Productivity

Driving productivity growth accross the supply chain is the second pathway under *Queensland's agriculture strategy*.

Productivity is the ratio of output to inputs in production, and is an average measure of the efficiency of production. Productivity growth means that output is growing more rapidly than inputs in real terms.

Ultimately, productivity growth is the major driver of real income growth and subsequently, living standards. In fact, the only sources of real income growth are productivity and terms of trade (which is the ratio of prices received to prices paid). Agriculture's terms of trade show long-term decline, so productivity is really the only ongoing source of output growth.

Conceptually, productivity relates the total social value of an activity to the total social value of the inputs to that activity. However, data does not exist to measure such a broad concept of productivity. For example, the environmental costs of an activity are not necessarily priced through market or other mechanisms and so are rarely taken into account in productivity measures. Similarly, the social impacts of an activity over and above those measured through market prices are not taken into account.

Traditionally, partial measures of productivity were widely used, such as yields (output per hectare) or labour productivity (output per person employed or per hour worked). More recently, broader measures of productivity have been developed to combine labour and capital inputs, and they are known as multi-factor productivity (MFP) measures. However, the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) has taken this further and developed a total factor productivity (TFP) index, which incorporates inputs of labour, capital, energy, materials and services.[1]

Productivity is related to profitability, in that both relate outputs to inputs. Increased productivity growth can help businesses become more efficient, resilient and profitable. Productivity growth is important for maintaining the long-term viability of an industry, especially in industries like agriculture that are largely trade exposed.

This section provides information on Queensland's agricultural production by industry, farm performance and productivity measures, fisheries, forestry and food manufacturing output, investment in research, development and extension, innovation, debt and government assistance measures.

1 TFP is not a true 'total' measure because unpriced inputs such as environmental impacts and the social benefits of an activity are not taken into account.

Value and volume of production

Value of production

For 2013–14, the total value of Queensland's primary industry commodities—combined gross value of production (GVP) and first-round processing—is forecast to be approximately $14.7 billion, which is 3 per cent higher than the average for the past five years. Dry seasonal conditions have reduced the forecast for 2013–14 GVP by an estimated $190 million in the last six months.

The total estimated primary industries value at the farm gate for 2013–14 is approximately $11.6 billion, which is 3 per cent higher than the average for the past five years.

For 2013–14, the value of first-stage processing (or value-added production) is forecast to be approximately $3 billion, which is 1 per cent higher than the average for the past five years.

Table 3.1 Estimates and forecasts of Queensland GVP – first-round processing and total primary industry, 2010–11 to 2013–14

	2010–11[b] ($m)	2011–12[b] ($m)	2012–13[b] ($m)	2013–14 Forecast, April 2014[c] ($m)	Change from October 2012–13 (%)	Change from last five-year average (%)
Commodity GVP[a]						
Livestock disposals						
Cattle and calves	3 418	3 281	3 247	3 259	0	-2
Sheep and lambs	396	67	47	78	66	47
Pigs	221	220	204	210	3	-5
Poultry	55	377	438	456	4	16
Kangaroos	39	20	12	12	0	-30
Other livestock	0	0	30	30	0	136
Total livestock disposals	**4 129**	**3 965**	**3 978**	**4 045**	**2**	**0**
Livestock products						
Wool	258	130	106	83	-22	-19
Milk (all purpose)	149	242	226	215	-5	-19
Eggs	118	112	138	140	1	5
Total livestock products[d]	**524**	**484**	**470**	**438**	**-7**	**-13**
Total livestock	**4 653**	**4 449**	**4 448**	**4 483**	**1**	**-1**

	2010–11[b] ($m)	2011–12[b] ($m)	2012–13[b] ($m)	2013–14 Forecast, April 2014[c] ($m)	Change from October 2012–13 (%)	Change from last five-year average (%)
Horticulture						
Fruit and nuts						
Bananas	283	360	550	570	4	40
Pineapples	50	68	77	73	-5	2
Mangoes	55	70	70	77	10	17
Mandarins	89	74	69	77	12	6
Strawberries	74	145	125	170	36	46
Avocados	170	145	140	167	19	40
Macadamias	35	42	59	54	-9	46
Apples	60	78	95	77	-19	-19
Table grapes	32	50	50	50	0	57
Other fruit and nuts	129	235	218	232	7	44
Total fruit	**978**	**1 189**	**1 453**	**1 547**	**7**	**32**
Vegetables						
Potatoes	52	54	54	54	0	4
Beans	94	78	74	79	7	14
Carrots	14	24	24	25	4	18
Lettuce	64	54	54	54	0	-12
Melons (rockmelon and cantaloupe)	24	34	32	36	13	20
Melons (watermelon)	30	37	36	33	-8	-13
Mushrooms	41	64	64	64	0	43
Pumpkin	26	21	21	22	5	-14
Onions	35	25	25	25	0	-11
Sweet corn	36	36	36	38	6	22
Tomatoes	230	266	243	291	20	36
Capsicums and chillies[e]	83	139	139	155	12	40
Zucchini and button squash	33	43	42	47	12	10
Sweet potatoes	53	56	52	52	0	0
Other vegetables	262	257	223	236	6	2
Total vegetables	**1 077**	**1 188**	**1 119**	**1 211**	**8**	**15**
Total fruit and vegetables	**2 055**	**2 377**	**2 572**	**2 758**	**7**	**24**

	2010–11[b] ($m)	2011–12[b] ($m)	2012–13[b] ($m)	2013–14 Forecast, April 2014[c] ($m)	Change from October 2012–13 (%)	Change from last five-year average (%)
Lifestyle horticulture production						
Nurseries	912	821	867	867	0	0
Turf	159	146	125	140	12	-1
Cut flowers	182	151	151	151	0	9
Total lifestyle horticulture production[f]	**1 253**	**1 118**	**1 143**	**1 158**	**1**	**1**
Total horticulture	**3 308**	**3 495**	**3 715**	**3 916**	**5**	**16**
Other field crops						
Sugar cane	940	1 218	1 140	1 068	-6	-4
Cotton (raw)[g]	660	872	633	632	0	7
Other crops[h]	79	105	197	155	-21	-18
Total other crops	**1 679**	**2 195**	**1 970**	**1 855**	**-6**	**-2**
Cereal grains						
Wheat	302	313	554	375	-32	-9
Barley	33	45	44	51	16	34
Grain sorghum	320	313	305	230	-24	-19
Maize	136	43	34	48.6	43	-24
Other cereal grains	111	37	164	85	-48	-12
Total cereal grains	**902**	**751**	**1 101**	**790**	**-28**	**-12**
Total crops	**5 889**	**6 441**	**6 785**	**6 560**	**-3**	**7**
Total agriculture	**10 542**	**10 890**	**11 233**	**11 043**	**-2**	**3**
Fisheries[hi]						
Commercial fishing						
Crustaceans	151	161				
Molluscs	9	9				
Finfish	100	114				
Total commercial fishing	**260**	**284**	**260**	**250**	**-4**	**-8**
Aquaculture	94	91	101	101	0	6
Total fisheries*	**354**	**375**	**371**	**351**	**-5**	**0**
Forestry and logging[j]	**187**	**189**	**150**	**175**	**17**	**2**
Total primary industries (farm gate)	**11 083**	**11 454**	**11 744**	**11 569**	**-2**	**3**

	2010–11[b] ($m)	2011–12[b] ($m)	2012–13[b] ($m)	2013–14 Forecast, April 2014[c] ($m)	Change from October 2012–13 (%)	Change from last five-year average (%)
First-round processing value added(k)						
Meat processing[h]	1584	1521	1526	1551	2	0
Sugar processing[h]	550	712	646	605.2	-6	1
Milk and cream processing[h]	136	128	119	113	-5	-19
Fruit and vegetables processing[h]	177	200	216	232	7	24
Flour mill and feed processing[h]	73	61	89	64	-28	-12
Seafood processing[h]	64	67	65	64	-2	0
Log sawmilling and timber dressing and plywood and veneer manufacturing[h]	386	390	309	361	17	2
Cotton ginning[h]	75	99	72	72	0	7
Total primary industries (first-round processing)	**3045**	**3178**	**3043**	**3063**	**1**	**1**
Total primary industries	**14 128**	**14 632**	**14 788**	**14 632**	**-1**	**3**

a GVP is 'gross value of commodities produced'. It is a measure of economic output. In this publication, GVP relates to the output of primary industry commercial operations only. The GVP is the value of recorded production at wholesale prices in the marketplace (e.g. cattle sold at saleyards, sugar cane at the mill door, fruit and vegetables at the wholesale market). It is derived by multiplying the output from each primary industry by the average wholesale price paid to producers.

b Australian Bureau of Statistics (ABS) final estimates unless otherwise indicated

c DAFF forecasts

d Excludes minor commodities such as honey, beeswax and mohair

e DAFF estimate does not include chillies

f The value of the lifestyle horticulture services sector has been calculated on a gross turnover basis rather than a value-added basis and will therefore contain some double counting.

g Includes value of cottonseed and lint

h DAFF estimates

i Includes catch from both federal-managed fisheries and state-managed fisheries

j Australian Bureau of Agricultural and Resource Economics and Sciences estimates

k 'Value added' is the value of the output produced minus the costs of the intermediate inputs.

* Recreational fishing has been mostly excluded from this report so the figures are slightly different to *AgTrends* releases.

Source: *AgTrends Update*, April 2014, DAFF

Production volumes

Data on the production of individual agricultural commodities in Queensland has been collected for many decades. Since 1996–97, this data has been combined into a volume of production index, which enables the aggregation of growth in production volumes across commodities to be put into a single, statewide index. This index can be used to distinguish between the influences of prices and volumes on the overall value of production.

Table 3.2 Volume of production index for Queensland's major agricultural commodities

	1996–97	1998–99	2000–01	2002–03	2004–05	2006–07	2008–09	2010–11	2011–12	2012–13
Grain sorghum	100	106	115	93	116	89	176	134	139	159
Major cereal grains	100	98	72	50	74	51	117	74	79	108
Sugar cane	100	98	71	94	97	91	82	77	77	83
Cotton lint	100	146	129	50	151	42	93	148	243	185
Major fruit and vegetables	100	102	132	119	134	145	138	164	167	153
Crops	100	105	92	82	105	85	103	104	118	117
Cattle calves and live exports	100	125	140	136	135	140	134	132	131	129
Poultry	100	108	111	123	138	147	158	170	174	174
Major livestock disposals	100	122	134	132	132	137	132	131	130	132
Milk (all purposes)	100	104	95	90	78	67	64	61	59	56
Eggs	100	133	173	135	191	260	266	495	504	562
Total agriculture	**100**	**111**	**107**	**98**	**109**	**100**	**107**	**109**	**117**	**116**

Source: *Queensland AgTrends 2012–13: Forecasts and trends in Queensland agriculture, fisheries and forestry production*, DAFF

Table 3.2 shows that eggs, poultry and cotton experienced the biggest increases in production volume; while the production volume of milk and sugar cane declined over the same period.

Table 3.3 Production volume – 10 year average

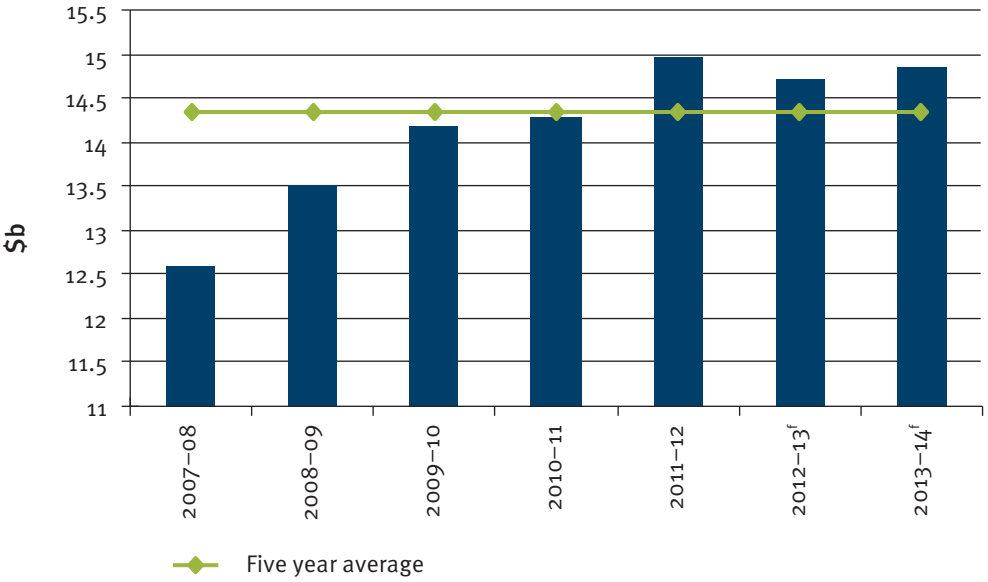
Commodity	Volume	Measure
Milk	534 430 000	litres
Eggs	70 629 247	dozens
Sugar cane (crushed)	30 878 992	tonnes
Grain sorghum	1 313 914	tonnes
Wheat	1 260 129	tonnes
Beef and veal	1 052 209	tonnes
Bananas	220 997	tonnes
Cotton lint	174 753	tonnes
Barley	160 057	tonnes
Tomatoes	121 431	tonnes
Pineapples	118 030	tonnes
Potatoes	101 084	tonnes
Pig meat	90 860	tonnes
Lettuce	55 628	tonnes
Capsicum and chillies	48 160	tonnes
Mangoes	29 643	tonnes
Avocados	25 924	tonnes
Wool	18 841	tonnes
Strawberries	11 682	tonnes
Macadamias	11 140	tonnes

Over the last 10 years, Queensland has produced a wide variety of agricultural products. Production on average includes 534 million litres of milk, nearly 71 million dozen eggs, just under 31 million tonnes of crushed sugar cane, approximately 1.3 million tonnes of both wheat and grain sorghum respectively, and just over 1 million tonnes of beef and veal.

This highlights that Queensland has continued to be a consistent, significant producer of agricultural commodities, despite natural disasters such as droughts and cyclones that occurred during that period.

Production trends

Figure 3.1 Gross value of production (GVP) for farm gate and first-round processing

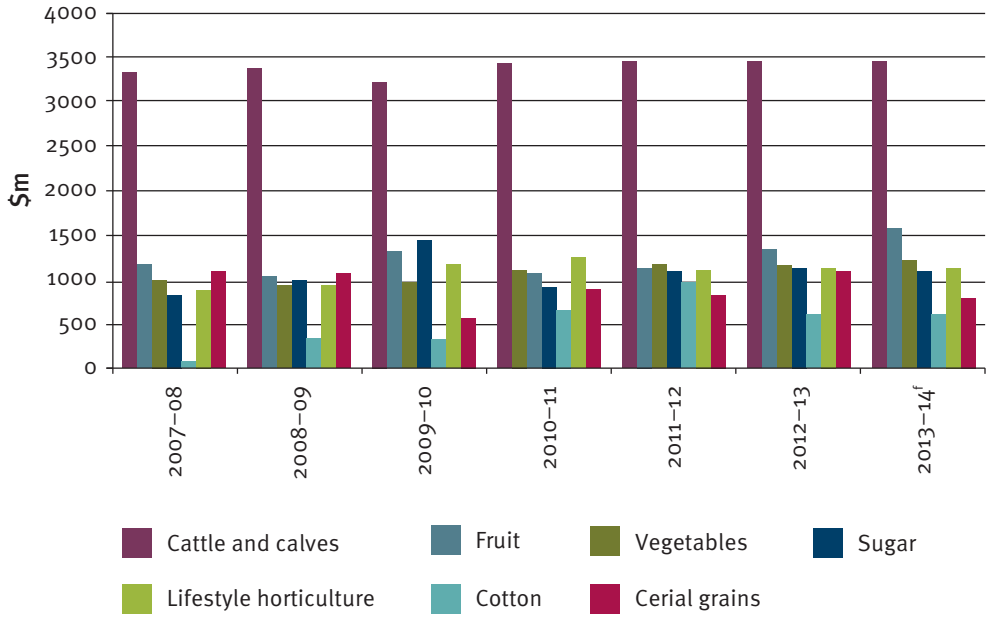


f forecast

Source: *AgTrends Update*, 2014, DAFF

Total Queensland nominal GVP (farm gate and first-round processing) has been trending upwards. Despite floods, cyclones and widespread drought conditions, the primary industry sector has demonstrated its resilience by remaining above the five-year average over the past two years. It is forecast that this trend will continue in 2013–14.

Figure 3.2 Major commodities



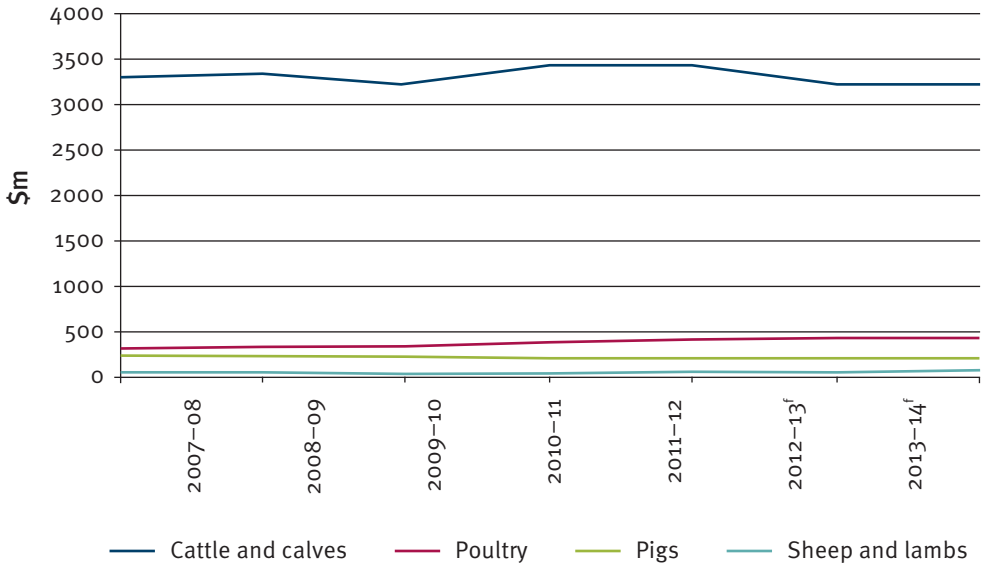
f forecast

Source: *AgTrends Update*, 2014, DAFF

The major primary industries in Queensland are cattle and calves, fruit, vegetables, sugar, lifestyle horticulture, cotton and cereal grains. The cattle and calves industry has a significantly higher nominal GVP than the other industries, which are only around one third of the figure, with the exception of cotton.

Livestock trends

Figure 3.3 Livestock disposals



f forecast

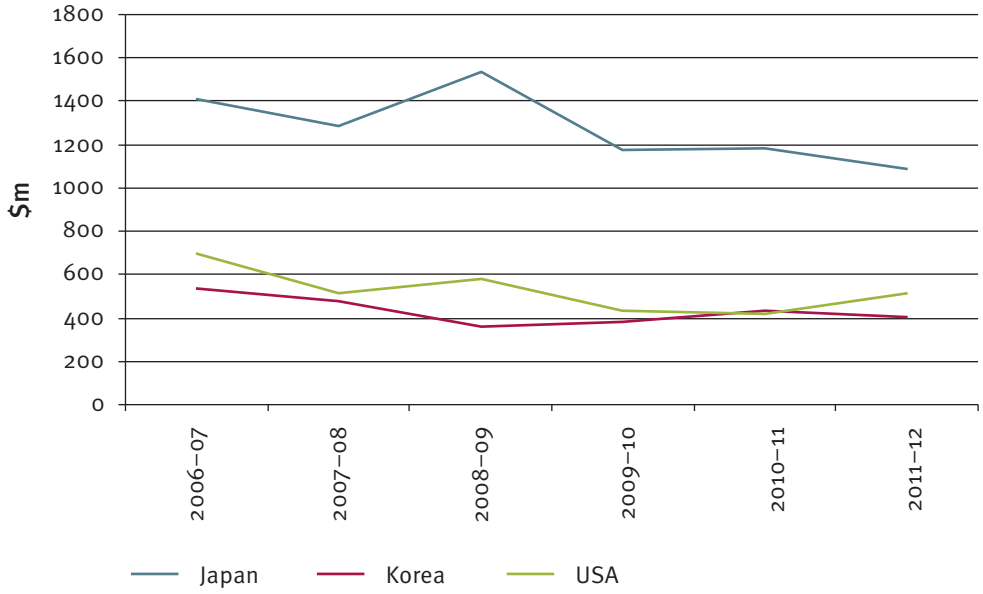
Source: *AgTrends Update*, 2014, DAFF

In Queensland, cattle and calves account for the majority of livestock disposals, which have displayed a relatively flat trend over the last five years.

Poultry meat is the second largest livestock industry in Queensland, and it has been slowly trending upwards over the last five years. In contrast, pigs and sheep and lambs have remained stagnant over the same period.

Beef market trends

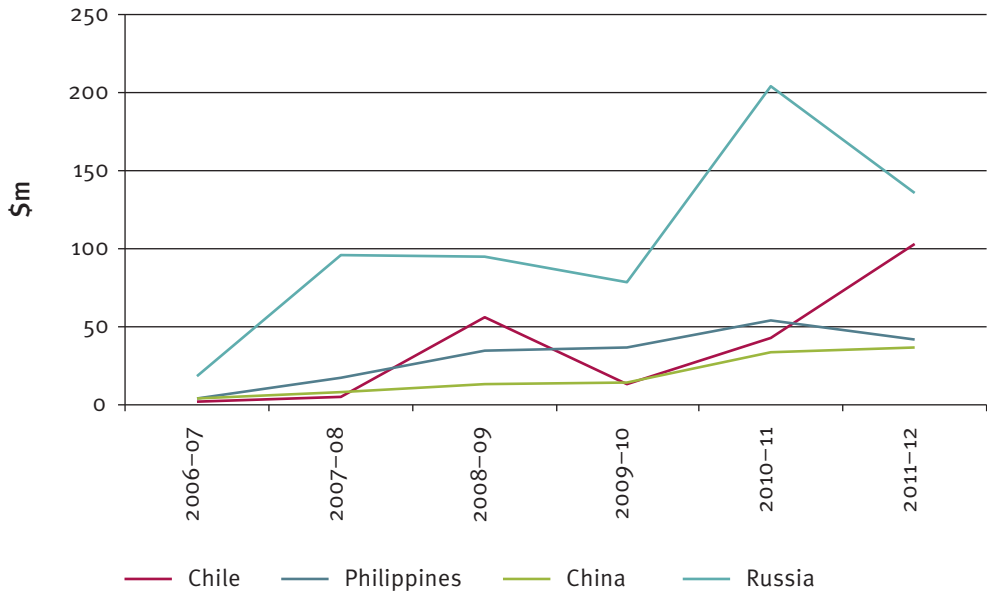
Figure 3.4 Traditional beef markets



Source: *Queensland AgTrends 2012–13: Forecasts and trends in Queensland agriculture, fisheries and forestry production*, DAFF

Japan, Korea and the USA have been Queensland's traditional major trading partners for beef. However, over the last five years the trend for these markets has been generally downward.

Figure 3.5 Emerging beef markets

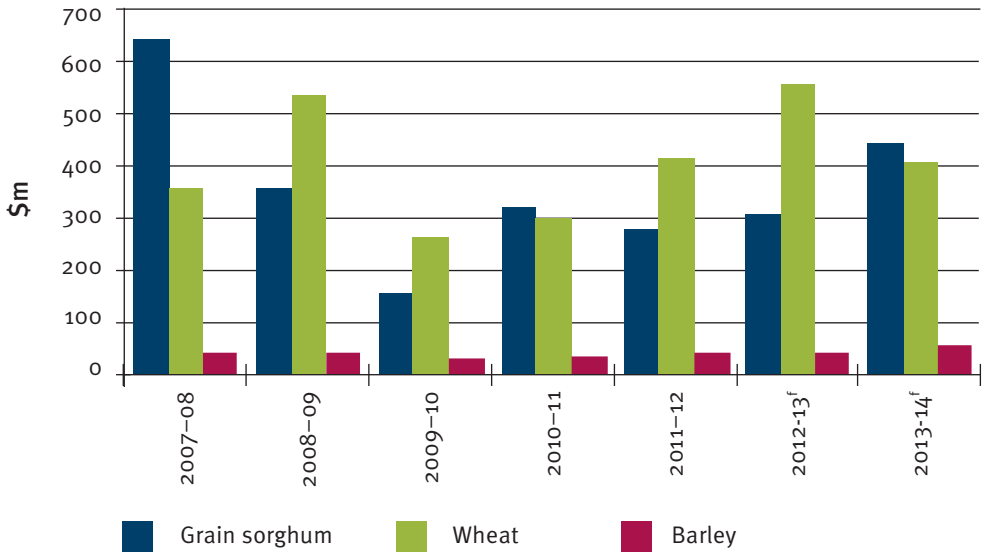


Source: *Queensland AgTrends 2012–13: Forecasts and trends in Queensland agriculture, fisheries and forestry production*, DAFF

The downward trend in traditional beef markets has been offset by emerging new export markets for Queensland beef. The emerging markets include Chile, the Philippines, Russia and China. While these markets currently take lower volumes than Queensland's traditional markets, they still offer significant opportunity.

Crop trends

Figure 3.6 GVP of major crops

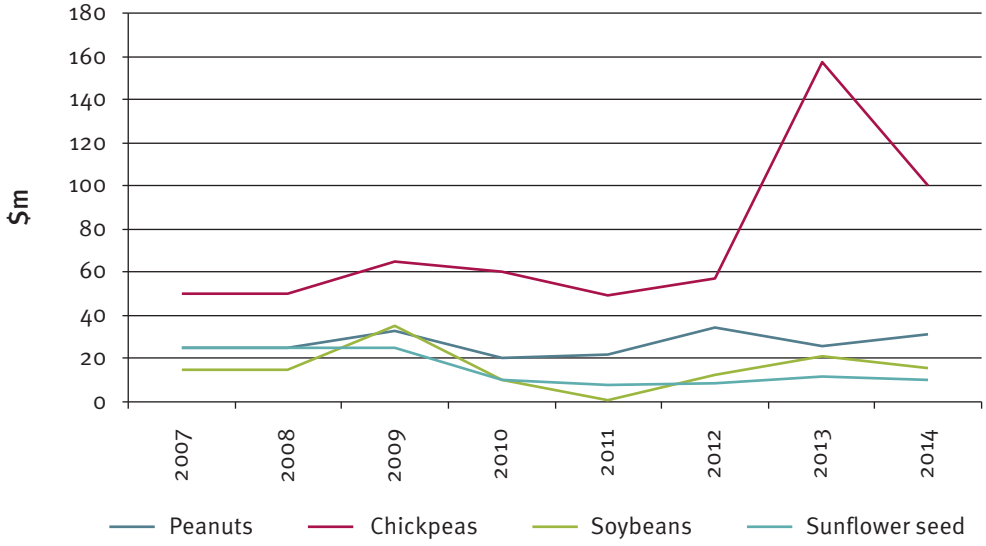


f forecast

Source: *AgTrends Update*, 2014, DAFF

In Queensland, grain sorghum and wheat have been competing as the top grain crop over the past few years. Barley has been a consistent crop in Queensland, but is minor compared with grain sorghum and wheat.

Figure 3.7 GVP of minor crops



Source: *Queensland AgTrends 2012–13: Forecasts and trends in Queensland agriculture, fisheries and forestry production*, DAFF

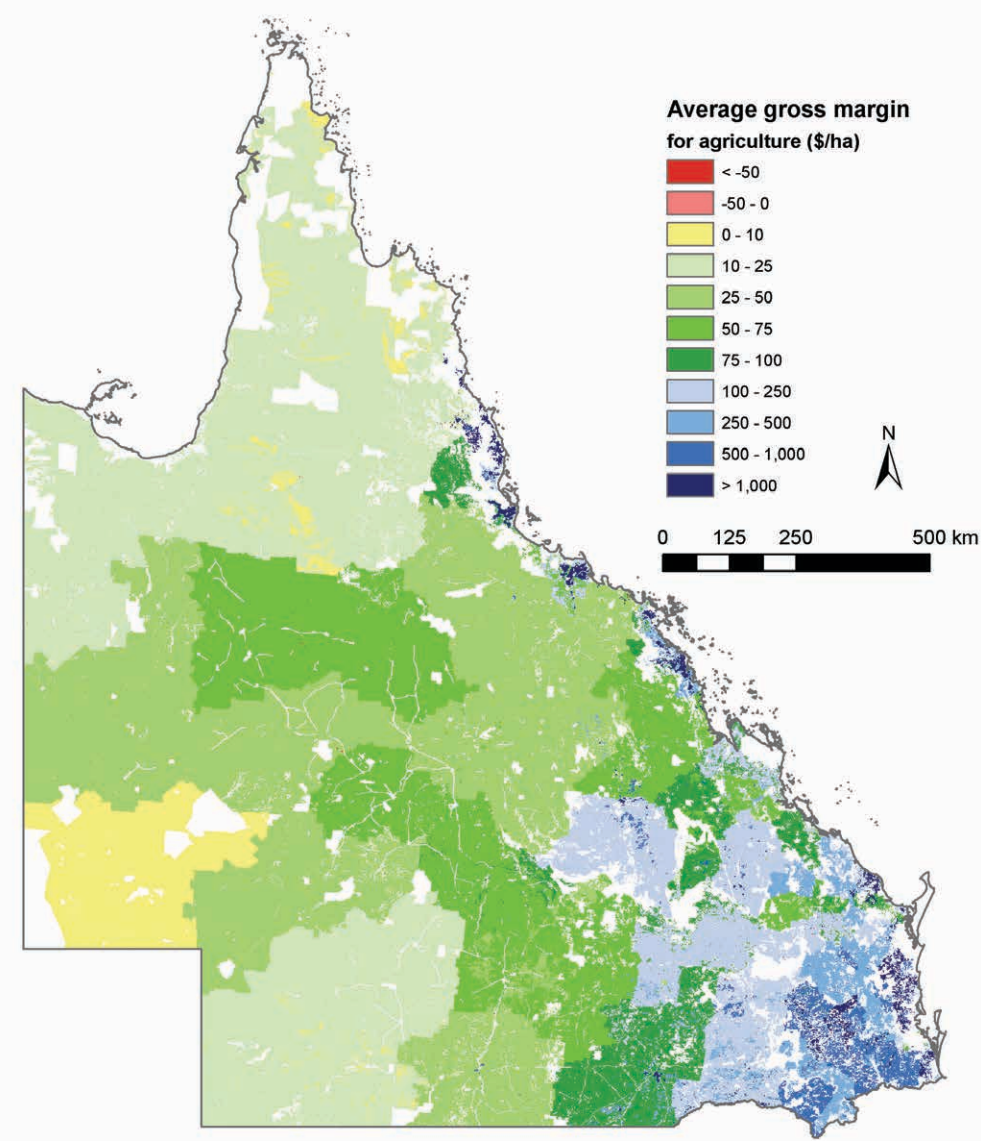
In recent years, chickpeas have emerged to challenge barley as Queensland's third largest cereal grain due to the significantly increased value of chickpeas over the last two years. Peanuts, soybeans and sunflower seed remain constant but are minor crops.

Gross margin

Gross margin is the difference between revenue and directly attributable costs of production for an activity. As such, it is a relatively simple partial measure of profitability at the activity level, before considering the overhead costs. Gross margin is widely used in farm business and financial analysis because of the availability of the required data.

CSIRO has generated a map indicating the average agricultural gross margin on a per hectare basis throughout Queensland. Figure 3.8 shows the generally greater gross margins in the more intensively-farmed, eastern part of Queensland. Data at a local level is available and can be used by producers, their advisers and other analysts for a range of purposes, such as benchmarking individual operations with similar enterprises in a region.

Figure 3.8 Average gross margin for agriculture in Queensland

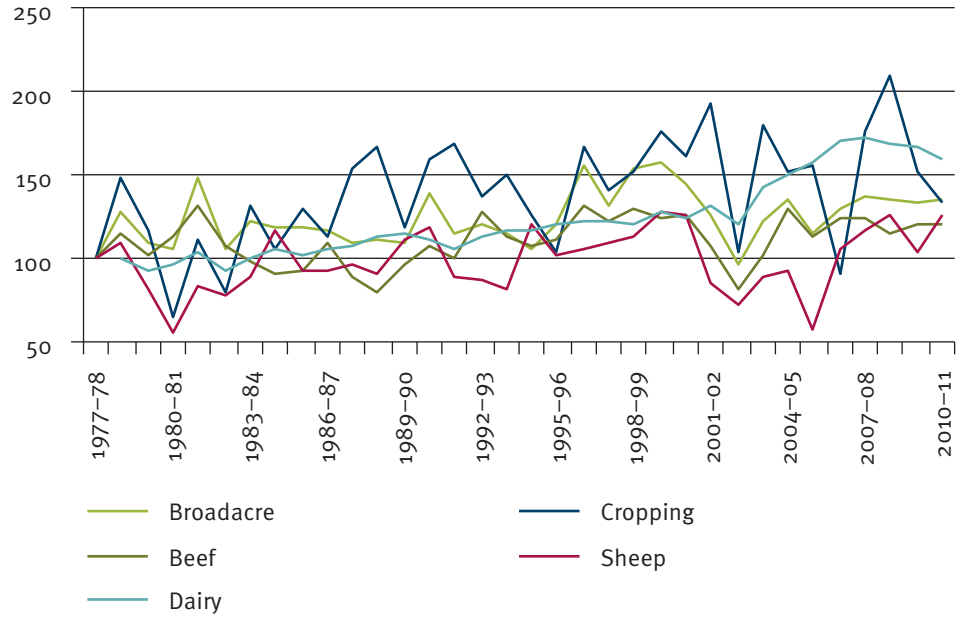


Source: Map of time series average gross margins ($/ha for the state of Queensland – eight observations between 1992–93 and 2010–11), CSIRO. (Dollar values are in 2011 dollars. Artificial borders in the map are caused by the underlying statistical entities to which census data is aggregated as per the ABS.)

Total factor productivity change

ABARES estimates of total factor productivity change (TFP) growth in Australian broadacre agricultural industries are based on ABARES farm surveys which record farm output as well as input use, such as capital, labour, energy, materials and services.[2]

Figure 3.9 Total factor productivity change in Queensland's agricultural industries



Source: ABARES, 2013[3]

Figure 3.9 shows the TFP performance of broadacre industries relative to 1977–78, and dairy industries relative to 1978–79. An upward trend is apparent, although annual rates are highly volatile, largely reflecting factors such as weather.

Table 3.4 Estimates of annual rates of TFP change in Queensland's agricultural industries

	Broadacre (%)	Cropping (%)	Beef (%)	Sheep (%)	Dairy (%)
Average annual TFP growth rates, 1978 to 2011	0.93	0.86	0.57	0.71	1.47
Last 10 years	-0.60	-1.88	-0.43	-0.03	2.46
Last 5 years	3.32	-3.09	1.35	17.29	0.26

Source: ABARES, 2013

2 A detailed description of the estimation methodology and description of inputs can be found in Nossal, K, Zhao, S, Sheng Y & Gunasekera, D 2009, 'Productivity movements in Australian agriculture', *Australian Commodities*, March quarter 09.1, pp206–216.

3 Dahl, A, Leith, R & Gray, E 2013, 'Productivity in the broadacre and dairy industries', *Agricultural Commodities*, vol. 3, no. 1, March quarter, ABARES, Canberra, pp.200–220.

Total factor productivity domestic comparisons

Queensland's average annual broadacre TFP growth of 0.5 per cent from 1978 to 2011 is the second lowest in Australia, only exceeding Tasmania (0.1 per cent). This reflects different industry structures across the states, in particular Queensland's higher reliance on grazing industries which had lower TFP growth than cropping industries.[4]

Table 3.5 Broadacre average annual TFP growth by state, 1977–78 to 2010–11

	Input growth	Output growth	TFP growth
All	-0.9	0.1	1.0
NSW	-1.2	-0.4	0.8
Vic	-1.1	-0.1	1.0
Qld	-0.6	-0.1	0.5
SA	-0.9	0.7	1.6
WA	-0.8	0.8	1.6
Tas	-2.9	-2.9	0.1
NT (beef only)	-0.5	1.1	1.6

Source: ABARES, 2013

Total factor productivity for other industries

Due to differences in data and methodologies, ABARES estimates of TFP are not comparable with estimates from the ABS for other industries. The ABS[5] produces similar estimates (termed multi-factor productivity); however, they are not available at state level and they also incorporate forestry and fisheries.

At the national level, the agriculture, forestry and fishing sector recorded TFP growth of 2.0 per cent per annum, the second highest rate of TFP growth of any industry over the period 1975 to 2010. It was second to the information media and telecommunications sector.[6]

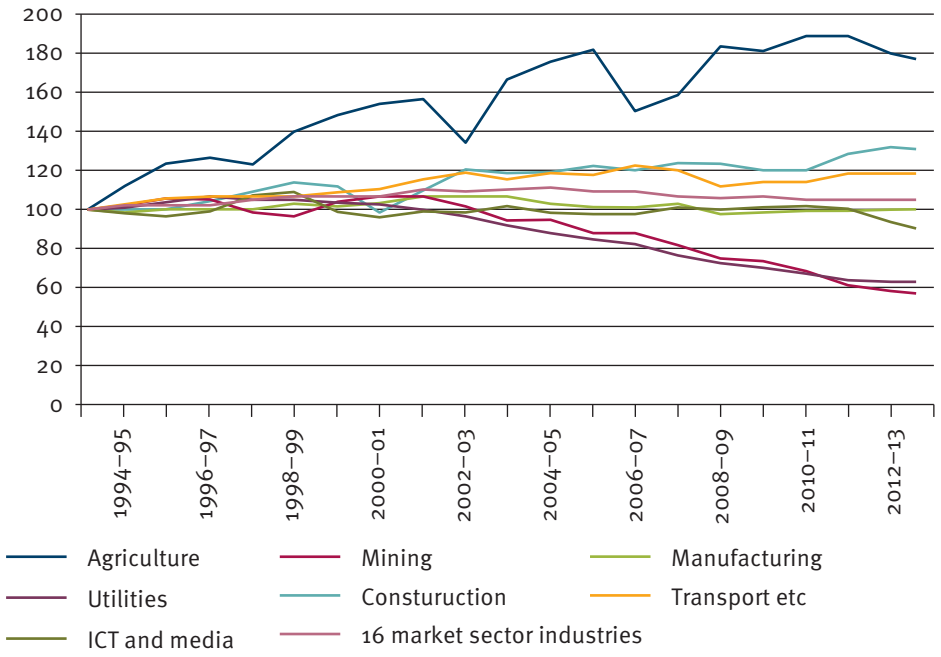
For the more recent period of 1994–95 to 2012–13, agriculture, forestry and fishing recorded the highest rate of TFP growth at 3.0 per cent per annum (see Figure 3.10). This represented the net impact of output growth of 3.0 per cent per annum, declining labour input of 1.2 per cent per annum, and growth in capital inputs of 0.7 per cent per annum. Almost three quarters of the growth in capital was due to investment in buildings and structures.

4 Nossal, K & Sheng, Y 2010, 'Productivity growth: Trends, drivers and opportunities for broadacre and dairy industries', *Agricultural Commodities*, vol. 17, no. 1, March quarter, ABARES, Canberra, pp.216–230.

5 ABS catalogue number 5260.0.55.002

6 http://www.pc.gov.au/__data/assets/pdf_file/0018/118116/11-coag-reform-supplement-chapter10.pdf

Figure 3.10 Total factor productivity by industry, Australia, 1994–95 = 100

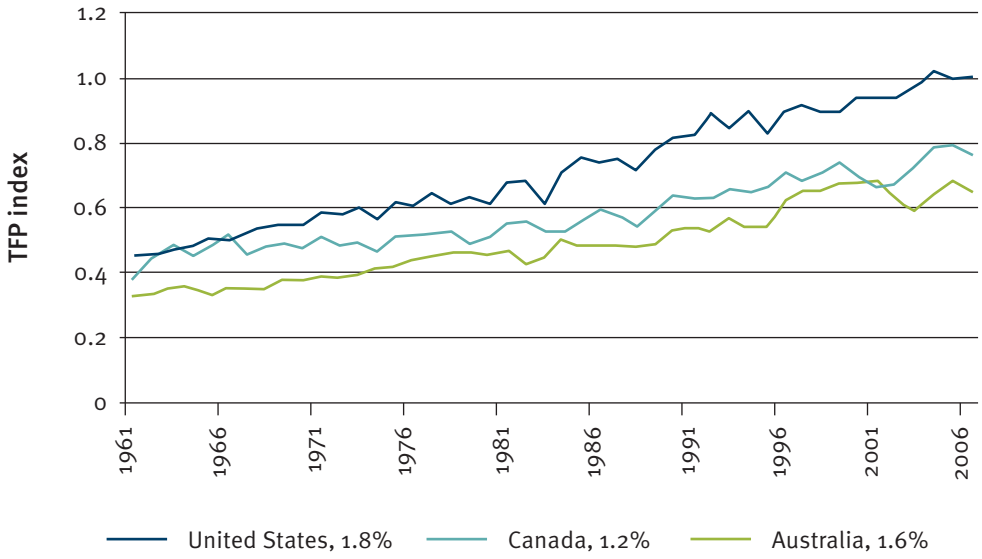


Source: Estimates of industry multifactor productivity 2012–13, ABS 5260.0.55.002

Trends in agricultural TFP are somewhat masked by the effect of variable seasonal conditions, with TFP falling in drought years as output declines proportionally more than inputs. Nevertheless, strong growth in agricultural TFP in Australia is apparent over the decade up to 2005–06. This is broadly in line with, and indeed ahead of, the acceleration of national productivity growth during this period. Agricultural productivity growth appears to have slowed since 2005–06 in line with the national productivity slowdown, taking into account the seasonal influences.

Total factor productivity international comparisons

Figure 3.11 TFP change for Australia, Canada and the USA, 1961–2007



Source: ABARES, 2013

ABARES[7] estimates that while Australia's agricultural TFP is lower than that of the USA and Canada, the rate of growth in Australia is higher than in Canada and only just below the USA's growth rate.

Arguably, Queensland's largest international competitor is Brazil. Studies comparing Australian and Brazilian agricultural TFP directly[8] estimate that Brazil's average annual rate of TFP change over the period of 1970–2001 was 1.4 per cent per annum, whereas Australia's averaged 2 per cent per annum.

Drivers of total factor productivity growth

The main drivers of long-term TFP growth are technological advances and innovation, as well as changes in scale and output mix. These are, in turn, driven by competition (including a conducive regulatory environment), human capital, investment both on and off the farm (including infrastructure), and scientific progress.

Mullen (2007)[9] found a strong link between investment in agricultural research, development and extension (RD&E) and TFP growth, with lags of up to 35 years. Evaluations of rural R&D projects typically show high average rates of return, with benefit-cost ratios of around 6:1.[10] These benefits are widely distributed across the supply chain, with studies suggesting that consumers are the main beneficiaries of rural RD&E.[11]

While these studies can suffer from attribution problems it is clear that on average RD&E is a worthwhile investment for society, and there is no evidence that these returns are falling over time.

7 Sheng, Y 2013, 'Comparing agricultural total factor productivity across countries: The case of Australia, Canada and the United States', paper presented at *Australian Agriculture and Resource Economics Society conference*, Sydney, 5-8 February, http://www.aares.org.au/aares/documents/2013AC/Presentations/Sheng.pdf

8 Rao, P, Coelli, T & Alauddin, M 2004, 'Agricultural productivity growth, employment and poverty in developing countries: 1970–2000', *Employment Strategy Papers*, University of Queensland, Centre for Efficiency and Productivity Analysis, School of Economics, Brisbane.

9 Mullen, JD 2007, 'Productivity growth and returns from public investment in R&D in Australian broadacre agriculture', *Australian Journal of Agriculture and Resource Economics*, journal 51, pp.359-384.

10 Successive RD&E evaluations conducted by the Rural Industries R&D Corporation (RIRDC).

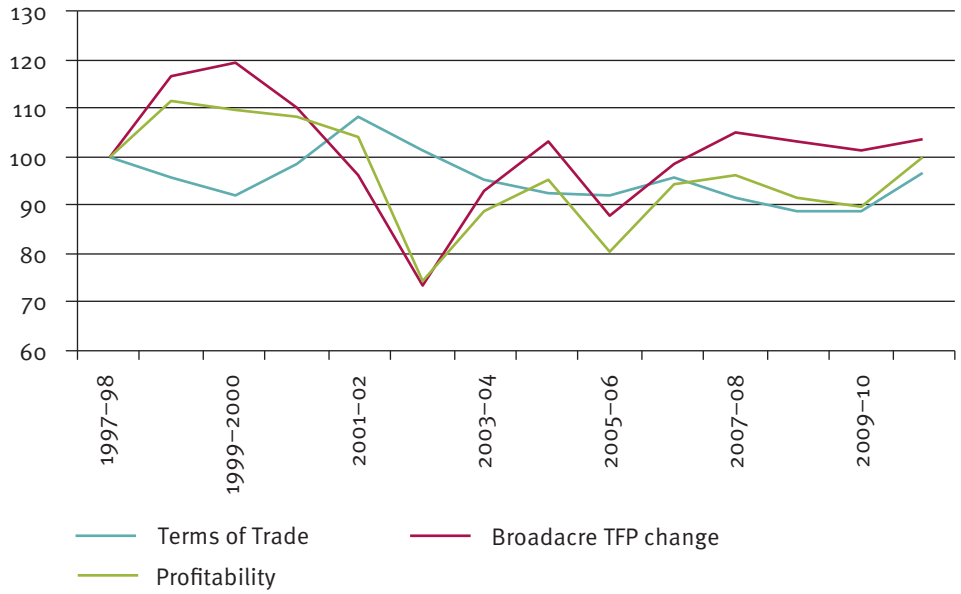
11 Zhao et al, *The incidence of gains and taxes associated with R&D and promotion in the Australian beef industry*, Department of econometrics and business statistics, Monash University, working paper 16/2002

Profitability

While it can be argued that a producer's goal tends to be profitability rather than productivity, changes in productivity can impact on profitability. Since TFP is the ratio of output quantities to input quantities, and terms of trade means the ratio of output prices to input prices, profitability change can be calculated as the product of an index of TFP change and an index of terms of trade.

ABARES only provides estimates of terms of trade for Australia as a whole, and only for the total broadacre industry. However, using the assumption that prices do not vary significantly across Australian states, estimates of profitability change for the Queensland broadacre industry are presented in Figure 3.12. These estimates show the high variability of profitability, but little trend change.

Figure 3.12 TFP, terms of trade and profitability change, 1998–2011, 1997–98=100



Source: ABARES, 2013

Farm financial performance

Table 3.6 shows overall farm financial performance data for Queensland broadacre industries from the latest ABARES farm surveys.

The data shows average farm business equity at just under $4 million. This figure has fallen significantly due to falling land prices post the global financial crisis (GFC). The 2013–14 dry season has depressed receipts, and therefore incomes significantly, resulting in negative farm business profits. As a result, the proportion of farms with low equity ratios has increased.

This pattern is broadly similar across the grains, sheep, beef and dairy industries. ABARES has also provided data for the vegetable industry to 2012–13. Average farm cash incomes have been slightly higher in the dairy and vegetable industries ($114 000 and $162 000 respectively on average since 2007–08) than in the beef industry ($68 000).

An estimated 11 per cent of Queensland broadacre farms had low equity and a high interest burden in 2013–14, up from 9 per cent in 2012–13 and 5 per cent in 2011–12. Table 3.7 shows the industry and regional breakdown of these indicators. Of particular note are the relatively low proportion of dairy farms with low equity/high interest, and the very high proportion of farms in the Central North and Charleville/Longreach regions with low equity/high interest.

Table 3.6 Farm financial performance, Queensland broadacre industries

		Average for five years to 2011–12	Preliminary estimate 2012–13	Provisional estimate 2013–14
Farm financial performance				
Total cash receipts	$	**390 402**	**366 166**	**325 608**
Total cash costs	$	**306 378**	**274 241**	**286 201**
Farm cash income	$	84 024	91 925	39 407
Cash operating margin	%	22	25	12
Farms with negative farm cash income	%	29	33	33
Farm business profit	$	20 672	-5 036	-77 682
Rate of return to total capital used	$	1.2	0.8	-0.7
Rate of return to total capital used, including capital appreciation	$	-0.3	-0.9	n/a
Total capital value at 30 June	$	**5 882 616**	**4 854 235**	**n/a**
Net capital additions	$	44 014	-18 060	n/a
Farm business debt and equity				
Farm business debt at 30 June	$	612 243	562 017	586 281
Farms with less than $10 000 debt	%	40	40	43
Farm business equity at 30 June	$	4 990 000	4 134 138	3 974 079
Equity ratio	%	89	88	87
Interest paid to receipts ratio	%	11	11	12
Farms with high debt servicing costs and low security for further borrowing				
Farms with interest to receipts ratio over 15%	%	25	24	26
Farms with less than 70% equity ratio	%	6	10	12
Farms with high interest to receipts and low equity	%	5	9	11

Source: *Australian Agricultural and Grazing Industries Survey*, ABARES

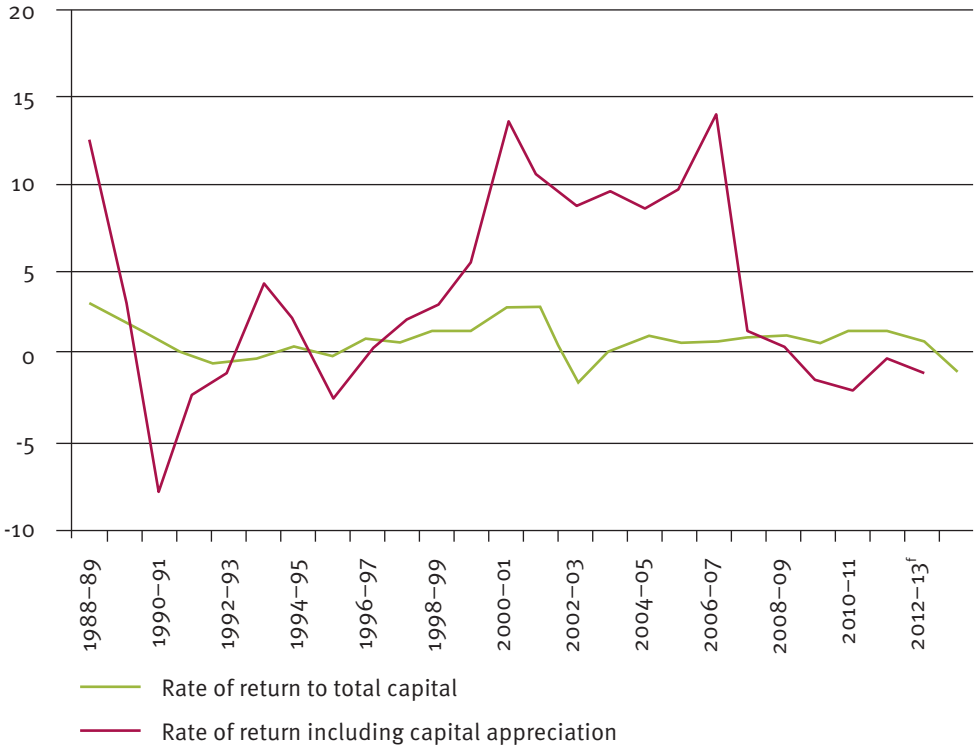
Table 3.7 Farm incomes and business equity

Industry	Farm cash income ($)		Farm business equity ($)		Proportion with low equity and high interest (%)	
	2012–13	2013–14	2012–13	2013–14	2012–13	2013–14
Grains	179 129	31 833	3 807 265	3 682 840	7	13
Sheep	74 824	76 280	2 977 259	2 842 110	11	11
Beef	67 010	38 938	4 319 171	4 163 692	9	11
Total of above	91 925	39 407	4 134 138	3 974 079	9	11
Dairy	80 925	80 133	2 621 120	2 571 282	3	2
Vegetables	130 000					
Region						
Cape York/Gulf of Carpentaria	86 676	55 313	6 369 774	6 259 787	8	8
West/South West	335 262	53 741	5 144 678	4 955 954	6	7
Central North	125 533	- 34 077	5 424 055	5 198 283	31	32
Charleville/Longreach	124 760	73 058	4 668 068	4 255 626	29	34
Eastern Darling Downs	67 153	15 267	2 665 399	2 487 839	4	6
Darling Downs/Central Highlands	118 490	45 314	5 056 895	4 892 714	6	10
South Queensland Coastal	17 413	50 105	3 535 894	n/a	5	5
North Queensland Coastal	18 543	48 881	3 273 123	n/a	3	3

Source: *Australian Agricultural and Grazing Industries Survey*, ABARES

Figure 3.13 shows the percentage rates of return for average Queensland broadacre farms since 1988–89; indicating that rates of return are sensitive to seasonal conditions. There is a positive rate of return before capital appreciation in most years. A pre-GFC land price bubble is evident between 2000–01 and 2007–08, due to high rates of return (including capital appreciation) during those years.

Figure 3.13 Percentage rate of return for average Queensland broadacre farms (excluding and including capital appreciation) from 1988–89 to 2013–14



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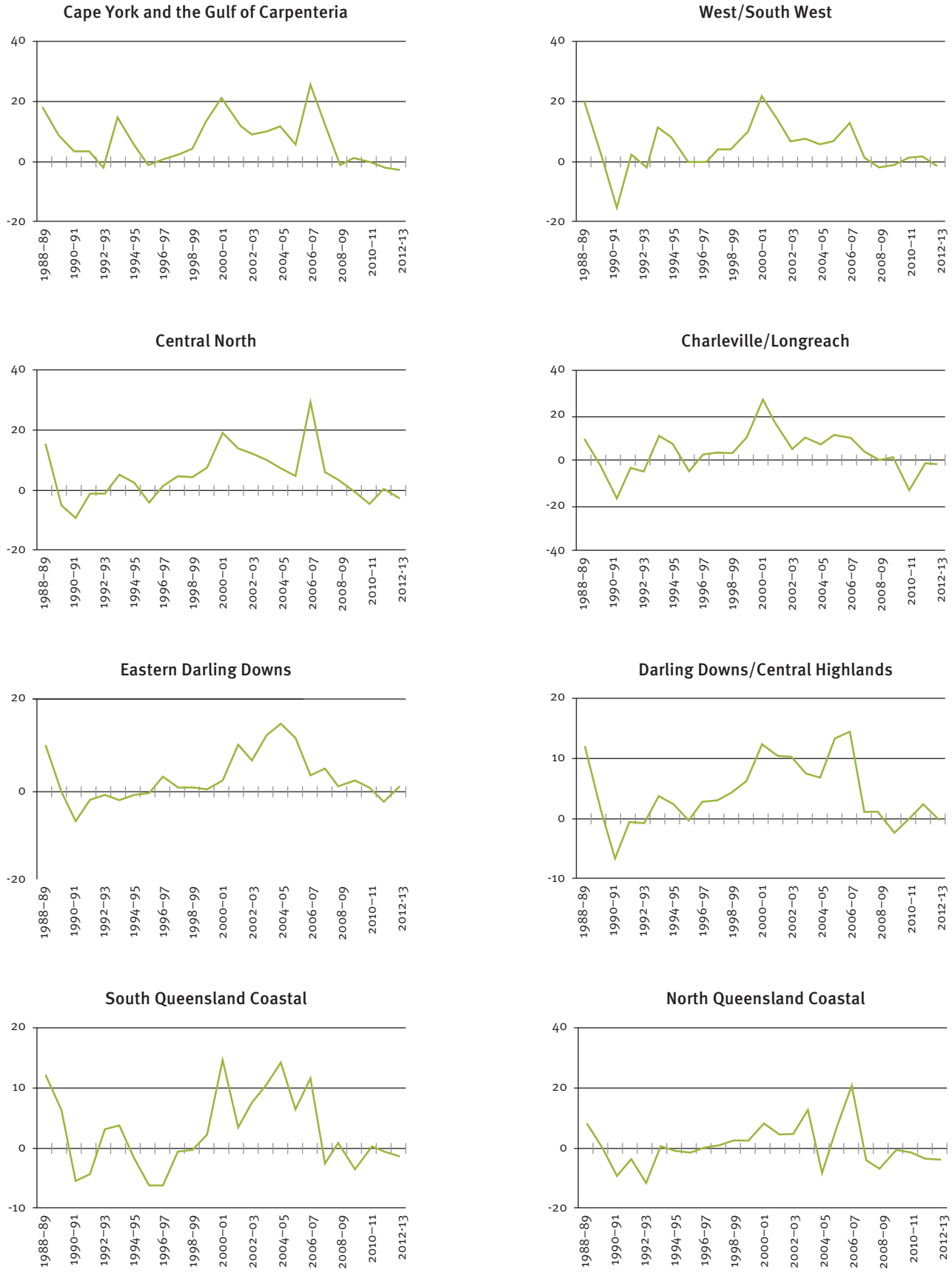
Source: *Australian Agricultural and Grazing Industries Survey*, ABARES

Figure 3.14 shows a regional break-down of the rate of return including capital appreciation. The mid-2000s land price bubble was evident in all regions of Queensland (which is not surprising as it was a global phenomenon); equally the adjustment through low returns since the GFC is also evident in all regions.

Figure 3.14 Percentage rate of return (including capital appreciation) for Queensland regions



Source: *Australian Agricultural and Grazing Industries Survey*, ABARES

While ABARES does not publish data on the most successful farms in individual Australian states, it does publish data for Australia as a whole. The top 25 per cent of farms ranked by their rate of return to capital[12]:

- achieved consistently higher rates of return—5.9 per cent on average over the last 20 years, compared with 1.1 per cent for all broadacre farms
- produced 54 per cent of the sector's output over the three years ending 2011–12
- accounted for 64 per cent of net capital additions on farms over the three years to 2011–12.

The top 25 per cent of farms ranged in size, industry, ownership structure and region, suggesting there is scope for many farms in Australia to improve their performance.

Farm management deposits

Farm management deposits (FMDs) are issued on behalf of the Australian Government to help farmers handle the variability of farm returns and particularly to help them prepare for drought.

As at March 2014, Queensland farmers held 7857 FMDs worth $686 million, representing 21 per cent of the national total.

The highest levels of holdings were among beef producers ($207 million), followed by horticulture ($109 million) and sugar ($102 million).

The value of FMDs increased slightly among Queensland farmers, up by 1.7 per cent over the year to March 2014.[13] This is consistent with the view that FMDs help farmers manage their individual circumstances regardless of industry fluctuations.

Government assistance

The Australian Government's Productivity Commission estimated the net value of all government assistance to Australian primary industries in 2011–12 at $1.576 billion, with a further $1.318 billion contributed to food manufacturing. The effective rate of assistance (net assistance as a proportion of unassisted value added) for manufacturing as a whole is 4.1 per cent and 3.3 per cent for both primary industries and food manufacturing.

Budget outlays ($891 million) and tax concessions ($548 million) provided most of the assistance for primary industries, whereas most assistance for food manufacturing arrived in the form of net tariff protection ($1.212 billion).[14]

12 *Agricultural Commodities*, December 2013, ABARES

13 *Farm Management Deposits Statistics*, Australian Department of Agriculture

14 *Trade and Assistance Review 2011–12*, Productivity Commission. (Net tariff protection is the gross benefit an industry receives from tariffs on competing imports minus the cost of tariffs on imported and import-competing inputs.)

In Australian primary industries the highest effective rates of assistance were for forestry and logging (7.2 per cent) and horticulture (3.5 per cent).

Effective rates of assistance have declined significantly over the years, down from 5.9 per cent in 2006–07 for primary industries. The largest falls during that period were recorded for dairy cattle farming (from 12.5 per cent down to 1.8 per cent) and fishing and aquaculture (from 12 per cent down to 3.3 per cent).

From a longer-term perspective, effective rates of assistance for both agriculture and manufacturing have fallen since the early 1970s, with assistance to manufacturing falling to around the same level as agriculture since the mid-1990s.

Government support for Australian farmers is low by international standards. The OECD estimates the producer support equivalent for Australian farmers at 2.7 per cent in 2012, compared with the OECD's average of 18.6 per cent. International support for farmers has also been falling, down from 30.6 per cent in 2002. Only New Zealand (0.8 per cent) and the Ukraine (1.3 per cent) had lower support for farmers in 2012.[15]

Low levels of assistance have forced Australian farmers to be more innovative and competitive, which has strengthened productivity growth in the sector.

This support is delivered at both the federal and state level. Queensland Government assistance is largely provided in the form of drought assistance, estimated to be worth $31 million in 2013–14; which is a nominal rate of assistance of around 0.4 per cent. However, the Queensland Government also provides substantial support for the sector through other means, such as research, development and extension, biosecurity, and fisheries management.

15 Agricultural Policy: Monitoring and Evaluation 2013, OECD

Rural debt

Farmers take on debt to finance investment in land, equipment and structures. They also take on debt to help them through what they hope will be temporary downturns. Whether trends in rural debt are considered 'good' or 'bad' is dependent on which motive is dominating, whether any current downturn is in fact temporary, and on likely movements in interest rates.

Figure 3.15 shows rural debt as a share of agricultural output. There was a trend increase in debt levels over the 30 years prior to the GFC, with an acceleration around 2003 that coincided with increased capital investment. Since the GFC however, debt levels have declined back towards the pre-2003 trend.

Figure 3.15 Rural debt as a percentage of annual agricultural production in Australia

Sources: Reserve Bank of Australia 2014; *Australian national accounts*, ABS, cat. no. 5206.0

Debt levels tend to be higher among the better performing farms, suggesting that the investment motive is dominant. Approximately 11 per cent of Queensland broadacre farms have a high interest payment to receipt ratio and low equity, up 5 per cent from two years prior. This suggests that the overwhelming majority of farmers do not have debilitating debt and only a small proportion of farmers have debt problems. More detailed data on the distribution of debt is only available to 2012. This shows that, as at 30 June 2012, 56 per cent of Queensland broadacre farms had less than $100 000 in debt, and 72 per cent of farms had equity ratios exceeding 90 per cent. The figures for Queensland dairy farms were similar at 49 per cent and 78 per cent respectively. These figures are slightly higher than the Australia-wide average at that time for broadacre farms and are significantly higher for dairy farms.[16]

In the medium term however, the relatively benign environment for rural debt of recent years is likely to deteriorate. This reflects a likely decline in commodity prices from relatively high levels, as well as a rise in interest rates from currently very low levels.

16 Australian farm survey results 2010–11 to 2012–13, ABARES, Canberra

Rural debt is defined as the total indebtedness of all farmers/rural enterprises throughout Queensland, where the servicing of rural debt relies primarily on rurally-generated income.

Debt was mainly sourced through commercial credit providers such as major trading banks and their financial subsidiaries and specialist rural debt agencies and institutions.

Size

The 2011 Rural Debt Survey by the QRAA found significant diversity in rural debt, both in industry sectors and locality, due to the geographical size of Queensland. The survey identified $16.976 billion of rural debt in Queensland, with an average debt per borrower of $1.073 million. These figures are current as at 31 December 2011.

The survey identified a 19 per cent increase in rural debt between 2009 and 2011, with an increased average debt per borrower of 17 per cent over the same period.

Table 3.8 Rural debt movement, 2009 to 2011

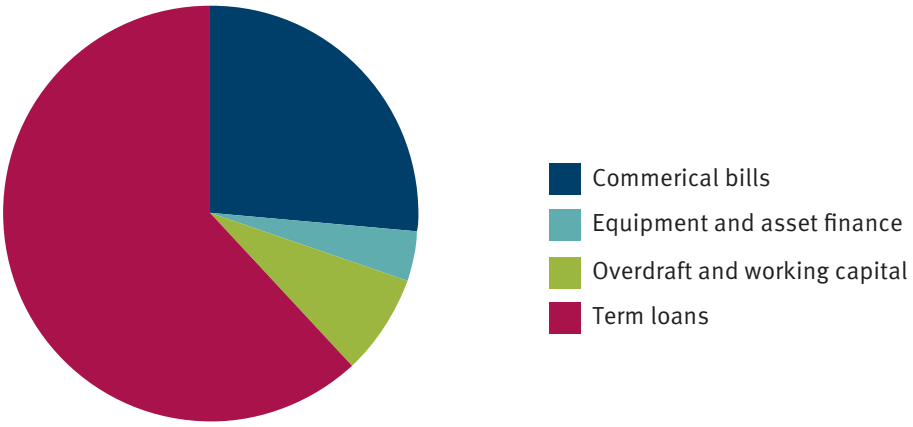
Amount ('000)	2009	2011	Movement ($)	Movement (%)
Total debt ($)	14 308 873	16 976 301	2 667 428	19
Number of borrowers	15 540	15 822	282	2
Average debt per borrower ($)	921	1073	152	17

Sources: *2011 Rural Debt Survey*, QRAA, page 7

Loan type

The 2011 survey was the first time that the types of loan facilities held by borrowers were released by financiers. This information is critical for highlighting that the majority of the $16.9 billion debt held in 2011 by rural borrowers was for term loans (63.3 per cent), with commercial bills (27.1 per cent), overdrafts and working capital (7.8 per cent) and equipment and asset finance (1.7 per cent) making up the rest of the total debt.

Figure 3.16 Rural debt by loan type



Source: *2011 Rural Debt Survey*, QRAA, p10

Debt by industry

In 2011, analysis of debt levels by industry indicated that the beef industry (54.1 per cent) remains the largest contributor to overall rural debt in Queensland. This was followed by the cotton industry (7.7 per cent), grain and grazing (6.8 per cent) and grain (6.5 per cent). All of these industries combined, make up more than three quarters of the total debt.

Table 3.9 Rural debt survey

Industry		Total debt ($000)	Number of borrowers	Average debt per borrower ($000)
Beef	2009	7 832 637	5 658	1 384
	2011	9 178 477	6 499	1 412
	Movement (%)	17	15	2
Wool	2009	88 868	106	840
	2011	96 677	152	636
	Movement (%)	9	44	-24
Cotton	2009	954 034	382	2 498
	2011	1 305 935	361	3 618
	Movement (%)	37	-5	45
Sugar	2009	845 851	2 038	415
	2011	976 030	1 742	560
	Movement (%)	15	-15	35
Grain	2009	937 686	706	1 328
	2011	1 098 885	826	1 330
	Movement (%)	17	17	0
Dairy	2009	266 084	434	613
	2011	237 420	452	525
	Movement (%)	-11	4	-14
Grain and grazing	2009	865 496	969	893
	2011	1 160 728	1 140	1 018
	Movement (%)	34	18	14
Horticulture – tree crops	2009	577 442	752	767
	2011	590 035	779	757
	Movement (%)	2	4	-1
Horticulture – vegetables	2009	500 603	762	657
	2011	595 624	707	842
	Movement (%)	19	-7	28

Industry		Total debt ($000)	Number of borrowers	Average debt per borrower ($000)
Intensive livestock	2009	436 072	435	1 002
	2011	471 642	495	953
	Movement (%)	8	14	-5
Commercial fishing (marine fishing)	2009	151 041	336	449
	2011	140 904	280	503
	Movement (%)	-7	-17	12

Source: *2011 Rural Debt Survey*, QRAA

The largest increase in the amount of debt held from 2009 to 2011 was in the beef industry, which increased by over $1.3 billion. This included an increase in the number of borrowers and a slight increase in the average debt held by those borrowers.

Fisheries catch, effort and licences

Commercial fishing is forecast to be worth $250 million in 2013–14, including fisheries targeting crustaceans, molluscs and finfish, which is 8 per cent lower than the five-year average. Approximately $184 million is expected to be derived from state-managed fisheries and $66 million from federal-managed fisheries in Queensland.

In Queensland's conservatively-managed fisheries, commercial catch closely follows fishing effort which, in turn, is strongly influenced by the number of licensed fishers (see Figure 3.17). Nevertheless, the relationship between catch and effort is not stable because productivity growth in fishing often takes the form of 'effort creep'—which means increasing catch per unit of effort over time. This represents an ongoing challenge in managing fisheries.

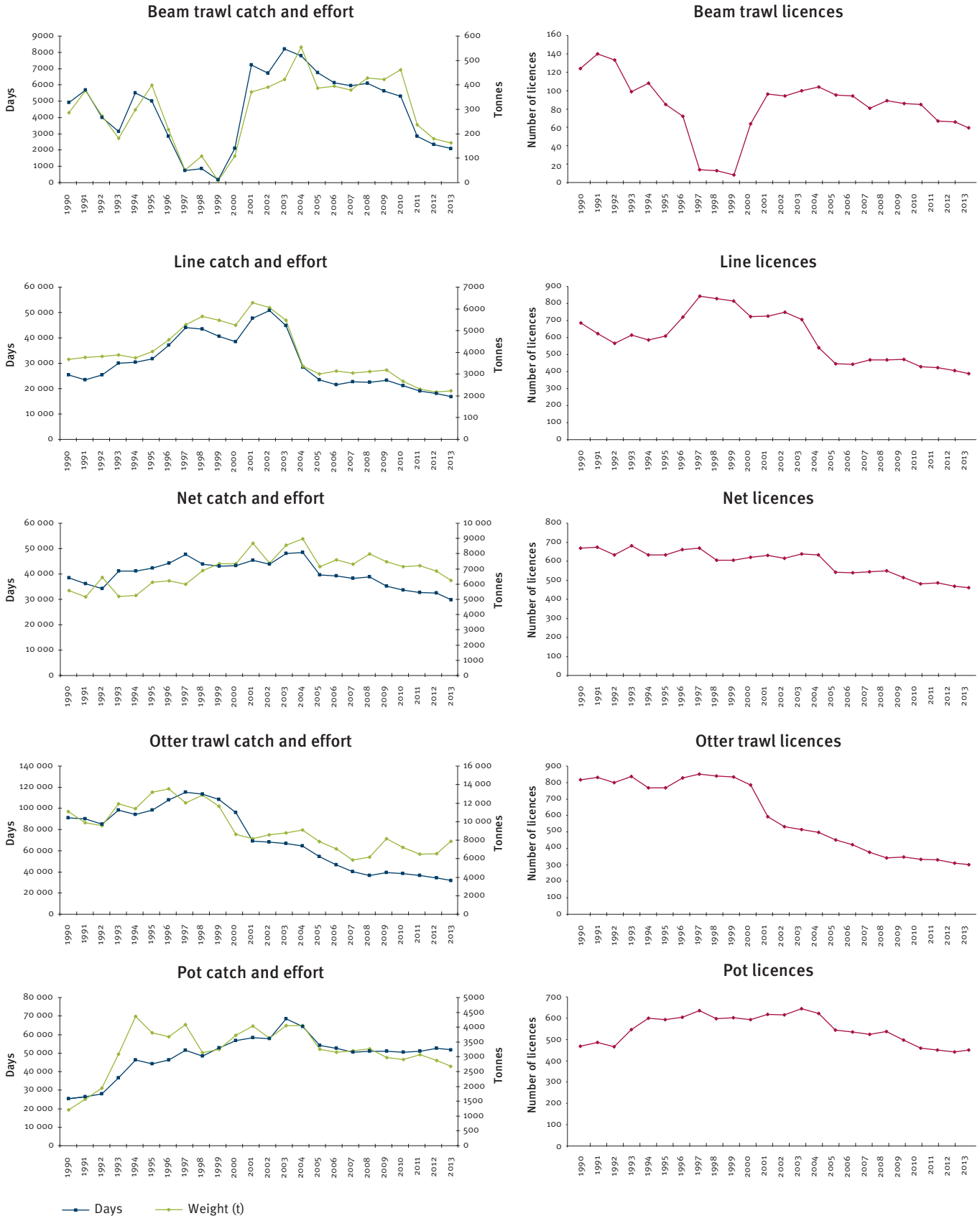
An abrupt decline in catch, effort and licences for some fisheries in the early 2000s reflected the establishment of a Great Barrier Reef Marine Park Zoning Plan, which excluded fishing from certain areas and included a structural adjustment scheme to avoid displaced effort.

Fisheries stock status

As at 2012, 75 Queensland-managed stocks were assessed—65 east coast stocks and 10 Gulf of Carpentaria stocks. Of those assessed, 31 were considered sustainably fished:

- Snapper was the only stock considered 'overfished' against the criteria, whereas three stocks were not fully utilised.
- Remaining stocks were 'uncertain' or 'undefined', reflecting a lack of data rather than sustainability concerns.
- Coral trout and blue swimmer crab moved from 'sustainably fished' in 2011 to 'uncertain' in 2012 due to depressed catches and catch rates.

Figure 3.17 Fisheries catch and effort



Source: DAFF

Table 3.10 Fisheries stock status assessments

Category	Definition	Stocks in category
Not fully utilised	Resource is underutilised and has the potential to sustain harvest levels higher than those currently being taken.	Spanner crab, redthroat emperor (east coast), trochus
Sustainably fished	Harvest levels are at, or close to, optimum sustainable levels. Current fishing pressure is considered sustainable.	Barramundi (east coast and Gulf), yellowfin bream, balmain bugs, Moreton Bay bugs, mud crab (Gulf), three-spot crab, grey mackerel (east coast), eel, dusky flathead, Spanish mackerel (east coast and Gulf), spotted mackerel, banana prawns, eastern king prawns, endeavour prawns, northern king prawns, tiger prawns, saucer scallop, white teatfish (sea cucumber), sea mullet, stripey snapper, tailor, blue threadfin (east coast and Gulf), tropical rock lobster, sand whiting, stout whiting
Uncertain	There are inconsistent/contradictory signals in the information available that preclude determination of exploitation status with any degree of confidence.	Blue-swimmer crab, coral trout (east coast), mud crab (east coast), red emperor (Gulf), grey mackerel, (Gulf), pearl perch, crimson snapper (Gulf), saddletail snapper (Gulf), king threadfin (Gulf)
Undefined	Some information is available but no reasonable attempt can been made to determine exploitation status at this time. This may be due to the need for additional information or analyses to adequately determine stock status against the criteria.	Amberjack, blue eye trevalla bonito, cobia, cuttlefish, grass emperor, red emperor (east coast), spangled emperor, groper, javelin (east coast and gulf), yellowtail kingfish, red champagne lobster, school mackerel, shark mackerel, mahi mahi, octopus, coral prawn, greasyback prawn, school prawn, bar rockcod, mud scallop, burrowing blackfish, sharks, crimson snapper (east coast), goldband snapper, hussar snapper, rosy snapper, saddletail snapper (east coast), pencil squid, teraglin, king threadfin (east coast) trevally, tuskfish
Overfished	Harvest levels may be exceeding sustainable levels and/or yields may be higher in the long term if the effort levels are reduced. The stock may still be recovering from previous excessive fishing pressure. Recovery strategies will be developed for all overfished stocks to reduce fishing pressure within prescribed time frames.	Snapper

Source: Stock status assessments, DAFF, http://www.daff.qld.gov.au/fisheries/monitoring-our-fisheries/data-reports/sustainability-reporting/stock-status-assessments

Fisheries export accreditation

Nineteen Queensland fisheries are accredited as being sustainably managed under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), permitting export of product. To maintain export approval, the Department of Environment requires certain conditions to be actioned within a specified time frame. If these conditions are not met the Department of Environment can withdraw the accreditation.

Table 3.11 Export accreditation for Queensland fisheries

Fishery	Current accreditation expires
East Coast Bêche-de-mer	17 Jul 2014
Stout Whiting Trawl	15 Aug 2014
Gulf of Carpentaria Inshore Fin Fish	20 Nov 2014
Marine Aquarium Fish	25 Nov 2014
Pearl	20 Jan 2015
Mud Crab	20 Feb 2015
East Coast Inshore Fin Fish	27 Feb 2015
River & Inshore Beam Trawl	10 Apr 2015
Trochus	3 Jun 2015
Coral Collection	26 Jun 2015
Blue Swimmer Crab	14 Oct 2015
Gulf of Carpentaria Fin Fish	25 Nov 2015
Tropical Rock Lobster	17 Dec 2015
Coral Reef Fin Fish	6 May 2016
East Coast Otter Trawl	25 Nov 2016
Gulf of Carpentaria Line	24 Nov 2016
Spanner Crab	1 Feb 2017
East Coast Spanish Mackerel	14 Jul 2017
Eel	17 Apr 2019

Case study

Coral trout fishery

Commercial coral trout fishing can be a lucrative business as the species is highly regarded by international consumers who are prepared to pay a premium due to its superb eating qualities. The fishery has evolved from producing frozen product in the 1980s to targeting the modern, high-value, Asian live fish market.

It is managed as part of Queensland's Coral Reef Fin Fish Fishery (CRFFF) which extends from the tip of Cape York to the Queensland – New South Wales border, although much of the coral trout fishing occurs in the Great Barrier Reef Marine Park.

The fishery is primarily managed through:

- a limited number of licences (367)
- an overall quota of 1088 tonnes that is divisible and transferable
- minimum size limits for fish
- seasonal spawning closures
- technical restrictions on boat size
- numbers of fishing tenders
- numbers of lines and hooks.

Commercial fishing for coral trout generally occurs out of tenders (small vessels) operating from a primary vessel and using a hook and line fishing method. However the types of businesses operating in the fishery are very diverse, given the variety of vessel sizes, numbers of tenders, fishing trip length, amount of quota owned or leased, and how crew are employed and paid. These factors all affect the level of return for the business owners.

CSIRO led a unique, in-depth project to investigate the CRFFF after it identified a need to improve understanding about the economics, business profiles and management strategy for the fishery's ongoing viability. The project was part of a broader management strategy evaluation funded by the Fisheries Research and Development Corporation.

A unique survey was conducted to provide the most up-to-date and comprehensive understanding of the economic characteristics of the fishery. The CSIRO economic survey estimated the gross value of the CRFFF at $44 million, of which $36 million can be attributed to live coral trout, and the remaining to 'dead' coral trout and other coral reef finfish. These figures are based on the 2010–11 financial year.

Analysis of the business profiles found that fishing businesses are clearly differentiated into three groups based on similar vessel characteristics and activity profiles.

- Group 1—Two thirds of businesses in the fishery operated smaller boats under 10 metres in length, and landed 20 per cent of coral reef finfish which primarily ended up as frozen produce.
- Group 2—One quarter of businesses focused on live coral trout and contributed to three quarters of the total harvest in the CRFFF, operating larger boats of around 15 metres and expending a high level of fishing effort in the fishery.
- Group 3—This group comprised diversified businesses operating within a range of fisheries where coral reef finfish are a small component of the landings.

Quota ownership is also an important point of diversification between businesses. A key finding of the survey indicated that 42 per cent of the quota was owned by investors who lease the quota out to fishers, while lease-dependant businesses held only 11 per cent of the quota but harvested more than two thirds of coral trout landed by the fishery.

Quota ownership structure will greatly influence the level of inherent risk and response by businesses to externally driven changes in the operating environment. Overall, industry-wide changes may generate different responses from different businesses, which also explains the variety of perspectives in relation to the future management of the fishery (particularly quota for coral trout).

Similarly, whether fishing vessels are operated by their owners or a hired skipper is a key distinction that is instrumental to the ongoing viability of businesses during tough economic conditions. This was evident in how businesses responded to reduced harvest levels caused by Tropical Cyclone Hamish in 2009 and Yasi in 2011, which caused extensive damage to reef off Cairns to Gladstone.

Owner-operators were able to offset the adverse impacts of the cyclone by temporarily adjusting their returns to labour downward in order to remain viable. In contrast, businesses that had chosen to operate with hired skippers were more limited in the adjustments they could make to skipper remuneration and levels of returns on investment, with the risk of losing skilled employees.

This high diversity in businesses operating in the CRFFF is an important consideration when developing regulatory frameworks, as the businesses are impacted differently by external factors that erode profitability and subsequently, short- and long-term economic viability. This calls for flexibility, adaptability and responsiveness in the regulatory framework.

The diversity also influences the flow-on effects of incentives for business investment in the fishery, and for individual businesses to support alternative approaches aimed at restoring the overall economic health of the fishery. The detailed investigative approach and knowledge gained can be applied to various primary industries in Queensland, based on their ability to respond to external factors such as drought and related assistance and preparedness programs, uptake best management practices, and operate within regulatory frameworks. Increasing understanding of businesses across the sector will guide the delivery of policy and initiatives which provide the framework for growth and profitability into the future.

Forestry

Queensland harvests around 2.5 million cubic metres of log timber (softwood and hardwood) each year. Most of this annual harvest is processed by Queensland's primary timber processing sector.

Around 80 per cent of this volume is sourced from Queensland's privately-owned timber softwood and hardwood plantation estates of approximately 250 000 hectares. The remaining amount is sourced from state and privately-owned native forests (estimated at more than 10 million hectares).

The forecast value of forestry and logging in Queensland in 2013–14 is $175 million, which is an increase of 2 per cent over the average of the previous five years.

Timber and wood processing

Queensland has a diverse timber and wood product processing and manufacturing sector that predominantly processes locally-grown plantation softwood, but also hardwood and cypress softwood from native forests. The sector, particularly the secondary processing sector, is increasingly using imported sawn timber from overseas and interstate producers.

The sector includes primary processing activities that transform log timber into a range of products using sawing, veneering and chipping processes, as well as secondary processing or manufacturing activities that transform the output of the primary processing sector into a range of more complex timber-based and paper-based products.

Primary processing plants range from large-scale, fixed location sawmills or plants producing veneered products, woodchips or reconstituted timber and panel products, through to small, portable or 'mobile' sawmills operating within forests.

The number of primary processing plants in Queensland (and Australia) has fallen significantly over the last decade. The former Queensland Department of Primary Industries and Fisheries identified 222 licensed 'fixed location' sawmills (under the now repealed *Sawmills Licensing Act 1936*) in Queensland in 2001–02.

This is in comparison to the 100 primary processing plants in Queensland reported by ABARES in 2012, which represent about 26 per cent of all primary processing plants in Australia. Although this data should be interpreted cautiously, given the differences in data collection processes, both provide a strong indication of a significant consolidation in Queensland sawmilling over the last decade.

The forecast value of log sawmilling, timber dressing, and plywood and veneer manufacturing in Queensland in 2013–14 was $361 million, which is an increase of 2 per cent over the average of the previous five years.

In 2011–12, wood product manufacturing as a whole—which includes sawmills as well as processing and fabrication operations—employed 9865 people in Queensland. This figure was down 4.3 per cent on the previous year. Total industry turnover was $2.6 billion, down 10.6 per cent on the previous year; in line with declining residential construction during that year.

Food processing

Processed food is any food that has been transformed from its raw form.

Primary food processing begins with whole raw products in their natural state. It then transforms them either into a finished product ready for consumption, an ingredient, or an unfinished product that will be processed further. These foods are simple, that is, they have not yet been mixed with other ingredients.

Secondary food processing further transforms primary processed foods in one or more ways to create a different finished food or ingredient. These foods are still simple in that they have not yet been mixed with other ingredients.

Composite food begins with a mix of primary and/or secondary processed foods and/or food ingredients and combines them to make an elaborate food product.

The following table provides examples of various foods at each stage of processing. These food products can be fresh, frozen, cooked, packaged or unpackaged.

Table 3.12 Processed food stages (primary, secondary, composite)

Live	Minimally transformed	Substantially transformed	Elaborately transformed
Whole live product	**Primary processed**	**Secondary processed**	**Composite food**
Cattle, chickens, pigs, goats, fish and seafood	Farm animal and poultry carcase, scaled fish, shelled or chilled seafood	Meat and poultry cuts, mince, bones for stock, trimmed offal	Burgers, sausages, pies, stews, soups, sauces, ready to eat meals, pet food Pet foods
Sugar cane	Sugar cane juice	Sugar, molasses, treacle, refined cane juice	Toppings, jam, confectionery, cakes, biscuits, desserts, drinks
Fruit, vegetables and herbs	Washed/frozen dried fruit, rinds, vegetables and herbs	Sliced/juiced/diced/dried/ peeled/pitted fruit and vegetables	Soups, pies, ready to eat meals, jams, herb pastes, prepared salads
Grains, seeds and nuts	De-husked whole grains, seeds and nuts	Flour, precooked/rolled/ puffed grain, bran and germ, oil, milk, stock feed	Bread, biscuits, cakes and cake mix, thickeners, cereal, health bars
Milk	Pasteurised/skimmed/ homogenised milk	Cream, butter, cheese, yoghurt, buttermilk	Custard, yoghurt, desserts, drinks, ice-cream, snacks, ready to eat meals

There are approximately 1200 food and beverage processing businesses in Queensland. In terms of size, the majority (95 per cent) of these businesses are either classified as micro or small (employing under 20 staff) or medium (employing under 200 staff), while the remaining 5 per cent are larger businesses. The larger businesses include multi-nationals specialising in a range of sectors, such as beef, sugar, beverage and food ingredient processing. Many of these large businesses are foreign-owned and are part of global supply chains.

Queensland's industry ranges from producers of fresh, natural and organic products to producers of manufactured foods, such as ready-made meals, confectionery, beverages, additives and nutritional supplements. The industry is supported by Queensland's extensive agriculture industry, including beef, seafood, grains, fruit and vegetables.

In Queensland, the food and beverage processing sector is the largest employer of manufacturing workers, with an estimated 42 000 employees.[17] This equates to approximately one quarter of Queensland's entire manufacturing workforce.

Value of food processing

Food and beverage processing is Queensland's largest manufacturing industry in terms of revenue. It generated $18.2 billion or approximately 25 per cent of Queensland's total manufacturing revenue in 2010–11.[18]

The value of Queensland's processed food and beverage exports was $5.265 billion in 2012–13. This increased in value by 5 per cent from 2008–09, with exports accounting for 25 per cent of production in 2010–11.

Not surprisingly, meat and meat product manufacturing dominates Queensland's processed food and beverage exports, and was valued at $4.045 billion in 2012–13. This was an increase of 4.8 per cent from 2008–09.

Table 3.13 Value of Queensland's processed food and beverage exports from 2008–09 to 2012–13

	2008–09	2009–10	2010–11	2011–12	2012–13
Meat and meat product manufacturing	3 860 117 039	3 187 878 034	3 646 398 008	3 772 684 048	4 045 969 080
Dairy product manufacturing	28 801 020	32 784 826	33 852 034	36 958 775	44 430 781
Fruit and vegetable processing	276 857 845	282 879 504	283 213 055	359 426 697	494 022 909
Oil and fat manufacturing	46 915 636	35 937 931	37 677 483	39 928 320	32 787 958
Flour mill and cereal food manufacturing	34 945 946	29 970 337	26 204 805	29 501 450	24 492 760
Bakery product manufacturing	22 934 855	24 603 886	22 510 993	24 038 664	21 389 038
other food manufacturing	721 020 571	434 169 547	537 257 684	588 028 290	549 985 404
Beverage and malt manufacturing	22 403 956	26 542 995	26 722 942	48 320 062	52 255 804
Total food and beverage exports	**5 013 996 868**	**4 045 767 060**	**4 613 837 003**	**4 898 886 306**	**5 265 333 734**

Source: Exports – Industry (4-digit ANZSIC 1993 edition), Queensland Treasury

17 Labour force, Australia, details, quarterly, February 2014, Australian Bureau of Statistics, 2012–13, ABS 6291.0.55.003

18 Australian industry, 2011–12, ABS 8155.0

Research, development and extension

Research, development and extension (RD&E) assists productivity growth and creates new economic possibilities by:

- providing purposeful changes to agricultural products and production techniques
- creating new products
- increasing production efficiency of existing products in collaboration with producers, industry and other stakeholders
- enabling producers and the industry to act on new technical possibilities and new market opportunities.

In particular, Queensland's RD&E efforts focus on tropical and subtropical agriculture, and are driven by 'market failure' to convert basic research into technology that the industry needs.

Research is systematic investigation or experimentation involving innovation or technical risk. The outcome of research is new knowledge or new or improved products, processes, materials, devices or services. RD&E activity extends to modifications to existing products and processes.

Development is systematic work using knowledge gained through research or practical experience. It is directed into producing new materials, products, devices, policies, behaviours or outlooks; and installing new processes, systems and services, or substantially improving those already produced or installed.

Extension involves a range of activities that enable producers to improve productivity and profitability in collaboration with researchers and the broader industry. Activities include engaging in the development of research priorities, co-developing and co-designing solutions via development extension, providing advice, information and community education, and disaster management support.

RD&E funding

The agricultural RD&E system in Australia is a cooperative model involving:

- state and federal government
- producers
- industry bodies
- rural research and development corporations (RDCs)
- Collaborative Research Centres
- universities and research bodies
- non-government organisations (NGOs)
- private enterprise.

Policy and funding reflects the complex set of relationships across the value chain. The National Primary Industries RD&E framework articulates federal, state and industry priorities, while sector strategies (developed by RDCs) further explore RD&E priorities for particular sectors. Sector strategies are also linked to multiple commodity plans, for example the Citrus Plan. The National Primary Industries RD&E framework also forms part of the work program linked to the Intergovernmental Agreement on Biosecurity.

A range of cross-sector strategies also come into play for elements such as food, biofuels, soils etc. Each strategy is championed by a research and development corporation (RDC) with an interest in achieving cross-sector outcomes.

Funding for RD&E is also cooperative. A funding pool is drawn from primary producers who provide significant support for RD&E through national levies managed by RDCs. These levies attract matching funding from the Australian Government. Other sources of funding come through the CSIRO, higher education institutions, other research programs and the Queensland Government particularly through DAFF, non-profit organisations and privately-owned businesses.

Table 3.14 Summary of sectoral agricultural R&D activity nationally in 2011–12

	Field of research: Agricultural and veterinary sciences		Socio-economic objective: Economic development		
			Plant production and products	Animal production and products	Total
	($m)	(%)[a]	($m)	($m)	(%)[a]
Business[a]	455.4	34.2	302.5	165.6	34.7
Australian Government[b]	176.8	13.3	121.1	98.0	16.2
State governments	393.3	29.5	188.9	154.8	25.5
Higher education[c]	307.9	23.1	198.4	120.9	23.6
Total[d]	**1333.4**	**100.0**	**810.9**	**539.3**	**100.0**

a Relates to funding, not necessarily where the R&D is carried out

b Relates to R&D by Federal Government entities such as the CSIRO and AIMS; excludes federal funding to research providers in other sectors

c Higher education refers to the year 2010

d Indicative total only

Source: Research and Experimental Development series, ABS

The ABS no longer publishes information on the state location of most of this agricultural R&D activity. Available information shows:

- In 2011–12, the Queensland Government spent $260 million on all in-house R&D programs. This represented 23 per cent of all State Government R&D spending. On the other hand, only 10 per cent of all Federal in-house R&D spending was in Queensland.[19]
- In 2011–12, the Queensland Government spent $105 million on agricultural research. Most of this (approximately $83 million) was spent in-house.[20] Agricultural R&D therefore represents a large proportion of total State Government R&D spending. This represents about 21 per cent of spending on agricultural R&D by state governments, broadly in line with Queensland's share of national agricultural output.

19 *Research and experimental development,* government and private non-profit organisations, Australia, 2011–12, ABS 8109.0

20 *Queensland Government Research and Development Expenditure Report 2011–12*, Queensland Government Chief Scientist

- In 2011–12, Queensland agriculture, forestry and fishery businesses spent an estimated $33.2 million on R&D, which is 17.5 per cent of the national total.[21] This is slightly below Queensland's share of the national agricultural sector. However, it does not include Federal R&D levies, nor does it include agriculture-related R&D by non-agricultural enterprises, such as chemical companies.
- In 2010, Queensland universities carried out an estimated $73.5 million in agricultural and veterinary science R&D. This represented 24 per cent of the national university effort in this area, but only 5 per cent of the total R&D activity by Queensland universities.[22] Again, these percentages are broadly in line with the sector's share of the overall economy.
- In 2012, Queensland universities carried out an estimated $98.8 million in agricultural and veterinary science R&D. This represented 25 per cent of the national university effort in this area, slightly ahead of Queensland's share of sectoral activity, but only 6 per cent of the total R&D activity by Queensland universities.[23] It was a significant increase from activity in 2010 ($73.5 million), partly reflecting the re-allocation of research activity from the Queensland Government through the creation of the Queensland Alliance for Agriculture and Food Innovation.

Department of Agriculture, Fisheries and Forestry (DAFF)

The Queensland Government, through DAFF, undertakes research, development and extension to lift the productivity of Queensland's agricultural businesses. A breakdown of the funding sources for DAFF programs from 2008–09 to 2012–13 is provided in the following table.

Table 3.15 Breakdown of funding sources for DAFF programs from 2008–09 to 2012–13

Fund source	2008–09 ($)	2009–10 ($)	2010–11 ($)	2011–12 ($)	2012–13 ($)
Australian Government	5 324 872.70	4 693 123.00	5 857 043.64	6 404 865.20	5 224 737.25
Business	1 037 788.96	1 965 827.00	1 805 412.19	1 037 511.32	820 631.53
State funds	64 980 932.13	60 014 568.00	60 940 840.17	56 589 062.21	56 671 724.82
Joint government/business	19 951 367.00	22 632 995.00	21 809 360.06	22 127 756.23	16 151 068.23
Other state and local government	1 860 042.45	1 041 549.00	1 293 161.29	1 001 194.12	769 234.14
Overseas sources	8 958.70	48 073.00	104 353.00	15 834.09	97 233.93
Universities	625 369.79	1 437 706.00	3 286 897.86	5 502 086.89	5 587 409.51
Other Queensland Government		721 284.00	593 439.75	1 032 088.42	281 584.44
Total	**93 789 331.73**	**92 555 125.00**	**95 690 507.96**	**93 710 398.48**	**85 603 623.85**

Note: 2012–13 was based on R&D activities only. No extension included.

Source: Agri-Science Queensland, DAFF

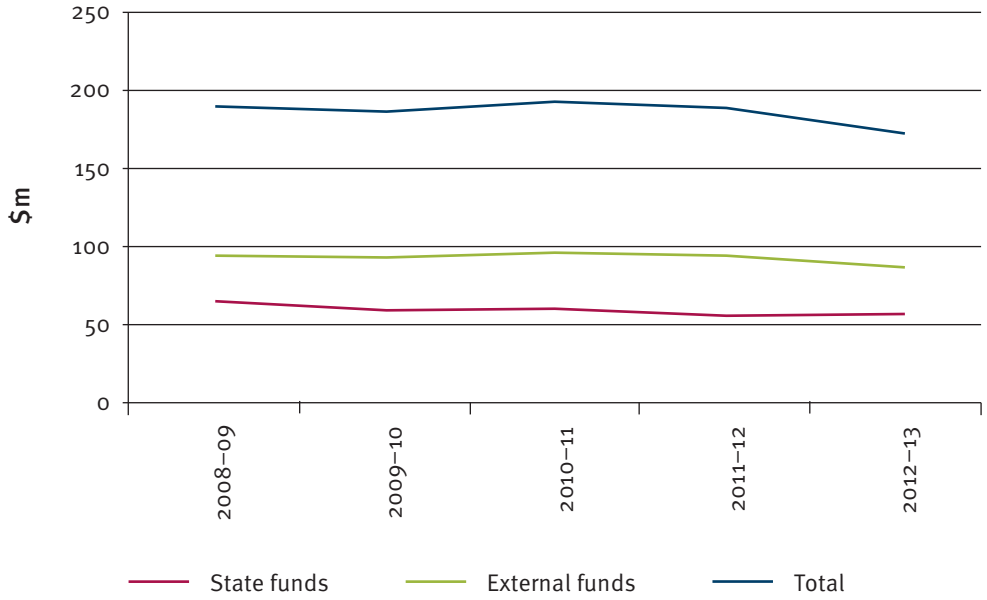
21 Research and experimental development, businesses, Australia, 2011–12, ABS 8104.0

22 *Research and experimental development*, higher education organisations, Australia, 2010, ABS 8111.0

23 Research and experimental development, higher education organisations, Australia, 2012, ABS 8111.0

Figure 3.18 shows a general downward trend in funding over the period, particularly in external funding.

Figure 3.18 State-sourced funding vs. external funding from 2008–09 to 2012–13



Source: Agri-Science Queensland, DAFF

Case study

Strawberry runners

In the 1990s, Queensland's $40 million strawberry industry struggled to stay competitive. With poor 'runner quality' identified as the major contributor to poor crops and reduced monetary returns for producers, DAFF researchers set about improving the quality of runners and their production and management systems.

The research focused on delivering high-quality, minimally-diseased and pest-free strawberry plants to approved runner growers in a timely manner. This meant:

- establishing and maintaining nucleus plants in high health status greenhouses
- tissue culturing plants
- conducting DNA testing for trueness to type
- maintaining minimal pest and disease levels
- virus indexing runners to ensure no viruses are present.

The research program has since seen:

- development of a number of new strawberry varieties suitable for Queensland growers. The most successful to date is Rubygem, with more than three million plants producing fruit in Queensland each year and 10 million plants sold overseas
- new vegetative methods of producing minimally-diseased, pre-foundation plants from nucleus plants in sterile media to replace the labour intensive and expensive tissue culture of foundation plants.

To maintain the momentum of productivity gains, DAFF set up an industry steering committee in 2011 that included fruit and runner growers. The aim of this committee was to develop a new, approved runner scheme for the Queensland Strawberry Growers Association.

In 2014, the committee established the industry-owned and run Australian Strawberry Runner Accreditation Authority (ASRAA) Limited to manage the approved runner scheme. ASRAA was incorporated on 17 March 2014.

In line with the Government's priority for building market capability, runner growers have set up new licence arrangements for University of Florida bred cultivars with the California based licensor, and contracted the work producing pre-foundation plants (previously done by DAFF) to Crop Health Services in Victoria.

Now, there are approximately 200 strawberry growers in Queensland producing between 6000 tons to 15 000 tons (60 million punnets) of strawberries per season. The industry is now worth approximately $180 million to Queensland's economy and produces 60 per cent of Australia's strawberries.

Innovation

In 2010–11, an estimated 30 per cent of Australian agricultural businesses engaged in innovation. Innovation relates to changes in goods or services, and changes in operational, organisational and managerial processes or marketing methods. This compares with 39 per cent of Australian businesses as a whole engaging in innovative activity.

Compared with other industries, innovation in agriculture is more concentrated on acquiring machinery, equipment or technology (52 per cent compared with the average for Australian businesses as a whole of 36 per cent).[24]

Computer use on farms has been expanding rapidly. In 2012–13, computer hardware and software assets in Australian farm businesses totalled $887 million or 0.5 per cent of all (non-land) capital assets. This figure was up from $116 million or 0.1 per cent of (non-land) capital assets in 1989–90.[25]

In 2011–12, 84 per cent of Australian agricultural businesses had internet access and 11 per cent had an online presence. These figures compare with Australian businesses as a whole, at 92 per cent and 45 per cent respectively. Thirty-seven per cent of farm businesses placed orders via the internet, compared with 55 per cent of Australian businesses as a whole.

The ABS does not release a state by state breakdown of this data at industry level.

24 *Innovation in Australian business*, 2010–11, ABS 8158.0

25 *Estimates of industry multifactor productivity*, 2012–13, ABS 5260.0.55.002