

The Queensland Beef Supply Chain



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Government



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Sources used in obtaining the information, based on which we performed our analysis to reach certain conclusions and points of view that are included in this guide, are outlined in references section of this report.

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Executive Summary

Cattle Grazing

Queensland has the largest beef cattle herd in Australia at 42% of the national herd. Australia represents 2% of global beef cattle, and 15.7% of global beef meat exports.

Queensland has two dominant production systems. The North of the state is dominated by cattle breeding operations. Northern cattle, which generally comprise of a high *Bos Indicus* content, are sold into three different markets. These include live export, manufacturing beef and backgrounding operations, for preparation of cattle entering fattening systems.

The Southern region of Queensland has more intensive cattle production systems due to the increased productivity of the land, and higher rainfall. The herd is dominated by *Bos Taurus* cattle. Production in the south is focused on fattening cattle for processing and exportation as boxed beef.

The cattle grazing industry in Queensland is dominated by family businesses with a small number of large fully integrated corporate operations.

98% of Australian beef farms are family owned.

Beef cattle production systems are exposed to economies of scale, with larger operations benefiting from a lower marginal costs base and as such, higher profitability.

Bank debt is the dominant source of debt funding in the rural sector (RBA). Land purchases are the dominant purpose of farm debt followed by working capital (ABARES). The requirement for working capital funding is reflective of the irregular

cash flow characteristic of the industry.

The performance of Queensland's beef cattle sector is tightly aligned to natural factors, in particular rainfall and drought. An extended dry spell in 2014 saw 80% of Queensland drought declared. This drought and corresponding herd re-building cycle had a significant impact on cattle prices as demand exceeded supply and cattle prices reached record levels.

Breeding operations measure productivity via calving rates and mortality rates, whereas backgrounding and fattening operations measure their performance via daily and total weight gain.

Feedlotting

Feedlotting is a key component of the Queensland beef cattle supply chain.

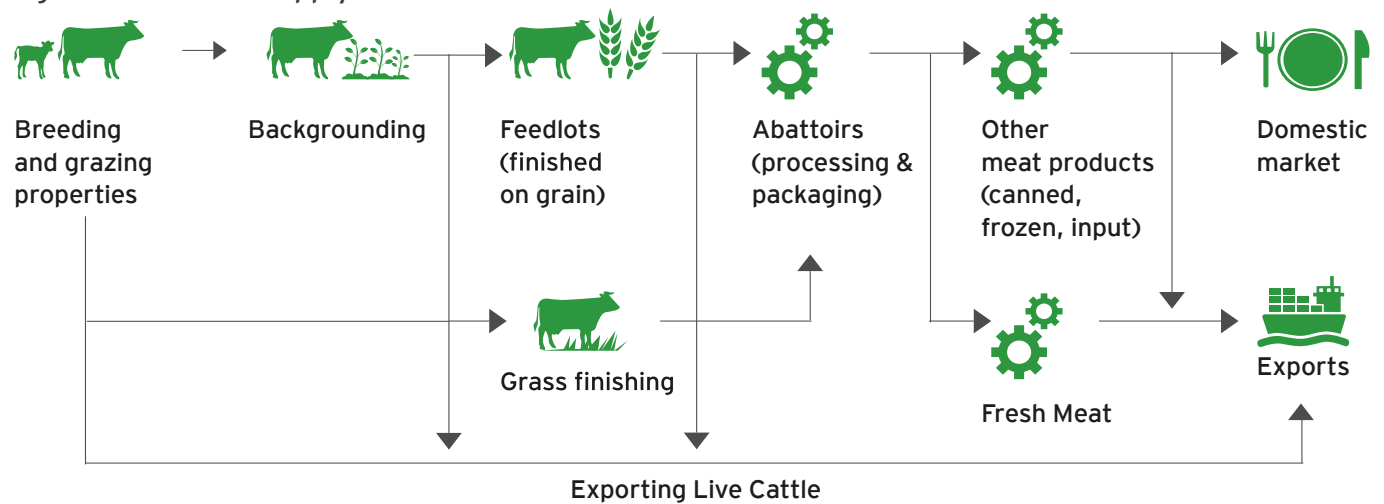
The high proportion of grainfed cattle in Queensland is reflective of the lower availability of high-quality grass finishing country and availability of grain compared to other States. Feedlots also provide for greater consistency of quality and less supply volatility due to their controlled nature.

While feedlots are run as standalone operations, they also often form a key component of an integrated production system, both with breeding and processing.

The increasing demand for high quality beef from Asia's growing middle class is correlated with the growth of Australia's feedlot industry. According to IBIS World (A0142), the sector experienced annual growth of 11.2% from 2012 to 2017.



Figure 1: The beef supply chain



The success of a feedlot is impacted by a number of factors such as grain prices, drought, and the domestic price of feeder cattle and downstream factors such as the demand for grainfed beef and the domestic price for beef. While feedlots are somewhat less exposed to weather volatility than grazing production systems, they are exposed to the impact weather can have on grain prices and the supply of feeder cattle, with the price of feeder cattle accounting for 60% of industry costs.

50% of finished Queensland cattle are grainfed

The national average is

15.7%

Processing

Queensland accounts for almost 50% of Australia's processed beef. Queensland's beef processing facilities are predominately located in the South East coastal area, with several also on the Northern coast. Beef processing in Queensland is dominated by three companies; JBS Australia, Teyes Australia and NH Foods accounting for 65% of all cattle processed in Queensland. These processors have well established supply chains, and have the ability to sell into international markets. Obtaining relevant export certifications, including Halal, United States Department of Agriculture (USDA) Certified Beef and export approval from the Certification and Accreditation Administration of the People's Republic of China, has enabled processors to capitalise on improving market access.

A recent report by Meateng found that there was currently no shortage of processing capacity in the Queensland beef cattle industry.

Queensland beef processors are at the forefront of innovation with the adoption of automation, robotics and objective carcase measurement as examples of technology aimed at reducing costs and increasing efficiency. Like feedlots, processors benefit from vertical integration. A processor's integration with a feedlot will reduce its supply risk and improve quality control.

The beef processing industry, like the feedlotting sector is highly exposed to changes in the price of cattle. Supply also impacts processors; if the supply of cattle is tight processors will be paying more for cattle and will likely have reduced throughput and increased exposure to fixed costs.

Live exports

Australia has consistently been one of the world's largest live exporters. Australia was the world's largest source of live cattle each year between 2014 and 2016, and supplied more than one-quarter (27.6%) of global demand in 2015 (USDA, 2018).

The overwhelming majority of live exports (89.2% in 2017) were feeder and slaughter cattle. However, breeder cattle represented an average 24.8% of live exports by value over the seven years to 2017, despite accounting for an average 11.9% of volume over the same period. This market segment has been subjected to rapid growth in recent years, with exports to Indonesia more than doubling in 2017 (ABARES, 2018). Live export volumes are forecast to be flat over the medium term, after 7.1% growth in 2018. Exports by value are also likely to be flat in real terms (ABARES, 2018).

Queensland was the third largest exporter of live cattle amongst Australian states and territories in 2017, with 25.2% of Australia's total being exported through Townsville, Karumba and Brisbane. Cattle raised in north-western Queensland are also exported through Darwin, Australia's largest live export terminal (ABARES, 2018).

Infrastructure

There is a large and complex infrastructure network supporting the Queensland beef cattle sector. This network comprises transport infrastructure including rail, road, air and sea transport. Transport is focused on live animals, processed beef and feed for feedlots.

Given Queensland's scale and the geographic scale of the industry, transport infrastructure and services are key to its success. Cattle saleyards are also a key component of the beef industry's

infrastructure network. The largest saleyards are located at Gracemere, Roma and Dalby.

Support Services and Technology

As the beef cattle industry grows off the back of increased demand for Australian beef so will its supporting services industry. This includes transport providers, agronomics, business support, branding, assurance and advisory services.

Increasingly, support for the beef cattle industry is growing via technology and digital advancements. Technology in the beef cattle sector is focused at the direct operational level, including innovations such as on-farm walkover cattle weighing and automation within cattle processing facilities through to the broader supply chain level with digital supply chains and data analytics.

Flexibility of supply chain components

Queensland's producers, feedlotters and processors demonstrate a level of flexibility in aligning their products to emerging market trends and opportunities. Each export market has a myriad of regulations and specifications for both processed beef and live cattle imports. The flexibility of producers, expertise of support services and capability of processors has allowed Queensland to be in a prime position to respond to export opportunities as they arise. This flexibility has been a cornerstone in cementing the State's reputation as a premium producer, and a key reason why Queensland beef is highly sought after around the world.

Quality assurance

The Queensland Government, as well as industry groups such as Meat and Livestock Australia (MLA), invest heavily in quality assurance (QA) programs that span the supply chain. These QA programs focus on food safety and product traceability however areas including animal welfare, biosecurity and environmental management have been key factors in the development of these programs. These systems create a preventative approach to food safety, maintain market access and create Queensland's premium reputation in international markets (Safe food Queensland).

Summary of supply chain components

Supply Chain Operation	Description
Breeding and grazing properties	Beef cattle breeding and grazing operations comprise the breeding and raising of weaner cattle. Success of breeding operations is contingent on building and managing the genetic composition, health and reproductive performance of a herd and the implementation of sustainable land management practices.
Backgrounding properties	Backgrounding is the process of preparing weaner cattle for feedlots or grass finishing. Backgrounding properties “group and acclimatise animals prior to entry into a feedlot or intensive finishing system” (MLA). Backgrounding properties raise cattle on grass for a period of time or until they reach a weight target. Backgrounding cattle entails implementation of sustainable land management practices and managing the health of cattle including feeding, watering and supplementation.
Grass finishing properties	Grass finished cattle are fattened on pasture prior to sale for processing. Pasture finishing is generally conducted in more productive areas, as an alternative to feedlotting.
Beef cattle feedlots	Feedlots are used to finish cattle on grain prior to sale for processing. Feedlots fatten cattle on grain for a specific period of time or until a weight target is reached.
Beef processors	Beef processors are responsible for the slaughter and butchery of cattle for sale to wholesale, retail and export markets.
Agricultural services	The beef sector uses services across the whole supply chain, including stock and station agents, veterinarians, transport services, geneticists, natural resource management consultants, and business consultants.
AgTech	AgTech is a growing industry equipping the beef cattle supply chain with hardware and software tools to assist in improving the efficiency and effectiveness of farm operations. Software applications include precision agriculture, animal data, predictive analytics, digital supply chain, digital marketplaces and farm management software. Hardware development includes the introduction of smart irrigation, robotics, drones, automation and production sensors.

Overview of the Queensland Beef Industry

Cattle production is Queensland's largest agricultural industry and plays an important role in the Queensland economy.

Queensland Beef Industry Statistics

42% Queensland's cattle herd is almost half of the national herd

702,462 tonnes red meat exported from the Port of Brisbane in 2017

This is **42.5%** of the national total and makes Brisbane the largest red meat export terminal

Queensland's herd is

1.1%

of the global beef cattle herd in 2017

Queensland had

8%

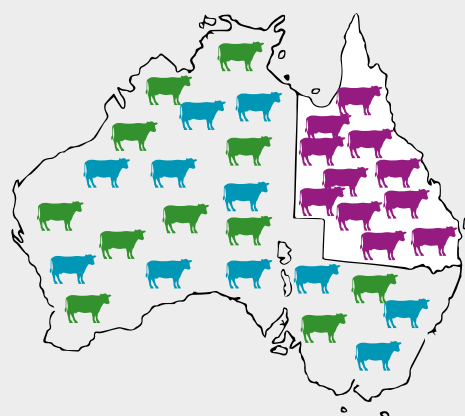
of global beef exports in 2016

25.2%

of Australia's live cattle exports in 2017

Source:

ALFA, ABS DAWR & ABARES, 2018



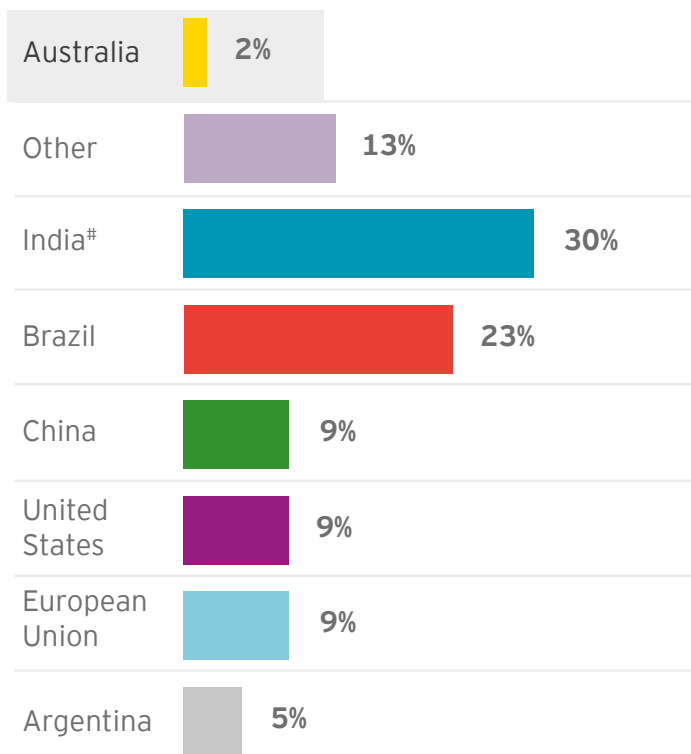
Beef cattle production is Queensland's largest agricultural industry and plays an important role in the Queensland economy, particularly in regional areas (Queensland Treasury, 2017)

Australia's share of the global herd is significantly smaller than the other major exporting countries (Figure 2). Australia was the third largest exporter of beef and veal in 2016 (Figure 4).

The major beef exporting countries are Australia, Brazil, India and the US. A significant proportion of Australian exports, especially to the United States, is comprised of manufacturing beef and is traded in US Dollars.

Australia's chilled and grainfed beef is considered a premium product, earning an average export price of \$6.05/kg (September 2016 qtr.). Meanwhile, India's frozen buffalo (carabeef) traded at \$3.91/kg, Brazilian beef at \$5.17/kg and US beef at \$7.13/kg (MLA Industry Insights, 2017).

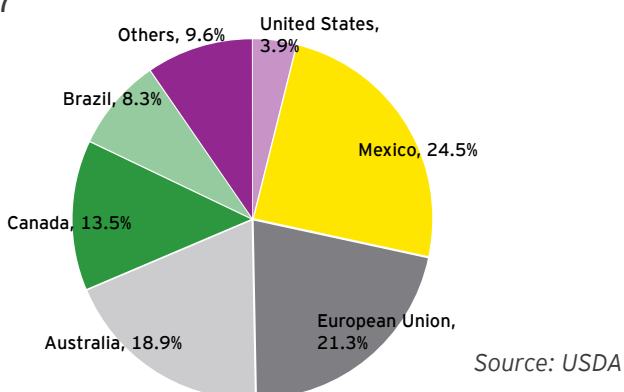
Figure 2: Global herd proportions*



*As of October 2017 – (USDA, 2017)

#Includes Indian buffalo (carabeef)

Figure 3: Global live cattle export market share, 2017

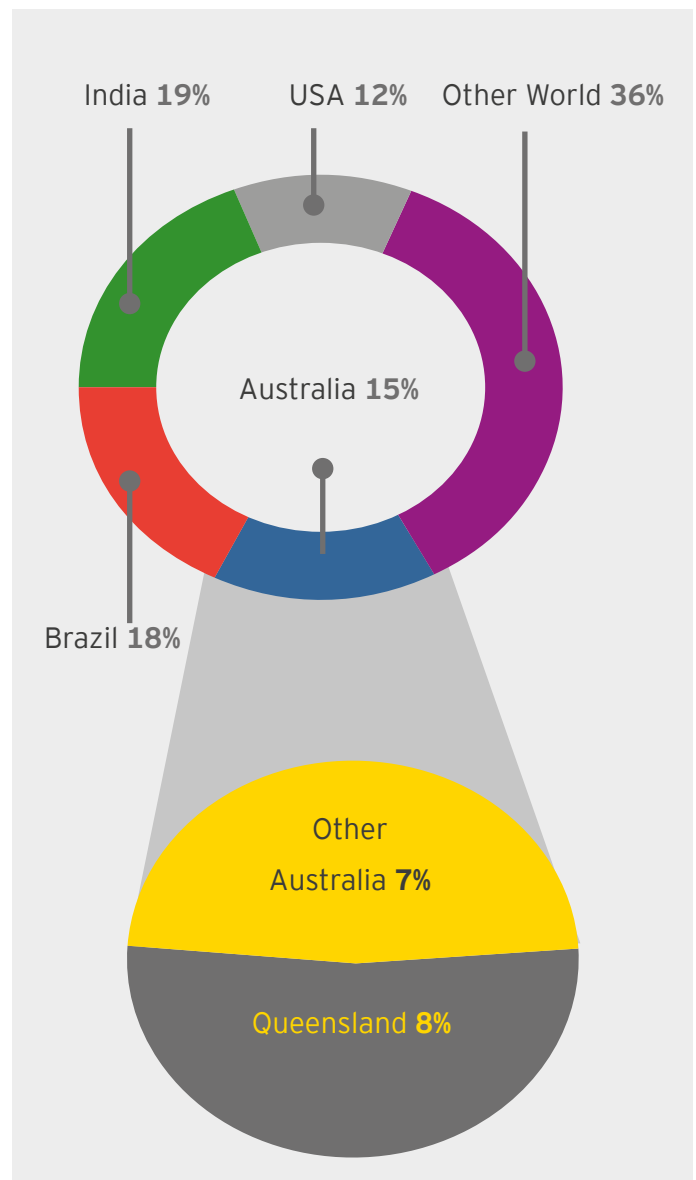


Source: USDA

Australia's beef demands a price premium over competitors

Traceability is a key component of this value proposition. The National Livestock Identification System (which has been mandatory since 2005) allows all cattle at any stage of the beef life cycle to be traced back to the properties on which they were raised, finished and processed. Aside from the biosecurity benefits, traceability and provenance has proven to be a significant driver of value for premium beef products, especially in the Chinese market (MLA, 2018).

Figure 4: Global beef meat exports (volume tonnes shipped) - 2016

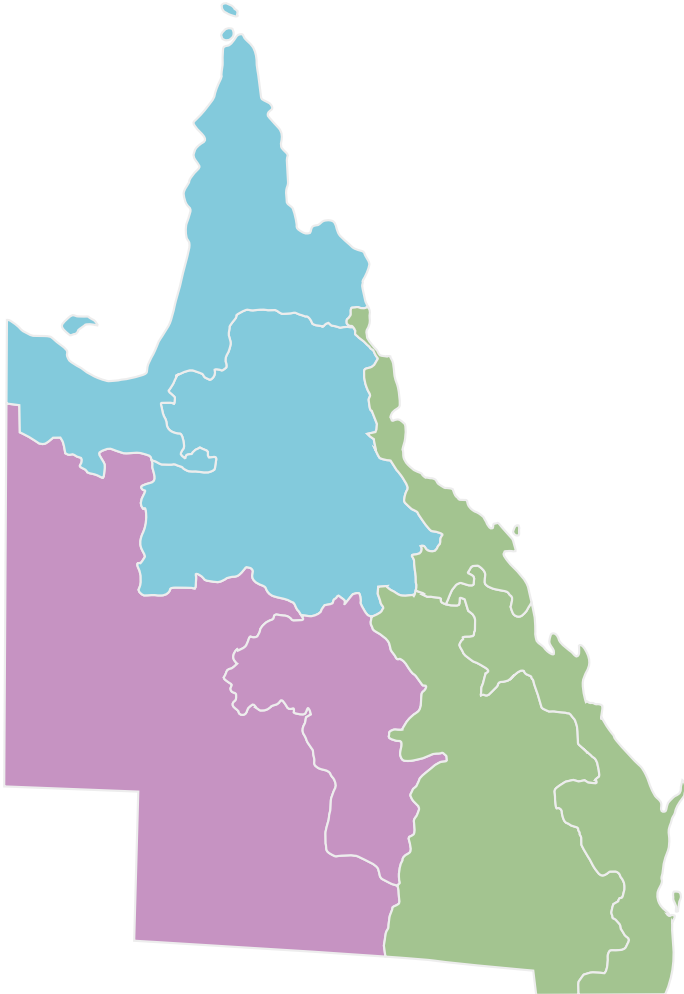


Source: ABARES; Office of Economic and Statistical Research, Queensland Treasury.

Note: includes buffalo meat (carabeef) and does not include live exports.

Queensland's grazing and production systems

There are two key production systems in Queensland which produce cattle for either live export or domestic processing. There are three key grazing regions in Queensland defined as Northern, Central and Southern.



Northern grazing properties allow for the low cost production of cattle through breeding on vast grazing pastures.

Central grazing properties are commonly used for backgrounding cattle. With breeding and finishing operations also common.

Southern properties are characterised by smaller properties with intensive grazing areas.

Dominant bovine species

Bos Taurus

Of British and European decent
Best suited to temperate climates
Produces a high yield of beef
Produces high marbling and tenderness in beef

Bos Indicus

Of Southern Asia decent
Well suited to extreme temperature conditions
Tick resistant

Northern production systems

Northern Queensland production systems are characterised by extensive grazing pastures dominated by annual wet and dry seasons.

The dry hot conditions of Northern Queensland create a climate more suited to *Bos Indicus* breeds such as Brahman cattle. Their drought and tick resistant qualities allow them to remain productive in long dry seasons, However, their meat is of a lower value in the Australian domestic market and they are often exported live as feeder cattle to Asia markets. Northern cattle that are processed domestically overwhelmingly cater to the commodity beef market and are processed by Northern and Central Queensland abattoirs.

Live cattle exports to Asia is an important market option for Northern production systems,

providing increased market options.

Northern graziers are increasingly producing cattle suited to domestic and boxed beef export markets. This is achieved through cross-breeding with *Bos Taurus* breeds to create cattle that demonstrate the harder traits of a *Bos Indicus* animal and the improved marbling, tenderness and yields of a *Bos Taurus* animal. Examples of these breeds include Droughtmaster and Santa Gertrudis, both of which are well established within Queensland. The aim is for the cattle to achieve an optimal weight for age to meet market specifications. These cattle are turned off Northern properties after weaning and generally moved to backgrounding properties.

Backgrounding properties allow weaners to grow out to a larger size prior to entering more intensive finishing systems. Backgrounding can also prepare cattle for intensive systems, introducing handling, socialisation and acclimatisation to feed bunkers.

Within the Queensland beef industry the major methods of cattle sales include;

- ▶ cattle through saleyards (lwt)
- ▶ direct to abattoirs by carcass weight (cwt)
- ▶ through online sales platforms (lwt)
- ▶ to live export companies (lwt).

Southern production systems

Queensland's Southern grazing properties are

characterised by smaller land holdings with intensive farming practices. Southern production systems generally produce *Bos Taurus* breeds such as Hereford, Angus, and Charaloi.

Saleyards are used heavily in the Southern production systems. Predominantly cattle suitable for domestic market use, restocking properties and breeding purposes are sold through saleyards. Processors are also active buying suitable cattle. Cattle generally go through a finishing system before processing.

Finishing systems are the method of fattening cattle before they are processed. Cattle are either finished on improved pastures, creating grassfed beef, or finished in feedlots creating grainfed beef. Finishing systems are focused in the Southern region of Queensland due to the accessibility of grain, higher quality pastures and dominance of *Bos Taurus* cattle. Finishing systems help to create consistency in product and cater for the high value domestic and export markets.

Farm size is generally inversely correlated with productivity¹ – smaller farms tend to be located on more productive land and vice versa. Queensland's south eastern region is characterised as being more productive and farm sizes are typically smaller in these areas than the North of the state. Table 1 demonstrates the higher average carrying capacity of Southern properties in comparison to Northern properties.

Table 1: Queensland's farm sizes and proportion of herd by region

Production Region	Region	# Farms (approx.)	Avg Area operated at 30 June 16 (ha)	Proportion of herd	Avg carrying capacity* (ha/cow)
Northern	Cape York and the Queensland Gulf	78	177,832	6%	24.74
	Central North	581	43,719	16%	34.93
Central	West and South West	359	118,769	13%	16.45
	Central West	605	16,817	9%	11.93
Southern	Eastern Darling Downs	857	1,851	3%	5.41
	Southern inland	2,962	5,608	34%	5.15
	Southern Coastal	2,298	2,982	15%	4.80
	Northern Coastal	419	3,465	3%	4.83

Source: MLA Farm Survey Data for beef, slaughter lamb and sheep industries

*Average carrying capacity was determined by dividing average area operated by beef cattle with the intention to demonstrate productivity difference and should not be used as management advice.

¹Productivity is defined as the carrying capacity of the land (head/hectare)

Cattle Breeding and Grazing

Beef cattle breeding and grazing operations comprise the breeding and raising of weaner cattle. Success of breeding operations is contingent on building and managing the genetic composition, health and reproductive performance of a herd and the implementation of sustainable land management practices.

Cattle breeding and grazing is the core component of the Queensland beef cattle supply chain and establishes the base herd of animals that flow through the rest of the chain. Grazing includes breeding, backgrounding and grass finishing production systems. The success of these core components of the supply chain directly impact both the feedlotting and processing stages. Queensland has abundant grassland suitable for cattle grazing.

Cattle breeding and grazing is regulated by a range of assurance systems that manage risks associated

with food safety, this includes the mandatory National Livestock Identification System (NLIS) where all cattle must have an RFID ear tag, Livestock Production Assurance (LPA) system which requires producers to declare any chemicals or veterinary product use and feeding as well as optional programs such as the Pasturefed Cattle Assurance System (PCAS) which provides a set of standards to meet pasturefed certification.

Table 2 shows the herd size for each Australian State and their proportion of contribution to the total Australian herd.

Table 2: Herd Size per State (2016)

State	Herd Size	Proportion of Herd
QLD	10,544,965	42%
NSW	4,997,700	20%
NT	2,238,375	9%
VIC	3,483,990	14%
WA	2,003,253	8%
SA	1,048,606	4%
Other	648,486	3%
Total Australia	24,965,375	100%

Source: ABS

Queensland and New South Wales stand out as top performers by a significant margin, followed by the Northern Territory, Victoria and Western Australia.

For simplification purposes, production in other areas such as Tasmania and Australian Capital Territory were combined in the 'other' category due to their low individual results.

Key success factors

The success of a cattle breeding and grazing operation is focused on the efficient production of weaner cattle. Effective herd, property, genetic and environmental management will all contribute to a positive financial outcome.

Managing the natural environment to optimise a cattle breeding operation is a significant challenge given its inherent volatility. New and emerging technology is set to enhance on farm management and decision support around these key success factors. The adoption of technology will increase the sophistication of an operation and will become key to the sector's financial performance.

Key Success Factors for Cattle Breeding and Grazing



Financial Performance

- ▶ Rate of return
- ▶ Herd size
- ▶ Unpaid labour costs



Herd Management

- ▶ Branding rate
- ▶ Cattle mortality rate%
- ▶ Turn-off rate



Environment

- ▶ Average rainfall/overland flow
- ▶ Normalised difference vegetation index (NDVI)
- ▶ Biomass measures
- ▶ Drought history
- ▶ Weather and climate forecasts
- ▶ Stocking rates



Property

- ▶ Geographic location
- ▶ Proximity to downstream operators
- ▶ Carrying capacity



Genetics

- ▶ Breed (type)
- ▶ Estimated breeding values
- ▶ Reproductive rates

Australian beef farm sizes and structures

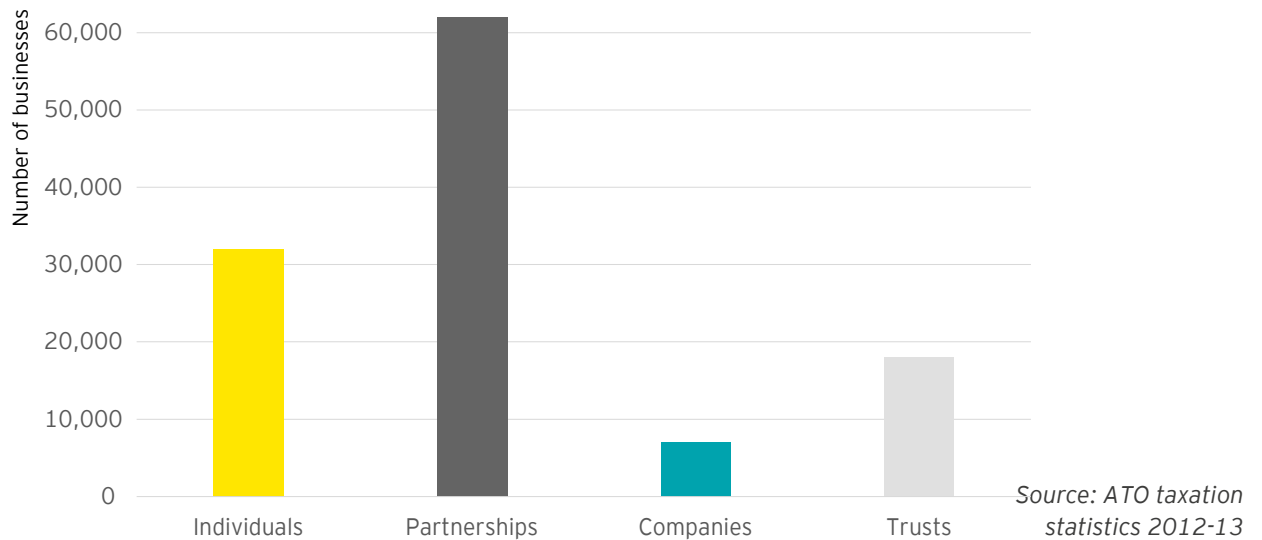
Family businesses dominate the beef cattle sector with a small number of large fully integrated corporate operations

In the Australian beef cattle farming industry, Australian Agricultural Company Ltd and Consolidated Pastoral Company hold the biggest individual market shares, although both are less than 1% of the total market (IBISWorld A0142).

Figure 5 demonstrates that partnerships and individuals are the dominant business structures in the farming sub-sector. These structures, along with trusts, make up the vast majority of businesses, and all of these structures are common to family farming operations.

Many graziers have a business organised under one of these structures, but have not investigated whether an alternative structure would be more suitable (Heath & Tomlinson, 2016).

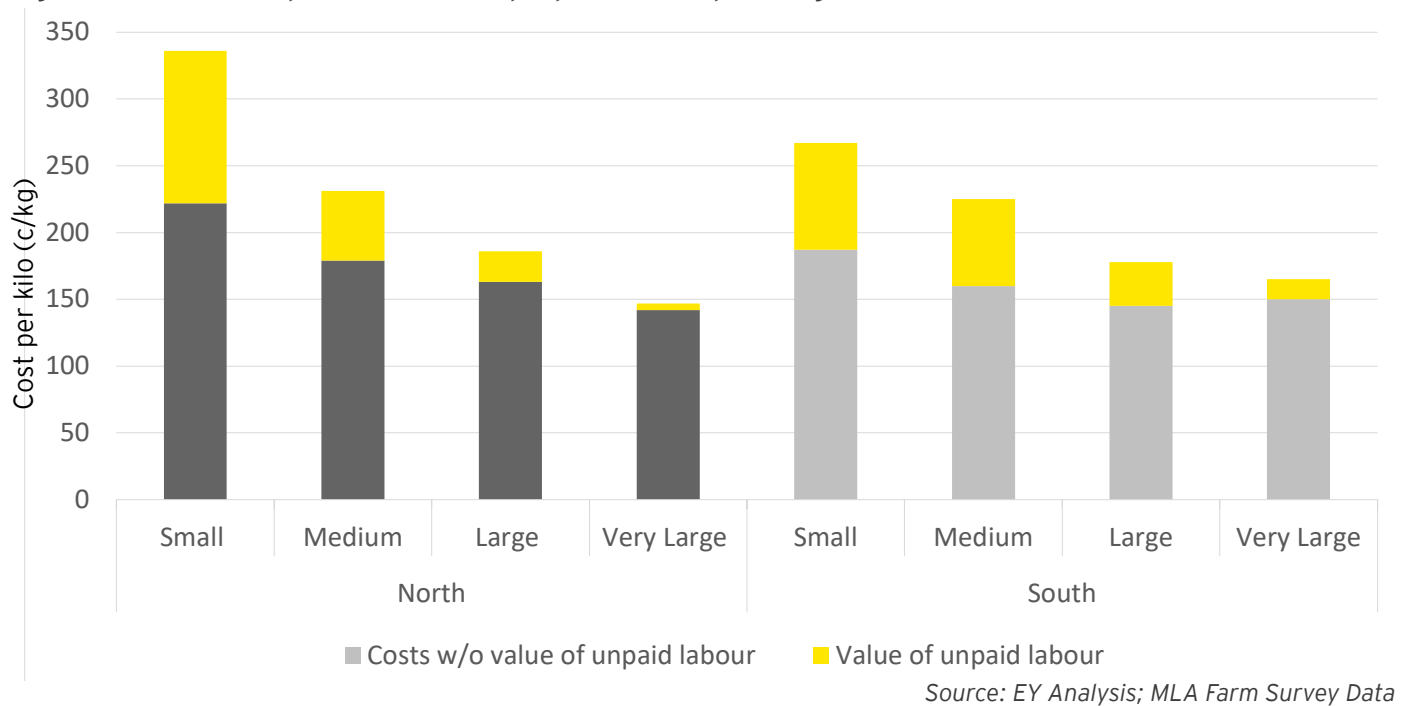
Figure 5: Business structures used in sheep, beef, cattle and grain farming businesses (2012-2013)



Comparison of farm size and economies of scale

The viability and sustainability of small farms can be compared to that of large farming operations by analysing the reliance on unpaid labour. It is thought that the majority of smaller businesses are family operated, which often employ little or no on-farm labour. Figure 6 suggests smaller and medium operations (typically holding 100 to 400 and 400 to 1,000 head respectively) rely heavily on unpaid labour for day-to-day farming operations, suggesting that their financial position would be materially different if market-based labour costs were imposed upon their operations and captured in their financial statements. Comparison between Northern and Southern regions of Australia, and across different farm sizes, indicates that the impact of unpaid labour is primarily due to the scale of operations. As a result, the financial performance of small and medium-sized businesses is largely contingent upon the containment of non-labour costs. However, reliance on on-farm labour also provides greater year-to-year flexibility for producers to respond to volatility in terms of weather patterns and market demand.

Figure 6: Value of unpaid labour as a proportion of operating costs



EY analysis of MLA Farm Survey Data shows that the size of a beef cattle operation is inversely correlated with operating costs. Figure 6 illustrates that the total value of unpaid labour reduces as the size of the operation increases. This is due to the impact of economies of scale on costs. EY analysis also shows that the price received is very similar across all size categories. When cost and price are considered, it is clear that the larger operations will have greater profitability due to their lower operating cost.

Figure 7: Total costs cents/kilogram

The total cost per kilo vary significantly by farm size. This is evident in northern regions, where total costs per kilogram produced are double for small farms than that of very large farms.

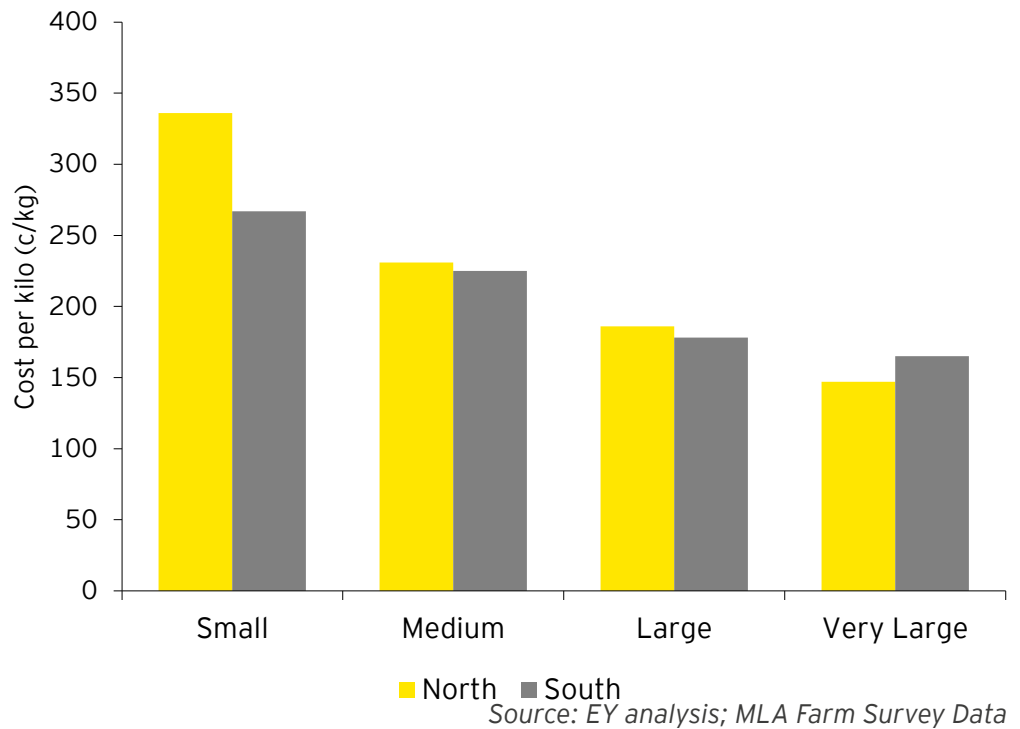
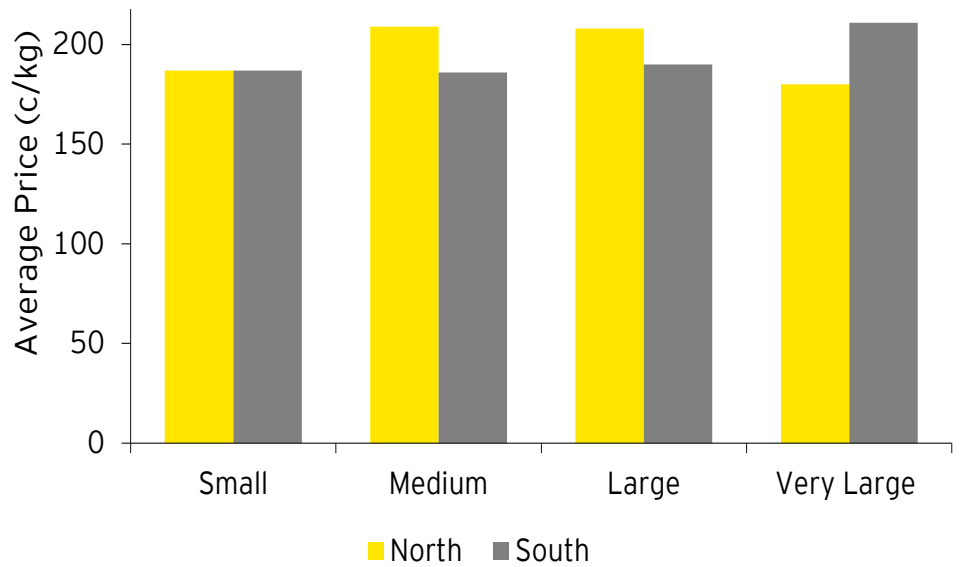


Figure 8: Average price received (c/kg)

Average price per kilogram, however, is similar across all farm sizes and location. Whether in the North or South profitability is positively correlated with farm size.



Bank debt is the dominant source of rural debt in Australia (Figure 9).

In family farming businesses, the land and other fixed assets are often passed down through generations. This can lead to the gradual repayment of debt, alongside appreciation in the value of real assets. As a result, the industry is not highly leveraged, with an average debt to equity ratio of 13% (MLA Farm Survey data, 2017 – see Table 3). By comparison, the average long-term debt-to-equity ratio for commercial property developers and managers, another capital-

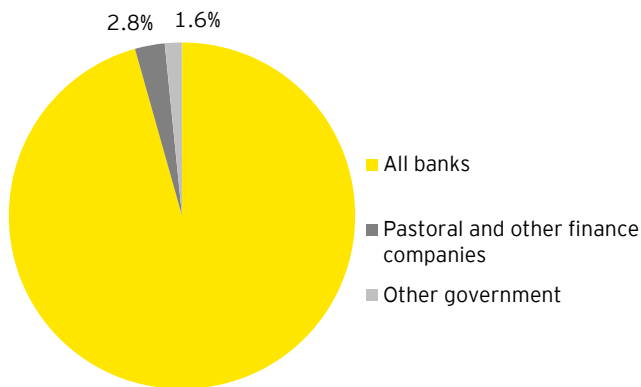
intensive industry, is 17% (EY Analysis; CapitalIQ). For family businesses, traditional bank debt is both the main source of this existing debt and the main source of additional funding (Figure 9). Table 3 shows that larger businesses (those with herd sizes of greater than 5,400 cattle) are more highly leveraged than the industry average, with a debt to equity ratio of 30% (MLA, 2017). The higher debt to equity ratio for the larger business is likely due to these businesses leveraging debt funding for expansion of their operations.

Table 3: Queensland’s debt to equity by cattle herd size in FY15-16

Herd Size (Qld)	Avg Farm debt at 30 June (AUD)	Avg Farm equity 30 June (AUD)	Debt to Equity
100 to 200 Cattle	130,031	2,251,897	6%
200 to 400 Cattle	276,499	2,393,368	12%
400 to 800 Cattle	359,623	3,517,658	10%
800 to 1,600 Cattle	605,717	4,910,575	12%
1,600 to 5,400 Cattle	1,540,713	10,636,804	14%
More Than 5,400 Cattle	6,799,977	23,029,625	30%
All Herd Sizes Combined	616,692	4,579,047	13%

Source: MLA Farm Survey Data for beef, slaughter lambs and sheep industries (<http://apps.daff.gov.au/MLA/mla.asp>)

Figure 9: Rural debt by lender in 2017



Source: Reserve Bank of Australia

Funding sources are expected to become more diverse as the Queensland beef cattle supply chain becomes an attractive investment to less traditional sources.

The Australian Farm Institute notes the changing landscape of farm businesses, particularly the noticeable shift towards the corporatisation of management and business structures aimed at attracting external investors (Heath & Tomlinson, 2016). Analysis by ABARES (Figure 10) shows that over 50% of debt is allocated to the purchase of land, and over 30% is for working capital. Such a high proportion of debt being allocated to working capital is indicative of the cash-constrained nature

of the industry, with revenue only being received intermittently through-out the year as cattle are sold. Livestock and on-farm structures collectively account for less than 5% of debt.

Land use and land title in Australia

Land tenure is a necessary consideration when using land for commercial purposes. There are a number of different types of land tenures that dictate the purpose of the land and responsibilities of the land owner. The two most common types of grazing land tenure are leasehold and freehold.

At present, 66% of rural Queensland agricultural properties are under a government lease (ABC News, 2014), requiring payment of an annual royalty to the State Government, even if the land was acquired outright from another party. Annual rents are calculated as a percentage of unimproved land value.

Leasehold occurs when leases are issued over State land for specific purposes. Lessees may only use the land for the specified purposes within the land tenure or lease. Leases can include (but are not limited to) using the land for pastoral purposes in the Northern and Western parts of the State,

grazing in more intensively farmed areas from the coastal belt to the centre of the State, or for commercial purposes.

Amendments to the Land Act 1994 in 2014 simplified the process and reduced the costs of both renewing term leases and converting both term and perpetual leases into freehold titles.

A freehold lease is issued when a landholder of a lease elects to pay the purchase price for their lease in instalments over a number of years. On the final payment, the lease is converted to freehold, in which the owner is then free to conduct any activity. For more information on leases in the context of Queensland's beef industry, please refer to the *Investment Analysis of the Queensland Beef Supply Chain*.

A majority of Queensland's leasehold tenure is pastoral holdings, accounting for 39% of the State's land area. A further 8.5% of the State is allocated as grazing homestead leases (Queensland Government Data, 2018). In these cases, the land tenure specifies a leaseholder over the land which is specified for pastoral or grazing

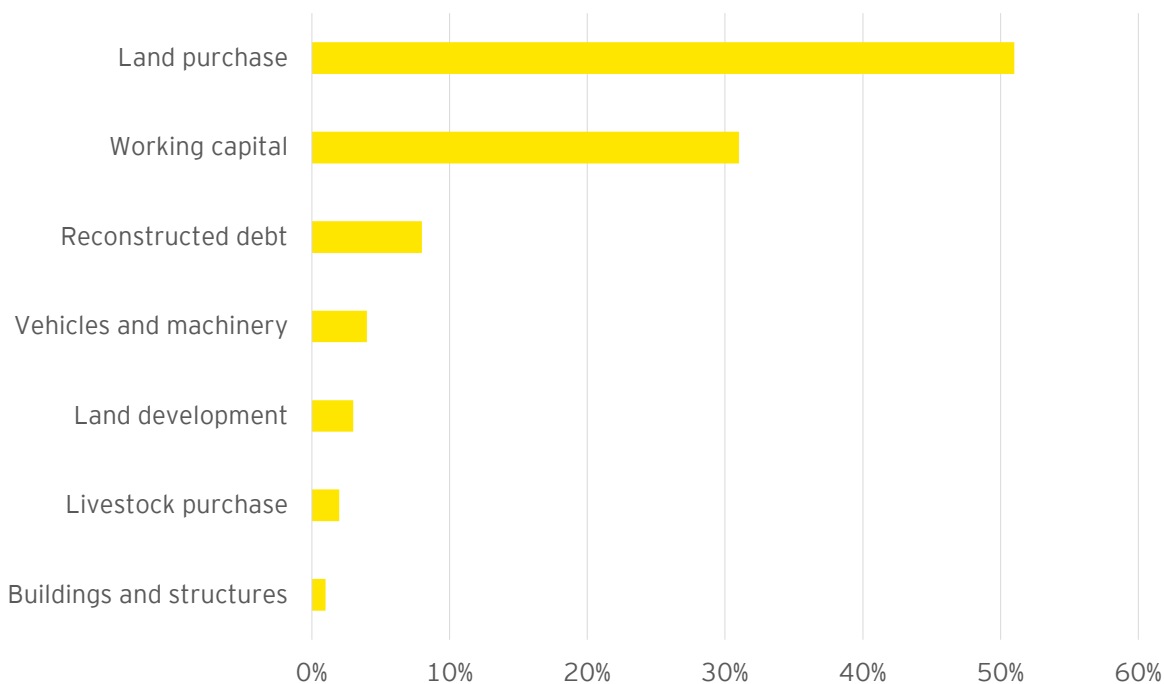
purposes.

When making a state land application, you may be required to address native title issues as a condition of offer. Land subject to native title means a group of Indigenous Traditional Owners of the land, or native title group, has made a claim to this land. Native title can be held exclusively or alongside another type of land tenure. Landholders and Indigenous Traditional Owners can negotiate mutually beneficial outcomes or appropriate arrangements as to what leaseholders can use the land for.

Investors must follow the statutory process set out in the *Native Title Act 1993* that protects the rights of native title holders and their interests in the land. Notwithstanding, native title is extinguished on freehold land or where a valid grant has been made by government.

More information on land tenure can be provided by the Queensland Government Department of Environment and Department of Natural Resources and Mines.

Figure 10: Main purpose of farm debt, beef farms, Australia 2013-14 to 2015-16



Source: ABARES, 2017, Australian Agricultural and Grazing Industries Survey



Drought

Performance drivers are strongly linked to natural factors, in particular rainfall and drought. An extended dry spell in 2014 saw 80% of Queensland drought declared. This drought and corresponding herd re-building cycle had a large impact on cattle prices.

The Beef industry is exposed to the cyclical nature of the climate, which largely influences cattle prices within Australia (Figure 11). The severity of the 2014 drought can be seen on the drought declaration maps spanning 2008 – 2018 (Figure 14). As of March 2018, 66.3% of the State remains drought declared (The Long Paddock, 2018).

This unprecedented drought period led to a substantial decrease in the Australian herd, from 29.1 million head in 2014 to 24.9 million head in 2016, marking a twenty year low in Australian herd numbers (MLA, 2018). The reduction in herd size led to market conditions in which demand for Australian cattle exceeded supply, driving record prices in 2016 (USDA, 2018). However, low herd numbers meant these high prices did not deliver correspondingly higher earnings for primary producers. Figure 12 illustrates the year

on year change in prices of herd numbers and demonstrates that cattle prices, represented by Eastern Young Cattle Indicator (EYCI) and over-the-hooks (OTH - an indicator based on processors grids), generally trends in the opposite direction to herd sizes. Since 2013, greater volatility in the EYCI (relative to both OTH and herd sizes) has meant this trend has been more pronounced. As herd size decreases, supply becomes constrained, resulting in an appreciation in cattle prices. Macro drivers such as exchange rates, consumer demands, competition in key export markets and live export prices also impact the EYCI and OTH prices.

Figure 13 compares the turn-off rate (seasonally adjusted) to EYCI and OTH indicators. Similar to Figure 12, this graph demonstrates that an increase in supply (turn-off increase) tends to lead to a price decrease both at the saleyard and at the abattoir, despite an alignment of these trends over the second half of 2017. Conversely, for a given level of demand, a decrease in the turn-off rate would be expected to result in a price increase due to restricted supply in the market.

Figure 11: The impact of drought on the beef cattle market

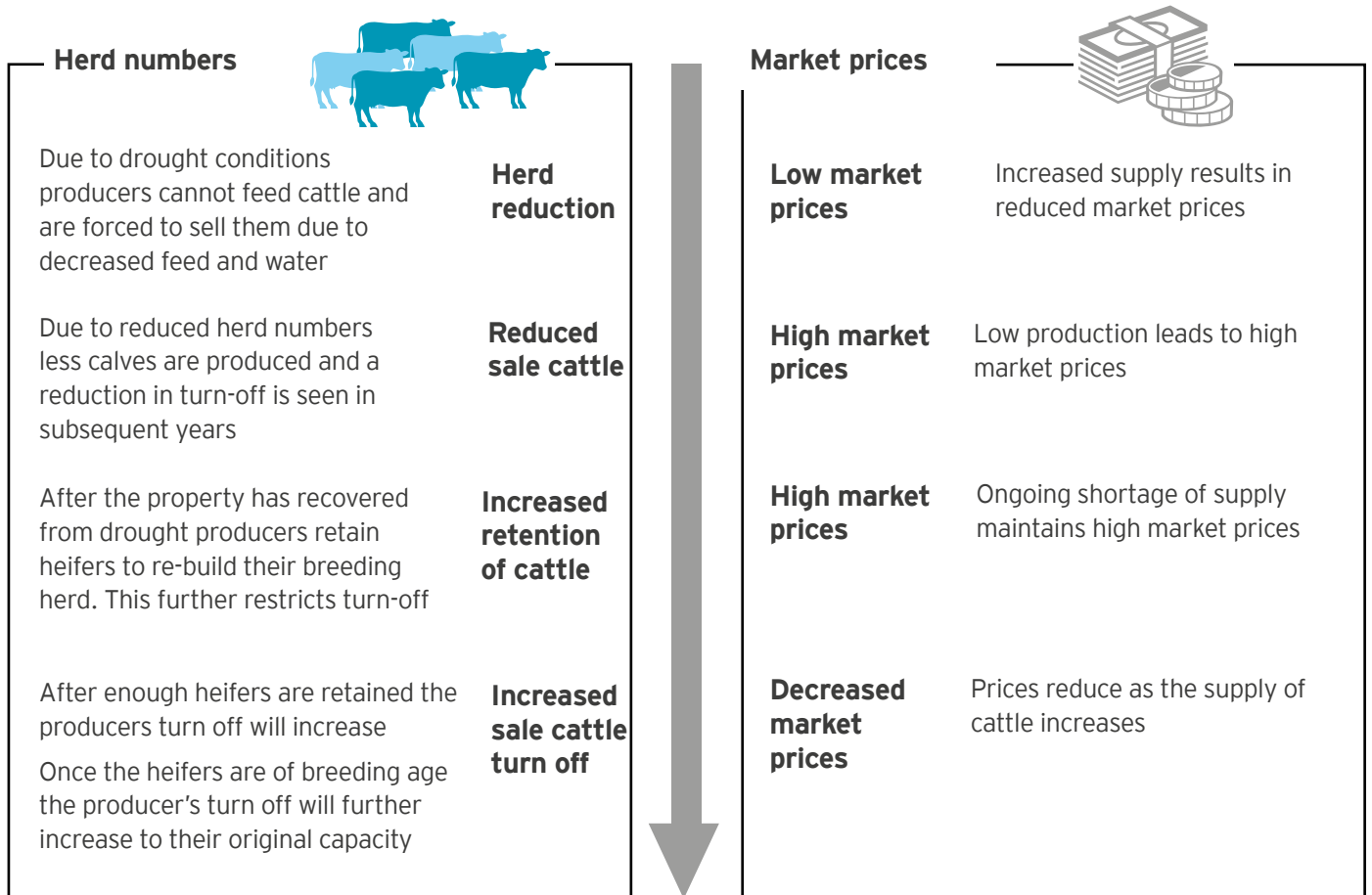
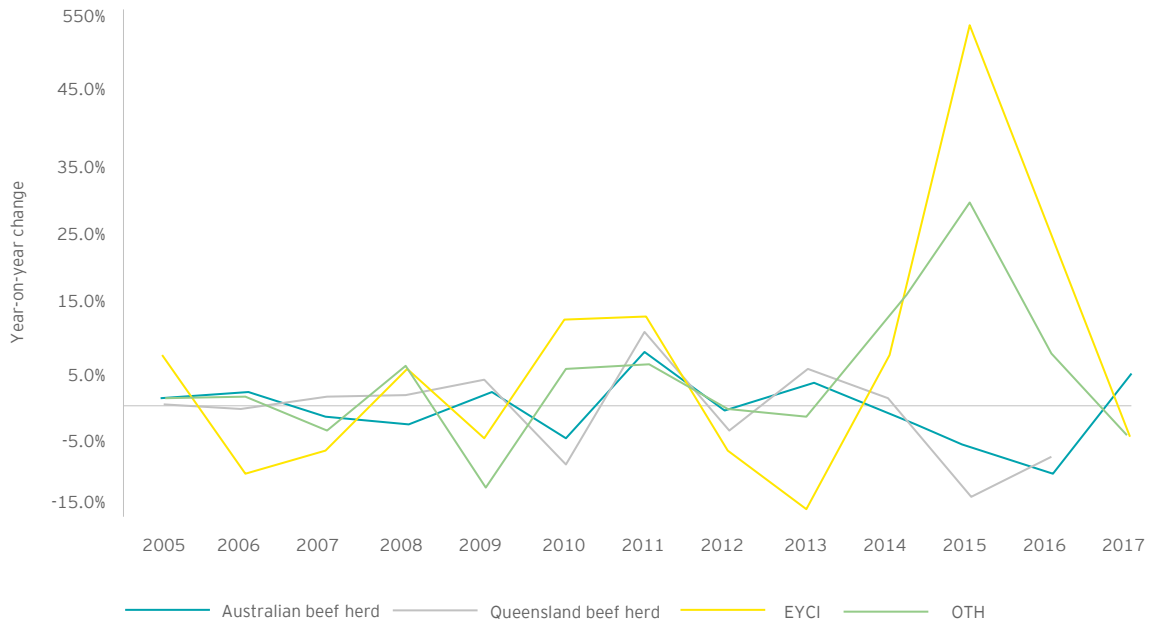
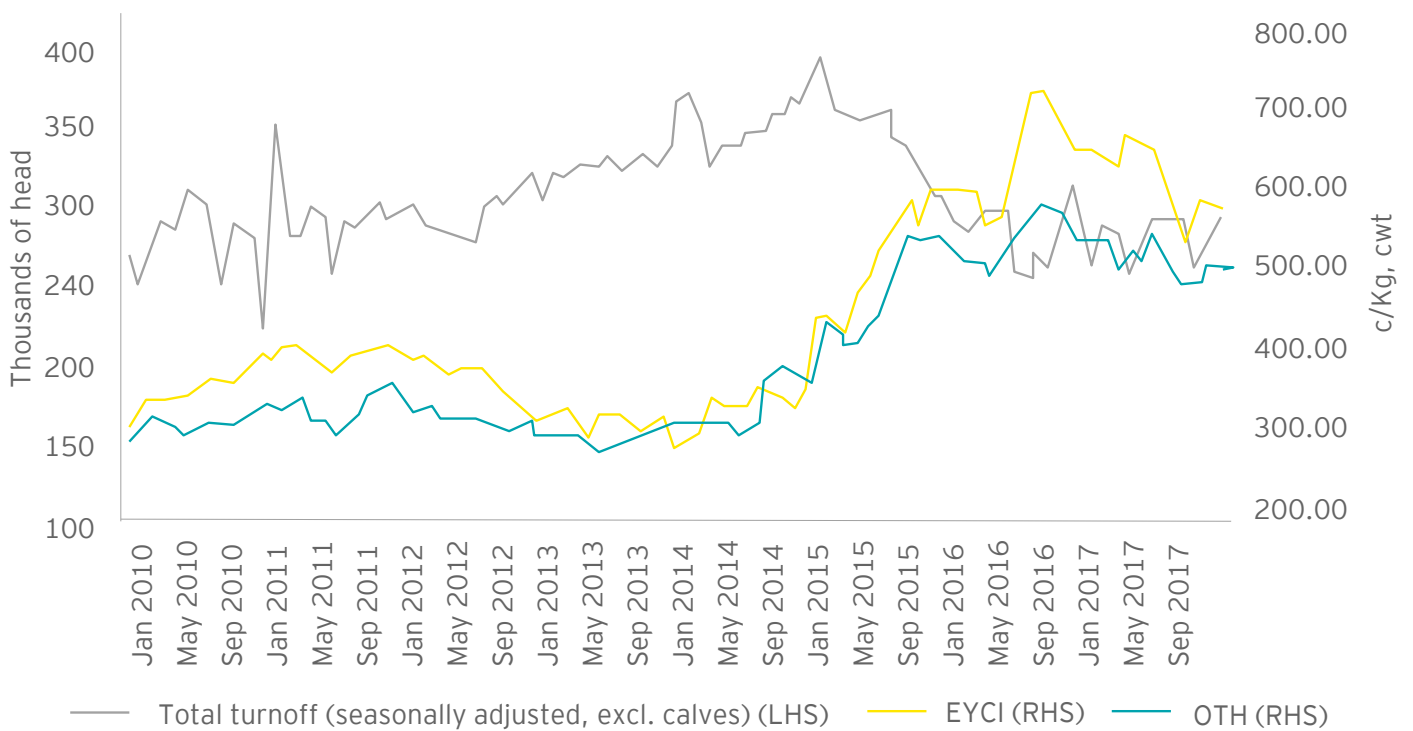


Figure 12: The Australian herd (head) and the Eastern Young Cattle Indicator (c/kg dw)



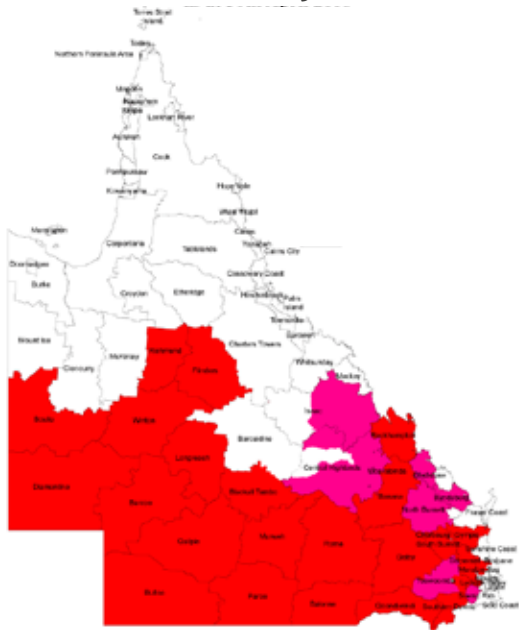
Source: ABS, 2017; MLA

Figure 13: Australian turn-off (head), the Eastern Young Cattle Indicator and OTH indicator (c/kg dw)

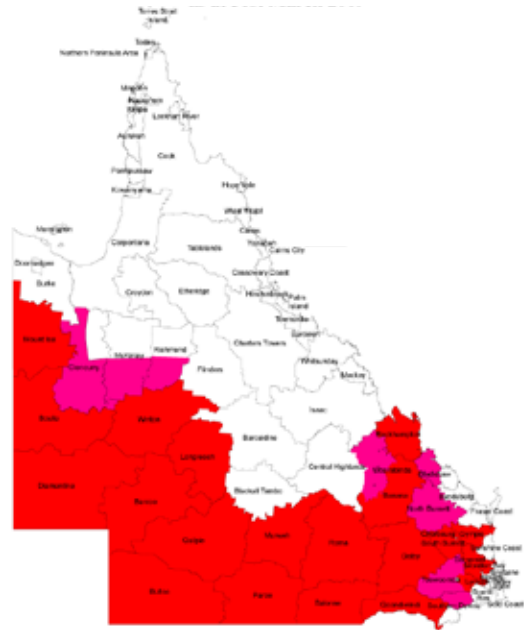


Source: MLA and ABS, 2018

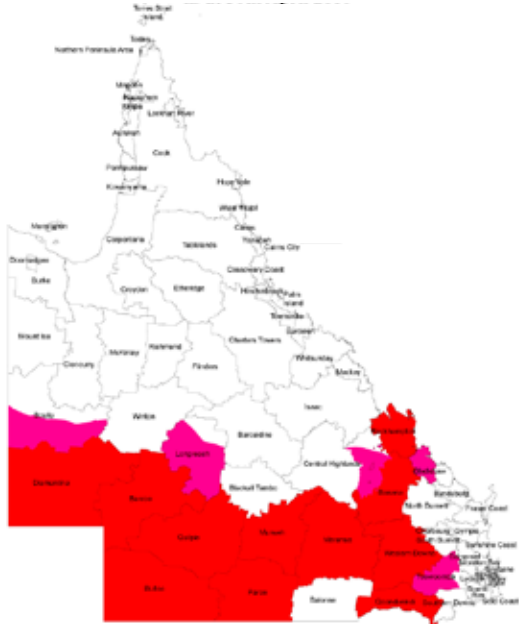
Figure 14: Queensland drought situation maps 2008-2018



30th April 2008



31st March 2009



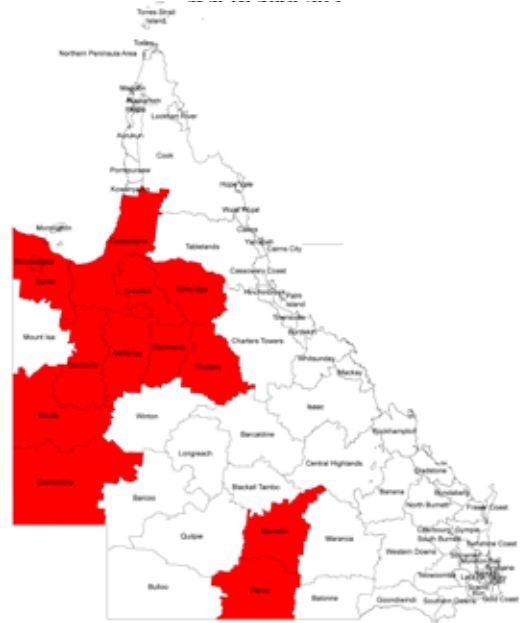
30th April 2010



31st March 2011

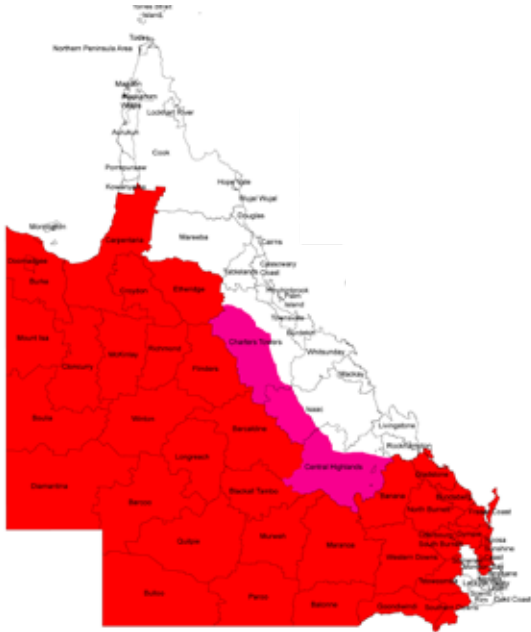


30th April 2012

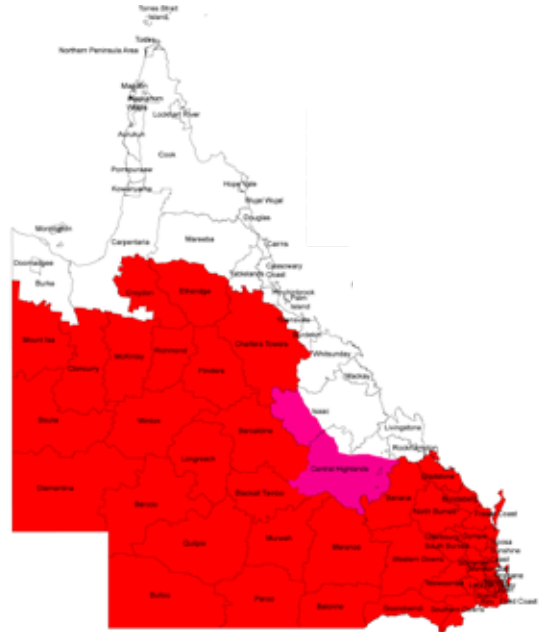


1st April 2013

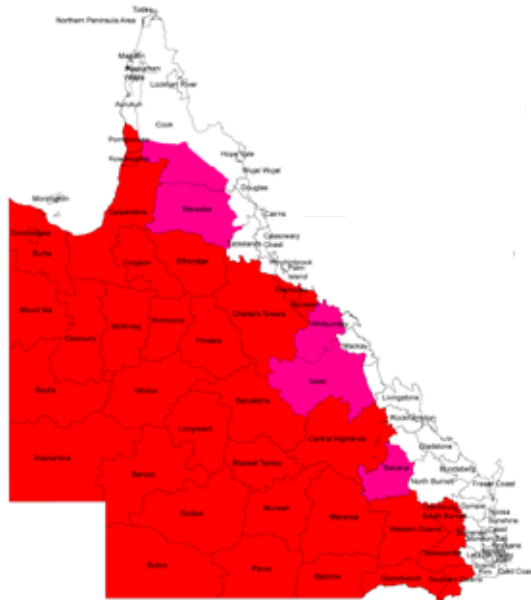
Source: The Long Paddock, 2018



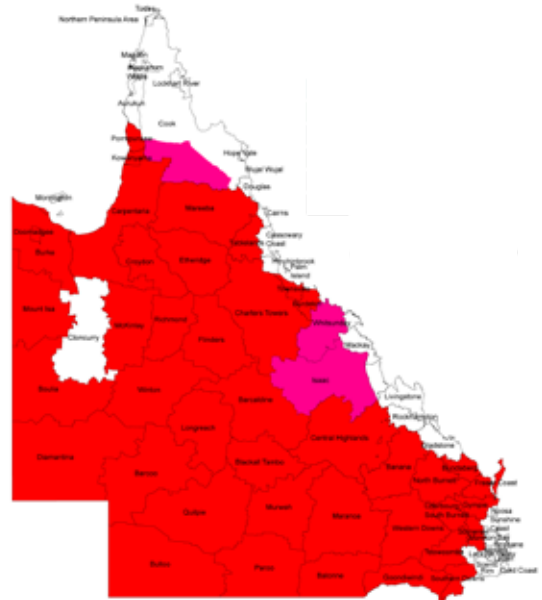
7th March 2014



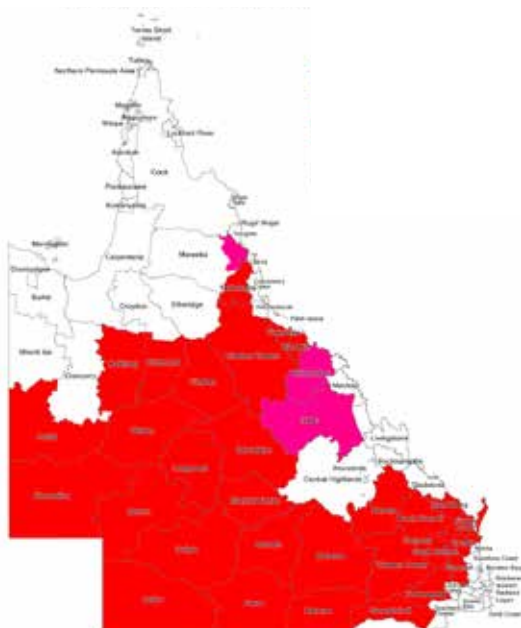
1st April 2015



1st March 2016



10th March 2017



Update 25th May 2017 last reviewed 6th March 2018



(IDPs = Individually Droughted Properties)

Source: The Long Paddock, 2018

Live export industry

The health of the live export trade is also an essential component of the Queensland beef industry's performance.

Australia's live export program has grown steadily, expanding at an annualised 2.2% between 2001 and 2016 (Figure 15), as market access improved on the back of new Free Trade Agreements (FTA) and Australia's burgeoning reputation for beef quality and safety. Australia's live exports are regulated through the Australian Standards for the Export of Livestock (ASEL) and the Exporter Supply Chain Assurance Scheme (ESCAS) (Safe food Queensland). Although the trade has continued to grow, it is exposed to volatility relating to both domestic industry challenges as well as potential international political issues.

Live export volumes collapsed 24.1% year-on-year in 2017, as the ending drought and ongoing herd rebuild limited cattle availability, as reflected by

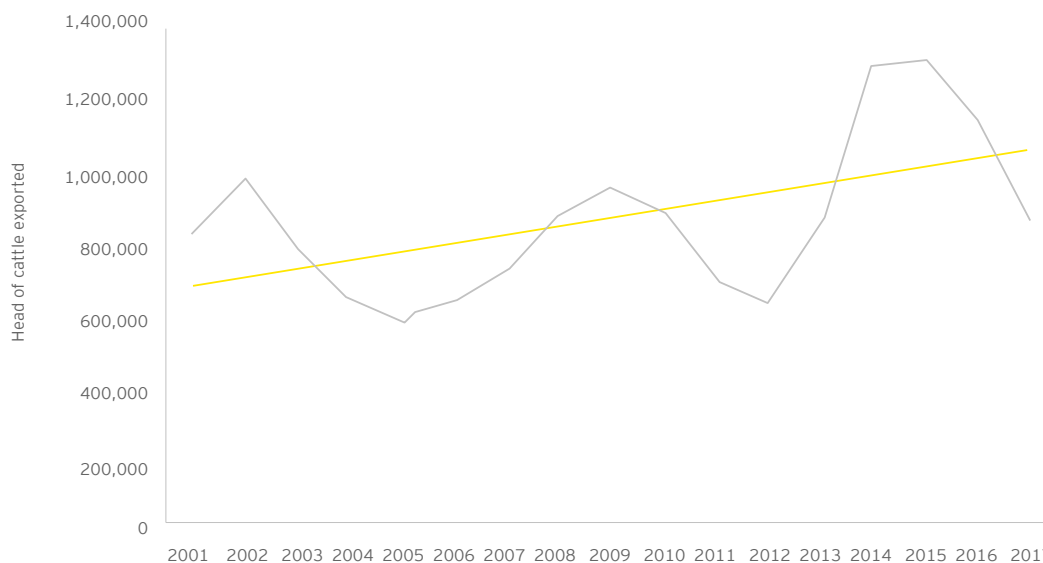
surging EYCI and OTH prices, higher export prices, and declining turnoff rates.

Major dips in volume in 2005 and 2011-12 were attributable to international factors. Export volumes receded significantly from 2004-06, as major trade partners in Southeast Asia and the Middle East substituted Australia's higher quality, higher price beef for lower cost alternatives amid ongoing domestic economic struggles (Livecorp, 2006). The subsequent rebound from 2005-10 was propelled by continued demand growth from Indonesia, as well as strengthened trade relationships with China and Vietnam.

The dip from 2011-13 was a result of the short-lived, federally-imposed ban on live exports to Indonesia, the largest destination for Australian cattle.

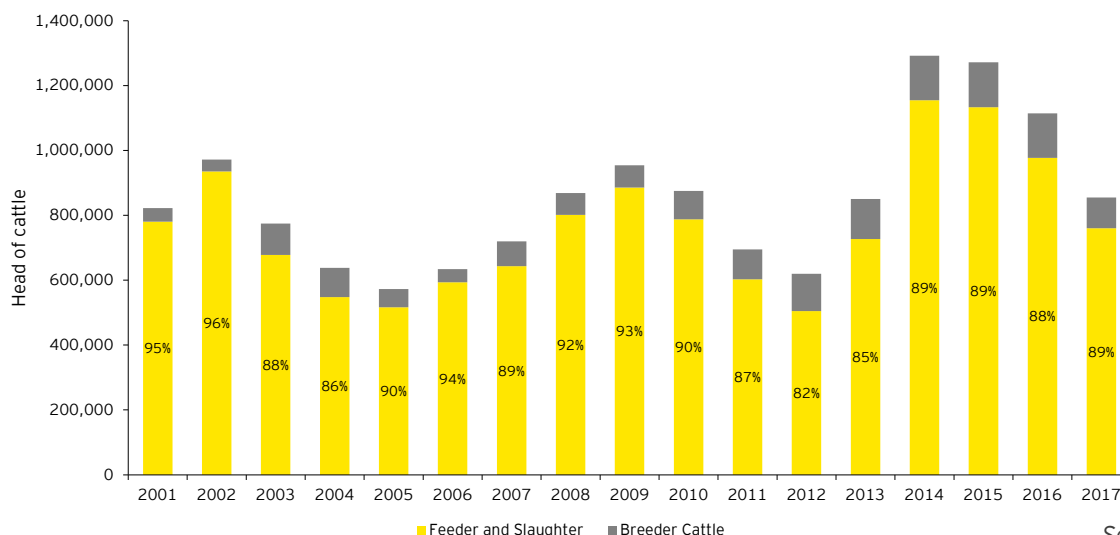
Feeder and slaughter cattle comprise the majority of live exports, averaging 89.5% between 2001 and 2017 (Figure 16). China is the largest market for breeder cattle, accounting for 60% of exports in 2017. However, Indonesian breeder imports have

Figure 15: Australian live export volumes, 2001-17



Source: MLA

Figure 16: Live cattle exports by type, 2001-17



Source: DAWR

surged in recent years as its government seeks to improve the resilience and self-sufficiency of the domestic herd (Sydney Morning Herald, 2017). Whilst exports of breeder cattle may adversely impact live exporters over the longer term, they command a significant premium to feeder and slaughter cattle in the short-term. Breeder cattle represented an average 24.8% of live exports by value over the seven years to 2017, despite accounting for an average 11.9% of volume.

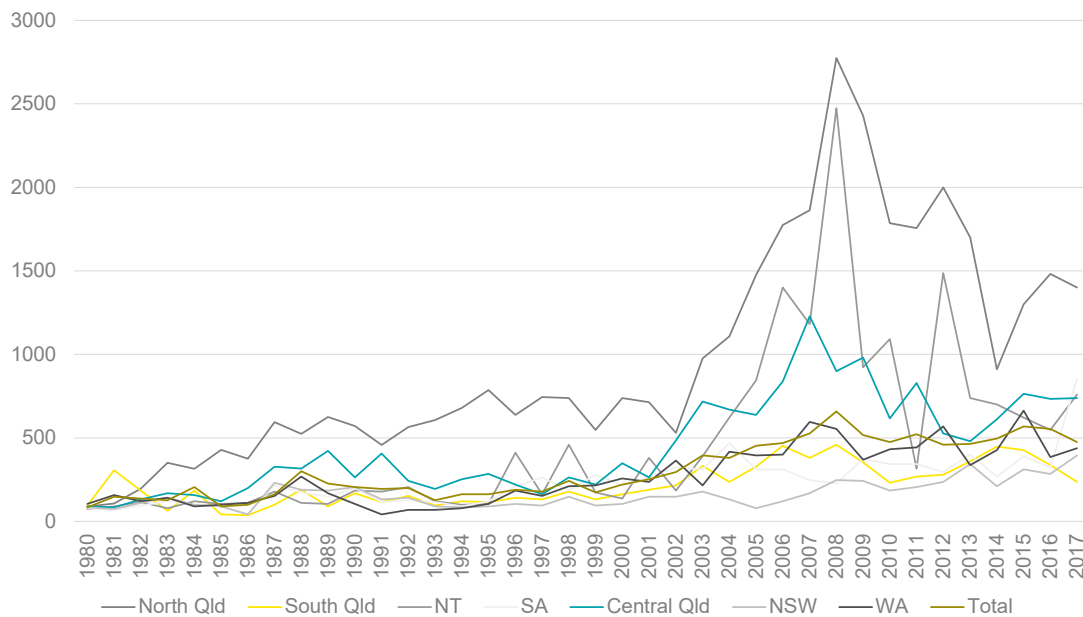
More than one quarter (25.2%) of live cattle exports originated in Queensland in 2017, with the Port of Townsville being Australia's second-busiest export terminal. However, many cattle from north-west Queensland are exported through Darwin, somewhat understating the contribution of Queensland's export-focused producers.

Smaller land parcels generally correlate with higher productivity, and therefore demand a higher land value. Herron Todd White's Australian Grazing Property Index (Figure 17 and 18) illustrates that North Queensland has experienced the strongest growth in property values over the reporting period. This is likely due to the growth in live exports, investment in productivity boosting on-farm infrastructure, strong commodity prices and expectations of further growth (AFR, 2017). As illustrated below valuations reduced over the last decade (relative to the decade prior) due to the impacts of drought conditions, volatility in live export volumes and the end of the commodities super-cycle reducing demand for grazing land from resources companies. The greater exposure of northern regions to these factors is evidenced by the higher volatility in North Queensland and Northern Territory valuations. Improved land valuations are not always welcomed due to resulting increases in leases and council rates.

Land Prices

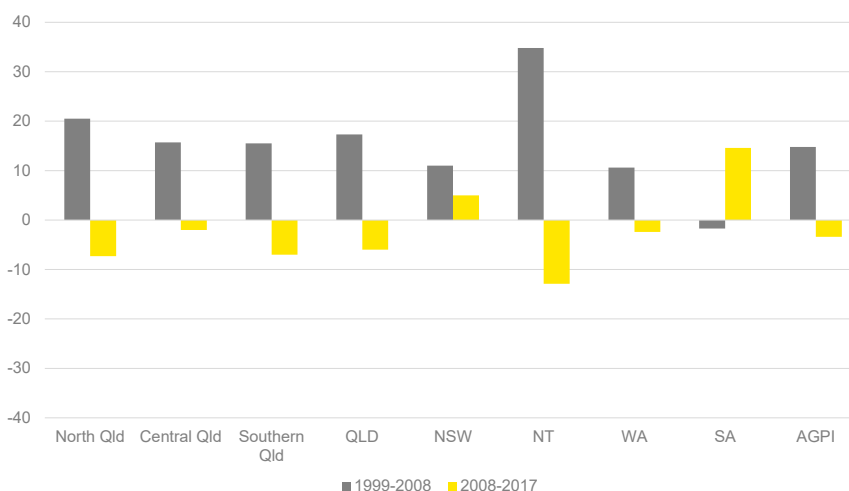
Land prices are tied to the size and location of the property.

Figure 17: Australian Grazing Property Indexes (\$ per hectare)



Source: Herron Todd White

Figure 18: Growth (% p.a.) in Australian Grazing Properties (\$ per hectare)



Source: Herron Todd White

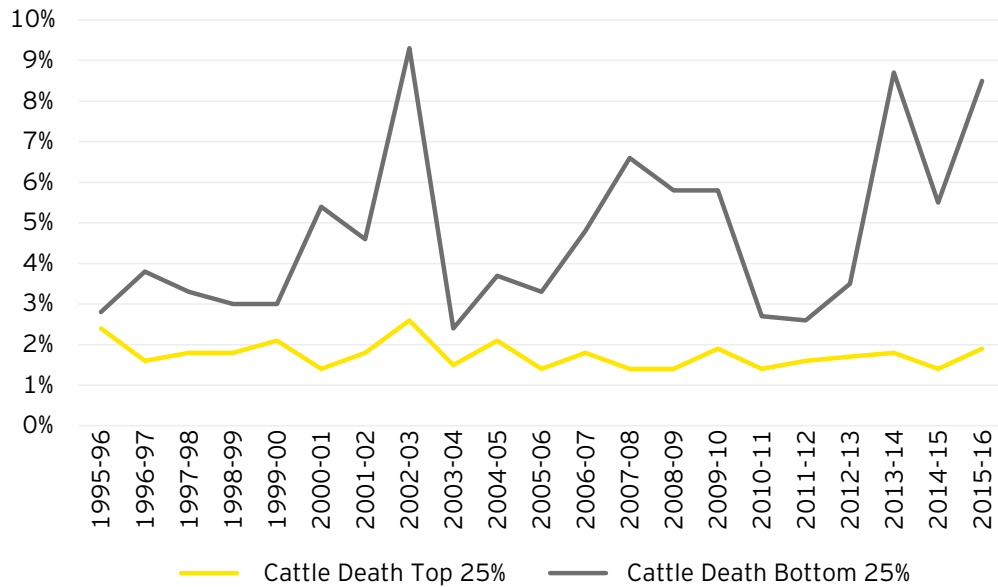
Performance of breeding operations

Cattle mortality rates and calving rates act as indicators of breeding performance. Figure 19 shows a comparison between the top and lowest 25% performing operators in terms of rate of return on the proportion of cattle deaths of the total herd each year, with the bottom 25% exhibiting a higher and more volatile cattle death rate.

Calving rates are thought to be an indicator of fertility and breeding performance. Figure 20 illustrates, whilst the top performing operators have a steady calving rate, there is significant volatility amongst the lower 25%. The relative

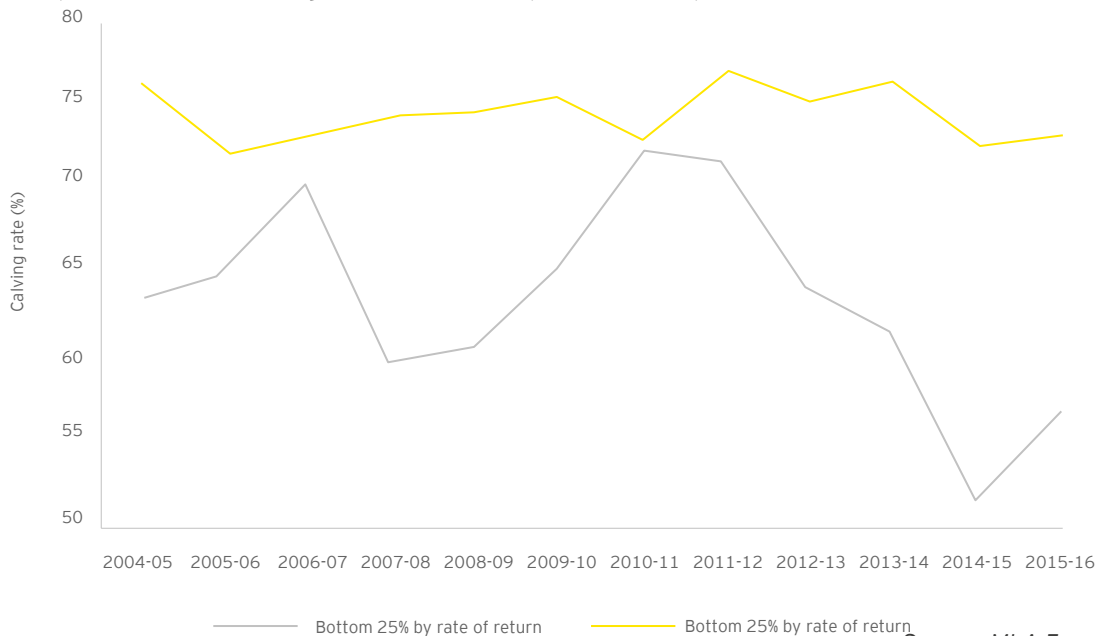
volatility in both mortality and branding rates for the lower performers indicates that there is more that can be done to improve breeding performance and outcomes for the herd as a whole. The farms with higher branding and lower mortality rates tended to be those with larger herds, better resources and better financial performance, with higher proportions of income earned on-farm. This suggests that larger properties are likely to see better breeding performance than smaller properties. Lower productivity of bulls in northern herds is also thought to be a contributor to the performance gap (MLA, 1994). This is thought to be a result of both reproductive tract abnormalities and social issues within the context of herd behaviour.

Figure 19: Cattle deaths as a proportion of total herd comparison



Source: MLA Farm Survey Data

Figure 20: Comparison of branding rates across top and lower performers



Source: MLA Farm Survey Data



Case Studies

These case studies examine the supply chain strategies of a cross section of Queensland beef producers, highlighting some of the steps taken to boost both quality and productivity of their herds and define a point of differentiation for their products.

S. Kidman & Co

S. Kidman & Co Pty Ltd (Kidman) is one of Australia's largest beef producers with a herd of 171,000 cattle. The company has pastoral leases covering approximately 80,000 square kilometres in three states and the Northern Territory. Gina Rinehart acquired Kidman in 2016 for \$386.5 million in partnership with Shanghai CRED Real Estate Stock, which holds about one third of the unit (The West, 2018).

Kidman cattle stations produce grassfed beef for export to Japan, the USA and South East Asia. The company has begun its transition from traditional 'cattle producer' to 'vertically-integrated branded-beef producer', putting some early foundations in place to build consumer brand programs for export and domestic markets (Beef Central, 2018).

Kidman has gone into business with Willalooka Basin Beef Genetics to produce lighter cattle, better suited to tough Northern conditions with improved carcass attributes (Kidman, 2018).

Kidman through Hancock Agriculture has launched the 2GR premium Wagyu brand. The full blood Wagyu cattle are produced in Dubbo NSW and processed at John Dee plant near Warwick in Queensland. This first consignment of 2GR frozen boxed beef was exported to China in 2017 (The West Australian, 2017).

NAPCO

The North Australian Pastoral Company (NAPCO) is one of Australia's largest privately owned cattle companies, commencing operations in 1877. NAPCO currently manages 6.1 million hectares of grazing country, in both Queensland and the Northern Territory. The company was purchased by the Queensland Investment Corporation, owned by the state government in 2016 (Australian Financial Review, 2016).

NAPCO grazing operations are integrated with its Wainui Feedlot and Farm on the Darling Downs. It can feed approximately 18,000 head of cattle at any time on 5,000 acres (NAPCO, 2018).

NAPCO's vertical integration strategy has allowed it to oversee and control its cattle through all phases of production, ensuring high quality, to-specification beef is produced for both domestic and export chilled beef markets (NAPCO, 2018).

NAPCO has two composite breeds which are the final result of a breeding program which is acknowledged as the largest program of its type in the world (NAPCO, 2018).

NAPCO's vertical integration allows it to optimise the flow of cattle through its supply chain, minimising waste and maximising profit at each stage of production. Combining this vertical integration with its own bespoke composite breeds, bred specifically for its operating environment, NAPCO will be driving the efficiency and effectiveness of its operations.

OBE Organic

OBE Organic produces organic beef and is Australia's first and only premium meat exporter 100% dedicated to the production of organic beef.

OBE Organic was established in 1996 and is comprised of 30 pastoralists in a co-operative aimed at maximising returns to family farmers.

The beef is chemical, pollutant and hormone free. The predominantly Hereford cattle free roam across more than 7 million hectares of certified organic grasslands.

The cattle feed on over 250 species of seasonal native grasses and plants (OBE, 2018). OBE pursue a premium market for its high quality organic beef.

Stanbroke

Stanbroke operates eight cattle stations in Northern Queensland, which encompass over 1.6 million hectares of prime grazing country. The company also manages 46 properties in Southern Queensland, which are used to background cattle and prepare them for entry into the feedlot

(Stanbroke, 2018).

The company is vertically integrated with a feedlot in Chinchilla and a processing plant in the Lockyer Valley.

Stanbroke has a long tradition of beef production and selects the best breeds of cattle for their beef range, rear them on pastures and apply strict nutritional programs, whilst controlling the end-to-end aspect of the production process. In recent years the company has diversified its grainfed operations to include a large Wagyu program (Stanbroke, 2018).

Stanbroke processes much of its herd at its Grantham abattoir, with output destined for export markets. The success of Stanbroke's bespoke Wagyu brand demonstrates the value of vertical integration for premium producers.

Stanbroke produce five branded products, including its organic brand Diamantina.

Stanbroke's complete vertical integration from breeding to processing allows it the benefit of full traceability and control which should translate in a high level of product consistency, critical to brand value and success.



Feedlotting

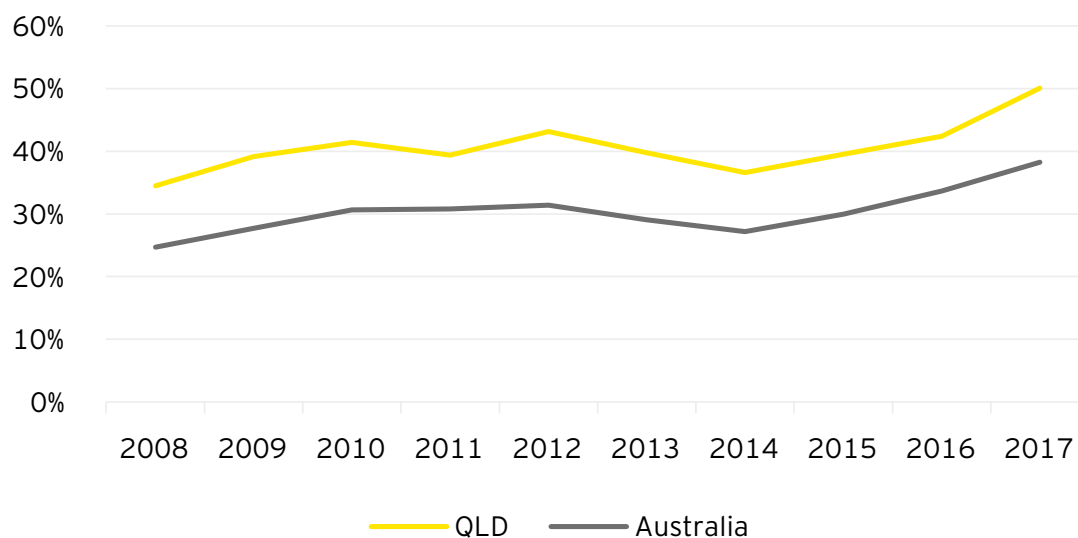
Feedlotting is a common step in the Queensland Beef Supply Chain. Queensland has a dry climate, with naturally lower quality pastures than other States.

Overview of feedlotting

Feedlotting is a common step in the Queensland Beef Supply Chain. Queensland has a dry climate, with naturally lower quality pastures than other States. This makes the feedlot industry an essential component for finishing cattle to a standard acceptable to the market. As a result, Queensland producers are well versed in feedlotting. The National Feedlot Accreditation Scheme (NFAS) covers grainfed beef for all Australian domestic and export markets (Safe food Queensland).

A substantial proportion of Queensland's cattle are finished in a feedlot. Grains fed are high in sugar and fat allowing cattle to gain weight quickly prior to being processed. Queensland consistently has a higher portion of grain fed cattle. In 2017, the portion of grainfed cattle in Queensland was 50% compared to the national average of approximately 39%, (Figure 21). Grain feeding cattle aims to increase the tenderness, consistency and quality of the meat, and often services higher value export markets. Approximately 27% of Queensland beef exports are grainfed. The number of days on feed is a key contributor to meat quality.

Figure 21: Percent of grainfed turn-off



Source: ABS and ALFA/MLA Feedlot Surveys

Feedlots can smooth cattle supply, ensuring grainfed cattle can be brought to market year round. Although not immune from the impacts of drought, feedlots are slightly more robust in facing weather events that may otherwise impact grass production. Despite the size of Queensland's feedlotting industry, the state still produces more grassfed cattle than grainfed. Over a five-year period to 2017, Queensland averaged 59% of grassfed turn off, compared to 41% grainfed (ABS

and ALFA/MLA Feedlot Surveys, 2017).

Due to the high volumes of grain required to operate feedlots, they tend to be located close to grain producing regions with ready access to cattle. Geographically, feedlots are located slightly inland. In comparison beef processors are mainly located on the coastline close to markets and ready supplies of labour and water. Figure 22 illustrates the location of Queensland's feedlots (over 10,000 head capacity).

Figure 22: Feedlots with over 10,000 head capacity throughout Queensland



Source: DAF

Feedlots are either run as standalone businesses or as part of vertically integrated operations that include meat processors or primary producers.

It is becoming more common for feedlots to act as a complementary activity for processors.

Feedlots can assist meat processors to have a consistent supply of cattle which can enable their success. For example, JBS Australia is the largest meat processor in Australia and operates five feedlots in total, two of which are integrated feedlot and process plants. This reduces transport costs and simplifies logistics.

Grainfed beef is the mainstay for Australian domestic consumption. However, there is an emerging trend toward grassfed beef as a result of shifting consumer preferences. Demand for grassfed beef has not dented demand for grainfed beef. With Australian grainfed beef highly sought after in export markets for its premium characteristics, such as its marbling, the focus is likely to remain on grainfed produce for domestic and international consumption.

Global demand for Australian grassfed cattle is high by comparison. Amongst Australian exports to the United States, 97% of cattle are grassfed, compared with approximately 73% of cattle exported by Australia's other main trading partners (MLA, 2018, Global Snapshot Beef). The United States' market is unable to meet local demand for grassfed cattle, and therefore Australia helps address the gap. The US is similarly constrained in available land for grass finished cattle. Grassfed Australian exports to the US comprised 11% of Australia's total beef production volume in 2017.

Consumer preference for grainfed beef has increased, especially in growing Asian markets.

Table 4 illustrates the proportional breakdown of Queensland's grassfed and grainfed exports by export destination in 2017 and as a five year average over 2012 to 2016.

Overall, 2017 saw an increase in the portion of grainfed beef exported. Although grainfed demand from North America dropped, there was a significant increase in grainfed beef exported to Asia markets. 2017 represented a total combined increase of 41,044 tonnes shipped to selected

export destinations compared to the previous five year average, or 18% (MLA, 2018, Global Market Snapshot Beef).

China, Indonesia and South East Asia were some of the largest Asia markets for grainfed Australian beef, a large portion of which is supplied by Queensland. These three Asia markets are expected to increase their beef consumption by an average 0.15 million tonnes cwt from 2017 to 2021. This increase coincides with an increase in population and household earnings in each of these markets (MLA, 2018, Global Market Snapshot Beef).

The Australian Beef Cattle Feedlot industry has experienced 11.2% annual growth from 2012 to 2017.

Over 2012-2017, revenue has grown from approximately \$2.7 billion to \$4.6 billion. Despite this strong annualised growth, this period included two years of negative revenue growth (IBISWorld, A0143).

There are numerous factors impacting the growth of feedlots, including revenue volatility, and external drivers such as grain prices, drought, the domestic price for beef, and the domestic price of feeder cattle.

The financial viability of feedlots is heavily influenced by the price of grain, given it is the main component of the feed ration and represents a substantial input cost for the industry. High prices for coarse grains can negatively affect feedlot profit margins. Feedlots manage their exposure to grain price volatility through contract and spot purchasing.

Weather conditions tend to most heavily impact feeder cattle availability, but it can also impact the supply of grain. When weather and rainfall are unfavourable, backgrounders tend to increase the number of cattle sent to feedlots. This is often due to the cattle being unable to be finished to market specification on pasture. Sustained poor weather can also impact the supply of grain for feed. Conversely favourable weather conditions can reduce feeder cattle availability and hence the demand for feedlots.

An increase in beef prices tends to reflect an increase in earnings-per-head of cattle for feedlots. Over the 2012 to 2017 period, domestic prices for beef increased from an index of number 100 to 130, and they are projected to rise to 135 in the next five year period ending 2022 (IBISWorld, A0143).

The price of feeder cattle represents the largest industry cost, accounting for approximately 60%.

This price is related to the supply of feeder cattle, from background operations. Over the 2012 to 2017 period, the domestic per head price of feeder cattle increased from approximately \$A750 to \$A1,100, and is projected to rise to \$A1,175 in the next five year period ending 2022 (IBISWorld, A0143).

Table 4: Proportional breakdown of grassfed and grainfed beef exports in Queensland

Tonnes shipped	2017		5 yr Avg (2012-2016)		Percentage change in 2017 vs. 5 year average tonnes shipped
	Grassfed	Grainfed	Grassfed	Grainfed	Grainfed
North America	227,158	6,954	289,916	8,617	-19%
Japan	150,308	142,057	160,169	127,964	+11%
Korea	94,987	53,564	113,946	39,590	+35%
China	83,544	26,515	94,330	16,588	+60%
Taiwan	28,687	2,423	32,064	2,383	+2%
Indonesia	48,517	1,181	43,343	750	+57%
South East Asia (exc. Indonesia)	48,989	12,532	52,494	8,330	+50%
European Union	3,977	13,897	7,485	13,271	+5%
Middle East and North Africa	21,761	7,459	38,835	8,045	-7%
Combined	707,928	266,582	832,582	225,538	+18%
Portion of Total	73%	27%	79%	21%	+6%
Australian Production	2,149,077		2,355,623		
Estimated Beef Production	1,327,653	821,424	1,643,117	712,506	+15%
% of Beef Exported to main trading partners	33%	12%	35%	10%	+2%

Source: MLA Global Market Snapshot Beef January 2018 (export types by destination); ABS cat 7218.0.55.001 – Livestock and Meat, Australia (Australian Beef and Veal Production)

Note: Estimated beef production recalculated using % of cattle turn-off from ABS and ALFA/MLA Surveys (provided above) – 2017 % of grainfed turn-off used was 38% and 5yr average was 32%

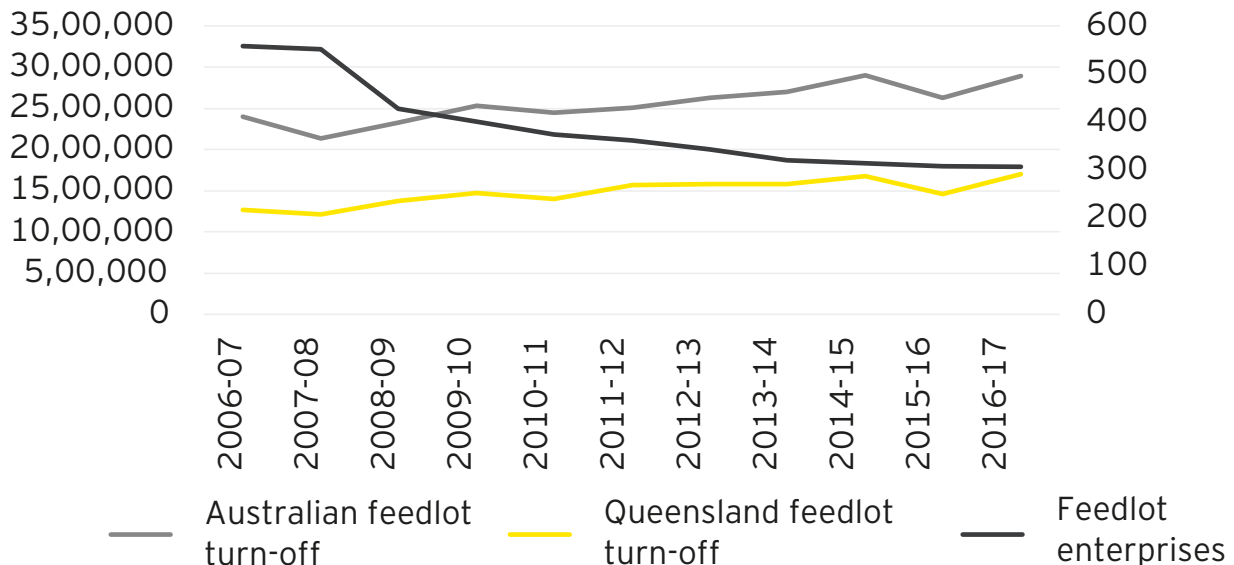
The trading partners above are the main partners, and does not include all beef exports.

Success factors and key metrics

Figure 23 demonstrates the consolidation that has taken place within the feedlot industry, with the number of enterprises decreasing by 24% over a 10 year period while feedlot turn-off over the same period has increased. This indicates the benefits gained from economies of scale.

There are numerous influences impacting the financial performance of feedlots including upstream factors such as grain prices, drought, and the domestic price of feeder cattle and downstream factors such as the demand for grainfed beef and the domestic price for beef and other substitute products such as chicken, lamb and pork.

Figure 23: The number of feedlot enterprises against the yearly Australian and Queensland feedlot turn-off (head)



Source: Yearly (as of December) turn-off – ALFA; Number of feedlot enterprises – IBISWorld

Key success factors for feedlotting



Financial Performance

- ▶ Rate of return
- ▶ Volatility in returns



Exposure to Volatility

- ▶ Cost of cattle
- ▶ Cost of grain
- ▶ Beef prices



Regulatory Compliance

Regulatory compliance measures for example animal welfare and drainage water management



Feeding Performance

- ▶ Daily weight gain
- ▶ Live weight gain (Final bodyweight minus Initial bodyweight)
- ▶ Fat Score (processor level)



Location

- ▶ Proximity to upstream and downstream operators
- ▶ Access to water sources

Table 5: Feedlot utilisation at December 2017

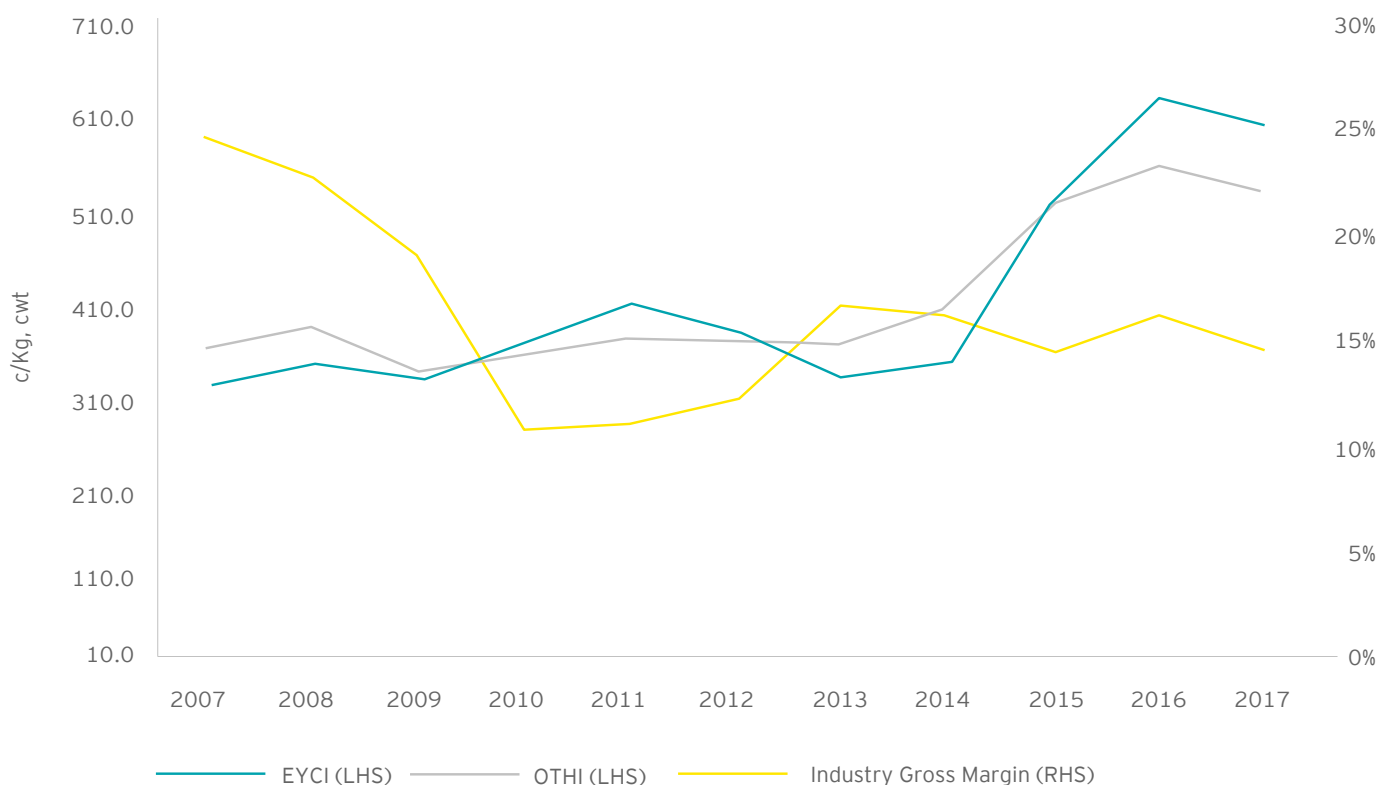
State	Cattle on feed (Dec 17)	Total capacity	Capacity utilisation
QLD	518,749	709,999	73%
NSW	317,414	394,863	80%
VIC	65,761	73,552	89%
SA	20,959	40,937	51%
WA	50,293	74,272	68%
Australian total	973,176	1,293,623	75%

Source: Australian Lot Feeders' Association

Table 5 illustrates feedlot utilisation per Australian State. It also illustrates cattle on feed and feedlot capacity per State. Queensland has the third highest rate of feedlot utilisation at 79%, behind Victoria (84%) and New South Wales (81%). Queensland's feedlot utilisation is aligned with that of Australia's and is indicative of Queensland's

contribution to the national total. Full utilisation may optimise the fixed assets of a feedlot but over the medium to long term the lack of capacity redundancy will create risks and inefficiencies in terms of flexibility and changes to operating procedures and as such will quickly offset any marginal fixed cost savings.

Figure 24: EYCI, OTH and Industry Value Added (IVA) (profit including wages and depreciation) as a gross margin



Source: IBISWorld, MLA

Figure 24 plots gross margin calculated as Industry Value Added (profit including wages and depreciation)/ Industry Revenue) against movements in the EYCI and OTH indicators. Whilst there has been less volatility in gross margins

relative to the EYCI, it demonstrates that feedlots generally record better financial performances when saleyard and processor cattle prices are lower.

Beef Processing

Image: AMPC

The beef processing industry contributed \$A20.2b to the Australian economy in FY17 - Exports made up \$A11.8b of this revenue (IBISWorld, C1111).

Overview of beef processing

The beef processing industry contributed \$20.2b to the Australian economy in FY17. Exports made up \$11.8b of revenue in 2017 (IBISWorld, C1111), with approximately 47.6% of output by volume exported. The United States was Australia's largest market for processed beef, accounting for 20.1% of total exports.

Queensland is the largest beef processing State in Australia producing almost 50% of all processed beef. The scale of beef processing in Queensland is illustrated in Table 6. Queensland is the only State with a 'proportion of volume produced' higher than its 'proportion of total processors'. This illustrates that Queensland's processors are each producing on average more beef than the processors in the other states.

Table 6: The Australian processing industry (2017)

State	Tonnes produced	Portion of volume produced	Portion of processors
QLD	1,024,835	49.5%	31%
NSW	450,383	21.8%	27%
Vic	331,038	16.0%	23%
SA	106,423	5.1%	7%
WA	102,801	5.0%	9%
Others	53,134	2.6%	3%
Australian total	2,068,614	100%	100%

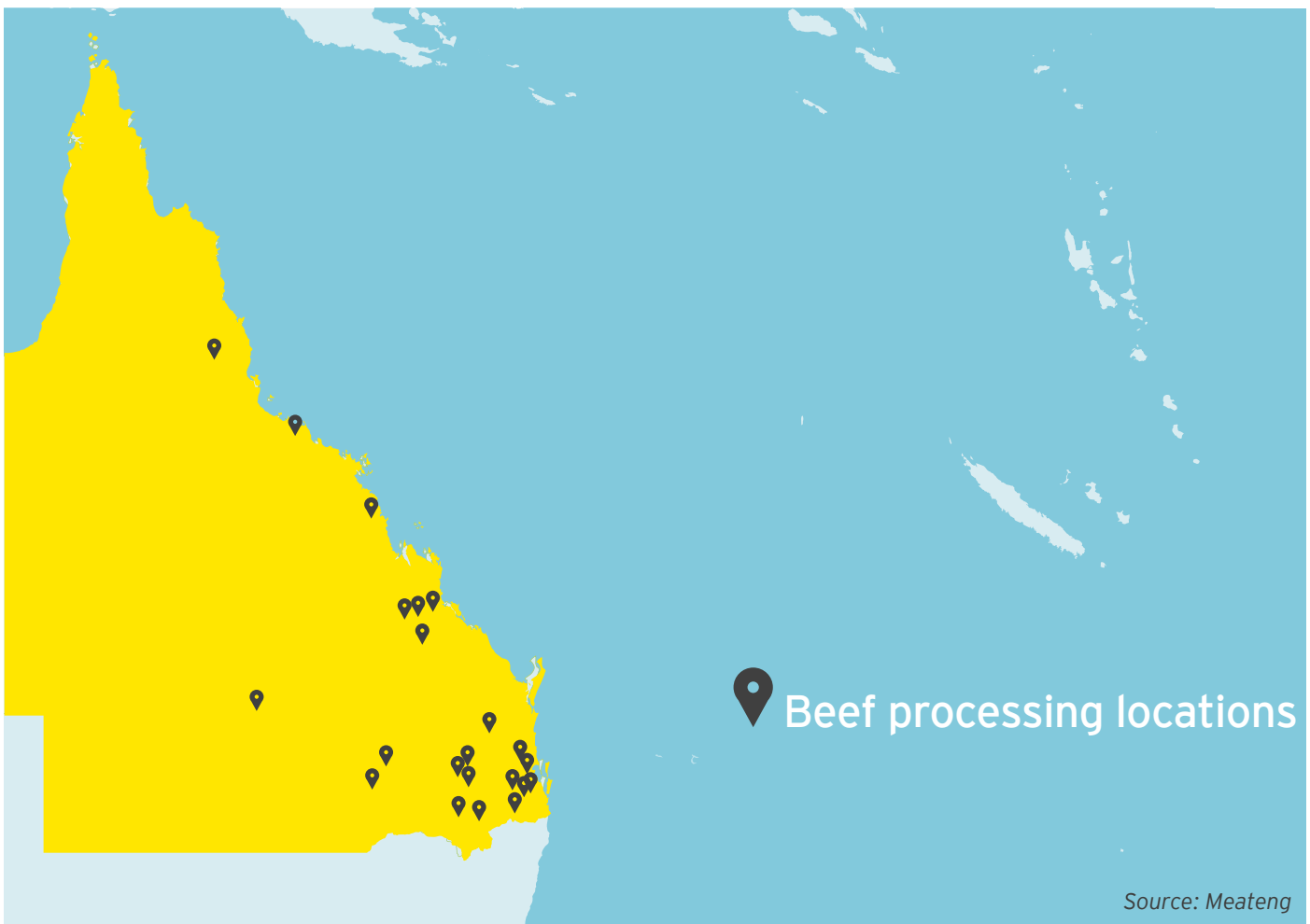
Source (Production FY16-17): ABS Cat 7218.0.55.001 Source (Producers FY1718): IBISWorld report C1111

There are currently 38 facilities processing exclusively for the domestic market and 16 export approved facilities supplying both domestic and export markets. All processing plants are required to be approved with the relevant State Food Regulator, and in addition plants intending to export require certification for country specific exports and must be certified by Biosecurity Australia (Safe food Queensland).

Queensland's beef processing facilities are predominately located in the South East coastal

area, with a handful on the Northern coast, as illustrated in Figure 25. Processors are generally located close to large populations and regional cities, which supply the required labour force for processing operations. South East Queensland processing plants are also located in proximity to the Port of Brisbane, Australia's busiest terminal for beef exports.

Figure 25: Map of Queensland processing facilities



In 2012 the Queensland Government commissioned a study into the viability of new beef processing plants in specific regions in Queensland. In 2017, a further complementary study was commissioned by the Department of Agriculture and Fisheries to include the entire state. This study (completed by Meateng, design and project management engineers in the meat processing sector) assessed a number of potential locations throughout Queensland for new beef processing facilities. The analysis focused on the most viable areas of Roma, Goondiwindi and Emerald, all of which are located further inland

than the State's existing processing plants. The study concluded that, given the forecast future demand of beef, it is more cost effective to expand current processing facilities than to create a processing facility in a new location. It was found there was currently no shortage of processing capacity in the Queensland beef cattle industry, however it is arguable that some of the processing capacity is too distant from production areas (Meateng, 2018).

Structure of processing sector

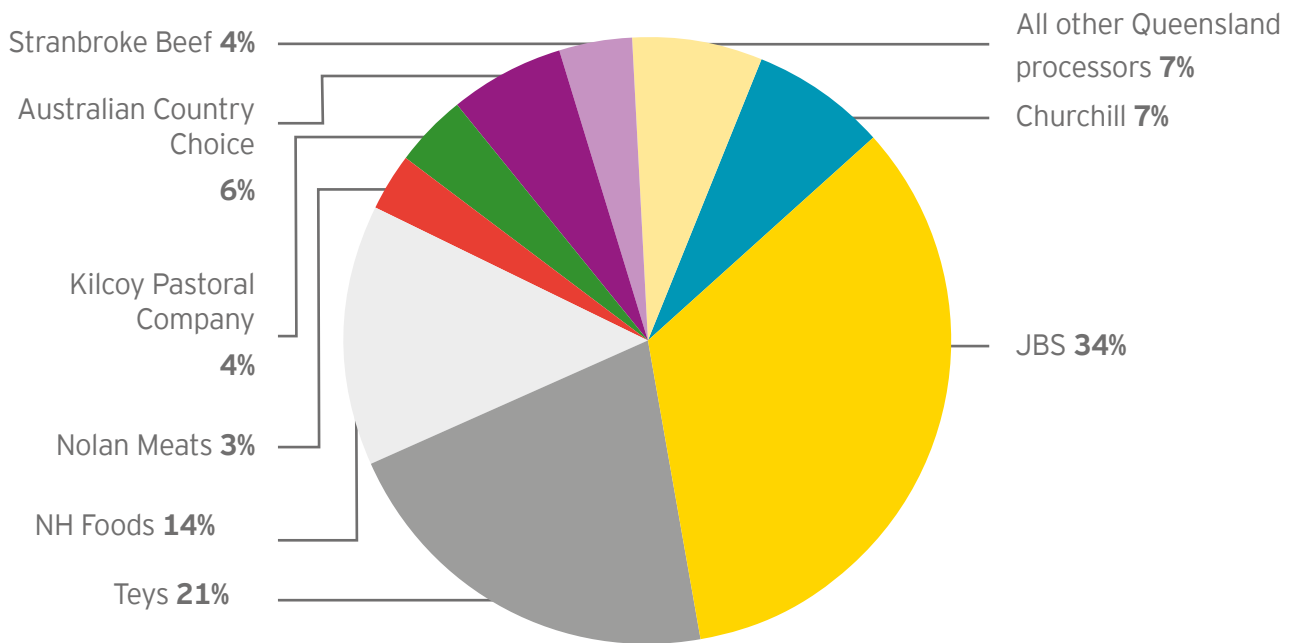
Beef processing in Queensland is dominated by three companies – JBS Australia, Teys Australia and NH Foods. These companies process an estimated 65% of the total volume of cattle available each year (Meateng, 2018). Processing is generally a high input, low margin business, meaning that scale achieved by the big three processors provides significant benefits in terms of ongoing viability.

Other significant processors include Kilcoy Pastoral, Australian Country Choice, Nolan’s Meats, Stanbroke Pastoral and John Dee. These companies process an estimated 23% of available

cattle (Meateng, 2018).

A common feature of these main market players is their well-established supply chains and ability to sell into international markets. Established processors often have alliances and contracts with major feedlots and graziers to ensure they obtain a consistent supply of cattle for their processing operations.

Figure 26: Queensland beef processing capacity by company



Source: Meateng, 2018

*Data points represents the percentage of Queensland’s total processing capacity based on the daily processing data obtained or assumed for each site.



Strengths and competitive position of Queensland processing sector

Access to markets and exports

Queensland's beef supply chain is structured to service export demand. Queensland's beef cattle supply chain flows south via an efficient logistics network to the South East Corner from where the vast majority of Queensland's processed beef is exported. This structure allows for easy access to sea freight (and on rare occasions air freight) exporting out of Brisbane, of which the Port of Brisbane exported approximately 42.5% of total processed red meat exports in December 2017 (ABARES, 2017). This reduces costs for transport and delivery time – which is key for transporting fresh meat, as chilled or frozen transport carries a higher cost, and fresher meat will hold a higher value.

Many of the main processors in the industry have strong international connections, either through parent entities or business partners. These international relationships provide sales channels for overseas markets.

JBS Australia – JBS SA is the largest animal protein processing company in the world and has many international sales channels (Reuters, 2018)

Teys Australia – the counter-party to the Teys Australian JV is Cargill, a US based manufacturer.

NH Foods Australia – NHA is subsidiary of Japanese-based NH Foods Ltd. NHA also has operations in the US.

Nolan Meats – Nolan Meats is an Australian owned business. Their main export markets include Indonesia, Brunei, Japan, Korea, Malaysia, The Middle East, Taiwan and the US (under the Private Selection and Vale Brands).

Kilcoy Pastoral Company – Kilcoy is a wholly owned subsidiary of the Chinese company New Hope Group.

Vertical integration helps processors smooth supply.

Constrained supply of cattle is a key factor that affects meat processor performance. Macro

factors such as climate, market conditions and water supply can all impact the supply of live cattle from primary producers or feedlots to processors.

Drought can adversely impact the supply of cattle in the market. As a drought commences, primary producers begin destocking their properties. This can have a positive impact on processors in the short-term, increasing supply and thereby depressing prices. However, as the drought progresses, the supply of cattle can lighten. Following de-stocking producers have a smaller herd producing less offspring, they must retain more females for herd re-building and as conditions improve they may choose to hold cattle for longer to take advantage of this. This potential volatility in supply can have adverse impacts on the processors' operational efficiency. In response to constrained supply, processors may reduce the number of shifts or prolong seasonal closures to minimise the impact of variable cattle supplies.

Many processors invest in feedlots and grazing properties as part of their supply chain. This enables greater control and transparency of the volume of cattle moving through the chain, and allows the processor to more efficiently schedule its operations. It will also provide greater control of the specification of cattle entering the processing facility, increasing yields and financial returns.

Many of the case studies noted have feedlots to complement their activities. Key examples include JBS Australia which has feedlots attached to two of their main processing plants, which is key to their operating model, resulting in reduced costs and increased quality compliance. Another example is Teys' Condamine feedlot and processing facility.

Australian beef is regarded in the global industry as being high quality, healthy and disease free.

Australia exported an average 47.6% of total processed beef produced between 2010 and 2017 (ABARES, MLA. 2018). Demand for Australian beef is driven by its reputation for being high quality and disease free. MLA's Global Consumer Tracker 2017 recorded 82% of interviewees rating Australian beef as a superior fresh meat and is regarded as healthy (MLA, 2017, Market Snapshot: Beef). Occurrences of disease (such

as in Brazil) in cattle can severely damage the global demand for that country's beef exports. In some instances countries such as the US have banned produce from Brazil, during times in which food borne diseases were affecting this market (NewsCorp Australia, 2017).

The National Livestock Identification Scheme (NLIS), introduced in 1999, can be used to deliver full traceability back to source in case of a cattle disease outbreak or food safety incident. In addition, technology is being used at some processing plants to achieve traceability of individual meat cuts through to the consumer. The NLIS scheme and the assurance it provides is integral to maintaining Australia's reputation in the global market.

The meat processing sector in Australia is making technological advancements in order to maintain full traceability, as well as providing a level of quality assurance. X-ray and 3D digital imagery are just some examples of technologies that can assist with quality assurance.

With exports accounting for nearly half of processed beef production by volume, Australian processing plants hold a range of certifications to maximise market access. These include certifications for meeting product and handling specifications of the European Union and United States Department of Agriculture, as well as Halal Meat Preparation and Supervision standards.

Processors must also comply with the *Australia and New Zealand Food Standards Code*, which provides standards for both processing facilities and production with respect to animal welfare, hygiene, food safety and product integrity.

Australian beef processors are at the forefront of innovation.

The Australian beef processing industry is embracing innovation, with a number of breakthroughs in the industry which will likely reduce costs of production and improve quality and traceability.

In 2016 AUS-MEAT² announced it would be implementing objective carcass measurement technology in 90 of its accredited processors across Australia, including the adoption of Dual-energy X-ray absorptiometry (DEXA) technology. This technology uses X-ray scanning to provide timely, accurate, transparent and objective information on the lean meat, bone density and fat composition of a carcass. This information is beneficial for processors as it allows for better understanding of a carcass before it is processed. As a result, processors can optimise carcass

²AUS-MEAT is an Australian and New Zealand accreditation service for descriptions and standards of red meat (a joint venture between the Australian Meat Processor Corporation and Meat & Livestock Australia).

sorting and labour requirements, allowing for increased automation, and maximising the efficiency of boning a carcass (MLA, 2016).

In 2017, a \$3.7m research and development project commenced into the automation of beef boning in Australian abattoirs. This will reduce labour costs and improve the precision of cuts, resulting in better quality meat cuts and less wastage (MLA, 2017).

Performance measures

The financial performance of a processor is thought to be highly correlated with the performance of the upstream supply chain participants (breeding, grazing and feedlotting). Restricted supply from breeders will typically negatively impact processors, as the increased price for the cattle flows downstream to the processor. Conversely, when there is a high supply of cattle the processor benefits from reduced prices. This is demonstrated by Figure 27, which plots monthly turnoff rates against both EYCI and OTH indicators. Turn-off and EYCI have tended to trend in opposite directions since 2010, although the EYCI and OTH indicators have diverged since mid-2016. MeatEng (2018) demonstrates the dependence processors have on the margin between the price of cattle and the sale price of meat.

Key performance measures for processors include production cost per head and plant utilisation. During periods of low turn-off rates and plant utilisation, fixed costs are spread over fewer production units.

Case studies on Kilcoy Pastoral Company a predominantly export focused plant and Nolan Meats a predominantly domestic focused plant are presented in Table 7. Both of these companies experienced reduced profitability in 2016 relative to the three previous years. This coincided with a reduction in turn-off rates, which pushed market cattle prices higher. In contrast, the period from June 2013 to June 2015 saw higher turn-off rates (and as such increased supply). During this period, processors displayed significantly better financial performance, as evidenced by revenue and return on equity figures. This demonstrates both the volatility of the industry and the upside potential.

Figure 27: Monthly average of the EYCI, OTH and cattle slaughter

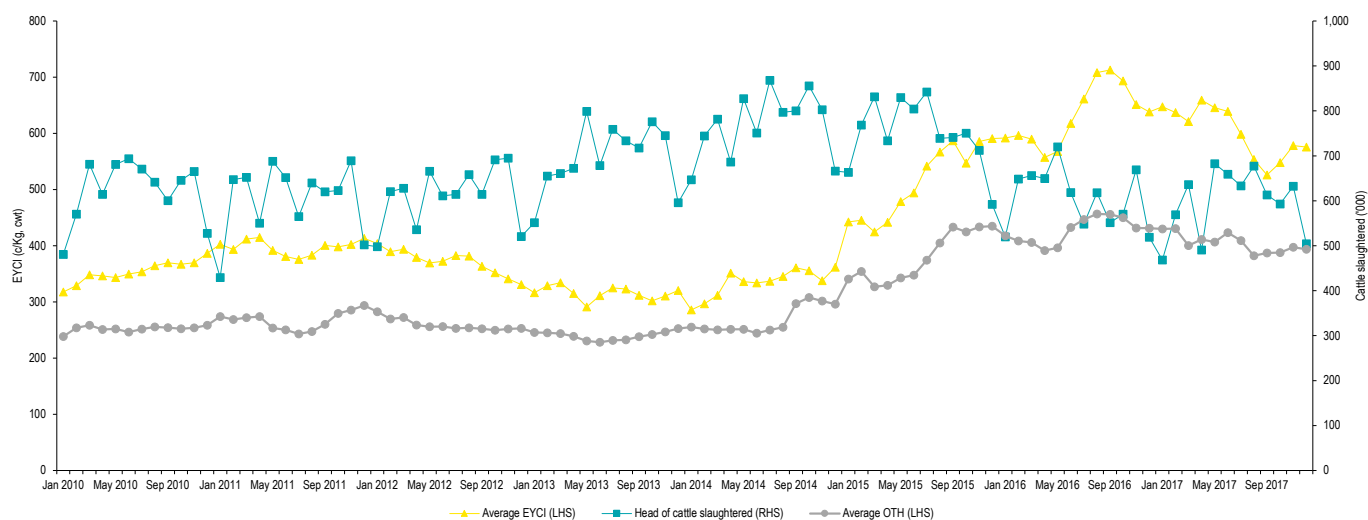


Table 7: Financials and reporting information of two Australian processors

Kilcoy Pastoral Company						
Reporting Date	31-Dec-2016	31-Dec-2015	30-Jun-2015	30-Jun-2014	30-Jun-2013	Average
Period (Months)	12	6	12	12	12	
Revenue (AUD millions)	768	377	602	511	475	622
Return on Equity (%)	4.2	15.7	36.2	53	28	27
Return on Assets (%)	2	10.3	19.5	28.8	9.5	14
Profit Margin (%)	0.5	4.8	5.8	7.7	2.3	4
Nolan Meats						
Reporting Date	30-Jun-2017	30-Jun-2016	30-Jun-2015	30-Jun-2014	30-Jun-2013	Average
Period (Months)	12	12	12	12	12	
Revenue (AUD millions)	193	215	207	174	146	187
Return on Equity (%)	-10.3	2.3	30.4	22.8	19.6	13
Return on Assets (%)	-5.5	1.7	20.7	15.9	12.8	9
Profit Margin (%)	-3.4	0.2	9.1	5.7	2.8	3

Source: IBISWorld Company reports

Key Success Factors for Processing



Financial Performance

- ▶ Rate of return
- ▶ Volatility in returns
- ▶ Upstream costs



Supplier & Customer Relationships

- ▶ Existing relationships, contracts and market channels



Vertical Integration

- ▶ Contracts and linkages with supply chain participants



Technology

- ▶ Technological sophistication



Regulatory Compliance

- ▶ Regulatory compliance measures for example animal welfare and processors compliance



Location

- ▶ Geographical location
- ▶ Proximity to upstream and downstream operators





Case Studies

These case studies examine leading Australian processors

JBS Australia (Industry Park Pty Ltd)

- ▶ Wholly owned subsidiary of Brazilian based JBS S.A
- ▶ Entered market in July 2007 through acquisition of US-based Swift & Company, which included its Australian operations
- ▶ JBS owns feedlots and meat processing facilities across Queensland, New South Wales, South Australia and Tasmania
- ▶ JBS has an Australian meat processing market share of 20.5% (IBISWorld)
- ▶ JBS has an estimated 33.6% of Queensland's total processing capacity (Meateng, 2018)
- ▶ JBS Australia's NSW and QLD processing plants have a combined monthly capacity of 233,000 head of cattle.
- ▶ JBS' feedlots are based in NSW and QLD and have annual cattle turn-off of around 330,000 (JBS).

Nolan Meats Pty Ltd

- ▶ Nolan Meats Pty Ltd is an Australian-owned private company
- ▶ Nolan Meats started as a small retail butchery in 1958 and in 1964 acquired a small slaughterhouse to complement the retail operations
- ▶ Nolan Meats operates a processing plant in Gympie, in South East Queensland and operates a feedlot located in Wide Bay
- ▶ Nolan Meats has an estimated 2.8% of Queensland's processing capacity
 - ▶ Capacity – 500 head per day, 15,200 per month (Meateng, 2018)

Kilcoy Pastoral Company Limited

- ▶ Kilcoy Pastoral Company Limited is a foreign-owned, unlisted, public company. It is wholly owned by New Hope Investment, incorporated in China
- ▶ Kilcoy Pastoral Company was established in 1953 as a processing plant to supply to local surrounding retail butchers based in the Sunshine Coast region in Queensland. Kilcoy is a single, standalone meat processor
- ▶ Kilcoy has an estimated 4.4% of the capacity in Queensland
 - ▶ Capacity – 800 head per day, 24,320 per month (Meateng, 2018)

Teys Australia – a Cargill Joint Venture

- ▶ Equal joint Venture between Teys Investments Pty Ltd (Australian Based) and Cargill Australia Ltd (subsidiary of US based Cargill Inc). The Joint venture is operated by Teys Australia Pty Ltd
- ▶ The Teys family has been operating in the industry since 1946. In 2011 the Cargill joint venture was formed, which trades under Teys Australia – a Cargill Joint Venture, which is operated by Teys Australia Pty Ltd
- ▶ Teys operates six beef processing facilities across Queensland, New South Wales and South Australia and three feedlots in Queensland, New South Wales and Victoria
- ▶ Teys occupies 9.6% of the market share in the Australian industry (IBISWorld C1111)
- ▶ Teys processors have an estimated 21.4% of Queensland's processing capacity (Meateng, 2018)

NH Foods Australia Pty Ltd

- ▶ NH Foods Australia (NHA) was formerly known as Nippon Meat Packers Australia Pty Ltd and was incorporated in New South Wales in 1978
- ▶ NHA is now a foreign-owned private company, wholly owned by Japan-based NH Foods Ltd
- ▶ NHA is a vertically integrated company, it owns and operates the following businesses:
 - ▶ Whyalla beef – involved in breeding, backgrounding and feedlotting of beef cattle. The Whyalla feedlot has the largest operational capacity of feedlots in Queensland
 - ▶ Oakey beef exports – a beef processing plant and vertically integrated supply chain in Queensland
 - ▶ Thomas Borthwick & Sons – operates a beef processing plant in Mackay, Queensland
 - ▶ Wingham beef exports – operates a beef processing plant in Wingham, New South Wales and specialises in processing British beef, grainfed and grassfed cattle
- ▶ NHA comprises an estimated 13.9% of processing capacity in Queensland (Meateng, 2018)



Service Industry

The beef cattle service industry is comprised of technology, infrastructure and support services.

Technology

Agriculture has the opportunity to embrace digital technology to drive performance improvements throughout the value chain. The digital evolution of the beef cattle industry will touch all components of the supply chain – from predictive modelling of genetics and production to efficiently scheduling transport logistics.

Digital disruption is occurring discretely within each stage of the beef supply chain as well as occurring collectively along the end-to-end supply chain.

The Australian Farm Institute's Digital Farmer's Conference held in Sydney in 2016 highlighted how digital technology was 'fundamentally changing agriculture'. A key technology driven change is the move away from skills-based management to a more industrialised model, where decisions are based on objective data.

New technology solutions will disrupt the existing industry.

New technology includes a new suite of solutions to improve livestock reproduction. This technology moves away from artificial insemination towards cattle IVF processes that can quickly build the quality and size of global herds (The Lead, 2018). The rollout of these technologies will likely boost producers' efficiency over the next five years (IBISWorld, 2018).

Australian agriculture is expected to become a **\$100 billion industry** by 2030.

Investment in Australian agriculture technology has **increased significantly** in the last 2 years.

MLA has welcomed a **\$4.8 million** Australian Government grant to develop new measurement technology for the industry.

Walk-over Weighing systems are disrupting the way producers monitor cattle performance. These systems provide the ability to monitor weight performance in near real time in the paddock to enable fact based decisions on health, feed management and marketing.

Operational efficiencies by leveraging technology

Meat & Livestock Australia (MLA) has unveiled a visionary plan aimed at operational efficiency and accelerating the digital future of Australia's red meat and livestock industry.

The 'Digital Value Chain Strategy' – an industry first – will be designed to empower every participant at every point in the value chain through data-driven commercial decision making. MLA will lead the development of the strategy with industry to deliver seamless capture, integration and interpretation of the vast and increasing range of data being generated by new technology.

Another operational efficiency is the development of technology to leverage the NLIS system. NLIS tagging is mandatory under Australian law, both to enable meat traceability in the event of a disease outbreak, and to meet the import standards of key trade partners, given the importance of exports to Australia's beef sector.

There is significant potential in the existing NLIS infrastructure as a base data source for performance improvement and proof of provenance solutions. NLIS provides a unique identifier of an animal that can be leveraged by technology to record its performance and productivity, and can be recorded against a range of variables. The data can be leveraged overtime to inform the development of algorithms to predict performance of an animal or an operation.

New technology advancement's and their transformative role

A diverse range of digital technology advancements have been made in the beef industry. A few examples are:

Walk over weighing

A system to monitor individual animal weight trends in the paddock in near real time to inform health, feed management and marketing decisions.

Auto drafting

Auto drafting reduces human involvement in the process of handling cattle, improving safety and reducing costs. Auto drafting leverages the Radio Frequency ID tag as a unique identifier of the animal and, subject to predetermined criteria, informs rapid gate movements to place cattle in specific holding pens.

Beef cattle digital supply chain

The Beef Cattle Digital Supply Chain Proof of Concept tests the ability to forecast producers' future beef production (volume and grade) using a combination of spatial and production data.

The project aims to develop a digital solution utilising this data to provide insights to primary producers and processors. This will optimise the beef cattle supply chain, allowing primary producers to secure forward off take and processors to secure supply of product.

Australian Reproductive Technologies (ART)

Queensland-based firm ART is helping beef producers internationally to accelerate the growth and genetic improvement of their herds.

ART has led the way in combining best-practice cattle biotechnology with the latest human IVF techniques, resulting in significant improvements in embryo production and quality.

Saleyards

Saleyards are the physical markets at which live cattle are traded. Producers sell cattle at saleyards to other producers, feedlots and occasionally directly to processors. The increasing prevalence of vertically-integrated beef supply chains has reduced the role and relevance of saleyards in Australia.

The EYCI is an index of cattle sale prices at saleyards across Australia.

There are approximately 47 saleyards across Queensland, 17 of which (approximately 36%) are owned by the relevant local government authority and 64% that are privately owned. Saleyards use quality assurance systems such as the National Saleyard Quality Assurance Program (NSQAP), which maintains the integrity and traceability of the animals.

Alternative sales options include online marketplaces such as Auction Plus, an online saleyard used to provide electronic exchange of ownership of livestock and other products. Listing fees are charged to the selling agent for the number of head entered in the catalogue and covers pre-sale marketing, cataloguing, catalogue distribution and conduct of sale.

Figure 28: Queensland's saleyard locations



Source: DAF

Transport

Queensland's road network spans the state, supported by livestock rail services subsidised by the State Government and seaports for the export of live cattle and beef.

A significant proportion of North Queensland's beef cattle turn-off is typically destined for live export channels. Beef cattle in the Southern region of Queensland are generally processed domestically. Processing and feedlot infrastructure is concentrated in the State's grain growing region with 70% of the State's processing capacity located in the South East corner and almost all exports of processed beef pass through the Port of Brisbane (ABARES 2017). Queensland is also Australia's leading exporter of beef and veal via air freight, making up 50% of the national total in 2017 (ABARES 2018).

There are four live cattle export terminals in Queensland - Brisbane, Weipa, Townsville and Kurumba. Townsville is the primary gateway, handling 95.3% of Queensland's and 23.5% of Australia's total live cattle exports in 2017 (ABARES, 2017). Cattle raised in North West Queensland may also be exported through the Port of Darwin due to its relative proximity.

Queensland's road network spans across the state.

Queensland's regional road network is generally high quality and high capacity, underpinning the transport of cattle across the State, between properties and facilities. The National Vendor Declaration Program operates in conjunction with the NLIS to provide cattle traceability during transport and make sure animal welfare standards are complied with at all times.

Recognising the importance of a robust and reliable road network to Australia's beef industry, the Australian Government has committed \$100 million to upgrading key cattle transport routes across Northern Australia, improving supply chain resilience (Infrastructure Australia, 2016).

Although the road network is expansive some efficiencies are lost in restricted weight and truck type areas. The location of the Townsville processing plant in a weight-restricted part of the network hampers the productivity and efficiency of beef processing operations, ultimately increasing the costs of transport and production. Much of Central and Southern Queensland suffers a similar problem, with cattle from the Western grazing country potentially facing two changes in transport mode to reach the bulk of Queensland's processing capacity in the south-east corner (ABARES 2015).

Figure 29: Queensland's road network

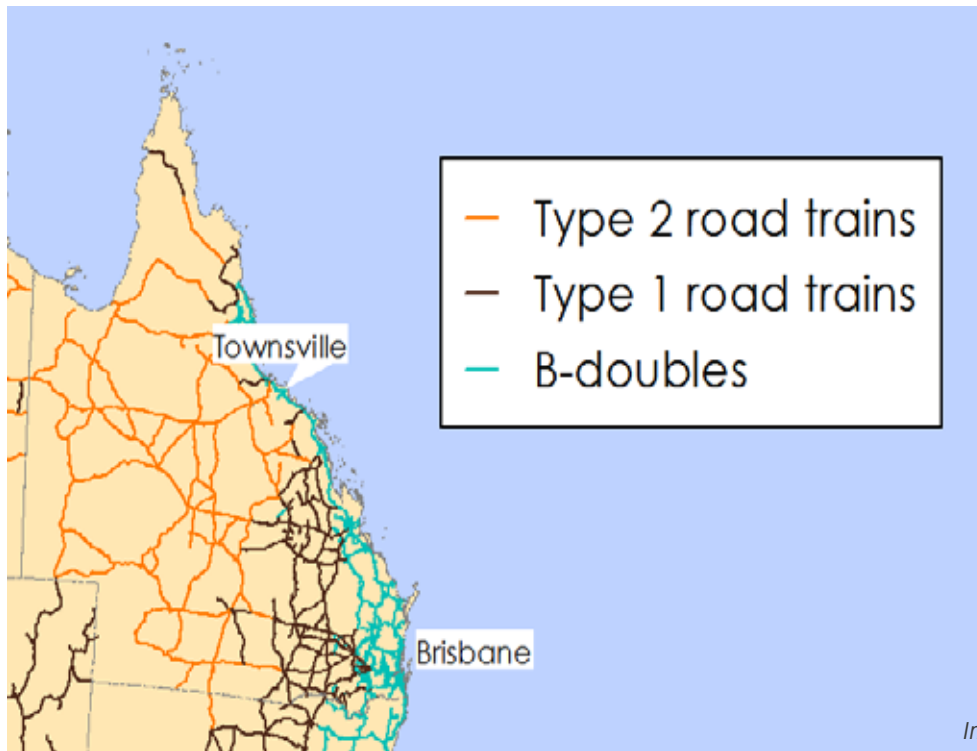


Image: ABARES 2015

Figure 30: Queensland's livestock rail service map



PORTS

- Port of Brisbane
- Port of Townsville

AIRPORTS

- Brisbane airport
- Wellcamp airport

The rail network presents significant opportunities to efficiently transport cattle.

Queensland is the only state with a rail network that supports the transport of cattle. Figure 30 illustrates the extensive rail network covering the state. Livestock rail services are subsidised and provide regular scheduled services at a fixed-rate throughout the year. The network contributes to safer roads through a reduction in heavy haulage traffic, provides an alternative to trucking. Use of the rail network has been impacted by its deregulation, although the Queensland livestock rail service presents significant opportunities for the Queensland beef industry to efficiently transport cattle.

Grain Industry

The grain growing industry in Australia has achieved 6.5% annual average growth over the five year period ending 2017. Future growth of the industry is heavily reliant on the level of annual rainfall, the world price for wheat, and the domestic price of fertiliser. Growing meat consumption is projected to lead to expanding livestock industries and is likely to result in increased demand for feed grains.

Australia's wheat industry is predominately an export orientated industry, however it also serves

local markets. Approximately 12.3% of Australia's grain growers reside in Queensland (IBIS World A0149).

Support services

Services supporting the beef farming industry includes transport providers, agronomics, business support, branding, assurance and advisory amongst other support services.

Agronomics looks into the distribution, management and productivity of land, often utilising new technologies to analyse areas for business improvement.



Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AACo	Australian Agricultural Company
ABARES	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACC	Australian Country Choice
ACWP	Agricultural Competitiveness White Paper
ASEAN	Association of Southeast Asian Nations
ALFA	Australia's Lot Feeding Association
ASEL	Australian Standards for the Export Livestock
ART	Australian Reproductive Technologies
ATO	Australian Taxation Office
AUS-MEAT	Australian and New Zealand accreditation service for descriptions and standards of red meat (a joint venture between the Australian Meat Processor Corporation and Meat & Livestock Australia)
Camm	Camm Agricultural Group
ChAFTA	China-Australia Free Trade Agreement
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
c/kg dw	Cents/kilogram dressed weight
Cwt	Carcass weight – The weight of an animal's carcass
DAF	Department of Agriculture and Fisheries
DAWR	Department of Agriculture and Water Resources
DEXA	Dual-Energy X-ray Absorptiometry
ESCAS	Exporter Supply Chain Assurance System
EYCI	Eastern Young Cattle Indicator
FIRB	Foreign Investment Review Board
Grainfed	Meat from animals that are fed grain-based diets during the finishing process
ha	Hectare
Intra-industry sale	The acquisition of one company involved in the beef supply chain by another similarly engaged company
IVA	Industry Value Added
JAEPA	Japan-Australia Economic Partnership Agreement
KAFTA	Korea-Australia Free Trade Agreement

Acronym/Abbreviation	Definition
Kt	Kilotonnes - 1 kilotonne = 1,000 kilograms
m	Million
MDC	MLA Donor Company
MLA	Meat & Livestock Australia
MSA	Meat Standard Australia – An Australian standards system developed for the red meat industry, which guarantees eating quality
NAIF	Northern Australia Infrastructure Facility
NAPCO	National Australian Pastoral Company
NHA	NH Foods Australia
NDVI	Normalised Difference Vegetation Index
NLIS	National Livestock Identification Scheme
OTH	Over the hooks – is an indicator derived from the pricing grids released weekly by meat processors
PSP	Public Sector Pension Investment Board
QGPI	Queensland Grazing Property Index
QGSO	Queensland Government Statistician's Office
QIC	Queensland Investment Corporation
REITs	Real Estate Investment Trusts
RFG	Rural Funds Group
Shipped weight	The weight of beef aboard a shipment
TPP	Trans-Pacific Partnership
Turn-off	The number or rate of livestock sold to market
USD	US Dollars
USDA	United States Department of Agriculture



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'The Queensland Beef Supply Chain' is part of the document series 'The Investment Outlook for the Queensland Beef Supply Chain' developed by EY on behalf of the Queensland Department of Agriculture and Fisheries. This document series explores the existing and growing opportunities for the Queensland beef industry. It consists of:

- ▶ Strategic Drivers of the Queensland Beef Supply Chain
- ▶ The Queensland Beef Supply Chain
- ▶ Future Outlook for Queensland Cattle and Beef Products
- ▶ Investment Analysis of the Queensland Beef Supply Chain
- ▶ Investor's Guide to the Queensland Beef Supply Chain
- ▶ Queensland Beef Producer Investment Guide



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