Collaboration and trust
in the northern beef supply chain
of Western Australia

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REPORT TO
DEPARTMENT OF AGRICULTURE AND FOOD, WESTERN AUSTRALIA
3 APRIL 2017

COLLABORATION
AND TRUST

IN THE NORTHERN BEEF SUPPLY CHAIN OF WESTERN AUSTRALIA
DRAFT FRAMEWORK AND PLAN
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The Department of Agriculture and Food, Western Australia (the Department) commissioned ACIL Allen Consulting to conduct a study into collaboration in the northern beef supply chain. The study is part of Northern Beef Futures (NBF), a four year $15 million project led by the Department and funded by Royalties for Regions.

The aim of the study was to scope a framework for measuring collaboration in the northern beef supply chains; and develop an implementation plan for ways to improve collaboration that will benefit the development of the northern beef industry.

Western Australian's northern beef industry is connected to supply chains feeding live export and boxed beef supply chains, directly and indirectly, in northern and south-west Australia, for domestic and international markets. Spot markets are widely used to manage the considerable supply side risk associated with the beef industry in the north-west and across Australia. This limits the level of collaboration across the supply chains and the potential total value of the industry to some degree.

The literature review found that:

- improved supply chain collaboration must have an economic case for change
- individual businesses must see benefit and even then may be constrained by personal circumstances
- social and cultural considerations become critical once these conditions are met
- implementation needs to be specific, targeted, will be messy and require ongoing adaptation.

In terms of developing a Framework to measure trust and collaboration the complexity and variability of the supply chain limit the value of monitoring collaboration on a business by business basis. Rather the Framework should focus on continually developing readily understood concepts of how the supply chain and collaboration work and analyse the benefit of changes to understand industry impact and inform business cases for industry and government.

Modelling of backgrounding Pilbara cattle showed that collaboration takes longer to generate greater value but won't necessarily out-perform the status quo if there is a shock. This confirms the need for a specific and targeted focus to both identifying and implementing trials to improve collaboration that can then be replicated or expanded if possible and as required.

In terms of developing a collaboration Implementation Plan to implement actions, our review found that many current and proposed NBF investments are already targeting improved collaboration across the supply chain in the key areas required. So beyond partnering with national bodies on larger scale information systems we recommend the plan focus on evaluating these projects.
This report presents the draft framework and implementation plan for improving trust and collaboration in the boxed beef and live export supply chains for the northern beef industry in Western Australia which comprises of the Pilbara and Kimberley regions.

1.1 Purpose

The Department of Agriculture and Food, Western Australia is leading Northern Beef Futures, a four year $15 million project funded by the State Government’s Royalties for Regions program, to transform Western Australia’s northern beef industry through improving markets, businesses and productivity. The Northern Beef Futures project will support the success of the beef industry to capture new market opportunities, particularly in Asia, and secure sustainable growth.

ACIL Allen Consulting has been commissioned by the Department of Agriculture and Food, Western Australia to conduct a study into collaboration in the supply chains for live export and boxed beef from the northern beef region.

The aim of the study is to scope a framework for measuring collaboration in the beef supply chains and to develop an implementation plan for ways to improve collaboration that will benefit the development of the northern beef industry.

1.2 Approach

The project approach was to address four questions iteratively through analysis and consultation:

- What is the northern beef supply chain?
- What is supply chain collaboration?
- What is the current status of northern beef supply chain collaboration?
- How can collaboration in the northern beef supply chain be improved?

The initial iteration involved an extensive literature search into examples of trust and collaboration in agricultural supply chains from social and economic perspectives. In addition, ACIL Allen mapped the northern beef supply chain network, using 2015 NLIS data, to trace the movements of all cattle in Western Australia from their property of origin through to the final destination. In most cases, the final destination was a processor or the live export market.

The initial findings were discussed with the project reference group consisting of Northern Beef Futures staff and a small number of industry champions with expertise and knowledge across the supply chain. It was agreed to focus on desktop analysis at this stage given a number of NBF commissioned reports initially reviewed reduced the need for consultation.
The second iteration involved applying the findings of the literature review to scope potential collaboration frameworks, implementation plans, including an economic model to quantify the benefits of collaboration. The second round findings were reviewed by the reference group and also presented to the full Northern Beef Futures team.

The third iteration involved developing the economic model to pilot the collaboration framework and inform the focus on the implementation plan. The combined results of the three iterations were reviewed and integrated to develop this draft report.

1.3 Report structure

This report forms the draft framework and implementation plan for improving trust and collaboration in the boxed beef and live export supply chains for the northern beef industry.

— Chapter Two describes the northern beef industry and its supply chains. It also presents the economic and social cases for greater trust and collaboration in the northern beef supply chain.
— Chapter Three presents the draft framework for improving trust and collaboration
— Chapter Four presents the draft implementation plan
— Chapter Five presents the conclusions
— Appendix A provides further information on the economic analysis of the benefits of collaboration
The economic value of the Western Australian beef industry is considered to be not fully realised. The purpose of this project has been to test the assumption that collaboration in the beef industry's supply chain is sub-optimal and improved collaboration would help the industry increase its capabilities, "build value and strengthen relationships within new and existing supply chains and diversify and align products to suit new and expanding markets" (NBF 2016). Previous research has identified the need for increased information sharing, decision synchronisation and goal alignment (Perrin, 2016). This Chapter examines the idea of 'collaboration' generally and considers the implications for the northern beef in terms of the industry's structure, economics and social processes.

2.1 Industry snapshot

The northern beef industry comprises the Pilbara and Kimberley regions of Western Australia. In 2014, the northern beef industry turned off 318,000 cattle including some interstation transfers. Around 54 per cent or 179,500 of these cattle entered the live export market while 44,000 were slaughtered in Western Australia primarily at one of two main abattoirs. A total of 89,400 cattle from the northern beef region travelled to another farming property as their final destination in 2014. These cattle were then likely to move further along the supply chain in 2015.

Figure 2.1 and Figure 2.2 show the final destinations of cattle from the northern beef region by year.

**FIGURE 2.1** FINAL DESTINATION OF CATTLE: PILBARA AND KIMBERLEY REGIONS: TOTAL

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>42,381</td>
<td>13,200</td>
<td>26,123</td>
<td>93,071</td>
<td>3,138</td>
</tr>
<tr>
<td>2014</td>
<td>39,363</td>
<td>23,114</td>
<td>43,817</td>
<td>160,383</td>
<td>5,049</td>
</tr>
<tr>
<td>2013</td>
<td>66,212</td>
<td>16,300</td>
<td>57,300</td>
<td>189,810</td>
<td>6,700</td>
</tr>
<tr>
<td>2012</td>
<td>83,518</td>
<td>11,949</td>
<td>32,070</td>
<td>154,128</td>
<td>9,047</td>
</tr>
<tr>
<td>2011</td>
<td>91,230</td>
<td>10,466</td>
<td>34,956</td>
<td>155,996</td>
<td>9,415</td>
</tr>
</tbody>
</table>

2.1.1 Live export market

A large number of cattle from the Pilbara and Kimberley regions enter the live export market through the ports of Fremantle, Broome, Wyndham, Port Hedland, Geraldton and Darwin. The Port of Broome is the largest exporter of cattle from the northern beef region accounting for nearly 100,000 northern beef cattle in 2014 or 64 per cent of all cattle exported from the region. Fremantle Ports and Wyndham Port are also key ports for cattle from the regions accounting for almost 32,300 and 14,500 cattle respectively in 2014. In addition, nearly 18,000 cattle reached export depots in Western Australia in 2014 as their final destination and are therefore also likely to reach the live export market. In 2014, nearly 8,000 cattle from the northern beef industry travelled through the Port of Darwin. There were no exports of cattle through the Port of Port Hedland in 2014, 2015 or 2016.

The live export market is influenced by whether cattle originate from the Pilbara or Kimberley regions. The Port of Broome is the primary export point for cattle from the Kimberley region accounting for 42 per cent of all turnoff from the Kimberley region and 75 per cent of all live exports from this region. The port of Wyndham accounts for 14,500 Kimberley cattle, the Port of Fremantle exports 8,000 Kimberley cattle and the Port of Darwin accounts for 7,500. Less than 100 cattle from the Kimberley region are exported through the Port of Geraldton.

Fremantle Port is the key port for cattle from the Pilbara region accounting for 24,300 cattle or 68 per cent of the live export trade from that region. Three quarters of all northern beef cattle that travel to the port originate in the Shire of East Pilbara and the Shire of Ashburton. The other key ports for cattle
from the Pilbara region are Broome Port (9,200 Pilbara cattle) and Geraldton Port (2,000 Pilbara cattle). There were no recorded exports of cattle from the Pilbara through the Port of Wyndham and very few through the Port of Darwin in 2014.

2.1.2 Processor market

In 2014, 44,000 cattle from the northern beef region were slaughtered in Western Australia. This represents around 11 per cent of the 413,000 cattle that were slaughtered in Western Australian abattoirs in 2014 (Department of Agriculture and Food, Western Australia, 2015).

There are nine abattoirs in Western Australia that slaughter cattle from the northern beef region, with two of them accounting for 85 per cent of the 44,000 slaughtered cattle from the region in 2014.

There are differences in where cattle from the region are slaughtered. While cattle from the Kimberley region are almost exclusively slaughtered at the two key abattoirs in Western Australia, cattle from the Pilbara region are slaughtered at all nine Western Australian abattoirs. Even so, three quarters of Pilbara cattle are slaughtered in the two key abattoirs.

In 2014, 34,500 cattle from the northern beef region travelled through a saleyard in Western Australia. The majority of cattle who enter the saleyard system originated in the Pilbara region. In 2014, 93 per cent or just over 32,000 cattle from the Pilbara region entered a saleyard.

Cattle from the northern beef region were sold through one of three saleyards in Western Australia with nearly all cattle sold through the Muchea Livestock Centre. In 2014-15, the Muchea Livestock Centre sold 104,774 cattle (Western Australian Meat Industry Authority, 2015) with northern beef cattle comprising 31 per cent of this throughput.

2.1.3 Network analysis

An analysis of the supply chain networks that comprise the Australian northern beef industry found that the industry was far more export focussed than Western Australia as a whole which was more focussed toward the slaughter market. The Kimberley region was even more focussed to the export market while the Pilbara region showed links to both processors and the live export trade.

When the analysis was further defined into property sizes, it revealed that the largest northern beef properties were characterised by a complex network with Kimberley properties linked to the Port of Broome via one of two export yards. Pilbara properties were linked to the Muchea Livestock Centre and one of two large feedlots located in the rest of the state.

Medium sized properties tended to be characterised by a number of networks including those connected to the Port of Broome, one processor, the Muchea Livestock Centre, and one large feedlot in the rest of Western Australia.

Smaller properties were linked to the Port of Broome and the Muchea Livestock Centre.

2.2 The economic case

Traditionally the degree of integration and collaboration across individual Australian beef supply chains, between producers and processors, has been minimal. In contrast, in the dairy industry, and in many other non-agricultural industries, integration and collaboration is at a much higher level and has grown rapidly since the 1980s as these industries sought to achieve competitive advantage through managing relationships up and down the supply chain across various channels.

When considering trust and collaboration in the northern beef supply chain, any change in supply chain arrangements must assess whether the change will better serve customer needs in terms of whether live or boxed beef from the northern beef industry will:

— Be delivered to the customer at a lower cost, or
— Have improved quality in the eyes of the customer, or
— Be supplied more reliably and/or with greater consistency to the customer.
There are three main drivers for members of the supply chain to improve the level of trust and collaboration. These are to:

- achieve cost efficiencies
- manage risk
- secure price premiums.

**Cost efficiencies**
The spot market acts to encourage efficiency gains across competing suppliers. The efficiency gains may be restricted, however, by characteristics of the supplying market. In agricultural markets, despite major efficiency gains being made over an extended period of time, factors are evident that prevent potential efficiency gains being converted into realised efficiency gains.

There is an opportunity to increase productivity through a more business-like approach to livestock production. The major barrier to vertical integration in the beef supply chain is the prohibitive cost of capital to achieve meaningful integration. Although some Australian processors own reasonably significant livestock operations and some producers own/own several processing operations, compared to the total size of the industry, the degree of common ownership between sectors is small. Two barriers have led to this result. The first is the large capital investment required to own significant tracts of agricultural land. This not only has prevented significant processing investment in cattle production, but has also meant that the cattle production sector itself is fragmented. Secondly, the degree of specialist skills required in each sector of the industry (and even within sectors) has resulted in the failure, for instance, of a number of producer forays into the processing sector.

**Managing risk**
There are two predominant sources of risk in the meat and livestock supply chain being supply risk and price risk.

For processors and live exporters, supply is the greatest risk for three primary reasons which all focus on the need for a consistent throughput of cattle:

- The customers of Australian processors and live exporters expect a consistent supply of product. If Australian processors cannot supply a consistent quantity of product, either in export markets or the domestic market, they risk customers going elsewhere.
- The capital investment in Australian processing plants is significant and will continue to increase into the future. In order to maintain per unit costs, throughput must remain at certain levels.
- Australian labour laws, and labour retention/availability, also encourage consistent cattle throughput. Australian processors and live exporters have managed supply risk through three strategies:
  - Vertically integrating into feedlots - feedlots account for about one-third of Australian beef production and all major beef processing firms (the top three) have significant feedlot operations.
  - Spatially diversifying - Australia's top three beef processors, accounting for over 50 per cent of production, have operations in both northern and southern Australia.
  - Offering forward contracts to producers - forward contracts have been used to encourage greater supplies during seasonal downturns.

In terms of price risk, processors have relatively limited exposure as the majority of product marketed by processors is sold on the spot market. Efficient processors when selling on the spot market can dissipate any risks by also buying on the spot market. The major price risks in the beef industry are borne by producers. Instead of directly managing price risks, the main risk management strategies adopted by top producers have been:

- To run their operations lean. This strategy minimises losses in times of price downturn and maximises profits in good times.
- To diversify farm operations - e.g. for southern producers to have a mix of livestock and grains.

The management of risk is therefore unlikely to be a major driver of supply chain collaboration in the northern beef region.
Price premiums
Where collaboration has been successful in the Australian cattle and beef industries, is where supply chain relationships have been formed with the purpose of achieving price premiums or securing customer loyalty.

The increasing specificity of customer demands is opening up opportunities in this area. An important subset of consumers is demanding more information regarding the food they purchase. These demands were initially driven by concerns over food safety but now extend into food providence. These developments create opportunities to develop brands that not only meet customer needs in terms of taste and tenderness, but which also address animal welfare and environmental issues and the demand for “naturally” produced product.

The emergence of these new brands, which make claims over “whole of life” treatments necessarily require strong collaboration over the entire supply chain.

2.2.2 Cost of collaboration
Collaboration incurs a cost. This means that the drivers for and benefits of collaboration need to be powerful enough to overcome the costs that will inevitably be involved.

There are the costs associated with the time and effort of participants in collaborating. There are also costs associated with the loss of buyer flexibility. As one New Zealand farmer observed: “Commitment has a cost to it and the reason being that I can’t just go and market all my cows as in-calf. Getting involved in this supply chain means we make a commitment that we won’t change that policy for the long term and that has a cost. I could sometimes make more money by going to trading”.

Lees and Nuthall (2015)

The economic costs of loss of flexibility tend to be greater in changeable markets including the meat and livestock markets which are volatile. Commitment can also mean suppliers are vulnerable to opportunistic behaviour, especially where they have made relationship-specific investments (Lui 2012).

2.3 The social case

2.3.1 What is this thing we call ‘collaboration’?
If we think of the supply chain as a system of people, interacting/working with each other in varying ways and degrees of frequency and intensity we can better identify the (social and psychological) conditions which drive, sustain and/or obstruct collaboration. If we want to know more about building collaboration in the beef supply chain it is helpful to understand:

— What is collaboration generally and why do people engage in it (and why not)?
— What is collaboration in supply chains generally, how does it help, and what are its enablers and obstacles?
— What other lessons are there to be learned from collaboration in other (agrifood, primary industry) supply chains?
— What do we know about collaboration in beef supply chains?

To ‘collaborate’ as defined by the Merriam Webster dictionary is to “work with another person or group in order to achieve or do something.” Mariner-Moyano (2008) adds the dimension of effectiveness to their definition, citing a process of two or more people or organisations working together to achieve something successfully. The presumption here is that there are ways to work together that may or may not achieve ‘success’, assuming that what comprises ‘success’ can be or is mutually agreed on by the participants. It also presumes that those parties are in (implicit or explicit) agreement about what is to be achieved; their goals. Either way, the fundamental components of basic definitions of ‘collaboration’ are two or more actors working in some kind of joint effort.

What then does it mean to ‘work together’? We can safely presume that ‘collaboration’ involves various types and degrees of cooperation. Synonyms of ‘collaborate’ include terms such as: alliance, teamwork, or partnership. Cooperation might be thought of as the ‘glue’ of the act of working together.
it enables people to have some kind of mutually beneficial relationship. In a working context, people typically have to exchange and share resources and knowledge to accomplish a particular task or tasks. Mashek and Nanfito (2015) (Table 2.1) formulated a continuum of working together where the intensity of commitment, trust, and sharing of responsibilities and risks increases as you move from left to right. Another way to help us better understand what is the essence of collaboration is to consider what is NOT collaboration. Common antonyms of ‘collaborate’ include: division, separation, disunion and non-cooperation.

**TABLE 2.1 A COLLABORATION CONTINUUM**

<table>
<thead>
<tr>
<th>Networking</th>
<th>Coordinating</th>
<th>Cooperating</th>
<th>Collaborating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchanging info for mutual benefit</td>
<td>Exchanging info for mutual benefit</td>
<td>Exchanging info for mutual benefit</td>
<td>Exchanging info for mutual benefit</td>
</tr>
<tr>
<td>Low to no level of trust required</td>
<td>Some altering of activities to achieve shared purpose</td>
<td>Increased altering of activities</td>
<td>Altering activities – may include modifying and/or adding positions</td>
</tr>
<tr>
<td>Limited time commitment</td>
<td>Slight increase in organisational involvement</td>
<td>Additional increase in organisational involvement</td>
<td>Substantial increase in organisational involvement</td>
</tr>
<tr>
<td>No sharing of turf</td>
<td>Some degree of trust</td>
<td>Some sharing of resources (e.g. staff, finances)</td>
<td>Commitment to sharing of resources (e.g. staff, finances)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increasingly formal organisational commitment</td>
<td>Formalised organisational commitment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial time commitment</td>
<td>Substantial time commitment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High level of trust</td>
<td>Very high level of trust</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Significant sharing of turf</td>
<td>Extensive sharing of turf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May involve written agreements</td>
<td>Written agreements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sharing of risks, responsibilities, resources, rewards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Commitment to learning from each other</td>
</tr>
</tbody>
</table>

SOURCE: MASHEK AND NANFITO 2015

It is reasonable to conclude that collaboration cannot be achieved without actors cooperating with each other, and that any group or organisation’s success depends heavily on the voluntary cooperation of its members as opposed to forcing people to work together (Tyler 2010). Coercion alone cannot achieve optimal levels of cooperation amongst people. There is a wide body of research that examines what drives people to cooperate and collaborate with one another. Some of this work frames people as “self-regulators” of their cooperative/collaborative behaviours – influenced by a range of internal and external factors when deciding how and to what extent they will engage with others (Sullivan et al 2008, Tyler & Blader 2000).

2.3.2 Why do people cooperate and collaborate?

Tyler (2000; 2010) distinguishes between two key instrumental reasons for cooperating. Firstly, people will act out of self-interest, because cooperating often brings some kind of reward. That is, when a person chooses to cooperate with others to achieve something they (expect to) gain something from that action. That ‘something’ can be a tangible benefit such as a promotion or financial gain. It can also be a sense of having done some good for others or a greater good. Secondly, choosing not to cooperate may invite some form of punishment or sanction for not following some norms and/or formal
rules about how to behave. Nonetheless, when seeking to instil greater (voluntary) cooperative or collaborative behaviour in groups or organisations, it is the former group of motivational forces (rewards) that is thought to be more influential.

It is worth examining the expectations of rewards in more detail. Tyler (2008) points out that where cooperation or collaboration requires a person to do more than what might appear in their formal job description, they will be motivated by a commitment to some greater good (e.g. success of the group or organisation they belong to). He notes that this kind of motivation is not likely to be present if that person does not ‘identify’ in some way with the group (e.g. have shared attitudes and values) or have a strong sense of pride in that group or feel respected by the group. Tyler (2008) also asserts that how decisions are made by the group or organisation is critically important. People need to feel they have a genuine opportunity to help make or provide input into decision-making, and this is referred to as ‘procedural justice’. People will balk at cooperating when they do not trust that it is safe to do so.

2.3.3 What is supply chain collaboration?

‘Collaboration’ in a supply chain context is a complex phenomenon that is variously defined. Fawcett et al (2015) define it as the ability of people to work across organisational boundaries to build and manage unique value-added processes. Simatupang and Sridharan (2005) as cited in Soosay and Hyland (2015) use the term to describe close cooperation among separate business partners trying to simultaneously satisfy customer needs and lower costs. Thompson et al (2007:3) see it as:

“… a process in which autonomous or semi-autonomous actors intersect through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions.”

Rota et al (2012) and Matopoulos et al (2007) note that collaboration is about working together over and above ‘normal’ relationships – people are coordinating activities that cross the boundaries of their own organisations. The commonality across these definitions is the involvement of multiple businesses forming relationships that seek shared improved benefits that cannot necessarily be achieved by acting alone (Soosay and Hyland 2015).

Benefits of collaboration

The overall benefit of collaboration is meant to be to help ensure more effective and efficient functioning in the supply chain, noting that participants will require individual benefits to improve their own collaboration. The specific benefits cited include greater product uniformity, lower production costs, social benefits (closer relationships, lower isolation for primary producers), improved access to larger markets, more stable pricing, longer term contracts, better relationship building, confidence building, forward planning, and investment (Partida 2015; Perrin 2016; Wagner & Leydesdorff 2008).

In these cases the social benefits (e.g. social relationships) can assist in establishing and maintaining collaborations, but there must be a commercial return. The role of information sharing is particularly important in communicating the market requirements so that participants can identify the most efficient value chain step to perform the required value add activity regardless of ownership. Through monitoring consumer demands changing trends can be feedback down through a collaborative value chain more quickly to meet consumer expectations.

Trust and collaboration

Trust is a critically important ‘ingredient’ that must be in place in order for supply chain participants to reap such benefits. Fawcett et al (2004) described five different dimensions of supply chain trust. They include:

- Performance-based trust - mutual dependencies, congruent goals, understanding others’ abilities, ensuring that words match actions;
- Information sharing – open and true sharing of various materials;
- Behavioural evidence – people are genuinely sharing various risks and rewards of collaborating and investing in partners’ capacities;
- Personal trust – developing face-to-face relations
Supply chain position and influence—asymmetrical power can lower trust (e.g. buyers tend to have more power, while suppliers have less and can therefore be less trusting).

Barriers to collaboration

Not surprisingly, it is widely acknowledged that collaboration in the supply chain is not easy to achieve and does not occur as frequently as some might wish (Barrat 2004; Fawcett et al 2015; Kuluratna et al 2001; Soosay & Hyland 2015). There are significant obstacles to achieving greater collaboration in the supply chain, which include:

- Inadequate understanding of and incompatible definitions of supply chain ‘collaboration’, as well as a lack of consensus of what problems it is meant to solve (Soosay & Hyland 2015;);
- Structural resistors (territoriality, strategic misalignment, poor systems connectivity, inadequate organisational routines) and sociological resistors (e.g. among supply chain participants low trust, resistance to change, information hoarding, inadequate & inappropriate skills (e.g. leadership voids, low critical analysis) (Fawcett et al 2015; Fawcett et al 2004);
- Lack of collaborative ‘culture’ in organisations: an overemphasis on functional silos while neglecting the need to facilitate (internal and external) trust and mutuality of benefits and risks; and insufficient recognition that collaboration requires substantive change and resources (Barrat 2004);
- As noted above, power imbalances/asymmetrical power (e.g. buyers with more, suppliers with less—which then links to low trust) (Fawcett et al 2004; Vereecke & Muylle 2006);
- Overemphasis on technology while neglecting developing shared understanding among supply chain partners regarding the ‘hows’ and ‘whys’ of collaboration (Barrat 2004; Jie & Parton 2009).

2.3.4 Collaboration in primary industry supply chains

Collaboration in the seafood supply chains has been challenged by particular characteristics of this industry—unpredictable, perishable product, low margins, minimal product tracking and global market/demand. Complex, personal & imbalanced relationships are common (Nature Conservancy 2015). The Australian prawn industry is focussed on whole of chain analyses as a priority, as their changing market poses a challenge to maintaining profitability.

For the beef industry in the United Kingdom, constraints to greater supply chain coordination have been conservative attitudes to change among some (but not all) beef producers (Jie and Parton 2009). Francis et al (2008) found that because of the high variability and power imbalances in the UK beef supply chain, technological aspects of “Kaizen” programs or “Lean” approaches could not easily be implemented in the beef food service sector1. Those initiatives were originally developed in more collaboratively evolved industries (e.g. manufacturing). In a developing country context (Bali, Indonesia) beef industry challenges for collaboration include lack of coordination among a large number of unorganised parties; wide geographic dispersal; adversarial relations among different segments (prices, volatile margins); low synchronisation between product and market demand; and insufficient information getting back to producers (Mappigau et al 2015). The end result has been low incomes for beef farmers. A range of issues associated with skills deficits challenge better supply chain performance in the Australian beef industry (Jie et al 2009).

2.3.5 Additional perspectives

Natural resource management frameworks on drivers and constraints to farmers’ taking up and maintaining more sustainable land management practices (or innovations) might lend some insight into why and to what extent people in different parts of the beef supply chain are choosing to collaborate. It is important to recognise that when we talk about ‘improved’ collaboration or ‘more’ collaboration—we want people in the supply chain to do something ‘different’ from what they have been doing to date (e.g. beef producers working more closely together to achieve better prices, beef producers who are more willing to send their cows south in the off season, etc.). Getting people to do something ‘different’ is about behaviour change. Rural sociologists have helped us to see that people do not necessarily change their behaviour just because someone suggests that they do (Pannell et al

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1 These are business improvement processes focussed on continuous internally driven incremental improvement in the case of Kaizen and the reduction of waste in systems and processes for lean approaches.
2006). They have shown that when people decide to change their behaviour (or not, or only a little) – it is because they are being influenced by a range of factors (personal, social, structural) that can encourage or discourage them (see Figure 2.3).

**FIGURE 2.3 BEHAVIOURAL INFLUENCES**

People’s values and belief systems, attitudes and perceptions, personalities, and goals will inform their judgements on the extent to which they should engage in (more) collaborative practices. They will be asking, “do I want to do it?” (is it consistent with what I believe in? is it fair and reasonable?). But they will also be asking, “Can I do it”? This will depend on their access to different forms of resources (or capital), such as: social capital (networks, support, peer pressure); human capital (skills, education); financial capital (revenue, investments); physical capital (equipment, infrastructure); and natural capital (water, land).

In addition to these personal and situational factors are the features of any prescribed collaborative practice or activity, which will also affect people’s choices. These features include the practice’s effectiveness, practical benefits, ease of use, and how it has been designed and disseminated (that is “Does it work?”). For example, climate forecasting tools to assist farmers can be more effective if they include and make more explicit concepts and features that are important to stakeholders (e.g. linking historic rainfall records to people’s memory of climatic events). Finally, there will always be a range of macro-level factors that may be outside people’s direct control, but still influence their choices (e.g. economic conditions and pressures; government policies, legislation, programs and priorities; public pressures; and environmental conditions).

Rural sociologists have been able to identify how certain individual and situational factors encourage people to take up new practices and/or make changes to existing practices, while others discourage that uptake. For example, adopting a new practice is helped if those advocating for a new practice (e.g. natural resource management officers) have high degrees of credibility in the eyes of landholders; where landholders live in close proximity to others who have adopted the new practices; and when people are very tolerant of risk (financial and other kinds).
Some work has been done grouping people into segments according to their overall attitudes towards practice change in natural resource management (Mesiti & Vanclay 2006) and in the beef supply chain (Gattorna 2013). These segmentations can help advocates for practice change better understand their target audience's respective interests and needs. The work/research on the beef industry we have looked at for this project primarily focusses on getting producers and feedlotteras to do things differently in order to collaborate more and therefore increase the value of the industry (e.g. producers grow more cows, producers take their cows off the grass earlier, feedlotteras sharing price information more widely, customers receive better product). We have not seen this segmentation focussed on people working in other sectors of the supply chain.

2.4 Key points

This Chapter highlights that collaboration (in the supply chain) is a multi-dimensional phenomenon and is defined in various and not always compatible ways. There are many forms of working together and no such thing as 'one size fits all' models (Mashek 2016). Collaboration is hard, messy and highly iterative work that takes time (Mashek & Nanfis 2015). Essentially, collaboration is about relationships: people choosing to engage with each other in ways that help achieve something beneficial to them and others. The choices people make about how, when and how much to cooperate with others happens for many reasons. Understanding the wide range of those reasons is central to facilitating improved collaboration.

The extent to which people conceptualise the supply chain and/or sections of it as a group they belong to will be a key determinant (not necessarily the only one but an important one) of how and to what extent they will want to collaborate within it. It is important to recognise that the northern beef industry is not a singular or isolated concept, rather a series of parallel supply chains, communities and businesses that often have has much to gain from competing as from collaboration.

Particular problems in WA’s beef supply chain collaboration (information sharing, decision synchronisation and goal alignment) (Perrin 2015) appear consistent with problems found in supply chains more broadly, and are likely to be underpinned by those barriers that constrain collaboration and cooperation more generally. Therefore, proposed solutions to date, such as (new, different) governance frameworks and supporting data (e.g. Perrin 2015) should be evaluated in light of the degree to which they rely solely on technocratic responses and fail to address the range of social and economic constraints to collaboration – which research suggests are the more powerful determinants of improved collaboration.

The more general Northern Beef Futures is about what specifically they are asking people to do differently (or more of, or less of) the greater the effort required will be will be to assess how 'adoptable' those practices are and therefore achieve greater collaboration. It is critically important to move from the macro (and therefore more abstract) discussions about what needs to be done to improve collaboration in the beef industry supply chain to the more 'micro' level discussions whereby we think about what is it we are asking which people to do when we ask them to "collaborate more".

These findings are applied in the following Chapters to develop a Framework and a Plan for measuring and improving capability respectively.
The purpose of a Trust and Collaboration Framework is to assist industry and government to target improved collaboration and to evaluate the resulting impact on the northern beef industry. The Framework also needs to be flexible and adaptable given its purpose and focus will change over time in response to changing conditions and what is learnt. Based on these considerations the proposed Framework focusses on two areas: trends and benefits as shown in Figure 3.1 below.

**FIGURE 3.1 PROPOSED SUPPLY CHAIN COLLABORATION FRAMEWORK**

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**SOURCE: ACIL ALLEN CONSULTING**

### 3.1 Collaboration trends – where to look

Collaboration is influenced by the characteristics of the market drivers and the business practices that operate within the northern beef supply chain. Strategically it is important for industry and government to develop a (shared) understanding of how market drivers, shape the supply chain and collaboration.

At the same time industry and government need to acknowledge and integrate the different concepts of what the supply chains are and how they interact to drive diagnostics on where opportunities lie and how they can be addressed.

**Functional drivers**

For example northern beef needs to increase the area under production, intensify (lift productivity) and/or add value to cattle produced in order to grow the value and volume of the industry. Adding value is the area with the greatest potential for collaboration and to develop the industry (Figure 3.2 overleaf). This is because there is limited ability to expand the area under production and improving
productivity is not sufficient on its own. Rather productivity improvements need to be linked to turning off cattle that better meet market requirements which in turn requires greater collaboration across the supply chain.

**FIGURE 3.2 WHERE COLLABORATION CAN HELP IMPROVE FUNCTIONAL DRIVERS**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Drivers</th>
<th>Change</th>
<th>Action</th>
<th>Impact</th>
<th>Collaboration Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased turnover</td>
<td>Intensification (↑ Ma)</td>
<td>Improved yields</td>
<td>Genetics, water and feedlot</td>
<td>More &amp; better</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intensity production</td>
<td>Irrigation</td>
<td>cattle</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improve products</td>
<td>Consistent and reliable</td>
<td>Better demand</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improve positioning</td>
<td>Target markets and brand</td>
<td>Better demand</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transforming product</td>
<td>WA processing</td>
<td>Better demand</td>
<td>High</td>
</tr>
<tr>
<td>Farm more land (↑ ha)</td>
<td></td>
<td>Access more crown land</td>
<td>More approved uses</td>
<td>More cattle</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use more private land</td>
<td>Cattle replaces others</td>
<td>More cattle</td>
<td></td>
</tr>
<tr>
<td>Add value (↑ $)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF COROLUS 2016**

**Markets and supply chain structures**

An alternative way to conceptualise the supply chain is as the flow of cattle and how they interact with key market settings (Figure 3.3). Building the supply chain's capability to hold and finish (grow out, background, feedlot etc.) is important to growing both volume and value. The lighter live cattle export market to Indonesia has dominated the northern beef industry in recent years because it is well established, less complicated than alternatives and profitable at the currently strong prices. In March 2017 the Indonesian Government increased its limit from a total average of 350 to 450 kilograms in line with other export markets.

**FIGURE 3.3 KEY POINTS IN THE NORTHERN BEEF SUPPLY CHAIN**

**SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF COROLUS 2016**
Measuring the capacity and use within the supply chain also provides an important diagnostic identifying and addressing constraints. For example, the 2016 PWC study identified greater feedlotting capacity is required to meet potential higher value growth markets. Similarly ACIL Allen (2016) identified that lack of a readily accessible and fully functional holding yard in Port Hedland is limiting live exports from that port.

**Business mix, capacity and business practices**

The number of businesses involved in the northern beef industry is relatively small and in hundreds rather than thousands of enterprises. There are only a few abattoirs, saleyards and live exporters operating and not all pastoral properties are currently fully operational and productive. In the South West northern cattle concentrate in a limited number of backgrounding and feedlotting properties.

However considerable variability in the size, capital depth, skills, goals, risk appetites and diversification between the businesses is reported. Similarly the degree of vertical integration between businesses across the supply chain varies enormously.

Understanding these characteristics will assist considerably in understanding potential opportunities and constraints for each of the businesses and targeting programs to address through NBF and other initiatives.

However the combination of structural barriers to collaboration as well as enterprise diversity means the feasibility of actually measuring collaboration trends in detail at the industry scale is unlikely to be cost effective or particularly informative to industry or government.

Rather NBF should focus on using a customer relationship management (CRM) approach to target collaborators and use the supply concepts to analyse the benefits of improved collaboration.

### 3.2 Collaboration benefits – where to focus effort

The benefit part of the Framework (Figure 3.1) can inform government and industry by:

- demonstrating the impact of improved collaboration in the northern beef industry;
- providing scenario and other tools to identify policies and programs to develop the industry;
- developing business cases for public and private investment in the industry; and
- evaluating trials targeting collaboration to determine their impact and the role of collaboration.

These areas overlap with the whole of the NBF project. The increase in the volume and value of the northern beef industry has been established by various studies such as PWC 2016 and Coriolis 2016. NBF is also conducting numerous projects that involve trialling collaboration (Table 4.2).

The challenge for NBF, industry and government is how to further realise the potential growth identified by:

- exporting heavier live cattle and meeting the market quality and timing requirements;
- better meeting the requirements of higher value boxed beef;
- while maintaining economies of scale and scope in both live export and boxed beef markets.

There is a role here for the Framework to analyse how collaboration and other improvements benefit and incentivise change across the supply chain to realise the industry's potential.

A case study outlining the potential benefit of improved collaboration in backgrounding cattle is described in the following section.

### 3.3 Case study – benefit of improved Pilbara collaboration

In order to better understand the benefits of collaboration a case study on continuously supplying Pilbara breeder cattle to southern abattoirs was developed and modelled over ten years under different ownership and assumptions (Table 3.1). The full case study is provided in Appendix A.

The case study considers the impact of improved collaboration on two key northern beef industry challenges – variable supply and quality of cattle turned off. A smoother supply of Pilbara cattle across
the year will provide greater confidence and incentive improving the ability increase volume, quality and price across the supply chain.

To achieve this there needs to be collaboration with backgrounders and feedlots to provide the buffer between supply and demand in the supply chain. Different ownership arrangements were modelled to explore whether returns varied under breeder or abattoir ownership. The counterfactual is continuation of current markets but under 450 rather than 350 kilogram cattle exports to Indonesia. The assumptions included improvement in cattle prices arising from on-going feedback due to collaboration (growth and mark-up). Higher cost (from collaboration) and shock (from an endogenous variable such as drought) scenarios were also developed to provide a lower bound estimate.

Table 3.1 shows that if only the first three years/one generation is considered, the abattoir and counterfactual scenarios have similar net present values (NPV) that are significantly higher than those under the breeder ownership scenarios.

In contrast to the abattoir ownership scenario, the counterfactual does not require any coordination with others or any other form of collaboration. This approach might appear most attractive in the short term as its NPV of $51 million is only marginally lower than that under the abattoir ownership scenario ($52 million). Additionally, without collaboration breeders are also more likely to capitalise on price spikes and for example a 10 per cent price increase would result in a NPV of $59 million under the counterfactual scenario in which case it yields the highest single short term payoff.

<table>
<thead>
<tr>
<th>Assumption set</th>
<th>Breeder ownership</th>
<th>Abattoir ownership</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Best case $ million</td>
<td>High cost $ million</td>
<td>Shock $ million</td>
</tr>
<tr>
<td>After 3 years</td>
<td>27</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Base (after 10 yrs)</td>
<td>289</td>
<td>240</td>
<td>NA</td>
</tr>
<tr>
<td>Growth (after 10 yrs)</td>
<td>291</td>
<td>242</td>
<td>239</td>
</tr>
<tr>
<td>Mark up (after 10 yrs)</td>
<td>336</td>
<td>287</td>
<td>NA</td>
</tr>
<tr>
<td>Growth and mark up (after 10 yrs)</td>
<td>339</td>
<td>289</td>
<td>234</td>
</tr>
</tbody>
</table>

Growth assumes turning off lighter cattle will increase birth rate by 1 per cent per annum
Mark-up assumes 10 percent price premium/discount after 5 years
High cost assumes on-going 10 per cent greater costs associated with increased collaboration
Shock assumes a 30 percent decline in birth rate in year 4 due to drought or another exogenous influence

Over ten years, collaboration payoffs are greater than the counterfactual if growth or a price premium (mark-up) is included. Payoffs are highest under the breeder ownership scenario because the breeders benefit from the value added by the intermediaries and can sell at a higher price both to the abattoir and the live export market. The main driver under the abattoir ownership scenario is the reduced transport cost. In contrast to live exports, both scenarios offer opportunities for growth beyond the base revenue. If collaboration costs are higher the pay-off will only exceed the counterfactual if growth and premiums from collaboration are achieved. A shock such as a significant drought or reducing birth rate by 30 per cent will result in no net gain from collaboration.

Overall the case study indicates collaboration can benefit the industry, but will require the northern breeders to collaborate and is not without risk. Goals, capital depth, skills and attitude to risk will significantly influence willingness and ability to participate.
The initial scoping has identified two areas where targeted actions may improve collaboration and accelerate development of the industry: information sharing and collaboration trials (Figure 4.1). Collaboration trials include decision synchronisation and goal/incentive alignment as integrated rather than separate actions. The rationale for doing so is that collaboration needs to be developed and grounded at a level where supply chain participants can engage.

**FIGURE 4.1** PROPOSED TRUST AND COLLABORATION PLAN

### 4.1 Information sharing

For the purposes of this report, information sharing is considered to be the process whereby members of the supply chain regularly share and access data along the supply chain. Literature suggests that information quality is an important determinant of information sharing in terms of accuracy, timeliness, adequacy and credibility.

There are a number of benefits to sharing information in the supply chain. The most valuable of these are that it:

- Improves compliance
- Assists in planning and decision making
- Leads to improvements in profitability
- Improves timeliness/responsiveness to markets
Supports collaboration

The ACCC found that significant gains could be achieved in the Australian cattle industry through improvements to information flows and transparency. This requires greater engagement between parties at each stage of the value chain. Buyers, agents and representative organisations all have a role to play in ensuring that producers have clear signals that allow them to match production to market demands (ACCC, 2016).

There are a number of examples of information sharing in the Australian beef industry which can aid producers and other members of the supply chain. These include:

- **Livestock data link** – uses NLIS data to provide information on individual carcasses in terms of fat score, dentition, weight range and fat colour. Provides links to research, studies and so on that present information on how to improve compliance rates. Outcome is an improved rate of compliance and ultimately productivity.

- **Livestock information platform** – being developed. Aims to integrate existing databases so that they communicate with each other. Examples include NLIS, Meat Standards Australia, National Livestock Reporting Service (NLRS), genetics, on-farm data and weather.

- **MLA Value Chain Digital Strategy** – currently being developed to deliver seamless capture, integration and interpretation of the vast and increasing range of data being generated through new technology. Examples include a live animal and carcase measurement technology that will pave the way for value based pricing.

Greater information in the northern beef supply chain will assist in creating a more efficient industry by improving, amongst other things, compliance in the industry. It will also have the potential to increase productivity and to maximise the benefits of production related information that is being driven through programs delivered by Northern Beef Futures, MLA and others.

There are already a number of information sharing initiatives that are underway or being developed that the northern beef industry could tap into which are listed above. But these initiatives focus on parts of the supply chain and particularly the link between processors and producers. They do not cover the whole of the northern beef supply chain and importantly, they do not include customer feedback.

There is benefit in sharing information across the entire supply chain from producers, through to transport companies, saleyards, processors, live exports and customers. For example:

- Freely available specification requirements for live and processed cattle would allow the industry to target cattle to the most appropriate market. A better understanding of these requirements and how to interpret them is also important.

- Feedback from live export customers would allow the industry to transition toward a higher value product that is slaughter ready.

- Being responsive to export markets will assist the industry in maintaining or increasing market share in an increasingly competitive and complex market.

- Benchmarking of northern beef cattle against industry averages will allow the industry to better market its product. This includes being able to provide consumers with information relating to quality, animal welfare, food miles and so on.

To improve information sharing NBF should consider pursuing two actions:

1. Partner with MLA to pilot greater use of existing livestock data by the industry based on enduring digital platforms as part of the Digital Value Chain Strategy
2. Collate and publish all performance results from NBF projects to inform industry.
4.2 Trust and collaboration trials

Ultimately the reasons for, and benefits from, improved collaboration need to come from the trial projects embedded in the supply chain. This will create an experiential approach focussed on evidence to demonstrate the benefit of collaboration and build support within the industry.

We have identified four types of projects that require collaboration and will improve the industry (Table 4.1). These opportunities can be pursued in three ways:

— evaluating existing collaboration projects and communicating results to encourage broader adoption
— industry and government cooperating to establish new collaboration trials
— relying on existing commercial drivers to realise the opportunities.

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>Assumptions</th>
<th>What is involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closer ports</td>
<td>Transport costs are significant</td>
<td>Regional aggregation</td>
</tr>
<tr>
<td></td>
<td>Close ports limited by supply</td>
<td>Agreement to supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New business models</td>
</tr>
<tr>
<td>Continuous live export supply</td>
<td>All year live export demand</td>
<td>Align N-S ports with supply</td>
</tr>
<tr>
<td></td>
<td>Premium for all year supply</td>
<td>Regional aggregation</td>
</tr>
<tr>
<td>Boxed beef</td>
<td>Branded beef demand exists</td>
<td>Abattoir-production collaboration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off season supply</td>
</tr>
<tr>
<td>Live exports</td>
<td>Market will grow</td>
<td>Growing out</td>
</tr>
<tr>
<td></td>
<td>Existing can’t meet demand</td>
<td>Supply contracts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meeting market specifications</td>
</tr>
</tbody>
</table>

*Table 4.1 POTENTIAL TYPES OF COLLABORATION PROJECTS

Evaluating existing collaboration projects is important to provide a proof of concept, and lessons that can be applied more widely. This can include projects collaborating with and supported by NBF or operating independently (recognising the latter may not see value in participating in evaluations). Ideally each project will be evaluated at commencement and completion. Evaluating at commencement is particularly important given there will be uncertainty around the actual economic impact and degree of change/collaboration required at that time. A formative evaluation will outline how supply chain collaboration is structured around the project at that time and assist in sharpening the rationale and focus of the trial. This will form the basis for collecting evidence to during the trial and the subsequent summative evaluation on completion.

Given the challenges in strengthening trust and collaboration there is opportunity for industry and government to cooperate in establishing new collaboration trial projects.

NBF will soon be calling for expressions of interest to invest in trial projects to develop emerging supply chains. Table 4.2 lists some of the current and potential projects that require improved collaboration and could be supported by NBF. This list is not exhaustive and further potential trials will be put forward through the expression of interest. All of these projects should be subjected to a formative and summative evaluation that includes assessing the drivers and barriers to collaboration and overall impact.
<table>
<thead>
<tr>
<th>Project status</th>
<th>Description</th>
<th>Proponents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>North-South integration/backgrounding</td>
<td>Mingenew Irwin Group and West Midlands Group, Harvey Beef and Taurindi</td>
</tr>
<tr>
<td>Project in development</td>
<td>Breeder/feeder live cattle export to Thailand</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Project in development</td>
<td>North-South integration and backgrounding</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Project in development</td>
<td>Live cattle supply chain development to Hainan Island, China</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Project in development</td>
<td>Boxed beef to China and live export trade development to China.</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Project in development</td>
<td>Grass-fed beef quality assurance program</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Potential project</td>
<td>Mosaic agriculture on irrigated forage evaluation and animal trials in the Pilbara</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Potential project</td>
<td>Expanded chilled boxed beef export to China</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Potential project</td>
<td>Collaboration regarding mosaic agriculture, aggregated feeding the north and expanded boxed beef exports from southern processors to China</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Potential project</td>
<td>Aggregated feeding facility</td>
<td>Commercial in confidence</td>
</tr>
<tr>
<td>Potential project</td>
<td>Aggregated joint venture business models for investment</td>
<td>Commercial in confidence</td>
</tr>
</tbody>
</table>

SOURCE: DAFWA
5.1 Key findings

Western Australian's northern beef industry is connected to supply chains feeding live export and boxed beef supply chains, directly and indirectly, in northern and south-west Australia, for domestic and international markets.

The economic potential of the northern beef industry and degree of collaboration across the supply chains are described as sub-optimal by some because:

- Turn-off is below production potential and many cattle are not sold to highest value markets
- Spot selling rather than longer arrangements dominate much of the cattle trade
- There is distrust and limited collaboration between many participants across the supply chain

Structurally the industry has considerable supply-side risk for producers and processors as well as ongoing price risk. Production is variable and seasonal, creating intermittent and inconsistent turn-off. This limits the ability to guarantee supply. Spot markets provide industry an efficient mechanism to manage these risks along with lean operations and diversification for individual businesses. While effective, they limit supply chain collaboration and full economic potential, as in other beef industries.

Nonetheless the economic value of the industry can grow considerably if supply chain participants collaborate. Analysis of the Pilbara supply chain indicates the value of the industry can be increased over 10 years through collaborating to provide a continuous, reliable supply of cattle that meet market specifications. The level of increase ranges from matching current arrangements to 40 per cent growth.

The range of potential returns highlights a key finding from the literature review and consultations: supply chain collaboration cannot be achieved through communicating and promoting the macro (abstract) level opportunities alone. Rather supply chain collaboration requires an economic case for change where individual businesses involved can see benefit. Even then an individual business' ability to collaborate may be constrained by their own circumstances, particularly in relation to business goals, financial capability and skills.

Once the conditions of (potential) mutual benefit, willingness and capability are present social and cultural considerations become important. Collaboration operates across a continuum from networking to coordinating to cooperation to collaboration. Consequently effective supply chain collaboration can take time to build and may involve a number of iterations that progressively evolve across the collaboration continuum as the sharing, commitment and trust involved is created. This is particularly true when there is no immediate commercial imperative and participants need to work collectively to trial and develop the solution.
5.2 Implications

These findings have different implications for collaboration through information sharing, decision synchronisation and goal/incentive alignments. The specific information needs and circumstances of individual businesses within the northern beef supply chains vary considerably. They cannot be provided to a level where such information can fully inform business decision making. As such, improvements to information sharing need to focus on providing information and strengthening information brokering at a market level to foster collaboration. On the other hand decision synchronisation and goal/incentive alignment need to be focussed down to a level where individual businesses can understand the risks and returns of doing so.

Trust and Collaboration Framework

In terms of developing a Framework to measure trust and collaboration, the complexity and variability of the supply chain limit the value of monitoring collaboration on a business by business basis. Rather the Framework should focus on continually developing readily understood concepts of how the supply chain and collaboration work and analyse the benefit of changes to understand industry impact and inform business cases for industry and government.

Trust and Collaboration Implementation Plan

There are two areas where the Implementation Plan to improve collaboration should focus: information sharing and collaboration trials.

The aim of the information sharing is to increase the flow of cattle trade and performance data across the supply chain that is readily available to all participants. This should be undertaken in partnership with MLA as a pilot of the red meat Digital Value Chain Strategy to create an enduring digital platform. NBF must regularly publish the results from its projects so they are available to industry.

Ultimately the reasons for and benefits from improved collaboration needs to come from trials being implemented in the supply chain by industry participants. Areas where collaboration may strengthen the industry include:

- making greater use of underutilised ports to improve supply chain efficiency
- continuous live export supply to attract a premium for all year supply
- reliable and consistent supply to abattoirs to support branded product development
- meeting tighter live export volume and quality specifications to secure markets

The upcoming NBF expression of interest for emerging supply chains will result to a number of new projects that will require greater collaboration. These projects should be subjected to a formative and summative evaluation. The formative evaluation will outline how collaboration is perceived and structured when the projects commence. This will provide insight on how collaboration can be improved and a baseline for the summative evaluations on completion.
Collaboration is influenced by the characteristics of the market drivers and the business practices that operate within the northern beef supply chain. Strategically it is important for industry and government to develop a (shared) understanding of how market drivers shape the supply chain and collaboration.

Ultimately the northern beef industry needs to increase the area under production, intensify (lift productivity) and/or add value to cattle produced in order to grow the value and volume of the industry. Adding value is the area with the greatest potential for collaboration and to develop the industry. This is because there is limited ability to expand the area under production and improving productivity is not sufficient on its own. Rather productivity improvements need to be linked to turning off cattle that better meet market requirements which in turn requires greater collaboration across the supply chain.

Building the supply chain’s capability to hold and finish (grow out, background, feedlot etc.) cattle will be critical to growing both volume and value. However the lighter live cattle export market dominates the northern beef industry because it is well established, less complicated than alternatives and profitable at the current strong prices.

This chapter develops an analysis framework that assesses the (economic) benefits of extending supply chain capability towards producing a finished product and explores mechanisms that encourage breeders to produce cattle that meet the requirements of such a supply chain.

A.1 Analysis framework

In essence, breeders can sell into two markets: 1) live export and 2) the domestic market. If sold into the domestic market, cattle typically pass through a backgrounding facility and a feedlot before being processed at an abattoir. The analysis framework depicts the interaction between breeders and the two intermediaries.

The model is driven by relatively few simple assumptions and all components of the model are highly stylised and similar in many aspects. This approach was adopted in order to allow modelling of complex interactions without running into data and/or confidentiality issues.

In total the model simulates a turn off of 96,250 head per year (representative of the 2014 turn-off from the Pilbara) for ten years. It assumes that 50 per cent of calves are born in October and 50 per cent in November. All players are subject to the market conditions outlined in A.2 below. Assumptions driving behaviour are discussed in the scenario sections (A.3 andA.4). The players are:

- 50 stylised breeders with an (initial) annual turn-off of 1,925
- up to 70 backgrounders with a holding capacity of 5,000 head each
- up to 20 feedlots with a holding capacity of 5,000 head each.

Figure A.1 outlines the analysis framework and summarises key attributes of each supply chain component.
A.2 Market assumptions

The analysis framework assumes fixed values for (exogenous) influences that can be expected to be very similar (if not identical) for all involved parties. These influences are:

— **Price**
Prices are sourced from MLA market information and enter the model as two separate components:
- Base prices (shown in Table A.1) are determined by the sales weight and remain unchanged throughout the analysis.
- Price seasonality (shown in Figure A.2) is a monthly adjustment parameter that is applied to the base price. It is based on seasonal patterns derived from the past three years.

— **Weight gain (Figure A.3)**
- Breeder: 150 kg per annum taking place between November and June
- Backgrounder: Between 0.5kg/day and 1.0kg/day depending on the feed mix that can be controlled by the backgrounder
- Feedlotter: 1 kg/day

— **Feed costs (Figure A.4)**
- Breeders: Total cost of $1.3 per kg of live weight gained (ABARES: Cost of production)
- Backgrounder: Feed costs are lower when hay is available (between June and December) and also depend on the target weight gain. Lower energy food is assumed to be cheaper than higher energy food.
- Feedlotter: Fixed cost of just under $300 per tonne.

— **Transport cost**
Confidential.

**TABLE A.1 BASE PRICE AND WEIGHTS**

<table>
<thead>
<tr>
<th></th>
<th>Turn off weight (gross)</th>
<th>Curfew loss</th>
<th>Base price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder</td>
<td>200kg to 350kg</td>
<td>6 per cent</td>
<td>2.44 $/kg</td>
</tr>
<tr>
<td>Backgrounder</td>
<td>450kg</td>
<td>6 per cent</td>
<td>2.58 $/kg</td>
</tr>
<tr>
<td>Feedlotter</td>
<td>600kg</td>
<td>6 per cent</td>
<td>2.98 $/kg</td>
</tr>
</tbody>
</table>

*Source: MLA*
FIGURE A.2  PRICE SEASONALITY

Note: The three annual series are based in January of the respective year

SOURCE: WYCI DATA RETRIEVED FROM MLA WEBSITE

FIGURE A.3  AVERAGE WEIGHT GAIN PER MONTH

SOURCE: DAFWA
A.3 The counterfactual

Prior to the recently lifted weight restriction, the most common turn off weight in the past years was 350kg. The reason for this was that it was the most flexible (least risky) option for the breeder because an animal weighing 350kg could be sold to an agent without consideration of the final market. The most likely routes to market in this setting were the Muchea Livestock Centre and Broome Port for live export.

With the lift of the weight restriction of the live cattle destined for Indonesia industry expects a shift to a live export weight of 450kg. ACIL Allen expects that cattle currently exported through Fremantle Port will be turned off lighter\(^2\) and backgrounded in the south west while cattle currently exported through a northern port will be turned off weighing 450kg. The number of cattle on each route is not expected to change.

The analysis below first calibrates the analysis framework to the (observable) status quo in which cattle weighing 350kg are live exported and then uses this framework to develop a non-collaboration counterfactual in which live export cattle weigh 450kg.

350kg live exports

The analysis framework assumes that births are timed such that animals with the desired weight can be turned off at the end of the weight gain period, i.e. in May and June (compare Figure A.3) in order to minimise the time between birth and turn off. With calving occurring in October and November and a required weight gain of 300kg, cattle can be turned off in May and June at an age of approximately 20 months. As a consequence, the first turn off occurs in year three of the modelling period. Figure A.5 shows the resulting turn off profile for the Pilbara region.

\(^2\) ACIL Allen analysis suggests that adding less than 200kg through backgrounding is not economically viable. Industry confirmed this view. Consequently cattle going south are assumed to be sold at an empty weight of 250kg.
Transport costs to Muchea are estimated to be $96 per head which translates to almost 20 per cent of the total cost of producing a 350kg animal. Consequently a strong incentive exists for breeders to export through a northern port that is closer to their property presents an overview of the market faced by the breeders.

**TABLE A.2** AS IS: MARKET OVERVIEW

<table>
<thead>
<tr>
<th></th>
<th>Muchea</th>
<th>Broome</th>
<th>Port Hedland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight at turn off (kg)</td>
<td>350</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Age at turn off (months)</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Sales weight (kg)</td>
<td>329</td>
<td>329</td>
<td>329</td>
</tr>
<tr>
<td>Sales price ($/kg)</td>
<td>$2.55</td>
<td>$2.55</td>
<td>$2.55</td>
</tr>
<tr>
<td>Value per head</td>
<td>$840</td>
<td>$840</td>
<td>$840</td>
</tr>
<tr>
<td>Average transport distance</td>
<td>1,600</td>
<td>600</td>
<td>100</td>
</tr>
<tr>
<td>Cost per head (incl. transport)</td>
<td>$493</td>
<td>$438</td>
<td>$405</td>
</tr>
<tr>
<td>Profit per head</td>
<td>$347</td>
<td>$402</td>
<td>$414</td>
</tr>
<tr>
<td>Active month</td>
<td>May and June</td>
<td>May and June</td>
<td>May and June</td>
</tr>
<tr>
<td>Head</td>
<td>96,250</td>
<td>96,250</td>
<td>96,250</td>
</tr>
</tbody>
</table>

**SOURCE: ACIL ALLEN MODELLING**

Currently approximately 66 per cent of Pilbara cattle go south (mainly through Muchea) and 34 per cent are exported via a northern port (mainly Broome). Hence the current (expected) average per head profit is approximately $366 per head^3.

**The counterfactual (450kg live exports)**

As discussed, ACIL Allen does not expect the number of cattle on each route to change. This means that 66 per cent of the turn off will continue to go south but will be turned off with a gross weight of 275kg and the remaining 34 per cent live exported weighing 450kg. This means that to continue turn off in May and June, calving needs to occur in February and March and animals are turned off at an

\[^3\] \ 0.66 \times \$347 \text{ per head} + 0.34 \times \$402 \text{ per head} = \$366 \text{ per head}
age of 16 months (light) and 28 months (heavy). As a consequence the first turn off of light cattle only occurs in year two of the modelling period and the last turn off of heavy cattle in year 12 of the modelling period. This scenario further assumes that the direct live exports occur through Port Hedland in order to minimise transport costs. Table A.3 shows the resulting turn off profile.

**FIGURE A.6 COUNTERFACTUAL: BREEDER TURN OFF PROFILE**

![Graph showing turn off profile for breeders with different ages of cattle.]

**SOURCE: ACIL ALLEN MODELLING**

Table A.3 presents an overview of the counterfactual market faced by the breeders. It shows that while the profit for lighter cattle is lower than for 350kg cattle, the profit for heavier cattle is higher. On average a breeder can expect a profit of $375 per head under this scenario which is equivalent to the expected profits under the "as is" scenario.

<table>
<thead>
<tr>
<th>TABLE A.3 COUNTERFACTUAL MARKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn off month</td>
</tr>
<tr>
<td>May and June</td>
</tr>
<tr>
<td>Sales price per head</td>
</tr>
<tr>
<td>Cost per head</td>
</tr>
<tr>
<td>Profit per head</td>
</tr>
</tbody>
</table>

**SOURCE: ACIL ALLEN MODELLING**

Since they reflect a world without collaboration, the economics of this scenario can be interpreted as the minimum requirements of the breeders. If breeders are not at least marginally better off with collaboration they do not have an incentive to change their behaviour. Hence, if under an alternative arrangement the breeders' (expected) average per head profit is not at least $375 per head\(^4\), collaboration is unattractive.

---

\(^4\) 0.66 * $283 per head + 0.34 * $554 per head = $375 per head
A.4 Collaboration

The collaboration framework presented below is developed based on the following principles:

1. The aim of collaboration is for more cattle to remain in the domestic market
2. Abattoirs require a reliable supply of finished animals all year round
3. There is fixed seasonality in the north west
   - Calving occurs in October and November
   - Turn off is not feasible in summer and early autumn (heat and transport issues)
4. Breeders must be marginally better off than under the As is scenario

These principles imply that if it is to be worthwhile, collaboration needs to provide mechanisms that distribute the turn off from northern properties into a steady supply stream of finished cattle without reducing the breeders' average per head profit. The following analysis develops a collaboration scenario by sequentially applying principles one to four.

Turn off at live export weight and slow backgrounding

Under the market assumptions presented above, backgrounders can, by exploiting their ability to control weight gain, distribute turn off from one batch of cattle over several months. For example, backgrounding an animal from 330kg to 450kg can take between four months (1kg/day) and eight months (0.5kg/day). The resulting supply profile is presented in Figure A.7.

**FIGURE A.7** SUPPLY PROFILE WITH 350KG CATTLE FROM BREEDER AND MAXIMUM SMOOTHING AT BACKGROUNDER

![Supply Profile Chart](chart.png)

**SOURCE: ACIL ALLEN MODELLING**

The figure shows that under this scenario backgrounded cattle from the North West can only be traded in five months blocks. An abattoir operating under this arrangement would be able to acquire around 25,000 animals from the north in February and April, 12,000 in January and none in the remaining months. This does not align with principle two.

**Turn off at the end of the first weight gain period and slow backgrounding**

While it is risk minimising from a sales perspective for the breeder to turn off 20 month old animals weighing 350kg, it involves an extended period of inaction which could be avoided if animals were turned off at the end of the first weight gain phase weighing 200kg. This would mean that more weight
would be added by backgrounders which in turn would increase their ability to distribute turn off from one batch over nine months.\textsuperscript{5} The resulting supply profile is presented in Figure A.8.

**FIGURE A.8** SUPPLY PROFILE WITH 200KG CATTLE FROM BREEDER AND MAXIMUM SMOOTHING AT BACKGROUNDER

![Graph showing supply profile with 200kg cattle from breeder and maximum smoothing at backgrounder.](image)

**SOURCE: ACIL ALLEN MODELLING**

The figure demonstrates that with more backgrounding flexibility, backgrounded cattle can be traded in nine month blocks. An abattoir operating under this arrangement could have access to a steady supply of 6,200 animals from the north per month from July to March and up to 12,500 between August and February and none in the remaining months. This leaves three months without supply which does not align with principle two.

**Turn off at optimised weight mix and slow backgrounding**

If breeders turn off cattle weighing 350kg, finished cattle can be supplied from January to May and if they turn off at 200kg finished cattle can be supplied from July to February. This means that with a mix of turn off weights an almost steady supply could be provided. Under the following assumptions a steady supply of 6,200 head per month from July to May can be achieved:

- 66 per cent of the simulated northern cattle are turned off at 200kg, of these
  - 75 per cent come from properties with births in October
  - 25 per cent come from properties with births in November
- 34 per cent of the simulated northern cattle are tuned off at 350 kg, of these
  - 25 per cent come from properties with births in October
  - 75 per cent come from properties with births in November
- Backgrounders turn off cattle weighing 450kg and can control weight gain at rates between 0.5kg/day and 1.0kg/day.
- Backgrounders and feedlots are co-located in order to save transport cost

**Figure A.9** below shows the resulting supply profile. The figure highlights the more even spread of cattle throughout the year.

---

\textsuperscript{5} adding 260kg takes 17 months at 0.5kg/day and nine months at 1.0kg/day
As Table A.4 demonstrates below, finishing cattle can add substantial value to an animal and under the scenario developed above, the breeder is less well off. This issue is discussed further below.

<table>
<thead>
<tr>
<th>TABLE A.4 STEADY SUPPLY CASH FLOWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>200kg (63,125 head)</td>
</tr>
<tr>
<td>Sales price</td>
</tr>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Profit</td>
</tr>
<tr>
<td>350kg (32,500 head)</td>
</tr>
<tr>
<td>Sales price</td>
</tr>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Profit</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Sales price</td>
</tr>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Profit</td>
</tr>
</tbody>
</table>

SOURCE: ACIL ALLEN MODELLING
5.1 Incentive mechanisms

Under the counterfactual the supply chain ends with the breeder. In other words, depending on the point of export and the export weight the total value add per animal is between $283 and $554 (compare Table A.3) with an expected value of $375 per head. Table A.4 shows that under the collaboration scenario the expected profit of selling into the domestic market is only $246 per head for the breeder. This is too low to incentivise the breeder to change behaviour.

The problem is the current flow of money along the supply chain: The breeder sells to the backgrounder, the backgrounder to the feedlotter and the feedlotter to the abattoir. Under such an arrangement any premiums paid by the abattoir will go to the feedlotter. Since benefits only materialise if the breeder is incentivised not to live export, mechanisms need to be found for funds to flow from the abattoir to the breeder.

One option is that backgrounder and feedlotter would become low risk service providers with low capital requirements as they would not need to procure cattle. For simplicity, the analysis assumes that they only have to cover variable costs presented in Table A.4. Since there would be no procurement costs, backgrounder would have to be paid an average fee of $447 per head and feedlotter of $198 per head.

Preventing cattle from changing ownership along the supply chain is a straightforward solution. There are two options:

5. The breeder retains ownership until cattle are sold to the abattoir and pays a service fee to the backgrounder and feedlotter. Assuming the sales prices presented above, the breeder would make an average per head profit of $662 per head.

6. The abattoir acquires cattle directly from the breeder and abattoir and pays a service fee to the backgrounder and feedlotter. Assuming that the breeders would be compensated based on the expected live export price the abattoir would spend on average $1,020 per head. This is substantially lower than the average sales price from the feedlotter of $1,664 per head.

This high level analysis shows that if the required backgrounder and feedlot capacity could be provided at a cost recovery basis, under both scenarios breeders and abattoirs could be at least marginally better off.

The key difference between the two scenarios is the end of the supply chain at which the benefits are realised. Keeping ownership could almost double the average per head profit of breeders. However this would mean that they would have to coordinate their turn off such that it is available in the required timeframe and from relationships with backgrounder and feedlotter and manage that relationship. This could cause issues as realised profits would differ between breeders which means that the system has an inherent tendency for individuals to deviate from the optimal solution if profits are not ex-post redistributed. In other words this approach requires a very high level of collaboration and trust.

The second scenario appears easier to implement as a single entity coordinates turn off that could ensure that every party receives the same payments by paying a fixed price irrespective of weights for a batch that contains the required weight/age mix.

---

6 This does not take into consideration the opportunity cost of an under-utilised asset. Under-utilisation in this scenario is significant as backgrounder keep one generation of cattle for effectively two years. This means that the backgrounder system would have to have a capacity of up to 345,000 head that would on average only be 17.5 per cent utilised. At the supply rates and weight gains presented above, feedlotter are only able to finish one generation per year too resulting a minimum capacity of 100,000 head that would be utilised at an average rate of 40 per cent.

7 66% * $516 per head + 34% * $316 per head = $447 per head
66% * $197 per head + 34% * $200 per head = $198 per head
6 $1,664 per head - $357 per head - $447 per head - $198 per head = $662 per head
6 $375 per head + $447 per head + $198 per head = $956 per head
A.5 Financial modelling

As discussed above, the key to growing the domestic market is to incentivise breeders to refrain from live exports. Improving their financial position could create this incentive. This chapter develops three scenarios assessing the breeders' average cash flows under the following assumptions:

7. Breeders retain ownership
- Breeder cost: $357 per head
- Backgrounding service fee: $447 per head
- Feedlotter service fee: $198 per head
- All three costs are increased by 10 per cent in high cost assumption set
- Turn of weight mix developed in the collaboration scenario (see section A.4)
- Turning off lighter cattle can lead to an increase in the birth rate of 1 per cent per annum (only in assumption set: growth)
- The direct interaction with the abattoir improves the quality of the delivered cattle which can be rewarded by a 10 per cent price premium after 5 years or punished by 10 per cent if breeders are unable to deliver the expected number of animals (only in assumption set mark up)
- Under the shock assumption set birth rates experience a one off drop to 30 per cent in year 4. The resulting turn off gap is half filled by tuning off animals from the herd. The herd is assumed to be refilled by acquiring a total of 47,700 animals weighing 100 kg between year 7 and 11.
- Cattle are sold to abattoirs weighing 600kg

8. An abattoir acquires cattle directly from the breeders in the Pilbara
- Breeder cost: $307 per head
- Abattoir buys cattle for a fixed price of $682
- Per head (irrespective of weight) reflecting the expected cost and profit discussed in section A.5.1
- Turning off lighter cattle can lead to an increase in the birth rate of 1 per cent per annum (only in assumption set: growth)
- The direct interaction with the abattoir improves the quality of the delivered cattle which can be rewarded by a 10 per cent price premium after 5 years (only in assumption set mark up)

9. Counterfactual
- Breeder cost: $401 per head
- 34 per cent of cattle live exported at 450kg from a northern port
- 66 per cent of cattle sold at 275kg to a backgrounder in the south west

In all three scenarios cost and revenue are realised on an average per head basis when animals change ownership. The scenarios assume the turn off weights, prices and seasonal pattern discussed in section A.5 above.

Scenario 1 further assumes that animals that would exceed the demand from the abattoir when finished, are live exported after backgrounding weighing 450kg.\textsuperscript{10} Figure A.1 presents the resulting sales pattern. It shows that abattoirs can expect a steady supply of 6,200 head of finished cattle for 11 months of the year with excess cattle sold to the export market. The only supply gap under this scenario can be expected to be filled with southern cattle as June is one of the peak turn off months in this region.

\textsuperscript{10} A similar assumption could be made for the abattoir acquires cattle from the breeder scenario, but is left out of the analysis as it would not contribute to the breeders' cash flows.
Figure A.11 shows the breeders’ monthly aggregate (undiscounted) net cash flows under the three scenarios. It demonstrates that under scenario 2 and 3 the breeders’ cash flows are highly concentrated whereas under scenario 1 they are spread relatively evenly over the entire year. Under scenario 2 breeders have the first cash flow in year two after selling the first generation of light cattle.

The net cash flows presented above translate into the present values (discount rate of 10 per cent) presented in Table A.1. The table shows that if only the first three years/one generation is considered, the abattoir and counterfactual scenarios have similar net present value (NPV) that are significantly higher than those under the breeder ownership scenarios.
### TABLE A.15
**PRESENT VALUE OF NET CASH FLOWS BY SCENARIO AND ASSUMPTION SET**

<table>
<thead>
<tr>
<th>Assumption set</th>
<th>Best case</th>
<th>High cost</th>
<th>Shock</th>
<th>Abattoir ownership</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
</tr>
<tr>
<td>After 3 years</td>
<td>27</td>
<td>22</td>
<td>22</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Base</td>
<td>289</td>
<td>240</td>
<td>289</td>
<td>215</td>
<td>239</td>
</tr>
<tr>
<td>Growth</td>
<td>291</td>
<td>242</td>
<td>239</td>
<td>226</td>
<td>239</td>
</tr>
<tr>
<td>Mark up</td>
<td>336</td>
<td>287</td>
<td>243</td>
<td>240</td>
<td>239</td>
</tr>
<tr>
<td>Growth and mark up</td>
<td>339</td>
<td>289</td>
<td>234</td>
<td>253</td>
<td>239</td>
</tr>
</tbody>
</table>

*Growth assumes turning off lighter cattle will increase birth rate by 1 per cent per annum.
Mark-up assumes 10 per cent price premium/discount after 5 years.
High cost assumes 10 per cent increase in cost associated with increased collaboration.
Shock assumes a 30 per cent decrease in birth rate in year 4 due to drought or another exogenous influence.
SOURCE: ACIL ALLEN MODELLING*

In contrast to the abattoir ownership scenario, the counterfactual does not require any coordination with others or any other form of collaboration. This approach might appear most attractive in the short term as its NPV of $51 million is only marginally lower than that under the abattoir ownership scenario ($52 million). Additionally, without collaboration breeders are also more likely to capitalise on price spikes and for example a 10 per cent price increase would result in an NPV of $59 million under the counterfactual scenario in which case it yields the highest single short term payoff.

Considered over ten years however, the breeder ownership scenario yields substantially higher payoffs than the counterfactual. If a price premium is included the abattoir ownership is also likely to improve the breeders' position. Without growth or a price mark only the best case breeder ownership scenario appears likely to result in a significant improvement over the counterfactual. Payoffs are highest under the breeder ownership scenario because the breeders benefit from the value added by the intermediaries and can sell at a higher price both to the abattoir and the live export market.

The main driver under the abattoir ownership scenario is the reduced transport cost. In contrast to live exports, both scenarios offer opportunities for growth beyond the base revenue.

### A.6 Sensitivity scenarios

Two sensitivity scenarios were run:
- A lower birth weight of 30kg
- A higher feedlotter weight gain rate of 1.4 kg

The tables below (Table A.2 and Table A.3) present the results. Both tables show the net present values of the tested scenario and the change compared to the reference scenario in brackets.

The lower birth weight requires cattle to be born in June and July to ensure turn off in late autumn. Breeders also have to add more weight per head which moves the turn off of heavier cattle from April and May to May and June. While these changes reduce the short term (three year) NPV, they fill the June supply gap allowing the sale of 6,200 additional (higher value) finished cattle per year. As a consequence the long term breeder ownership NPVs are slightly higher under this scenario.
# Table A.26: Birth Weight 30kg: Present Value of Net Cash Flows by Scenario and Assumption Set

<table>
<thead>
<tr>
<th>Assumption set</th>
<th>Breeder ownership</th>
<th>Abattoir ownership</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Best case</td>
<td>High cost</td>
<td>Shock</td>
</tr>
<tr>
<td></td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
</tr>
<tr>
<td>After 3 years</td>
<td>24 (-3)</td>
<td>20 (-2)</td>
<td>24 (-3)</td>
</tr>
<tr>
<td></td>
<td>239 (0)</td>
<td>NA</td>
<td>215 (0)</td>
</tr>
<tr>
<td>Base</td>
<td>291 (0)</td>
<td>240 (-2)</td>
<td>236 (-3)</td>
</tr>
<tr>
<td>Growth</td>
<td>342 (6)</td>
<td>291 (4)</td>
<td>NA</td>
</tr>
<tr>
<td>Mark up</td>
<td>343 (4)</td>
<td>292 (3)</td>
<td>231 (-3)</td>
</tr>
</tbody>
</table>

Brackets show difference to NPVs with 50kg birth weight. Growth assumes turning off lighter cattle will increase birth rate by 1 per cent per annum. Mark-up assumes 10 percent price premium/discount after 5 years. High cost assumes 10% increase in cost associated with increased collaboration. Shock assumes a 30 percent decline in birth rate in year 4 due to drought or another exogenous influence. Source: ACIL ALLEN MODELLING

The higher feedlotter weight gain rate does not have an effect on the modelling results.

# Table A.37: Feedlotter Weight Gain Rate of 1.4kg/day: Present Value of Net Cash Flows by Scenario and Assumption Set

<table>
<thead>
<tr>
<th>Assumption set</th>
<th>Breeder ownership</th>
<th>Abattoir ownership</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Best case</td>
<td>High cost</td>
<td>Shock</td>
</tr>
<tr>
<td></td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
</tr>
<tr>
<td>After 3 years</td>
<td>27 (0)</td>
<td>22 (0)</td>
<td>27 (0)</td>
</tr>
<tr>
<td></td>
<td>289 (0)</td>
<td>NA</td>
<td>215 (0)</td>
</tr>
<tr>
<td>Base</td>
<td>291 (0)</td>
<td>242 (0)</td>
<td>239 (0)</td>
</tr>
<tr>
<td>Growth</td>
<td>336 (0)</td>
<td>287 (0)</td>
<td>NA</td>
</tr>
<tr>
<td>Mark up</td>
<td>339 (0)</td>
<td>289 (0)</td>
<td>234 (0)</td>
</tr>
</tbody>
</table>

Brackets show difference to NPVs with feedlotter weight gain rate of 1.0kg/day. Growth assumes turning off lighter cattle will increase birth rate by 1 per cent per annum. Mark-up assumes 10 percent price premium/discount after 5 years. High cost assumes 10% increase in cost associated with increased collaboration. Shock assumes a 30 percent decline in birth rate in year 4 due to drought or another exogenous influence. Source: ACIL ALLEN MODELLING
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