Rural Economies
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Supply Chains of the Sheep and Goat Meat Industry

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Executive summary

The purpose of this report is to identify and map the supply chain models that exist in the Qld Sheep and goat meat industry. This will provide a base to develop information and feedback to government and industry to address identified problems and prospects. The underlying aim of this research and subsequent policy advice is to help producers within the industry increase their financial returns and contribute to economic growth in sheep and goat producing communities.

To map and classify the supply chain, interviews were conducted with a number of intermediaries. This allowed the structure of sheep and goat meat supply chains to be assessed in the context of networks, key attributes and critical linkage points. The questions were centred around mapping the supply chain structure and processes. The supply chain questions were conducted using different thematic foci on where value is added, key aspects of the links that make them flexible or rigid, and limitations or opportunities in the supply chain.

Animal management and production was recognised as an integral part of the supply chain.The impact of wild dogs was noted as an issue particularly in southern Queensland, from Warwick through to the western corner. It was noted that the management of breeds and capacity to access improved genetics both for sheep and goat meat would be key to the meat industries' expansion in Queensland. These genetic improvements may focus on the meat quality and taste, along with animal production traits and characteristics. It wsa also identified that was a critical shortage of expertise regarding animal health, nutrition and management.. The technical support accessed for some of the producers was in Western Australia, which was extremely limiting to the growth of the Qld industry. Goat meat may achieve this once goats are removed from the Biosecurity Act, and sustainable management program is developed.

Sheep and goat meat was identified as having a relatively short-supply chain, particularly in Outback Qld, providing increased food security. However, cold chain logistics are still required to maintain the food network and support the expansion of market access for a number of intermediaries in the supply chain. The road network is critical to this in ensuring all weather access. Employment was identified as a key issue across the supply chain and this, in conjunction with very low margins for some intermediaries, resulted in very fragile supply chains. Informal networks were currently fostering the development of new markets and supporting the viability of a number of players in the supply chain.

Introduction

Supply chains are complex and involve a number of key operators and links to ensure that they function efficiently. The sheep and goat meat supply chain in Queensland is simpler than some agrifood supply chains but still involves a number of agents that operate and contribute to the overall chain.

The performance of agrifood supply chains such as for sheep and goat meats can be affected by a range of external factors (e.g., market information, quality of road network) which are typically not considered in individual business supply chain analyses but are more relevant at industry levels. Agrifood supply chains at an industry level typically provide individual producers, industry bodies and governments with information about issues (e.g., price bargaining power of mid-supply chain entities, poor road quality or network) and opportunities (e.g., increasing consumer demand, export) at a broader scale.

Individual businesses and industries require a supply chain analysis to identify whether their industry and business performance complies with their corporate objectives or strategies and to assess their competitive advantage within the market (Chopra, 2007). There are a number of approaches such as value chain analysis, risk analysis and criteria including efficiency, flexibility, responsiveness, agility that can be applied to analyse agrifood supply chains at an individual business level (Beamon, 1998; Chopra, 2007; Estampe *et al.*, 2013). These insights allow improvements at an industry level to then be assessed.

The purpose of this report is to understand and map the supply chain models that exist in the Qld Sheep and goat meat industry. This will provide a base to develop information and feedback to government and industry to address identified problems and prospects. The underlying aim of this research and subsequent policy advice is to help producers within the industry increase their financial returns and contribute to economic growth in sheep and goat producing communities.

This study analyses the sheep meat and goat meat supply chain in an effort to optimise agrifood distribution networks to increase the value generated within the network. This is then expected to increase the return to agriculture and its surrounding community. The scope of this study does not include an assessment of sustainability components of the sheep and goat meat supply chains (e.g., carbon footprint, food waste mitigation), nor does this research focus on aspects which may be important for consumers of sheep and goat meat, such as traceability and food safety considerations within agrifood supply chains.

The key aims of this report are to improve our understanding of the following:

- sheep and goat meat supply chains and classifications
- overall value change for the sheep and goat meat industry by meeting consumer demands
- limitations for industry to meet the demands of increased processing
- key aspects in the domestic supply chain to provide greater confidence in investment

Background and Context

Factors that differentiate an agrifood supply chain from other supply chains are, for example, a) the nature of production which is based of biological processes, thus, prone to high variability and risk, b) the characteristics of the product, such as, perishability and bulkiness which require consideration in the supply chain, and c) consumer expectations in regard to food safety and production standards (Aramyan *et al.*, 2006; Lemma *et al.*, 2014).

Yet, there are several common factors across agrifood supply chains which typically include:

- production input providers (e.g., equipment, seed, genetics company, technology, capital investment),
- agricultural producers,
- processors (e.g. Slaughtering and preparation),
- wholesalers (e.g., distribution),
- retailers (e.g., distribution, marketing and sales), and
- consumers.

To foster further development of the sheep and goat meat supply chains the characteristics of the product should be considered. This may include information about the food category (e.g., sheep and goat meat), perishability, freight type (e.g., cold chain), product categories (e.g., primary or secondary) and seasonality of supply. The second category of information which is required for a description of an agrifood supply chain is the mapping of the supply chain's structure and processes. Such maps can illustrate the architectural structure of entities that operate within a supply chain and how these are connected (Gardner and Cooper, 2003). Supply chain mapping of the sheep and goat meat industry can then be used to enhance strategic planning processes, facilitate redesign or modification, obtain clarity about network dynamics, enhance communication, enable monitoring of supply chain strategies and to provide a basis for supply chain analysis (Gardner and Cooper, 2003; Albu and Griffith, 2006; M4P, 2008; Kaminski *et al.*, 2018).

The structure of agrifood supply chains are generally considered as open networks (Mena *et al.*, 2013), which means that there is only a one-directional physical flow of the product from producer to consumer via a number of entities (in the absence of recycling or after-consumption collection like for products produced by other industries (Mena *et al.*, 2013; Gong *et al.*, 2018). Furthermore, most agrifood supply chains are constructed around a very similar group of entities, such as, producers, processors, wholesalers, retailers, and consumers. However, the way in which these entities are connected with each other can differ significantly (e.g., Plagányi *et al.*, 2014). However the Qld Sheep and goat meat supply chains have not been mapped or classified in recent times and therefore there is ambiguity about where government has a role in supporting the development of the industry and the supply chain. This report aims to map and classify the supply chains and then consider what are the key areas where government support is most useful.

Methods

This component involves collection and analysis of expert information to understand the critical components of sheep meat and goat meat supply chains. Direct interviews were selected as the method of data collection as suitable secondary data could not be identified. Interviews with 25 stakeholders from Western Qld and the Darling Downs and the domestic supply chainwere completed either in-person and over the phone. The interviewees ranged from processors, wholesalers, agents, livestock carriers and were selected to represent a variety of pathways and functions in the supply chains. In the interviews each of the participants were asked a combination of open ended and closed ended questions.

The questions were centred around mapping the supply chain structure and processes. The supply chain questions were designed using different thematic foci on where value is added, key aspects of the links which make them either flexible or rigid, and limitations or opportunities in the supply chain (Gardner and Cooper, 2003). Such thematic foci enables subsequent supply chain network mapping (e.g., Fassinou Hotegni, Lommen, van der Vorstc, Agbossoud, & Struike, 2014). The assessment of supply chain governance processes, such as, relationships among supply chains players (e.g., collaborative or coordination) were identified as factors of interest (Denolf, Trienekens, van der Vorst, & Omta, 2015; Zhang & Aramyan, 2009).

All aspects of survey design and implementation adopted social research best practice and adopted the five ethical responsibilities towards survey participants, namely voluntary participation, informed consent, no harm, confidentiality and privacy (De Vaus, 2002). The surveys were completed under Ethics Project Number 000022983 at CQUniversity.

Sheep and Goat Meat Supply Chain Attributes

The interviews quickly identified the key attributes of the sheep and goat meat supply chain which impact on where the largest improvements can be made. These factors are live animals, cold chain logistics, competition, and perishability (Figure 1).

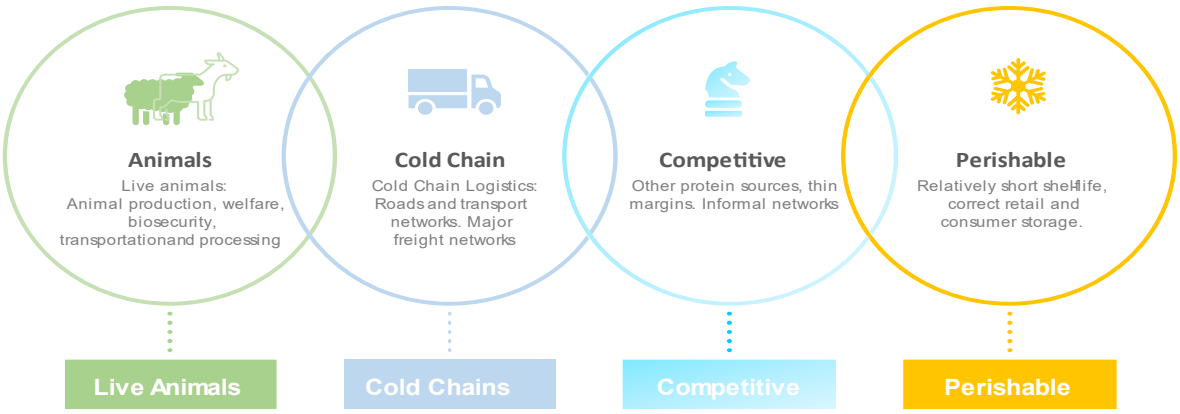

Figure 1 Key attributes of the sheep and goat meat supply chains

Animals

Animal management and production was recognised as a key function in the supply chain. The impact of wild dogs was noted as an issue, particulary in southern Queensland, from Warwick through to the western corner. It was noted that the management of breeds and capacity to access improved genetics both for sheep and goat meat would be key to the meat industries' expansion in Queensland. These genetic improvements may focus on the meat quality and taste, along with animal production traits and characteristics.

There appears to be a gap around skills in goat nutriiton and for goat animal health products approved by the AMVMA. For goat producers, there is not yet sufficent animal health advice or knowledge to grow the industry with certainty. Many producers are unsure of the cause and effect of different health issues and mortalities that specifically affect goats. This was identified by a number of producers and is a key limitaiton to the growth of the industry.

All surveyed producers acknowledged the small number of parasitic worming products registered for goats in Australia as a problem for the meat goat industry, along with a low level of technical advice regarding goat nutrition and animal health. As the price of goats (including goat stud offerings), and goat meat increases, this will become of increasing importance to the industry as poor animal health outcomes and mortalities become more expensive for producers to incur. Goat nutritional requirements differ depending on the location of the animal. Nutritional requirements, and animal husbandry, of goats owned by breeders on the southern downs and Burnett areas differs to the goat production systems on western and rangeland areas where animals are consuming large amount of tannins through the browsing for the control of woody weeds. Likewise, the capacity

to bred animals in the southern downs and other inland areas for relocating out west for finishing or genetic herd building is impacted by limited knowledge of animal health.

Having goat management guidelines and a dedicated research and extension program tailored specifically for the biophysical properties of rangelands and south east regions would allow the industry to progress. This work would allow best practice approaches to be developed meeting biosecurity requirements and would meet the increasing consumer demands for animal welfare.

Queensland has experienced increasing pressures of climate change which results in more variable weather and prolonged droughts. To manage the landscape and to avoid long term degradation and supply chain shortages of animals the long term management of both sheep and goats is required to be considered in the management guidelines. Both have a history of creating significant degradation during drought events that have had long term resource impacts.

Outside of animal health and related services, increased knowledge by financial advisors and lenders would assist industry development. Government services, eg DAF, are often an early contact point for lenders and advisors. For example, in developing lending policy, or establishing benchmark guidelines for animal sales and production capacity, QRIDA (Queensland Rural and Industry Development Authority) first seeks to build on government resources, and would make contact with DAF. It would be difficult for QRIDA to make an informed lending policy, or lending decision, in an industry or sector where there are limited resources and extension knowledge to draw on.

Cold Chain Logistics

Access to domestic markets is driven by trucking cold freight logistics. Sheep and Goat retailers and wholesales that are on a major highway or freight path have access to different, typically more geographically diverse, markets due those in more isolated areas. A number of butchers who slaughtered their own animals and then supplemented supply found that the cold chain links to wider supply chains were increasing difficult to access due to the poor communication of suppliers. Experiencing variances of timing (to have capacity to unload to another cold room or deliver when the truck arrives), some found this so limiting to their business growth that they purchased refridgerated trucks or trailers to ensure that product arrived with the required level of food standard and safety.

The logistics task across large distances and on, at times, poor quality unsealed roads presents a number of challenges for the industry and growth. The limitations to get stock out for processing in wet conditions is a critical management consideration, highlighting the importance of all weather roads.

Competitive

All animal proteins compete with each other when people make the choice on what meat to consume. Australia exports the majority of its meat production in a number of product lines (beef, goat, pig, sheep). For this reason, the price of meat is driven not only by domestic demand but by international demand and the current value of the Australian dollar. Both sheep and goat meat are expensive relative to pork and chicken, and are competing

with beef and seafood. The price that domestic consumer will pay is relative to the price of these meats. Currently the margins for established goat and sheep meat producers are relatively high however after the producer sells his animal, the margins become thinner as the product moves through the supply chain. Therefore volume becomes a critical aspect of ensuring viability for all operators along the supply chain as improved economies of scale are realised. Similarly, to maintain sheep and goat stock numbers, in order to cater to the domestic and international markets, the industry benefits from longer-term producers who can maintain supply over varying seasons and years.

There are a number of informal networks and relationships that are critical to the supply chain. These are based around producers selling to processors and or butchers, or based on butchers in one area demanding product that can be supplied from another butcher. These informal networks are based on established relationships and margins that ensures ongoing viability.

Perishable

The perishable nature of meat requires it to be retailed and then stored by the customer in particular conditions. Perishability is a key influence in the size and shape of the supply chain, from processing through to sale to the consumer. Due to this characteristic of perishability, many regional butchers still process their own meat. Having their own stock reduces the potential for spoilage once processed. The perishable nature of the product highlights why so many variations of cold supply chains exist, and why many of these have small, regional footprints. It also explains why no one supplier who covers Queensland in its entirety was identified, and why butchers and smaller processors ensure local level food security in remote areas of Queensland. It also presents challenges with correct cold chain logistics, delivery of home delivered orders, and developing new markets.

Supply Chain Mapping

Mapping the supply chains allows an understanding of the supply chain management strategies employed by the businesses in the supply chains which may focus on different products and customers.

After the interviews, three key maps were formulated that represented the supply chains that are most commonly implemented for both sheep and goat meat in Queensland. There are large differences between these three key models however these are specific to the operation and location and present flexibility and opportunity for those key links within them. It must be remembered there is a further export supply chain for both sheep meat and goats. This export supply chain is a direct competitor of the domestic supply chains and influences the price as the largest export market for goats is the US therefore the exchange rate relative to the US dollar is a key driver.

Supply Chain One:

The first supply chain map exhibits large amounts of vertical integration (Figure 2). A majority of the supply chain businesses were owner operated with many having different entities set up to facilitate each step of the supply chain. Most either have a small holding or are able to source livestock through the various purchasing channels (through existing relationships, saleyards, or auctions plus) in smaller lots (50-100), and have capacity to transport them or have them transported to their holding property.

The target weights for live weight goats is 30kg and 50kgs for lambs, which then translates into 17kg goat and 18-25kg dressed lamb carcasses. Crossed meat breeds such as Suffolk or Dorper will yield a higher amount however there is no clear lamb or goat grid that producers are paid on. This was identified throughout the supply chain as an opportunity for the industry. In this supply chain there are many private kills taking place for service fees whereby the animal is provided by a property, and then is slaughtered, cut up to their specifications and packaged by the butcher.

The majority of these animal processing facilities have been operating for ten or more years and are flexible with the capacity to do between 10 and 100 bodies per week. They have a large portion that wholesale and meet the demands of their own retail base. Having such vertical integration allows them to provide customer information regarding the story behind their meat and allows them to process in a way that suits the demands for each of their separate customers (i.e. some wholesalers may want whole bodies while others may want packaged cuts). This supply chain allows the business entities to manage price fluctuations and limits risks of not having product to deliver. It also allows the utilisation of the whole carcass and ensures that the product is fresh.

Price of sheep and goats and potential losses of product were identified by all of the interviewees as risks to be managed. This supply chain model results in a larger margin to be gained at each step of the supply chain but also hold more responsibility, in ensuring that wholesale orders are able to be filled regularly. This high price leads to concern over product demand that can't be utilised and for that reason many of the retails would also order in boxed lamb loin chops from wholesalers to supplement their supply without having to then slaughter more animals and not have demand for the other cuts. However it was noted that cold chain logistics, when reliant on other freight carriers, can be difficult and creates risks regarding temperature management and timing (the supplementary goods not arriving on time for an order).

These vertically integrated supply chains were more common in areas that were more remote where risk was presented by being reliant on coordination of other entities through the supply chain. In this supply chain model butchers and processors were more likely to keep their "patch" of wholesale clients and respected that in order to maintain viability. There was, however, co-ordination through the butcher retail network in regards to meeting demands that other retailers may have. This was done through their informal networks and relationships.

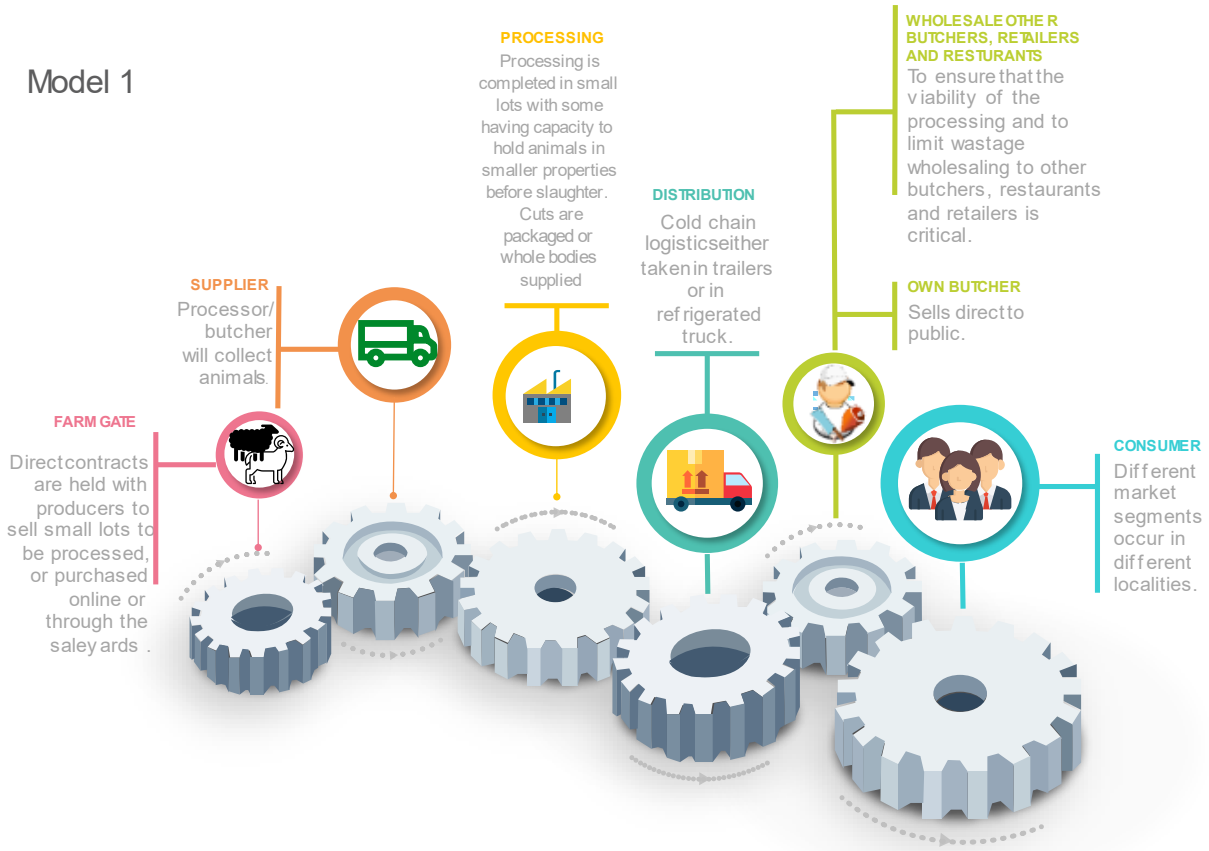

Figure 2 Supply Chain Map-Supply chain one with large amount of vertical integration.

Supply Chain Two:

Supply chain two mirrors that of supply chain one with large vertical integration, with an added extra component to ensure that the product that is processed really meets the demands of the retail and wholesale customers with animals feed on a ration for eight weeks or more commonly supplementary feeding rations are provided. This includes both goats and sheep. This model requires a larger holding site and capacity to feed grain however also has a more premium product for its customers both at a wholesale level and at a retail level.

It was identified through the interviews that there were a large proportion of owner-operators who were in the first 10 years of business who were willing to take on the vertical integration path. While two butchers were currently seeking to sell their retail component whilst maintaining the processing component this was because of employment issues rather than viability concerns.

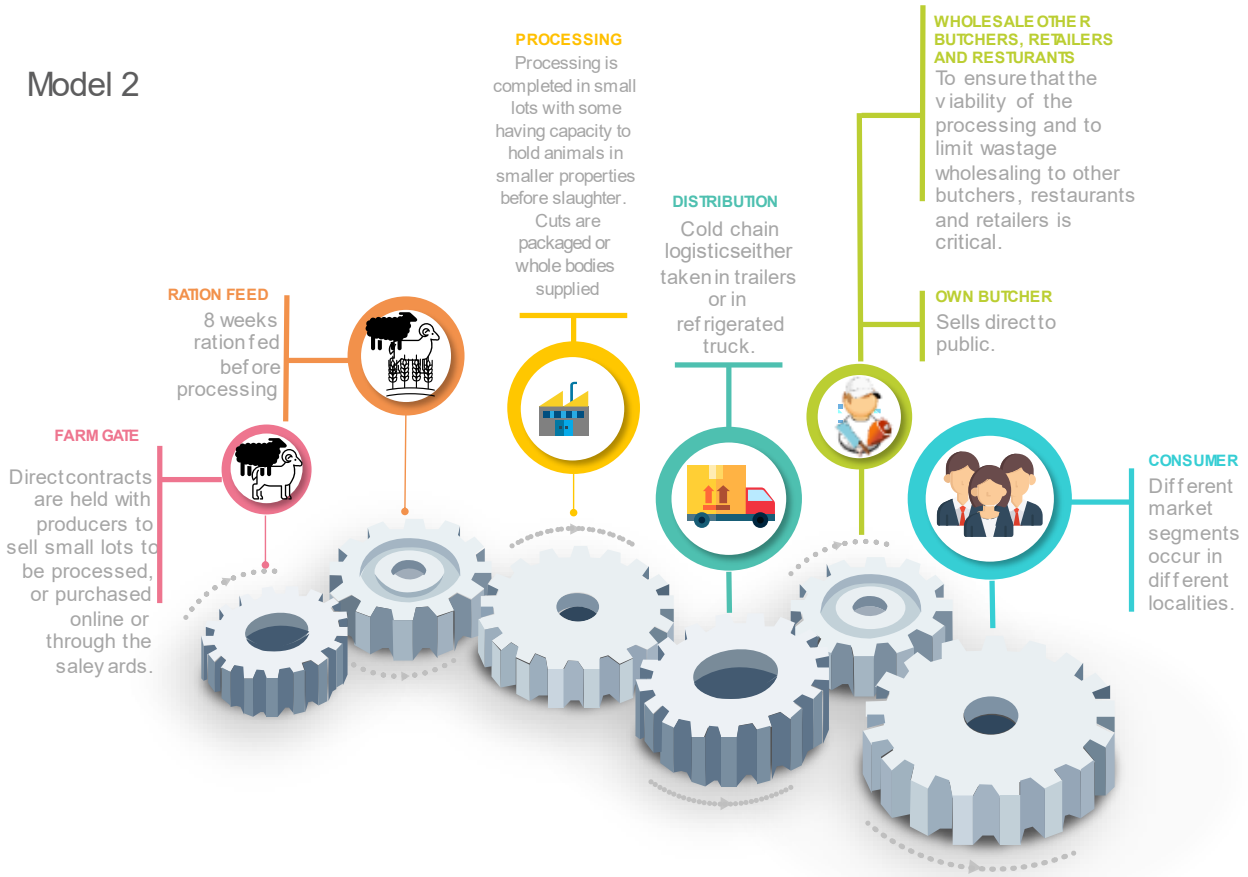

Figure 3. Supply Chain Map-Supply chain two increased value add through ration feeding.

Supply Chain Three:

This model present a shorter supply chain with the processing completed interstate and the bodies trucked up to Queensland weekly in cold chain logistics as whole bodies or boxed product. These butchers were more focused on providing traditional lamb products rather than goat meat and were also more focused on the local market (Figure 4). The capacity to run this model was geographically based with highway logistics proving critical to ensuring this model was effective.

There were a large number of butchers who had been in business for a longer period of time who implemented this model. They also may not have had an existing processing facility that they could employ in close proximity to their retail outlet, and were faced with lengthy time and large capital requirements to processes their own animals. There were other owners who had a number of retail butcher outlets making the freight from Victoria or NSW a viable option due to the scale of the order which were then distributed across the retail outlets. This model tended to exist in areas where the population density was higher.

Model 3

Figure 4. Supply Chain Map-Supply chain three short supply chain.

Value chain analysis

A value chain analysis can be conducted by calculating the incremental value changes of the product based on the progression through the network (see Figure 5). Value chain analysis is important to understand what are the aspects that the key links in the chain add to the product and the opportunities and challenges that these links face. It provides context for why the different supply chain models exist and how they can be further developed and where margins exist for further entries into the supply chain. In this project the value chain was put together for both goat and lamb, highlighting commonalities in the vertical integration supply chain, particularly around existing processing facilities.

The first step in the value chain is the purchase of the animal from producers at the target domestic weight. Prices vary for both lamb and goat however currently ranges between $7.20 to $9.50 per kilogram depending on the animal and the time of the year (Figure 5). At times high demand for lamb and goat (such as during Ramadan) means prices increase in the saleyards, auction or through existing relationships. Seasonal fluctuations in both supply and demand helps explain the range that is experienced in the value chain. Price fluctuations of domestic lamb is in part influenced by the time of year, export market (which takes heavier lambs in the 30-35kg range) and the seasonal conditions. Processing involves slaughtering and breaking down the animal, value adding another 31-37% to the farm gate price. There is a need for accredited processing facilities with many interviewees noting that the time lags and capital required for installation makesit difficult to add new processing facilities.

From here the product is freighted to wholesalers and broken down further before being packed into the required cuts for retailers. The freight, cold chain logistics and the preparation for retail adds a further 43- 59% to the value. Processing and wholesale stages were often operated by the one entity. There are substantial requirements to meet with processing regulations and extensive meat inspector training.

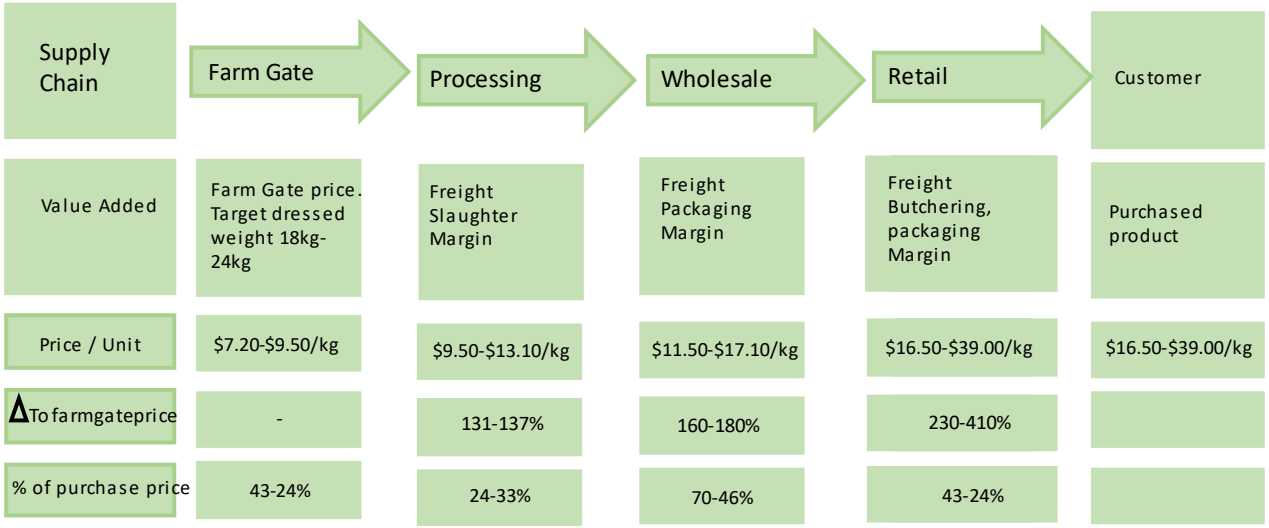

Figure 5. Value chain for sheep and goats.

The largest value add was identified in the wholesale stage of the value chain. It explains why so many entities have both processing and wholesale stages, as this also has the largest scope for volume for processors. Those that can retail also capture this added value with a doubling in the value add, although they would not necessarily have the capacity to move the volume all year around. As the margins are also small the transparency through the value chain is limited (no use of consistent quality grid), as processors and wholesalers compete to achieve the highest margins.

Many entities in the supply chain that process and wholesale also have cold chain logistics. This is important because while having their own fleet can reduce margins it also ensures that the product arrives in the correct conditions and on the correct days to fulfill orders. Compared to other value chains both the lamb and goat meat value chains in Queensland are marginal, with the direct impact of exports and exchange rates pushing up the price for lamb and goat meat.

Supply chain classification

Food supply chains are often classified as either long or short chains characterised by a number of aspects. They can be classified by the spatial scale (locally-based, regional and national), relation with the state (new

innovations in governance are associated with short chains), food production values (beyond commodity value), and farm-level incomes and impacts (Smith *et al.*, 2016).

Long supply chains are described as supplying through supermarkets in urban and regional areas. They are largely retailer-driven, involving inter-state transport, minimal inventory, "just in time" delivery of products and are heavily regulated. Short supply chains are often described as operating largely independently from the long supply chains, and have few intermediaries and actors along the chain, and have critical relationships and networks. These agri-food short supply chains can include aspects such as farmers markets, food-related cooperatives and close spatial distance between links in the supply chain. The classification between the two can be problematic and there is little consensus on defining "long" and "short" geographically. In an Australian context, a Brisbane-based project has defined local as within a five hour drive from the city (Smith et al., 2016).

However, all supply chains are increasingly trading upon the values of quality and localisation which are more commonly associated with short supply chains. However there is some evidence to suggest that increasing vertical integration (a key characteristic of long chains) facilitates the flow of information (as well as goods) along the supply chain, particularly via the use of quality standards, accreditation and certification schemes used increasingly by retailers (Burch and Lawrence 2007). The "hybridization" of both conventional and alternative chains has also been noted (Mount 2011; Wilson 2012; Wilson and Whitehead 2012).

Table 1. Supply chain classification

Supply chain	*Characteristics*	*Classification*
One	Vertical integration, few intermediaries, focus on quality and fresh, spatially close	More focused on short supply, however exhibits Hybridised approach with vertical integration.
Two	Vertical integration, few intermediaries, focus on quality and fresh, spatially close	More focused on short supply however exhibits Hybridised approach with vertical integration.
Three	Inter-state transport, just in time delivery, retail-focused.	Long supply chain

From these supply chain maps, classifications and the interviews, the three key elements that seem most relevant to apply to sheep meat and goat meat supply chains in Queensland are diversity, responsiveness and cohesion. An additional element draws from the short and long chains, which we have determined to be an aspect of scale. These categories can be used to assess the extent to which various supply chain structures demonstrate resilience and ensure food security and growth to regional communities.

We follow the definition of Smith et al (20116) and define these as scale, diversity, responsiveness and cohesion. Together, these four components highlight the resilience of a supply chain. Based on the interviews, we have separated these classification themes, but in reality they are highly interconnected and combine to affect overall food system resilience.

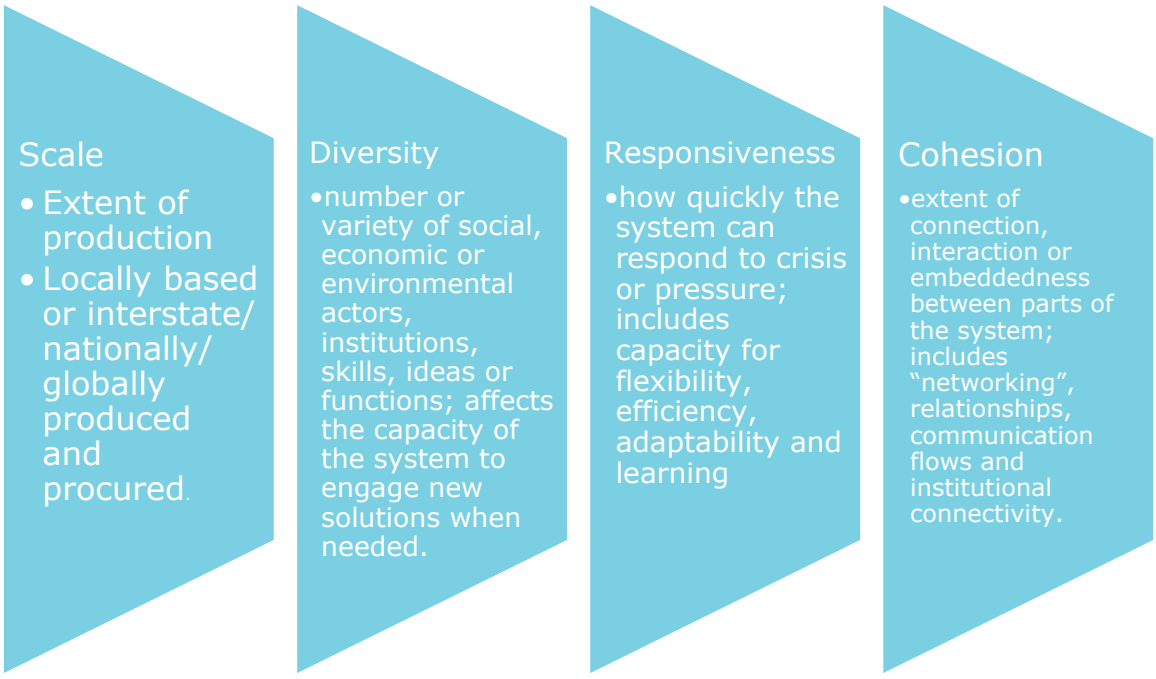

Figure 6. Resilienace of supply chains.

Scale

The scale of supply chains one and two are generally less than 100 animals per day, with only one stakeholder able to process and manage significantly more than this, of which the majority is export-focused. Although vertical integration exists with many butchers, processing and having the capacity to hold their own stock, the quantities purchased are still less than 1,000 head per week. In the rangelands, the scale or density of livestock is low in the poor seasons and the consistency of supply is varied. In the context of broader interstate supply chains, the Qld supply chains are still relatively small. The number of existing processors with aging infrastructure was also identified as a scale factor with a number of processors highlighting the cost and regulation process required to get a new processing facility approved.

Supply chain three is a part of a long supply chain where the supply is from interstate with lower variations in supply, relationshipsmore focused on wholesale and greater volume to meet the demand of a number of retail

outlets. These supply chains however, can be impacted by external shocks, there are a number of intermediaries geographically a long distance away, and they have limited influence on the outcomes.

Supply chains one and two have a large proportion of locally-based food systems, and on the whole are less dependent upon inputs derived from distant locations. This allows the supply chains to continue in the face of natural disasters in times of pandemic restrictions, increasing the food security and economic opportunities for the locations where they operate. These supply chain agents are more closely connected to customers, providing flexibility in relation to food access. This was evident with one processor being contacted regarding the capacity for the supply chain to continue at the height of the COVID-19 pandemic. Yet, in not having the wider networks of the state- and nationally-based food retailers, local systems may not have the resources to quickly recover when factors such as natural disasters or external factors occur.

Diversity

All three supply chains have elements of diversity; this is in part due to their diversity of animals that they have the capacity to source but also the key aspects of relationships that they hold between themselves and other supply chains that are running parallel to their business' supply chain. These strong relationships allow interactions when difficulties arise, ensuring the supply chain remains operational. These networks and fewer critical dependencies are stronger in the context of supply chains one and two however the processing aspect is critical to these supply chains being maintained. Supply chain three also has linear network features that also can be disrupted.

The diversity between the supply chains that exist is both spatial and market-based which was identified as a strength across the interviews. The supply chains were also highly collaborative and flexible in meeting the needs of the other supply chains if needed.

Responsiveness

Responsiveness or capacity to respond in times of pressure or uncertainty is enhanced by the "vertical integration" of supply chains one and two as butchers have oversight over both the movement of goods and the movement of information along the supply chain. Notions of quality, value, trust and are increasingly central to all food supply chains, but can be highly variable if constructed by a number of parties in the supply chain. Having increased vertical integration limits misinformation and allows trust and quality to be built and maintained.

Responsiveness also allows new markets to be built and developed. A number of retailers in supply chains one and two are servicing ethnic markets. These links have been identified in the regional cities and in Brisbane with these supply chains being responsive to the product that is being demanded by consumers. It also enables fluctuations in demand to be more responsive throughout the year as they are also directly interacting with the customer to adjust cuts to meet these demands.

Cohesion

The three different supply chains all exhibit cohesion. The broader supply chains have the capacity to work together to fill orders and the industry is relatively small in Queensland, enabling interaction and relationship building. There are many aspects that are based on informal relationships to achieve a mutually beneficial outcome. For example many landholders supply sheep and lambs, but also have private kills done. Butchers filling orders for existing wholesalers find that if they are short, extra numbers can be slaughtered for one-off wholesale demand. In many supply chains this can equally be facilitated or hindered by the number of intermediaries and stakeholders within a supply chain. Here, the distance between producers and consumers can be extended or shortened by the numbers of actors who handle and exchange food along the length of the supply chain.

Discussion and conclusions

There are a number of challenges and opportunities in the three identified supply chains from the interviews that will support or deter the growth of the sheep and goat meat industry. These can be grouped into the broad areas of: animal production and management, logistics, thin margins, local trust and quality.

Animal Production and Management

There are some key aspects that require attention in regards to animal production and management for meat sheep and goats.

- Improved animal production and technical support at a paddock scale level and consideration of the different production models i.e rangelands, south east corner, feedlot,
- Increased on-label animal health products for use in goats through changes through the APVMA.
- Increased animal health, animal management, and genetic management advisors and tools (eg, vets with goat expertise, goat nutrient experts, goat herd scanners accredited for use KIDPLAN, herd management tools)
- Management best practices established for animal welfare and landscape management.
- Surveyed goat breeders mentioned the need for increased knowledge and services in animal health services (eg, vets, accredited operators for scanning goat herd genetics), and animal recording systems (herd management systems and KIDPLAN). Also mentioned was the need for amendments to current import requirements for goat genetics.

Logistics

Cold chain logisticscan be difficult in western areas, with the following needs identified:

- Improve road networks and support maintenance of key unsealed roads.
- Increased service of sealed roads to ensure all weather access to Outback Qld towns.

Thin Margins

The three domestic-focused supply chains are competing with the export demand and the US dollar, resulting in increases in the domestic value of lamb and goat. This in turn makes the value margins domestically across the supply chain thinner than otherwise may be the case.

- The other aspect is that there is not an interest in marketing an product at a retail level which has a very small margin and a limitation on the volume that can be sold.
- The thin margins also hinder the desire of butchers to market the product to their customers as there are other meats such as pork which have a larger margin. This was identified by many as the key meat with the largest margin currently.

Local trust and quality

A key opportunity for supply chains one and two is to market the vertical integration of the supply chains and the local quality. This proves null and void however, if there is not a margin for the butcher in building this for sheep and goat meat.

- Trust and quality were the key aspects of diversity, responsiveness and cohesion which exist in the supply chains one and two. For outback-based supply chains this also forms a central part to what the tourist market segment is seeking.
- Skilled labour was identified by all interviews but two as a critical gap in the supply chain. Many rural areas rely on butchers and processing for providing food security. Critical skill shortages in these fields limit existing growth and highlight the challenge in creating more growth in the sheep and goat meat industries.

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