BEEF SUPPLY CHAINS IN AUSTRALIA: IMPLICATIONS FOR KOREAN BEEF INDUSTRY†

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ABSTRACT

Australia has over time developed an entire of beef supply chains approach involving the production, processing and distribution sectors to provide consistent high quality beef to consumers both domestically and overseas. The Australian beef supply chains have proved to be effective, which in turn have contributed to the further development and success of the beef industry. The Australian experience in developing and

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managing its beef supply chains can be of great relevance to beef industries of other countries. This paper highlights the development and management of the Australian beef supply chains and draws implications for the future development of Korean beef industry.

Ⅰ. Introduction

Over a history of about 200 years, Australia's beef industry has developed from non-existence to one of the world's leading beef producers. Today, the industry is an important contributor to the national economy. The gross value of cattle and calf production is almost A$5 billion (MLA 2001).[1] While Australia is not the largest beef producing country, it has, however, become the world's largest exporter of beef and live cattle. In 2001, Australia exported 66% of its total beef production, about 2 million tonnes (MLA 2001).

Due to the beef industry's great importance to the national economy and also its great reliance on the export market, Australia has over time developed a 'whole of supply chain' approach involving the production, processing and distribution sectors of the beef industry. The Australian beef supply chains have proved to be effective, which in turn have been conducive to the further development of the beef industry. Despite the fact that the Australian beef industry has evolved out of some conditions that are unique to the isolated continent, the experience in developing and managing its beef supply chains can still be of great relevance to beef industries of other countries.

The Korean beef industry is currently facing challenges to its future development, especially following the further opening up of its beef market to overseas competition in early 2002

[1] 1 A$ = 0.5179 US$ (2001).

(Choi, Zhou and Cox 2002). The survival and development of Korea's beef industry plays a significant role in the Korean economy. Although total direct employment offered by the beef industry in Korea is on the decline, many indirect employment opportunities are created by the beef industry for the needs of processing, marketing and retailing. Further, the Korean native beef, Hanwoo, is an integral part of the Koreans' social and cultural heritage. However, to face up to the strong competition from overseas suppliers so to maintain a market share for its native beef, it is vital for the Korean beef industry to provide consistent premium quality beef to the market. In this regard, how the Australian beef industry develops and manages its beef supply chains to provide quality beef can be of great relevance to the Korean beef industry. In this paper, we will investigate the beef supply chains in Australia and draw implications for the development of the Korean beef industry.

Before we look into the components of the beef supply chains, it will be valuable to have a brief overview over the developments of the Australian beef industry. This will help to understand where the Australian beef industry came from and how the beef supply chains were evolved. This is the subject of the next section. Then, in Sections 3 and 4, we will examine in detail the various components of the beef supply chains — from farm to table. Section 5 addresses how Australia responds to industry and market changes in order to effectively manage its beef supply chains. In Section 6, we conclude the paper by exploring how the Australian experience may be of relevance to future development of the Korean beef industry.

Ⅱ. Developments of the Australian Beef Industry and Supply Chains: An Overview[2]

Australia's meat and livestock industry began in 1788 when the First Fleet landed on the shores of Sydney Harbour. Along with the British convicts sentenced to transportation and some adventurous settlers, Captain Phillip and his crew brought along a cargo including seven cows, a bull, a bull calf, 29 sheep and a handful of goats, pigs and poultry. These animals were meant to assist in sustaining the new colony.

Early efforts at growing crops and grazing on the dry and sandy foreshores of the Australian east coast were unsuccessful. The coastal areas were unsuited for traditional European food production methods and the settlers had no experience with this new climate. They struggled for years, experiencing a perpetual food shortage and with seemingly no hope of establishing a reliable food supply.

The erratic arrival of ships with provisions (including salted meat) kept the colony from starvation and certain abandonment. Relief came when inland exploration to the Hawkesbury River valley found fertile soil for crop growing and grasses for grazing. Even so, crop production still presented tremendous problems as the farmers had no working knowledge of Australian soils or climate.

While the settlers struggled with their attempts at farming, livestock grazing became well established as the animals began to thrive on the natural grasses. Further exploration found more land suitable for raising stock, and cattle and sheep numbers swelled as the settlers learned to manage their new environment.

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[2] Information contained in MLA (2002a) and The Land (n.d.) was invaluable in the writing up of some parts of this paper. We are deeply indebted to these publications.

The success of one pioneer producer, Captain Macarthur, encouraged others from England to settle in New South Wales and other centres around Australia. Macarthur imported Merino sheep from Spain and pioneered a wool industry, which has now become one of the most revered in the world. As settlements grew, the use of land changed from grazing to mixed farming, creating the right conditions for producing market lambs and thus enterprise began to expand.

A large cattle industry soon grew up alongside the sheep industry. In the early days, no distinction was made between dairy cattle and beef cattle, but as the inland grass plains were discovered, beef producers drove their stock further into the outback, while dairy farmers tended to stay on the fertile coastal strip.

The 1850's saw the opening of new pastoral lands and increasing herd numbers. This period also marked Australia's 'Gold Rush' days when the country experienced a huge influx of people keen to find their fortune buried in the ground. Prices for cattle and sheep increased dramatically during the Gold Rush with squatters and pastoralists catering for the population boom.

As gold fever dwindled, so did the demand for meat. Producers were left with large quantities of unsold stock. Efforts were made to export meat with Britain being regarded as the most feasible target. But before Australia could start exporting it needed to develop new ways of preserving the meat for the long journey by sea. At that time, salting, smoking and canning were the only preservation methods available and the raw meat reaching Britain was not in prime condition.

However, in 1879 a landmark cargo of meat arrived in London from Sydney — it was Australia's first frozen meat shipment and this new method of low temperature transportation revolutionised the meat export industry worldwide. For Australia, it marked the beginning of a prosperous and extensive

international export trade in both meat and livestock. Since then the industry has gone from peak to peak, regularly exporting to over 100 countries around the globe as well as supplying quality meat to its own domestic consumers.

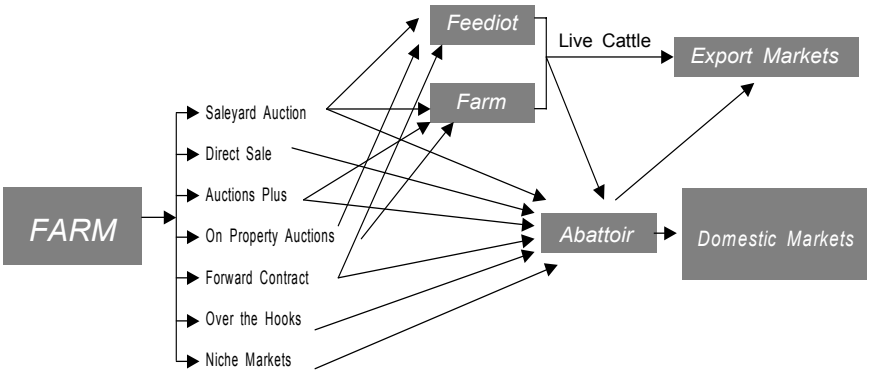
From the handful of stock that arrived with the First Fleet in 1788, Australia now has a cattle herd of about 29 million head in 2001 (ABARE 2001a, 159). Australian cattle numbers, slaughterings, average weight, beef and veal production, exports and consumption are given in Table 1 below.

TABLE 1. Australian Beef and Veal Statistics

	Cattle Numbers	Slaughterings	Average Weight	Beef and Veal Production	Exports	Consumption
	(000)	(000)	(kg)	(kt)	(kt)	(kt)
1960	n.a.	4,403	168	740	n.a.	n.a.
1970	n.a.	5,727	176	1,011	510	n.a.
1980	n.a.	8,833	174	1,534	883	663
1990	n.a.	8,253	211	1,738	1,064	676
1991	25,381	8,427	208	1,749	1,080	678
1992	25,330	8,731	210	1,834	1,191	644
1993	25,182	8,343	217	1,814	1,169	644
1994	25,758	8,366	221	1,845	1,164	698
1995	25,731	7,906	217	1,719	1,106	626
1996	26,377	7,968	218	1,734	1,028	726
1997	26,695	9,148	212	1,939	1,189	753
1998	26,851	9,308	213	1,987	1,278	695
1999	26,578	8,756	227	1,991	1,272	705
2000	27,588	8,657	234	2,025	1,329	698
2001	28,768	8,623	233	2,072	1,407	654

n.a.: not available.
Source: ABARE (2001a, 158-159).

FIGURE 1. An Overview of the Australia Beef Supply Chains



Apart from other contributing factors, the success of the Australian beef industry is attributable to the development and effective management of the beef supply chains over the past two centuries. The Australian beef industry has been innovative in managing these complex supply chains, right from the production stage to the final consumption of the beef product by the consumers. Figure 1 below provides an overview of the beef supply chains to show how beef goes from the farm to the consumer and in the following sections we will examine in detail how some of the major links in the chains work.

III. Beef Production in Australia

Cattle are raised in all states of Australia over an area extending across nearly half the continental landmass. The production systems are diverse and are moulded to accommodate different environmental factors and changing markets. Beef production takes place on farms and in feedlots.

1. Breeds

Australian cattle breeds are divided into two main groups: temperate breeds (*Bos taurus*) and tropical breeds (*Bos indicus*). Temperate breeds are largely confined to the high rainfall

districts of southern Australia, whereas tropical breeds are well suited to the high temperatures of the north.

Cattle are not indigenous to Australia and the earlier herds were based on British breeds, especially the *Shorthorn*. Another major breed was the *Hereford*. The *Angus* and *Devon* breeds have also played their part in the beef industry.

Since the 1930s the *Brahman* and its crosses, and other *Bos indicus* breeds, have played an important role in overcoming tick resistance and heat problems experienced by British breeds. *Bos indicus* cattle mated with *Bos Taurus* breeds produce progeny showing resistance (or at least tolerance) to heat and tick-borne problems. This crossbreeding paved the way for the development of new tropical breeds such as *Braford*, *Droughtmaster*, *Brangus*, *Belmont Red* and *Charbray*.

While these tropical strains and breeds of cattle were evolved, cattlemen also developed and upgraded the *Murray Grey* breed. In the early 1970s European breeds such as the *Charolais*, *Simmental*, *Limousin* and *Chianina* were introduced to Australia.

Crossbreeding, purely for increased production, is commanding more interest in Australia. Most of the crossbreeding in Australia has been with the aim of developing new breeds. With the introduction of European cattle, crossbreeding to produce F1 (first cross) breeding dams has accelerated.

With the genetic pool in Australia embracing such a wide variety of mature size and environmental adaptability, cattlemen have ample opportunity to buy the breed, strain or type of animal that will suit their particular environmental conditions.

Table 2 shows the breed composition of the current Australian beef herd. Clearly, *Hereford*, *Brahman* and *Indicus/Taurus* Cross are the three major breeds. In general, over the past years, the proportion of the British breeds has been declining (e.g., *Hereford* and other British breeds) while that of *Brahman* and *Indicus/Taurus* Cross has been on the increase.

TABLE 2. Breed Composition of the Current Australian Beef Herd (%, at 30th June)

Breed	1990	1994	1997	2000(p)
Hereford	26.7	22.1	19.7	11.2
Angus	4.2	5.7	9.0	9.1
Other British Breeds	11.2	6.8	6.5	5.8
European Breeds	3.1	1.3	0.6	2.1
Brahman	8.8	13.4	17.4	13.2
Santa Gertrudis	2.8	3.8	5.2	5.0
Other Tropical Breeds	6.3	4.0	4.6	6.2
British Breed Cross	1.1	9.6	11.0	11.0
British/European Cross	7.4	5.2	4.2	5.5
Indicus/Taurus Cross	22.8	19.2	14.6	26.4
Other*	5.5	8.9	7.1	4.6

* Includes mainly dairy breeds used for beef production and dairy/beef cross cattle.
(p) Preliminary.
Source: ABARE (2001b, 20).

2. Systems of Production

Due to vast differences in climate and the available feedstuffs in Australia's south and north, farmers also manage the cattle differently. Consequently, there are two broad systems of beef production: northern and southern beef production systems. In the north (Queensland, the Northern Territory and upper regions of Western Australia), cattle are run extensively on large cattle stations, grazing on native pastures at very low stocking densities. The main products of this sector of the industry are manufacturing beef destined for the United States, lot-fed beef and live cattle exports. In the south, cattle are grazed more intensively on smaller farm holdings sown with introduced pastures and fodder crops. The industry in the south supplies smaller, younger animals chiefly for the Australian domestic market and higher quality stock for the Japanese market.

Cattle are bred on breeding properties and produced and fattened both on breeding properties, fattening properties and in

feedlots (see Figure 1 for possible interactions between breeding and fattening properties and feedlots). A range of farm enterprises are engaged in beef production — from the specialist beef producer who concentrates solely on cattle, to mixed farm operations with interests spread across cattle, sheep, wool and crop production.

According to the surveys by the Australian Bureau of Agricultural and Resource Economics (ABARE), in 2001 there were approximately 19,900 specialist beef properties, carrying around 62% of the Australian cattle herd. These specialist beef enterprises range in size from an average of less than 250 ha in Victoria to more than 350,000 ha in the Northern Territory. There were a further 23,350 properties that ran more than 50 beef cattle but were engaged mainly in enterprises other than beef cattle, e.g., sheep, and crops. These non-specialist beef properties carried around 27% of the total beef cattle. One percent of the national beef cattle herd was carried on properties with fewer than 50 beef cattle. The remaining beef head (around 10%) that was not covered by the ABARE survey were on dairy farms, farms with an estimated value of agricultural operations between A$5000 and A$22500, and on properties in other industries not covered by ABARE survey (Riley et al. 2002, 14-15).

While pasture-fed production dominates the Australian beef industry, the use of feedlots has also developed. Feedlots have operated in Australia since the 1960s to 'finish' cattle so they meet the demands of particular markets and to overcome drought situations. Realising the benefits of this more intensive system of production, commercial feedlots are now common in Australia. Most growth in the feedlot industry has occurred since the mid-1980s. There are about 680 accredited cattle feedlots in Australia that can feed a total of almost 850,000 head of cattle at any one time. However, not all of these feedlots operate 100% of the time. Most of the feedlots are in south-east Queensland and New South Wales close to the cattle and feed supplies, however there are feedlots in each state.

TABLE 3. Situation and Outlook for the Australian Cattle Industry

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cattle number (000)	26,780	26,826	26,578	27,588	28,400	29,500	30,300	30,800	30,800
% change	1.5%	0.2%	-0.9%	3.8%	2.9%	3.9%	2.7%	1.7%	0.0%
Slaughterings (000)									
Cattle	7,881	8,100	7,653	7,578	7,680	8,100	8,800	9,200	9,600
Calves	1,280	1,224	1,113	1,080	980	1,040	1,055	1,100	1,150
Total	9,161	9,324	8,766	8,658	8,660	9,140	9,855	10,300	10,750
Average beef carcase weight (kg)	241	240	257	262	265	263	265	266	267
Total beef and veal production (kt, carcase weight)	1,942	1,989	2,004	2,023	2,052	2,160	2,370	2,480	2,600

Source: adapted from MLA (2002d, 14).

3. Beef Output and Regional Distribution

Australia's beef output tends to fluctuate, influenced by weather conditions and changes in overseas demand. However, overall Australian supply of beef and veal has been increasing. According to Meat and Livestock Australia (MLA 2002d), total beef and veal production will be increased from the current a little over 2 million tonnes to about 2.6 million tonnes in 2005 (see Table 3).

Queensland is the largest beef-producing state with 46.9% of the nation's cattle production followed by New South Wales (21.6%), Victoria (17.8%), Western Australia (5.0%), the Northern Territory (1.9%), South Australia (4.2%) and Tasmania (2.6%) (MLA 2001).

Ⅳ. Beef Marketing, Processing and Distribution in Australia

1. Livestock Marketing: From Farm to Abattoir

Livestock may be sold directly to abattoir for processing or sold to a feedlot or fattening property for further feeding who then sell the cattle to an abattoir (see Figure 1). Various selling systems exist to cater for different needs and markets. The several major ones include:

- Saleyard auctions
- Direct sale
- Auctions Plus
- On Property Auctions and Feature Sales
- Forward Contract
- Over the Hooks Marketing, and
- Niche Markets

Saleyard Auctions Saleyard auctions enable large numbers of livestock to be sold. Agents sell livestock on behalf of the producer for a commission. Producers pay a yard fee, industry and government levies and transport costs.

With this method, buyers can view the animals they are purchasing. The price is usually very competitive, with lots of animals being sold to the highest bidder. The sale price may be on a per head or liveweight basis. A few major disadvantages associated with this method include (1) animal stress after transport which may affect meat quality, and (2) the lengthy time between paddock and abattoir which can also affect meat quality and carcase weight as well.

Saleyards may become quality assurance accredited with the National Saleyard Quality Assurance (NSQA) scheme. This Hazard Analysis Critical Control Point (HACCP)-based quality assurance aims to improve animal welfare and reduce the stresses

that might affect meat quality, taking into account many factors including livestock receival procedures and yard construction.[3]

Direct Sale Direct sale is where animals are sold directly to the processor, without going through a yard facility. A buyer or agent may visit the property, inspect the livestock, and negotiate a price (either per head or liveweight). Direct sale can also be done over the telephone if the buyer is familiar with the producer, and the type and condition of the livestock being sold.

This method reduces the number of times animals are handled and the distances they travel. This minimises stress levels and bruising, enhancing meat quality. Agents who have a large network of processors, exporters and producers, tend to use this method to match products to markets. Livestock exporters also often employ this system.

Auctions Plus This method combines the advantages of direct sale with the competitive pricing of saleyard auctions. Auctions plus (previously called Computer Aided Livestock Marketing, or CALM) is a unique Australian computer-based marketing and communication system. It was originally designed as an electronic auction system for livestock, but has evolved to become a sophisticated marketing and communication tool, assisting even the most isolated producers in marketing their product. It has over 30000 subscribers throughout Australia.

Trained assessors evaluate livestock on farm and describe consignments using the AUS-MEAT language. Market operators use data from the assessors to create the catalogue that is available to potential buyers via the Auction Plus system. Auctions are organised and supervised by the market operators

[3] HACCP is recognised internationally as a risk-management tool for identifying where things can go wrong and using this to prevent problems from occurring. The concept was first developed by NASA in the United States to stop astronauts from suffering food illness during space missions and it is proving particularly useful in meat production processes.

and the Auction Plus computer conducts an auction according to a standard set of rules. Several electronic auctions are run each week.

One significant advantage of this method is that it enables livestock to remain on the property until sold. Trade is not dictated by distance, and the distance between buyer, seller and livestock becomes irrelevant in this market. This provides significant economic advantages in a country as vast as Australia.

On Property Auctions and Feature Sales There are a small number of auctions held directly on farm. This enables buyers to inspect livestock and the conditions they have been bred under. It encourages interaction between buyer and producer. This system is predominantly used for breeder and stud livestock.

Forward Contract In a forward contract sale, a producer arranges and agrees to meet the requirements of a specific market by a specific time for an agreed price. Livestock will be produced to a specified weight and condition. This method is common in the feedlot industry, where the growth rate of an animal can be controlled.

Over the Hooks Marketing Over the hooks marketing is the selling of livestock to a processor, where payment is based on the Hot Standard Carcase Weight (HSCW) and fat measurement plus the value of the hide. After liveweight and the fat scores have been evaluated, other factors affecting dressing percentages are assessed.

Over the hooks marketing is market specific and ensures that producers get paid for exactly what they produce. Producers choose which market specifications they will meet and prices may be negotiated when the weight, fat scores and hide quality are known.

This method emphasises guidelines regarding transport (loading, unloading, time and cleanliness), handling, lairage, watering, feed, and stress. It also ensures constructive

communication and feedback.

Niche Markets With this method, the farmer produces cattle suited for a particular buyer and market, for example, organically produced beef.

According to ABARE surveys, sale by auction remains the most common method to sell beef cattle in Australia. Over the hooks is the next most common method of sale, followed by direct sales (Riley et al. 2002, 42).

2. Processing, packaging and Transportation

At the abattoir (in the Australian beef industry, abattoir is also referred to as "meatworks"), cattle are processed into beef and other products such as offal and hides. Carcasses are cooled at the abattoir in large refrigerators called chillers. The carcass is cut in half or quarters and hung on hooks in the chilling room. The chilling process ensures the meat stays fresher for longer and is tastier when it is finally cooked and eaten. Some meat is also frozen to extend storage life. Some abattoirs carry out further processing of the cattle products such as boning when carcases are cut into smaller pieces called primal cuts. Some make other products from the carcasses, for example, carton meat like individual cuts (such as a portion sized pieces of rump steak), salami, sausages, hamburger patties or pizza toppings.

Meat is packaged in a variety of ways for ease of handling and transportation for both export and domestic markets. The majority of beef exported overseas is boneless, 'primal cuts' or in bulk cuts for manufacturing. The cuts that may be individually wrapped in plastic include, for example, rumps, silverside and striploin. This type of packaging ensures the products are protected during freezing and the cuts can be separated easily for additional processing. There are other types of packaging. Meat can be packaged to meet the exact requirements of the customer. Various types of meat prepared to meet each customer's requirements are placed into cartons that are labelled with the AUS-MEAT language describing the

product.

Transport is an important stage in delivering meat to the consumer. For the domestic market, meat is transported in refrigerated trucks from the abattoir to a retailer (butcher shop or supermarket) or to a wholesaler who then sells it to retailers or restaurants. Meat is unloaded from the truck and placed into chilled storage as quickly as possible. Meat for overseas markets is transported by ships or by aeroplane. The meat is packed into large refrigerated boxes called containers. A truck delivers the containers to the port or to the airport.

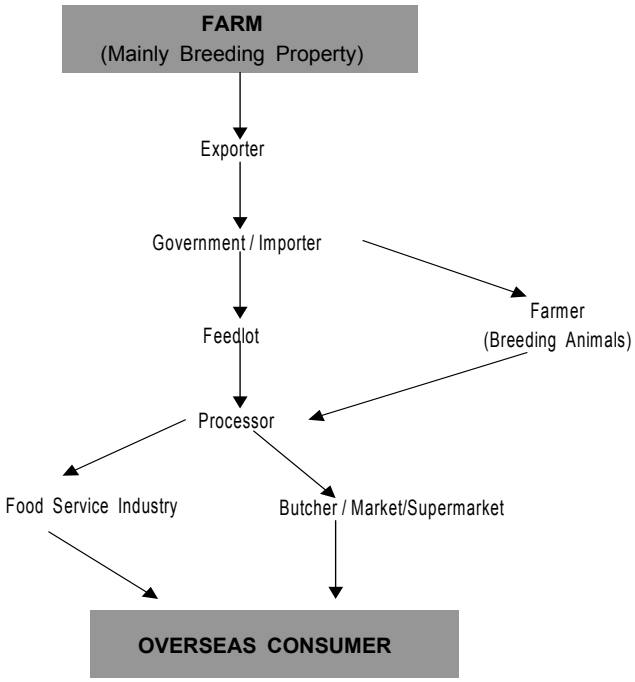
3. Domestic and Export Supplying Channels

Limited by the small population, Australia's domestic consumption of beef products is small and only about 34% of production is consumed domestically while the remainder is exported. With a reputation for raising stock in a natural environment and utilising advanced farm management, breeding and processing techniques, the Australian beef industry regularly exports to over 100 countries around the globe.

The majority of meat is exported as either fresh (chilled) or frozen, with a smaller portion exported in processed form. Container shipping remains the most popular transportation method. However, air-freight is also gaining popularity due to its speed and convenience. In the mean time, the export of live cattle has also become a growing industry. Upon arrival, animals are either processed according to local custom, are used to stock local feedlots, or, on a much smaller scale, used as breeding stock.

The differences between supplying the domestic and overseas market and between the meat and live cattle export result in different chains through which beef is channelled through from the farm to the consumer. Figures 2-4 provide details on the links that consist of the domestic beef supply chain, the export beef supply chain and the live cattle export supply chain.

FIGURE 4. Live Cattle Export Supply Chains



4. Beef Retailing in Australia

The majority of consumers get their meat from either the butcher or a supermarket. In the early 1980s, butchers were the fastest declining segment of the retail industry. After a period of intense competition, the supermarkets, with their market niche of pre-packed, one-stop, convenience, displaced many butchers. However, butcher retailing has now focused on providing personalised and friendly service that a supermarket cannot offer. They also tap into niche markets such as providing organic and chemical-free products. In 2001 approximately 70% of all meat purchased was from supermarket meat outlets, comparing to 46% in 1995 (Morgan 2001, per. comm.).

Ⅴ. Dynamics in the Beef Supply Chain Management in Australia

The success of the Australian beef industry is clearly attributable to the well established beef supply chains. This success, however, is also attributable to the effective management of the chains. The Australian beef industry has been creative and innovative in managing these chains. In this section, we focus our discussion on how the Australian beef industry effectively manages the supply chains in four important aspects: (1) responding to change, (2) innovation, (3) quality assurance, and (4) market expansion and consumer education.

1. Responding to Change

The Australian beef industry is critically affected by weather conditions and fluctuations in overseas demand for its beef product. Australia is a very dry continent and severe drought conditions occur periodically. Such harsh conditions greatly affect the growth of the animals and also in some cases producers' ability to carry the stock over the drought season. Overseas demand can also change drastically which may be caused by various factors such as changes in economic conditions or consumers' preferences in the importing countries. For example, the 1997 'Asian financial crisis caused a profound drop in beef and live cattle exports to some Asian destinations, such as Korea for beef and Indonesia for live cattle. In 2001, the discovery of the Bovine Spongiform Encephalopathy (BSE) in September in Japan led to a dramatic 30-50% fall in Australia's exports to this market in the last two months of 2001.

Both the changes in weather and overseas market conditions are beyond the control of the industry. However, the industry has developed necessary capacity to handle such uncertainties. In the case of adverse weather conditions, most of the livestock producers in Australia today have contingent plans in place. They are able to carry the stock over a certain time

period. Producers respond to prolonged droughts by selling off their stock, some of which may be bought for meat processing and some may be bought by other producers that have the capacity to raise the animals. When there is a drastic change in overseas demand, the industry is able to quickly modify the product specifications to supply alternate markets or to develop new markets. For example, following the sharp drop in orders from Korea as a result of the financial crisis, those producing for the Korean market soon changed their product specifications for supply to the US market.

It is noted that while the beef industry has to respond to changes in weather and market conditions in order to survive and grow, this is done with little government assistance.[4] Despite the fact that the beef industry is a major contributor to the national economy, the government provides no subsidy to the industry. The resources used by the industry's apex bodies for promoting the beef products both in Australia and overseas are largely from industry levies that are collected from the producers. Levies are collected on the sale of animals with a set proportion spent on research (matched 50% by government funding) and the remaining portion allocated to domestic and export marketing activities, these are not normally matched by government funds.

2. Innovation

The beef industry has been very innovative in managing the supply chains. Some examples of the key initiatives include Meat Standards Australia (MSA), Producer Alliances, VIAscan, the National Livestock Identification Scheme.

Meat Standards Australia (MSA) is Australia's first eating

[4] In addition to respond to changes in weather and market conditions, the industry is also active in responding to changes in the country's demographic compositions. In the past five decades, there have been increased immigrants with diverse dietary customs from almost all over the world that come to settle down in Australia. The industry has tried to build up their demands for animal products or meet their dietary habits. See Section 5.4 on consumer education for further discussion.

quality evaluation system. MSA is an extremely comprehensive scheme involving total traceback capability and meticulous quality evaluation. MSA is a cuts-based grading system that uses scientific methods to judge the eating quality of a particular cut of meat. Every single MSA carcase is graded independently and a DNA sample is taken. This means that any product that later proves to be substandard can be traced back to all participants involved with the carcase. All MSA participants-producers, processors, retailers and food service operators-maintain quality assurance systems and product movement records. Thus, MSA participants are always accountable. With MSA, the links between paddock and plate are visible and traceable.

BeefNet provides an example of producer alliances. Founded in 1996, BeefNet encourages alliances among the producers. Horizontal alliances provide producers with leverage to get into the commercial world by combining to deal with a significant volume of product. Vertical alliances enable the application of improved marketing and production techniques and, by melding the producer with the marketer, perfect communication and motivation.

Currently, BeefNet covers more than 84 different alliances. Numerous alliances have recently purchased their own butcher shops or own wholesaling businesses. This system of vertical alliance means that the butcher is confident standing behind the product. Customers who are interested in where the meat they purchase comes from highly value the opportunity to be informed and to offer valuable feedback.

Making changes to meat cuts provides another example of industry innovation. Meal patterns and food choices have changed enormously over the last 20 years. Australia's multicultural influences, food fashions, and consumers' perceptions of diet and health have affected the way consumers demand red meat. Higher proportions of Australians are eating less red meat and are looking to lower the fat levels in the diet, thus the trend to lean beef. Those large meat cuts for ‘traditional’ Australian dishes have been viewed as old fashioned, time consuming and unhealthy.

The industry has responded by producing meat cuts that can be stir-fried or served with salads. Such cuts are perceived as lighter, leaner and healthier (Cox 1999).

3. Quality Assurance

Many markets the Australian beef industry serves are mature consumer markets. The demand for safe and high quality beef product is strong. Hence, the ability to produce consistent quality product is crucial for the success of the industry. Over the years, the industry has developed and implemented a series of integrated quality assurance programs to ensure the supply of quality products to consumers.[5] Such programs are backed by Australian Commonwealth and State government regulations. The Australian Quarantine and Inspection Service (AQIS) provides vital quarantine inspection services for the arrival of international passengers, cargo, mail, animals and plants or their products into Australia, and inspection and certification for a range of animal and plant products exported from Australia.

Quality assurance (QA) involves developing systems that will guarantee every aspect of a product to meet customer expectations. The QA systems developed by the Australian beef industry cover all the links in the supply chains, from paddock to fork.

Quality assurance on farms Australia's commitment to quality assurance and food safety begins on the thousands of farms and rural properties scattered across the country. As an island nation, Australia is fortunate to remain free from many of the major cattle diseases that exist in other parts of the world. Strict government quarantine controls are enforced to maintain this status.

In addition to various government regulations that ensure

[5] The Australian meat industry also endeavours to frequently review and improve those existing quality assurance programs. An on-farm quality assurance review for the red meat industry has just recently been completed. For details, see MLA (2002e).

that livestock remain free of contaminants, the industry has also developed its own quality assurance programs such as CattleCare using the principles of HACCP. To become accredited under this program, cattle producers must follow all elements of a strict code of practice, which must be documented and verified through an independent audit process.

Underpinning all the QA on farm is Australia's comprehensive animal identification system which can be used to trace the origin of livestock, and the introduction of National Vendor Declarations which verify the management and husbandry history of stock prior to sale. A capability to trace the origin of livestock affected with diseases or residues has been in place in Australia for many years. Starting in 1998, a new system of traceability for cattle, the National Livestock Identification Scheme (NLIS), was introduced across Australia. This is a system of permanent identification of cattle using devices imbedded with an electronic microchip. The device is read electronically and the information is held on a national database. The database will provide information relating to the animal such as disease and residue status, market eligibility and commercial information. The database is available for all industry sectors with password access. NLIS will allow Australia to market its beef domestically and internationally, providing traceability for a product with the highest standards of integrity.

Quality assurance on feedlots Quality assurance systems have also been developed to cover cattle entering the feedlot system. The National Feedlot Accreditation Scheme (NFAS), introduced in 1993, was designed to meet modern standards in terms of the environment, animal welfare, feeding regimes and freedom from residues. The NFAS is a self-regulatory system based on compliance with national standards. Participants in the scheme are subject to an annual external audit of their quality assurance scheme; ongoing accreditation being dependent on satisfactory performance. The NFAS is administered by AUS-MEAT Limited and overseen by the Feedlot Industry Accreditation Committee

(FLIAC) comprising representatives from government and industry.

Quality assurance with processors Processing is one of the most critical points in the meat supply chain. The Australian processing industry has implemented quality assurance systems to support the supply of quality products from the farm to the consumer's plate. These systems are backed by existing government regulations relating to food safety, health and hygiene.

Since January 1997 all abattoirs (export and domestic) have been required to operate under a new Australian standard which includes a mandatory HACCP plan. Since July 1997 all abattoirs have been required to complete an independent audit of their plan, and only those abattoirs that pass the test are allowed to operate. The benefits of HACCP plans for processing plants are two-fold. Firstly, they assist in identifying, measuring, monitoring and verifying critical points in the meat production process to ensure food safety and quality is maximized. Secondly, HACCP plans can be applied not only to food hygiene but also to the control of key production practices, improving overall processing performance and customer satisfaction.

The Australian processing industry has also introduced a number of other measures to enhance meat quality. All export abattoirs implement Standard Operating Procedures for Sanitation (SOPS) that detail strict cleaning and sanitising techniques, and as well, conduct routine microbiological testing. All these measures are fully consistent with internationally accepted systems currently being implemented by other major meat producing countries. They are designed to complement the rigorous inspection and residue testing systems that have been in place in Australia for many years, ensuring Australian meat products continue to be of high quality.

Quality assurance with delivery Another critical link in the supply chain is the delivery of product from one point to another.

This may involve transporting stock from the vast cattle stations of northern Australia to abattoirs, or exporting chilled meat to a far away country. Today, Australia's beef producer and processing sectors are supported by a wide network of service industries that have also accepted the quality challenge. Some of these service providers include saleyards, transporters, and live stock exporters.

A significant number of Australia's cattle are sold through saleyards. As noted earlier, the National Saleyard Quality Assurance program (NSQA) uses a HACCP-based approach to identify and manage key quality issues such as food safety, meat quality, product traceability and customer satisfaction.

Cattle are produced in most regions of Australia making livestock transportation a vital part of the distribution system. Australian livestock transporters have also initiated a customer-focused quality assurance program drawing together HACCP principles, ISO 9002 and road transport accreditation arrangements. The program includes components related to pre-transport preparation of stock, livestock loading, welfare and quality controls, equipment standards and customer service.

Extensive quality assurance systems are also in place throughout the live export chain - from the farm gate to the final port, to ensure quality is maintained. In 1996, the Australian Livestock Exporters Council (ALEC), together with a committee comprising of all segments of the industry, created the Livestock Export Accreditation Program (LEAP). These standards combine all the various codes of practice and standards relating to livestock exports into a single document.

Quality assurance with consumers The commitment to quality assurance needs to extend to the consumers - the last link in the meat supply chain. Contamination of meat products often occurs after they have left the meat wholesaler or retailer. In Australia there are a number of initiatives to enhance existing regulations to ensure the quality of meat is maintained until the final consumers.

Domestic meat retailers are developing a quality assurance

program covering areas such as product handling, cleaning, display temperature and even business management. However, one of the biggest challenges remaining is to protect consumers from themselves. In Australia, as in many western countries, the increasing preference for pre-prepared and convenience foods has led to a general decline in consumer cooking skills and knowledge about safe food handling practices. Recognising this trend, the beef industry has taken a pro-active approach to this issue by embarking on an extensive campaign to educate consumers and food handlers about safe food storage and preparation techniques.

4. Market Expansion and Consumer Education

To realise the value of the efforts to supply good quality beef products, there must be the final consumers that accept them. However, the domestic consumer base is too small to consume all the beef products that the Australian beef industry is able to produce. Consequently, the overseas demand for the Australian beef product to a great extent determines the growth and success of the industry. Hence, building demand for beef from the overseas market is a continuous challenge that the industry faces.

The Australian beef industry has been successful in expanding the overseas market for Australian beef. MLA, as a major industry apex body, has been taking the leading role in this regard and conducts and supports activities that promote Australian beef. Worldwide MLA promotes Australian beef as nutritious, safe, good value and great to eat - essential to sustain and raise consumer demand for these products. MLA operates in a range of global regions, in East Asia, North America, the Middle East and Europe.

Using a range of promotional tools, from trade seminars and trade missions to menu development, MLA taps into the overseas foodservice sector to increase sales and visibility of Australian red meat on menus around the world. MLA also participates in a number of industry renowned international trade

shows to promote Australian beef and project a safe and high quality image of the Australian beef.

MLA works closely with major overseas retailers to effectively display Australian red meat in supermarkets and butcher stores. Using point-of-sale materials, education programs and in-store food tasting, MLA encourages overseas consumers to put Australian beef on the table in households around the world.

MLA also carries out strong consumer education programs. In addition to educate overseas consumers about the availability of the Australian beef products and the benefits to consume them, MLA also pays great attention to educate domestic consumers. Health attitudes and beliefs surrounding red meat tend to undermine consumer confidence and thus their demand for beef. Immigrants from some origins, particularly from the Asian region, are relatively unaware of the nutritional benefits of a diet rich in red meat. Hence, MLA's domestic campaigns try to achieve two major objectives: (1) to assure those beef-eaters that the beef product is safe and nutritionally beneficial so to retain them as beef eaters, and (2) to convey the nutritional benefits of eating red meat to those non-beef-eaters, including those new migrants, so to build increased demand for the Australian beef.

One recent example of education programs is the "Red Meat. Feel Good." campaign. When it comes to health concerns, consumers often mistakenly believe they need to avoid red meat. However, lean red meat at least 3-4 times a week is an important source of essential nutrients for health and vitality such as zinc for boosting the immune system, iron for mental alertness, vitamin B12 for the nervous system and omega-3s. The key message that the "Red Meat. Feel Good." campaign tries to deliver is that red meat in one's diet is an important source of vitality and well-being.

To accompany various promotional campaigns, the beef industry also provides the consumers with necessary information or suggestions such as meal ideas, what cuts to buy, and how to cook. Such information with great practical value is easily

available on beef product packaging, beef retailing outlets in supermarkets or butchers. Such information is also publicised on the MLA website with frequent updating with new recipe ideas created by leading chefs from around Australia.

In summary the creative and innovative approach in managing the supply chains by the Australian beef industry has contributed significantly to the industry's success and growth. The effective management of the supply chains helps to secure a future for the Australian beef industry.

Ⅵ. Concluding Remarks and Implications for the Korean Beef Industry

Over a period of about 200 years, Australia's beef industry has developed from non-existence to one of the world's leading beef producers. Today, Australia is the world's largest exporter of beef and live cattle. Apart from other contributing factors (such as the rich endowment of natural resources and an isolated continent), the success of the Australian beef industry is attributable to the development and effective management of its beef supply chains. The Australian beef industry has been innovative in managing these complex supply chains, right from the production stage to the final consumption of the beef product by the consumers as has been highlighted in this paper. In this regard, beef industries of other countries can benefit from learning how Australia has developed and managed the beef supply chains.

The Korean beef industry is currently facing challenges for its future development, especially following the further opening up of its beef market to overseas competition in early 2002. Over the past decade, Korea's beef production has been declining and this trend is unlikely to be reversed. However, this, by no means, suggests that Korea's beef industry will have no future. It is well known that the Korean native beef, Hanwoo, is an integral part of the Koreans' social and cultural heritage. The Korean beef industry can capitalise on this fact and develop a strategy such as "do small, do well". That is, although the Korean beef industry

does not produce a large quantity of beef, yet it produces high quality native Hanwoo beef to target niche markets domestically, and where possible, overseas as well. To do so, it is clear that there is a strong need for the Korean beef industry to provide consistent high quality beef to the market. As such, Australia's experience in producing beef of consistent high quality provides useful revelation for the Korean beef industry.

With the significantly reduced trade barriers, beef imports into Korea have become easier. Increased beef imports further confine Korean farmers' ability to produce. A direct consequence of this for the Korean society is the reduced employment opportunity in the rural community due to reduced domestic beef production. However, this consequence can be lessoned through considerate importing practice by the Korean beef industry. That is, the industry may consider to import, where practical, primal cuts. This generates employment opportunities for further processing. To do so, however, one key issue is how to maintain the quality of the beef product during and after further processing so that consumers' benefits are not compromised. Again, Australia's advanced processing techniques and quality assurance programs can offer valuable benchmarks for the Korean beef industry.

Given that the demand for beef is increasing but domestic supply is unlikely to increase, the Korean beef industry may resort to increase supply by producing overseas, e.g., in China (cheaper labour and lower transportation cost to get the product to Korea) or in Australia (clean and green environment and learning from the Australian way of beef supply chain management). In this way, the industry secures the beef supply for the Korean domestic market, places the products under their own control and reduces the strains on the domestic environment due to the very limited per capita agricultural resources. It is also possible for the Korean beef industry to use this approach to produce overseas for overseas markets. Currently this approach is used by a number of Japanese companies through their investment in Australia. They source high quality primal beef

cuts for their domestic consumers, but supply various lower priced cuts and by-products to markets in other countries. The extent by which Korean companies make use of this approach is rather limited.

Forming an alliance with the Australian beef industry can be another useful approach to quickly learn how beef supply chains are developed and managed in Australia. In this respect, industry exchange visits may be arranged through peak bodies in both countries for senior industry personnel. On the other hand, technical training tours may be organised for various other industry personnel to learn from each other various techniques related to beef products such as preparation, cooking, promotion, and specifications.

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