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Regional feedlot investment study

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Abstract

The cattle lot feeding industry is a crucial component of Australia's beef supply chain. This report estimates the economic contribution and economic impact of the feedlot sector to the Australian economy. The total (direct and indirect) economic contribution of the national feedlot industry to gross domestic product (GDP) in 2012-13 was $2.5 billion, and approximately 28,600 full time equivalent jobs. The contribution to local, regional, state and the national economy are estimated. The economic impact of the industry is estimated using computable general equilibrium (CGE) modelling. Two scenarios are modelled; the first considers the size of the economy in the absence of feedlots. The second scenario is built on top of the first scenario, and also accounts for the productivity loss in the grazing sector, resulting from the absence of feedlots. Under the first scenario, gross domestic product (GDP) is $2.6 billion lower in the absence of feedlots than under a baseline scenario of no change in 2030. When productivity losses to the grazing sector are also accounted for, GDP is expected to be $3.0 billion below baseline in 2030.

Executive summary

The cattle lot feeding industry is a crucial component of Australia's beef supply chain. The industry experienced intermittent development from the 1960s, but took off significantly in the mid-1980s following relaxation of the beef import restrictions into Japan and Korea. In the 1990s, it was noted that the value of lot feeding to domestic buyers, particularly supermarkets has also been an important factor in this growth (Senate Standing Committee on Rural and Regional Affairs 1992).

The ability to finish cattle on grain in a feedlot environment provides a range of benefits to the beef cattle industry as a whole, such as:

- Enables the supply of beef that satisfies domestic and international customer preferences for quality and consistency (irrespective of seasonal conditions).
- Beef can be produced that has characteristics highly valued by some consumers, which would be very difficult to replicate outside a lot feeding environment.
- Lot feeding effectively increases the efficiency of the Australian beef cattle industry. As feedlots provide cattle with a nutritionally superior diet, more beef can be produced with less land, water and other inputs. This provides benefits to cattle producers and consumers (in terms of lower retail prices) and enables residual land to be used for other productive purposes.
- Feedlots underpin the processing sector's ability to operate through reducing volatility in supply. The role of feedlots has evolved from drought mitigation (consistent quantity) to also ensuring consistent quality. This continuity of supply from feedlots supports the broader beef supply chain in terms of employment and output, and ensures that domestic and export market demands are met.
- Feedlots play an important economic role in their local and regional economies. Not only are they often amongst the largest direct employers in communities, their operation also supports a range of other economic activity throughout regional and rural Australia. This comes mainly from:
    - the direct purchasing of local inputs, principally feeder cattle and feed,
    - the stimulus to the immediate downstream supply chain, such as abattoirs and transport, and
    - eventually to many other areas of local and regional economies, such as retail trade, schools and health care, through the role of feedlots in sustaining jobs and population.
    - Providing economic stability to regional communities, especially when they are otherwise distressed because of poor seasonal conditions undermining agricultural production. Indeed, feedlots are often most valuable when seasonal conditions are poor, and rural communities are most needing stimulus. As a result, feedlots are often the backbone supporting communities in rural and regional Australia.
- Feedlots provide a relatively stable market for feeder cattle during good and bad seasons. This is particularly relevant during bad seasons when pasture and/ or water is insufficient with extensive grass fed cattle only able to reach marketable condition after entering a feedlot. In this way, feedlots can provide an insurance value for the cattle industry against droughts and poor seasons.
- Feedlots are also often countercyclical to extensive cattle production in that they are generally profitable when the extensive grass fed sector is not. In times of

drought, when the grass fed sector is unviable, the feedlot sector benefits from lower cost cattle for finishing. The presence of feedlots therefore allows rural and regional areas to receive a positive economic stimulus when the broader extensive cattle sector is financially struggling.

This report was commissioned by Meat & Livestock Australia (MLA). This report includes data collected and analysis undertaken by Deloitte Access Economics and has been prepared subsequent to, and following consideration of the FLOT.404 'The impact of feedlot investment' report, prepared for MLA in 2003 by WJ Yates (Macarthur Agribusiness), EJ Sparke (Aquila Agribusiness Pty Ltd), JB Morison (EconSearch Pty Ltd) and P Hughes (Hughes Consulting Services). This report provides an update and extension of the 2003 report.

While the 2003 report only considered the economic contribution of the feedlot industry, this report also presents an economic impact analysis. The economic contribution is a good way to describe an industry, and is a measure of the scale of operations at a point in time. Economic impact analysis, on the other hand, considers the implications of an industry scenario on resource distribution in the economy.

Key results

- Feedlot industry revenue was $3.2 billion in 2012-13.
- Feedlot capacity was 1.1 million head in September 2014, with just over 0.9 million head on feed, giving a national utilisation of 80%.
- The total (direct and indirect) economic contribution of the national feedlot industry to gross domestic product (GDP) in 2012-13 was $2.5 billion, and approximately 28,600 full time equivalent employees. This mostly comprised the indirect contribution of feedlots, that is, the flow-on demand for goods and services in other industries, created by what feedlot operations buy.
- This compares to the conceptually equivalent figure from the last time this assessment was made in 2003, of $0.8 billion (equivalent to $1.0 billion in 2012-13). Gains are likely to reflect industry growth, though any differences between methodologies in the two reports could also influence values.
- Economic contribution alone is not a complete assessment of the value of feedlots to the national economy. Two computable general equilibrium scenarios were modelled in this analysis to highlight the economic impact of the feedlot industry. The first scenario considered the size of the economy in the absence of feedlots. The second scenario was built on top of the first scenario, and also accounted for the productivity loss in the grazing sector, resulting from the absence of feedlots.
- Under the first scenario, gross domestic product (GDP) is $2.6 billion lower in the absence of feedlots than under a baseline scenario of no change in 2030. When productivity losses to the grazing sector are also accounted for, GDP is expected to be $3.0 billion below baseline in 2030.
- In 2030, the employment impact of the first scenario is a net loss of 3,184 full time equivalent jobs in the economy, relative to baseline. For the second scenario, it is estimated that there are 3,766 less jobs in the economy. These numbers are significantly lower than those derived through the economic contribution analysis due to the nature of what is being estimated. Economic impact analysis presents a net employment figure after accounting for movements of labour in and out of employment, as well as across industries and geographies.
- In the absence of a feedlot sector in the Australian economy, the grazing beef industry would decline, with flow on implications to the processed meat manufacturing industry. In addition, a smaller economy would lead to reduced taxes and consumer expenditure, resulting in a decline in output from the government services, recreation, and construction and trade sectors.
- On the other hand, the decline in beef production and exports would be likely to lower the Australian dollar, which would offer small advantages to some trade-exposed industries such as mining, other agriculture and business services.

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Glossary

ABARES	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ALFA	Australian Lot Feeders' Association
AUS	Australia
CGE	Computable general equilibrium
DAE	Deloitte Access Economics
DAE-RGEM	Deloitte Access Economics – Regional General Equilibrium Model
FTE	Full time equivalent
GDP	Gross domestic product
GOS	Gross operating surplus
MLA	Meat & Livestock Australia
NFAS	National Feedlot Accreditation Scheme
SCU	Standard cattle unit

Direct contribution – the economic contribution (see below) found within an industry or enterprise of interest. In the current context, the feedlot industry's direct economic contribution exists in the returns to capital and labour of feedlot businesses.

Economic contribution – this is a well-established economic metric of value added of a given industry or enterprise of interest. Value added is equal to the sum of gross operating surplus, compensation of employees, and production taxes less subsidies. An industry or enterprise's economic contribution is a static measure, defined within a given time period, usually a single financial year.

Economic impact – this refers to the effect of some change in the economy. As distinct from economic contribution analysis, economic impact analysis employs methods that allow the user to ask 'what if' type questions. In the current context, the economic impact of the feedlot industry has been analysed using computable general equilibrium. This method estimates the impact of some change (usually a change in government policy) on the economy modelling a baseline scenario (where the change does not occur) and a counterfactual scenario, where the change does impact the economy.

Full time equivalent (FTE) – a measure of total level of staff resources used. The FTE of a full-time staff member is equal to 1.0. The calculation of FTE for part-time staff is based on the proportion of time worked compared to that worked by full time staff performing similar duties.

Gross domestic product – the current price measure which is the sum of all final expenditure, changes in stocks and imports less exports. It is a measure of national value add.

Indirect contribution – the economic contribution associated with the supply intermediate inputs. In the current context, the feedlot industry's indirect economic contribution is found mostly in the income earned by graziers through the sale of cattle to feedlots.

Input-output analysis – the method of analysis used to estimate indirect economic contribution of a given activity. This is done using information on the profile of input expenditure of different industries..

Input-output table – a table that quantifies the purchases and sales of goods and services in an economy at a given point in time. The table accounts purchases by one sector as sales for another.

Local economy – defined in this study as the local government area in which a given feedlot is located.

Regional economy – defined in this study as the local government areas bordering the one in which a given feedlot is located.

Standard cattle unit – an animal with a liveweight at exit of 600kg. To allow for various exit weights for different markets, conversion factors have been developed. These factors account for metabolic body weight and hence potential to produce manure and urine.

Where capacity of a feedlot is expressed in SCUs, numbers of cattle can be significantly changed if production changes from heavier to lighter cattle or vice versa. These changes can occur in relation to market requirements and allow for greater flexibility for a feedlot, without renegotiating approvals.

Utilisation – the proportion of total feedlot capacity (measured in SCU or head) that is in use.

1 Introduction

The lot feeding industry is a crucial component of Australia's beef supply chain. The industry experienced intermittent development from the 1960s, but took off significantly in the mid-1980s following relaxation of the beef import restrictions into Japan and Korea. The value of lot feeding to domestic buyers has also been an important factor in this growth (Senate Standing Committee on Rural and Regional Affairs 1992).

The ability to finish cattle on grain in a feedlot environment provides a range of benefits to the beef cattle industry as a whole, both on the supply and demand sides. Feedlots enable consistent production of quality beef, reduce volatility in supply and underpin the processing sector's ability to operate.

This report was commissioned by Meat & Livestock Australia (MLA). It is an update and extension of the 2003 report commissioned by MLA and the Australian Lot Feeders' Association (ALFA) (FLOT.404 'The impact of feedlot investment') on the regional and national impact of feedlot investments and the 1994 report commissioned by the Meat Research Corporation (MRC) (M.558 'Regional impact of feedlot investment').

This report provides an up-to-date evidence base for the industry on the economic contribution and impact of feedlots. The rest of this chapter describes key features of the feedlot industry in 2014. This is followed by a chapter that describes the report's methodology. Chapter 3 presents and discusses the results of the economic contribution study, in which direct and indirect value added and employment estimates are provided. In Chapter 4, the economic impact of the feedlot industry is modelled. This includes analysis of the broader economic impacts that the feedlot industry has on the grazing beef industry.

1.1 The lot feeding industry in 2014

In September 2014 national feedlot capacity was over 1.1 million head (see Table 1). With 908,118 cattle on feed, this represents a national utilisation rate of 80%. Over half of these cattle were held on feedlots with capacity over 10,000 head. Less than 3% of all cattle on feed were held on feedlots with capacity less than 500 head.

In 2013 and into 2014 the feedlot sector played a vital role in providing a means of preparing cattle for slaughter in the midst of trying seasonal conditions in parts of Australia. In 2013-14 utilisation rates reached levels not seen since mid-2006, as prolonged periods of rainfall deficiency drove beef cattle production increasingly into the feedlot industry.

Table 1: Industry profile by feedlot size, September 2014

Feedlot Size	Capacity	Number on feed
Less than 500 head	38,019	21,207
500 to 1,000 head	68,874	33,852
1,000 to 10,000 head	430,585	339,618
Over 10,000 head	596,982	513,441
Total	1,134,460	908,118

Data source: MLA 2014, ALFA 2014.

The scale and nature of the feedlot industry varies significantly across states (Table 2). Within each state, feedlots are generally located in areas within close geographic proximity to feeder cattle, grain, water and processing facilities. Queensland dominates the feedlot industry, with 55% of national capacity as at September 2014. New South Wales has one third of feedlot capacity. To an extent, these statistics simply reflect the physical distribution of the beef herd around Australia but that is not all that drives the numbers, with feedlots a more important part of beef production in New South Wales and Queensland.

Table 2: State characteristics of the lot feeding industry, September 2014

	Capacity	Share of national capacity (%)	Utilisation (%)	Standard deviation of utilisation^
New South Wales	377,496	33.3	73.6	13.1
Queensland	624,045	55.0	86.9	9.8
Victoria	69,898	6.2	73.8	16.9
South Australia	24,893	2.2	100.0	15.1
Western Australia	38,128	3.4	30.0	19.6
National	1,134,460	-	80.0	10.1

Data source: MLA 2014, ALFA 2014, ABS 2014a, ABARES 2014. Data are not available for Tasmania (which has only one feedlot). The Northern Territory and The Australian Capital Territory have no feedlots.

^ Standard deviation of quarterly utilisation figures December 1998 to March 2014.

The commercial or opportunistic nature of the feedlot industry across Australia is partly evidenced by differences in operations around the country. The Queensland and New South Wales feedlot industries are generally more commercial in nature – the business model is to a greater extent based on consistent throughput to meet customer specifications, regardless of seasonal conditions. This is less so in other states, where there is clear seasonality to utilisation patterns. In Western Australia, for example, there are highs in the March and June quarters, and lows in the September and December quarters. From December 2013 to March 2014 utilisation in Western Australia increased by 56 percentage points – the greatest change between any two quarters in any state over the last 15 years.

A map of accredited feedlots in Australia, by feedlot size, is presented below. It is clear that the bulk of the feedlot industry, both by number of feedlots and capacity, is in south east Queensland, New South Wales and northern Victoria.

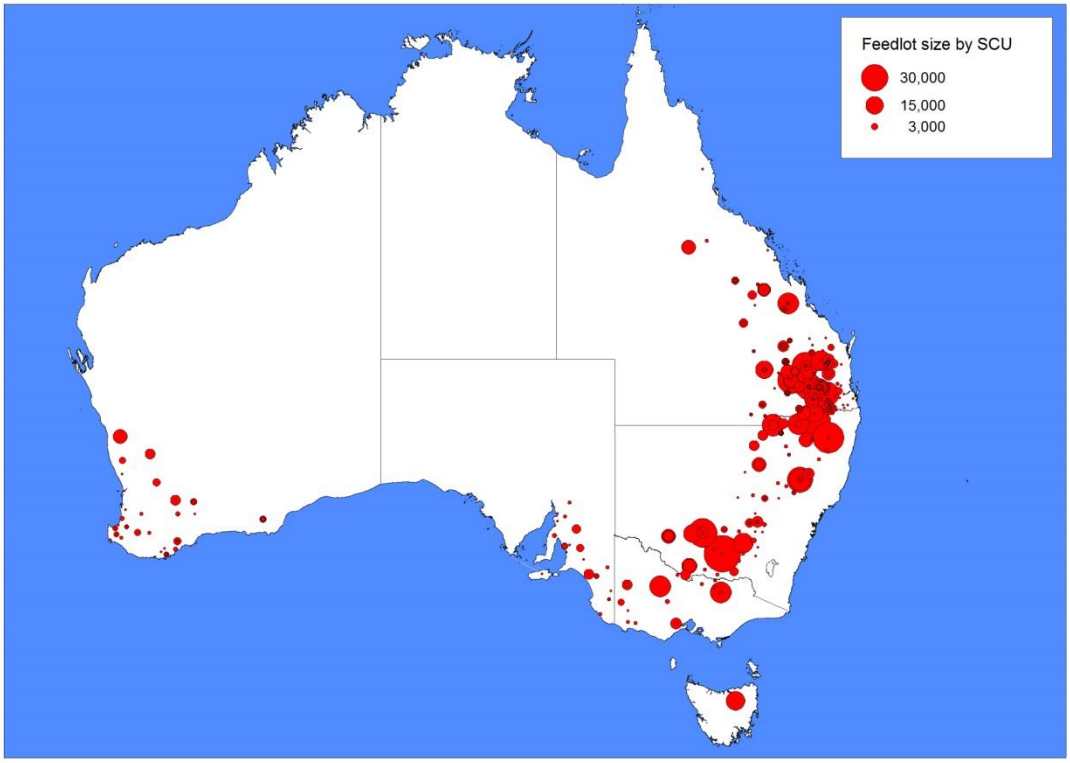


Figure 1: Feedlot distribution around Australia

Source: MLA 2014, ALFA 2014.

Note: Dots placed in the midpoint of the postcode area of each feedlot. Not all feedlots are visible at the scale of this map

There are also clear differences across Australia in terms of the export or domestic focus of the industry (Figure 2). In the first three months of 2014 nearly 64% of lot fed cattle were destined for export markets, but this ranged between the states from 75% (New South Wales) to 0% (Western Australia).

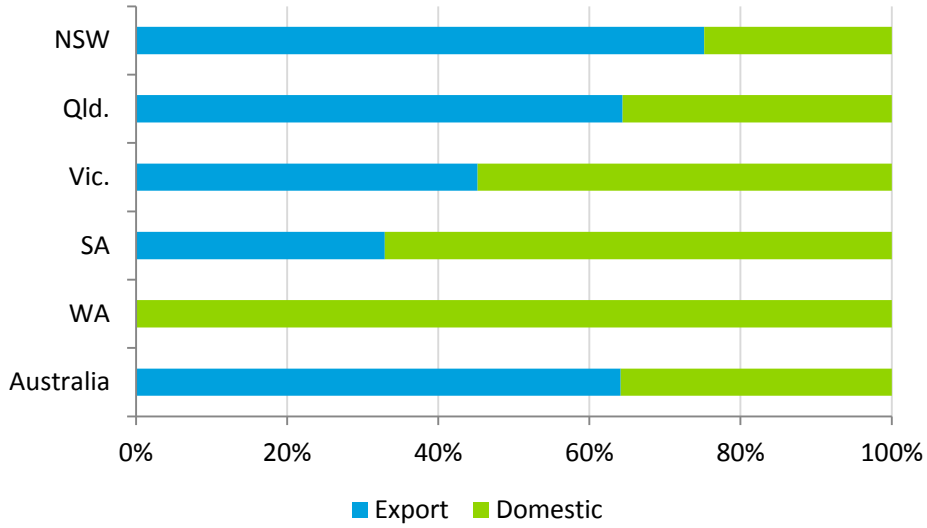


Figure 2: Market destinations of lot fed cattle, March quarter 2014

Data source: MLA 2014. Note: More recent data was not available. Data are not available for Tasmania (which has only one feedlot). The Northern Territory or the Australian Capital Territory have no feedlots.

1.2 Historical trends

Australia's feedlot industry has changed significantly over time. Since 2002, licenced capacity in the sector has increased by nearly 35% (see Table 3).

Table 3: Australian feedlot industry in 2002 and 2014

	Capacity	Cattle on feed	Utilisation
September 2002	841,929	652,881	76%
September 2014	1,134,460	908,118	80%

Source: 2003 report, MLA 2014, ALFA 2014.

This increase has not been evenly distributed across the states (Figure 3). Strong growth in Queensland (which already made up 48% of national capacity) and Victoria, and limited growth in New South Wales, more than compensated for declines in the industry in South and Western Australia.

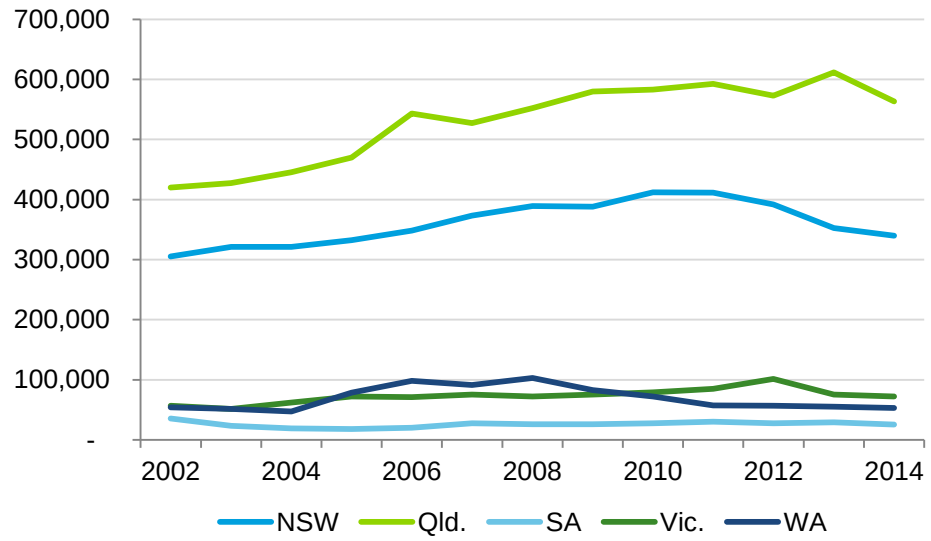


Figure 3: Feedlot capacity by state, 2001-02 to 2013-14

Data source: MLA 2014, ALFA 2014. The data are financial year averages of quarterly data to show trends over time. Data are not available for Tasmania (which has only one feedlot). The Northern Territory and the Australian Capital Territory have no feedlots.

The number of cattle on feed has been far more volatile than the growth (or decline) in feedlot capacity in different states over time (see Figure 4 below).

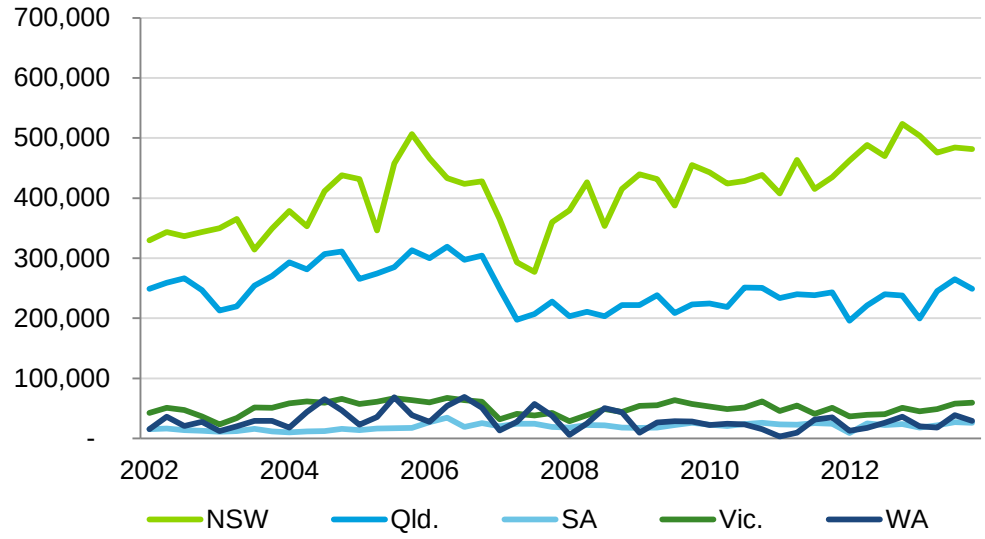


Figure 4: Cattle on feed by state, 2001-02 to 2013-14

Data source: MLA 2014, ALFA 2014. The data are quarterly. Data are not available for Tasmania (which has only one feedlot). The Northern Territory and the Australian Capital Territory have no feedlots.

There has also been variation in which parts of the industry have expanded –net investment has been focussed in larger feedlots. This is clearly demonstrated in Figure 5. Capacity in feedlots of 1,000 to 10,000 and 10,000 or greater has increased by 25% and 38% respectively in 2013-2014 relative to 2001-02. Conversely, the available capacity in facilities of less than 1,000 head has almost halved.

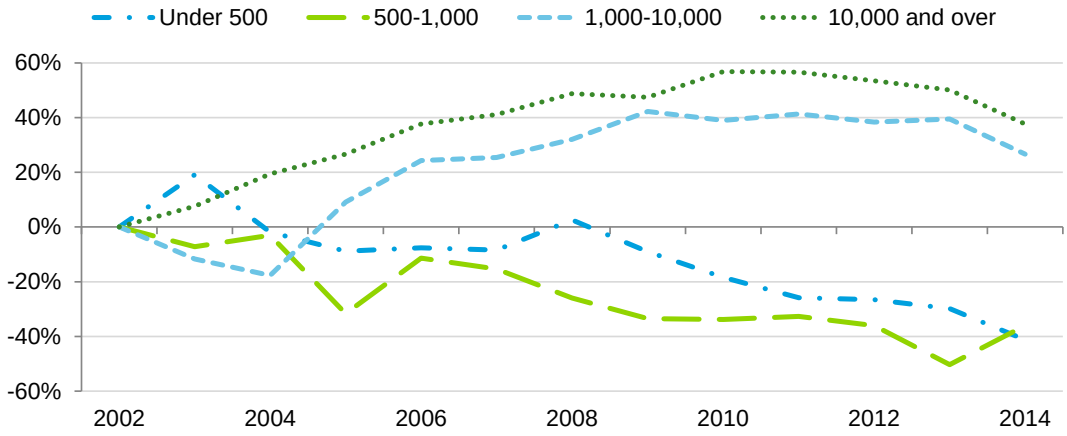


Figure 5: Percentage deviation in capacity relative to 2001-02, by size

Data source: MLA 2014, ALFA 2014. The data are financial year averages of quarterly data.

While there have been increases in capacity and turnoff from the lot fed industry, this has not corresponded to significant changes in the lot fed share of the national beef herd or total beef industry turnoff.

Over the last 15 years, lot fed cattle have accounted for between 26% and 34% of total turnoff (see Figure 6 below). At the same time, on average only 3.0% of the Australian herd are in feedlots at any time. These apparently contrary statistics make sense because cattle spend only part of their life on feedlots.

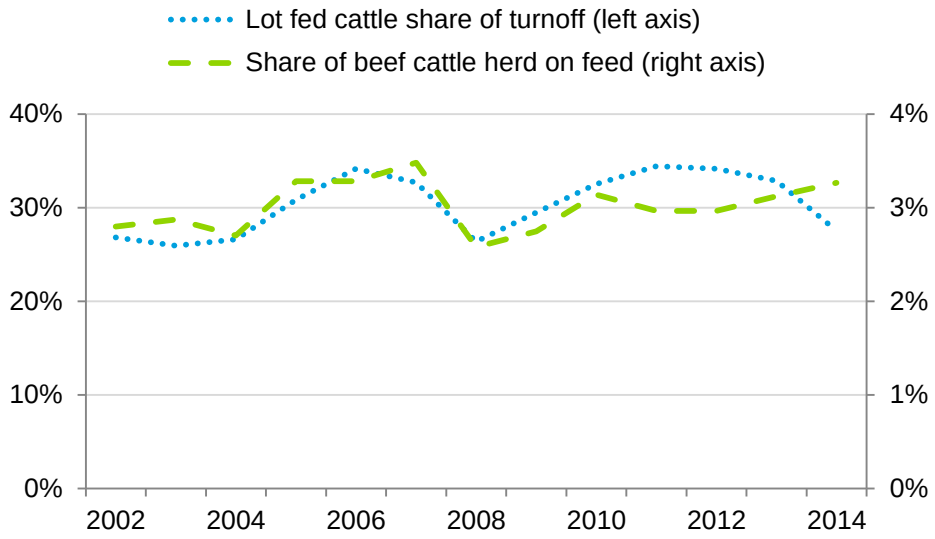


Figure 6: Share of beef herd on feed and grain fed cattle turnoff

Data source: MLA 2014, ALFA 2014, ABS 2014b, ABARES 2013.

Note: quarterly cattle on feed numbers averaged to calculate annual figures

The gap gulf between the number of cattle on feed and the lot fed share of beef cattle slaughter may actually be under-estimated because cattle that spend less than the minimum 'days on feed' (more likely in drought years) will not meet 'Grain fed' market specifications, and not be recognised as such at the time of slaughter. This fact is evidenced in Figure 6, which indicates that the share of cattle turnoff from feedlots declined in 2014, but the number of cattle passing through feedlots actually increased.

2 Approach to the study

This study provides estimates of both the economic *contribution* of feedlot operations and investment and the economic *impact* of the feedlot industry. It is important to understand the distinction between these concepts.

The historical precedents for this project (released in 2003 and 1994) provided estimates of the economic contribution of feedlot industry operations or investment. The first modelling component of this project – hereafter called the 'economic contribution' of feedlots – replicates the approaches used in these earlier studies. This study then adds a separate economic impact component.

This chapter delineates the methodology underlying the economic contribution and impact analysis undertaken for this project, as well as the data sources that have been used.

2.1 Economic contribution

The economic contribution of an industry is a measure of its wages and production. This definition of economic contribution used in this analysis is aligned with the measurement of gross value added in the Australian Bureau of Statistics (ABS) System of National Accounts and the income approach to GDP measurement.[1]

The *direct* economic contribution of the feedlot industry is the value added generated within the industry itself. The ABS provides estimates of the direct economic contribution, or value added, of 114 industries, including the sheep, grains, beef and dairy cattle industry (as a whole). Feedlots are not separately represented.

The industry also has an *indirect* economic contribution via its expenditure on goods and services from other industries which also generate value added. In the context of the feedlot industry, this is predominantly expenditure on cattle and feed. There are returns to labour and capital in the businesses supplying cattle and feed to the feedlot industry, and this is measured in the indirect economic contribution of the industry.

Suppliers of intermediate inputs to the industry of interest also consume intermediate inputs from industries that generate value added, and so on. This is depicted in Figure 7 below. It should be noted that expenditure on imported intermediate inputs does not contribute to value added in Australia. For this analysis, only upstream effects are considered.

The methodology of economic contribution analysis is discussed further in Appendix A.

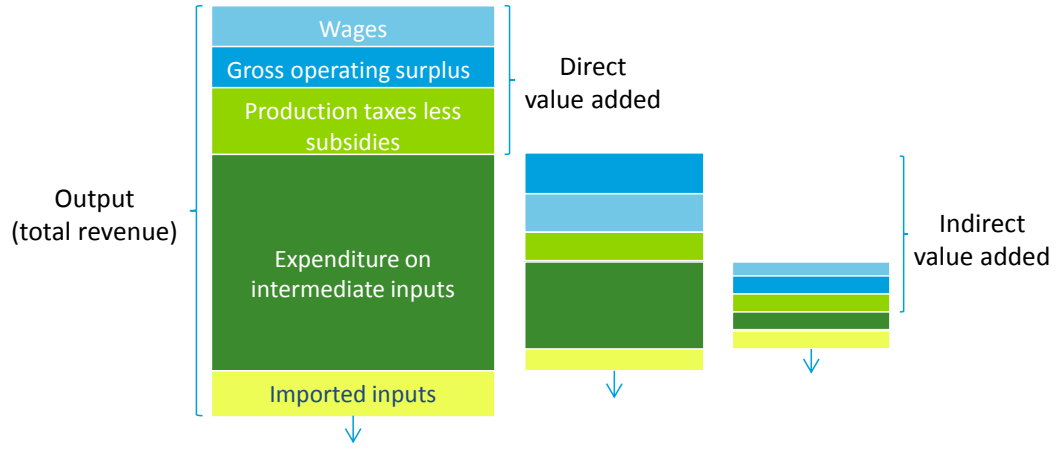


Figure 7: Economic contribution framework

[1] The economic contribution is defined as the sum of its wages, gross operating surplus and production taxes less subsidies . Gross operating surplus, or GOS, is measure of the return on capital, and may also be referred to as earnings before interest, taxes, depreciation and amortisation.

2.2 Economic impact

Economic impact analysis is conducted using computable general equilibrium (CGE) modelling. For this analysis, Deloitte Access Economics has used its in-house regional general equilibrium model (DAE-RGEM). DAE-RGEM is a large-scale, dynamic, multi-region, multi-commodity model of the world economy. The model is comprised of a set of relationships between representative agents of the economy, including households, producers, investors and an international component. Further detail on DAE-RGEM can be found in Appendix B.

Economic impact analysis using CGE modelling overcomes the limitations of economic contribution analysis. Principal among these is that it explicitly represents the impact of different parts of the economy on one another through changes in supply, demand and prices. This allows for analysis of what the economy would look like under any number of scenarios of interest.

The economic impact of the feedlot industry has been modelled by shaping a scenario in the economy without the feedlot industry. The deviation relative to the baseline scenario, that is, the lower gross domestic product (and other variables) under a scenario where no feedlot industry exists, represents the economic impact of the feedlot industry. This has been represented in the modelling via two changes to the economy:

- The feedlot industry is removed from the economy, with the effect that there is reduced demand and prices for livestock.

- Grazing industry output is lower because producers have to stock their properties at levels that can be sustained. Having feedlots allows for the industry to have more breeding stock and greater throughput of head from grazing.

These scenarios are intended to capture the economic impacts of the feedlot industry as a major buyer of livestock from graziers, the benefit of feedlots as a tool for reducing the impact of seasonal variation on herd management, and the impact of reduced breeding stock on grazing land if more grazing land had to be used for fattening instead of breeding.

The scenario modelled, intended to represent the Australian economy without feedlots, is obviously stylised, and does not capture all aspects of the feedlot industry or its historic impacts.

2.3 Economic contribution vs economic impact

As detailed above, these two measures of economic value are distinct and complementary. While the economic contribution considers the existing industry and the scale of operations, the economic impact measure takes into account a change in resources and redistribution of capital and labour under a given scenario. These differences, and the assumptions and limitations of the analysis, are further discussed in Appendix C.

2.4 Non-quantifiable impacts of feedlots

There are a number of non-quantifiable impacts of feedlots which are not directly included in the economic analysis. While the scenarios modelled in the economic impact analysis goes some way towards accounting for changes in demand for particular industries and employment which are not captured in an economic contribution analysis, some non-quantifiable impacts remain difficult to quantify or are out of scope. This section details these impacts which nonetheless add to the value of the industry to the broader local, regional and national economy.

Firstly, the environmental impacts of feedlots are not directly covered in this analysis. These include water, air and noise pollution. While these impacts can be more acute than in extensive beef cattle operations (if not managed appropriately), feedlots also provide positive environmental benefits through the ability to reduce methane emissions per kg of beef production, opportunity to capture and utilise manure as a soil conditioner, a carbon sequestration tool, or to produce energy. Negative impacts are addressed through both the National Feedlot Accreditation System and environmental legislation in the various states. Greenhouse gas emissions are a significant environmental impact for the beef cattle industry as a whole, and this is recognised by the feedlot sector, with abatement and reducing its emissions profile a research and development priority.

There are also social benefits of feedlot development. While the modelling captures the impacts of feedlots in an economic sense (particularly in terms of output and employment), it does not highlight the regional social impacts. As feedlots are major employers, they can provide some centralisation of employment in a region, resulting in clustering of supporting businesses such as veterinarians, merchandise suppliers and transport industries. Other supporting services, such as banks, hospitals and mechanics may then cluster here, with ongoing flow-on demand. This may develop into an employment centre for a region, with resulting agglomeration benefits and facilities for the regional population.

Infrastructure development may also be stimulated by the presence of a feedlot, for example transport linkages may be improved through joint investment through feedlots and government.

There are also risk management benefits of the feedlot industry. While the modelling scenarios attempt to capture the impact of the ‘insurance’ benefits of feedlots for producers during poor growing seasons, there are also benefits where feedlots offer fixed-price forward buying opportunities to the grazing beef industry. On the supply side, feedlots also underpin the processing sector, ensuring continuity of supply in both quality and quantity terms.

2.5 Data

Industry consultation and data collected through the Australian Lot Feeders’ Association quarterly surveys provide the foundation for analysis.

A number of feedlots in varying locations and of different size were engaged in the consultation process. The consultation questions are attached at Appendix D. Data collected included:

- Total revenue
- Total turnoff
- capacity
- Employment
- Total costs, as well as the share of expenditure on
    - Cattle
    - Feed
    - Labour
    - Transport
    - Energy
    - Equipment and maintenance
    - Other
- Expansion costs
- Daily weight gain
- Target markets (e.g. domestic short fed)
- Catchment area for cattle and feed purchases.

All data collected was for the 2012-13 financial year.

Current and historical data from the Australian Lot Feeders' Association quarterly surveys have been combined with industry consultation to estimate the economic contribution of the lot feeding industry. Data from the quarterly surveys that has been utilised includes:

- Capacity by size of feedlot and state
- Numbers on feed by size of feedlot and state
- Turnoff figures by state.

The industry consultation and Australian Lot Feeders' Association quarterly survey data have been combined to estimate revenues and costs in the feedlot industry. Data collected on turnoff and revenue from a number of case study feedlots has been combined with total industry turnoff data to estimate industry revenue. Data on the cost structure of individual feedlots, including amounts spent on a range of intermediate inputs, labour, and returns to capital, and total industry turnoff data have been used to estimate industry costs and expenditure in a range of areas (most importantly, cattle and feed).

3 Economic contribution of feedlots

Industry profile

- Number of accredited feedlots (May 2014): 455
- Total feedlot capacity (September 2014): 1.1 million head
- Numbers on feed (September 2014): 908,118 head
- Utilisation (September 2014): 80%
- Average feedlot size (May 2014): 2,714 head SCU
- Proportion of Australian cattle herd in feedlots: 2-3%
- Average age of feedlot employees (Feb 2013): 35 – 44 years
- Proportion of female feedlot employees (Feb 2013): 29%
- Proportion of Australian owned feedlots (2012): 96%

This chapter provides estimates of the economic contribution of Australia's feedlot industry. The industry's direct contribution (value added in the industry itself) and its indirect contribution (value added in industries supplying intermediate inputs to feedlots) have been estimated. Estimates of employment associated with the industry are also provided.

Estimates are provided for the industry as a whole and for feedlots of specific sizes (5,000, 15,000 and 30,000 SCU). Estimates of the economic contribution to both local economies (within 75 kilometres) and regional economies (within 150 kilometres) are also provided.

Note that these estimates are specific to the 2012-13 financial year. Across the year, the relative prices of feeder cattle, feed grains, and beef made profitability difficult. Nevertheless, moderating feeder cattle prices throughout the year, underpinned by poor seasonal conditions (mostly in Queensland), led to numbers on feed increasing by 27% nationally from September 2012 to September 2014.

In reality, feedlots' economic contribution will vary across locations and time based on variations in production methods, prices, utilisation, and a range of other factors. These results provide indicative estimates of the economic contribution (including indirect employment) of feedlots of a range of sizes, ultimately based on national estimates produced for 2012-13.

Where possible, and appropriate, comparison is made to results from the 1994 and 2003 studies that estimated the feedlot industry's economic contribution.

3.1 Feedlot operations

3.1.1 Total industry economic contribution

Lot feeding is a low margin business, and this certainly appears to have been the case in 2012-13. Industry revenues were estimated to be just over $3.2 billion, and total costs just less than that (see Table 3). The major cost items are cattle and feed, with expenditure on these two inputs alone estimated to be worth over $2.8 billion in 2012-13.

Table 3: Australian feedlot industry 2012-13 financial profile

Total revenue ($m)	3,238
Cattle purchased ($m)	1,948
Feed purchased ($m)	887
Wages ($m)	79
Other costs ($m)	256
Total costs ($m)	3,170
Gross operating surplus ($m)	68

Source: Industry consultation and Deloitte Access Economics. Note: wages paid to owner-operators are included in the wages line item, so the gross operating surplus solely represents capital income. Total revenue is for 2012-13, distinct from the key points box which reports annual revenue at January 2014.

The economic contribution of the industry is comprised of both the value added generated in the industry itself (the payments to labour and capital to feedlot industry employees and owners) but also, and more importantly, the value added in industries supplying inputs to the industry. Through its significant expenditure on inputs (especially cattle and feed), the feedlot industry has a substantial indirect economic contribution.

In 2012-13, the economic contribution of the feedlot industry was estimated to have been just over $2.5 billion (see Table 4). Following the pattern of feedlot operations across the states discussed in Chapter 1, Queensland is the dominant state in terms of the feedlot sector's economic contribution.

The economic contribution can also be interpreted as the value add of the feedlot industry. It is particularly notable that while the industry had a relatively low gross operating surplus of $68 million in 2012-13 (as shown in Table 3) due to the high proportion of costs relative to revenue, its economic contribution was $2.5 billion. This represents a large multiplier effect between operating surplus and the economic contribution, and the significant input costs required to achieve this economic contribution.

Table 4: Economic contribution of the feedlot industry 2012-13 ($m)

	Direct ($m)	Indirect ($m)	Total ($m)
New South Wales	37	593	630
Queensland	91	1,466	1,557
South Australia	5	82	87
Victoria	8	125	133
Western Australia	6	95	101
Australia	147	2,361	2,509

Source: Deloitte Access Economics, MLA data, industry consultation. Note: The distribution across states is based on the state distribution of feedlot turnoff in 2012-13. It is assumed that all inputs are purchased in the state of turnoff, but this will not always be the case.

The stand out result in Table 4 is the significant indirect contribution of the feedlot industry. This is the result of a number of factors. Lot feeding is generally a low-margin business and uses relatively small amounts of labour. In 2012-13 payments to capital and labour are estimated to have been only $68 million and $79 million, respectively. This means that the industry spends a significant amount of money on intermediate inputs, primarily cattle and feed. Further, the input-output tables underlying the economic contribution analysis show that these inputs are purchased from an industry that has a high value added to output ratio.

It is estimated that in 2012-13 the feedlot industry employed nearly 1,800 FTE jobs directly, and supported a further 26,000 indirectly (see Table 5).

Table 5: Employment contribution of the feedlot industry 2012-13 (FTEs)

	Direct	Indirect	Total
New South Wales	442	6,738	7,180
Queensland	1,093	16,658	17,751
South Australia	61	934	995
Victoria	93	1,422	1,515
Western Australia	71	1,080	1,151
Australia	1,761	26,831	28,593

Source: Deloitte Access Economics, MLA data, industry consultation. Note: the average wage used to calculate direct employment is set at $45,000.

The indirect employment figure in Table 5 is large, both relative to direct employment and compared with historical estimates in the previous MLA reports. A major factor driving these results is that in the farming sector, which feedlots purchase most of their inputs from, the number of FTEs per unit of output is among the highest of all Australian industries. This is discussed further at the end of this chapter.

3.1.2 Economic contribution by SCU capacity

This section provides estimates of the economic contribution of feedlots of a range of sizes; 5,000 SCU, 15,000 SCU, 30,000 SCU. The local (i.e. within 75 kilometres) and regional (i.e within 150 kilometres) contribution are estimated under the assumptions that a third of feed and cattle are purchased locally, and two thirds are

purchased within the regional economy. (Labour and other inputs are assumed to be available locally.)

It is assumed that feedlot operators will prefer to source inputs locally to minimise transportation costs, but this is not always possible. Consultations conducted for this report indicated local expenditure on cattle and feed ranging from 14 to 40%, and regional expenditure between 27 and 82%. In some cases, cattle are trucked from over 1,000 kilometres away.

It is also assumed that smaller feedlots will source a greater percentage of their cattle and feed inputs locally. However, this percentage may be difficult to distinguish when looking at total industry figures. A 30,000 SCU feedlot sourcing only one sixth of its feed locally will still purchase as much as a 5,000 SCU feedlot sourcing 100% of its feed needs locally.

The economic contribution of feedlots of each specific SCU capacity has been estimated based on its share of average industry capacity in 2012-13[2]. For example, because a 30,000 head feed lot represents 3% of 2012-13 capacity, the economic contribution results for a 30,000 SCU feedlot represents 3% of the industry estimates provided in Section 3.1.1 above.

Finally, the data in the following tables should be interpreted in a manner similar to concentric circles. The 'local' economic contribution (in both dollar and employment terms) is the contribution for the local government area (LGA) directly incorporating the feedlot. The 'regional' economic contribution includes the local contribution, and represents all LGAs directly surrounding the LGA in which the feedlot is located. The 'state' contribution comprises both the local and regional contributions. The 'total' contribution accounts for the total contribution to the Australian economy. Hence, the 'difference' between each of the categories represents the incremental regional, state and interstate contributions. For the estimates produced in this report, the local, regional and state economic contribution is based on the Goondiwindi local government area, which reports a relatively large number of feedlot workers, and is located in Queensland. Obviously, the economic contribution of any particular feedlot can vary from the estimates produced below, depending on their location and economic relationships with surrounding businesses.

5,000 SCU feedlot

A 5,000 SCU feedlot is estimated to have a total economic contribution of over $11 million. The thin profit margins in 2012-13 mean that the vast majority of this contribution is indirect, mainly through the purchase of cattle and feed.

[2] Average capacity has been used because feedlots often fall in and out of consideration in the quarterly ALFA survey. For example, from December quarter 2012 to March quarter 2013 national capacity as indicated in the survey data fell from 1,145,453 to 1,058,931. Annual average capacity is an indicator that reduces the effect of these short-term variations.

Table 6: 5,000 SCU feedlot economic contribution – value-add

	Direct	Indirect	Total
Local[3] ($m)	0.7	2.8	3.5
Regional ($m)	0.7	5.2	5.9
State ($m)	0.7	7.3	8.0
Total ($m)	0.7	10.5	11.2

Source: Deloitte Access Economics. Note: comparisons with 15,000 and 30,000 SCU values may not be exact due to rounding.

Table 7 below shows that it is estimated there are 8 FTE people employed on a 5,000 SCU feedlot (it is assumed all direct employment is drawn from the local economy.) This is comparable to the estimate of 10 found in the 2003 report. This result is obviously highly sensitive to the labour share of total costs and the wage rate used.

As the industry results above indicated, there is substantial indirect employment associated with feedlot operations. Even a 5,000 SCU feedlot is associated with a total employment contribution of 119 FTEs, most of which is within the regional economy.

Table 7: 5,000 SCU feedlot employment contribution (FTEs)

	Direct	Indirect	Total
Local	8	34	42
Regional	8	66	74
State	8	94	102
Total	8	119	127

Source: Deloitte Access Economics. Note: comparisons with 15,000 and 30,000 SCU values may not be exact due to rounding.

Figure 8 below summarises the total economic contribution results for a 5,000 SCU feedlot. Note that results for successively larger geographic units include the results for smaller units.

[3] Local is defined in this study as the local government area in which a given feedlot is located. The regional economy includes the local government areas bordering the one in which a given feedlot is located.

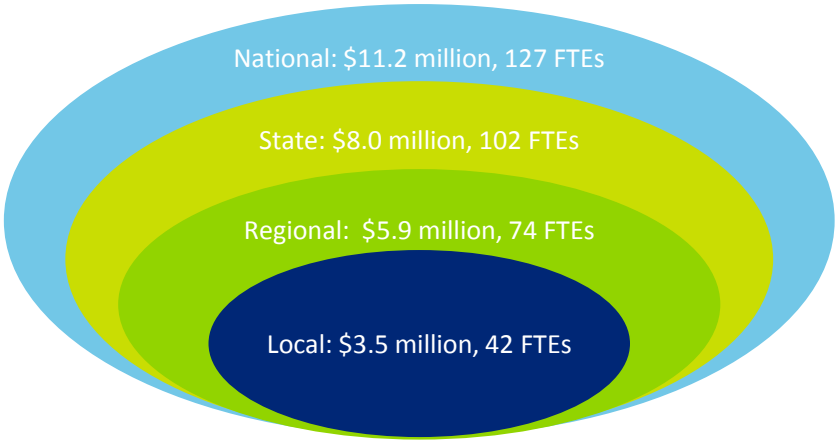


Figure 8: Total (direct and indirect) economic contribution of a 5,000 SCU feedlot
Source: Deloitte Access Economics

15,000 SCU feedlot

The following table presents the economic contribution of a 15,000 SCU feedlot. Again, the direct contribution is expected to be entirely incurred in the local economy, and is valued at $2 million. The indirect contribution is more than 4 times greater than the direct contribution, with more than half attributable to the local and regional economies and the other half within the state and the rest of Australia.

Compared with the 2003 study (with values inflated to 2012-13 dollars), the direct economic contribution is about half; but the indirect impacts are around three times those in the earlier study. The total economic contribution of $32.1 million is close to double the 2003 estimate of $13.4 million (approximately $17.2 million in 2012-13 dollars).

Table 8: 15,000 SCU feedlot economic contribution – value-add

	Direct	Indirect	Total
Local ($m)	2.0	8.4	10.4
Regional ($m)	2.0	15.7	17.6
State ($m)	2.0	21.0	22.9
Total ($m)	2.0	30.2	32.1

Source: Deloitte Access Economics. Note: comparisons with 5,000 and 30,000 SCU values may not be exact due to rounding.

On the employment side, again, all of the direct contribution is assumed to be realised in the local economy. The indirect employment contribution is estimated at around 3 times the estimates in the 2003 study.

Table 9: 15,000 feedlot employment contribution (FTEs)

	Direct	Indirect	Total
Local	23	103	127
Regional	23	197	221
State	23	275	299
Total	23	347	371

Source: Deloitte Access Economics. Note: comparisons with 5,000 and 30,000 SCU values may not be exact due to rounding.

These results are summarised in Figure 9 below.

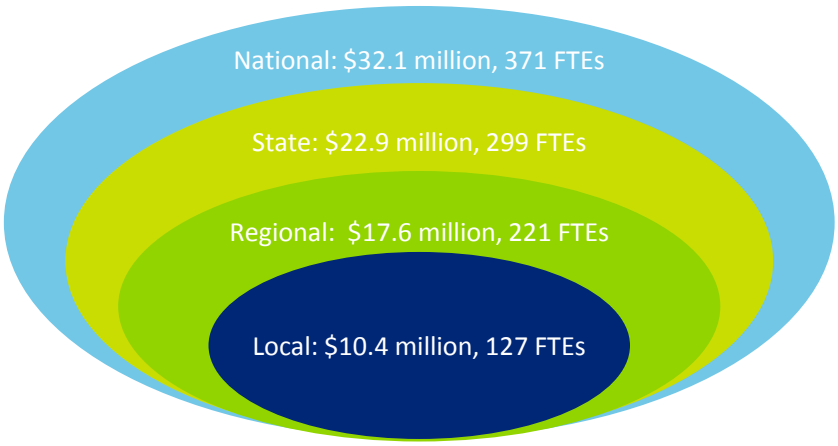


Figure 9: Total (direct and indirect) economic contribution of a 15,000 SCU feedlot
Source: Deloitte Access Economics

30,000 SCU feedlot

The total economic contribution of a 30,000 SCU feedlot is approximately double the economic contribution of a 15,000 SCU feedlot. The direct economic contribution attributable to the economy is $3.9 million, incurred all in the local economy. The indirect contribution is estimated at approximately $59.3 million.

While these estimates of the contribution of feedlots are derived from the estimates for the total industry, it is acknowledged that larger feedlots are likely to source a greater proportion of their inputs from further away. The requirements for inputs (both of feed and cattle) may be more likely to be sourced from the wider region than for a smaller feedlot with lower input requirements.

Table 10: 30,000 SCU feedlot economic contribution – value add

	Direct	Indirect	Total
Local ($m)	3.9	16.8	20.7
Regional ($m)	3.9	31.3	35.2
State ($m)	3.9	41.2	45.1
Total ($m)	3.9	59.3	63.2

Source: Deloitte Access Economics. Note: comparisons with 5,000 and 15,000 SCU values may not be exact due to rounding.

The direct employment contribution of a 30,000 SCU feedlot is estimated as 47 full time equivalent employees. Indirect employment is significantly higher, with around a third occurring within the local economy, and around two thirds in the regional economy. The total employment contribution for a feedlot of this size in the Australian economy is estimated at 733 full time equivalent employees.

Table 11: 30,000 SCU feedlot employment contribution (FTEs)

	Direct	Indirect	Total
Local	47	207	254
Regional	47	394	441
State	47	544	591
Total	47	686	733

Source: Deloitte Access Economics. Note: comparisons with 5,000 and 15,000 SCU values may not be exact due to rounding.

Figure 10 below summarises the total economic contribution results for a 30,000 SCU feedlot.

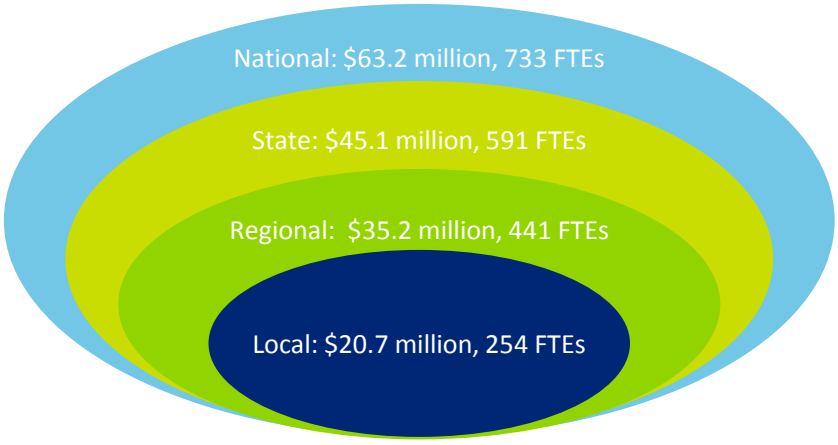


Figure 10: Total (direct and indirect) economic contribution of a 30,000 SCU feedlot
Source: Deloitte Access Economics

3.2 Feedlot investment

In 2002, the feedlot industry was undergoing significant consolidation and development. As such, the 2003 report estimated the construction impact of feedlot construction on the local, regional, state and national economies.

Consultations conducted in 2014 suggested that the industry was not in a development phase, though some expansion had occurred since 2002. On average, such expansions were costed between $400/head and $900/head. It is acknowledged that more significant expansions may have occurred in the industry during this period, however, these were not captured in the consultations.

3.3 Comparison with 2003 study

The following table compares the total Australian feedlot industry economic contribution results from the 2003 study with the ones in this report. As noted before, differences in methodology, different growing seasons, and further industry growth and maturity over the last decade account for some of the differences between the values.

Table 12: Comparison of results, 2012-13 dollars ($m)

	2003 study	2014 study
Direct contribution ($m)	247	147
Indirect contribution ($m)	808	2,361
Total contribution ($m)	1,055	2,509
Direct employment (FTE)	1,570	1,761
Indirect employment (FTE)	6,992	26,831
Total employment (FTE)	8,561	28,593

Source: 2003 study and Deloitte Access Economics.

There is broad agreement between the two studies on the number of people employed in the industry and the relative size of the direct and indirect contribution. The most obvious difference between the 2003 and 2014 studies is the estimated size of the indirect contribution. The 2014 estimate is significantly larger, and cannot alone be explained by the level of expenditure on intermediate inputs, which are similar in the two time periods.

It is likely that a combination of different seasonal conditions between the 2003 and 2014, a different methodology between the two studies[4], and a general maturity of the industry and its supply chain all contribute to different results.[5]

4 Economic impact of feedlots

This chapter provides estimates of the wider economic impact of the feedlot industry. As noted above in Section 2.2 this has been done through the use of CGE modelling of two scenarios, from 2014 to 2030. All GDP impacts are presented in 2013-14 dollars.

4.1 The scenarios modelled

The first scenario considered the size of the economy in the absence of feedlots, and with the grazing beef cattle industry operating in its absence. This results in reduced demand and prices for livestock. This scenario is another way of measuring the value of the feedlot industry, and its outputs are comparable with analysis of the economic contribution of the feedlot industry presented in Chapter 3.

Modelling the removal of the feedlot industry has three main immediate effects: demand for cattle is reduced, demand for feed is reduced, and there is reduced throughput in the processed meat sector.

Beyond its significant role as a buyer of both cattle and feed, the feedlot industry has other effects on the broader agriculture sector. Their role as a risk management tool for graziers was discussed in Section 2.3. An effect of their development has been a modification to herd structure associated with graziers that target feedlot as opposed to direct to slaughter markets.

Our second scenario modelled includes the first scenario, but also adds a productivity shock in the grazing sector to represent change in grazing herd structure that would have to occur without feedlots.

[4] It has not been possible to directly interrogate the methodology used in 2003, in order to understand the role of differing methodologies.

5 Closer examination of the indirect employment number from the current report (which is driven by the indirect value added number) support these estimates. In the current estimate of indirect employment associated with the feedlot industry, around 11,500 FTEs are attributable to cattle purchases. The 2011 Census of Population and Housing indicated there were 44,850 people employed as specialist beef cattle farmers. Comparing these two numbers (and ignoring employment associated with beef cattle production on mixed farming operations) would indicate that around 26% of those employed as specialist beef cattle farmers earn a living based on supplying cattle to feedlots. In 2012-13 lot fed cattle made up 33% of the total slaughter of cattle (excluding calves). Similarity between these numbers – a rough estimate of the share of beef cattle producers targeting feedlot supply, and the share of cattle slaughtered that came from feedlots – is a strong indicator that the methodology underlying the estimation of the indirect economic contribution is sound.

This productivity shock was estimated in two ways:

- Based on the reduction in breeding cattle - hence number of livestock being born and eventually overall output - from grazing land that would have to occur if more grazing land had to be used to fatten cattle, in the absence of feedlots. In this case, overall cattle output from grazing land would be just over 7% less, for the same cost and the same amount of land, than it is with feedlots.

- Based on comparison of an estimated productivity index for graziers targeting feedlots and those who supply cattle direct to slaughter. This is based on the value of cattle supplied to feedlots and cattle direct to slaughter, informed by publicly available data sets and information gathered in consultation for this project. The input requirement is an estimate of the dry sheep equivalent requirements of the preparation of cattle for feedlots and cattle direct for slaughter. The essential difference between grazing operations targeting feedlots or slaughter is the ability to concentrate on breeding and the production of calves, as opposed to the production of fattened cattle in slaughter condition. This shock was modelled as a 4.1% reduction in total factor productivity for the grazing industry in 2013-14[6], relative to the baseline.

In our scenario, we conservatively take the 4.1% from the latter example, even though they are both different ways of quantifying reduced grazing beef productivity in the absence of feedlots.

In our modelling, it should be noted that the scenario includes the impacts of the feedlot industry not existing (the first modelled scenario). There are no overlaps between the shocks due to the nature of the modelling. Hence, the impact of the productivity shock alone can be estimated as the difference between the first and second scenarios.

That said, this chapter does not present the impacts of the productivity shock alone as the impacts are assumed to occur as a result of the removal of the feedlot industry, and not in isolation.

4.2 Results

Figure 11 below shows the reduced size of the economy in 2030 if the feedlot sector did not exist. In present value terms, the absence of the feedlot industry results in GDP being $2.1 billion below the baseline scenario in 2015, growing to $2.6 billion below baseline by 2030.

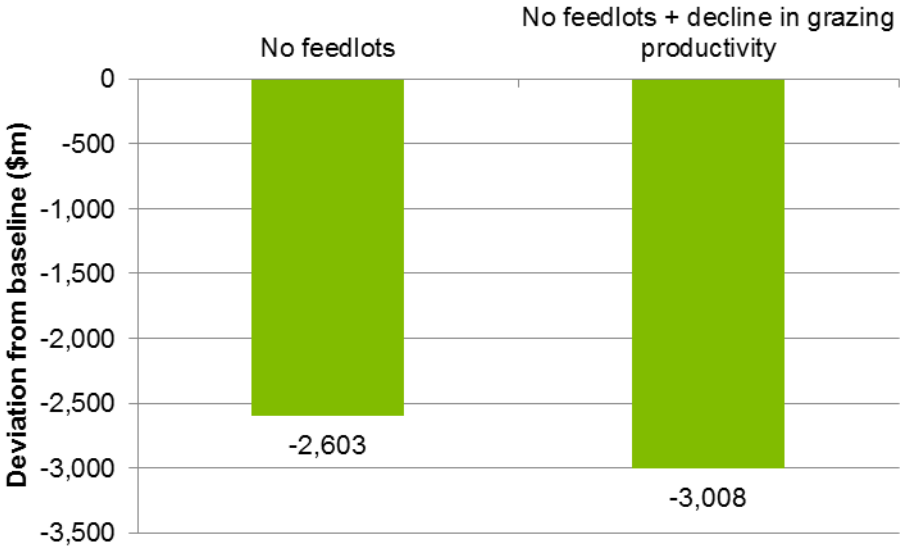
This result is consistent with the economic contribution approach, which valued the contribution of the feedlot industry to the economy at $2.5 billion in 2012-13.

[6] The shock is applied to grazing industry productivity as represented by a single year in the underlying database. While productivity measurements for agricultural industries can change significantly from year to year due to seasonal conditions, the modelling is driven by the *deviation* in productivity from the baseline to the policy scenario, so ignoring seasonal variation in measured productivity is not expected to harm the results of the analysis.

Under the second scenario, where productivity impacts on grazing are taken into account, the negative deviation from the baseline scenario is $2.5 billion in 2015 and $3.0 billion by 2030. This is a more complete picture of the impacts and suggests that the decline in grazing productivity leads to a further loss to the economy valued at approximately $400 million.

It is noted that the economic contribution and economic impacts estimated are lower than industry revenue in the same period. Further, the economic impact is lower than the economic contribution, as it takes into account the redistribution of labour and capital in the economy.

Figure 11: Economic impact on GDP, 2030



Source: Deloitte Access Economics.

Figure 12 shows the impacts over time, from 2015 to 2030. Given the constant shocks (absence of feedlot industry and 4.1% reduction in total factor productivity) put into the model, it is to be expected that the economic impact grows in line with economic growth assumptions. Over the modelling period, the negative deviation from GDP grows from $2.1 billion below baseline in 2015 to $2.6 billion below baseline in 2030 in the no feedlot scenario, and $2.4 billion below baseline in 2015 to $3.0 billion below baseline in 2030 in the no feedlot and productivity loss scenario.

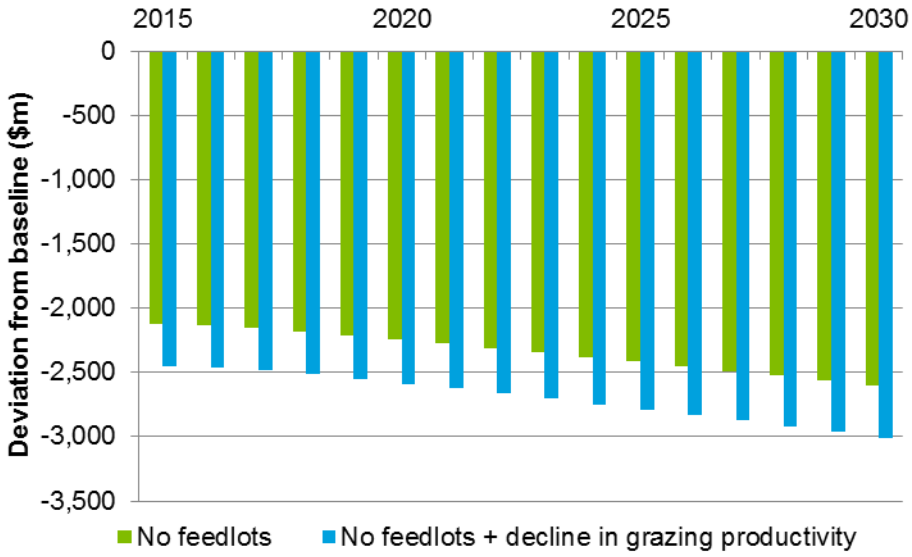


Figure 12: Economic impact analysis – results
Source: Deloitte Access Economics.

Figure 13 shows the economic impact of the two scenarios on employment. Relative to the baseline, there is a negative deviation of around 3,200 FTE employees in 2030, and a negative deviation almost 3,800 FTE when productivity impacts are also accounted for.

These numbers are significantly lower than those derived through the economic contribution analysis due to the nature of what is being estimated. Economic contribution analysis accounts for the number of FTE employees who are directly employed by feedlots, and those who are employed in industries that indirectly provide inputs to feedlots.

Economic impact analysis, on the other hand, accounts for movements of labour in and out of employment, as well as across industries and geographies. The economic impact figures are a *net* figure of the economy's change in employment in a given scenario. Hence, the interpretation of these values is that there are 3,200 less jobs in the economy in the absence of the feedlot industry, relative to the baseline scenario.

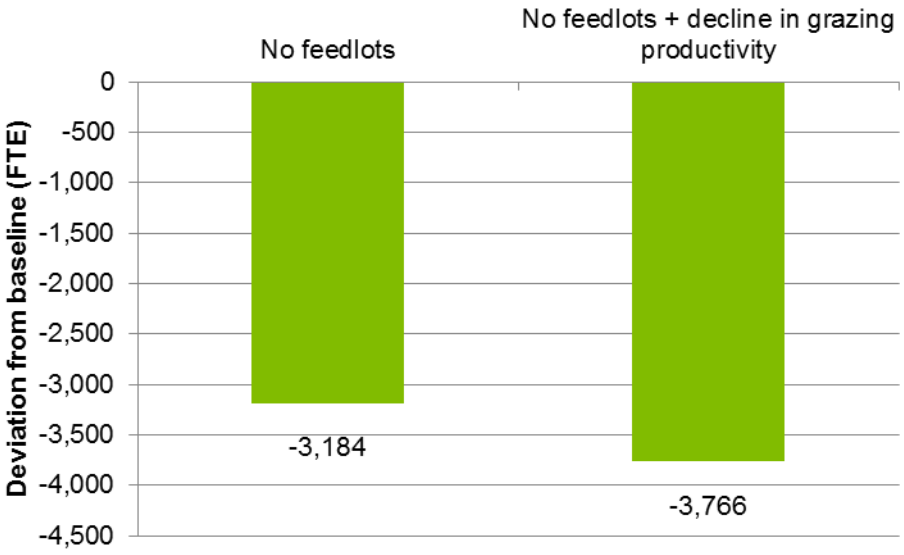


Figure 13: Economic impact on employment, 2030
Source: Deloitte Access Economics.

4.3 Industry impacts

Figure 14 below shows the economic impact of the two scenarios on the economy, broken down into industries. The greatest negative deviations relative to baseline are experienced by the processed meat manufacturing and grazing beef industries. These negative impacts are in the order of a 10% deviation relative to the baseline scenario (where the feedlot industry continues to operate). The impact nears 20% in the grazing sector where the productivity shock is taken into account.

An absence of the feedlot industry reduces the overall size of the grazing beef herd and the numbers of cattle slaughtered, with flow on implications for the processing industry. The impacts also reflect the lower productivity of the grazing industry when feedlots are removed, as cattle take longer to finish on grass (or can't be finished at all – and hence must be sold at reduced prices), and the loss of a key purchaser of cattle from beef producers.

Furthermore, if the feedlot industry had not developed, the processed meat manufacturing industry would look very different to what it does today. But the results do demonstrate that a decline in the feedlot industry would have significant negative flow on effects for processing industry businesses and employees.

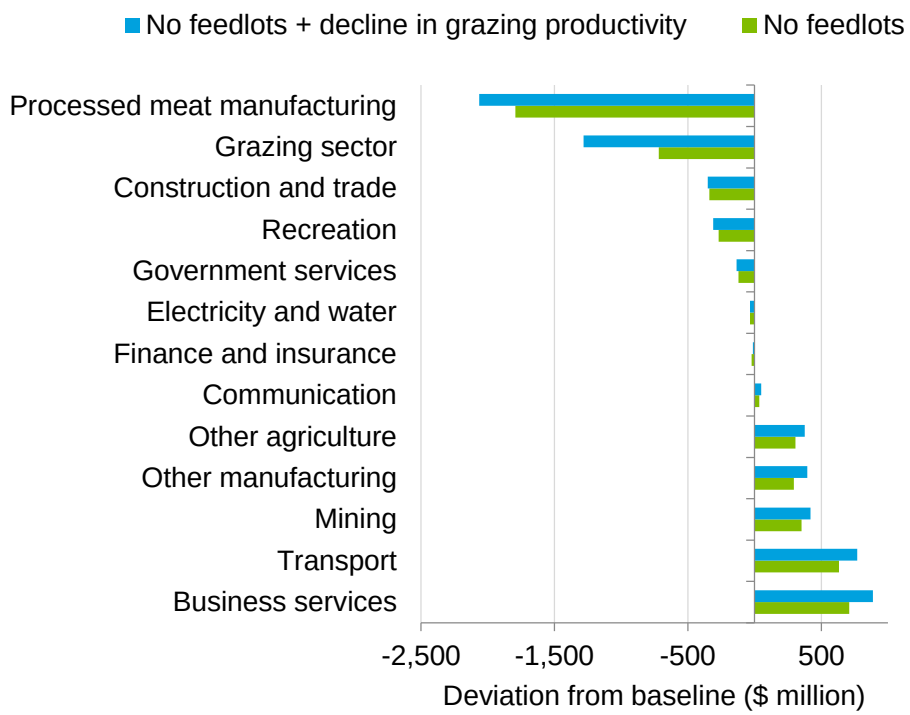


Figure 14: Economic impact analysis – results for industries
Source: Deloitte Access Economics.

Impacts outside the grazing and processed meat manufacturing industries are small, both positive and negative (in the order of 1% either way). For example, in the absence of the feedlot industry, the government services, recreation, and construction and trade industries experience negative impacts. This largely reflects that, without the feedlot industry, the economy is poorer, reducing demand in these sectors as expenditure in areas such as recreation and construction decreases. Flowing from this, there is also less tax paid in the economy, which will impact the provision of government services.

Conversely, some industries experience positive impacts without a feedlot industry. These are largely due to reduced competition for resources, such as labour and land, and the exchange rate effects on the Australian dollar. The decline in beef production (and exports) in an economy without feedlots would reduce the value of the Australian dollar, which is advantageous to industries that are either exporters (e.g. mining), or compete with imports (e.g. manufacturing). This would benefit trade-exposed industries – such as agriculture, mining and manufacturing.

5 Discussion

The ability to finish cattle on grain in a feedlot environment provides a range of benefits to the beef cattle industry as a whole:

- Feedlots enable the supply of beef that satisfies domestic and international customer preferences for quality and consistency (irrespective of seasonal conditions).

- Beef can be produced that has characteristics highly valued by some consumers, which would be very difficult to consistently replicate outside a lot feeding environment.
- Lot feeding effectively increases the efficiency of the Australian beef cattle industry. Feedlots allow for more cattle to gain weight quicker, than if the beef industry had to exist on grass animals alone. The land that would be needed to fatten beef if feedlots didn't exist can be used for other productive purposes, including the breeding of beef cattle
- Lot feeding ensures that cattle can meet market end-point specifications in a specific production cycle or predetermined finishing period.
- Feedlots underpin the processing sector's ability to operate through reducing volatility in supply. The role of feedlots has evolved from drought mitigation (consistent quantity) to also ensuring consistent quality. This continuity of supply from feedlots supports the broader beef supply chain in terms of employment and output, and ensures that domestic and export market demands are met.
- Provides stability to grazing beef, by being a market for feeder cattle during bad seasons as well as good. This is particularly relevant during bad seasons when pasture and/ or water is insufficient with extensive grass fed cattle only able to reach marketable condition after entering a feedlot. In this way, feedlots can provide an insurance value for the cattle industry against droughts and poor seasons.
- Feedlots are also often countercyclical to extensive cattle production in that they are generally profitable when the extensive grass fed sector is not. This allows rural and regional areas to receive a positive economic stimulus when they need it most, because the broader grazing and other agricultural sector is financially struggling.

The results from the economic contribution and economic impact analysis highlight the value of the feedlot industry to the Australian economy. As discussed in section 2.3, the economic contribution provides an accounting estimate of the value of the industry at a point in time, while the economic impact estimates the deviation from baseline resulting from given scenarios (in this case the absence of the feedlot industry from the economy, and a reduction in grazing productivity).

The economic contribution analysis is able to determine the contribution of individual feedlots based on the revenue and expenditure profiles obtained through consultations. However, the economic impact analysis works on an economy-wide scale and presents deviations from a baseline scenario where there is no industry change. As such, its results cannot be dissolved or averaged to a per-feedlot level.

In particular, the theoretical removal of different sized feedlots in different locations will not have the same economic impacts. State-based assumptions on labour supply and labour mobility will have implications for the economic impact in different states. On an economy-wide level, however, these differences between jurisdictions even out.

The economic contribution and economic impact analysis presented in this report outline the implications for the Australian economy in a world without feedlots. The direct impacts which flow from the theoretical absence of the feedlot sector are the reduction in gross domestic product and employment. There are also several indirect

impacts, including reduced demand for goods and services inputs from suppliers as well as implications for other unrelated industries through exchange rate effects on trade and wealth effects on consumption.

It is important to recognise the role of feedlots in contributing to the beef industry in Australia. The feedlot sector has been resilient even in conditions when market prices and weather have been unfavourable. The unutilised capacity in feedlots allows them to quickly respond to fluctuations in the market, providing an important regular input to the processing sector. Even though the total numbers of cattle that exit feedlots is not recorded in the official statistics, there has been a trend towards increased grain feeding of cattle in the last decade. This is clearly evidenced in the quarterly feedlot survey data.

Although the impacts of feedlots upon the national economy are notable, their importance at a smaller area regional or local level can be even more pronounced. Not only are feedlots often amongst the largest direct employers in communities, their operation also supports a range of broader other economic activity throughout regional and rural Australia. This comes not only from feedlots direct buying off, and selling to, local businesses, such as graziers and meat processors, feedlots also support many other areas of local and regional economies, through their role in sustaining local jobs and populations. Feedlots also provide economic stability to agriculturally dependent communities by providing stimulus, a benefit particularly during extended dry periods or droughts when such areas need it most.

It should be reiterated that the economic analyses are based on industry estimates in a difficult year for extensive beef production and strong dependence on feedlots in eastern Australia. In a wet year, with more favourable growing conditions, feedlot utilisation would generally be lower as more producers have the option of finishing cattle on pasture. This could reduce the economies of scale experienced by feedlots, resulting in higher costs relative to revenue. Lower feedlot utilisation and revenue would result in a lower industry economic contribution and smaller deviations from baseline for the economic impact scenarios. It should be noted however, that when this report went to print in 2015, seasonal conditions had further deteriorated meaning that the 2012-13 analysis would have under-represented the importance of the feedlot sector to production, relative to 2013-14.

Finally, these analyses are not complete measures of economic value. Certain values of feedlots have not been quantified in this analysis, including the insurance value of feedlots and their environmental benefits relative to grass fed production. The value of feedlots to the beef industry, in reducing the risk associated with herd investment in uncertain climatic conditions is significant but difficult to quantify. The environmental benefits of feedlots include reduced emissions, improved soil fertility along with reduced soil erosion and runoff from cattle being turned off grass earlier, relative to grass fed production, while not quantified, most certainly have a value.

The scope of the analysis was also limited to accredited feedlots and does not measure the size or impact of the ‘opportunity’ feedlot industry on grazing land. These operations may be significant in some years, but are not captured in the official statistics. As such, the estimates in this report are likely to be conservative.

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Senate Standing Committee on Rural and Regional Affairs 1992, *Beef Cattle Feedlots in Australia*.

Appendix A: Input-Output analysis

Input-Output (I-O) analysis is used to estimate the economic contribution of a given sector. Economic contribution is measured using value added, which is the sum of payments to labour, capital and production taxes less subsidies associated with the activities of interest (Figure 15).Payments to capital (usually found in company financial statements as earnings before interest, tax, depreciation and amortisation) includes the value of all pre-tax income to capital used in the production process.

There is both a direct and indirect component of value added. In the current project, the value added generated by feedlots themselves represents the direct value added of the industry. Indirect value added is the sum of payments to labour, capital and production taxes less subsidies in those parts of the economy supplying intermediate inputs to the industry. The sum the direct and indirect value added gives the total economic contribution of the sector.

As Figure 15 suggests, expenditure on imported intermediate inputs do not show up in the economic contribution of the feedlot industry to the Australian economy. It is possible that some economic activity in Australia involves supplying foreign firms supplying inputs to domestic industry (as example, imagine aluminium manufacturers exporting aluminium to Japan that is used to construct cars ultimately purchased by an Australian hire care company).

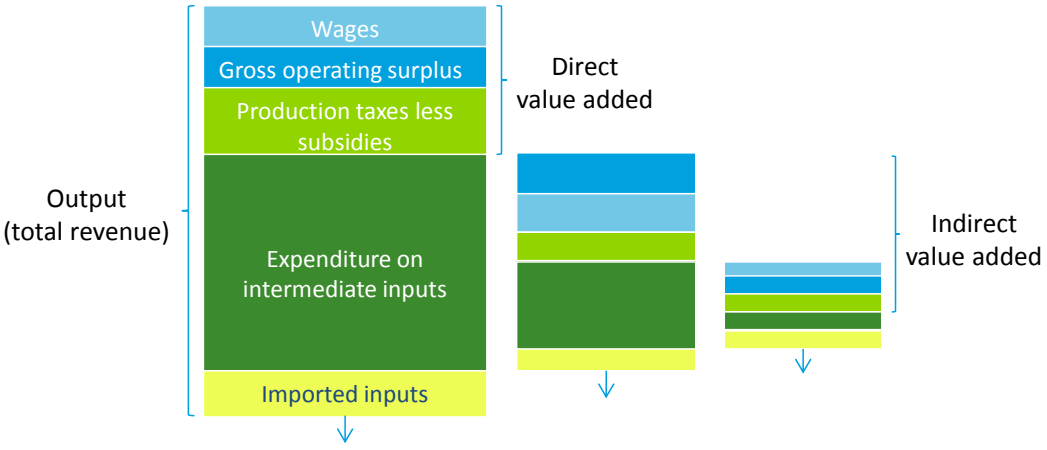

Figure 15: Economic contribution framework

The *Australian National Accounts: Input-Output Tables, 2009-10* (ABS 2013) provide the foundation for estimation of the indirect economic contribution of any given industry in Australia. They provide information on the pattern of expenditure on intermediate inputs across 114 industry categories. The indirect economic contribution of the feedlot industry is estimated based on these tables, but also through consultations with individual feedlot operations.

Value added is preferred as a measure of economic contribution over other variables (such as revenue) because it enables consideration of the indirect contribution of any

given sector, while avoiding the problem of double counting. Nevertheless, it is *not* a measure of the overall impact on welfare from the presence of particular activities. Identification that a given sector has a positive economic contribution (it could be less than zero if subsidies are significant) does not permit inferences about whether or not the economy is better off with that sector.

Economic contribution represents the gross contribution of the sector of interest. That is, while value added measures the income to wages and capital engaged in the activity of interest, it provides no information on the opportunity cost (and therefore the marginal welfare benefits) of having those labour and capital resources utilised in the sector of interest. This means that economic contribution analysis does not permit inferences about counterfactual scenarios – for example, what might happen to living standards in the absence of the sector of interest.

Appendix B: CGE modelling

The Deloitte Access Economics – Regional General Equilibrium Model is a large scale, dynamic, multi-region, multi-commodity computable general equilibrium model of the world economy. The model is underpinned by a substantial body of accepted microeconomic theory, and allows policy analysis in a single, robust, integrated economic framework. This model projects changes in macroeconomic aggregates such as GDP, employment, export volumes, investment and private consumption. At the sectoral level, detailed results such as output, exports, imports and employment are also produced.

The model is comprised of a set of relationships between representative agents of the economy, including households, producers, investors and an international component. These relationships are solved simultaneously, so there is no logical start or end point for describing how the model actually works. Prices are determined via market-clearing conditions that require sectoral output (supply) to equal the amount sold (demand) to final users (households and government), intermediate users (firms and investors), foreigners (international exports), and other Australian regions (interstate exports).

Figure 16 shows the key components of the model for an individual region. The international component could be other regions, Australian states or territories, or foreign regions, depending on the analysis being conducted. Below is a description of each component of the model and key linkages between components. Additional technical detail is also provided.

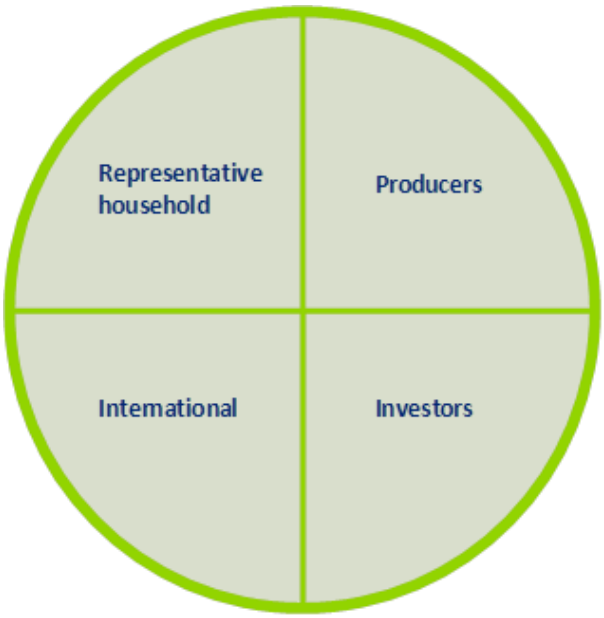

Figure 16: Key components of DAE-RGEM

Households

Each region in the model has a representative household that receives and spends all income. The representative household allocates income across three areas (private household consumption, government consumption and savings) to maximise a Cobb-Douglas utility function. Private household consumption on composite goods is determined by minimising a CDE (Constant Differences of Elasticities) expenditure function. Private household consumption on composite goods from different sources is determined is determined by a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function. Government consumption on composite goods, and composite goods from different sources, is determined by maximising a Cobb-Douglas utility function. For most regions, households can source consumption goods only from domestic and imported sources. In the Australian regions, households can also source goods from interstate.

The representative household interacts with producers in two ways. First, their consumption of goods and services sustains demand for production. Second, the representative household owns and receives all income from factor payments (labour, capital, land and natural resources) as well as net taxes. Factors of production are used by producers as inputs into production along with intermediate inputs. The level of production, as well as supply of factors, determines the amount of income generated in each region.

The representative household's relationship with investors is through the supply of investable funds – savings. All savings generated in a region are used to purchase bonds whose price movements reflect movements in the price of generating capital.

The relationship between the representative household and the international sector is twofold. First, importers compete with domestic producers in consumption markets. Second, other regions in the model can lend (borrow) money from each other.

Producers

Producers are cost minimisers, and can substitute between domestic, imported and interstate intermediate inputs (under the Armington assumption) via a CRESH production function, as well as between primary factors (through a CES aggregator). Substitution between skilled and unskilled labour is also allowed via a CES function. Sectoral output equals the amount demanded by consumers (households and government) and intermediate users (firms and investors) as well as exports.

Producers supply goods by combining aggregate intermediate inputs and primary factors in fixed proportions (the Leontief assumption). Composite intermediate inputs are also combined in fixed proportions, whereas individual primary factors are combined using a CES production function. Apart from selling goods and services to households and government, producers sell products to each other (intermediate usage) and to investors.

Capital is an input into production, and investors react to the conditions facing producers in a region to determine the amount of investment. Generally, increases in production are accompanied by increased investment. In addition, the production of

machinery, construction of buildings and the like that forms the basis of a region's capital stock, is undertaken by producers. In other words, investment demand adds to household and government expenditure from the representative household, to determine the demand for goods and services in a region.

Producers interact with international markets in two main ways. First, they compete with producers in overseas regions for export markets (and in their own region). Second, they use inputs from overseas in their production.

Investors

Investment takes place in a global market and allows for different regions to have different rates of return that reflect different risk profiles and policy impediments to investment. The global investor ranks countries as investment destination based on two factors: current economic growth and rates of return in a given region compared with global rates of return.

Given the aggregate level of investment determined in the model, regional investors construct capital goods by combining composite investment goods in fixed proportions. This is done in a cost-minimising way by choosing among domestic, interstate, and international sources in a cost-minimising way via a CRESH production function. Investment in each region depends on the rate of return in that region compared with the national rate of return.

International

For internationally-traded goods (imports and exports), the Armington assumption is applied whereby the same goods produced in different countries are treated as imperfect substitutes. But, in relative terms, imported goods from different regions are treated as closer substitutes than domestically-produced goods and imported composites. Goods traded interstate within the Australian regions are assumed to be closer substitutes again.

Each of the components outlined above operate, simultaneously, in each region of the model. That is, for any simulation the model forecasts changes to trade and investment flows within, and between, regions subject to optimising behaviour by producers, consumers and investors. Of course, this implies some global conditions that must be met, such as global exports and global imports, are the same and that global debt repayment equals global debt receipts each year.

Appendix C: Economic contribution vs economic impact, benefits and limitations

There are a number of significant shortcomings associated with using an economic contribution analysis in the context of the feedlot industry as the sole way to develop an overall value proposition. These shortcomings can be addressed through CGE modelling.

Most important of these shortcomings is that economic contribution analysis considers the impact of feedlots narrowly, only capturing the economic contribution of the feedlot production in an accounting sense, rather than the contribution that feedlotting makes to the beef cattle industry more broadly.

For example, the 2003 study considers the impacts of feedlots as only being from what they buy and sell, as per a standard economic contribution analysis. This approach may be satisfactory where feedlotting is the dominant means of cattle production for the animal's life, as it tends to be in other areas like the United States. However in Australia - where feedlots are often used for short periods to finish store animals that have previously been grazed, sometimes in as little time as as a few months - this approach does not fully capture all values. Most importantly, it doesn't reflect a reality that pasture grazing of animals across some marginal and seasonally unreliable areas of Australia is only economically viable because there is the prospect of feedlotting to finish animals that otherwise may not meet market specifications.

This, along with the role of feedlots in ensuring overall beef industry productive stability and maintaining herd sizes even in bad times – needs to be an important part of a study such as this. These types of value – which are effectively raising productivity and acting as insurance for another industry – cannot be captured by I-O modelling, but can be by economic impact (CGE) modelling.

That said, an economic contribution analysis is an important step in developing a sound understanding of the industry in its current form, as IO tables are a building block of the CGE modelling. Economic contribution studies of this nature outline the value-add generated through the normal operations of an entity such as a feedlot, or the entire feedlotting industry. Value-add is the measure of the contribution the entity makes to the local/regional, state and national economies because of what the entity directly buys and sells. In addition to value add, economic contribution studies also report the contribution to (regional) employment.

Economic impact analysis has a number of benefits:

- The CGE model allows for consideration the economic impact of the feedlot industry in a broader sense (i.e. including its impact on the non-feedlot (grazing) cattle industry).
- The CGE model considers global impacts and thus better captures the reality of the feedlot industry operating in a global market.
- Where the economic contribution model is static (and linear) and does not project the supply-side impact or any crowding out, the CGE model is a dynamic (and

non-linear) economic model that incorporates these effects. The overall impact on the labour force is an important consideration for government, as increased employment in one sector may draw resources away from other parts of the economy.

Assumptions and limitations of the approach

Deloitte Access Economics' approach in estimating the economic contribution of feedlots is based on consultations with 'representative' case study feedlots. The process of case study selection and its limitations are discussed in Appendix C.

For the economic impact modelling, the definition of the feedlot sector in the CGE model was important in determining its impact. Public and consultation data sources enabled customisation of the model to support modelling of industry-specific shocks and their broader economic impacts. In the database used in the modelling (GTAP 8), the beef industry was separated from all other 4-legged livestock production. Further, the industry was then split into grazing beef and feedlot beef production based on the value of production of these sectors.

Finally, consideration of the 2012-13 growing season in this analysis has implications for the overall estimates. 2012-13 was a difficult year for beef producers, with drought across much of eastern Australia (particularly Queensland), high costs of farm inputs and a high Australian dollar. The above-average rainfall experienced in the two years prior had led to many producers rebuilding herds, which needed to be rapidly turned off given the climatic conditions. This strong supply resulted in depressed prices.

That said, tough conditions for the grazing industry are conversely strong seasons for the feedlot industry. The use of 2012-13 data in this analysis thus has implications for the analysis as it reflects a high-production year with record-breaking export volumes and relatively high input costs. A wetter year would reduce feedlot utilisation and result in a lower economic contribution being estimated.

Appendix D: Industry consultations

Data used in the estimation of the economic contribution of the feedlot sector was collected through case study consultations between Deloitte Access Economics and Australian feedlots.

The case study feedlots were selected based on their capacity, location and availability for discussion. The categories for the case studies were Western Australia small feedlot, Darling Downs small feedlot, Riverina medium feedlot, and Darling Downs large feedlot.

It is acknowledged that such an approach is an approximation only and does not fully capture the differences across the industry. While a sample across geographies intends to capture differences in climate and access to inputs, and a sample across different sized feedlots reflects the differences in economies of scale in production, the sample size was limited.

Indeed, individual operations may be affected by a number of specific factors, such as the operator's relationship with suppliers and markets, contract discounts or varying animal husbandry techniques. Such anomalies are difficult to isolate and therefore are likely to affect the overall contribution when extrapolated to an industry-wide estimate.

It is acknowledged that a more detailed survey or consultation process involving a greater proportion of feedlots would improve the robustness of the analysis and its results, but was not feasible as part of this study.

Appendix E provides the consultation note and questions used for the stakeholder consultations. The questions were developed by Deloitte Access Economics and approved by MLA prior to dissemination to the involved parties.

Appendix E: Consultation note

Deloitte Access Economics

Regional feedlot investment study update

Consultation note

July 2014

Australian Lot Feeders' Association (ALFA) and Meat & Livestock Australia (MLA) are seeking to update the 2003 study on the regional and national impact of feedlot investment (FLOT.404). Deloitte Access Economics has been appointed to assist MLA with this task.

We are seeking your cooperation to be one of the case study feedlots providing information to the project. The objective is to analyse and model the regional economic impact of a select number of individual feedlots, and then to extrapolate to the feedlot industry overall so that an understanding of the value of the sector to local, regional, state and national economies can be obtained.

This consultation will play an important role in informing this study, complementing the overall industry data and supporting the economic contribution and impact analysis. Your feedlot has been selected for consultation from a list of accredited feedlots based on criteria including size and location.

The consultation would take approximately 1 hour via teleconference. If required, brief follow-up questions may be asked via another phone call or email, as appropriate.

We have developed a short list of questions, below, to guide our conversation with you. It should be noted that although this list provides a structure to the discussion, it is intended to be free-ranging and informal. Accordingly, we would be pleased to discuss any other issues you consider to be important to the study.

To maintain confidentiality, individual feedlots will not be identified in the report, however the 'representative' feedlot will have similar characteristics to your own. If you wish, we can provide you with the economic impact analysis of your feedlot, which you may find useful for your own planning or marketing purposes.

Deloitte Access Economics and MLA recognise that information discussed in these consultations is confidential. Appropriate measures will be taken as and where required to maintain such confidentiality. Please let us know if you have any specific concerns regarding this matter.

Should you wish to discuss any aspect of this consultation approach, please contact:

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We very much appreciate your taking the time to participate in this study.

Consultation questions

Feedlot operations

- Please describe the main operations of this feedlot. Does the feedlot undertake custom feeding of cattle (i.e. finish cattle on behalf of grass fed operators), finish its own cattle or both?
- What is the average daily weight gain per head?
- If the feedlot finishes its own cattle, what markets are being targeted (domestic vs export) and if export (short fed vs long fed)?
- Does your grain quality vary by the market that you're supplying?
- Could you please provide details on the ingredient composition of your feed ration (% by weight grain, protein source, roughage, minerals/vitamins)?
- What proportion of cattle are purchased locally (within 75km of feedlot) and regionally (within 150km of feedlot)?
- What proportion of feed is purchased locally (within 75km of feedlot)? regionally (within 150km of feedlot)?
- How many people are employed by the feedlot (including owner/operator)?

Revenue and expenditure

- What was your revenue for 2012-13?
- What proportion of your revenue was from:
    - Cattle sold through saleyards
    - Cattle consigned direct to slaughter
    - Custom feeding
    - Ancillary products (e.g. manure)

For each of the groups identified above,

- What was your expenditure for 2012-13?
- What proportion of your costs were on:
    - Cattle
    - Feed (broken down by grain, protein, roughage, minerals/vitamins)
    - Wages (personal vs staff)
    - Transport costs
    - Energy (e.g. fuel, electricity)
    - Feedlot equipment and maintenance
    - Other (please specify)?
- Have you expanded your feedlot operation since 2002? If so, what were feedlot expansion costs per head (excluding land)?

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