

# Queensland agriculture snapshot 2018



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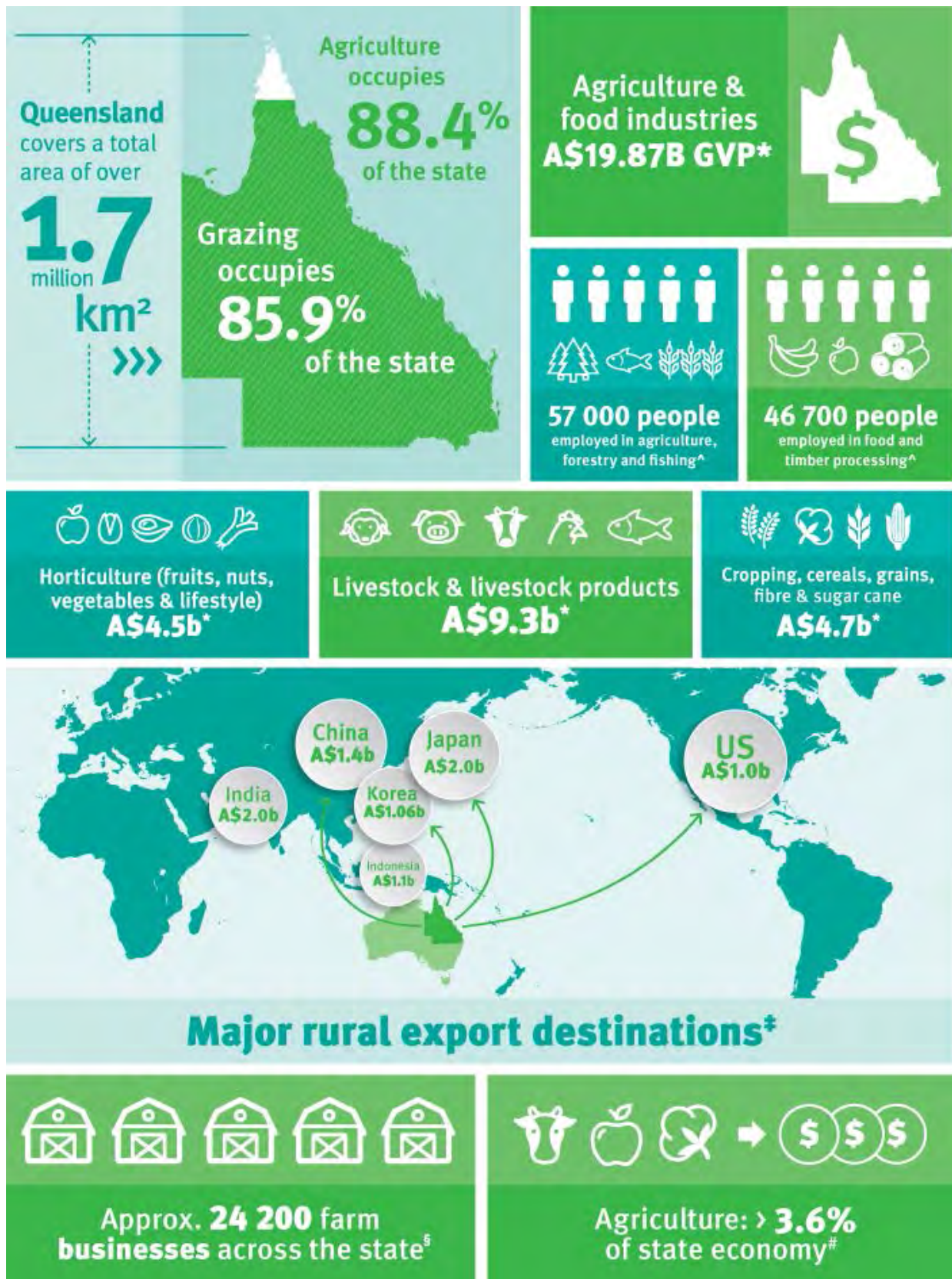
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# Queensland agriculture snapshot 2018





\* DAF, *AgTrends*, <<https://www.daf.qld.gov.au/business-trade/agtrends>>.

<sup>^</sup> ABS 6291.0.55.003, *Labour force, Australia, detailed, quarterly, Nov. 2017*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/6291.0.55.003>>.

<sup>‡</sup> Queensland Government Statistician, <<https://www.treasury.qld.gov.au/economy-and-budget/queensland-economy/statistics-and-indicators/>>

<sup>§</sup> ABS 7121.0, *Agricultural commodities, Australia, 2015–16*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/7121.0>>.

<sup>#</sup> ABS 5220, *Australian National Accounts: State Accounts, 2016–17*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/5220.0>>

# Minister's foreword



Since the very beginning of our state, agriculture has been part of the Queensland way of life and a vital part of our economy.

The total value of Queensland's primary industry output is forecast to be \$20 billion in 2017–18. Even though much of the state is drought-declared, this is a significant increase of 11% over the 5-year average.

This report provides a snapshot of Queensland's agriculture and food industry sector—its performance, its place in the world, its relationship with the broader economy and society, and the issues it faces.

This snapshot identifies the outstanding opportunities available to the sector with the emergence of a food culture and an increasingly prosperous global market that values safe, ethical and sustainable produce. In pursuing these opportunities, the sector has two overriding strengths.

The first strength is its diversity. The resource base of the sector is extremely diverse, operating in a wide range of climates and on a wide range of soil types. Its pattern of production is diverse, with dozens of different food and fibre products produced commercially. The business structures and the people are diverse, with a broad set of relevant skills, attributes and knowledge. In diversity lies strength and resilience.

The second strength is that the agriculture and food sector in Queensland is very much part of the modern economy and society. It is innovative—trend productivity growth in the sector exceeds that in the broader economy. The sector is responsive to customers' demands.

Behind all of this are decades of government support for the sector. Government support for research, development and extension underpins innovation in the sector. Biosecurity Queensland underpins the sector's clean and green image—and its clean and green reality. Primary producers are assisted through the inevitable natural disasters. The sector has access to high-quality infrastructure and a high-quality education and training system. The direction of government policy in recent years has been to remove obstacles to innovation and to support innovation and growth.

This snapshot complements the Queensland Government's strategies for the sector. These are outlined in the *Agriculture and food research, development and extension 10-year roadmap and action plan*, the *Queensland biosecurity strategy: our next five years 2017–2022* and the *Queensland sustainable fisheries strategy 2017–2027*.

The snapshot will be of interest to all those associated with Queensland's agriculture and food sector. It will be particularly useful for those who are thinking of getting involved—potential investors, people thinking of a career in the sector, and policymakers in the public and private sectors. I commend it to you.

Honourable Mark Furner MP  
**Minister for Agricultural Industry  
Development and Fisheries**



# Contents

<b>Minister's foreword</b>	iii
<b>Introduction</b>	1
<b>The land</b>	1
<b>Our climate</b>	3
<b>What we produce</b>	4
<b>When we produce it</b>	6
<b>Our place in the world</b>	7
<b>Our businesses</b>	10
<b>Our people</b>	11
<b>Our opportunities</b>	13
<b>Support</b>	16
Biosecurity	16
Food safety	16
Research, development and extension	16
Investment	16
Climate variability	16
Education and training	17
Regulation	17
<b>A closer look</b>	18
Land and natural resources	18
Implications of climate change	18
Water	19
Soils	23
Biosecurity	23
Agriculture and the environment	24
Regional communities and economies	24
Production costs and infrastructure	26
Costs	26
Prices paid and received	27
Transport	30
Energy	31
Communications	33

Productivity and innovation	34
Trends	34
Technological change	35
Entrepreneurship	36
Adjustment	36
Innovation	36
Investment	37
R&D support	38
Outlook	40
Summary	40
Meat products	40
Dairy	40
Horticulture	41
Sugar	41
Cotton and wool	41
Cereals and related products	42
Forestry and timber	42
Fisheries and seafood	42
<b>Notes</b>	<b>43</b>



# Introduction

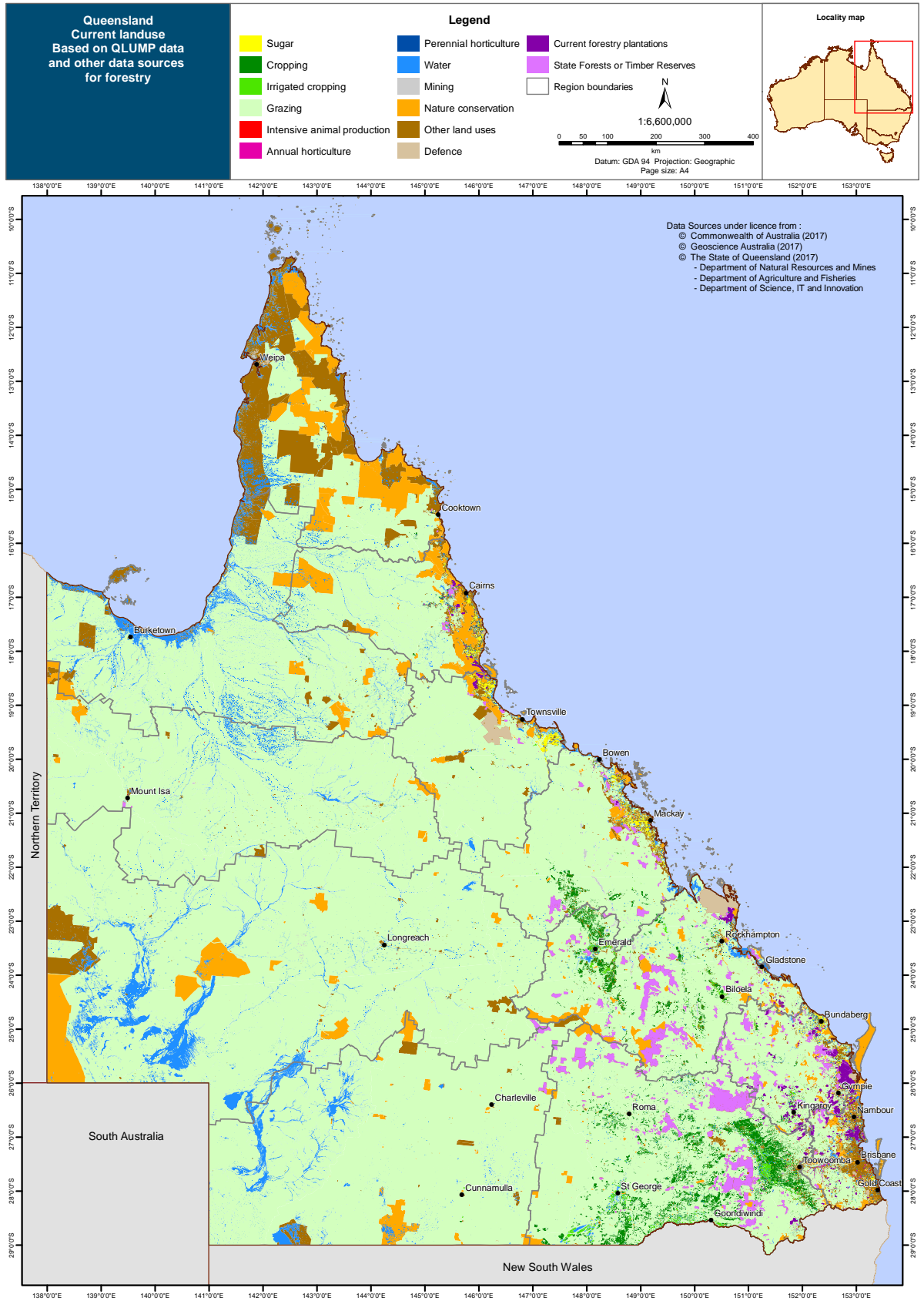
The agricultural, forestry, fishing and food industries are central to the Australian state of Queensland.

- They are central to our **culture, lifestyle and history**. Primary exports from Queensland extend back centuries; the industries were the mainstay of early European settlement and were the basis for the formation of our main political parties.
- They are central to our **economy**. These industries produce around \$20 billion in output each year, over half of which is exported. They provide more than 17% of the state's overseas exports of goods.
- They are central to our **society**. The industries directly employ more than 100 000 of us (more than 4% of our workforce).
- They are central to our **regions**. Queensland is the most decentralised of Australia's mainland states. The industries are important to all regions, but are particularly important in Darling Downs – Maranoa, Outback Queensland and Wide Bay, where they provide more than 10% of direct employment.
- They are central to our **environment**. Queensland's primary industries use 152 million hectares of land (88% of our total land area).
- They are central to our **place in the world**. Queensland's population of just under 5 million people (less than 0.1% of the world's population) produce 0.4% of the world's food supply and nearly 1% of the world's agricultural exports, from 1% of the world's total land area.

This snapshot of the industries is intended for anyone interested in Queensland's agriculture and food sector. It is particularly targeted to those who may be thinking of contributing to the future of the sector—as investors, employees, suppliers, buyers, analysts or leaders. It draws on information from many sources including the Queensland Department of Agriculture and Fisheries (DAF). For more information, visit our website at [www.daf.qld.gov.au](http://www.daf.qld.gov.au).

## The land

More than 88% of Queensland's land is currently used for primary production. Most (86% of the state) is for grazing (Figure 1). There is significant scope for expanding more intensive land uses, manyfold in some cases, from a purely agronomic point of view (Table 1). Any such expansion would be subject to considerations such as infrastructure, markets, environmental impacts and alternative land uses.

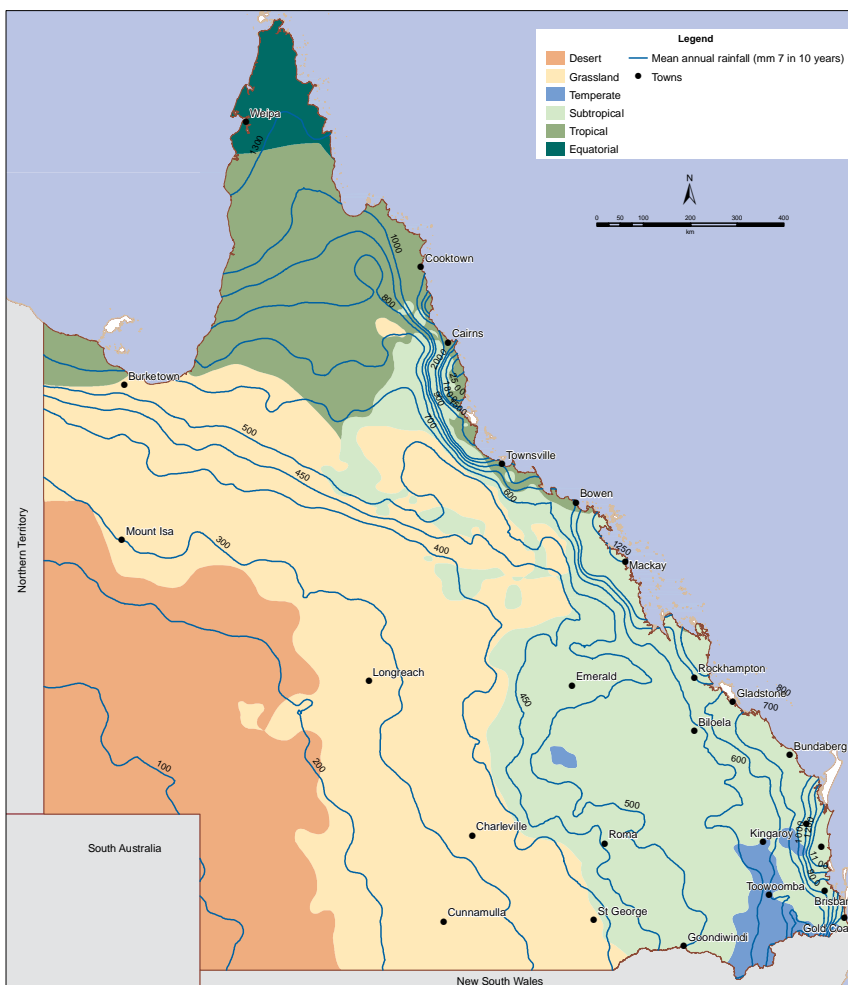


**Figure 1** Current land use in Queensland  
**Source:** DAF 2013, *Queensland agricultural land audit*, <<https://www.daf.qld.gov.au/environment/ag-land-audit>>.

**Table 1** Land use in Queensland

Land use	Current land use		Potential land use	
	Area (ha)	Percentage of state	Area (ha)	Percentage of state
Broadacre cropping	3 547 778	2.06	10 921 561	6.34
Sugar cane	565 162	0.33	6 997 216	4.06
Perennial horticulture	87 829	0.05	12 827 225	7.45
Annual horticulture	47 166	0.03	21 848 591	12.68
Grazing	147 926 860	85.87	155 729 682	90.39
Sown pastures	16 041 166	9.31	15 627 696	9.07
Intensive livestock	37 856	0.02	26 930 082	15.63
Aquaculture	4 548	0.00	492 557	0.29
Other land use (non-agricultural land use, may include some forestry)	20 060 748	11.64		
<b>Total</b>	<b>172 277 977</b>	<b>100.00</b>		

**Source:** DAF 2013, *Queensland agricultural land audit*, <<https://www.daf.qld.gov.au/environment/ag-land-audit>>.



**Figure 2** Queensland's climate

**Source:** DAF 2013, *Queensland agricultural land audit*, <<https://www.daf.qld.gov.au/environment/ag-land-audit>>.

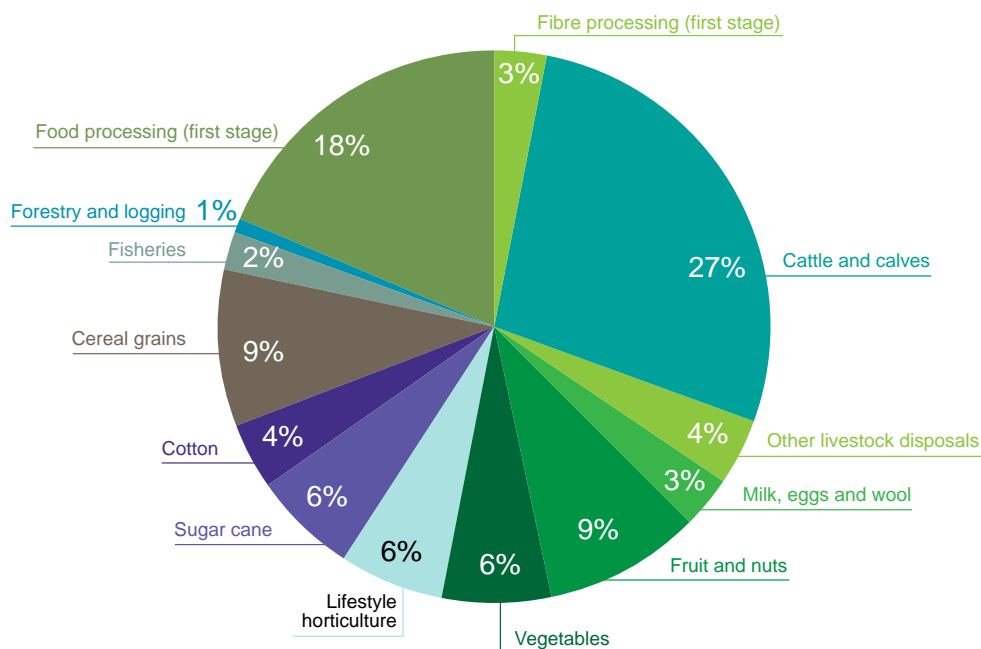
## Our climate

Queensland's climate (Figure 2) is diverse, variable and changing.

- We have mostly warm to hot temperatures, but some temperate areas in the south.
- Rainfall ranges from high in the north (3200 millimetres annual average), to moderate on the south coast (1000 millimetres) and over the range (700 millimetres), to low in the west (less than 2 millimetres).
- Cyclones can cause damage on the coast, but are a major source of rainfall for the dry inland areas, which are also prone to long periods of very dry conditions.
- Climate models suggest that global warming is decreasing expected rainfall over most of Queensland. However, rainfall in some regions may be increasing. Climate variability is also increasing in the form of increased severity of major weather events.

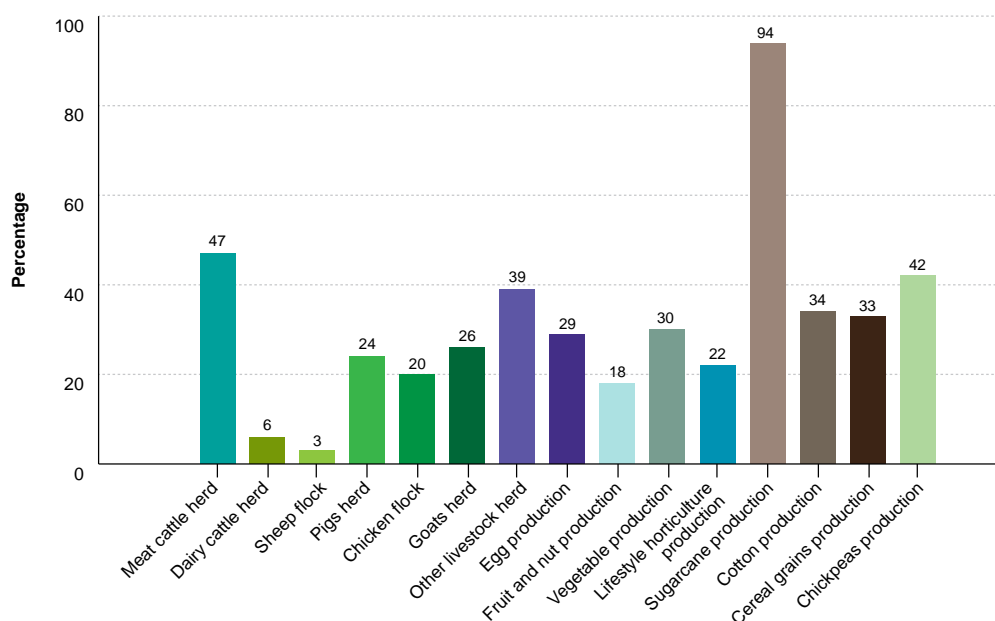
# What we produce

Queensland's agriculture and food sector is also highly diverse (Figure 3).



**Figure 3** Forecast Queensland agriculture and food production, 2017–18  
**Source:** DAF, *AgTrends*, <<https://www.daf.qld.gov.au/business-trade/agtrends>>.

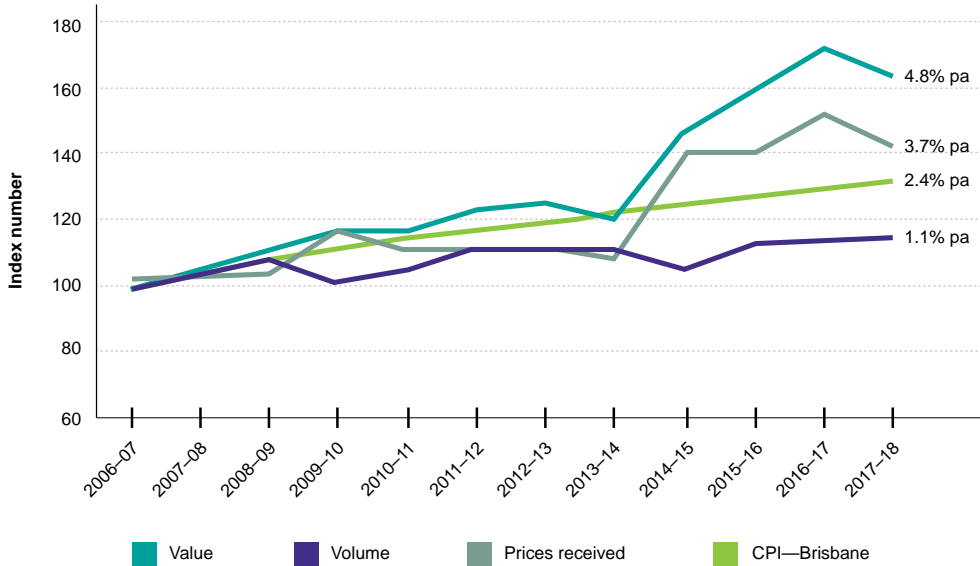
From 34% of Australia's total farm area, Queensland grows 94% of the nation's sugar cane, has 47% of the meat cattle herd, and produces 34% of the nation's cotton, 33% of grains and 30% of vegetables (Figure 4).



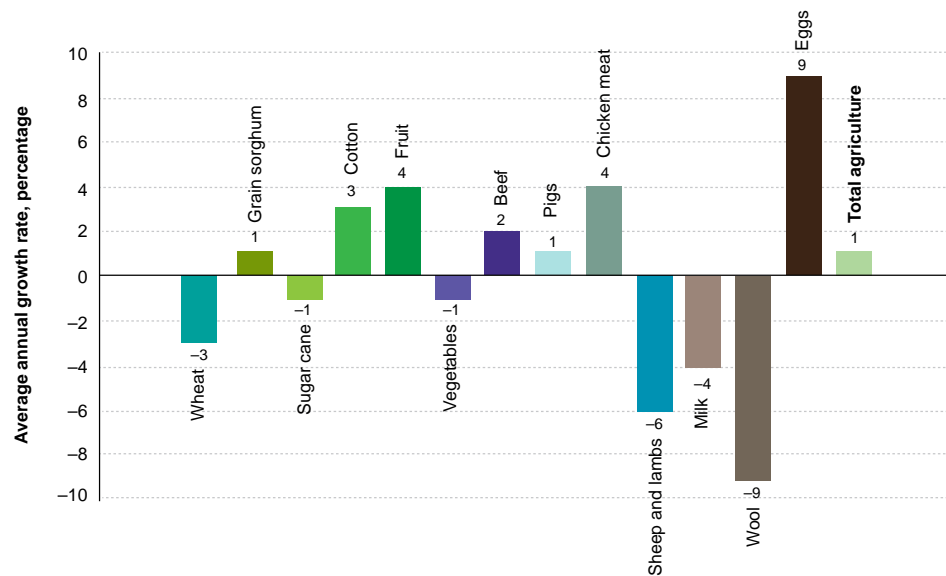
**Figure 4** Queensland's share of Australian total, 2015–16  
**Source:** ABS 7121.0, *Agricultural commodities, Australia, 2015–16*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/7121.0>>.

Growth in total agricultural volumes accelerated to 1.1% per year since 2006–07 (Figure 5), after little change in the previous decade. Prices received by producers have kept up with overall price movements.

There has been a significant shift in the composition of output, away from some traditional commodities such as sheep/wool, dairy, sugar and wheat, towards poultry products, fruit, cotton and cattle (Figure 6). These trends highlight the flexibility and market responsiveness of Queensland’s agriculture and food sector.



**Figure 5** Growth in value and volume of Queensland’s primary industries (2006–07 = 100)  
**Source:** DAF, *AgTrends*, <<https://www.daf.qld.gov.au/business-trade/agtrends>>.



**Figure 6** Trends in production volumes, 1996–97 to last 5 years  
**Source:** DAF, *AgTrends*, <<https://www.daf.qld.gov.au/business-trade/agtrends>>.

## When we produce it

Seasons, and seasonal conditions, drive the timing of much agricultural production. Also, the amount of preparation needed (which depends on soil quality, the influence of preceding crops and other factors) affects production schedules.

The sugarcane harvest generally occurs from mid-August to late October, but can finish as late as December and begin as early as late June. Harvest starts in the north of the state and moves south as the year progresses and the fields dry out. Following harvest, the ratoon crop will receive fertiliser (approximately 2 weeks post-harvest) and be left to grow until the next harvest. Generally this cycle repeats for 5 years and then the field would be left fallow or planted with a rotation crop such as a legume before preparation and replanting to start the cycle again.

Vegetable production occurs year-round with winter production in the north (mainly the Bowen–Burdekin area) and summer/spring/autumn production from Central Queensland, down through Bundaberg and Lockyer to as far south as the Granite Belt. The main vegetable crops are sweetpotatoes, tomatoes, capsicums, zucchinis, melons, pumpkins, sweet corn and beans. Each of these has their own starting point, with most having at least two preferred planting times during the year. Due to shorter crop rotations, several crops can be grown in a year.

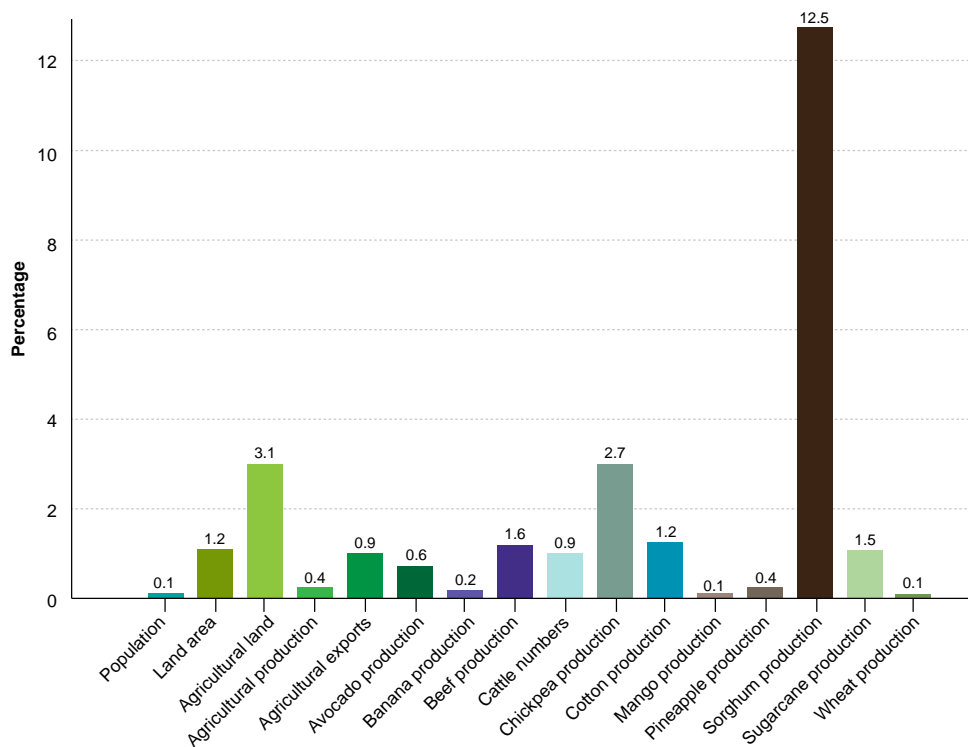
Avocadoes, being perennial crops, are grown year-round. They flower in late winter to spring, through August and September, and harvest from approximately March through to July, depending on the variety. Macadamias, also perennial crops, flower in spring, with harvest from February to July. Tropical fruits such as lychees, custard apples, bananas, longans and carambolas are perennial and so grow all year, with flowering and harvesting at different times.

For summer crops, such as sorghum and cotton, planting time varies depending on planting rains and soil temperature early in the season. Quick-maturing hybrids of sorghum will be sown for rain-grown spring plantings. For the main summer planting, which occurs late December to mid-February, slow-maturing hybrids will be planted early and the quick-maturing hybrids sown later to improve yield reliability. Harvest will occur after 4–5 months. Winter crops such as wheat and barley are planted and harvested around April and October respectively—earlier than in southern states.

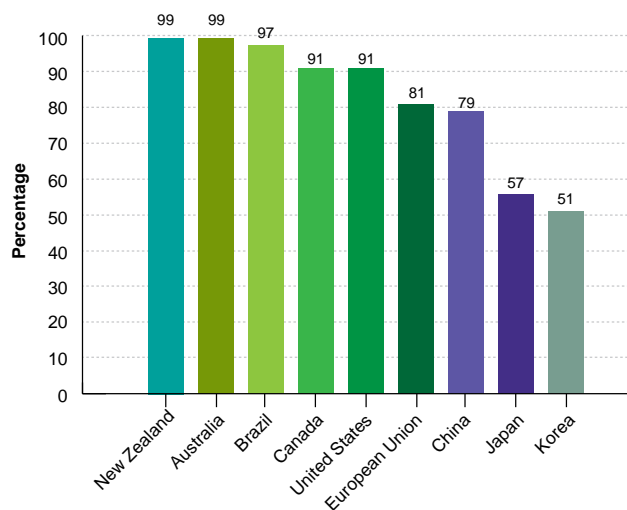
In cattle production, calving generally occurs in spring with calves growing over the summer months when rain is more reliable. Gestation length varies slightly between breeds.

## Our place in the world

In world terms, Queensland's agriculture and food production is not large (Figure 7)<sup>1</sup>, so our producers are price-takers on world markets. Most of their income is derived from the marketplace (Figure 8), so our producers need to be—and are—responsive to market trends and opportunities.

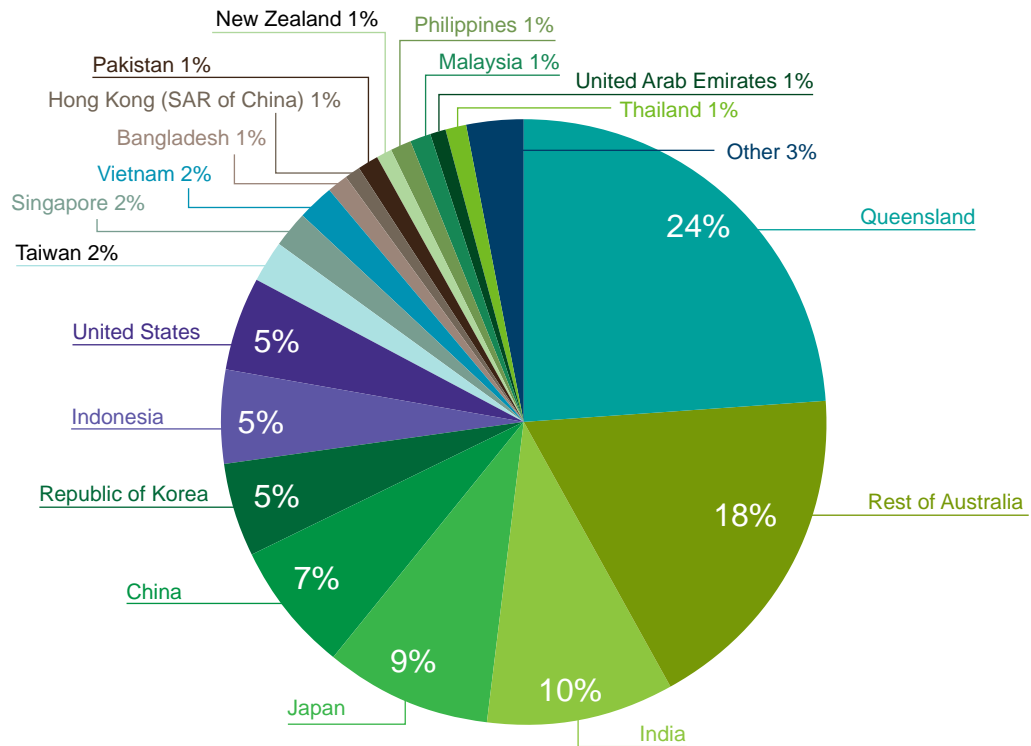


**Figure 7** Queensland's share of world production, 2014  
Sources: FAO, ABS.



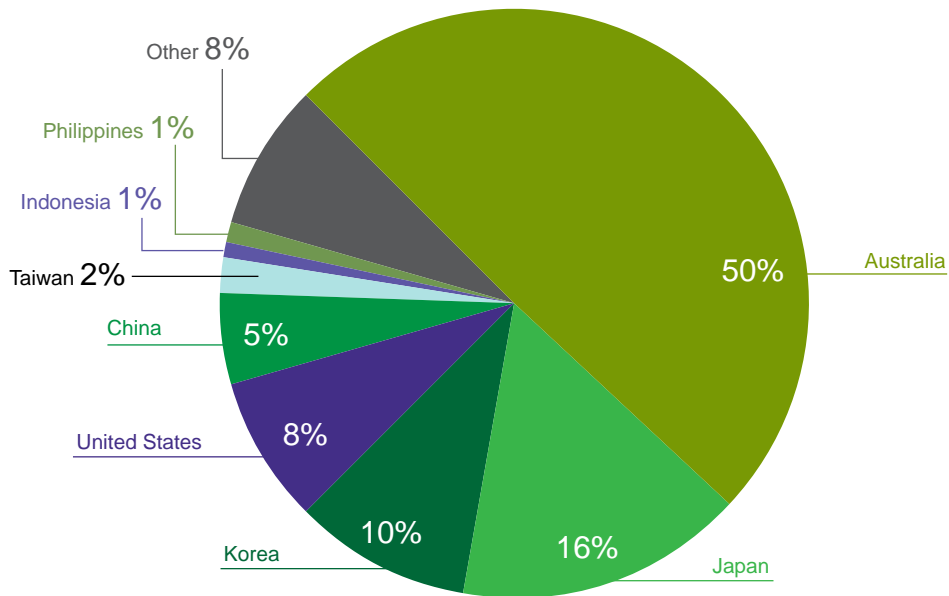
**Figure 8** Percentage of farm income derived from the market, 2014  
Source: OECD, *Agricultural policy monitoring and evaluation*, <[http://dx.doi.org/10.1787/agr\\_pol-2014-en](http://dx.doi.org/10.1787/agr_pol-2014-en)>.

Markets are as diverse as everything else about the sector (Figures 9 and 10). More than half of Queensland's agriculture and food output is exported overseas; around one-fifth is also 'exported' to other states of Australia, and around one-quarter is consumed within the state.<sup>2</sup> Queensland producers supply 93% of the agricultural, forestry and fishing products used in the state (with overseas and interstate sources providing 1% and 6% respectively).<sup>3</sup>

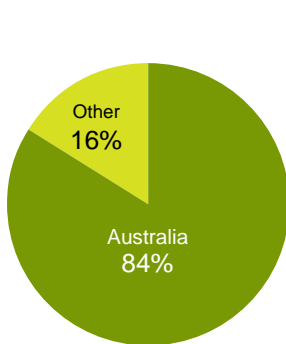


**Figure 9** Destinations of Queensland's agriculture and food production, 2016–17  
**Note:** Destinations over \$100 million are shown.  
**Sources:** DAF, Queensland Government Statistician.

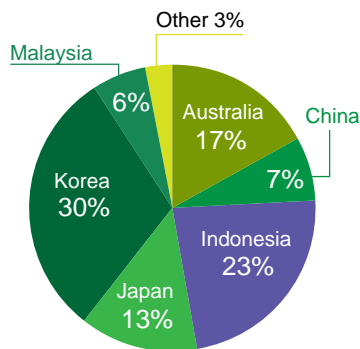




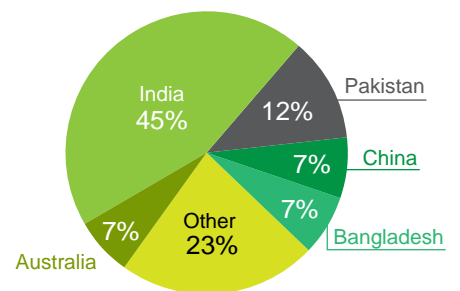
**Meat products**  
Total value \$9322 million



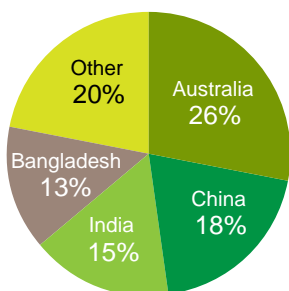
**Fruit and vegetables**  
Total value \$3167 million



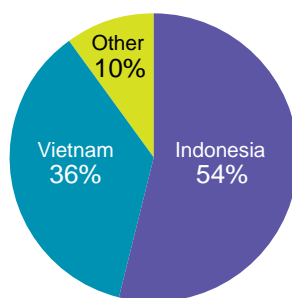
**Sugar**  
Total value \$2320 million



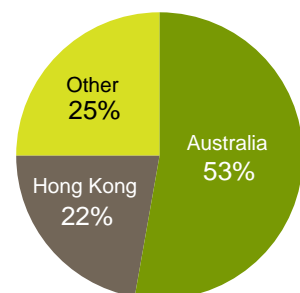
**Grains and grain products**  
Total value \$2032 million



**Cotton and wool**  
Total value \$1163 million



**Live animal exports**  
Total value \$278 million



**Seafood**  
Total value \$384 million

**Figure 10** Destinations of Queensland's agriculture and food industry output, 2016–17  
**Note:** Destinations over \$100 million for each commodity group are shown.  
**Sources:** DAF, Queensland Government Statistician.

## Our businesses

In 2015–16, there were 16 200 farm businesses in Queensland.<sup>4</sup> A further 2300 were involved in forestry and timber manufacturing, 1425 in fisheries and 2240 in food manufacturing.<sup>5</sup>

- A further 8000 businesses (mainly part-time and hobby operations) generate between \$5000 and \$40 000 in agricultural output each year. Together, these generate around 1.3% of total agricultural output.
- Farm numbers have been declining at a steady rate of about 1.1% per year. As total land area devoted to agriculture has changed little, average farm size has increased.

Many of these businesses are themselves diverse, producing multiple commodities:

- About 25% of farms conduct both cropping and grazing activities.<sup>6</sup>
- An ‘average’ broadacre crop farm produces 1.7 broadacre crops.
- An ‘average’ producer of orchard tree and nut products grows 1.6 different orchard tree and nut products.
- An ‘average’ vegetable grower produces 1.6 different vegetable products.<sup>7</sup>

Most businesses involved in agriculture, forestry and fishing are small businesses—56% have no employees apart from the business operators, and 40% have fewer than 20 employees.<sup>8</sup>

Information on the performance of farm businesses is collated in the ABARES survey of the 9900 businesses in the dairy and broadacre cattle, sheep and grains industries.<sup>9</sup> (Most of these businesses—73%—are specialist beef producers.) Some key statistics from this survey are discussed in the following paragraphs.

In 2015–16, these firms had:

- average capital value of \$5.5 million
- average debt of \$639 000, implying average net equity of \$4.9 million and an 87% equity ratio
- average farm cash income of \$188 000, representing business profit of \$72 000 (with income supplemented by additional off-farm income averaging \$59 000)
- average return on capital of 2% excluding capital appreciation and 7% including capital appreciation.

Behind these averages there is considerable variability and diversity.

An indication of variability is that, for example, 2015–16 was the first year with a healthy rate of return (above 1%) since 2006–07. Since 1989–90, annual returns (with capital appreciation) have averaged 2%, ranging from –8% (1991) to +12% (2007). Returns without capital appreciation have been more stable, averaging 1% and ranging from –1% (2002–03) to +2% (2000–01, 2001–02, 2015–16).

Examples of the farm sector’s diversity (for 2015–16) are:

- For broadacre farms, the rate of return including capital appreciation ranged from +3% in the North Queensland coastal region to +13% in the Cape York and Gulf region, and from zero in the sheep industry to +9% in the wheat and sheep–beef industries.
- Among the broadacre industries, 48% of farms were worth less than \$3 million, 42% were worth between \$3 million and \$10 million, and 12% were worth more than \$10 million.
- 76% of broadacre farms had turnover of less than \$500 000, 12% had turnover between \$500 000 and \$1 million and 12% had turnover exceeding \$1 million.

Of course, statistical averages are unlikely to be representative of the most productive, the most innovative, the most profitable, or the most investor-ready operations.

- 10% of farms have equity ratios below 70%, which might be an indicator of financial stress.
- On the other hand, 41% have equity ratios of 100%—these enterprises are unlikely to be growing their business, and are unlikely to be the most innovative firms. The same may also be true for many of the 31% of farms with equity ratios between 90% and 100%.
- The most innovative and credit-worthy growth operations are likely to be in the 20% of farms with equity ratios between 70% and 90%.

Comparing the 12% of (larger) broadacre farms that have turnover exceeding \$1 million with the 76% that have turnover less than \$500 000, we find that the larger farms were:

- much more valuable (\$18.3 million compared with \$3.3 million in average total capital)
- much more indebted (\$3.3 million compared with \$246 000) with much lower equity ratios (80% compared with 93%)
- much more profitable (rate of return including capital appreciation of 12% compared with 5%)
- larger in area (55 200 hectares compared with 6900 hectares).

However, the mid-sized farms—the 12% with turnover between \$500 000 and \$1 million—had the highest cash income per hectare (\$27 300 compared with \$12 400 for smaller farms and \$14 000 for larger farms). Mid-sized farms were between smaller and larger farms on the other indicators reported here.

## Our people

In 2017, there were 103 600 people employed in agriculture, forestry, fishing, food manufacturing and wood product manufacturing in Queensland.<sup>10</sup>

- This included 52 800 in agriculture, 3200 in fisheries, 8000 in forestry and wood product manufacturing, and 39 700 in food manufacturing.
- A further 255 500 people were employed in food and beverage services, food retail and grocery wholesaling operations, which are directly related to supplying food to the Queensland public.
- A further 75 000 jobs in other industries are involved in the supply of goods and services to the sector.<sup>11</sup>

So it could be said that the total supply chain of the food and agribusiness sector, including both forward and backward links from the agriculture and food sector itself, provides 434 100 jobs in Queensland—18% of the total number of jobs in the state. Figures 11 to 14 show that those engaged in the sector, compared to the workforce as a whole:

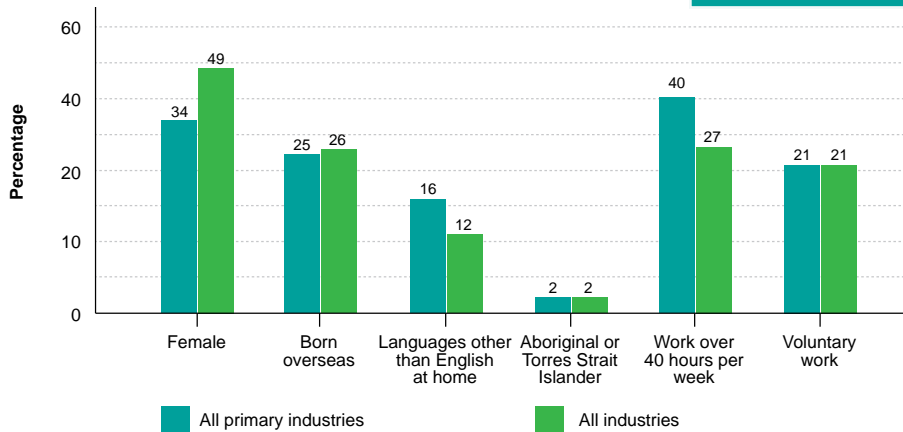
- are less likely to be female (34% compared with 49%)
- are just as likely to be born overseas (25% compared with 26%)
- are just as likely as to be Aboriginal people or Torres Strait Islanders (both 2%)
- are more likely to speak a language other than English at home (16% compared with 12%)
- work longer hours (40% working more than 40 hours per week, compared with 27%)
- are less likely to be employees (69% compared with 84%), and are more likely to be self-employed, employers or contributing family workers
- are more likely to be managers or labourers, or to a lesser extent plant machinery operators, and less likely to be in other occupational groups

In the food and agribusiness sector, the workforce is slightly older than for all industries (median age 42 compared with 40), with farm managers significantly older on average (54) .

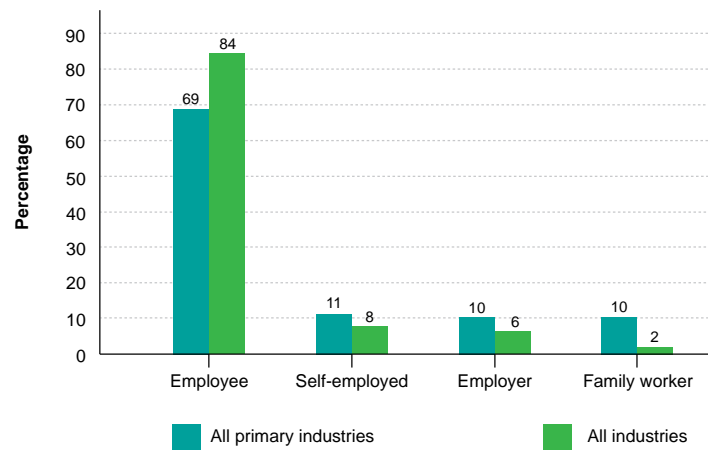
- have lower levels of education (11% with degrees compared with 27%) but comparable levels of trade qualifications (23% compared with 24%)
- have a diverse range of qualifications, for example agriculture and related qualifications (6%), engineering and related qualifications (13%—many would be at trade level) and management qualifications (8%).

A wide range of languages are spoken at home. Some of the more significant are Mandarin (spoken at home by 2% of the sector's workforce), and Vietnamese, Korean, Italian, Punjabi and Filipino (all 1%).

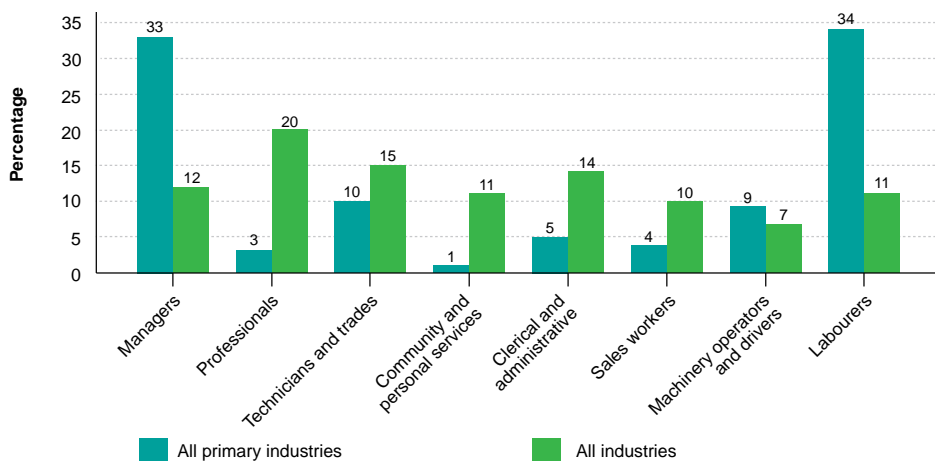
Many members of the workforce would speak two or more languages.



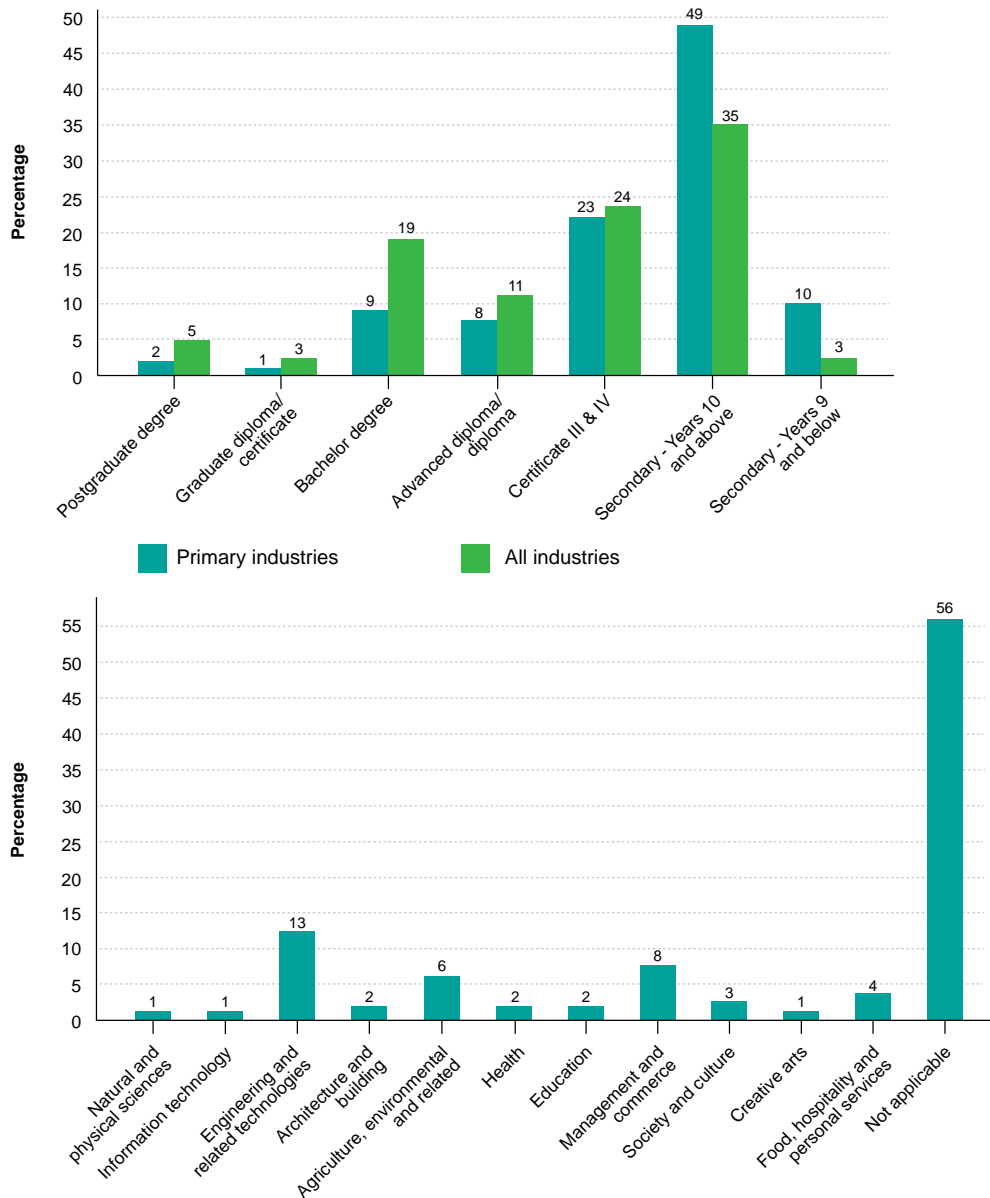
**Figure 11** Workforce demographics, Queensland, 2016  
**Source:** ABS, *Census 2016*, <<http://abs.gov.au/census>>.



**Figure 12** Employment status, Queensland, 2016  
**Source:** ABS, *Census 2016*, <<http://abs.gov.au/census>>.



**Figure 13** Occupation, Queensland, 2016  
**Source:** ABS, *Census 2016*, <<http://abs.gov.au/census>>.



**Figure 14** Education qualifications, Queensland, 2016  
**Source:** ABS, *Census 2016*, <<http://abs.gov.au/census>>.

Largely reflecting the occupational profile, employees in the sector are relatively low paid, with a median self-reported annual income (in the 2016 census) of \$45 094, compared with the workforce average of \$51 511.

## Our opportunities

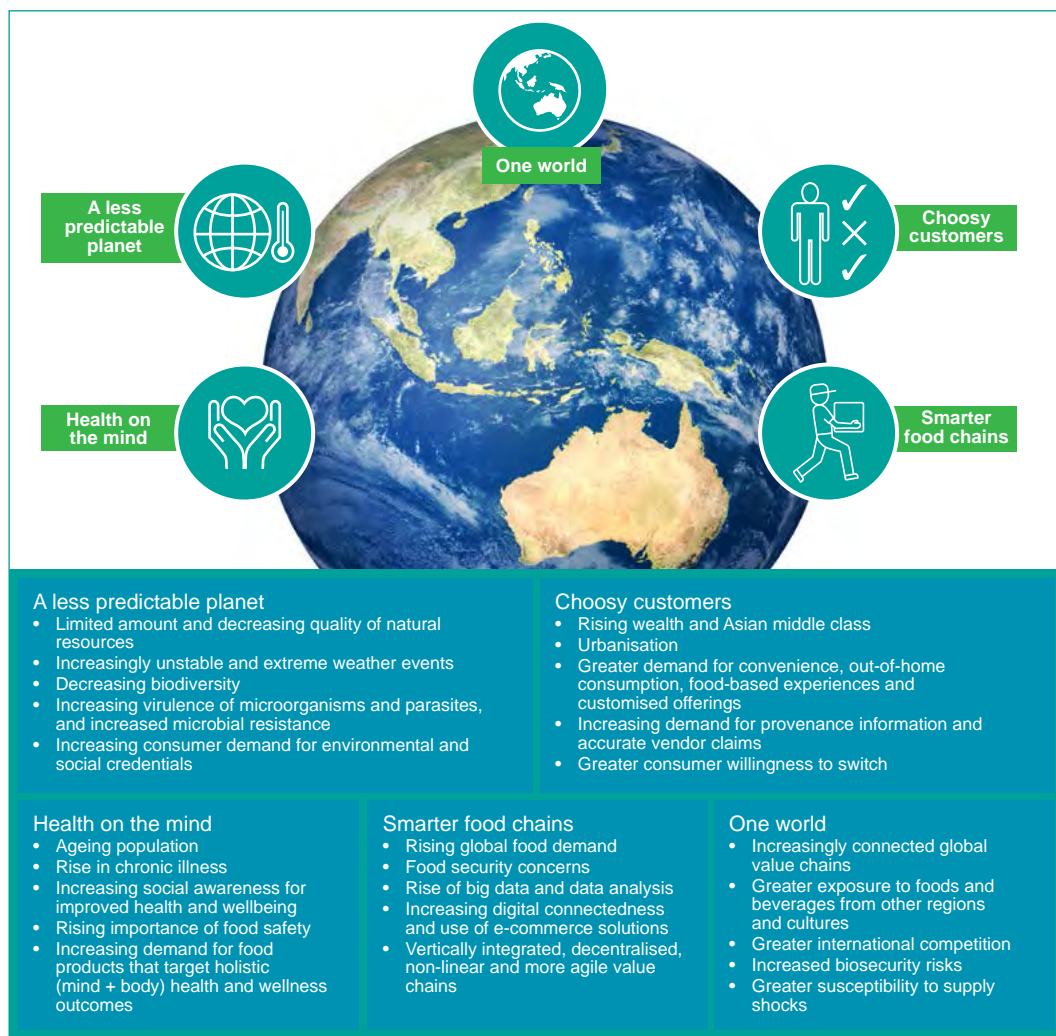
According to the CSIRO, five ‘megatrends’ are impacting the food and agriculture sector (Figure 15). All of these megatrends represent both challenges and opportunities.

Opportunities include:

- increased exports of protein-rich products (e.g. beef, seafood, some crops like chickpeas)
- exports of healthy food products

- increased exports of a variety of horticultural products (including exotic fruits), using the advantage of Queensland’s counter-seasonality to northern hemisphere producers
- value-adding to higher quality, more convenient and better packaged products across all industries
- increased exports deriving from increasing recognition of Queensland’s clean and green record and status.

Of course, reaping these opportunities will depend on meeting challenges, such as maintaining market access in an increasingly competitive international environment.



**Figure 15** The five megatrends impacting the food and agriculture sector  
**Source:** Adapted, and reproduced with the permission of CSIRO, from CSIRO, *Food and agribusiness: a roadmap for unlocking value-adding growth opportunities for Australia*, July 2017, <<https://www.csiro.au/en/Do-business/Futures/Reports/Food-and-Agribusiness-Roadmap>>.

Because of these opportunities, Deloitte describes agribusiness as ‘Australia’s forgotten hero’ and states that ‘Australia can be a long-term winner in this sector, particularly in grains, beef and dairy, wine, oil seeds and emerging areas like aquaculture’.<sup>12</sup>

Queensland is better placed to meet the challenges, and take advantage of the opportunities, than most of its competitors (Figure 16). In agriculture and food, this is because of several factors:

- The sector is **diverse**. Diversification is always a good risk management strategy. It is a key feature of Queensland’s agriculture and food sector, and of the Queensland economy and society as a whole.

- The sector has a **market-facing environment**. While well-supported by government (see pages 16–17), Queensland’s agriculture and food industries do not rely on government for their wellbeing (see Figure 8, page 7). Rather, they rely on their success in the marketplace.
- The sector has a recognised **clean and green status**. Australia—and especially Queensland—produces some of the highest quality foods in the world, and we are determined to maintain that status in the face of ongoing biosecurity threats and environmental challenges.
- The sector has extensive **supporting infrastructure** including:
  - hard economic infrastructure such as roads, railways and ports
  - soft infrastructure such as a supportive legal and regulatory environment
  - smart infrastructure such as research, development and extension, and an innovative culture more generally
  - social infrastructure such as a supportive education and training system.

## QUEENSLAND’S NEW ECONOMY



**Figure 16** Queensland’s opportunities for growth  
**Source:** Naughtin, C, McLaughlin, J & Hajkowicz, S 2017, *Opportunities for growth: driving forces creating economic opportunities for Queensland companies over the coming decade*, CSIRO, <<http://qldfutures.com.au/wp-content/uploads/2017/01/QFIs-Opportunities-for-Growth-Report.pdf>>.

# Support

While Queensland's agriculture and food sector faces the marketplace, it does so with the support of government at all levels. Nationally, 18% of agriculture, forestry and fishing firms received direct government assistance in 2015–16, compared with 11% of all firms.<sup>13</sup>

## Biosecurity

Australia, including Queensland, maintains very high biosecurity standards. Biosecurity is the responsibility of everybody—the Australian Government, the Queensland Government, local governments and landholders. World-leading arrangements are in place to prevent, detect, respond to and manage biosecurity incidents. The Queensland Government directly spent \$142 million on biosecurity in 2016–17.<sup>14</sup>

## Food safety

Safe Food Production Queensland seeks to ensure that Queensland's primary production and processing systems meet national food safety standards, that potential threats to the integrity of food supply are identified and dealt with decisively, and that consumers have confidence in food produced in Queensland. It administers food safety schemes for meat, dairy, eggs and seafood. The risks associated with horticulture are currently being considered.

## Research, development and extension

The Queensland Government invests nearly \$100 million per year in research, development and extension (RD&E) for the agriculture and food sector. This is more than a quarter of all research and development (R&D) expenditure by Queensland Government agencies.<sup>15</sup> A comparable amount (\$95 million in 2014) is spent on R&D in the agricultural and veterinary sciences in Queensland universities<sup>16</sup>, and some \$126 million is spent in Queensland annually on R&D by businesses involved in the sector, mainly food processing.<sup>17</sup>

## Investment

Trade and Investment Queensland seeks to attract and facilitate job-creating investment in the state. Specific programs, including the Primary Industry Productivity Enhancement Scheme of concessional loans administered by the Queensland Rural and Industry Development Authority, assist investment in agriculture and food.

## Climate variability

The Queensland Government helps primary producers manage their businesses through a range of drought services, including financial assistance, livestock nutrition and animal welfare information, and business management strategies.



## Education and training

Agriculture and food businesses require a wide range of skills. Nationally, a slightly higher proportion of primary producers than other firms nominate skill shortages as a constraint on business (12% compared with 11%).<sup>18</sup>

The sector in Queensland is supported by a strong network of education and training providers who offer a wide selection of courses ranging from short non-accredited training, through accredited training as part of the vocational education and training (VET) system, to degree and higher degree level as part of the higher education system.

In 2016–17, there were 13 540 publicly funded students undertaking accredited VET primary industry programs in Queensland. This is approximately 19% of the national total, slightly above Queensland's 17.2% share of employment in agriculture, forestry and fishing. It also represents around 5.2% of all publicly funded students undertaking nationally recognised training in Queensland—also higher than the industries' share of total employment in the state.

In 2016, 700 students completed university courses in agriculture and environmental studies in Queensland (383 at The University of Queensland, 132 at Griffith University, 82 at James Cook University, 46 at Central Queensland University, 35 at the University of South Queensland and 22 at Bond University). This was 17% of the national total of agriculture and environmental studies completions and 1.3% of all higher education completions in Queensland.<sup>19</sup>

## Regulation

Australian governments have removed many agriculture-specific regulations in recent decades. In the early 1980s, there were more than 60 statutory marketing boards nationwide; today just 1 remains (not in Queensland).<sup>20</sup> Over the same period, the volume and reach of regulations aimed at addressing environmental and social policy issues increased. Current regulation provides important protections for business owners, workers and the community, and sets a minimum level of performance required to meet community standards and expectations. This can have clear benefits to the industry in Queensland. For example, Australia's biosecurity regulatory arrangements provide a reputational advantage to Australian farmers and access to premium export markets.

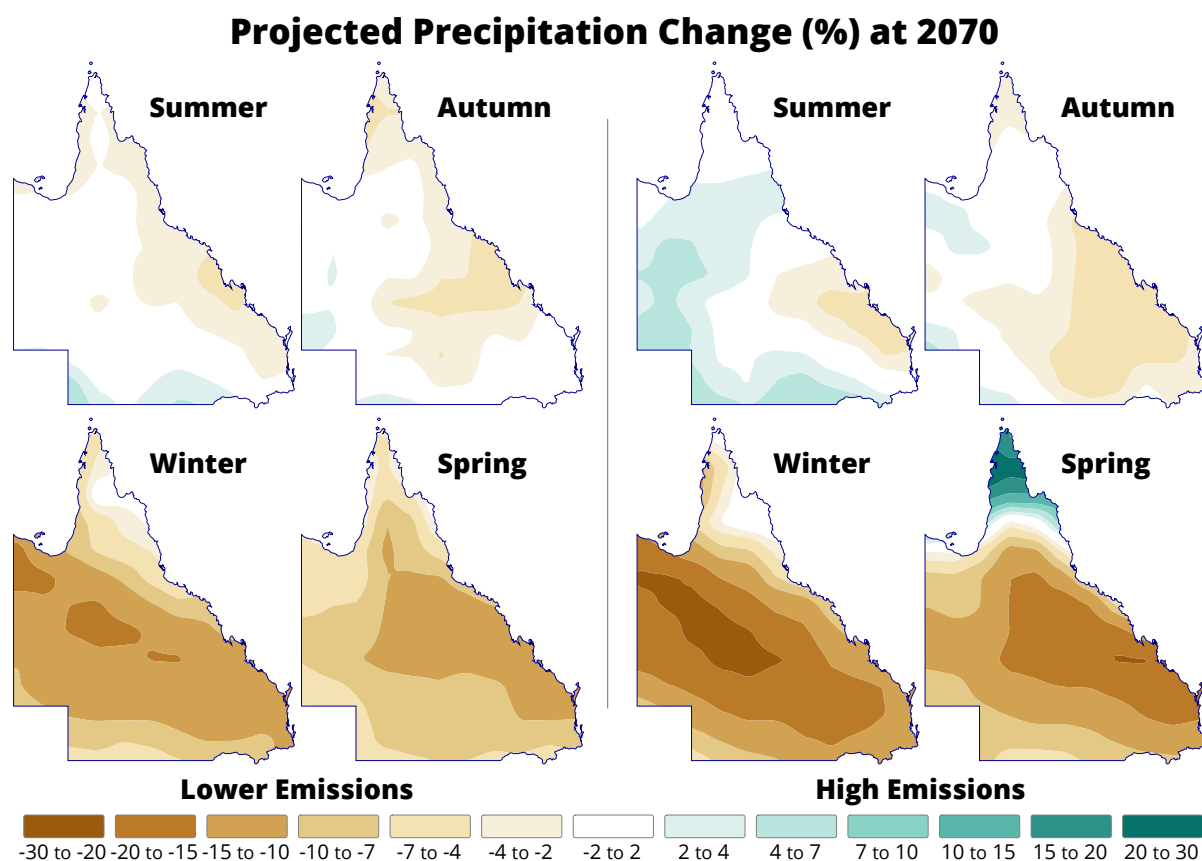


# A closer look

## Land and natural resources

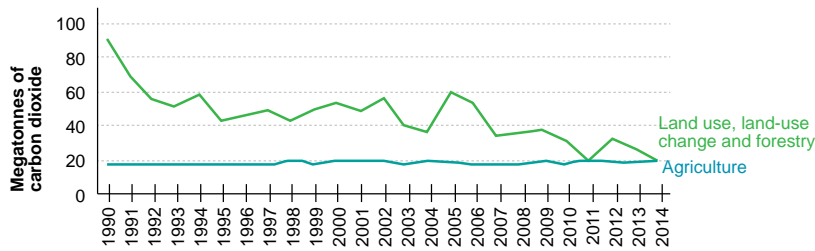
### Implications of climate change

Climate change is impacting Queensland and its agriculture and food sector. It brings a challenge to the sector in both adapting to, and helping to mitigate, the effects. Not all impacts are negative—increased concentrations of atmospheric carbon dioxide stimulate plant growth, and some regions may experience higher rainfall (Figure 17). However, on average, Queensland is expected to become drier—with annual precipitation falling by 2–3% by 2050—as well as warmer.<sup>21</sup> Most seriously, extreme events such as droughts and cyclones are predicted to increase in severity and impact, while climate change is expected to widen the range of many significant pests and diseases.



**Figure 17** The impact of climate change on rainfall—percentage change by 2070  
**Source:** Queensland Government, *Climate change in Queensland*, <<http://qgsp.maps.arcgis.com/apps/MapJournal/index.html?appid=1f3c05235c6a44dcb1a6faebad4683fc>>.

Queensland’s agriculture sector has much experience in facing climate variability. This, plus support from the government (as outlined in *Pathways to a climate resilient Queensland: Queensland climate adaptation strategy 2017–2030*), puts the sector in a strong position to handle the challenges of adapting to climate change.



**Figure 18** Queensland's greenhouse gas emissions  
**Source:** Queensland Government, *Total annual greenhouse gas emissions*, <<https://www.ehp.qld.gov.au/state-of-the-environment/finding/?id=3.4.o.1>>.

Agriculture accounted for 14% of Queensland's greenhouse gas emissions in 2014. This was mainly (82%) methane from ruminant animals, mainly cattle, and so varies over time in line with livestock numbers. A further 13% of Queensland's total emissions were from activity related to land-use change (such as tree clearing), which declined significantly up to 2014 (Figure 18). Globally, food and agribusiness is estimated to contribute 30% of global emissions.<sup>22</sup>

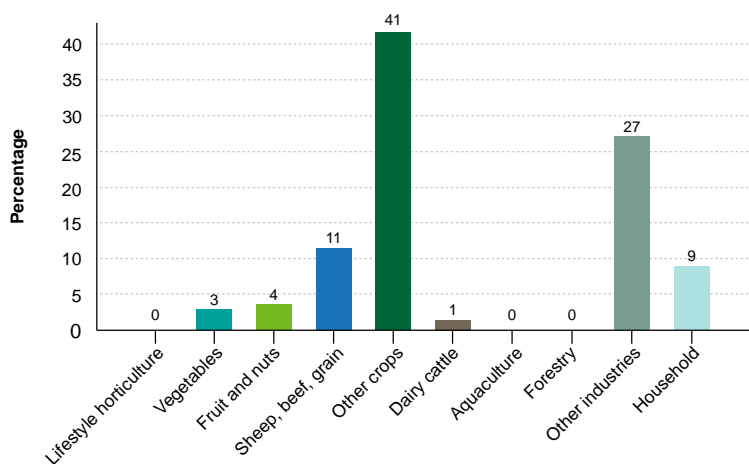
The focus of climate change mitigation policy has been on reducing tree clearing, with some emphasis on reducing livestock emissions through improved management practices. In an area the size of Queensland, there is also significant potential for the creation of carbon 'sinks' through re-forestation and soil management, supported by 'carbon markets' able to direct investment into these activities.

## Water

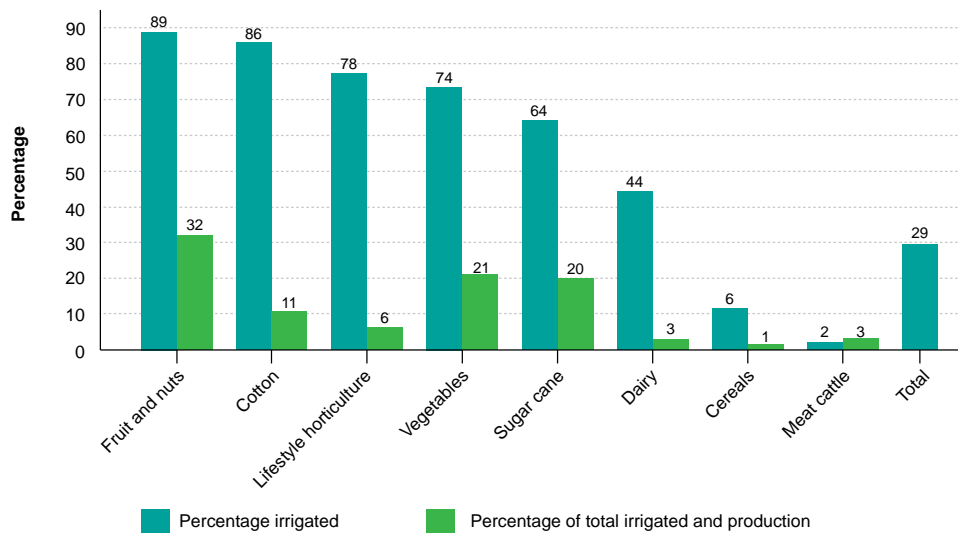
Queensland's primary industries used some 2454 gigalitres of water in 2015–16—this was 62% of total water use in Queensland (Figure 19). The main user (41% of total state water consumption) is the 'other' crop industries, mainly sugar cane and cotton.

In 2015–16, 29% of all Queensland agricultural production was irrigated on 30% of farms (Figure 20). Most cotton and horticulture is irrigated, as is a significant proportion of sugar cane and dairy production.

In 2015–16, 29% of irrigation water was from groundwater sources and 23% from natural waterways.<sup>23</sup>



**Figure 19** Industry share of total water use, Queensland, 2015–16  
**Source:** ABS 4610.0, *Water account, Australia, 2015–16*, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4610.0Main+Features12015-16>>.



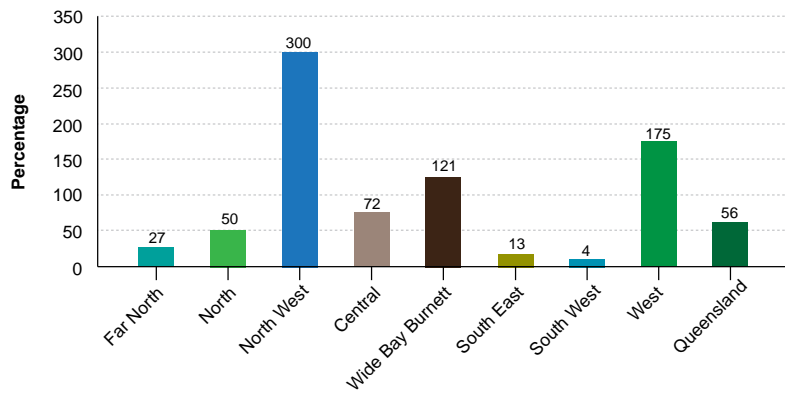
**Figure 20** Percentage of production irrigated, Queensland, 2015–16  
**Source:** ABS 4610.0, *Water account, Australia, 2015–16*, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4610.0Main+Features12015-16>>.

Water resources in Queensland are regulated through water resource plans for 24 water resource areas.<sup>24</sup> SunWater is the main bulk water supplier in regional Queensland. It operates 19 major dams, 66 weirs and barrages, 82 major pumping stations, 3155 kilometres of pipelines and channels, and 730 kilometres of irrigation drains (Figure 22).<sup>25</sup>

SunWater operates on a commercial basis, with additional storage and irrigation infrastructure added on the basis of detailed business cases. As a result, water infrastructure developments are continuing. For example, the Lower Fitzroy River Infrastructure Project will supply approximately 76 000 megalitres of additional water per year for urban, industry and agricultural use in Central Queensland; this is a 3% increase in supply of (distributed) water in Queensland.<sup>26</sup>

In principle, water users are charged for all operating costs (including depreciation) for the supply of water. The Queensland Government does not require any return on its capital invested; water infrastructure is considered an important economic development service to the Queensland community. Many irrigators pay lower prices than this, supported by a community service obligation payment. These prices are phasing upwards to full cost recovery, but price paths have been frozen until 2019 to support transfer of some of SunWater’s irrigation channel schemes to local ownership.

While most current water supplies in the state are fully allocated, there is considerable scope for expanding water supplies (Figure 21),<sup>27</sup> both through bulk water infrastructure and through individual property initiatives. For example, there is a significant amount of land in North Queensland available for grazing but only with additional investment in watering points accessible to grazing cattle.



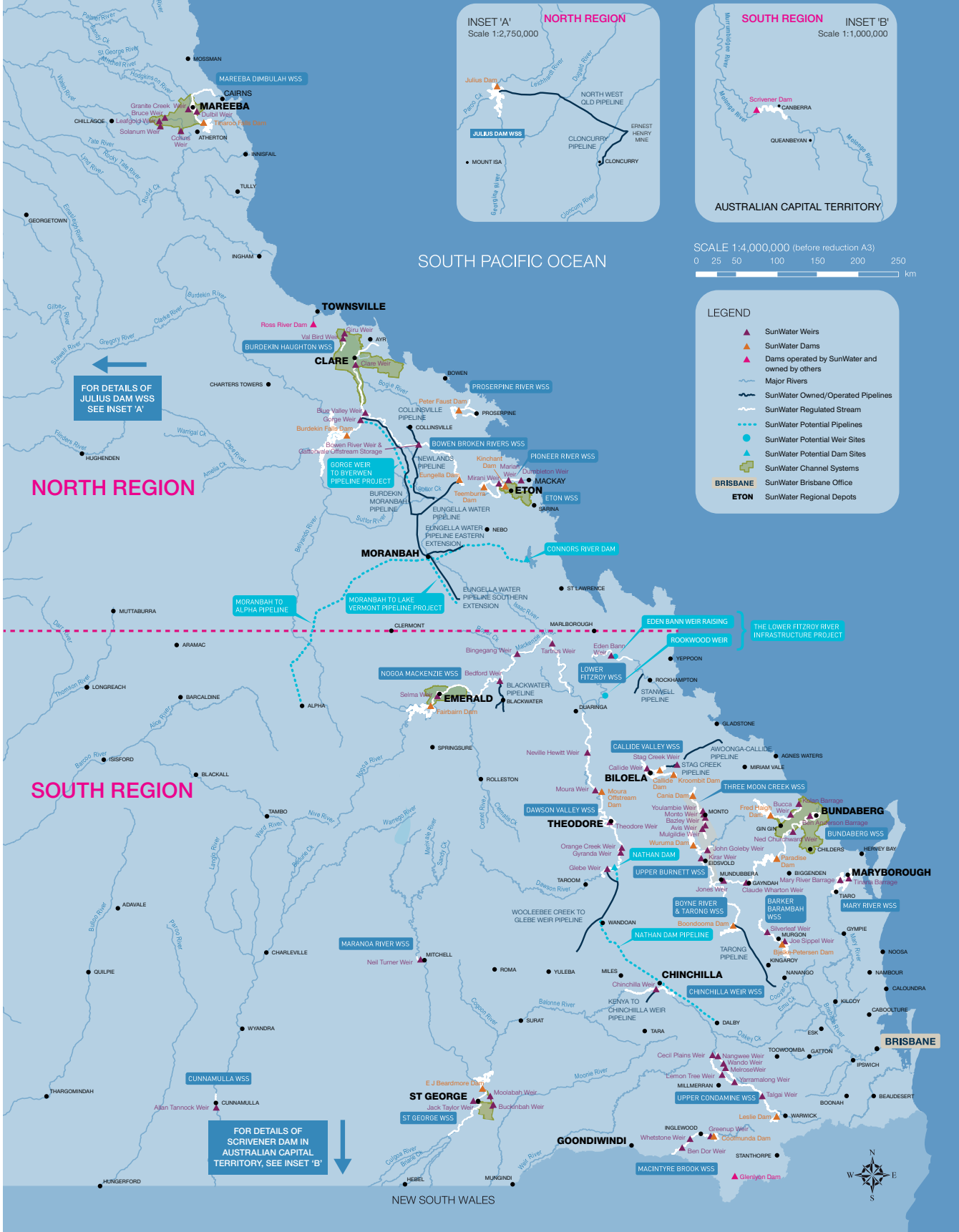
**Figure 21** Uncommitted and unallocated water share of 2015–16 consumption  
**Source:** Queensland Government 2017, *Queensland bulk water opportunities statement*, <[https://www.dews.qld.gov.au/\\_\\_data/assets/pdf\\_file/0007/1266883/qld-bulk-water-opportunities-statement.pdf](https://www.dews.qld.gov.au/__data/assets/pdf_file/0007/1266883/qld-bulk-water-opportunities-statement.pdf)>.

Investment in additional supply must meet environmental requirements as well as being economically justified. Water trading is also available, and is expanded with successive revisions to water resource plans, enabling water resources to be applied to their highest value use, and incentivising more efficient water use.



# SUNWATER OPERATIONS AND INFRASTRUCTURE

updated January 2017



**Figure 22** SunWater operations and infrastructure  
**Source:** SunWater, *Annual report 2015–16*, <[http://www.sunwater.com.au/\\_data/assets/pdf\\_file/0006/19689/SunWater\\_Annual\\_Report\\_2015-2016.pdf](http://www.sunwater.com.au/_data/assets/pdf_file/0006/19689/SunWater_Annual_Report_2015-2016.pdf)>.

## Soils

Soil is a precious resource, and Queensland's agriculture depends upon it. The inherent characteristics of soil, along with the availability of water, largely determine the amount and quality of food and fibre that land can produce. Agricultural soils also provide the community with a suite of other benefits such as clean water, climate regulation (e.g. through carbon sequestration) and biodiversity conservation. Soil is, however, largely non-renewable—a few centimetres may take hundreds or thousands of years to create—and it can be fragile. A generation's worth of soil can be lost in a single intense rainfall event if left unprotected or unsupported by appropriate land management practices.

The capacity of soils to support agriculture and to provide other benefits to the community can be degraded by erosion, salinisation, and structure and fertility decline. These processes occur naturally in different locations to varying levels; however, inappropriate land management greatly increases their extent and impact. Soil degradation is widespread across Queensland, and is estimated to cost more than \$2 billion per year in lost agricultural income, infrastructure damage and reduced environmental services.<sup>28</sup>

In 2006–07, Queensland farmers reported spending a total of \$121 million on land and soil conservation works.

Prime agricultural land is also lost to competing land uses such as urban development.

## Biosecurity

Queensland is home to many species that have been either deliberately or accidentally introduced since European settlement. Biosecurity Queensland<sup>29</sup> lists 50 emergency plant pests and diseases, 90 restricted plants (weeds), 19 restricted invasive animals, and 81 significant animal pests and diseases. Most weeds do not currently occupy their maximum distribution, and so have significant potential to spread (potentially exacerbated by climate change).

However, the Queensland community is determined to maintain the state's clean and green status:

- The Queensland Government directly spent \$142 million on biosecurity in 2016–17.<sup>30</sup>
- The Australian Government spent \$715 million on managing biosecurity and imported food risk in 2016–17. On a per capita basis, this is equivalent to \$143 million in Queensland.<sup>31</sup>
- Local governments spend around \$25 million per year on pest and weed management.<sup>32</sup>
- In 2006–07 (latest data), 86% of agricultural businesses in Queensland conducted weed control activities and 81% conducted pest animal control activities. The expenditure for this was \$451 million (equivalent to \$572 million in 2016–17 prices).<sup>33</sup>
- The *Biosecurity Act 2014* introduced the **general biosecurity obligation**. This applies to all Queenslanders and is in line with the principle that biosecurity is everybody's responsibility.

## Agriculture and the environment

Accounting for 88% of the land area of Queensland, primary industries are a significant part of the state's environment. The sector must consider issues such as climate change, biodiversity, habitats, and sediment and chemical run-off. This last is particularly important to the 26% of agricultural landholdings within Great Barrier Reef catchments.<sup>34</sup>

In 2015–16, 3.4% of the land in agricultural landholdings was not used for agriculture, and 40% of this (1.7 million hectares) was set aside for conservation/protection purposes. As part of this, 23% of farmers set land aside for conservation/protection purposes.<sup>35</sup>

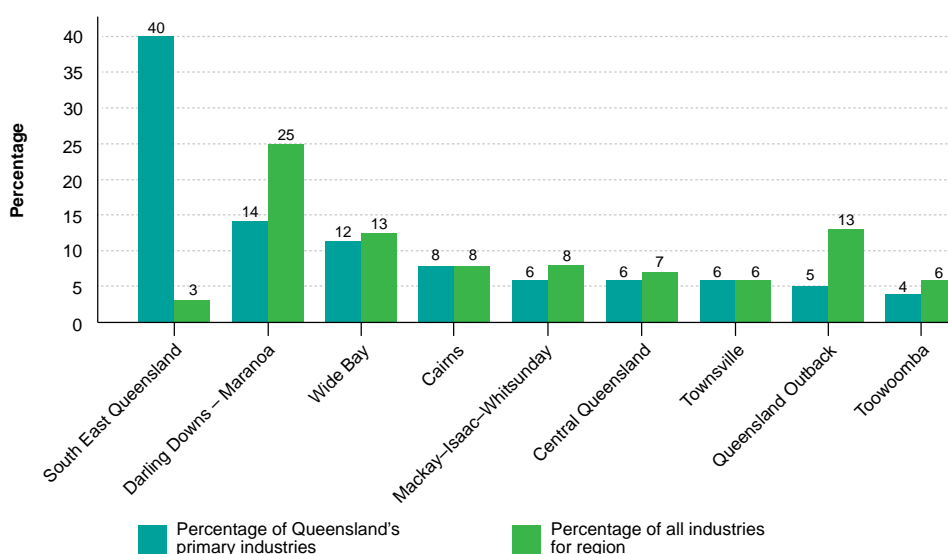
In 2015–16, in Great Barrier Reef catchments:

- 29% of pastures, 55% of streambanks and 25% of gullies on grazing lands were managed using best management practices
- 40% of sugarcane land was managed at best practice levels for sediments, 18% for nutrients and 39% for pesticides
- 72% of horticulture land was managed at best practice levels for sediments, 24% for nutrients and 45% for pesticides.

The target for 2018 is for 90% of lands to be managed using best practice systems.<sup>36</sup>

## Regional communities and economies

Figures 23 and 24 show the wide distribution of agriculture and food industry employment. South East Queensland has the largest number of people employed in the sector (primarily food processing), followed by Darling Downs – Maranoa and Wide Bay.



**Figure 23** Employment in agriculture and the food industry by region, 2016  
**Source:** ABS 6291.0.55.003, *Labour force, Australia, detailed, quarterly, Nov. 2017*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/6291.0.55.003>>.

Figures 23 and 24 also show the relative importance of industry employment (including agriculture, forestry, fishing, food processing and wood product manufacturing) to local communities. The sector is of most importance in Darling Downs – Maranoa, followed by Wide Bay and Queensland Outback.

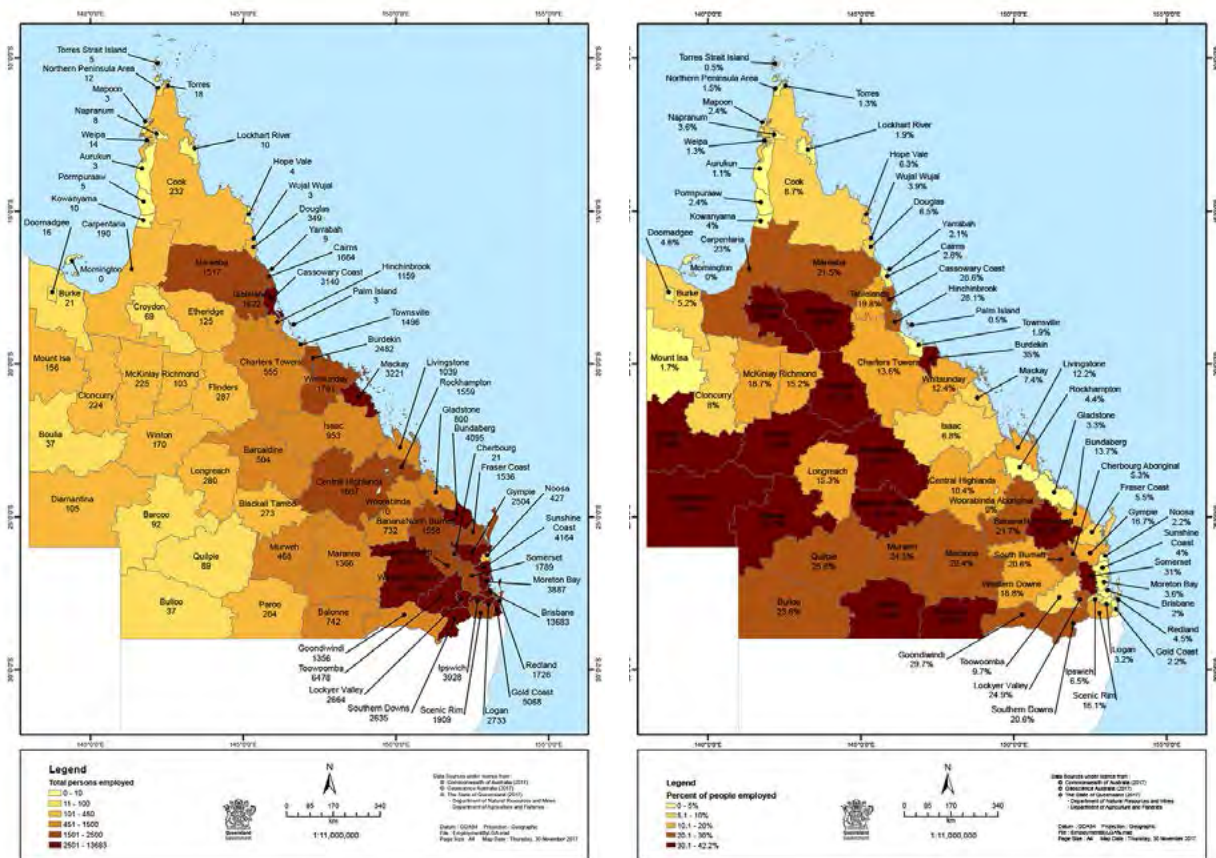
Figure 24 shows this relative importance at community level, as defined by local government areas.<sup>37</sup>



- The sector provides 25–40% or more of direct employment in a number of communities in the north (e.g. Etheridge, which has the highest share in the state at 42%), the west (e.g. 30% in Goondiwindi), and Central Queensland (e.g. 36% in Barcaldine), and in some coastal communities (e.g. 35% in Burdekin). Overall, the sector provides more than 25% of jobs in 18 of the 78 local government areas in Queensland.
- The sector provides 10–25% of jobs in 21 other local government areas in all areas of the state, including on the outskirts of South East Queensland (e.g. 25% in Lockyer Valley and 17% in Gympie) and in some major centres (e.g. 14% in Bundaberg).
- The sector has a significant presence in most communities, including the major cities such as Brisbane, Gold Coast and Townsville (all 2%, largely food processing).
- In some remote communities there is little direct employment in the sector. (However, this is most likely undercounting, as the census may not have collected data on work in many Indigenous community market gardens and Indigenous fishing activities.)

An estimated 3300 people who had been employed in agriculture, forestry or fisheries in the past 2 years were unemployed in 2016–17. Although this partly reflects the seasonal nature of much sectoral employment, it is a slightly higher unemployment rate (5.9%) than the workforce as a whole (3.9%).<sup>38</sup>

Of course, the contribution of the sector to local communities goes well beyond economic considerations. Just one indicator of their social contribution is shown in Figure 11 (page 12), which shows that, despite working longer hours, 21% of people engaged in agriculture and food industries also undertake voluntary work—this is the same proportion as for the broader workforce.



**Figure 24** Agriculture and food industry employment by local government area: number and percentage of all industries

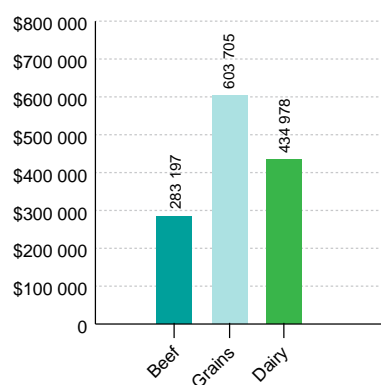
**Source:** ABS, *Census 2016*, <<http://www.abs.gov.au/census>>.

## Production costs and infrastructure

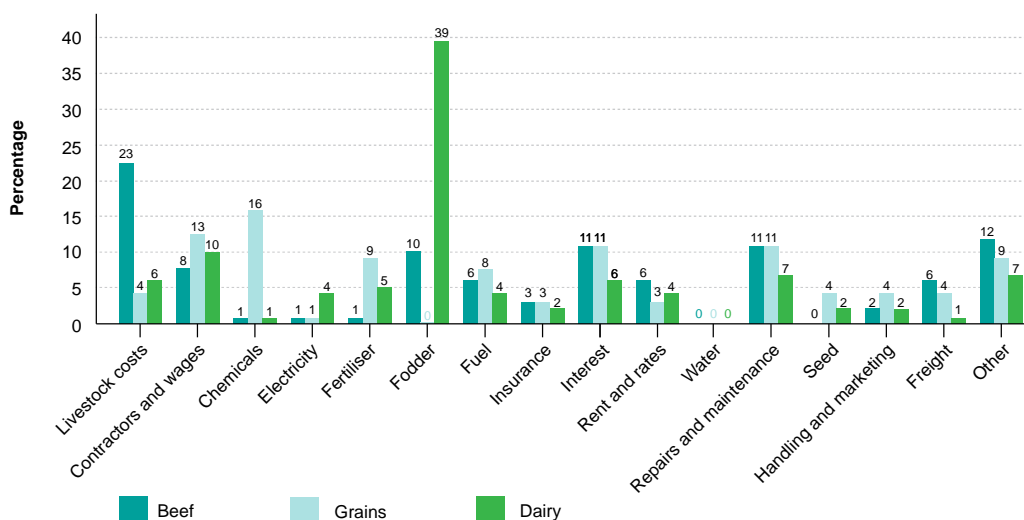
### Costs

The average total cash costs for broadacre farms in Queensland was \$322 812 in 2015–16, although total costs vary greatly between commodities (Figure 25) and farms. The composition of these costs is shown in Figure 26. (Sectors with higher levels of irrigation, particularly cotton and sugar cane, would have significantly higher electricity and water costs.) Note that many costs (such as purchases of livestock, fodder and seed) flow to other farms.<sup>39</sup>

Farm cost–price indexes are only available on a national basis. On average over time, farm costs increase broadly in line with overall inflation. While prices received tend to fluctuate, they also tend to rise on average over time, but less strongly. This is because, globally, the demand for food and fibre does not keep pace with overall income growth. At the same time, productivity growth in the supply of food and fibre tends to match (or even exceed) that of other sectors and so rises at least as rapidly as overall income growth. This excess supply pressure compared with demand tends to depress real prices. To maintain income levels, farmers have to compensate for this declining ‘terms of trade’ with productivity growth. Unsurprisingly, primary producers nationally are more likely than other firms to nominate input costs as a barrier to business (26% compared with 13%).<sup>40</sup>



**Figure 25** Average farm cash costs, Queensland, 2015–16  
**Source:** ABARES, *AgSurf*, <<http://apps.daff.gov.au/agsurf/>>.

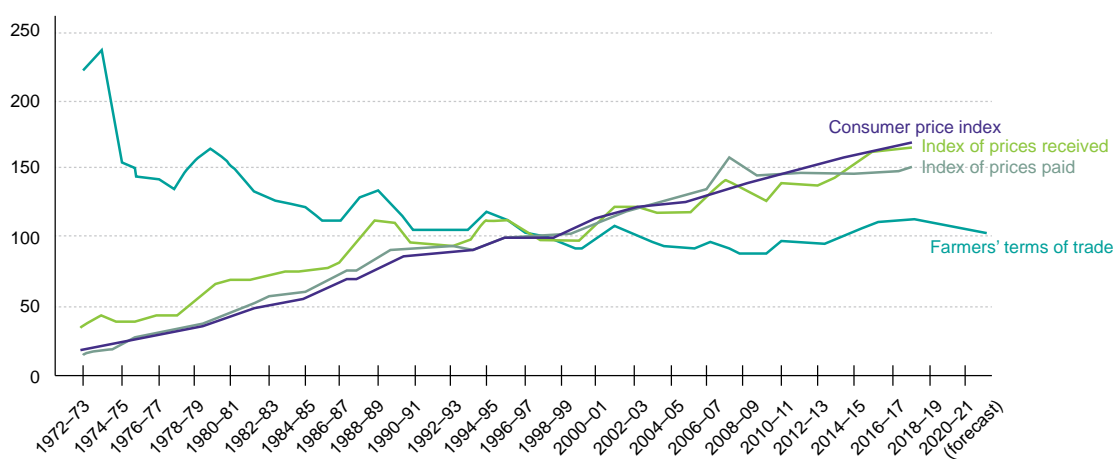


**Figure 26** Share of total average farm cash costs, Queensland, 2015–16  
**Source:** ABARES, *AgSurf*, <<http://apps.daff.gov.au/agsurf/>>.

Figure 27 shows these trends in operation. However, the declining terms of trade has been ameliorated since the early 1990s. This reflects a combination of factors, including:

- the effect of the Uruguay Round of multilateral trade negotiations in placing limits on price-depressing subsidies by major northern hemisphere countries
- improved macro-economic performance of the Australian economy generally, including lower inflation and a more competitive exchange rate
- the commodity price boom from 2006 to 2012, which has yet to be fully reversed, largely reflecting strong economic growth in populous Asian countries.

There was even a temporary increase in farmers' terms of trade since 2012–13. However, ABARES forecasts suggest that supply will respond to these price signals and as a result prices will decline slightly in coming years.<sup>41</sup>

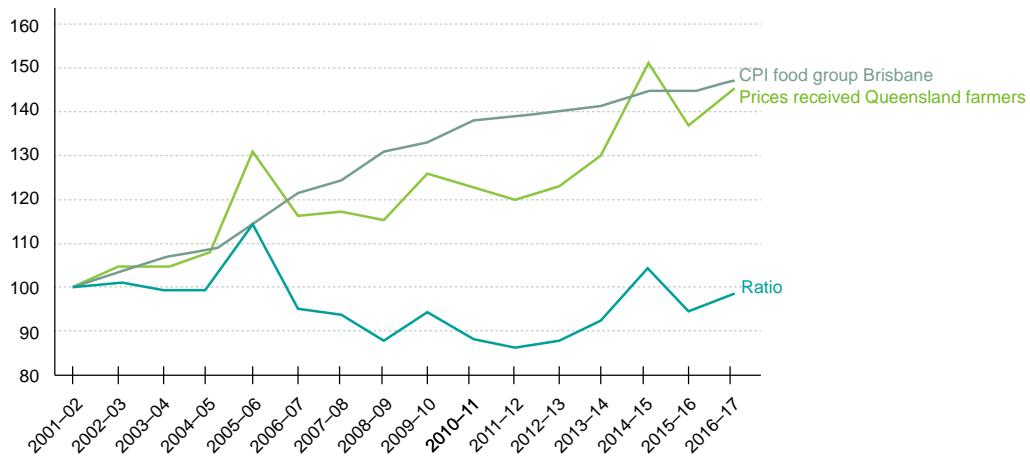


**Figure 27** Indexes of farm prices received and paid and the consumer price index, Australia, 1997–98 = 100  
**Source:** ABARES, *Agricultural commodities and trade data*, <<http://www.agriculture.gov.au/abares/research-topics/agricultural-commodities/agricultural-commodities-trade-data#2016>>.

## Prices paid and received

The 2014 *State of Queensland agriculture report* introduced a new measure of the ratio between food prices paid by consumers and prices received by farmers. This was described as a measure of the supply chain efficiency, implying that it would reflect efficiency and competition in the post-farm gate supply chain. However, this is potentially misleading in that other factors (such as changes in the value added at various stages of the supply chain) could affect this ratio. An example of this is the wide variety of fresh milk products that have become available to consumers in recent years.

Figure 28 updates the overall index. In trend terms, the prices received by Queensland farmers have not kept up with food prices paid by Brisbane consumers (increasing annually by 2.2% and 2.7% respectively). It is also noticeable how little of the fluctuations in prices received by farmers is reflected in food prices to consumers.

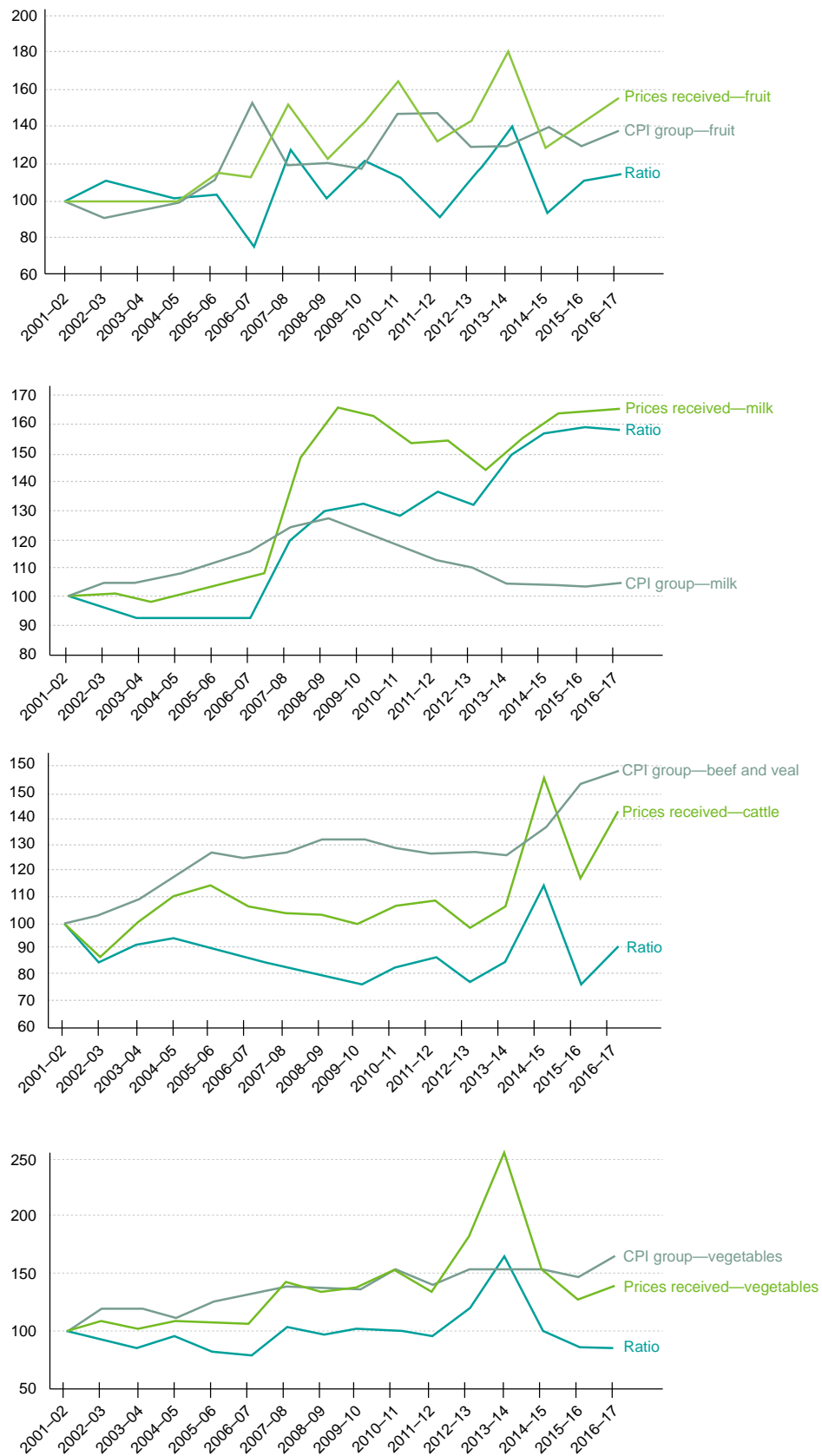


**Figure 28** Ratio of consumer food prices to prices received by farmers, 2001–02 = 100  
**Sources:** DAF, *AgTrends*, <<https://www.daf.qld.gov.au/business-trade/agtrends>>; ABS 6401.0, *Consumer price index, Australia, Sep. 2017*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/6401.0>>.

With only a quarter of Queensland’s agriculture and food production being consumed within the state, there are substantial compositional differences between the pattern of domestic food consumption and the pattern of Queensland production. Figure 29 shows the ratio at a more detailed level for fruit, vegetables, beef and milk.

Little trend, around wide fluctuations, is evident in the ratio of farm gate price to consumer price for fruit and vegetables, and a slight downward trend is evident for beef. For milk, on the other hand, there was a significant upward shift in the ratio over the past decade. Farm gate prices have been stagnant following a large jump in 2007–08 and 2008–09, while consumer prices have declined. This would suggest that a proportion, but by no means all, of supermarket milk discounting has been passed back to dairy farmers.

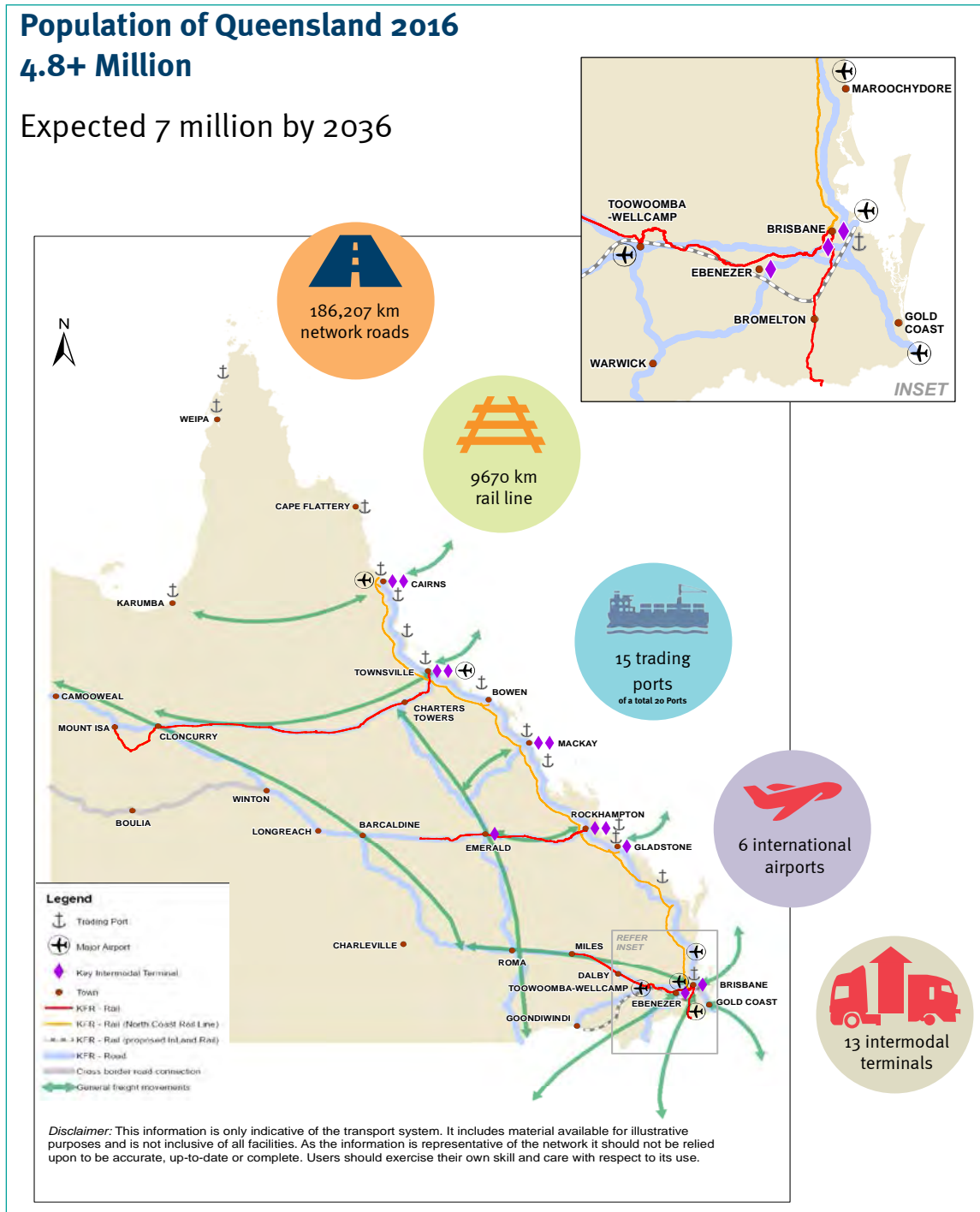




**Figure 29** Ratio of farm prices to consumer price, Queensland, 2001-02 = 100  
**Source:** DAF, AgTrends, <<https://www.daf.qld.gov.au/business-trade/agtrends>>; ABS 6401.0, *Consumer price index, Australia, Sep. 2017*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/6401.0>>.

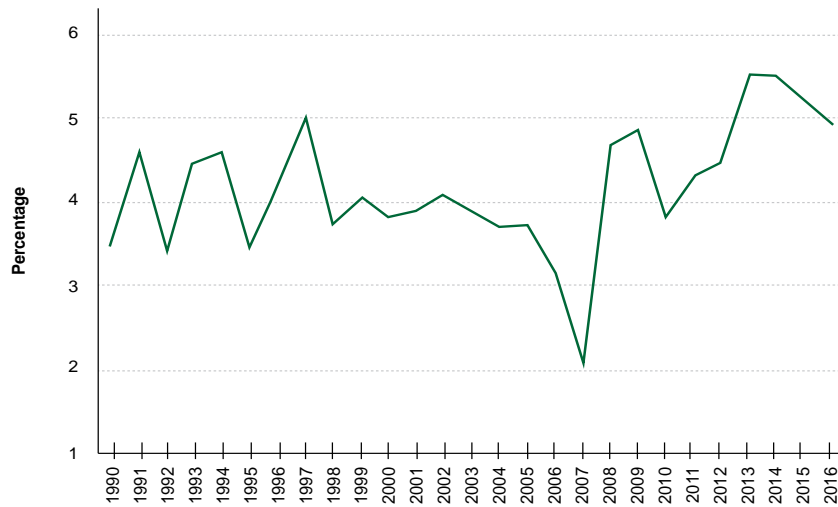
## Transport

Despite its large area, Queensland has a highly developed transport system (Figure 30).<sup>42</sup>



**Figure 30** Queensland's strategic freight network  
**Source:** Department of Transport and Main Roads, *Moving freight*, <<https://www.tmr.qld.gov.au/movingfreight>>.

All levels of government continue to invest strongly to upgrade this network. Total investment of \$8.7 billion is proposed for the primary road network in Queensland in the 4 years to 2019–20; this includes significant upgrades.<sup>43</sup>



**Figure 31** Freight share of farm cash costs, Queensland  
**Source:** ABARES, *AgSurf*, <<http://apps.daff.gov.au/agsurf/>>.

Direct freight costs are around 4% of total farm cash costs in the Queensland broadacre and dairy industries (Figure 31), fluctuating (mainly as other costs fluctuate) around what appears to be a rising trend in the most recent years.<sup>44</sup>

Many other transport costs are incurred off-farm in agriculture and food supply chains. Road and rail costs to port average 9.8% of Australian farm gate prices.<sup>45</sup> Broader studies put the overall cost of post-farm gate transport at around 13% of farm gate prices.<sup>46</sup>

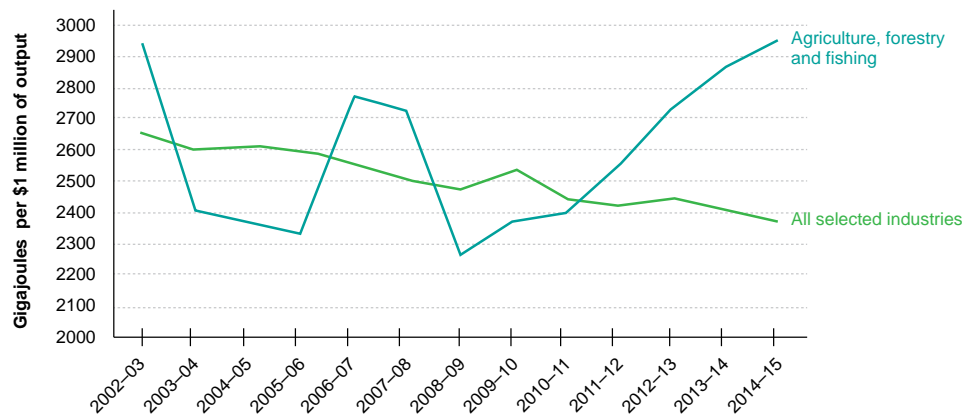
In 2015–16, trucks carried 80 megatonnes of food and live animals in Queensland. This was 22% of the national total, and 14% of the total tonnage carried by trucks in Queensland. Most (87%) of this tonnage was in articulated vehicles—well above the 47% of all road freight carried by articulated vehicles in Queensland.<sup>47</sup>

## Energy

Agriculture and food industries are significant energy consumers. In Australia as a whole in 2014–15, the agriculture, forestry and fishing industries used 4% of all the energy used by industry, at an energy intensity of almost 3000 gigajoules of energy per \$1 million of output—24% above the all-industry average (Figure 32).<sup>48</sup> Whereas the all-industry average has been declining, the energy intensity of the agricultural sector has been slightly trending upward, largely reflecting measures to improve water use efficiency, which in effect substituted energy for water inputs. According to the OECD, energy efficiency in Australian agriculture has declined, suggesting significant opportunities for efficiency improvements.<sup>49</sup>

Total energy (fuel and electricity) costs have averaged a consistent 8% of the total cash costs of Queensland broadacre and dairy farms.<sup>50</sup>

Electricity prices have risen significantly in recent years. This is mainly due to high network charges as a result of high capital costs and return on capital by electricity transmission and distribution operators permitted by the Australian Energy Regulator. These price increases particularly affect irrigators. The share of electricity in dairy farm cash costs, for example, increased from 2.9% in the 3 years to 2008–09 to 4.1% in the 3 years to 2015–16.<sup>51</sup>



**Figure 32** Energy intensity, Australia  
**Source:** ABS 4655.0, *Australian environmental-economic accounts, 2017*, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4655.0>.

Reflecting the small-business nature of the sector, and so the small size of individual consumption, agriculture, forestry and fisheries in Australia pay 81% more per unit of electricity than the all-industry average, although 15% less than the average household.<sup>52</sup>

In Queensland, many irrigators benefit from so-called ‘transitional’ and ‘obsolete’ electricity tariffs, well below the cost-reflective tariffs facing most electricity consumers. Current pricing prevents these tariffs from falling further below cost of supply, with these tariffs scheduled to be phased out in 2020. In addition, the Queensland Government has announced a \$10 million regional business customer support package to help regional businesses on transitional and obsolete tariffs (including farmers and irrigators) understand their electricity use, minimise their electricity costs and make informed choices about future tariff options.<sup>53</sup>

There are emerging opportunities for Queensland’s agricultural sector to create new markets as a supplier of renewable energy, biofuels and bioproducts. Queensland’s sugar mills have for many years produced bioenergy through co-generation using sugarcane bagasse.

The use of biofuels is increasing in domestic and international markets as they become competitive with petroleum fuels, particularly in recognition of their lesser greenhouse emissions. Queensland is well placed to develop biofuels and bioproducts industries, with a range of feedstocks (grain, sugar cane and other potential crops) available. This provides additional market opportunities to the industries concerned, potentially increasing revenue, including revenue from waste products. The *Queensland biofutures 10-year roadmap and action plan* envisages the biofutures industry as a major opportunity for the diversification of the agricultural sector and the state economy. By 2035, it could contribute \$1.8 billion to Queensland’s economy and employ more than 6600 people.<sup>54</sup>

The rapid growth in renewable energy technologies such as solar and wind power also creates new land-use opportunities, as well as opportunities for on-farm energy supplies compatible with multiple land uses. Queensland has the world’s highest rate of household rooftop solar power. Solar penetration is higher in areas connected to the national electricity grid, including many rural areas; customers connected to the grid are able to benefit from subsidies for renewable energy.<sup>55</sup>

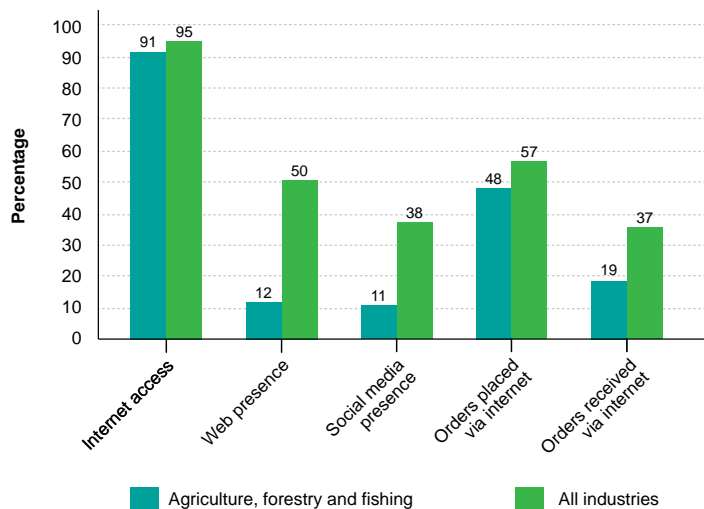


The cost of solar power is falling relative to other energy sources, and is expected to become competitive with other energy sources on an unsubsidised equivalised basis within the next 5 years.<sup>56</sup> As that happens, solar uptake will increase rapidly in rural and remote areas, presenting opportunities to significantly reduce costs compared with current power sources. Given the land availability, this is not just rooftop solar, but also solar farms—particularly where this can be compatible with other land uses (such as over irrigation channels, gaining an incidental benefit of reduced evaporation).

## Communications

Telecommunications is becoming an increasingly important infrastructure as the digital transformation of modern economies and societies proceeds.

Data on business use of the internet by the agricultural sector is only available on a national basis (Figure 33). Internet access is very widespread. A relatively high proportion of businesses in the sector also place orders through the internet. On other measures, however, businesses in the sector are well behind the all-industry average. It could be expected that the social isolation of many farm businesses would result in them having greater use of the internet than others. However, this is not the case, and in part reflects the nature of agricultural businesses, including their relatively small size—in fact, internet use among the relatively few large agricultural firms matches that of other large firms throughout the economy. Other factors influencing the usage include the quality and cost of the telecommunications infrastructure available to farm businesses.



**Figure 33** Business use of the internet, Australia, 2015–16  
**Source:** ABS 8129.0, *Business use of information technology, 2015–16*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/8129.0>>.

Telecommunications policy is primarily a responsibility of the Australian Government. Australia has had a longstanding policy of universal coverage of a basic voice telephony service. However, this principle has not been fully extended to modern mobile or data telecommunications.

The National Broadband Network (NBN) is bringing digital telecommunications to all parts of Australia. However, the service to rural and remote areas is significantly inferior to that in urban areas (maximum line speed of 25 megabytes per second<sup>57</sup> compared to 100+ megabytes per second<sup>58</sup>). Although 25 megabytes per second is adequate for most current purposes, this difference will become increasingly important in the future as global availability of higher bandwidth allows the development of more and more systems, including multiple systems ('app stacking'), using more and more bandwidth. In that sense, the NBN is future-proofing urban Australia, but not rural and remote Australia.

The other relevant telecommunications technology is mobile phones—including mobile internet access (such as '4G'). The major providers all claim 95–99% population coverage, although this relates to where people live, not necessarily where they want to make calls to and from.

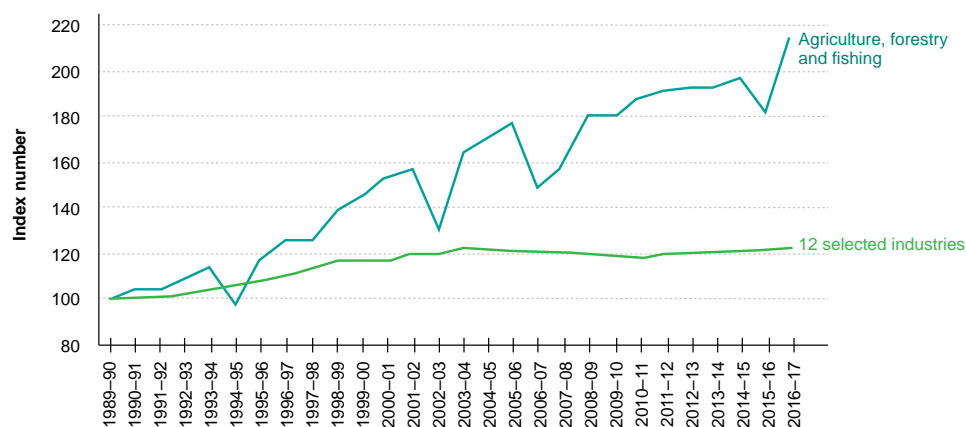
The Australian and Queensland governments have provided funds to more mobile telephony services than would be provided by the market alone.

## Productivity and innovation

### Trends

Productivity is the ratio of the quantity of output to the quantity of inputs. Anything that affects output or inputs affects productivity—it is not just about people working harder. Multifactor productivity refers to all inputs—including land, labour and all forms of capital.

Ideally, it should also refer to all outputs, but data limitations mean that productivity measures are limited in scope. Productivity is not the same as profitability, which is also affected by prices. Productivity growth is the main way in which economies develop and living standards are enhanced.



**Figure 34** Multifactor productivity growth, Australia, 1989–90 = 100  
**Source:** ABS 5260.0.55.002, *Estimates of industry multifactor productivity, 2016–17*, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/5260.0.55.002>>.

Industry multifactor productivity estimates are only available on a national basis. Figure 34 shows that annual multifactor productivity growth in the agriculture, forestry and fishing industries has been much stronger than the all-industry average. The overall productivity growth slowdown since 2003–04 also affected the agricultural sector; annual growth averaged 3.5% in the 14 years to 2003–04 and 1.8% in the subsequent 13 years. Output growth in the sector has almost exactly matched productivity growth, with little change in overall inputs (as measured by the ABS), as declining labour input has been matched by increased investment in capital.<sup>59</sup>

Productivity growth is driven by market opportunities and the ability to take advantage of those opportunities. It depends on:

- the knowledge, skills and aptitudes of business operators and employees
- the strength of the innovation system, including the pace at which new ideas are created and the rate at which they are adopted
- the competitiveness of the supply chain and the flow of information along it
- flexibility to reallocate resources into new activities
- investment embodying new technologies
- the creation of new businesses involving new ideas and approaches
- conducive institutions, including regulatory frameworks and infrastructure provision.

## Technological change

A wide range of technological opportunities are becoming available to the sector. As these opportunities are realised in practice, they will lead to continued growth in productivity and in output volumes to meet the demands of the future. Queensland encourages the development of new technologies, as well as the application of technologies developed elsewhere.

Unlike some other states, Queensland does not have a suspension on the commercial production of genetically modified crops. Instead, Queensland has adopted a regulatory framework that is locked in to national legislation (including labelling provisions), to ensure a consistent approach.

Modern ‘agtech’ (agricultural technology) includes digital technologies that provide the agricultural industry with the tools, data and knowledge to make more informed and timely on-farm decisions, and to improve productivity and sustainability. Some of its elements are:

- **biotech**—breeding of plants and bacteria with improved traits
- **smart farming**—data-based technologies making use of big data and predictive analytics to help farmers make better decisions on daily farm issues (such as irrigation, pest management and risk management)
- **crop protection**—non-toxic and environmentally friendly biological or chemical substances used for protecting crops from pests and diseases
- **machinery and robotics**—all kinds of robotics, machinery and equipment used primarily to automate farm work, including harvesting and sorting crops (with an estimated 57% of agricultural activities currently automatable, the fourth highest of all industries)
- **irrigation and water management**—creating innovative irrigation methods and water efficiency
- **post-harvest management**—technologies to reduce post-harvest losses in diverse ways (such as storage, packaging, treatments and climate management technologies)
- **farm-to-consumer models**—new business models to shorten and simplify the supply chain by connecting the farm to the end consumer (usually done through digital platforms)
- **novel farming systems**—innovative systems for growing plants, new types of greenhouses, urban farming, hydroponics and aquaponics
- **livestock improvements**—technology for farm animals and pets
- **waste technologies**—processing livestock manure, fertiliser run-off, harvest and food waste to reduce harmful substances and reuse the materials
- **special crops**—medicinal plants
- **aquaculture**—technologies to grow things in water.

Much of this is not new. However, modern agtech sets itself apart from the ongoing historical technological contribution to agriculture because of the speed with which the technology can scale and reach a global market. Indeed, modern agtech is about connectivity—particularly connecting things that have been around for some time—and about collecting and analysing data from multiple sources (big data) to improve decision-making.

The programs under the Queensland Government’s Advance Queensland initiative are supporting local agtech businesses to develop and deploy innovative new products and services.

## Entrepreneurship

In 2016–17, 3717 new businesses entered the agriculture and food sector. This was an entry rate into the sector of 8.3% in Queensland, slightly above the national average of 7.9%. The entry rate was higher for food and timber processing firms (12.3%) than for agriculture, forestry and fishing firms (8.0%). Entrants to the sector made up 5.9% of all the business entries in Queensland in 2016–17.<sup>60</sup>

This picture of considerable entrepreneurial activity in the sector is confirmed by other data sources. For example, total entrepreneurial activity as measured by the Australian Centre for Entrepreneurship Research at Queensland University of Technology shows entrepreneurial activity in rural areas as a whole of 10.9%, compared with 11.2% for all of Australia.<sup>61</sup>

## Adjustment

Business exits are the counterbalance to entries. In 2016–17, 3737 businesses left the Queensland agriculture and food sector. This exit rate of 8.3% is also well below the Queensland business average of 12.3% and close to the national agriculture and food sector average of 8.4%.<sup>62</sup>

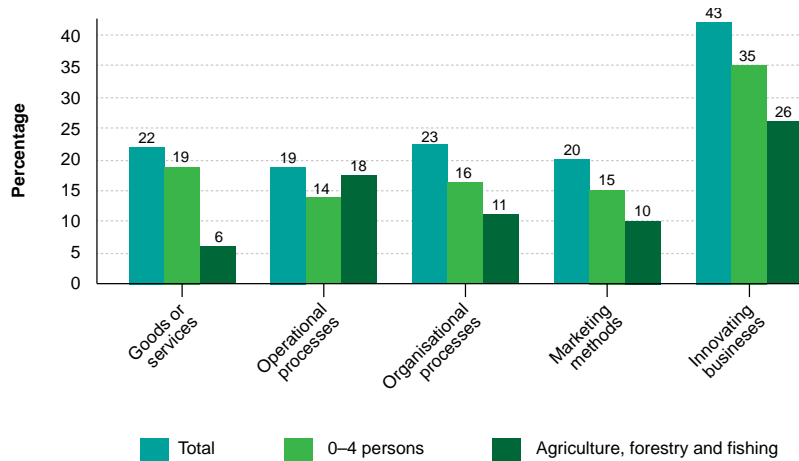
As exits exceeded entries in primary industries, the number of firms in the sector as a whole fell slightly over the course of 2016–17 (by 0.2% in Queensland and 0.5% nationally).

Most farm businesses have high levels of equity in a significant capital asset, which considerably aids adjustment—as noted above, the average broadacre and dairy farm in Queensland had 87% equity in a \$5.5 million asset in 2015–16.

## Innovation

Queensland and Australian primary producers have a well-deserved reputation for innovation. Many world-leading innovations, such as mechanical sugarcane harvesting, had their start in Queensland.

Innovation statistics on an industry basis are only available at the national level. Figure 35 shows that some 26% of Australian farm businesses were innovation active in 2015–16. This is below the all-industry average (43%), partly due to the relatively small size of farm businesses and to the relatively limited innovation opportunities open to them.<sup>63</sup>



**Figure 35** Percentage of Australian businesses innovating, 2015–16  
**Source:** ABS 8166.o, *Summary of IT use and innovation in Australian business, 2015–16*, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/8166.o>>.

## Investment

Data on investment in the sector is only available at the national level. Nationally, the net capital stock in the agriculture, forestry and fishing industry has increased at an annual average rate of 1.4% since 1989–90. Figure 36 shows the pattern of net investment (i.e. net of depreciation) in that time.<sup>64</sup>

There was little net investment in the 1990s, but investment grew strongly up to the global financial crisis in 2008–09, and while it has tailed off since it has remained at relatively strong levels. Of note is the relatively strong investment in plant and machinery in recent years, which is the form of investment most likely to embody new technology.



**Figure 36** Net investment in Australian agriculture  
**Source:** ABS 5260.o.55.002, *Estimates of industry multifactor productivity, 2016–17*, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/5260.o.55.002>>.

Agriculture, forestry and fishing firms nationally were more likely than other firms to seek external sources of finance in 2015–16 (27% compared with 15%). They were much more likely to seek debt (95% seeking finance) than equity (12%). Their motivation for seeking finance was more likely to be to purchase equipment (26% compared with 20%) or expand the business (34% compared with 22%). They also had a higher success rate in seeking finance (93% compared with 82%) and were less likely to identify finance as a barrier to business (10% compared with 14%).<sup>65</sup>

As at June 2017, 12.3% of agricultural land in Queensland was held by overseas interests—slightly below the national average of 13.6%. On a national basis, more than 98% of foreign-held agricultural land is held within Australian incorporated entities, around 80% is held on a leasehold basis, and more than 85% is used for livestock purposes. The United Kingdom is the largest foreign agricultural landholder (2.6% of agricultural land), followed by China (2.5%) and the United States (0.7%).<sup>66</sup>

For Australia as a whole, agriculture, forestry and fishing accounted for \$4.6 billion in approvals by the Foreign Investment Review Board in 2015–16 (approvals are required for acquisitions over \$15 million cumulative); this is equivalent to 3.9% of the estimated total capital value of the sector.<sup>67</sup>

## R&D support

The link between investment in rural research, development and extension (RD&E) and long-term growth in Australian primary industries is well established, with the productivity effects of RD&E activity persisting for some decades. Estimates are that R&D overseas is responsible for almost two-thirds of average annual productivity growth in Australia's broadacre agriculture sector<sup>68</sup> and that every dollar invested in public R&D generates around \$12 of benefit within 10 years.<sup>69</sup>

The Queensland Department of Agriculture and Fisheries (DAF) spent \$91 million on R&D in 2014–15. A further \$24 million was spent by other agencies on environmental sciences.<sup>70</sup>

A further \$95 million was spent on R&D in the agricultural and veterinary sciences in Queensland universities—24% of the national total, and a higher research intensity relative to the size of the sector (0.94%) than in the rest of Australia (0.80%).

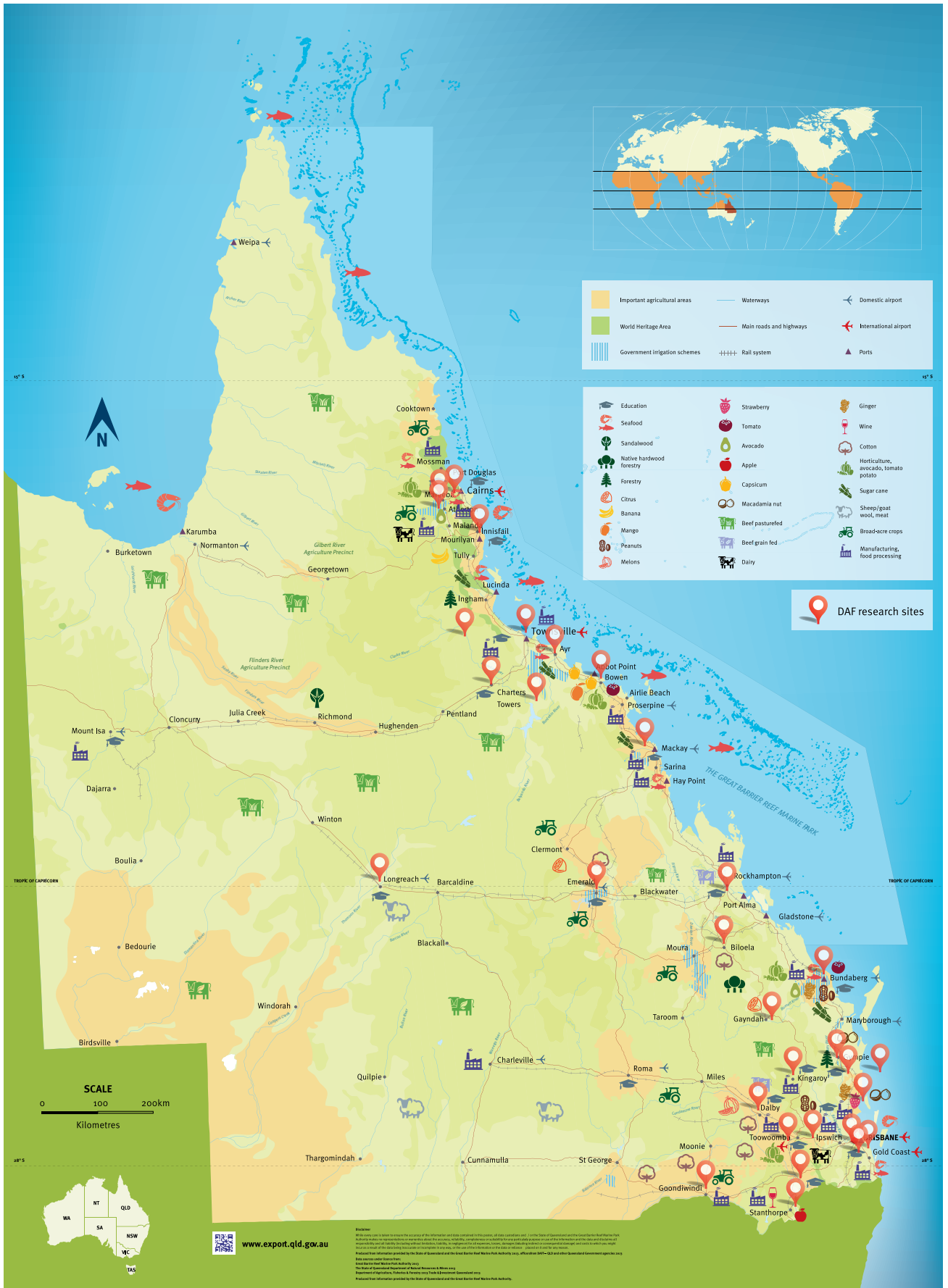
A further \$126 million was spent in 2015–16 by businesses involved in the sector, mainly on food processing.<sup>71</sup>

A major focus for future R&D is joint collaboration between DAF and the university sector. More than \$9 million is being spent on rural R&D by DAF through university alliances in 2017–18. The centrepiece is nearly \$8 million being spent by DAF, leveraging a further \$27 million from other parties, through the Queensland Alliance for Agriculture and Food Innovation, a joint initiative of DAF and The University of Queensland.

Every study of Australia's innovation system concludes that Australia rates well as both a generator of ideas and as an applier of ideas generated by others; where Australia rates poorly is in commercialisation of ideas generated locally. In other words, the weakness in our innovation system is the relative paucity of collaboration between research organisations and business users of R&D results.

DAF has a record of success in commercialising many traditional forms of agricultural research (such as new plant varieties) and has a considerable amount of intellectual property with commercial potential. As part of the Queensland Government's Advance Queensland innovation initiative, DAF is investigating alternative funding models, including scoping agtech and exploring support for early-stage private and public sector innovations.

Advance Queensland is supporting innovation in Queensland's agricultural sector through a variety of other programs, such as through doctorate scholarships, research fellowships, innovation partnership grants (to support collaboration between researchers and end users) and funding to support university graduates to work with businesses on innovative projects.



**Figure 37** DAF research stations in Queensland  
**Source:** DAF 2017.

## Outlook<sup>72</sup>

### Summary

The trends that have underpinned growth in Queensland's agriculture and food sector are expected to continue into the medium-term future. These trends are dominated by opportunities generated by ongoing growth in major Asian economies, which can be summarised as:

- increased demand for protein-rich products such as meat
- increased demand for healthy food products, particularly benefitting meat and some horticulture and grains products
- increased exports of a variety of horticultural products, including exotic fruits
- value-adding to higher quality, more convenient and better packaged products across all industries
- increased demand deriving from widening recognition of Queensland's clean and green record and status, benefitting meat, horticulture, timber and (potentially) aquaculture industries.

In short, subject to seasonal considerations, the next decade looks much like the last decade. In that time, the Queensland food and fibre industries recorded average annual growth of 4.6% in the value of production, as output volumes grew by 1.1% annually and prices received were maintained, or even increased slightly, in real terms.

### Meat products

Meat industry production is forecast to be \$8620 million in 2017–18; this is 43% of the forecast total output of Queensland's agriculture and food sector. The industry is dominated by beef cattle raising (62%), following by meat processing (28%), poultry (6%) and pigs (3%). Sheep and lambs and other livestock each constitute less than 1% of the industry.

The value of meat production has been increasing at an annual average rate of nearly 6% since 2005–06, reflecting healthy prices. Production volumes have been maintained despite challenging seasonal conditions for much of the period; the industry is currently in a building phase with substantial production increases expected in coming years.

The outlook for the meat industry in Queensland is positive, as global economic growth is expected to continue to boost demand for high-quality food products. ABARES forecasts imply that the current relatively high prices for beef will be broadly maintained over the next 5 years as supply, including in Australia, rises to match demand growth. It therefore forecasts production volume growth exceeding 2% per year for beef and veal, and around 2% for pig meat and more than 3% per annum for sheep meat and chicken meat.

### Dairy

Dairy is a relatively small industry in Queensland, with output forecast to be \$359 million in 2017–18, representing 2% of the sector. Some export-oriented investments are underway, but the dairy industry still primarily caters for the domestic fresh milk market, which, following major policy and structural changes over the last 30 years, is now part of the national milk market. Those changes led to significant industry restructuring, but resulted in little change in the value of production over the last decade, with healthy price growth offset by an annual average 3% decline in production volumes. This restructuring has run its course; stable conditions in the industry over the past 4 years are expected to continue into the future with output growth in line with population growth.



## Horticulture

Total production of the highly diverse horticulture industry is forecast to be \$4539 million in 2017–18, representing 23% of the sector. Fruit and nut growing are forecast to account for 40% of this value, with vegetables and lifestyle horticulture each 27% and fruit and vegetable processing 6%. The most valuable single commodities are bananas (\$580 million in 2017–18), tomatoes (\$298 million) and avocados (\$240 million), but dozens of different products are commercially available. The value of horticulture production has been growing by nearly 4% annually over the last decade, reflecting steady prices in real terms and healthy growth in production of fruit and nuts.

Horticulture has a bright future, as demand for its products—particularly fruits—grows strongly with income growth in Asia and other export destinations. A related source of demand derives from Queensland’s counter-seasonality to northern hemisphere producers. ABARES expects continued growth in production nationwide around 3% per year. There is considerable upside potential on the production side for Queensland, particularly given our high standards of biosecurity. Overall, growth in line with the recent past is expected into the future.

## Sugar

Sugar production remains a significant part of the sector in Queensland, and of some regions in particular. Production is forecast to be \$1830 million in 2017–18, representing 9% of the sector’s output. Output has been increasing by more than 1% per year over the past decade, while prices have been broadly maintained in real terms.

ABARES expects continued growth in the global demand for sugar, reflecting growth in food processing in developing economies, although this is expected to be matched by supply growth, with prices driving downwards somewhat from current levels. Consequently, Australian production growth is forecast to remain around current levels.

Sugar faces more long-term challenges than most Queensland primary industries. It is highly export-oriented, and it exports into markets that are heavily influenced by government policies in the major producing and consuming countries. Demand growth is also constrained by health concerns and opportunities for alternative sweeteners. On the production side, it is constrained by alternative land-use opportunities, by environmental impacts and by ongoing structural issues in its supply chain.

These challenges also represent opportunities to improve productivity, as well as to engage in new markets such as for biofuels and other uses of by-products.

## Cotton and wool

Together, cotton and wool fibre production is forecast to be \$1139 million in 2017–18, representing 6% of the sector’s output. More than 90% of fibre production is in cotton; wool production has declined significantly in Queensland in recent decades as the cattle industry has expanded. The value of fibre production is highly variable, reflecting the sensitivity of the cotton industry to seasonal conditions. Production values and volumes have increased by around 10% per year over the past decade, partly reflecting the pattern of seasonal conditions but also reflecting the competitive nature of the industries in responding to emerging market opportunities.

ABARES expects healthy global demand growth for cotton to continue, but for this to be matched by global supply and hence for prices to fluctuate around current levels. It expects the current relatively high production volumes to be maintained, seasonal conditions permitting, over the next 5 years.

A similar outlook is expected for wool. The adjustment out of sheep and wool in Queensland is thought to have run its course, helped by government initiatives such as wild dog control, and so production levels are expected to be broadly maintained. However, the ongoing competitiveness of the cattle industry as an alternative land use means that any significant swing back to sheep and wool is unlikely.

## Cereals and related products

Output of the grain and associated industries is forecast to be \$1881 million in 2017–18, representing 9% of the sector total. The value of production has increased at an annual average rate of more than 8% over the past decade. This largely reflects Queensland agriculture's current star performer, chickpeas, whose output has increased more than fivefold in the last 3 years alone as growers respond to a specific market opportunity. In 2017–18, chickpeas are expected to account for 36% of the output of the grain and pulses industry, followed by sorghum (21%) and wheat (20%).

ABARES expects slow growth in world grain consumption (less than 1% annually) over the next 5 years. As incomes grow, consumers tend to move away from food grain products, but demand for feed grains for livestock tends to grow more strongly. ABARES expects prices to fluctuate around current levels with some growth in Australian production. The Queensland chickpeas boom has not affected forecasts by ABARES and is likely to have peaked. This demonstrates the greater product diversity of the Queensland grains industry than its interstate counterparts, giving it a stronger position to take advantage of specific emerging market opportunities.

## Forestry and timber

Forestry and timber production is forecast to be \$705 million in 2017–18, representing 4% of the sector total. The value of production has been growing by more than 3% per year over the past decade, largely reflecting growth in residential construction and increasing use of timber as an attractive and renewable construction resource.

The outlook for timber production is positive, as demand for sustainable building materials rises and timber is used more in the mid-rise construction market.

## Fisheries and seafood

The value of fisheries and seafood activity is forecast to be \$457 million or 2% of sectoral output. This includes wild-catch fishing (39%), aquaculture (27%), seafood processing (13%) and the commercial equivalent of the catch taken by recreational fishers (21%). The value of fisheries and seafood production has increased by around 1.5% per year over the past decade.

Seafood is one of the few food products for which demand growth matches income growth over time. This reflects the attractiveness of seafood as a healthy and tasty source of nutrition. However, wild-catch fisheries production—both globally and in Queensland—is constrained by sustainability concerns and is unlikely to show significant growth. Recreational fishing remains a popular pastime, with an estimated 15% of Queenslanders engaged in recreational fishing at some point in 2013, although this is down from 17% in 2010 and 24% in 2000.

Strong demand growth for seafood globally is being met by aquaculture, particularly in Asian countries. This can be expected to continue as technological changes make open-water fish farming increasingly competitive. To date, Queensland has not fully participated in the global aquaculture boom, with no open-water fish farming, and the value of aquaculture production increasing by just over 4% per year over the past decade. There are many opportunities for aquaculture in Queensland, but taking advantage of these opportunities will depend on resolution of environmental concerns.

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