of the Uruguay Round of multilateral trade negotiations in 1990 is unlikely to lead to a substantial reduction in barriers to agricultural trade. The main barrier is influential farmer interest groups in major trading blocs resisting substantive change to the current protectionist regimes. The OECD has estimated that international dairy prices have been lowered by 40 per cent by restrictive domestic and export trading policies of major producing and consuming countries, such as the EC.

Beekeeping

The beekeeping industry consists of approximately 300-400 full-time apiarists, who produce approximately 70 per cent of Australian honey, and a large number of part-time apiarists who produce the rest. Some of these apiarists move as far afield as from Victoria to Queensland in an endeavour to obtain a continuous supply of nectar for honey from suitable flora. While honey production remains the predominant sector of the industry, production of breeding stock and provision of pollination services are significant.

Exports of honey are regulated by the Australian Honey Board which also promotes honey consumption.

Statistics up to and including 1985-86 in the following table relate to apiarists with forty or more hives. In 1986-87 the Census scope was revised to include establishments undertaking agricultural activity having an estimated value of agricultural operations (EVAO) of \$20,000 or more.

BEEKEEPING STATISTICS

Year	Number of apiarists	Number of beehives		Honey produced			Beeswax produced	
		Productive	Total	Quantity	Average production per produc- tive hive	Gross value	Quantity	Gross value
1983-84	2,148	393	529	25.0	63.6	19,220	467	1,622
1984-85	2,222	413	553	28.0	67.7	21,257	528	2,077
1985-86	2,250	427	560	26.9	63.0	25,387	490	2,035
1986-87	760	293	364	19.2	65.6	31,000	334	1,988
1987-88	770	285	366	23.0	80.8	32,500	428	1,900
1988-89	836	307	405	22.6	73.8	29,600	530	2,000

Eggs and Egg Products

Commercial egg production in Australian States (including NT but excluding ACT) in 1988-89 was about 184.0 million dozen. The decrease in recent years is expected to continue as all States endeavour to reach their goal of maintaining quota hen numbers at such levels as will result in production being very close to domestic needs with very little left over for export. Such action has been taken as the net return on exports of shell eggs and egg products has been well below the cost of production in past years.

Agricultural Improvements

Irrigation on agricultural establishments

Irrigation is one of the factors by which agriculture is developed. The variability in stream flow and annual rainfall means that successful irrigation of crops and pastures is dependent on storage. Ground water supplies are also used in areas where the quantity is adequate and the quality is suitable. The area of land irrigated (approximately 1.8 million hectares in 1986-87) forms 9.2 per cent of the total area under crops.

Chapter 16, Water Resources, contains additional details of water conservation and irrigation with international, national and interstate aspects.

Irrigation statistics are collected every three years in the Agricultural Census and represent area actually irrigated.

AREA IRRIGATED BY SOURCE OF WATER USED, YEAR ENDED 31 March 1987(a) (Hectares)

	NSW	Vic.	Qld	SA	WA	Tax.	Aust.(b)
<i>Surface water—</i>							
From State irrigation schemes	403,852	423,414	69,255	13,103	12,091	2,449	924,164
From other schemes (including private group schemes)							
Direct from rivers, creeks, lakes, etc.	350,963	62,300	50,770	21,555	1,777	13,314	501,713
From farm dams	16,848	34,564	31,792	3,692	4,498	20,797	112,194
Total	367,811	96,864	82,562	25,247	6,275	34,111	613,907
<i>Total surface water</i>	<i>771,663</i>	<i>520,278</i>	<i>151,817</i>	<i>38,350</i>	<i>18,366</i>	<i>36,560</i>	<i>1,538,071</i>

For footnotes see end of table.

AREA IRRIGATED BY SOURCE OF WATER USED, YEAR ENDED
31 March 1987(a)—continued
(Hectares)

	<i>NSW</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>Aust.(b)</i>
Underground water supply (e.g. bore, spear, well)	57,722	26,027	122,997	52,238	5,473	1,476	266,507
Town or country reticulated water supply	732	4,096	546	1,177	130	128	6,942
Unspecified(c)	24,951	—	—	—	—	—	24,951
Total all water sources	855,068	550,402	275,360	91,765	23,969	38,165	1,836,472

(a) Data for irrigation collected every 3 years. (b) Also includes figures for the ACT and NT. (c) ABS imputed data to balance area irrigated and source of water questions due to incomplete reporting in the Agricultural Census.

Fertilisers

Most Australian soils are deficient in phosphorus. Because of this and the significant but less widespread deficiency of sulphur in many soils, phosphatic fertilisers, particularly single superphosphate, account for the bulk of fertiliser usage. Nitrogen deficiency is also general in Australian soils and the use of nitrogenous fertilisers is increasing. Potassium deficiency however is confined mainly to soils in the higher rainfall areas which are intensively cropped or used for irrigated pastures.

The pattern of fertiliser usage in Australia has changed dramatically in recent years. Prior to 1973-74 the usual consumption ratio of elemental N:P:K has been 2:6:1, but by 1983 the ratio had changed to almost 3:3:1. This variation has resulted from a combination of reduced consumption of phosphatic fertilisers with an increased consumption of nitrogenous fertilisers.

The domestic industry has sufficient manufacturing capacity to meet normal local demand for phosphatic fertilisers but not nitrogenous fertilisers. Australia is dependent on imports of potassic fertilisers, rock phosphate and sulphur. Imports of compounded high analysis fertilisers and specialised fertilisers were insignificant until 1982-83. Since then, however, imports have been rising strongly, largely as a result of oversupply and lower prices on the world market.

ARTIFICIAL FERTILISERS: AREA AND USAGE

<i>Year</i>	<i>Area fertilised</i>	<i>Super- phosphate used</i>	<i>Nitrogenous fertilisers used</i>	<i>Other fertilisers used</i>
	'000 ha	'000 tonnes	'000 tonnes	'000 tonnes
1983-84	n.a.	2,481	414	721
1984-85	26,407	2,374	421	885
1985-86	25,089	2,160	408	869
1986-87	24,064	1,981	416	830
1987-88	26,651	2,454	431	953
1988-89	27,871	2,523	438	971

Since the World War II there has been a great expansion of the area of sown pasture accompanied by an increased use of fertilisers. New pasture varieties (including tropical species) have been developed, and nutrient or trace elements deficiencies in soils identified.

The main artificial fertiliser used in Australia is superphosphate, over half of which is used on pastures, mainly in areas with moderate to good rainfall. Large quantities are also used on cereal crops.

Employment in Agriculture

Employment on agricultural establishments

Prior to 1976, data on employment collected at the annual Agricultural Census differentiated between permanent full-time employees and temporary employees. Full-time workers excluded casual or seasonal workers and other persons working only part-time. Casual or seasonal workers were shown as temporary employees.

In the past it has been difficult to maintain comparability of employment on agricultural establishments from year to year because of the changing number of lessees and share farmers and because of the tendency of many farmers to include part-time family helpers as full-time workers in their returns. Since World War II there has been a decline in the percentage of people living in rural areas due, in part, to a rising standard of living accompanying the introduction of new techniques and increasing use of capital equipment, fuel, fertilisers, and pesticides. As a result, a smaller agricultural labour force is now producing a larger output of farm products.

The estimates in the table below are taken from the monthly labour force survey, and are not related to employment data collected at the annual Agricultural Census.

EMPLOYED PERSONS IN AGRICULTURE AND SERVICES TO
AGRICULTURE
(*000)

<i>Month of August</i>	<i>Males</i>	<i>Married females</i>	<i>All females</i>	<i>Persons</i>
1984	278.6	80.3	94.0	372.6
1985	287.5	90.3	107.7	395.3
1986(a)	278.6	94.8	112.8	391.4
1987	271.6	90.1	103.1	374.7
1988	284.0	97.5	118.7	402.7
1989	269.0	93.3	111.1	380.1

(a) From April 1986, the estimates of employed persons include persons who worked without pay between 1 and 14 hours per week in a family business or on a farm (i.e. unpaid family helpers).

Agricultural Research by CSIRO

Agricultural research conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is directed primarily to aspects of agricultural production and processing that are of widespread significance and require mid-term to long-term research. It is aimed at establishing principles, practices and technologies that will improve the efficiency and long-term viability of Australian agriculture and its capacity to respond to changing needs. It is vertically integrated, covering all aspects from production through to post-harvest handling, storage and processing, and includes studies designed to integrate new plant varieties, animal breeds and production technologies into sound production systems.

CSIRO's research is appropriate for attacking problems or developing opportunities that transcend State boundaries; are complex and require concentration of disciplinary effort for their solution; and may need sustained long-term effort before they yield practical results. Its agricultural research complements that of State government departments and universities, and the Organisation attaches considerable importance to collaborative research with them.

CSIRO's agricultural research covers the following research areas: plant improvement; plant physiology and biochemistry; soils and plant nutrition; crop and pasture pests and diseases; livestock production; livestock health; agricultural systems; irrigated agriculture; wool textiles and marketing; food handling, processing and storage; and agricultural and veterinary chemicals. There is also research directly relevant to the agricultural industries carried out within the research area of environmental protection and rehabilitation.

Most of CSIRO's agricultural research is performed within the Institute of Animal Production and Processing and the Institute of Plant Production and Processing and to a lesser extent the Institute of Natural Resources and Environment (rangelands, grazing, irrigated agriculture, plant/water bird interactions, and vertebrate pest control).

The Institute of Animal Production and Processing carries out scientific and technological research aimed at improving the efficiency of livestock production and processing and the quality and safety of human foods. The Institute's activities include research on control of indigenous and exotic animal diseases; nutrition, reproduction, genetics and management of livestock; methods of processing, handling and storing meat, dairy foods, and fruit and vegetables; and wool textiles and marketing. This research is performed by the following constituent units of the Institute—the Divisions of Animal Health; Animal Production; Tropical Animal Production; Food Processing; Wool Technology; and the Australian Animal Health Laboratory. The Division of Human Nutrition also conducts research for the benefit of the Australian community.

Research in the Institute of Plant Production and Processing is directed to improving the profitability and stability of industries based on field crops, pastures, horticulture and forests, and to providing knowledge for the use and management of Australia's soils, plants and insects. Specific objectives are: to increase understanding of basic plant biological processes and their interactions with insects and soils; to increase the variety and quality of plant-based products to meet market needs; to develop more efficient production systems; to develop technologies to provide new opportunities for Australian industries; and to improve the community's understanding of Australia's plants, insects and soils. This research is performed in the following constituent Divisions of the Institute: Entomology; Forestry and Forest Products; Horticulture; Plant Industry; Tropical Crops and Pastures; and Soils.

The Institute of Industrial Technologies is also engaged in research of direct benefit to the agricultural industries through research on the design and synthesis of potential agricultural chemicals performed by the Division of Chemicals and Polymers.

The Institute of Information Science and Engineering assists the agriculture industry to improve its competitiveness through the use of advanced computer, communications and space systems. The Institute's current research embraces development of geographic information systems, image analysis, image processing and graphics for the analysis of land use and monitoring of agricultural production and land management; ultrasonic yield and quality measurement for the meat and livestock industry; and quality control in agricultural production and processing.

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