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Australian beef

Financial performance of beef farms, 2013–14 to 2015–16

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Key points

This report presents detailed financial performance estimates for Australian beef cattle producing farms for 2013–14 to 2015–16. Beef cattle farms are defined as broadacre farms that had at least 100 head of beef cattle on hand at the end of June 2015. In 2014–15 Australia had around 26 600 beef cattle farms.

Farm financial performance

Average total cash receipts for Australian beef farms increased by around 14 per cent in 2014–15 to $391 000 and by a similar percentage in the following year to around $442 000. The increases in total cash receipts largely reflected higher receipts from cattle sales, which were largely a result of higher cattle prices.

Because of higher average total cash receipts and little change in average total cash costs, the average farm cash income for beef farms increased by more than 50 per cent in 2014–15 to around $122 000 per farm. In 2015–16 average farm cash income is estimated to have increased by one-third, to around $162 000. Higher total cash receipts are estimated to have more than offset an expected rise in total cash costs.

In real terms, estimated average farm cash incomes for 2014–15 and 2015–16 are among the highest recorded since 2000–01.

Northern region beef farms recorded higher average farm incomes than farms in the Southern region in both 2014–15 and 2015–16. Receipts from beef cattle sales in the Northern region account for a much higher proportion of total enterprise receipts than in the Southern region.

Reflecting higher incomes, the average rate of return (excluding capital appreciation) for beef farms increased from –0.1 per cent in 2013–14 to 0.6 per cent in 2014–15. Average rate of return is estimated to have increased further in 2015–16 to around 1.9 per cent.

Investment, capital and debt

From 2000–01 to 2015–16, around 50 per cent of beef cattle farms each year made an annual net investment of just over $40 000 in real terms. Net capital investment is the difference between total capital purchases and total capital sales.

Average beef farm debt mostly increased, in real terms, between 2000–01 and 2014–15. In 2014–15 average total debt was around $460 000 per farm. The increase in debt over time has largely been supported by an accompanying increase in the total capital value of beef farms. Consequently, average farm business equity ratios remained relatively steady over the period 2000–01 to 2015–16.

Productivity

Productivity growth, measured using total factor productivity, is important for maintaining international competitiveness and profitability. On average, total factor productivity in the Australian beef cattle industry increased by 1.3 per cent a year between 1977–78 and 2013–14. The Northern region recorded higher annual growth in total factor productivity (1.5 per cent) over this period than the Southern region (0.6 per cent).

1 Introduction

The beef cattle industry makes an important contribution to the Australian economy. In 2014–15 it accounted for around 21 per cent ($11.5 billion) of the total gross value of farm production and around 23 per cent of the total value of farm exports income (ABARES 2016).

This report presents detailed financial performance estimates for beef producing farms for 2013–14 to 2015–16, with an emphasis on 2014–15 results. Beef producing farms are defined as those Australian broadacre farm businesses that had at least 100 head of beef cattle on hand at 30 June 2015. Based on this definition, approximately 26 600—around 50 per cent of all broadacre farms—were classified as beef cattle producing farms in 2014–15.

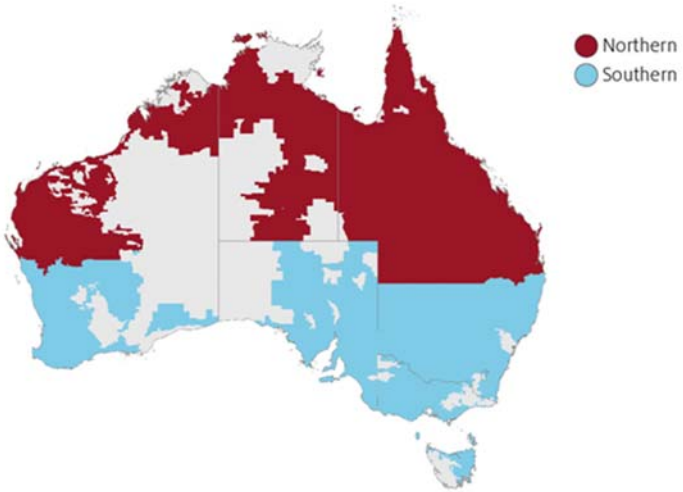
Farm performance data are provided variously at a national and regional scale. The two regions, Northern and Southern, are based on those used by Meat & Livestock Australia. The Northern region is defined as all of Queensland and the Northern Territory as well as northern Western Australia. The remainder of Australia, including southern Western Australia, South Australia, New South Wales, Victoria and Tasmania, make up the Southern region (Map 1).

The report draws on data from the ABARES annual Australian Agricultural and Grazing Industries Survey (AAGIS). This survey has been conducted by ABARES and its predecessors since 1977–78 and provides government and industry stakeholders with important data for analysing and monitoring changes in Australia's broadacre industries.

The AAGIS survey is funded by the Department of Agriculture and Water Resources, Meat & Livestock Australia and the Grains Research and Development Corporation. Meat & Livestock Australia commissioned and funded this report.

The information presented in this report complements farm survey results published in Martin (2016). Detailed results for previous years are available from the ABARES website and the Meat & Livestock Australia website.

Map 1 MLA beef regions



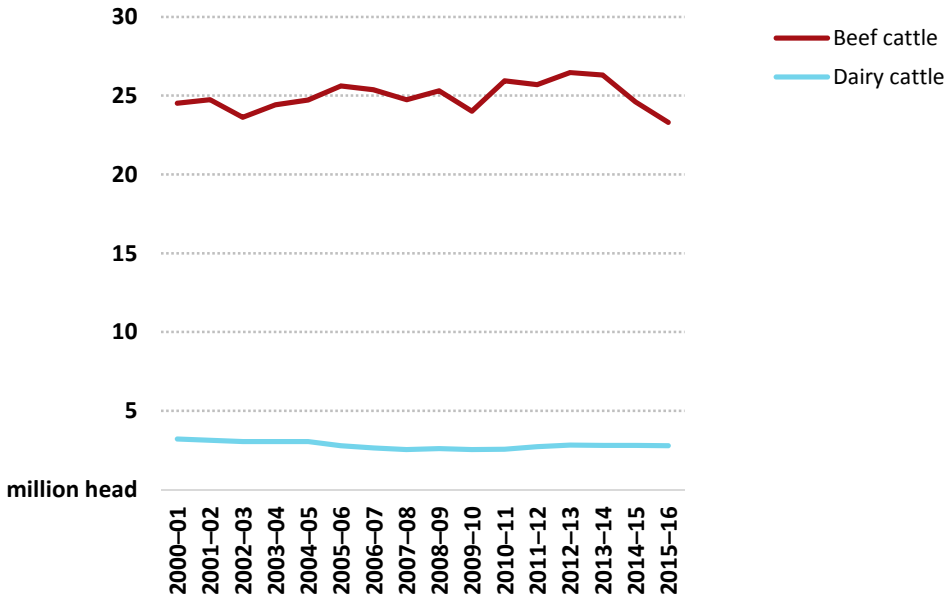
Note: Regions based on aggregations of ABS statistical local areas.
Source: ABARES

2 Industry overview

Since 2000–01 total cattle numbers in Australia trended upwards to around 29.3 million head by 2012–13. Although dairy cattle breeds contribute to beef and veal production, most production comes from beef cattle breeds that account for around 90 per cent of the total herd (Figure 1).

From 2012–13 to 2015–16 the beef cattle herd declined by around 10 per cent to an estimated 23.3 million head. This decline resulted from high cattle turn-off because of prolonged poor seasonal conditions and, more latterly, strong export demand (Mullumby, Whitnall & Perndt 2016). Dairy herd numbers changed little over this period.

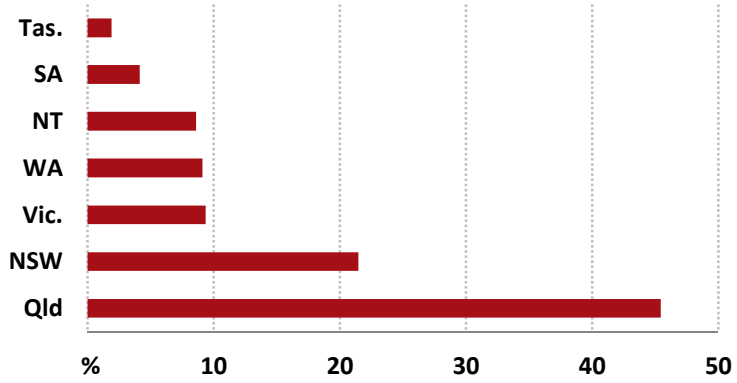
Figure 1 Cattle numbers, Australia, 2000–01 to 2015–16



Sources: ABARES (2011, 2015, 2016)

Queensland accounts for the largest proportion of Australia's total beef herd, with 45 per cent. New South Wales accounted for just over 20 per cent and Victoria, Western Australia and the Northern Territory each had almost 10 per cent of the total herd (Figure 2).

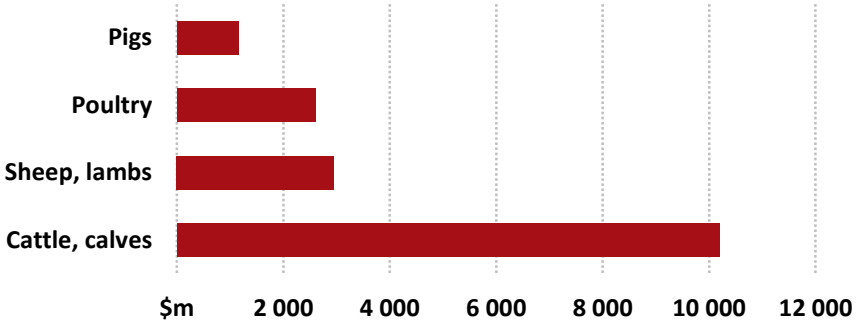
Figure 2 Shares of total beef cattle, by state, 2014–15



Source: ABS 2016

The gross value of cattle and calves slaughtered in 2014–15 was around $10.2 billion (Figure 3). This was more than the combined values for sheep, lambs, poultry and pigs, and roughly equivalent to the gross value of all grain crops.

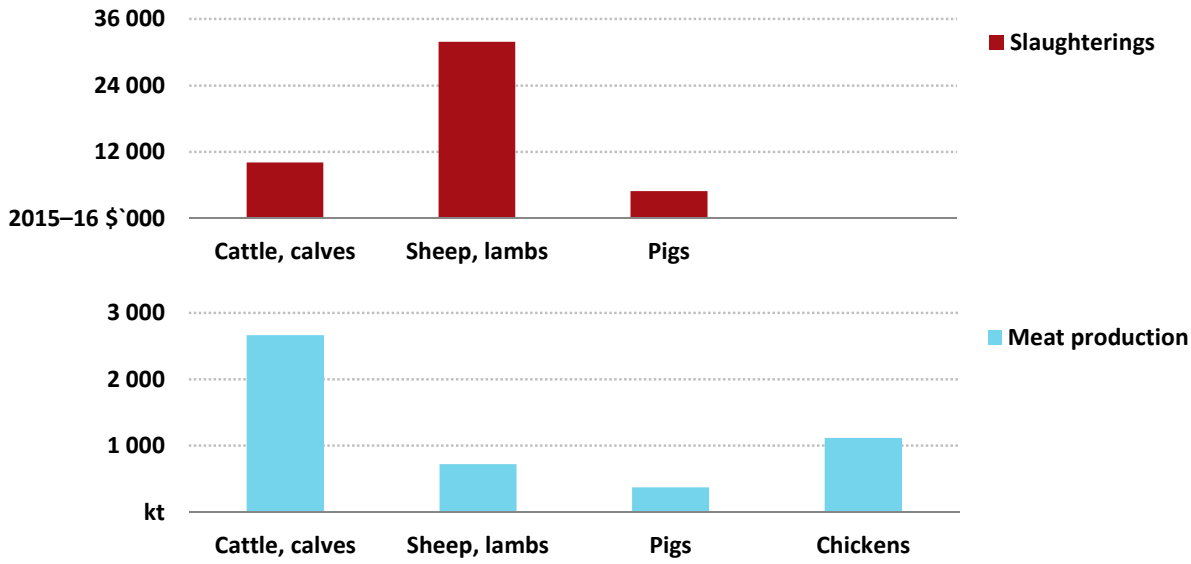
Figure 3 Gross value of livestock slaughterings by commodity, Australia, 2014–15



Note: Dairy cattle are included in cattle slaughterings.
Source: ABARES 2016

Australian cattle and calf slaughter was just over 10 million head in 2014–15, yielding around 2.7 million tonnes of beef and veal (Figure 4). Both slaughterings and meat production were around 7 to 8 per cent higher than the preceding year.

Figure 4 Slaughter numbers and meat production, Australia, 2014–15



Notes: Dairy cattle are included in cattle slaughterings. Slaughter data not available for chickens.
Source: ABARES 2016

In this report, the population of beef cattle farms has been divided into four groups according to number of cattle on hand at 30 June 2015:

- farms with 100 to 400 head
- farms with 400 to 1 600 head
- farms with 1 600 to 5 400 head
- farms with more than 5 400 head.

Of those farms with more than 100 head of beef cattle, around two-thirds ran herds of between 100 and 400 head—accounting for 18 per cent of total beef cattle on beef producing farms—and a further 28 per cent of beef farms had a herd of between 400 and 1 600 head—accounting for 26 per cent of beef cattle (Table 1). Less than 10 per cent of farms had herds larger than 1 600 head but they accounted for 56 per cent of beef cattle.

Table 1 Proportions of farms and cattle by herd size, Australia, 2014–15

Beef herd size a	Average number of farms	Share of farms	Share of beef cattle
	no.	%	%
100 to 400 head	16 800	63	18
400 to 1 600 head	7 420	28	26
1 600 to 5 400 head	1 940	7	26
More than 5 400 head	510	2	30
Total head	26 670	100	100

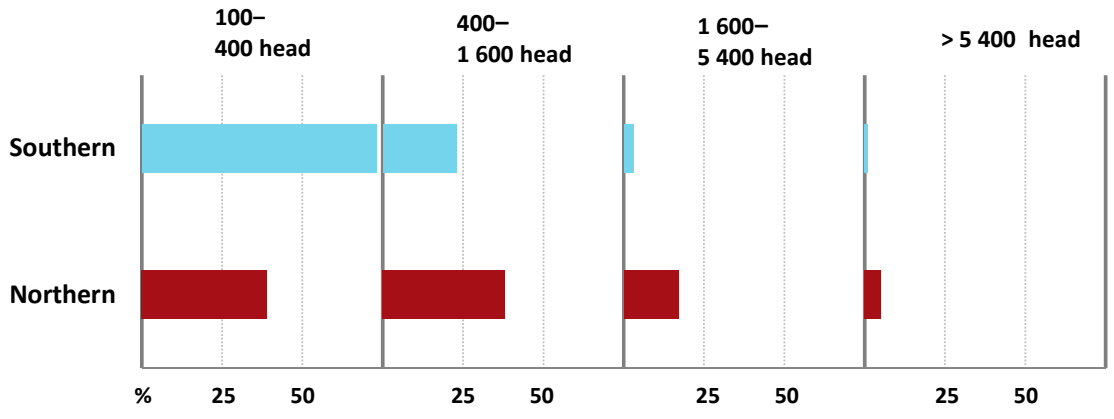
a Farms with herds less than 100 head are not reported on.
Source: ABS, ABARES Australian Agricultural and Grazing Industries Survey

As well as reporting results at a national scale, this report also provides results for the MLA defined Northern and Southern regions. The two regions have marked differences in climate, pastures, industry infrastructure and proximity to markets. This has affected the development and nature of the beef industry and associated farm businesses in each region over the past 20 years. Martin (2015) provides descriptions of each region.

The average herd size for Southern region beef farms in 2014–15 was 431 head. Almost three-quarters of beef cattle farms in the Southern region had a herd of between 100 and 400 head (Figure 5). A further 23 per cent had between 400 and 1 600 head of beef cattle and just 4 per cent had herds greater than 1 600 head.

Farms in the Northern region had much larger herd sizes. In 2014–15 the average herd size was 1 580. Over 20 per cent of farms had an average herd of greater than 1 600 head, including 5 per cent with greater than 5 400 head. Around 38 per cent of farms were in the 400 to 1 600 head category and a similar proportion ran between 100 and 400 head, mostly in southern Queensland.

Figure 5 Proportions of beef farms, by region, 2014–15



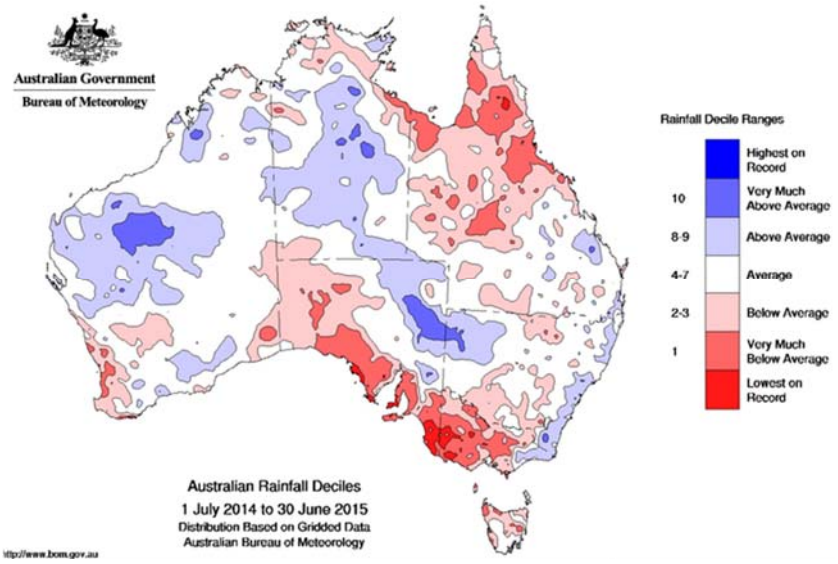
Source: ABARES Australian Agricultural and Grazing Industries Survey

3 Seasons, production and prices

Seasonal conditions

In 2014–15 rainfall was average in much of northern New South Wales and southern Queensland following widespread below average rainfall in those regions in 2013–14. However, it was considerably drier in 2014–15 in the beef producing regions of northern Queensland, southern New South Wales, Victoria, South Australia and south-west Western Australia.

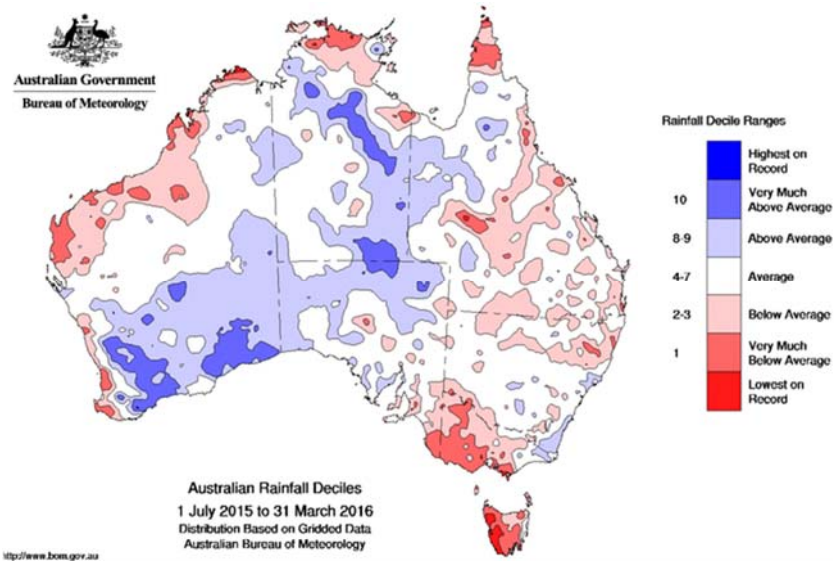
Map 2 Rainfall deciles, beef producing regions, 2014–15



Source: Bureau of Meteorology

In 2015–16 most of the beef producing regions of New South Wales and South Australia received average to below average rainfall, and rainfall was generally below to well below average in Queensland, northern Western Australia, the Northern Territory, Victoria and Tasmania. Much of south-west Western Australia recorded above average rainfall in 2015–16.

Map 3 Rainfall deciles, beef producing regions, 2015–16



Source: Bureau of Meteorology

Beef production

Total beef production increased by 8 per cent from 2013–14 to 2014–15, reflecting an increase in the number of cattle slaughtered in 2014–15 (Table 2). This increase in the number of cattle slaughtered was mainly because of dry conditions in many beef producing areas and high cattle prices (Deards & Mullumby 2015). Beef meat and live cattle exports also increased in 2014–15. Live cattle exports increased by almost 30 per cent, driven by strong demand from Indonesia and Vietnam.

In 2015–16 beef production is estimated to fall to around 2.4 million tonnes as a result of an estimated 12 per cent fall in total slaughterings (Mullumby 2016b). Live cattle exports are also estimated to fall, to around 1.12 million head, largely reflecting lower Indonesian permit allocations in the first quarter of the year (Mullumby 2016b).

Table 2 Beef production, Australia, 2013–14 to 2015–16

Year	Cattle slaughtered a	Beef meat production	Live cattle exports b	Beef meat exports
	('000)	(kt)	('000)	(kt)
2013–14	9 473	2 464	1 006	1 184
2014–15	10 103	2 662	1 295	1 349
2015–16	8 863	2 358	1 119	1 166

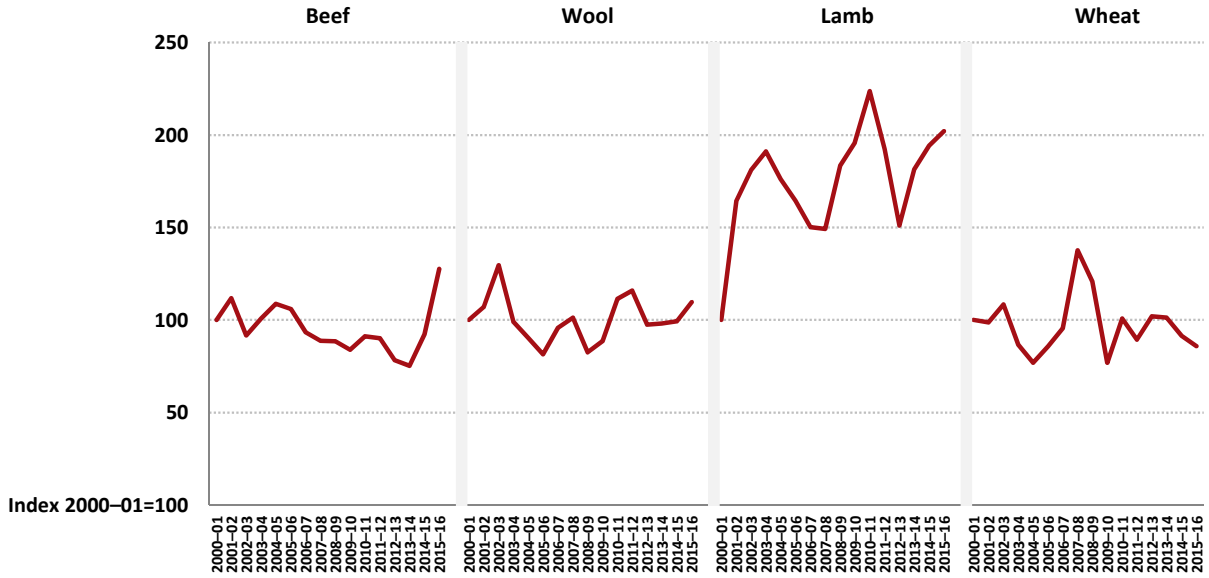
a Includes dairy cattle. **b** Includes live feeder and slaughter cattle.
Note: Data for 2015–16 are estimates.
Source: Mullumby (2016a, b)

At the farm level, the average number of beef cattle sold increased by 4 per cent in 2014–15. The increase in cattle sales was driven by the Southern region, which had an 11 per cent increase in the average number of cattle sold in 2014–15. In the Northern region, the average number of beef cattle sold fell by around 2 per cent in 2014–15, largely as a result of improved seasonal conditions in some areas. Data on the number of cattle sold at the farm level are not available for 2015–16.

Prices

After a mostly downward trend from 2000–01 to 2013–14, beef prices are estimated to have increased significantly in 2014–15 and 2015–16. Strong export demand for both packaged beef and live cattle, a lower Australian dollar and domestic re-stocker demand are the main drivers of this price increase (Mullumby 2016a, b). Prices for prime lambs are also expected to increase; wheat and wool prices have exhibited comparatively less variability (Figure 6).

Figure 6 Price indexes for selected commodities, Australia, 2000–01 to 2015–16



Note: Data for 2015–16 are estimates.
Source: ABARES estimates

4 Receipts, costs and profit

Farm cash receipts

In 2014–15 at the national level average total cash receipts increased by 14 per cent to around $391 000 a farm (Table 3). This increase in total receipts was largely because of higher beef cattle receipts. When averaged over the three years 2013–14 to 2015–16, receipts from beef cattle accounted for around 60 per cent of total cash receipts. The increase in beef cattle receipts from 2013–14 to 2014–15 was the result of both a modest rise in the number of cattle sold and a significant rise in average unit cattle price received.

Table 3 Farm cash receipts, beef farms, 2013–14 to 2015–16

average per farm

Total farm cash receipts	Unit	2013–14	2014–15	2015–16
Australia	$	343 800	391 000	441 600
Northern region	$	409 300	464 100	532 200
Southern region	$	314 900	358 500	399 300

Note: 2015–16 data are preliminary estimates.
Source: ABARES Australian Agricultural and Grazing Industries Survey

Average total cash receipts at the national level are estimated to increase further in 2015–16 to around $442 000, again largely driven by higher cattle receipts. Cattle receipts are expected to increase because of rising cattle prices more than offsetting a decline in the number of cattle sold.

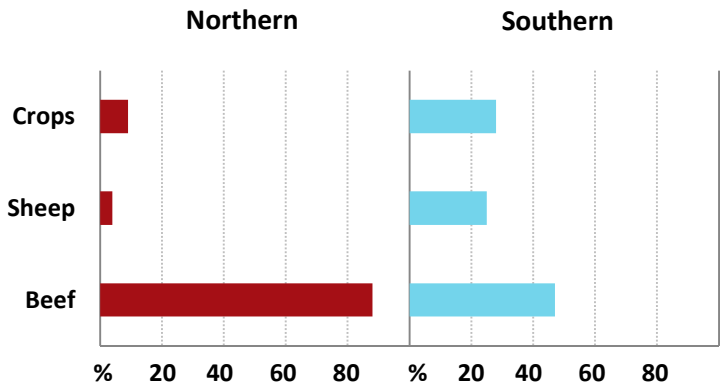
Australian beef cattle turn-off is estimated to fall in 2015–16 as a result of herd rebuilding in response to improved seasonal conditions (Martin 2016; Mullumby 2016a). When combined with expected strong export demand, the average saleyard price of beef cattle is estimated to increase by around 40 per cent in 2015–16 (Mullumby 2016a).

In the Northern region, total cash receipts increased by more than 13 per cent to around $464 000 in 2014–15 (Table 3). In the Southern region, total cash receipts increased by a similar percentage to about $358 000. In 2015–16 total cash receipts are estimated to increase further in both regions—to more than $532 000 and $399 300 in the Northern and Southern regions, respectively.

In the Northern region, beef cattle receipts are significantly more important than in the Southern region. From 2000–01 to 2014–15, beef receipts accounted for almost 90 per cent of total enterprise (crop, sheep and beef) receipts in the Northern region (Figure 7). Crop and sheep enterprise receipts were relatively insignificant at 9 per cent and 4 per cent, respectively.

In the Southern region, although beef cattle sales were also the most important source of enterprise receipts (47 per cent), they contributed less to total enterprise receipts than in the Northern region. Conversely, the proportions of total receipts from crops and sheep enterprises were much higher than in the Northern region at 28 per cent and 25 per cent, respectively.

Figure 7 Contribution of receipts by enterprise, by region, 2000–01 to 2014–15



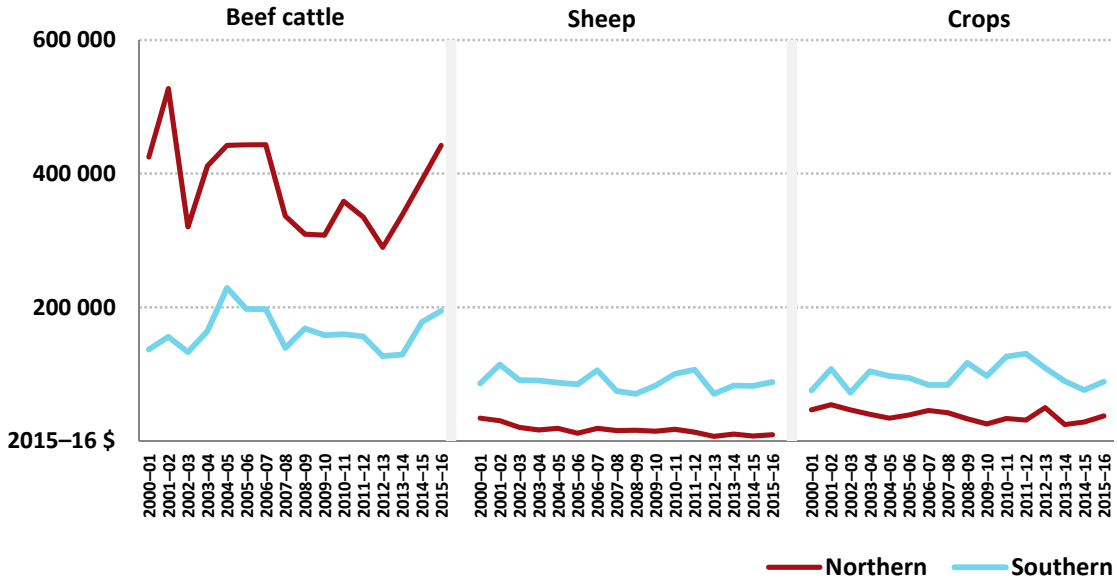
Source: ABARES Australian Agricultural and Grazing Industries Survey

From 2000–01 to 2014–15, average receipts from beef cattle sales in the Northern region exceeded $382 000 each year, ranging between around $290 000 and $528 000 (Figure 8). The average yearly receipts from crop and sheep enterprises were around $38 000 and $16 000, respectively.

In the Southern region, beef cattle receipts averaged around $164 000 over the period 2000–01 to 2014–15, receipts from crops were around $97 000 and receipts from sheep were around $88 000.

Figure 8 Cash receipts by source, by region, 2000–01 to 2014–15

average per farm



Note: Data for 2014–15 are preliminary estimates. Figures are rounded upwards.
Source: ABARES Australian Agricultural and Grazing Industries Survey

Farm cash costs

Average total cash costs on Australian beef farms increased by less than 2 per cent to around $269 000 in 2014–15 (Table 4). In the Southern region, total cash costs increased by 4 per cent to more than $244 000, mostly because of higher cattle purchase costs. In the Northern region, costs fell by 2 per cent to around $326 000.

In 2015–16 average total cash costs at the national level are estimated to have increased by $10 000 (3.7 per cent) to around $279 000. Total cash costs in the Northern and Southern regions are estimated to have increased by around 5.5 per cent and just over 2 per cent, respectively.

Table 4 Farm cash costs, beef farms, 2013–14 to 2015–16

average per farm

Total farm cash costs	Unit	2013–14	2014–15	2015–16
Australia	$	264 700	269 400	279 400
Northern region	$	333 000	325 700	343 800
Southern region	$	234 600	244 300	249 400

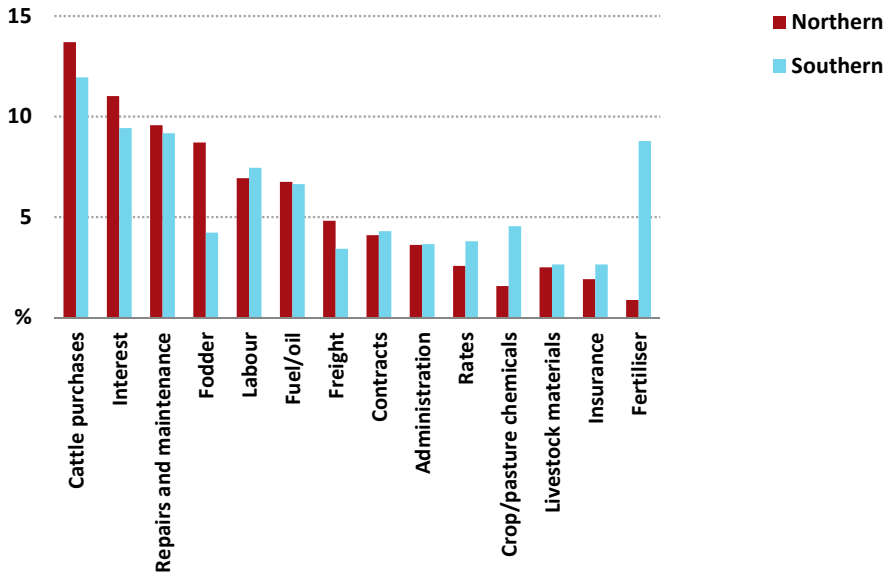
Note: 2015–16 data are preliminary estimates.
Source: ABARES Australian Agricultural and Grazing Industries Survey

From 2000–01 to 2014–15, cattle purchases, interest and repairs and maintenance were the three items accounting for the largest shares of total cash costs in both the Southern and Northern regions (Figure 9). Other items accounting for more than 5 per cent of total cash costs in the Northern region were fodder, labour and fuel and oil.

In the Southern region, while labour and fuel and oil also accounted for more than 5 per cent of total cash costs, fodder was much less important than fertiliser which accounted for almost 10 per cent of total cash costs.

Figure 9 Shares of total cash costs by cost item, by region, 2000–01 to 2014–15

average per farm



Source: ABARES Australian Agricultural and Grazing Industries Survey

Farm cash income

Reflecting higher total cash receipts and little change in total cash costs, average farm cash income increased by more than 50 per cent in 2014–15 to around $121 700 (Table 5). Average farm cash income for Australian beef farms is estimated to have increased further in 2015–16 to $162 200 as higher cash receipts more than offset an estimated increase in total cash costs. In real terms, the estimated average farm incomes for 2014–15 and 2015–16 will be among the highest recorded since 2000–01 (Figure 10).

Table 5 Farm cash income, beef farms, 2013–14 to 2015–16

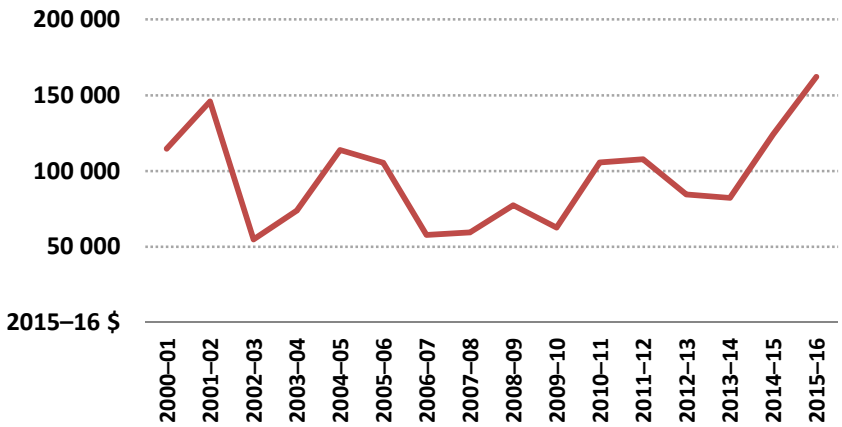
average per farm

Farm cash income	Unit	2013–14	2014–15	2015–16
Australia	$	79 100	121 700	162 200
Northern region	$	76 300	138 400	188 500
Southern region	$	80 300	114 200	150 000

Note: 2015–16 data are preliminary estimates.
Source: ABARES Australian Agricultural and Grazing Industries Survey

Figure 10 Farm cash income, Australia, 2000–01 to 2014–15

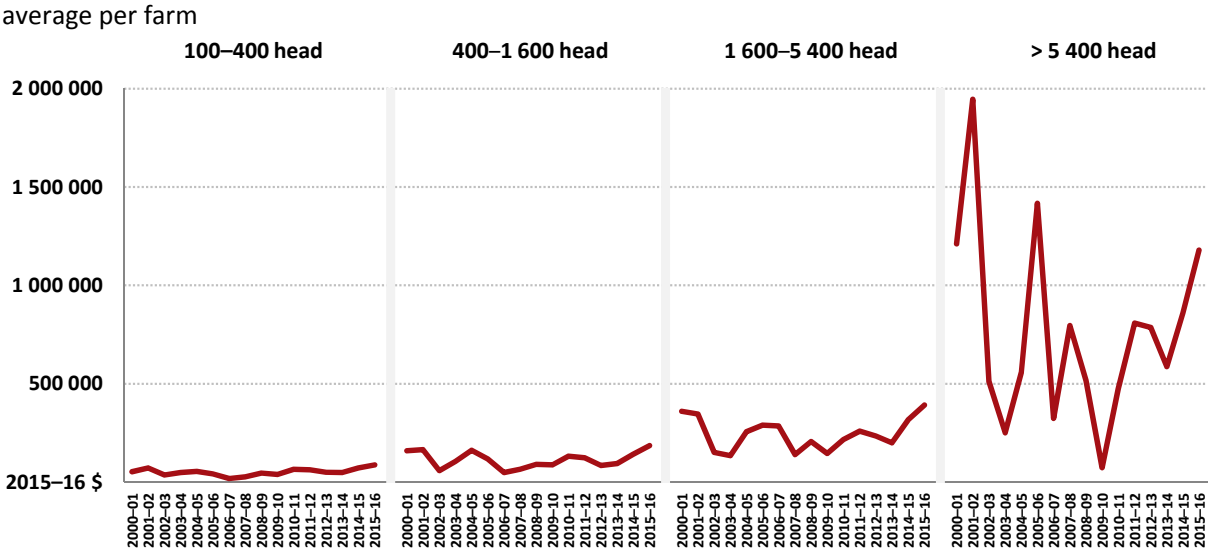
average per farm



Note: Data for 2015–16 are estimates.
Source: ABARES Australian Agricultural and Grazing Industries Survey

The average farm cash income for beef farms with 100 to 400 head was about $51 000 from 2000–01 to 2015–16 (Figure 11). For farms with 400 to 1 600 head it was $114 000 and for farms with 1 600 to 5 400 head it was $246 000. Those farms with more than 5 400 head had an average farm cash income of roughly $770 000, but with large variations from year to year.

Figure 11 Farm cash income by herd size, Australia, 2000–01 to 2015–16



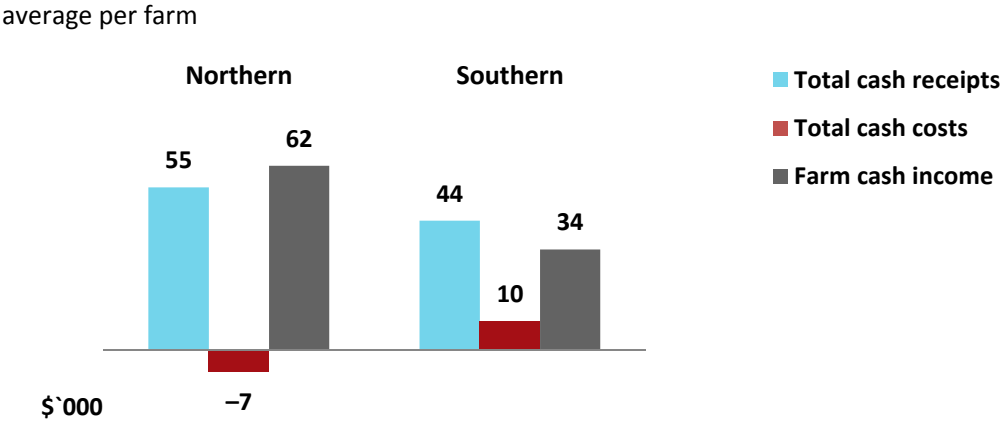
Note: Data for 2015–16 are estimates.
Source: ABARES Australian Agricultural and Grazing Industries Survey

Regional performance

Northern region beef farms recorded higher average farm cash incomes than farms in the Southern region in both 2014–15 and 2015–16 (Table 5). However, both regions recorded year-on-year increases from 2013–14 to 2014–15 and from 2014–15 to 2015–16.

Regional changes in total cash receipts, total cash costs and farm cash income from 2013–14 to 2014–15 are shown in Figure 12. Average farm cash income in the Northern region increased by more than $60 000 because total receipts increased by $55 000 and total costs fell by $7 000. In the Southern region, average farm cash income increased by $34 000 as a $10 000 increase in total costs was more than offset by a $44 000 increase in total cash receipts.

Figure 12 Changes in receipts, costs and income by region, 2013–14 to 2014–15



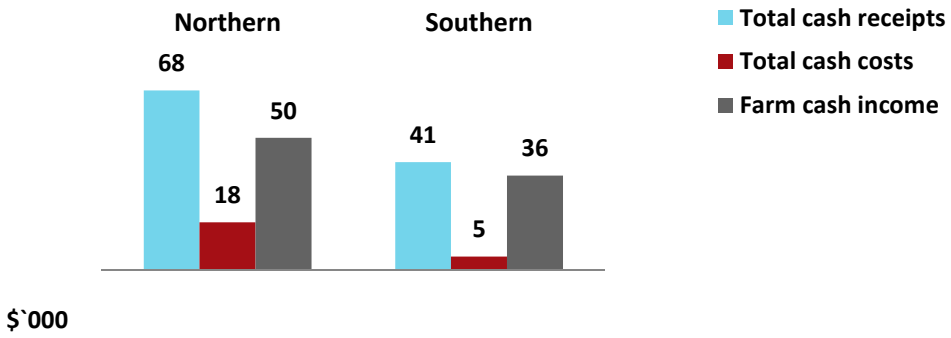
Note: Data for 2015–16 are projections. Figures are rounded upwards.
Source: ABARES Australian Agricultural and Grazing Industries Survey

From 2014–15 to 2015–16, average farm cash incomes in both regions are estimated to have increased further (Figure 13). In the Northern region, farm cash income is estimated to have

increased by $50 000 as a large increase in total cash receipts was only partially offset by an increase in total cash costs of around $18 000. In the Southern region, total cash receipts are estimated to have increased by just over $40 000, much greater than the $5 000 increase in total costs and resulting in farm cash income increasing by $36 000.

Figure 13 Changes in receipts, costs and income by region, 2014–15 to 2015–16

average per farm



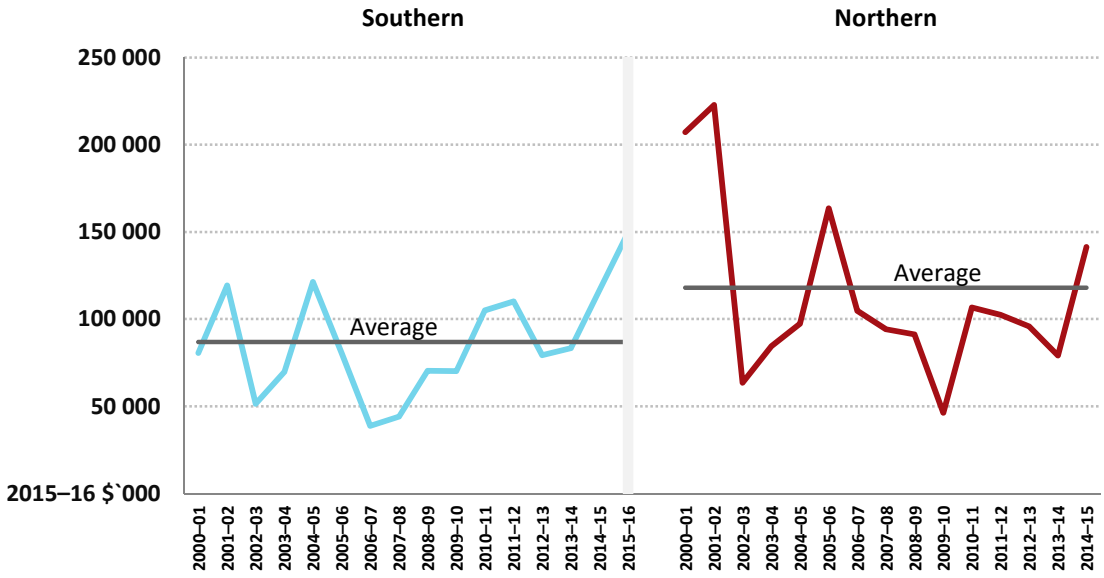
Note: Data for 2015–16 are projections. Figures are rounded upwards.
Source: ABARES Australian Agricultural and Grazing Industries Survey

In the Southern region, average farm cash income for the period 2000–01 to 2015–16 was $87 000 (Figure 14). The lowest recorded average farm cash income was around $40 000 in 2006–07 and the highest is the estimate for 2015–16 of $150 000.

Average farm cash income for the Northern region over this period was $118 000. The lowest average income was $46 000 in 2009–10 and the highest was $223 000 in the early 2000s.

Figure 14 Farm cash income by region, 2000–01 to 2015–16

average per farm



Source: ABARES Australian Agricultural and Grazing Industries Survey

Rate of return

Rate of return is a measure of the annual profit generated by a business, expressed as a percentage of the value of the capital used to generate that profit. Because it is expressed as a ratio, the rate of return for beef farms can be compared with the rate of return for other farm types or other potential investments. For example, the average rate of return for all broadacre farms in both 2013–14 and 2014–15 was 1.4 per cent (Martin 2016).

Reflecting higher incomes, the rate of return (excluding capital appreciation) for Australian beef cattle farms increased from –0.1 per cent in 2013–14 to 0.6 per cent in 2014–15. Average return is estimated to have increased further in 2015–16 to around 1.9 per cent.

Table 6 Rate of return, beef farms, 2013–14 to 2015–16

average per farm

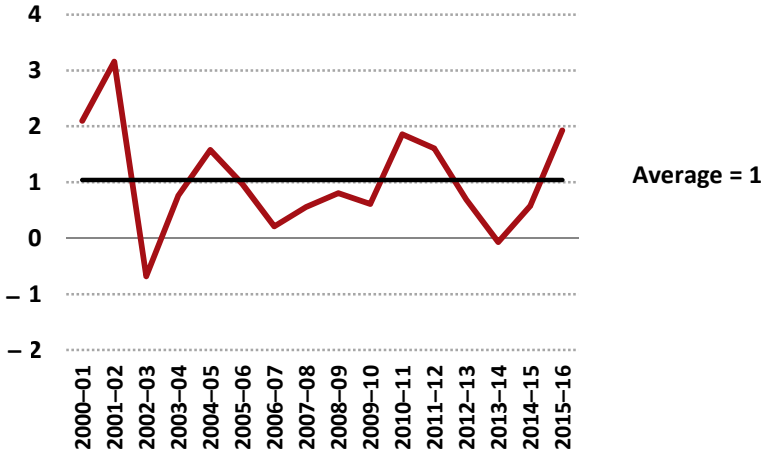
Farm cash income	Unit	2013–14	2014–15	2015–16
Australia	%	–0.1	0.6	1.9
Northern region	%	–0.5	0.1	1.6
Southern region	%	0.2	0.9	2.2

Notes: 2015–16 data are preliminary estimates. Rate of return excludes capital appreciation.
Source: ABARES Australian Agricultural and Grazing Industries Survey

For the period 2000–01 to 2014–15, the average rate of return (excluding capital appreciation) was 1 per cent (Figure 15). Both the highest average return (3.2 per cent) and the lowest average return (–0.7 per cent) were recorded in the early 2000s.

Figure 15 Rate of return, beef farms, Australia, 2000–01 to 2015–16

average per farm



Source: ABARES Australian Agricultural and Grazing Industries Survey

Variation in rates of return

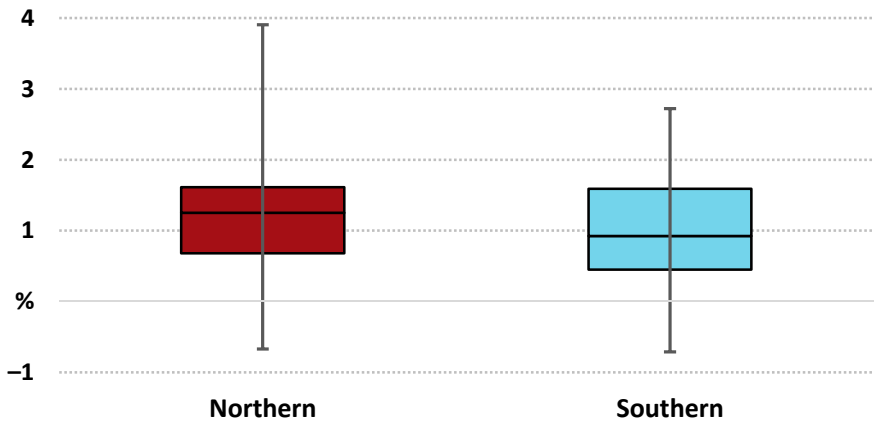
The long term performance of farm businesses is determined by both the level and variability of profits. Figure 16 summarises variation in the rate of return on capital (excluding capital appreciation) for the period 2000–01 to 2015–16. For each year, the returns generated by individual farms in each region have been averaged. As a result, the variation in returns reflects changes over time in average seasonal conditions and commodity prices experienced by farms in each region. Individual farms are likely to have experienced somewhat different variation in returns over this period, depending on the specific seasonal conditions and commodity prices that were realised and other farm-specific factors such as enterprise mix and the skill of the manager.

Figure 16 contains 'boxes' that are defined by the rates of return generated in the most moderate 50 per cent of years between 2000–01 and 2015–16. These rates of return are 0.7 per cent to 1.6 per cent in the Northern region and 0.4 per cent to 1.6 per cent in the Southern region. On average, farm profit will be in these ranges five years in every ten.

The best and worst 25 per cent of years fall above and below the boxes, respectively, with the vertical lines representing the highest and lowest rates of return earned in a particular year during the period. These are – 0.7 per cent and 3.9 per cent for Northern region farms and – 0.7 per cent and 2.7 per cent for Southern region farms. The horizontal line within each box represents the average rate of return generated over the period—1.3 per cent for Northern region farms and 0.9 per cent for Southern region farms.

Figure 16 shows some difference in variation between regions, with Northern region farms generating a relatively wide range of returns over the past 16 years. However, Figure 16 also reveals that, while beef farms in the Northern region experienced the greatest overall variation in returns over this period, very low and negative rates of return occurred no more often than in the Southern region.

Figure 16 Rate of return variability by region, 2000–01 to 2015–16



Source: ABARES Australian Agricultural and Grazing Industries Survey

5 Capital investment and debt

Farm investment

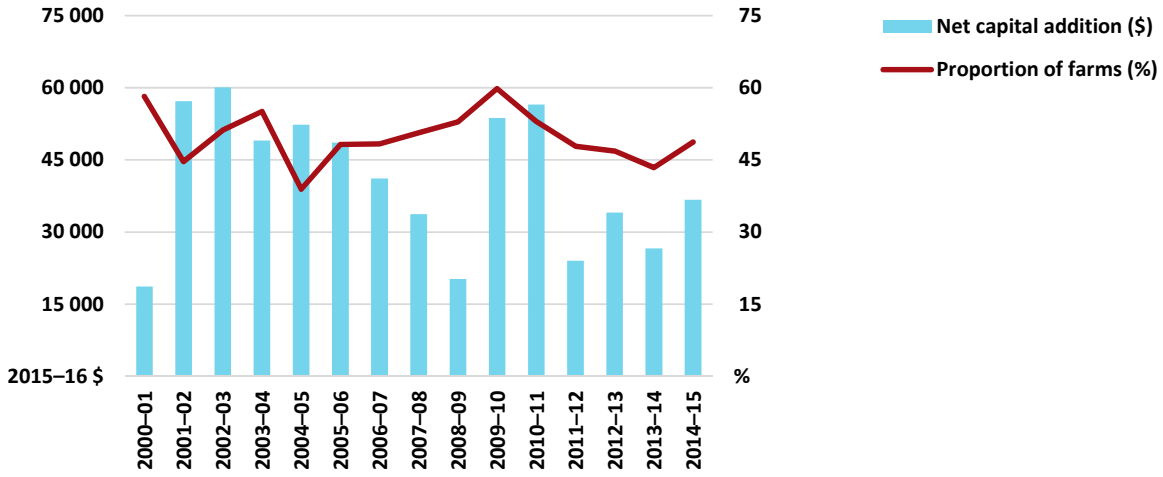
Producers' capacity to generate farm income is influenced by their past investments in land, farm infrastructure, and plant and machinery. Although only a relatively small proportion of farmers buy land in any given year, most make some annual investment in plant, vehicles, machinery and infrastructure.

From 2000–01 to 2014–15, an average of 50 per cent of beef cattle farms made an annual net capital investment. The annual average investment for these farms over the period was around $40 000. Net capital investment is the difference between total value of plant, vehicles, machinery and farm infrastructure purchased and total value of those items sold.

In 2013–14 the proportion of farms making capital investments and the value of those investments were lower than the long-term averages, at 43 per cent and around $27 000 respectively (Figure 17). In 2014–15 the proportion of beef farms making investments increased to about the long-term average at 49 per cent and the average net investment also increased, to almost $37 000.

Figure 17 Farms making capital additions, Australia, 2000–01 to 2014–15

average per farm and proportion of farms



Source: ABARES Australian Agricultural and Grazing Industries Survey

Debt and equity

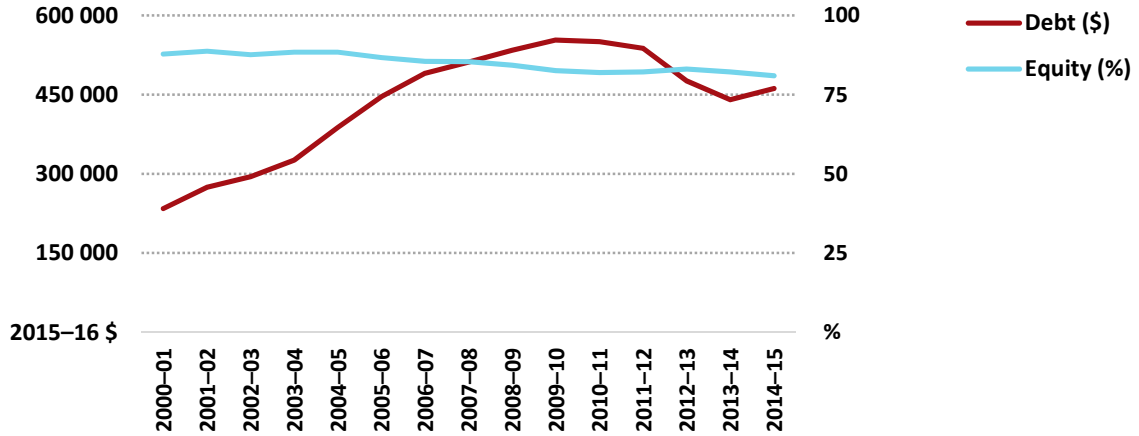
Debt is an important source of funds for farm investment and ongoing working capital for many beef producing farms.

Average beef farm debt mostly trended upwards, in real terms, between 2000–01 and 2014–15 (Figure 18). In 2014–15 the average farm debt for beef farms was just over $460 000. Increases in average debt over the past 15 years have been largely the consequence of a rapid increase in average farm size. An increase in average debt per farm would probably have occurred as a result of the exit of small farms even without any additional borrowing. Many small farms had little or no debt and their exit raised the average debt for the remaining farms.

The increases in debt over time have largely been supported by increases in the total capital value of beef production farms. As a consequence, average farm business equity ratios trended slightly downwards over the period 2000–01 to 2015–16. Change in farm equity ratios over time should be considered against the background of the increase in average farm size. Equity ratios are typically lower for larger farms because they are generally able to service larger debts.

Figure 18 Total farm debt and equity, Australia, 2000–01 to 2014–15

average per farm (two-year moving average)

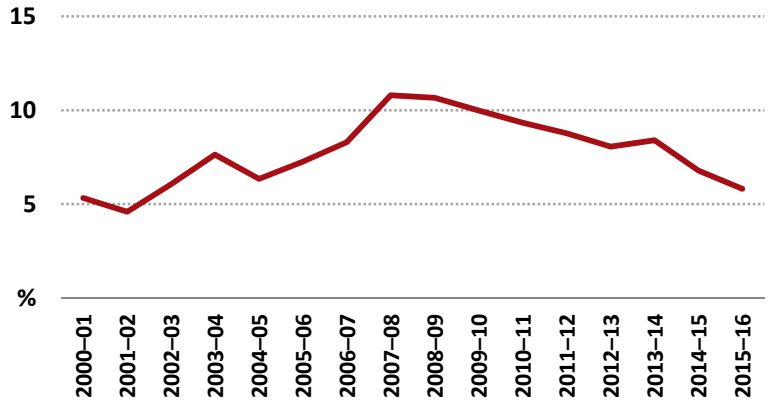


Source: ABARES Australian Agricultural and Grazing Industries Survey

Overall, changes in average debt over time have been modest relative to beef producers' capacity to service debt by generating income. The capacity to service debt—making interest and principal repayments—is an important part of farm viability. On average, around 9 per cent of beef farm cash receipts were used to make interest payments over the 10 years to 2015–16. This proportion has fallen in years of higher farm receipts and reduced interest rates (Figure 19).

Figure 19 Interest to total cash receipts ratio, Australia, 2000–01 to 2015–16

average per farm



Source: ABARES Australian Agricultural and Grazing Industries Survey

6 Productivity

Productivity is an important measure of performance for Australian agriculture because it reflects improvements in the efficiency with which inputs such as land, labour and capital are used to produce outputs such as meat, crops, wool and milk. Productivity growth is important for maintaining international competitiveness and profitability given long-term declines in Australian farmers' terms of trade.

Productivity growth is defined as an increase in output beyond any associated increase in input (or a decrease in the quantity of inputs needed to produce a unit of output). ABARES measures productivity using total factor productivity (TFP), which takes into account the full range of inputs and outputs that are generated on farm.

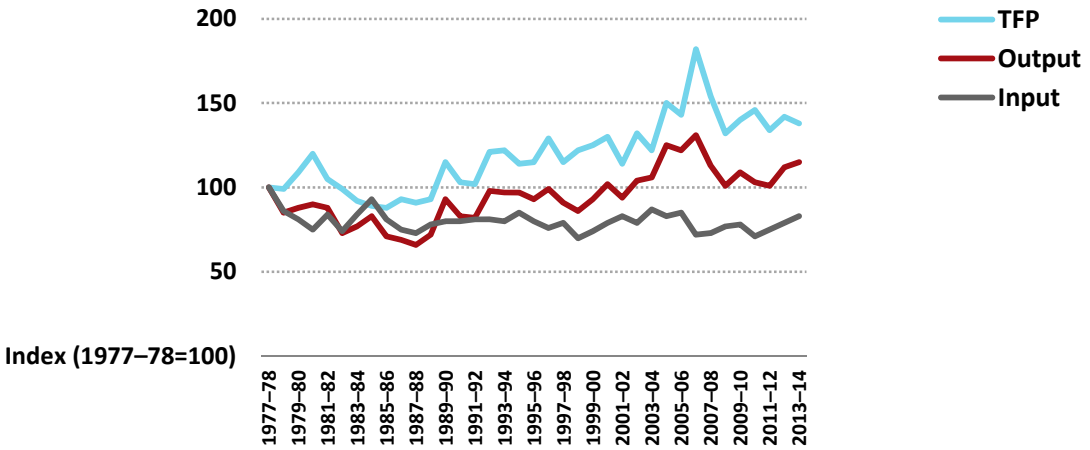
Productivity growth is generally measured over the long term because it is treated as an indicator of technological progress, which can involve significant time lags in both on-farm implementation and realised benefits. Further, short-term variability in productivity can reflect seasonal conditions rather than shifts in underlying technology or efficiency.

A number of fundamental drivers of productivity across the Australian farm sector have been identified, including climate conditions, structural adjustment, research and development, increasing farm size and management ability. Most important for the beef industry to achieve ongoing productivity growth will be its ability to continue adopting new technologies and management practices that generate improvements in efficiency.

Trends in beef industry productivity

Productivity in the Australian beef industry increased by 1.3 per cent a year on average from 1977–78 to 2013–14 (Figure 20). Output increased by 1.1 per cent a year while inputs declined by 0.2 per cent a year (Table 7).

Figure 20 Input, output and TFP, beef industry, Australia, 1977–78 to 2013–14



Source: ABARES Australian Agricultural and Grazing Industries Survey

Productivity growth in the beef industry has been supported by improvements in pastures, herd genetics and disease management. This has led to increased branding rates (calves marked as a percentage of cows mated) and lower mortalities.

Table 7 Average annual beef industry TFP growth, by region, 1977–78 to 2013–14

Beef farms	Input growth	Output growth	TFP growth
	%	%	%
All beef farms	–0.2	1.1	1.3
Southern region	0.5	1.2	0.6
Northern region	–0.4	1.1	1.5

Source: ABARES Australian Agricultural and Grazing Industries Survey

Most of the productivity gains in the beef industry between 1977–78 and 2013–14 were made in the Northern region (Table 7). Productivity growth in this region averaged 1.5 per cent a year, driven by output growth of 1.1 per cent a year and reduced input use of 0.4 per cent a year.

This improvement in productivity can be partly attributed to improved reproductive performance and reduced death rates resulting from the brucellosis and tuberculosis eradication campaign of the 1980s. Managers culled poor performing stock and invested significantly in fences, on-farm infrastructure and cattle management systems. Expansion of the feedlot sector and the live export trade during the 1990s also drove shifts in herd structure and greater use of climate appropriate *Bos indicus* breeds.

Productivity in the Southern beef region increased by 0.6 per cent a year from 1977–78 to 2013–14. Southern region output growth of 1.2 per cent a year was greater than that of the Northern region, but substantially higher growth in input use (0.5 per cent a year) meant that productivity increased at a slower rate.

Farms in the Southern region face different constraints from their northern counterparts. The climate is more varied and beef farms in the Southern region are more sensitive to drought conditions, which lead to increased feed purchases and destocking and restocking cycles that hamper output growth. Beef cattle farms in southern Australia are more intensive and diversified than those in the Northern region. They are also smaller and less profitable, which is likely to have contributed to lower average productivity growth (Jackson & Valle 2015).

Survey methodology

ABARES has conducted surveys of selected Australian agricultural industries since the 1940s. These surveys provide a broad range of information on the economic performance of farm business units in the rural sector. This comprehensive dataset is used for research and analysis that forms the basis of many publications, briefing material and industry reports. Since 1977–78 ABARES has conducted the annual Australian Agricultural and Grazing Industries Survey (AAGIS) to provide a set of data that are collected nationally using a consistent methodology.

Definitions of industries

Industry definitions are based on the 2006 Australian and New Zealand Standard Industrial Classification (ANZSIC06). This classification is in line with an international standard applied comprehensively across Australian industry, permitting comparisons between industries, both within Australia and internationally. Farms assigned to a particular ANZSIC have a high proportion of their total output characterised by that class. Further information on ANZSIC and on farming activities included in each of these industries is provided in Australian and New Zealand Standard Industrial Classification (ABS 2006).

The five broadacre industries covered by AAGIS are:

- wheat and other crops industry (class 0146 and 0149)
  - farms engaged mainly in growing rice, other cereal grains, coarse grains, oilseeds, pulses
- mixed livestock–crops industry (class 0145)
  - farms engaged mainly in running sheep, beef cattle and growing cereal grains, coarse grains, oilseeds, pulses
- sheep industry (class 0141)
  - farms engaged mainly in running sheep
- beef industry (class 0142)
  - farms engaged mainly in running beef cattle
- sheep–beef industry (class 0144)
  - farms engaged mainly in running both sheep and beef cattle.

Target populations

AAGIS is designed from a population list drawn from the Australian Business Register (ABR) and maintained by the Australian Bureau of Statistics. The ABR comprises businesses registered with the Australian Taxation Office. The ABR-based population list provided to ABARES consists of agricultural establishments with their corresponding geography code (currently Australian Statistical Geography Standard), ANZSIC, and a size of operation variable.

ABARES surveys target farming establishments that make a significant contribution to the total value of agricultural output (commercial farms). Farms excluded from ABARES surveys will be the smallest units and in aggregate will contribute less than 2 per cent to the total value of agricultural production for the industries covered by the surveys.

The size of operation variable used in ABARES survey designs is usually estimated value of agricultural operations (EVAO). EVAO is a standardised dollar measure of the level of

agricultural output. However, in some surveys in recent years other measures of agricultural production have also been used.

Since 2004–05 the ABARES survey has included establishments classified as having an EVAO of $40 000 or more. Between 1991–92 and 2003–04 the survey included establishments with an EVAO of $22 500 or more. Between 1987–88 and 1990–91 the survey included establishments with an EVAO of $20 000 or more. Before 1987–88 the survey included establishments with an EVAO of $10 000 or more.

Survey design

The target population is grouped into strata defined by ABARES region, ANZSIC and size of operation. The sample allocation is a compromise between allocating a higher proportion of the sample to strata with high variability in the size variable and an allocation proportional to the population of the stratum.

A large proportion of sample farms are retained from the previous year's survey. The sample chosen each year maintains a high proportion of the sample between years to accurately measure change while meeting the requirement to introduce new sample farms. New farms are introduced to account for changes in the target population, as well as to reduce the burden on survey respondents.

The sample size for AAGIS is usually around 1 600 farms.

The main method of collecting data is face-to-face interviews with the owner–manager of the farm business. Detailed physical and financial information is collected on the operations of the farm business during the preceding financial year. Respondents to AAGIS are also contacted by telephone in the latter part of each year to obtain estimates of projected production and expected receipts and costs for the current financial year. ABARES surveys also allow supplementary questionnaires to be attached to the main or to the telephone surveys. These additional questions help address specific industry issues—such as grain cost of production, livestock management practices and adoption of new technologies on dairy farms.

Sample weighting

ABARES survey estimates are calculated by appropriately weighting the data collected from each sample farm and then using the weighted data to calculate population estimates. Sample weights are calculated so that population estimates from the sample for numbers of farms, areas of crops and numbers of livestock correspond as closely as possible to the most recently available Australian Bureau of Statistics estimates from its Agricultural Census and surveys.

The weighting methodology for AAGIS uses a model-based approach, with a linear regression model linking the survey variables and the estimation benchmark variables. The details of this method are described in Bardsley and Chambers (1984).

For AAGIS, the benchmark variables provided by the ABS include:

- total number of farms in scope
- area planted to wheat, rice, other cereals, grain legumes (pulses) and oilseeds
- closing numbers of beef and sheep.

Generally, larger farms have smaller weights and smaller farms have larger weights. This reflects both the strategy of sampling a higher fraction of the larger farms than smaller farms and the relatively lower numbers of large farms. Large farms have a wider range of variability of key characteristics and account for a much larger proportion of total output.

Reliability of estimates

The reliability of the estimates of population characteristics published by ABARES depends on the design of the sample and the accuracy of the measurement of characteristics for the individual sample farms.

Preliminary estimates and projections

Estimates for 2013–14 and all earlier years are final. All data from farmers, including accounting information, have been reconciled; final production and population information from the ABS has been included and no further change is expected in these estimates.

The 2014–15 estimates are preliminary, based on full production and accounting information from farmers. However, editing and addition of sample farms may be undertaken and ABS production and population benchmarks may also change.

The 2015–16 estimates are projections developed from the data collected through on-farm and telephone interviews between September 2015 and December 2015. The estimates include crop and livestock production, receipts and expenditure up to the date of interview, together with expected production, receipts and expenditure for the remainder of the financial year. Modifications have been made to expected receipts and expenditure for the remainder of 2015–16 where prices have changed significantly since the interview. Projection estimates are necessarily subject to greater uncertainty than preliminary and final estimates.

Preliminary and projection estimates of farm financial performance are produced within a few weeks of the completion of survey collections. However, these may be updated several times at later dates. These subsequent versions will be more accurate, as they will be based on upgraded information and slightly more accurate input datasets.

Sampling errors

Only a subset of farms out of the total number of farms in a particular industry is surveyed. The data collected from each sample farm are weighted to calculate population estimates. Estimates derived from these farms are likely to be different from those that would have been obtained if information had been collected from a census of all farms. Any such differences are called ‘sampling errors’.

The size of the sampling error is influenced by the survey design and the estimation procedures, as well as the sample size and the variability of farms in the population. The larger the sample size, the lower the sampling error is likely to be. Hence, national estimates are likely to have lower sampling errors than industry and state estimates.

To give a guide to the reliability of the survey estimates, standard errors are calculated for all estimates published by ABARES. These estimated errors are expressed as percentages of the survey estimates and termed relative standard errors.

Calculating confidence intervals using relative standard errors

Relative standard errors can be used to calculate 'confidence intervals' that give an indication of how close the actual population value is likely to be to the survey estimate.

To obtain the standard error, multiply the relative standard error by the survey estimate and divide by 100. For example, if average total cash receipts are estimated to be $100 000 with a relative standard error of 6 per cent, the standard error for this estimate is $6 000. Two standard errors equal $12 000.

There is roughly a two-in-three chance that the 'census value' (the value that would have been obtained if all farms in the target population had been surveyed) is within one standard error of the survey estimate. This range of one standard error is described as the 66 per cent confidence interval. In this example, there is an approximately two-in-three chance that the census value is between $94 000 and $106 000 ($100 000 plus or minus $6 000).

There is roughly a 19-in-20 chance that the census value is within two standard errors of the survey estimate (the 95 per cent confidence interval). In this example, there is an approximately 19-in-20 chance that the census value lies between $88 000 and $112 000 ($100 000 plus or minus $12 000).

Comparing estimates

When comparing estimates between two groups, it is important to recognise that the differences are also subject to sampling error. As a rule of thumb, a conservative estimate of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and taking the square root of the result.

For example, suppose the estimates of total cash receipts were $100 000 in the beef industry and $125 000 in the sheep industry—a difference of $25 000—and the relative standard error is given as 6 per cent for each estimate. The standard error of the difference is $9 605, estimated as the square root of:

$((6 \times \$100\,000/100)^2 + (6 \times \$125\,000/100)^2)$

A 95 per cent confidence interval for the difference is therefore:

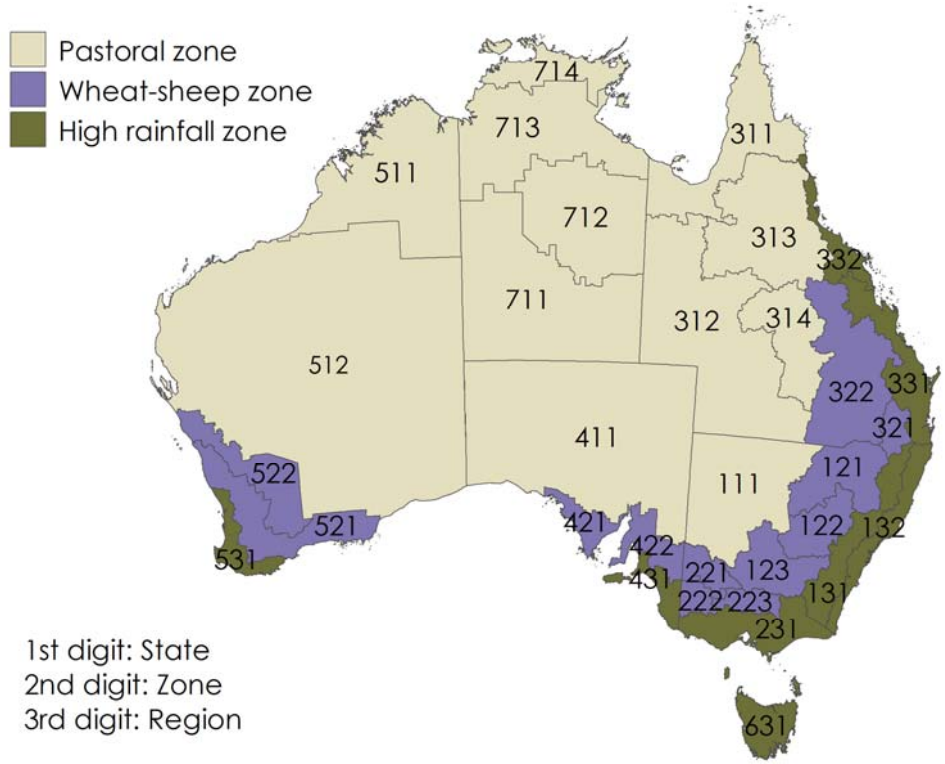
$\$25\,000 \pm 1.96 \times \$9\,605 = (\$6\,174; \$43\,826)$

Hence, if a large number (towards infinity) of different samples are taken, in approximately 95 per cent of them, the difference between these two estimates will lie between $6 174 and $43 826. Also, since zero is not in this confidence interval, it is possible to say that the difference between the estimates is statistically significantly different from zero at the 95 per cent confidence level.

Regions

Broadacre statistics are also available by region (Map 4). These regions represent the finest level of geographical aggregation for which the survey is designed to produce reliable estimates.

Map 4 ABARES Australian broadacre zones and regions



Note: Each region is identified by a unique code of three digits. The first digit identifies the state or territory, the second digit identifies the zone and the third digit identifies the region.
Source: ABARES

Glossary

Term	Definition
owner–manager	The primary decision-maker for the farm business. This person is usually responsible for day-to-day operation of the farm and may own or have a share in the farm business.
beef cattle	Cattle kept primarily for the production of meat, irrespective of breed.
dairy cattle	Cattle kept or intended mainly for the production of milk or cream.
hired labour	Excludes the farm business manager, partners and family labour and work by contractors. Expenditure on contract services appears as a cash cost.
labour	Measured in work weeks, as estimated by the owner–manager or manager. It includes all work on the farm by the owner–manager, partners, family, hired permanent and casual workers and sharefarmers but excludes work by contractors.
total area operated	Includes all land operated by the farm business, whether owned or rented by the business, but excludes land sharefarmed on another farm.
large stock unit	400 kilogram dry cow or steer.
capital	The value of farm capital is the value of all the assets used on a farm, including the value of leased items but excluding machinery and equipment either hired or used by contractors. The value of 'owned' capital is the value of farm capital excluding the value of leased machinery and equipment. ABARES uses the owner–manager's valuation of the farm property. The valuation includes the value of land and fixed improvements used by each farm business in the survey, excluding land sharefarmed off the sample farm. Residences on the farm are included in the valuations. Livestock are valued at estimated market prices for the land use zones within each state. These values are based on recorded sales and purchases by sample farms. Before 2001–02 ABARES maintained an inventory of plant and machinery for each sample farm. Individual items were valued at replacement cost, depreciated for

Term	Definition
	age. Each year the replacement cost was indexed to allow for changes in that cost. Since 2001–02 total value of plant and machinery has been based on market valuations provided by the owner–manager for broad categories of capital, such as tractors, vehicles and irrigation plant. The total value of items purchased or sold during the survey year was added to or subtracted from farm capital at 31 December of the relevant financial year, irrespective of the actual date of purchase or sale.
change in debt	Estimated as the difference between debt at 1 July and the following 30 June within the survey year, rather than between debt at 30 June in consecutive years. It is an estimate of the change in indebtedness of a given population of farms during the financial year and is thus unaffected by changes in sample or population between years.
farm business debt	Estimated as all debts attributable to the farm business but excluding personal debt, lease financed debt and underwritten loans, including harvest loans. Information is collected at the interview, supplemented by information contained in the farm accounts.
farm liquid assets	Assets owned by the farm business that can be readily converted to cash. They include savings bank deposits, interest bearing deposits, debentures and shares. Excluded are items such as real estate, life assurance policies and other farms or businesses.
receipts and costs	Receipts for livestock and livestock products sold are determined at the point of sale. Selling charges and charges for transport to the point of sale are included in the costs of sample farms. Receipts for crops sold during the survey year are gross of deductions made by marketing authorities for freight and selling charges. These deductions are included in farm costs. Receipts for other farm products are determined on a farmgate basis. All cash receipt items are the revenue received in the financial year. Farm receipts and costs relate to the whole area operated, including areas operated by on-farm sharefarmers. Thus, cash receipts include receipts from the sale of products produced by sharefarmers. If possible, on-farm sharefarmers' costs are amalgamated

Term	Definition
	with those of the sample farm. Otherwise, the total sum paid to sharefarmers is treated as a cash cost. Some sample farm businesses engage in off-farm contracting or sharefarming, employing labour and capital equipment also used in normal on-farm activities. Since it is not possible to accurately allocate costs between off-farm and on-farm operations, the income and expenditure attributable to such off-farm operations are included in the receipts and costs of the sample farm business.
total cash costs	Payments made by the farm business for materials and services and for permanent and casual hired labour (excluding owner–manager, partner and other family labour). It includes the value of livestock transfers onto the property as well as any lease payments on capital, produce purchased for resale, rent, interest, livestock purchases and payments to sharefarmers. Capital and household expenditures are excluded from total cash costs. Handling and marketing expenses include commission, yard dues and levies for farm produce sold. Administration costs include accountancy fees, banking and legal expenses, postage, stationery, subscriptions and telephone. Contracts paid refers to expenditure on contracts such as harvesting. Capital and land development contracts are not included. Other cash costs include stores and rations, seed purchased, electricity, artificial insemination and herd testing fees, advisory services, motor vehicle expenses, travelling expenses and insurance. While other cash costs may comprise a relatively large proportion of total cash costs, individually the components are relatively small overall and, as such, have not been listed.
total cash receipts	Total of revenues received by the farm business during the financial year, including revenues from the sale of livestock, livestock products and crops, plus the value of livestock transfers off a property. It includes revenue received from agistment, royalties, rebates, refunds, plant hire, contracts, sharefarming, insurance claims and compensation, and government assistance payments to the farm business.

Term	Definition
build-up in trading stocks	The closing value of all changes in the inventories of trading stocks during the financial year. It includes the value of any change in herd or flock size or in stocks of wool, fruit and grains held on the farm. It is negative if inventories are run down.
depreciation of farm improvements, plant and equipment	Estimated by the diminishing value method, based on the replacement cost and age of each item. The rates applied are the standard rates allowed by the Commissioner of Taxation. For items purchased or sold during the financial year, depreciation is assessed as if the transaction had taken place at the midpoint of the year. Calculation of farm business profit does not account for depreciation on items subject to a finance lease because cash costs already include finance lease payments.
farm business equity	The value of owned capital, less farm business debt, at 30 June. The estimate is based on those sample farms for which complete data on farm debt are available.
farm business profit	Farm cash income plus build-up in trading stocks, less depreciation and the imputed value of the owner–manager, partner(s) and family labour.
farm cash income	The difference between total cash receipts and total cash costs.
farm equity ratio	Calculated as farm business equity as a percentage of owned capital at 30 June.
imputed labour cost	Payments for owner–manager and family labour may bear little relationship to the actual work input. An estimate of the labour input of the owner–manager, partners and their families is calculated in work weeks and a value is imputed at the relevant Federal Pastoral Industry Award rates.
off-farm income	Collected for the owner–manager and spouse only, including income from wages, other businesses, investment, government assistance to the farm household and social welfare payments.
profit at full equity	Farm business profit, plus rent, interest and finance lease payments, less depreciation on leased items. It is the return produced by all the resources used in the farm business.

Term	Definition
rates of return	Calculated by expressing profit at full equity as a percentage of total opening capital. Rate of return represents the ability of the business to generate a return to all capital used by the business, including that which is borrowed or leased. Rate of return excluding capital appreciation and rate of return including capital appreciation are estimated.

References

Unless otherwise indicated, ABARES publications listed here are available at agriculture.gov.au/abares/publications.

ABARES 2011, *Agricultural commodity statistics 2011*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

—— 2015, *Agricultural commodity statistics 2015*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

ABARES 2016, *Agricultural commodities: June quarter 2016*, vol. 6, no. 2, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

ABS 2006, *Australian and New Zealand Standard Industrial Classification (ANZSIC)*, cat. no. 1292.0, Australian Bureau of Statistics, Canberra, available at abs.gov.au/1292.0.

ABS 2016, *Agricultural commodities, Australia, 2014-15*, cat. no. 7121.0, Australian Bureau of Statistics, Canberra, March, available at abs.gov.au/7121.0.

Bardsley, P & Chambers, R 1984, 'Multipurpose estimation from unbalanced samples', *Journal of the Royal Statistical Society*, Series C (Applied Statistics), vol. 33, pp. 290–299.

Deards, B & Mullumby, J 2015, 'Beef and veal', *Agricultural commodities: June quarter 2015*, vol. 5, no. 2, pp. 84–97, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Jackson, T & Valle, H 2015, 'Profitability and productivity in Australia's beef industry', *Agricultural commodities: March quarter 2015*, vol. 5, no. 1, pp. 226–235, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Martin, P 2015, *Australian beef: financial performance of beef cattle producing farms, 2012–13 to 2014–15*, ABARES research report prepared for Meat & Livestock Australia, Canberra, July.

Martin, P 2016, 'Farm performance: broadacre and dairy farms, 2013–14 to 2015–16', *Agricultural commodities: March quarter 2016*, vol. 6, no. 1, pp. 168–214, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Mifsud, C 2014, 'Beef and veal', *Agricultural commodities: June quarter 2014*, vol. 4, no. 2, pp. 92–102, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Mullumby, J 2016a, 'Beef and veal: outlook to 2020–21', *Agricultural commodities: March quarter 2016*, vol. 6, no. 1, pp. 103–111, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Mullumby, J 2016b, 'Beef and veal', *Agricultural commodities: June quarter 2016*, vol. 6, no. 2, pp. 82–90, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Mullumby, J, Whitnall, T & Perndt, N 2016, 'Recent dynamics in the Australian beef cattle herd', *Agricultural commodities: June quarter 2016*, vol. 6, no. 2, pp. 91–95, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Valle, H 2016, 'Productivity in Australian broadacre and dairy industries', *Agricultural commodities: March quarter 2016*, vol. 6, no. 1, pp. 215–225, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Further information

ABARES farm survey data for the livestock and other broadacre industries

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