final report

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Determining the Fate of Domestic Meat Packaging

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Contents

Executive summary

This report responds to a study commissioned by Meat & Livestock Australia (MLA) to gain a better understanding of the fate of packaging material throughout the meat industry supply chain, once it reaches the end of its life.

This follows an earlier study done by this consultancy (McKinna et `al, 2003), which provided a comprehensive review of packaging systems used by the meat industry, performance issues, emerging technologies, and so forth.

As per the terms of reference, this study specifically focuses on the domestic market for red meat and the key players within it. Packaging materials destined for export markets are not considered. It covers the full spectrum from processors, boners, value adders, through to distribution companies, food service operators and major supermarkets. It also includes the packaging companies, packaging recyclers, packaging industry associations (covering the major packaging types used for meat), environmental protection agencies and waste collection and sorting companies.

There are two basic packaging material categories which account for the vast majority of packaging used by the red meat industry: fibreboard and plastic. The standard industry packaging system features a cardboard carton with plastic inner linings and/or individually wrapped plastic vacuum packs. The film technology used for plastic films and wraps has improved, but the nature of the material has essentially not changed in 20 years. In addition, the industry currently uses two packaging systems for the retail channel: a case ready system which utilises modified atmosphere packaging (MAP) and doy packs; and the traditional expanded polystyrene and overwrap system.

It is not possible to make any direct assessment of the performance of the meat industry in terms of recycling or environmental performance. The available national statistics are collected on the basis of material type rather than by industry. It is the conclusion of this research that the Australian red meat industry is performing close to its potential in terms of recycling and reuse within the economic limitations of existing technology and supply chain management. With respect to fibreboard cartons, the industry is achieving a 90% recycling rate. This is just below the national average of 94% for non-kerbside collection. It is our assessment that the industry will never be able to achieve a 100% recycling rate for fibreboard cartons. There are three key factors at play here. The first is the issue of soiling and contamination which makes cartons unappealing to recyclers. The second is the fact that liner-less or high gloss coated cartons are problematic to recycle and end up in landfill. Finally, some remote areas do not have access to recycling services because collection is simply not economical.

With regard to plastics consumed by the industry, the research suggests that this is all currently going into landfill. There are three reasons for this. Perhaps the most critical is economics. Currently plastics coded 1 – 3 are widely collected and recycled. The majority of plastics used by the red meat industry are not within this specification and are not recycled. The issue is that the yield volumes relative to the cost of collection and recycling make it uneconomical. Moreover, in some cases the recycling industry also lacks a viable end market for the recycled product. A second issue is that of moisture and contamination and thirdly, the performance requirements of some plastics used by the industry necessitate the use of a multi-laminated film made of layers of various compounds which are unsuitable for recycling.

A summary of costs and volume of packaging consumed by the Australian red meat industry for the domestic market are detail below.

Total red meat packaging costs by packaging material

Packaging Component	Packaging cost $			Total packaging $
	Beef	Lamb	Mutton	
Fibreboard cartons	$77,178,835	$15,008,323	$12,823,060	$105,010,218
Plastics	$136,889,154	$40,967,470	$5,343,795	$183,200,419
Total Packaging Cost	**$214,067,989**	**$55,975,793**	**$18,166,855**	**$288,210,637**

Total red meat packaging volumes by packaging material (kgs)

Packaging Component	Packaging (kg)			Total packaging (kg)
	Beef	Lamb	Mutton	
Fibreboard cartons	17,671,513	3,846,579	3,471,696	24,989,788
Plastics	10,927,409	4,191,919	751,175	15,870,503
Total Packaging	**28,598,922**	**8,038,498**	**4,222,871**	**40,860,291**
Recycled	*15,904,362*	*3,461,921*	*3,124,526*	*22,490,808*
Landfill	*12,694,560*	*4,576,577*	*1,098,345*	*18,369,482*
Cost of collection	$253,891	$91,532	$21,967	$367,390
Cost of tipping	$736,285	$265,441	$63,704	$1,065,431
Total cost of disposal for landfill waste	**$990,177**	**$356,973**	**$85,671**	**$1,432,821**

The packaging which accompanies red meat through the supply chain to the domestic market is estimated to cost the industry over $288 million. The total cost of packaging in the domestic market has increased by 15% from the $243 million reported in 2003. As an individual packaging component, cartons incur the highest cost to industry at $105 million, followed by vacuum bags at $84.8 million. In terms of volume, the Australian red meat industry consumes 40,860 tonnes of packaging annually in the domestic market. Of this, it is estimated that 22,490 tonnes is recycled and 18,369 tonnes is sent to landfill which equates to a 55% recycling rate. Fibre cartons make up the bulk of packaging used by the industry and account for around 60% of volume. Of the plastics used, vacuum bags account for the greatest volume at 3,266 tonnes. The total cost of disposing of used meat packaging that is not recycled is estimated to be around $1.4 million.

A major issue for the red meat industry, which increases its consumption of packaging material vis-à-vis some other industries, is the fact that a particular piece of meat may go through two or three packaging systems before reaching its end destination. It is a finding of this report that the volume of packaging used by the Australian red meat industry is likely to increase going forward. This is attributed to a number of factors:

1. The trend towards the use of smaller cartons because of OH&S issues and inventory control purposes which increases the ratio of packaging to product.
2. The trend towards smaller primal or cut sizes which use more vacuum bags.
3. The trend towards case ready systems.
4. Increased primary packaging driven by consumer demand for convenience and retailers desire to extend shelf life.

Opposing the above is also the trend towards a down gauging of cartons to use less fibreboard in order to drive costs out of the supply chain.

There are a number of opportunities for the industry to improve its reuse and recycling rates:

1. There is the potential to use plastic and steel bulk bins in place of cartons for the transportation of primal cuts.
2. There is also an opportunity for the greater adoption of plastic totes for transferring meat to supermarkets.

Currently, the key issue constraining the wider adoption of the above is the cost of washing and transporting the bins and totes. Moreover, the total environmental impact of such systems needs to be evaluated, taking into account the cost of transportation (ie. emissions), water, chemicals and treating. Once these factors are taken into consideration, the environmental consequences may not make this approach advantageous. There are also a number of emerging technologies which may serve to improve the industry's recycling and reuse rates and include energy recovery from high temperature incineration; diesel recovery; and advanced biodegradable technologies.

The long term supply situation for fibreboard and plastics is quite optimistic. With regard to fibreboard, there is a high level of recycling with most cartons being recycled between 4 - 5 times. Furthermore, the fact that virtually all virgin fibre comes from new growth timber which is renewable and economically viable is noteworthy. The long term viability of plastics is dependent on the long term supply of oil. The inevitability of rising oil prices is not considered to impact on the price of plastic films to a great extent due to the fact that high oil prices put pressure on plastic producers to develop technologies which make plastics more efficient. The major packaging suppliers are optimistic that this trend can continue into the future. Should a situation arise where the price of oil-based plastics increases substantially, it is likely that there will be an increase in plastics made from other organic inputs such as corn starch and soy protein.

At present, the Packaging Covenant does not have specific procedures or guidelines for meat. However, it is likely that in time, the plastic material used by the meat industry may be subjected to more intense scrutiny because of the fact that virtually all plastics consumed go to landfill. The 2005 Covenant has established a target of no increases in packaging volumes to landfill. As the meat industry grows and the trend towards smaller cartons and other systems which use more volumes of plastic on a per kg basis continues, it will be difficult for the industry to make a meaningful contribution to achieving this target. However, it is likely that if any action is taken, it will be at the kerbside collection and separation level.

Part A

Introduction, Objectives & Methodology

Section 1

Introduction

Meat & Livestock Australia (MLA), has commissioned a study to gain a better understanding of the fate of packaging material throughout the meat industry supply chain, once it reaches the end of its life.

This follows an earlier study done by this consultancy (McKinna et al, 2003), which provided a comprehensive review of packaging systems used by the meat industry including performance issues, emerging technologies and so forth.

This study, as per the terms of reference, specifically focuses on the domestic market for red meat and the key players within it. It covers the full spectrum from processors, boners, value adders, through to distribution companies, food service operators and major supermarkets. It also includes the packaging companies, packaging recyclers, industry associations (covering the major packaging types used for meat), environmental protection agencies and waste collection and sorting companies. However, the research does not extend to smaller and independent food service operators, independent butchers and so forth.

As our 2003 report highlighted, typically a particular piece of meat goes through two or three packaging systems before reaching its end destination. This situation causes the industry to consume large volumes of packaging materials and has significant ramifications not only in high packaging costs, but also environmental consequences in terms of impact and long term sustainability. These issues need to be addressed.
As such, the ultimate aim of this type of research is to help identify strategies to reduce the use of packaging material;

increase the amount of recycled and reused packaging; and reduce the amount which goes to landfill.

The research is divided into eight parts, as follows:

Part A includes the introduction, objectives and methodology.

Part B articulates the findings of the program of desk research. It presents key packaging and red meat industry statistics; considers global packaging trends and key drivers; identifies the major packaging systems used by the Australian red meat industry; identifies the key packaging players; and outlines the various packaging regulations and their implications.

Parts C – E present the findings of the qualitative research and report on the knowledge gained from a series of interviews conducted with personnel representing the various levels of the meat and packaging supply chains.

Part F provides an input-output model for the Australian red meat industry.

Part G details the strategic implications that have resulted from the findings of the program of research.

Section 2

Objectives

1. To identify the fate of the major packaging items used by the domestic processing and boning operations once they have been finished with.

2. To provide quantitative measures of the breakdown of meat packaging by destination and type, across the various supply chain links and end points, including recycling, landfill and other, both in terms of volume and cost.

3. To identify the key issues and constraints inhibiting the rate of recycling or reuse of packaging materials.

4. To identify the key issues with respect to disposing of red meat packaging material and their consequences.

5. To provide an estimate of the cost to the Australian red meat industry of disposing of used packaging materials and the factors that are driving the cost increases.

6. To provide an understanding of the key trends and issues with respect to packaging disposal and to gain an understanding of the commercial, social and regulatory drivers of recycling or reduced use of packaging.

7. To determine the sustainability of the cardboard used in the manufacture of meat cartons, including: assessment of proportion of recycled fibre used; whether virgin fibre is sourced from plantations or old growth forests and the proportion of each; and the environmental status of manufacturing processes used in carton fabrication.

8. To identify new and emerging technologies, processes and trends with respect to reduced use of packaging, recycling and so forth.

9. To assess the position of the National Packaging Covenant in relation to recycling and the likely future impact of the covenant and other voluntary or compulsory requirements for recycling.

Section 3 Methodology

The methodology for the project involves the following stages:

Familiarisation and briefing

↓

Literature scan
To gain an understanding of global development.

↓

Qualitative research
To gain an understanding of the issues from the perspective of key stakeholders.

↓

Input-output model
Quantitative research and analysis to produce estimates of the input and output of packaging material for supply chain links immediately after the boning room/processor.

↓

Strategic situational analysis
Strategic analysis that draws all the information together logically; identifying and presenting the key issues; and developing scenarios going forward.

↓

Reporting

Part B

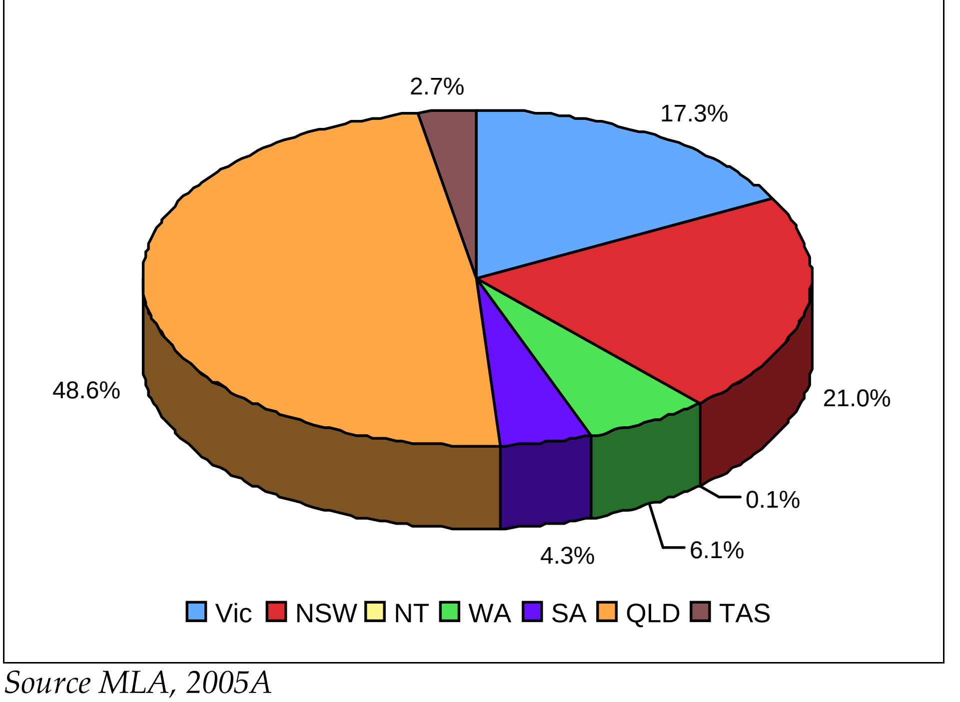
Literature Scan

Section 4

The Australian red meat industry

The Australian red meat industry encompasses beef, veal, mutton and lamb.[1] In 2004/5, the Australian red meat industry produced over 2 million tonnes of beef and veal; 375,000 tonnes of lamb; and 241,000 tonnes of mutton. The gross value of Australian production (including live exports) is approximately $7.7 billion for cattle and calves and $1.86 billion for sheepmeat (MLA, 2005A: MLA, 2005B). Queensland is a major producer of beef and veal (figure 1) while Victoria and NSW are leaders in sheepmeat production (figures 2 & 3).

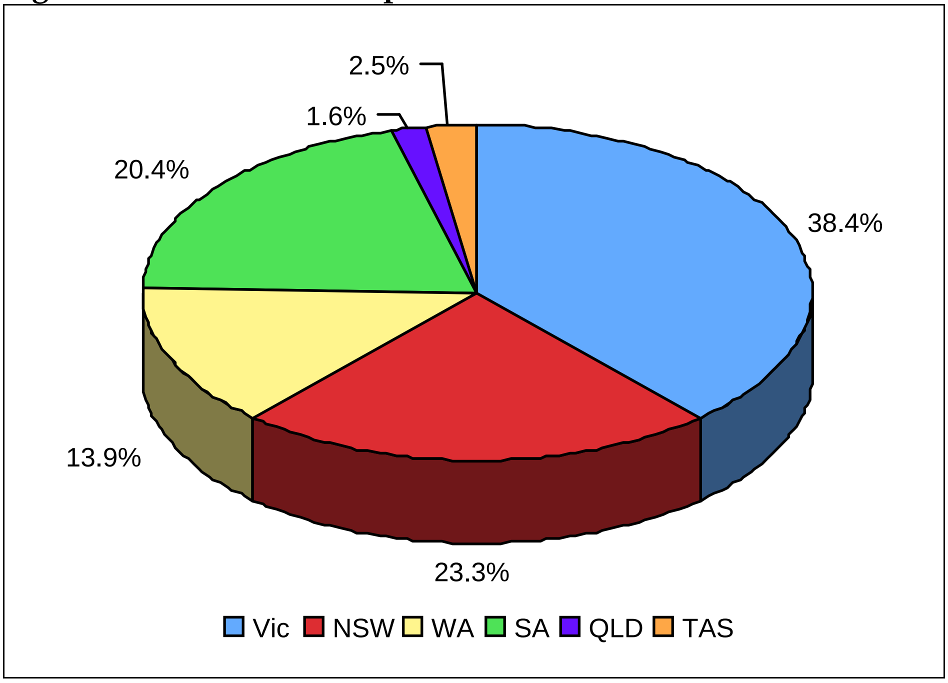
Figure 1: Australian beef and veal production



Source MLA, 2005A

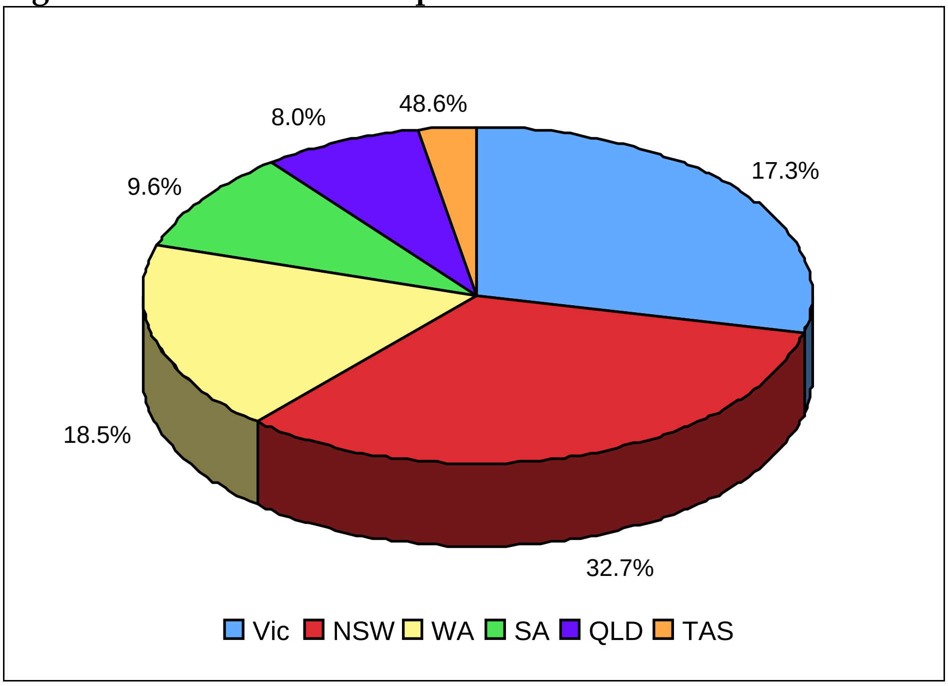
[1] Goatmeat is also a red meat industry component but is not considered in this research due to its lack of scale and export orientation.

Figure 2: Australian lamb production



Source MLA, 2005B

Figure 3: Australian mutton production



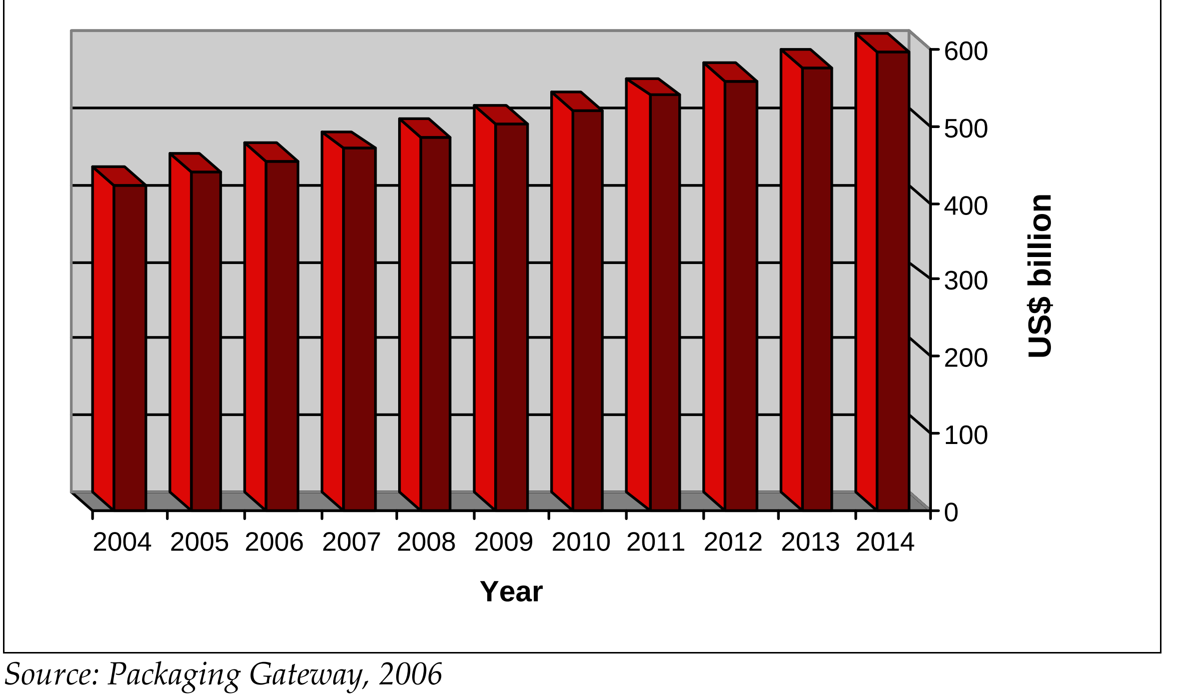
Source MLA, 2005B

Section 5

Packaging statistics

Over the last fifty years Australia has witnessed the rapid development of the global packaging industry in line with the increasing global dominance of consumerism. The global packaging industry was valued at US$424 billion in 2004 and is projected to grow at a rate of 3.5% annually over the next ten years (figure 4).

Figure 4: Global Packaging Market Trends from 2004 to 2014



Source: Packaging Gateway, 2006

Food is the highest value sector globally at US$161 billion and accounts for 38% of all packaging. This is followed by beverages with a global value of US$76 billion which accounts for 18% of the world market (table 1).

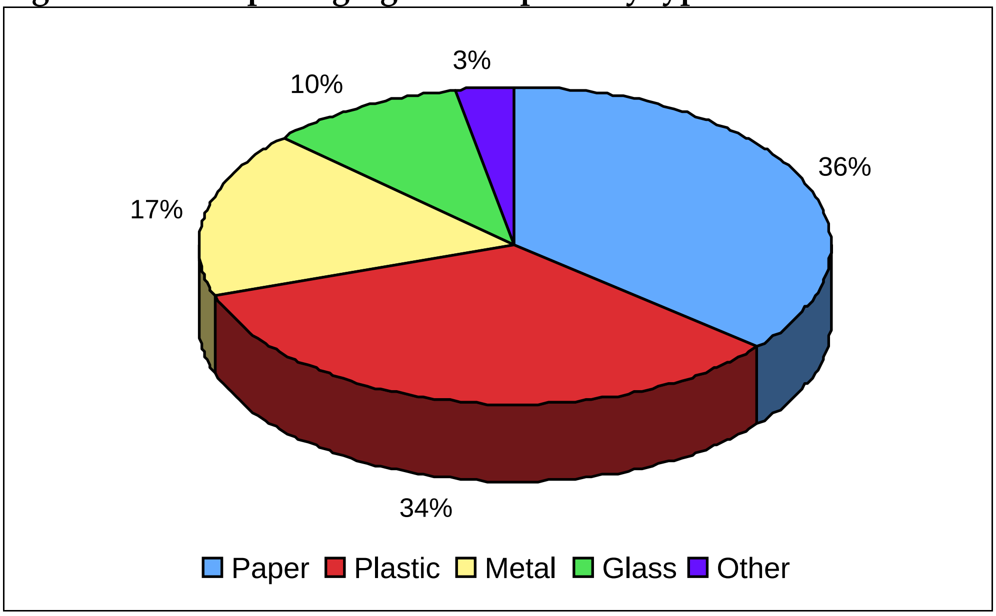
Table 1: Global Packaging Sector Breakdown

Sector	Value In US$ Billion	Percentage (%) (World Market)
Food	161	38%
Beverage	76	18%
Pharma	21	5%
Cosmetic	13	3%
Other	153	36%

Source: Packaging Gateway, 2006

In terms of materials, paper is the most highly consumed packaging material, followed by plastic and metal (figure 5).

Figure 5: Global packaging consumption by type



Source: Packaging Gateway, 2006

The Australian packaging industry is small by global standards with an estimated worth of $AUD7.5 billion. This represents around 1% of Australian GDP and a little over 1% of the global packaging market (Packaging Council, 2006).

Section 6

Trends and key drivers for the global packaging industry

There are a number of major trends and issues which will shape the packaging industry over the next decade, namely:

- Convenience packaging
- Product presentation and marketability
- Electronic business processes
- Supply chain management
- The environment & recycling
- Technology

These are all profiled in this section of the report.

6.1 Convenience packaging

A major driver of packaging consumption and technological advancement in packaging is the ever increasing consumer demand for convenience. Consumers are demanding a wider range of products and greater segmentation in terms of size, flavour etc. (Packaging Council, 2006). For example, pre-cut, pre-portioned, smaller, ready to consume products are increasing in popularity. This is particularly the case for packs that can go straight from the shelf or fridge to the oven or microwave.

Consumers want conveniently packaged food products that can be quickly made into meals without sacrificing quality, and are demanding packs that are easy to open, dispense, reseal and store. Moreover, food packaging must be easily accessible by all types of consumers including the elderly, children and disabled, in addition to other consumer groups (Packaging Gateway, 2006).

The trend towards convenience in packaging increases the amount of packaging consumed per unit of food. It also causes problems in terms of recyclability where more than one material is used.

6.2 Product presentation and marketability

Increasingly, food manufacturers are using packaging innovation as a point of differentiation and to drive sales of their products. Product presentation and marketability have become extremely important criteria. Packaging plays a significant role in building brand equity. Subsequently, packaging manufacturers are continually developing technologies to meet this market need by varying packaging parameters such as design, colour and patterns. Case ready systems, which are discussed in more detail later in the report, are an important innovation for the meat industry in terms of the marketability of product, in that they enable meat to be marketed in the same manner as other food products through the use of quality labelling for branding, product images and serving suggestions.

Other quality parameters such as the shelf life of the product; the security of the contents; and the taste and colour of the food contained inside the pack are also very important for the marketability of products. Food safety is a significant factor in consumer food purchasing decisions and there is a trend towards packaging systems with increased protection through safety seals and packaging systems which have more than one layer, i.e. an inner pack which protects the contents and another outer layer which maximises shelf appeal. This situation serves to increase the quantity and cost of packaging used by the food industry and is a trend which is set to continue into the next decade.

6.3 Electronic business processes

Advances in IT have had a profound effect on business processes, and in particular, have resulted in efficiency gains for logistics and supply chain management. Electronic business processes are allowing operations to link the entire supply chain from raw materials, through processing to retailers and the consumer. Increasingly, businesses will have online access to their suppliers' logistics systems, providing them with immediate information about the flow of stock and alerting them to potential delays (Packaging Council, 2006). Electronic business processes will become an essential component of managing the supply chain as it increases in complexity as a result of the ever-widening range of products and forms eg. chilled, frozen, shelf stable. The packaging industry has made significant advancements in facilitating this trend by developing packaging optimisation software and intelligent packaging systems which are discussed in the following pages.

6.4 Supply chain management

In the main, there are three levels of packaging: primary packaging which reaches the consumer; secondary packaging which groups products together at the point of purchase or is used to replenish shelves; and transport packaging. As noted by the Packaging Council (2006), there is an increasing trend by manufacturers and retailers towards better management of these three systems, either through merging or better coordination. This imperative is largely driven by the need to drive costs out of the supply chain.

As such, there are two conflicting dynamics working in the packaging industry at present: the demand from consumers for improved quality, product integrity and convenience (which increase the amount of packaging required); and the imperative of manufacturers and retailers to drive costs out of the supply chain by reducing their packaging consumption.

An example of this trend is Coles' recent introduction of plastic totes for fruit and vegetables which serves to minimise transport packaging and reduce costs. The move by supermarkets towards case ready/retail ready systems, where meat products are packed, labelled and priced in a central location and transported to the store ready to be put on the shelf, is also an example of changing supply chain management processes.

There has also been a trend towards retail packs that take up less space, or can be easily stacked, allowing retailers to maximise their shelf space.

6.5 Technology

Intelligent packaging

There are a number of innovations in the field of intelligent packaging which have the potential to dramatically shape the food industry in the future. Two forms of intelligent packaging already making an impact are Radio Frequency Identification (RFID) and Quick Response Codes (QRC)

Radio frequency identification (RFID)

RFID is a form of intelligent packaging involving the inclusion of microchips. The microchips provide information about the product and facilitate effective supply chain management by emitting Electronic Product Codes (EPCs) through radio frequency signals. RFID systems can also incorporate time/temperature indicators which provide effective monitoring of product quality from the producer to the consumer.

A major benefit of RFID is the speed in which accurate inventory data can be collected and collated and the ease of product identification and distribution. The RFID system also makes product recall faster and more efficient. Major users of RFID systems include Wal-Mart, Procter & Gamble and Gillette, to name but a few (Packaging Gateway, 2006).

In the future, advancements in RFID technology may mean that consumers will no longer need to line up at the check out. The RFID readers in the store will identify the contents of the entire shopping cart in one scan as the trolley is wheeled through and the cashier will only need to accept payment for the items.

A major barrier to RFID becoming mainstream is cost. The microchips cost between 25 cents and $2 and the hand-held readers range from $1,000 - $4,000 each (Packaging Gateway, 2006). The RFID system also makes the recylability of packaging problematic as the components must be removed.

Quick response codes (QRC)

A major development in the traceability of food origins has come about as a result of the new generation of mobile phones which provide instant internet connection. In countries like Japan, food companies are now putting an additional barcode on their packaging called a QRC. Once the consumer photographs the code with a mobile phone, it enables them to instantly connect to a web site which allows them to check the details of the supply of the product; the day it was produced; the history; and even the farm. All of this information is available via the phone handset. Whilst QRC is in its infancy, it is likely to expand dramatically in the next few years with the long-term expectation of becoming compulsory on all packaged food.

Figure 6: Quick response code (QRC)

Source: David McKinna et al Pty Ltd, 2005, Photo Library

Sealing technology

Driven by high product integrity standards and consumer demand for food safety, sealing technologies have experienced rapid advancement over the last five years. The development of permeable and non-permeable films, which can extend the shelf life of products depending on their application, have been an important packaging advancement. Other types of films have been developed for use in ready-to-eat packs whereby the pack allows steam to build up to a certain level but allows excess pressure to be released. This technology has resulted in microwave ready packs that are easy to prepare, and maintain the quality and attractiveness of the product inside (Packaging Gateway, 2006).

Active packaging

Active packaging is on the horizon and has the most potential application in the convenience food sector. Active packaging technologies may be used to assist the consumer in preparing products. For example, research is currently underway to develop a patch or film which changes colour during the cooking process to alert the consumer that the product is ready to eat.

Olfactory packaging

In the future it will be possible to stimulate the senses through packaging and influence buying behaviours. Olfactory packaging works by embedding scented and aromatic oils into capsules, integrating them into a label, plastic package or printable ink that releases scent.

6.6 The environment & recycling

A ramification of the trend towards improved marketability, product integrity, supply chain efficiency and convenience packaging as described already, is the fact that such packaging innovations are often at odds with recycling compatibility and environmental sustainability.

However, there is pressure from consumers and governments alike, on companies to be more environmentally friendly and to become more accountable for the impact that the packaging that they produce has on the environment. Globally, consumers are becoming more environmentally aware and are demanding higher ethical and environmental standards. However, environmental and commercial demand for reduced packaging needs to be balanced against the equally important need for product security, which can lead to an increase in packaging eg. tamper-proof devices.

Issues relating to the environment and recycling rates are considered to be of great importance to this project, and this subject is revisited throughout the report.

Section

7

Red meat packaging systems

To a large extent, packaging systems used by the meat industry have remained essentially unchanged over the past twenty years, with the exception of technological advances in retail red meat packaging systems. There are currently three basic packaging systems used by the red meat supply chain in Australia, namely:

- 26kg fibre carton and inner liner system and its variations;
- Expanded polystyrene retail pack system; and
- Case ready modified atmosphere packaging (MAP) system.

7.1 26kg fibre carton and inner liner system

The industry standard packaging system features a cardboard carton with plastic inner linings and/or individually wrapped plastic vacuum packs. The film technology used for plastic films and wraps has improved, but the nature of the material has essentially not changed in 20 years.

Carton

The packaging cartons tend to be on a standard 26kg footprint, and although the size and capacity of the cartons vary, this adjustment is achieved by the depth of the cartons and lids. Australian meat cartons are made in accordance with Australian Standard 3724 -1994. Meat cartons typically meet the following quality specifications:

- Leak-proof
- High stacking strength for chilling rooms
- Tamper proof lid sealing systems
- Full colour graphic printing.

The cardboard cartons are made from a combination of virgin pulp and recycled cardboard. Standard meat cartons are constructed out of two liners which face either side of a corrugated centre. The liners add strength to the carton and are generally made from virgin fibre kraft board, with the corrugated centre panel being constructed from 100% recycled product. The percentage of recycled board depends on the specifications and use of the carton. Meat cartons need to maintain performance in terms of combating the humidity of cool rooms, and tearing. The use of the virgin fibre kraft liners in the construction of the carton increases strength and general carton performance under these conditions.

Inner liners and vacuum bags

The typical packaging system utilises a plastic inner liner, and/or for certain applications, a plastic vacuum bag. Where plastic vacuum bags are used they tend to be multi-layered, laminated products with oxygen and moisture barrier properties (figure 7).

Figure 7: Cryovac vacuum packaging

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: Sealed Air, 2006

7.2 Expanded polystyrene retail pack system

The expanded polystyrene pack is the standard system utilised by the Australian retail sector and remains the most highly consumed by supermarkets. The system incorporates a general purpose polystyrene tray made of expanded polystyrene foam (figure 8) with a laminate over-wrap. Soaker pads are also commonly used (figure 9)

Figure 8: Expanded polystyrene tray

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: Polystyrene Australia, 2006

Figure 9: Cryovac Dri-Loc Meat, Fish and Poultry Pads

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source : Sealed Air, 2006

7.3 Case Ready modified atmosphere packaging

In terms of retail packaging, modified atmosphere packaging (MAP) is becoming more important. Major supermarkets are increasingly moving to case ready packaging systems because of the combination of economics, inventory control and most of all an inability to get trained butchers. (This will be discussed later in the report.) Case ready systems use rigid polystyrene trays with multi-laminated film lids (figure 10).

Figure 10: Cryovac barrier trays

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: Sealed Air, 2006

Section 8

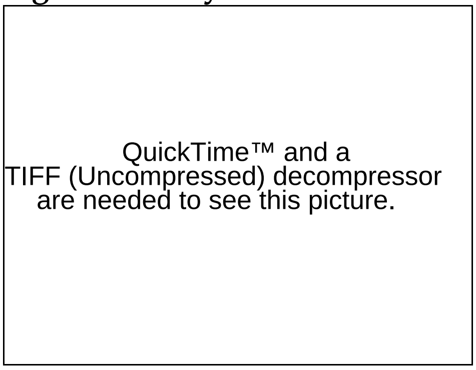
Key packaging industry players

The Australian packaging industry has been characterised by increased consolidation and concentration over the past decade. There are now a small number of large players involved in red meat packaging. In cartons, Amcor Fibreboard, Visy Board and Carter Holt Harvey control 90% of the market and in plastics, Amcor Flexibles, Sealed Air and Polystyrene Australia are the key players. An overview of each supplier is provided below.

8.1 Visy Board

Visy Industries is one of the world's largest privately owned packaging and recycling companies. Visy Board, a subsidiary of Visy Industries is Australasia's largest manufacturer of corrugated fibreboard boxes and is a key supplier to the red meat industry. An example of the Visy Board carton system is shown in figure 11. Visy Board produces cartons on a made-to-order basis. The majority of their products include an inner liner system, although they also make 'poly-free packs' which have an inner coating which eliminates the need for meat to be prepacked in plastic. The claim is made that this technology "*reduces freezer burn and partial thawing, as well as eliminating an entire packaging process from the production line, saving customers time and money*" (Visy, 2006A). However, the recyclability of such liner-less systems is questionable.

Figure 11: Visy Board carton

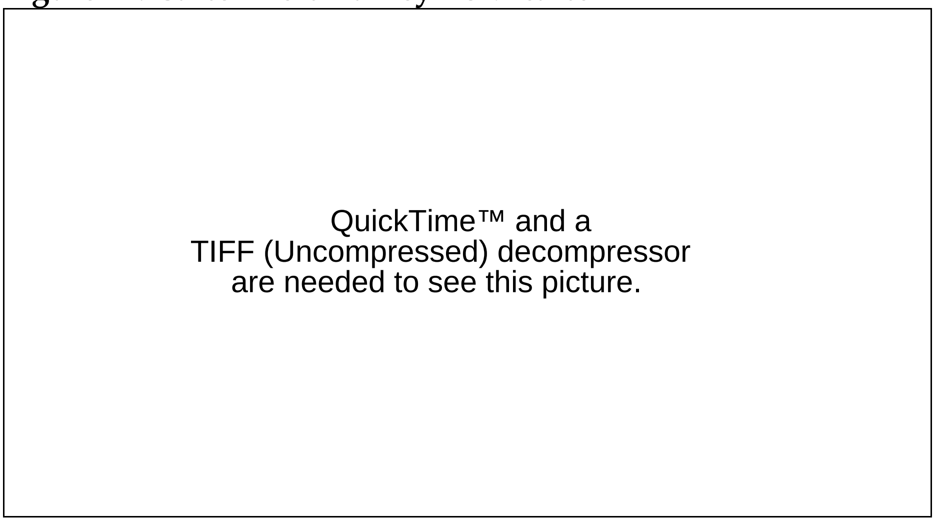


Source: Visy, 2006A

8.2 Carter Holt Harvey

Carter Holt Harvey is also a major suppler of fibre cartons to the Australian red meat industry. In addition to their standard meat carton, Carter Holt Harvey has develop the TSM boneless meat case (figure 11), which is manufactured in corrugated or solid fibre board and is designed to remain flat after freezing. The TSM case is a unique design, incorporating webs in the base and lid. These work to eliminate case racking and build-up on the corners in the lid which are detrimental to pack stability. TSM cases can be recycled and repulped. Carter Holt Harvey (2006) make the claim that "on a cost/performance ratio, TSM is the best option for boneless, frozen meat packaging currently available".

Figure 12: Carter Holt Harvey TSM carton



Source: Carter Holt Harvey, 2006

8.3 Amcor

Amcor is one of the world's top three global packaging companies and produces a wide range of packaging products including fibre cartons, aluminium cans and plastic packaging solutions. Amcor supplies two key packaging systems to the red meat industry: fibre cartons and MAP systems.

Amcor has extensive experience in MAP systems and runs this through its 'Amcor Flexibles' division. Amcor was a pioneer in the development of case ready packaging systems since their inception in Europe some 25 years ago. Amcor Flexibles produces a wide range MAP base trays and mono and multi-layer plastic films and laminations.

8.4 Sealed Air

Sealed Air produces a range of meat, poultry and other food packaging products under its Cryovac brand. Key products used by the Australian red meat industry include: Vacuum shrink bags; rigid polystyrene barrier trays for MAP systems; absorbent pads and case liners; various laminates; and packaging equipment (Sealed Air, 2006).

8.5 Polystyrene Australia

Polystyrene Australia is an important supplier of expanded and rigid polystyrene trays for retail packaging in the domestic market.

Section

9

Packaging regulations and their implications for the red meat industry

9.1 National packaging covenant

The Packaging Covenant is a government instrument designed to manage packaging waste in Australia. Since its introduction in 1999, the Covenant has attracted signatories across the spectrum of the packaging supply chain and industry.

The Packaging Covenant is a self-regulatory agreement and aims to share the responsibility of environmentally sustainable packaging solutions between the spheres of government and the packaging supply chain. In particular, the agreement aims to:

- Minimise the environmental impacts resulting from the disposal of used packaging;
- Conserve resources through better design and production processes; and
- Facilitate the re-use and recycling of used packaging materials.

The Covenant includes a waste hierarchy which provides an order of preference for waste management approaches: (1) Avoidance; (2) Re-use; (3) Recycling; (4) Energy recovery (5) Disposal.

The Covenant sets a number of mandates:

- That packaging should consist of a single material or materials that can be readily separated and sorted for recovery.

- Packaging should be designed to minimise the impacts that any components such as closures, labels, sleeves, carry handles, etc. may have on the recovery process.
- Priority should be given to incorporating post-consumer recycled material in packaging products to support markets for material collected from recovery systems.
- If environmental claims are being made about such things as recycled content of packaging, recyclability or degradability, then it should be made clear to consumers.

The original 1999 agreement had a five year life span, and in July 2005, a new and more ambitious agreement was introduced. The 2004 Covenant Review concluded that the model needed to be significantly strengthened and the 2005 document includes some key amendments designed to improve its performance substantially. An important directional change is the inclusion of recycling targets in the 2005 agreement. The key implication for signatories involved in red meat (predominantly packaging suppliers, retailers and food service), is an increased accountability for packaging management.

The Covenant (2005) has introduced five performance goals for signatories, namely:

1. *Packaging optimised to integrate considerations about resource efficiency, maximum resource re-utilisation, product protection, safety and hygiene.*
2. *Efficient resource recovery systems for consumer packaging and paper.*
3. *Consumers able to make informed decisions about consumption, use and disposal of packaging of products.*
4. *Supply chain members and other signatories able to demonstrate how their actions contribute to Goals (1) – (3) above.*
5. *All signatories demonstrate continuous improvement in their management of packaging through their individual Action Plans and Annual Reports.*

The 2005 Covenant has clearly articulated three overreaching targets.

Target 1: Increased recycling of post consumer packaging

The 2005 covenant has set targets to increase the amount of post consumer packaging recycled, from its current rate of 48% to 65% by 2010. Targets for specific materials are as follows:

- Paper & cardboard 70–80% (currently 64%)
- Glass 50–60% (currently 35%)
- Steel 60–65% (currently 44%)
- Aluminium 70–75% (currently 64%)
- Plastics 30–35% (currently 20%)

Target 2: Non Recyclable Packaging

The new agreement has also set targets for materials which are currently not recycled, i.e. plastics coded 4 – 7, which includes expanded polystyrene and rigid polystyrene trays (refer appendix 3). The target set is to increase the amount of these types of materials recycled from the existing 10% recycling rate to 25% by 2010. Targets are yet to be set for composite packaging materials which include the multi-laminated films for MAP systems.

Target 3: Packaging to Landfill

The Covenant has also established a target of no new packaging to landfill, i.e. maintaining current levels (against 2003 baseline data). This means that any additional packaging will need to be recovered for recycling and not disposed of into landfill. Considering that the vast majority of plastics used in the red meat industry are currently going into landfill, this target has considerable implications for industry.

9.2 Other regulations/initiatives

In addition to the National Packaging Covenant, there are a number of other regulations and initiatives which attempt to improve the sustainability and reduce the environmental impact of packaging materials. These initiatives are as follows:

1. The 'Zero Waste' campaign by WA and SA governments attempts to set out a sustainable framework for dealing with waste and offering strategic advice to the WA and SA local governments.

2. ISO (International Organization for Standardisation) and IEC (International Electrotechnical Commission) have developed voluntary agreements on technical and operational matters to ensure compatibility/consistency on an international basis for a wide range of technologies. ISO 14000 certification is primarily concerned with 'environmental management', which translates into what an organisation does to minimise the harmful effects of its activities on the environment and requires it to continually improve its environmental performance.

3. The Used Packaging Materials National Environment Protection Measure, instigated by the Environmental Protection and Heritage Council, aims to reduce environmental degradation arising from the disposal of used packaging, and conserve virgin materials. This initiative supports and compliments the National Packaging Covenant and ensures that participants in the Covenant are not unfairly disadvantaged in the marketplace.

4. The Sustainable Packaging Alliance aims to be an international focal point for knowledge, tools and expertise that catalyse and facilitate continuous improvement in the environmental performance and sustainability of packaging systems. Through these capabilities, SPA aims to contribute to the positioning of Australia as an international leader in commercial application and adoption of sustainable packaging systems.

5. The Sustainable Packaging Coalition is a US based industry working group inspired by cradle-to-cradle principles and dedicated to transforming packaging into a system that encourages economic prosperity and a sustainable flow of materials.

Part C

Qualitative Research Findings

Section 10

Introduction

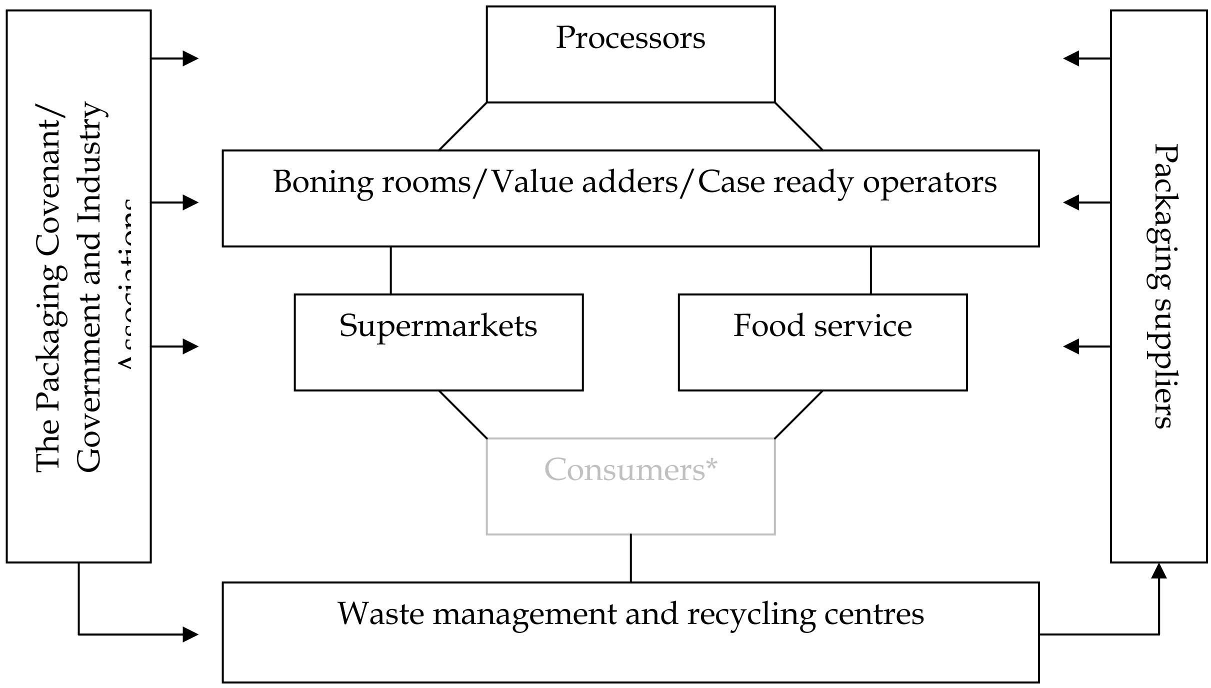
This section of the report outlines the findings from the qualitative research. It reports on the knowledge gained from a series of interviews conducted with personnel representing the various levels of the meat and packaging supply chains. The intention of this research is to generally scope out issues with regard to disposal of meat packaging at each level of the supply chain at the end of its life. The findings presented are purely qualitative - quantitative findings will be presented at a later stage of the project.

Due to the fact that there was much overlap in the information gathered from the different levels of the supply chain, in some aspects there is an element of repetition, however, efforts have been made to keep this to a minimum.

10.1 Methodology for the qualitative research

This section of the report deals with the qualitative stage of the research. The methodology involves systematically tracing through the supply chain and conducting interviews with represented players at each level of the red meat supply and packaging chains.

Figure 13: Relevant supply chain links



**Consumers are not covered in the qualitative research*

In selecting participants, the methodology relied very heavily on the AusMeat website database and the top 25 processors and value adders lists as published in MLA's Feedback: Meat & Livestock Industry Journal Supplement (2005A; 2005B). In addition, the Australian Packaging Directory was utilised to identify key packaging industry contacts (Packaging Council of Australia, 2006).

Where possible, interviews were conducted on a one-on-one basis, mostly on the respondents' premises. In some cases, because of timing and geographical constraints, it was necessary to conduct interviews by telephone.

Interviews were conducted on the prior understanding that no commercially sensitive data would be specifically attributed to any of the respondents; nor would we include data in the report which could be identified with any particular respondent. A list of the respondents is tabled in Appendix 1.

The focus of the interviews was on the current use of packaging and the disposal of packaging. The interviews were of an open-ended and exploratory nature, following a broad moderator's guide, which provided some structure to the interviews (Appendix 2).

In addition, the opportunity was taken to collect quantitative data, which has been used to construct the input/output models as detailed later in this report.

Part D

The Packaging Users' Perspective

Section 11

Overview

This study, as per the terms of reference, specifically focuses on the domestic market for red meat and the key players within it. It covers the full spectrum from processors, boners, value adders, through to distribution companies, food service operators and major supermarkets. It also includes the packaging companies, package recyclers and industry associations (covering the major packaging types used in meat), environmental protection agencies and waste collection and sorting companies. However, the research does not extend to smaller and independent food service operators, independent butchers, and so forth.

The discussion considers the key issues relevant to each supply chain link and consumption in terms of what packaging comes onto the premises and the packaging form in which product goes out.

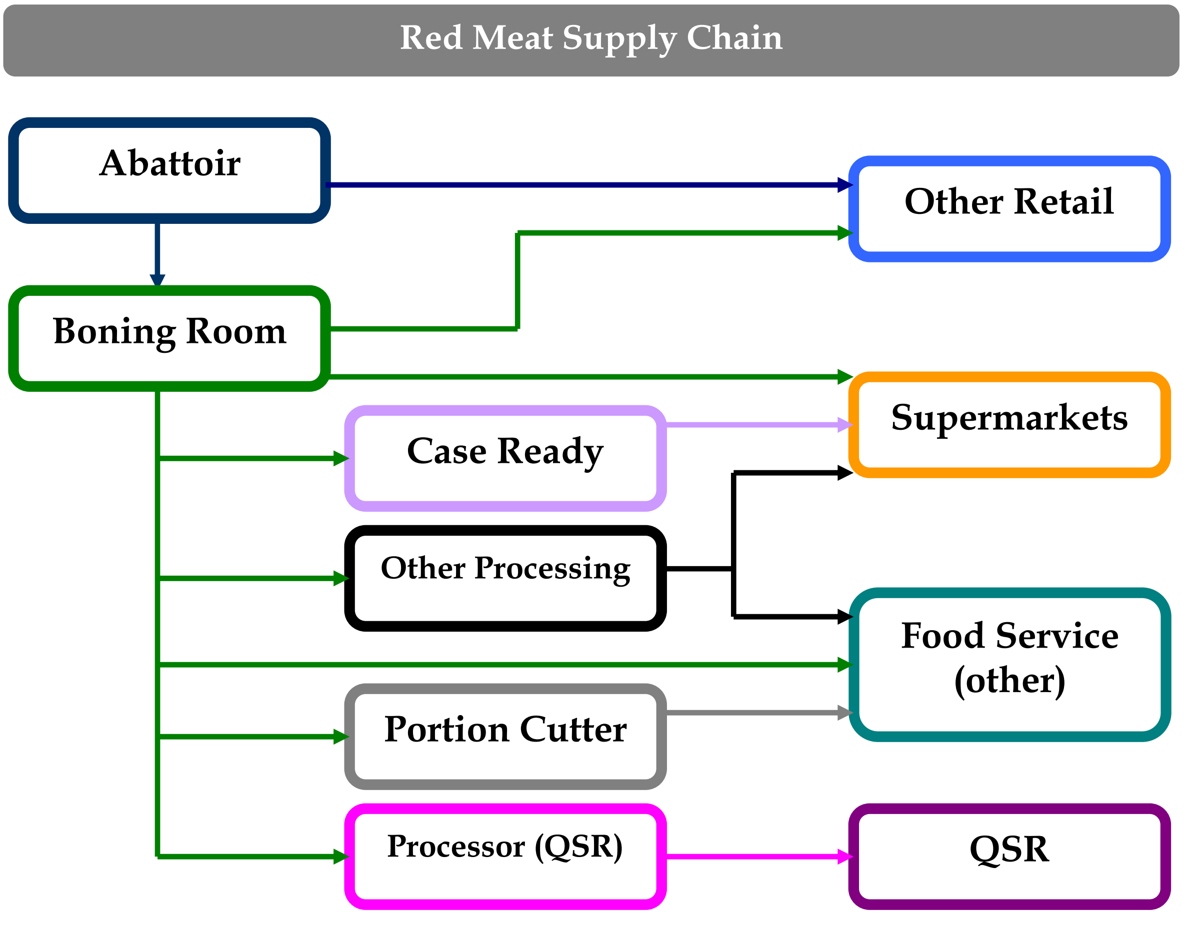
Section

12

The meat industry supply chain

The supply chain for red meat in Australia is complex compared to other primary industries. It is this complexity which drives the significant levels of packaging resources required. As has been mentioned, product is typically re-packed at every stage of the supply chain. The traditional carton/liner packaging system makes up the majority of this, however, there are also significant differences in the forms and types of packaging material used which need to be considered. A simplified version of the supply chain is diagrammatically presented in Figure 14.

Figure 14



12.1 Processors

The processing sector continues to go through stages of evolution, with a large amount of consolidation through mergers, takeovers and abattoirs exiting the industry. As a result, the industry is now centred around three or four dominant players who account for the vast majority of product processed.

In the main, processors kill for both domestic and export markets. For many, export is a much larger part of their business.

Processing works can be differentiated by the fact that there is no packaging material coming in, apart from that in which their consumable materials are delivered, including plastic gloves, clothing, etc. Typically, most processors also have on-premises boning operations, and in some cases, some carton meat is brought into the boning area to supply certain orders. Virtually all of the meat goes out of the processing works in the classic 26kg footprint fibre cardboard carton.

The typical pack configuration consists of the cardboard carton, in various sizes, but of uniform footprint; a lid of various depths; an inner liner; and either inner vacuum bags or individually wrapped vacuum bags. All cartons carry at least four labels. The cartons are then packed onto a pallet and are shrink-wrapped onto the pallet.

Mostly and increasingly, processors use glued lids, although some customers still demand strapping. There are a number of reasons why strapping is being phased out. The first is that it can lead to contamination of meat if fragments fall into the machinery used for further processed meats, such as trimmings, which are ground to make hamburgers, toppings, and smallgoods. Fragments of plastic strapping represent an unnecessary food safety hazard. The other issue is that straps make it easy for handlers to throw cartons around which causes damage; and the third issue is the aesthetics of the carton.

Increasingly, cartons are printed on glossy board, which is generally preferred for presentation and branding. The process of producing glossy boards involves watering cartons with a clay-based material, which can be recycled.

As a rule of thumb, on average there are twelve cartons needed to pack one carcass, although this obviously varies depending on carcass weight and product type. Clearly, more cartons are needed for larger bulls, and fewer for smaller weight cattle. Some unboned product requires bone-guard, which goes to landfill on disposal. Some companies are trialling a clear shield, which allows them to do away with the bone-guard.

The processors report that in general they are using more packaging than five years ago, in response to customer demands. The bigger issue for processors is the increased costs that have come with such demands.

In almost all cases, the choice of carton is dictated by the customers, with major customers having specific requirements. In particular demand are smaller cartons. Whereas export cartons tend to be a standard 26kg, the domestic market tends to have smaller cartons averaging 13kg. Occupational Health and Safety issues largely drive this shift. Many companies have all female workforces and OH&S rules specify a maximum of 14kg lifting weight for females. The other issue is that the customers are demanding smaller portion cuts, utilising more inner bags. Smaller cartons also allow better inventory control.

Some companies have experimented with 'liner-less' cartons, which allow them to do away with the inner bag, but have received complaints from customers about recycling problems because the cartons become soiled.

Increasingly, the trimmings from processors works are being delivered to the customer in bulk bins. There are a number of bulk systems including: bulk metal bins with inner liners; plastic pallecons; and cardboard CB7 cartons. Offal and trimmings for pet food mostly goes out in metal bins without liners.

Processors tend not to have any issues disposing of packaging because very little in the way of packaging material comes onto their premises.

12.2 Value adders

Value adders take boned meat in cartons from processors/boning rooms and undertake various value added services, such as portion cutting, mincing, grinding, cooking, slicing, saucing, flavouring, etc. Increasingly, value adders are becoming more specialised in areas such as portion cutting, cooking, hamburger patties, manufactured and retail case ready packs. This trend is driven by the fact that progressively, the large food service establishments are moving to the so-called 'knifeless kitchen', where meat products are delivered in a semi-prepared form, requiring either minimum cooking or reheating. Some of the specialist operations are discussed separately in the following sections.

For value adders, the meat comes predominantly in cartons with inner liners for prime cuts and bulk bins in the case of trimmings. These are the systems that have been described under the section on processors.

Increasingly, the value adders are receiving trimmings in disposable cardboard bins with spacing sheets between the cuts. This is because, overall, it is cheaper than hiring returnable pallecons/bins and washing them.

Disposal of packaging systems

In almost all cases, for value adders there is close to a 100% recycling rate for cardboard cartons. Mostly, recyclers leave dump bins and cardboard compactors on site to collect cardboard cartons. Typically, the recyclers take this away at no cost, in other words it is cost/revenue neutral to the value adder. In some cases, however, very large users receive rebates on cardboard cartons. With sufficient volumes, it is possible to sell cardboard back to recyclers. For smaller quantities the recyclers take the material away at no cost, however, there is a threshold in terms of quantity and distance at which the recyclers will not collect material because it is not viable.

Virtually all of the plastic material, including the inner bags, vacuum bags, individual wrap, strapping and pallet racking goes to landfill. Recyclers are not prepared to take this because it is contaminated and moist. Typically, depending on the volume, it costs around $1,000 to $3,000 per month for value adders to dispose of the material to the landfill. The landfill dumping charge is around $58 per tonne, with the additional cost being the price of the garbage contract.

Packaging out

The nature of the packaging used for value adders to ship their product to their customers varies, depending on the characteristics of the product mix. However, for all value adders the majority of product goes out in the standard carton system with various inner plastic wrapping systems. The number of vacuum bags inside depends on the configuration of the product.

Some value adders have been experimenting with reusable plastic totes, similar to returnable milk crates, which hold around 30kg of meat. These totes are reusable and widely employed by the chicken industry, but have not been popular with the red meat industry. The main reasons for the meat industry's reluctance to accept totes is the difficulty in returning them; the storage needed; the need for washing facilities that meet Australian Standards; plus a high level of tote pilferage.

Reusable plastic systems are widely used in the northern hemisphere, particularly in Europe. This appears to be because of more stringent environmental laws, plus the fact that there is infrastructure set up whereby independent parties collect, wash and hire the totes in the same way as it occurs in Australia with pallets. The volumes in Australia are not large enough to sustain a collecting and washing service.

Some value adders also use various plastic sleeve packs (doy packs) and tubs; these are used for soups, sauces, marinades, etc. Cooked and sliced product often goes out in sleeve packs or expanded polystyrene trays with an over-wrap.

12.3 Hamburger/patty makers

A sub-set of the value adders is the hamburger/patty makers, who typically also make pizza toppings. Their *modus operandi* is a little different from the standard value adder.

Typically, these companies are specialist hamburger manufacturers who are dedicated to major companies, such as McDonalds. Some companies only supply one customer, and exist specifically to service this customer.

Packaging in

Virtually all of the product comes to the processing facility either in carton or bulk form, about 50/50. Typically, the chilled product comes in bulk bins (approximately 1 tonne), and the frozen meat comes in cartons. Increasingly, value adders are receiving meat in disposable bulk bins made from cardboard fibre, which also can be recycled. Value adders report that they are increasingly looking to adopt bulk cardboard bin systems, because of the convenience and arguably greater environmental friendliness when compared to the resources required to wash, clean, transport and store reusable bins which still use a plastic liner.

In the case of the hamburger makers, virtually all of the cartons coming in are glued cartons because, as has already been mentioned, strapping causes a food safety hazard if a shred of it goes into the product.

Product out - Disposable packaging

The situation with regard to disposable packaging is almost identical to what has been discussed previously. Virtually all of the cardboard carton containers are recycled and virtually all of the plastic goes to landfill. This is because the recyclers won't take plastic for reasons which have been already covered.

Packaging out

All product, in the case of hamburger makers, goes out in cartons. Virtually all of the hamburger patties are frozen. The product is packed in cartons with an inner wax lining, which obviates the need to use inner bags and plastic wrapping systems. Again, waxed cartons cannot be recycled. Plastic slips are used between layers of product to separate them. In the case of slower moving lines, the product is contained in two or three inner bags for quality and inventory control purposes.

12.4 Industrial ingredient suppliers

Industrial ingredient suppliers are value adders who specialise in providing industrial ingredients to food manufacturers. These companies buy in meat and process it to their clients' specifications.

The value adders variously grind, dice, trim and cook meat as an ingredient to a recipe food. Their clients include manufacturers of pies, soups, baking foods, pasta and meat sauces, stocks, etc. In almost all cases, the product is delivered to the client in bulk bins, which can be tipped directly into the food processing bins. A small amount of product is delivered in cardboard cartons with inner liners.

The meat coming into the premises varies, depending on the specifications. Trimmings and offal almost exclusively come in reusable bulk bins with either metal, plastic or cardboard styles used. Higher end cuts and primals all come in cardboard systems. As is the case with the other value adders, cardboard is almost all recycled and plastic material goes to landfill.

12.5 Supermarkets

Large chains

Meat going into the large chain supermarkets is delivered in cartons. Previously, it was delivered as carcasses, sides or quartered meat and butchered in the store, however today, virtually no carcass beef goes to supermarkets; it is all primal cuts. There is still some lamb carcass meat being delivered to stores but the volumes are declining. Trimmings for mince are delivered to come stores in bulk bins (30 litres).

As has been indicated, the major supermarkets are moving to case ready systems (figure 15). Most case ready is being delivered to store in cardboard cartons, often without lids. These cartons then go into recycling.

Figure 15: Case ready packaging

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: Sealed Air, 2006

The supermarkets are, however, experimenting with reusable plastic totes, which have been used by the chicken industry. Coles has recently introduced totes for all fruit and vegetables. These are used throughout the entire length of the supply chain from orchard to on-shelf display. It is therefore likely that they will increasingly look to similar systems for meat. As mentioned, the problem with totes is the issue of space, cleaning, returning to supplier and pilferage. To date, totes have been considered to be uneconomical, however, combined with a fruit and vegetable tote system they may become viable in the future.

Virtually all supermarkets have compactors and bin systems for disposal of cardboard, which is collected by recyclers. All other materials go into general garbage and into landfill.

The vast majority of meat leaves supermarkets in expanded polystyrene trays with plastic over-wraps. However, increasingly, case ready systems are replacing the expanded polystyrene trays. Case ready meats use MAP utilising rigid polystyrene trays with multi-laminated plastic tops.

Some councils will now accept rigid polystyrene trays at kerbside for recycling. All expanded polystyrene trays and other plastics go to landfill. Some value added meat products are sold in vacuum sleeve bags or doy packs which also go to landfill.

One supermarket is experimenting with motherbag modified atmosphere packaging systems for case ready. This involves putting multiple standard expanded polystyrene retail packs inside a large gas flushed (high oxygen) outer pack. The advantage of master systems is longer shelf-life (3 weeks vs. 10 days). The motherbag MAP systems have applications in transporting product over long distances.

Independents

Whereas the larger chains are moving towards high tech systems such a MAP, by and large the independent chains continue to use expanded polystyrene trays and over-wrap which are not currently accepted for recycling, for reasons outlined previously. Where independent outlets have onsite butchers, red meat comes into the premises, typically through a wholesaler, in carton form and is portion cut and packaged onsite for retail sale. Where there is no onsite butcher, this is outsourced and meat is deliver in expanded polystyrene packs.

There are some independents using MAP systems, however, they are in the minority.

Like the other major chains, independent supermarkets tend to have a 100% recycling rate for cartons, however, the vast majority of plastic goes into landfill.

It is unlikely that the independent supermarkets will be switching over to MAP systems in any great volume in the near future. This situation is largely driven by margins. In the main, independent retailers are able to achieve higher margins through the traditional retail model than through a MAP case ready system.

The move by the larger chains to MAP case ready systems has benefited independents in two ways. Firstly, while the larger retailers are implementing case ready systems to combat butcher labour shortages, increasingly, the nationwide rollout of the case ready schemes has caused some retail butchers to be made redundant. This dynamic has allowed the independents with onsite butchers access to a larger butcher labour pool, enabling them to retain the traditional red meat retail model and enjoy greater margins.

A second benefit to independents is that because case ready systems use rigid polystyrene MAP packs, polystyrene producers are experiencing a permanent decrease in demand for their expanded polystyrene meat tray products, and are reported to be dropping their prices to shift excess stock.

12.6 Food service users

The food service sector comprises all away-from-home consumption forms. It is divided between discretionary outlets such as five star hotels and fine dining restaurants, bistros, pubs and clubs, sporting venues; and non-discretionary including institutions such as hospitals, jails, airlines, nursing homes, etc. This study falls short of covering independent food service outlets and concentrates only on the larger contract caterers and major users.

The catering sector is being dominated by big (and increasingly global) players, such as Sodexo, Eurest, Spotless, Qantas, etc., with contracts to service canteens, hospitals, sporting venues, airlines, corporate catering, etc.

The nature of the packaging in which meat is delivered to food service outlets varies from category to category. However, overwhelmingly, it comes in cartons ranging from 5kgs to 20kgs.

One of the biggest issues for food service operators, in terms of decisions about packaging, is shortage of storage space both for uncooked product and waste. Typically, food service kitchens operate in very tight spaces due to high rent costs. Therefore, there is limited storage for food or holding space to keep disposable bins. Consequently, they need frequent deliveries with smaller quantities, i.e. daily 'just in time' delivery. In remote areas, such as mining companies and military bases, the meat is mostly delivered in frozen form and tends to be packaged in smaller quantities for inventory control and usage convenience.

There is a tendency, particularly with respect to hospitals/institutions, to move towards central kitchens. For example, in hospitals and aged care facilities, the trend now is to use one central kitchen to supply up to a dozen other hospitals with heat/serve product.

The next generation, moving on from 'mother' kitchens, has involved the establishment of central facilities that cook and prepare meals for a wide range of institutions and catering operations. Some major caterers have central kitchens which prepare product for use at various sites.

Disposal

The method of disposal in food service varies considerably, depending on the site. Large hotels, casinos and conference centres tend to have quite sophisticated packaging disposal systems. Typically, they hire a garbage contractor who provides a total service. This involves providing equipment for collecting and compacting materials, removal of the material to landfill or the recycler, on-site sorting, and so forth. Many also provide consulting services to help the organisations achieve a higher recycling rate. Most large sites have a major cardboard container compactor, which compacts the cartons for pick up

Typically, the larger companies are very conscious of the environment and have quite sophisticated environmental policies. As a result, they go to great lengths to improve the amount of recycled or minimal use packaging. It is in their interest to be environmentally aware as minimising storage and packaging costs contributes to their overall profits. Some of the larger companies are signatories to the Packaging Covenant.

All of the major food service operators of this nature that we spoke to had what they believed to be a 100% recycling rate for cardboard containers, excluding waxed cartons. Waxed cartons are picked up but separated at the point of recycling and go to landfill. All of the plastic wrappings, vacuum packs and other plastic go into general waste which is dumped at the landfill. Some of the larger operators also recycle food waste for composting.

With respect to some of the smaller and remote sites, virtually all of this material goes into general garbage. This is because they either don't have room for sorting or storage on the premises; they don't have the sufficient volume to make it economical for a recycler to be interested in picking up the product; or for other logistical reasons. The economics of recycling are such that there need to be large quantities in close proximity to the recycling depot.

12.7 Quick Service Restaurants

Quick Service Restaurant (QSR) is the industry term for fast-food restaurants. This sector is dominated by major players such as, McDonalds, Yum! Restaurants (KFC and Pizza Hut), Burger King, etc. Typically, they are franchise operations with many sites scattered across the country. Sitting beneath the large corporate operators are a large number of smaller single site independent fast-food operators.

Most of the hamburger patties come into the store in frozen form in 14kg cartons. Again, this is for OH&S reasons. The cartons have a poly-liner and a slip-sheet between the layers of hamburgers. In some cases smaller volume product has two inner liners to facilitate stock rotation and inventory control. Some chilled product comes in bulk bins.

The major fast food chains have experimented with reusable plastic totes, which have been described earlier. These have proven to be unviable for a number of reasons, including the infestation of used totes; the cost of collection, washing and recycling; and the high levels of theft.

Disposal

Disposal of meat packaging from fast food restaurants varies, depending on the site. For sites in the inner city areas or where there are well established garbage services, virtually all of the cardboard is recycled and all of the plastic goes to landfill.

However, in the case of remote sites, all of the products go into landfill. This is because of the lack of access to recycling centres and the uneconomical prospect of recycling because of the small volumes used. Some sites have compactor systems on site, but others just have bulk bins.

The major QSRs are signatories to the packaging covenant and have strict environmental policies. McDonald’s current standard restaurant practice is to recycle all cardboard and used cooking oil. Cardboard contributes to approximately 50% of the chains' total kitchen refuse by volume. The remaining plastic liners and other packaging material go directly into landfill.

12.8 Independent restaurants, clubs and pubs

A substantial proportion of the domestic food service market is comprised of a large number of single site restaurants, pubs, clubs, sporting venues, etc. Collectively, these premises account for a significant proportion of red meat used by the food service sector.

In terms of sourcing meat, the large operators purchase meat in cartons from major food service providers. Increasingly, they are moving to portion cuts and semi-prepared products, a measure to save on labour and storage space. Smaller operators often purchase meat from a local butcher, most of whom have a significant food service operation. Typically, their meat is delivered in retail packaging.

With regard to disposal, this varies greatly. Large operators have recycling bales for paper and cardboard. Smaller operators may have access to local government kerbside recycle bins. What is not accounted for by the above is disposed of through general rubbish collection.

Part E

The Packaging Suppliers' Perspective

Section 13

Cardboard suppliers

The classic fibre cardboard carton is the principle packaging vehicle for the Australian meat industry and has been for many years. Our previous study in 2003 indicated that predominantly, meat now enters its usage destination in a cardboard carton. Carcass meat from abattoirs is almost a thing of the past, except for very small slaughterhouses.

The classic meat carton is made from a standard footprint, designed around the classic 26kg export carton. As we have previously indicated, the size of the carton varies greatly but still follows the same footprint. The varying factor is the height of the carton and the lid.

Choice of cartons, from the customer point of view, is very heavily cost driven. Processors and marketers are seeking out the lowest cost solution that will provide the strength, resilience and moisture resistance required, and still meet the customers' specifications.

As has been mentioned, meat cartons are made from a combination of virgin fibre and recycled paper. The outer layers are made from virgin fibre, kraft liner board and the corrugated centre is 100% recycled. Occasionally, a percentage of the virgin fibre kraft outer layer also includes recycled paper, however, the levels are believed to be fairly insignificant. In the main, packaging suppliers are driven to produce cartons constructed from 100% recycled materials because of economics but, as is the case for meat, some industries require levels of performance which recycled fibres alone cannot provide, hence the requirement for a virgin fibre outer layer. Due to the moisture in the product, the humidity of cold storage and the weight of the cartons, the meat industry will always require high performance cartons.

The specification of cartons depends on the customer's requirements and end use. The performance requirements of the meat industry vary between frozen and chilled product and therefore different cartons are available to service these different applications. For example, frozen trimmings and manufactured meat being exported to the United States require good stacking strength and greater containment qualities. However, frozen product can tolerate weaker carton strength, because being a frozen block of meat, it needs less support. Chilled cartons need far more support and strength for storage as well as logistical considerations.

Another issue is the presentation and appearance of the products. Increasingly, the meat industry is moving towards branded product and processors and value adders are using glossy and heavily printed cartons to project their brand image. The use of the virgin fibre, kraft outer layer allows for such printed branding to be of high quality.

We are told that the majority of virgin fibre used in Australia comes from new pine forests. Australian Paper is a key supplier of virgin fibre from this source to the major carton producers. Radiata pine fibre is preferred for cardboard cartons because its long fibre length makes it ideal for kraft board and it can be recycled many times. Anecdotal evidence suggests that short fibre hardwoods may also be used, which is predominantly sourced from eucalypts.

We understand from our research that there is quite a strong international market for recycled cardboard carton fibre, particularly in China, because of the fact that Chinese cardboard tends to use hardwoods with shorter fibre length, which needs to be blended with softer fibre to achieve suitable quality. As a result, a large amount of the cardboard from the meat industry is exported to China for recycling and blending with local container fibres.

The industry convention is that fibre cartons can be recycled between four and five times, although an estimate of up to eight was provided by one industry source. Every time cardboard fibre is recycled it loses strength and has a greater tendency to absorb moisture because of the shortening of the fibre length.

Recyclable fibre is sourced from old container cuttings (OCC) from industry compactors and domestic refuse. Our discussions with the major cardboard recyclers indicated that the quality of the OCC source is deteriorating, as a greater percentage of fibre is recycled multiple times. The quality of domestic refuse source is said to be poorer than OCC due to the fact that much of it is made up of newspapers and magazines which are not high performing inputs. The OCC input has the benefit of the virgin fibre kraft board which adds new fibres into the mix.

There are a few different technologies in fibre recycling. One method is to grade fibre by optical sorters, which provides a fairly crude but effective grading on fibre length. The grade of the fibre is used to determine the specifications of the paper that it is made from. Each time the fibre is recycled it is downgraded and relegated to lesser uses. The final stage of the fibre recycling chain is pizza trays and coffee cup trays, which require much lower levels of strength and moisture resistance.

Another technology uses a washing machine type system which accepts the waste. Chemicals are added to increase fibre strength and ensure that as many fibres as possible are saved. Those fibres that have been recycled too many times and are simply too small are then washed away. This method of recycling results in one grade of output which can then be combined with different chemicals or virgin fibres to produce different products.

The highly glossy cartons are coated with a clay-based layer, which is suitable for high quality printing. This clay layer can be slightly problematic at recycling stage in that it has to be taken from the carton before it can be recycled. This clay is only suitable for landfill, however, it is quite attractive to landfill because of its covering properties and its inert nature.

Over the last few years there has been a move towards using ‘liner-less’ cartons, which employ waxed or coated services. This obviates the need to use plastic inner liners and also increases the strength of the carton meaning that less virgin fibre is required. However, this technology comes at a cost environmentally because wax cartons are not recycled and go straight to landfill. As such, the environmental friendliness of waxed, liner-less cartons is highly questionable.

There is another alternative to wax coatings and plastic inner liners which is currently being employed by horticultural industries. The technology involves using a polylaminated liner, which is made out of polyethylene, in place of the virgin fibre, kraft lining board. This is not to be confused with the plastic liner bags currently used by the red meat industry. The polylaminated lined boxes have the increased strength of a kraft lined box, but negate the need for virgin fibre and therefore increase the amount of recycled fibre used. This type of system may have applications for the red meat industry, however, like the waxed cartons, recycling is problematic. While we have been advised by industry sources that these types of cartons can be successfully be recycled as the polymer layer is washed away in the recycling process, the multi-material nature of the boxes makes them non-recyclable by definition under the Packaging Covenant.

Over the past decade there has been a strong drive towards reducing the amount of fibre weight in cartons. This has been achieved through a combination of better designs, the use of new boards, and other techniques. Whilst this has a major environmental advantage, the main driver for this has been the need for people in the supply chain to reduce their costs.

The Australian packaging industry is extremely sensitive to the environmental aspects of its products. It is investing large amounts of money for its own benefit and on behalf of its clients, to reduce the amount of packaging; improve recycling rates; and its performance in terms of down-gauging carton weight. There is ongoing pressure to downgrade packaging used in cartons through new designs which utilise less board, and down-gauging the board through better design.

One instance of the environmental sensitivity that is not relevant to the Australian domestic market, is that of Genetically Modified Organisms (GMO) product in cartons. We were told by a large exporter that major supermarkets in the United Kingdom are querying the environmental friendliness of the cartons, because the glue that was used to hold together the layers of fibre was generated from corn which had been genetically modified. We were told that the supermarkets were not prepared to accept these cartons and that an alternative had to be found.

Section 14

Plastic packaging

Apart from cardboard cartons, the staple packaging item for the meat industry is plastic wrapping of varying types. This ranges from a simple one single layer coverage to multi-layer complex laminates that have varying properties to exchange gases, protect moisture and other purposes.

Virtually all meat, at every level of the supply chain, is in contact with some sort of plastic packaging. The cartons that carry the meat tend to have an inner lining. In addition, depending on the product and specification, meat products are individually wrapped with an oxygen barrier made from plastics, including vacuum packaging and other systems.

At a retail level, meat through supermarkets has been traditionally sold in expanded polystyrene trays, with a single laminate over-wrap. However, in recent years, with the evolution of the case/retail ready packaging, there is a growing use of modified atmosphere packaging (MAP), which involves far more complex packaging systems.

Packaging companies report that while these MAP systems are more expensive than the traditional expanded polystyrene and over-wrap system, they deliver on quality criteria such as extended shelf life; rigidity and oxygen permeability; shelf presence criteria such as high gloss and anti-fog; increased food safety; as well as offering supply chain benefits. Packaging companies report that the trend towards MAP packaging is likely to continue until a new technology is found that can better deliver on these attributes as well as others such as environmentally friendly considerations.

Typically, modified atmosphere packaging is based on a rigid polystyrene tray, with a multi-laminate over-wrap. The composition and properties of these materials have become far more complex, with the ability to allow some gases to permeate and others not to. The permeability of rigid polystyrene and its ability to extend shelf life compared to other plastics is the main driver for its use in meat packaging.

One of the reasons that laminated plastic materials are difficult to recycle is that they have multi-layers of different compound material. For example, a typical packaging film that appears in a vacuum pack or as an over-wrap, or a lid on a MAP pack involves a layer of linear low-density polyethylene, an adhesive, a layer of nylon, another layer of adhesive and another layer of polyethylene. The issue is that it is not possible to recycle these, or separate them.

One company in New Zealand is well advanced with a single layered film, which has all of the desired barrier properties as the multi-layered material, but does away with the problem of recycling. However, based on discussions with Australian packaging companies, an opinion exists that while such technology may in theory negate the problem of recyclability, in reality the economics of separating and recycling such barrier films in their current quantities would not be great enough to enable such a scheme.

Almost totally, plastic wrapping for meat is not recyclable, and goes to landfill in general refuse. There are a number of reasons for this. Overwhelmingly, the main reason is recyclers won't take plastic packaging material because it is contaminated and moist and therefore not suitable for recycling.

A second issue, which is related to the above, is that whilst there is large metreage of packaging, it is relatively low volume and not economical for recyclers handle.

The economics of plastic recycling is driven by the ability to achieve relatively large volumes in a close proximity to the recycling works and thereby satisfy the market price for recycled packaging. There is some economical plastic recycling, for example, shrink-wrap, which is used for industrial applications such as the automotive or whitegoods industries can be economically recycled where there is a large volume of consistent clear plastic in one particular location.

At the retail level, while use of MAP systems is increasing rapidly, the main pack is predominantly expanded polystyrene, of which none is recyclable, entirely because of economic factors. This product is 98% air, and recovery volumes are very low relative to yield from recycling.

Section 15

End-of-life uses

The packaging industry differentiates between the terms 'recyclable' and 'recycled material'. It is widely claimed that in a technical sense all packaging is recyclable. The fact that much of it isn't is purely due to economics.

As has been highlighted, cardboard fibre cartons, which are the mainstay of meat packaging, have a very high recycling rate. Packaging recyclers claim it to be close to 100%, but our research suggests that this is an overstatement. A proportion goes into general garbage, which ends up in landfill. There are a number of reasons for this:

- Some bloody and contaminated cartons are rejected by recyclers.
- The waxed lined cartons are not economical to recycle.
- In some regional and remote areas, cardboard recycling is not economical because of lack of volume and the distance to the recycling plants, meaning that the material goes into general garbage.

There is nothing on the horizon that suggests that plastic film can be recycled for use as a packaging tool. Whereas some of the plastic packaging, such as PET, can be recycled for further use in plastic bins, furniture, etc., this is not the case for the films used in meat packaging.

There are, however, some emerging technologies in the area of energy recovery and biodegradability. There are three emerging technologies in particular, which whilst not widely used in Australia, have strong prospects for the future.

15.1 Energy recovery from high-temperature incinerators

There is a point of view amongst the packaging community that the best way to reuse spent plastic packaging material is through energy recovery high-temperature incinerators or diesel fuel recovery.

Under high temperatures, the plastic is simply burnt and the energy given off is then used to generate electricity. There is a point of view that this is a very efficient way to recycle this material, because the energy recovery would be almost the same as if the electricity was generated from petroleum materials in the first instance. What this means is that the petroleum resource has a prior use (ie. packaging), as well as achieving the same level of energy recovery as the raw product.

High-temperature incinerators have been strongly resisted in Australia by the Green movement and the government based on environmental grounds. Indeed, as has been previously mentioned, the Packaging Covenant ranks energy recovery only just above landfill disposal in its waste hierarchy. The issue is that the plastic inputs may give off noxious gases because some chemicals such as PVC and ABS can give off dioxins. However, it may be a possible to overcome this through the use of high technology scrubbers, which remove this from the atmosphere.

The other issue with high-temperature incinerators is the substantial cost of the infrastructure in building the facility. We understand that there are some experiments in Australia where cement kilns are using a proportion of plastics in their mix. Because these burn at such high temperatures, there is believed to be a limited problem with the emissions.

15.2 Diesel recovery

Ozmotech is an Australian company which has developed technology that can convert plastic material into diesel fuel, which can go straight into fuel diesel engines.

The process can convert high density polythene (HDPE), low density polythene (LDPE), and certain types of polypropylene and polystyrene, but not polyethylene terephthalate (PET). It is important to note that these materials cover virtually all of the plastics used by the meat industry.

Essentially, the process involves putting the plastic through a catalytic converter, which shortens the cell length to produce diesel fuel with a Cetane (octane) rating similar to petroleum diesel. The fuel produced complies with international fuel and Environmental Protection Agency (EPA) standards. The process requires a degree of sorting of the plastic before processing, to ensure the optimum mix to achieve a suitable diesel fuel. The process of conversion is relatively environmentally friendly, with no emissions into the atmosphere.

In March 2006, Ozmotech signed a $190 million deal with Dutch renewable energy company EnvoSmart Technologies to purchase 31% of Ozmotech's ThermoFuel systems over the next four years. The first six systems are destined for Germany and will be operational in 2007. The rollout will then include systems for Netherlands, Poland, Sweden and the Czech Republic. The EnvoSmart contract brings the total number of ThermoFuel systems sales to over sixty. When in full production, the systems will produce an estimated 350 million litres of fuel per annum from over 400,000 tonnes of waste plastics, most of which will be diverted away from landfill.

Interestingly, there is limited interest for the technology in Australia. The issue is that the Commonwealth Government has ruled that a 38.4 cent excise tax apples to fuel produced through this process, which makes the economics questionable.

This ruling is currently under review and the outcome will decide the future of the technology in Australia.

15.3 Biodegradability

There is increasing interest in biodegradability in plastic filming. There has been some experimentation with polylactic acid (PLA). This is a cornstarch product whereby the PLA extract is taken from corn and used to make polymers for plastics. If it can be perfected it would mean that plastics could be totally renewable and biodegradable and ensure a fully sustainable system. We understand that a number of companies have some advanced technologies on the way to perfect this process. One of the limitations at this point in time, is the strength of the plastic and its suitability for contact with food. The polymer mixtures can be enhanced to either dissolve upon contact with water and then biodegrade rapidly; or by blending quantities of other biodegradable plastics into the starch, a waterproof product that degrades within a maximum 4 weeks can be produced. The successful application of such a technology to meat trays in terms of performance is therefore questionable.

Quite apart from the PLA technology, there has also been some other research and development surrounding degradability. Some of these systems involve simply adding starch based compounds to plastic so that the product breaks down in landfill. Many of the landfill operators and recyclers are quite concerned about this because, even though the packaging breaks up into smaller particles, the plastic materials themselves take a long time to breakdown.

There is a strong mood amongst the plastic industry, particularly the environmental groups, to introduce a standard terminology and ratings scale on biodegradability. There is a need for a standard labelling system, indicating the degree of biodegradability. This is problematic in instances where some of the materials will break into particles, but the particles themselves are not degradable. This becomes problematic for landfill operators.

The major impediment to the success of biodegradable plastics is economics. Whereas a standard polystyrene meat tray costs around 1 cent, biodegradable trays currently on the market cost between 15 and 20 cents.

Moreover, misconceptions exist about the fact that biodegradable materials break down quickly in landfill sites. The issue here is that materials deposited in landfill are compressed and sealed under tonnes of soil. This process itself minimises oxygen and moisture which are needed to enable the product to breakdown effectively. For biodegradable plastics to decompose they need to be treated like compost.

Section 16

Garbage disposal

As the report indicates, most of the plastic-based materials used by the meat industry go into landfill as general garbage. The issue is that whilst many of these materials can be recycled in a technical sense, the economics of sorting, cleaning and recycling do not stack up because of the low volume and value of the material related to the cost and the limited end market for such recycled products.

16.1 Materials Recycling Facility (MRF)

Most councils offer recycle bins at kerbside (wheelie bins). Refuse from these bins go to Materials Recycling Facilities (MRFs) which are collection and sorting sites. The MRFs are operated by recycling companies such as Visy Board.

These companies use a combination of mechanical and manual sorting to separate the material and sort it into various categories: paper, cardboard, glass, aluminium, and various types of plastic. Those materials for which there is an economic recycling market are sold off to recyclers. The remainder goes to landfill.

Cardboard, paper, glass and aluminium have a very high recycling rate. Some of the plastic materials, and some cardboard, are baled up and exported to China for further hand sorting and recycling.

16.2 Kerbide plastic recycling

The plastics industry has a numbering system known as the plastics identification code which is designed to assist recyclers in sorting plastics by resin type. The plastic identification code is comprised of seven categories (see appendix 3). Typically, only plastic types 1 – 3 are accepted for recycling.

Currently, PET soft drink bottles, HDPE milk bottles, cream bottles and orange juice bottles are the most commonly recycled plastic packaging products. In addition, some councils also collect PVC bottles such as those used for cordial. While a limited number of councils now collect the range of rigid polystyrene packaging used by case ready operators, in reality, the number of trays recycled is fairly inconsequential. Plastic recycling is covered in more detail in Section 17.

16.3 Landfill

All material which does not suit an economical recycling market goes to landfill. Landfill sites were traditionally operated by local government, but increasingly private companies are contracting this role. Traditionally, landfill sites were quarries, brickworks, etc., but as these fill up, purpose built landfills are being constructed.

There are very strict regulations regarding landfill sites, relating to leakage into the water table and emission of gases or odours.

Local councils and private garbage collectors are charging a fee of anywhere from $60 to $100 per tonne to dump in landfill, with the price much higher in heavily populated areas, eg. Sydney.

Various technologies are being adopted to more efficiently manage landfill. Increasingly, landfills are offering facilities to compost biological materials such as food scraps, which can be sold off to horticultural industries.

In some cases, the gases emitted from rotting garbage are collected and sold.

With the introduction of the 'no new landfill' target by the Packaging Covenant, industry will need to look for alternative solutions to manage the quantities of used packaging going into landfill.

Section 17

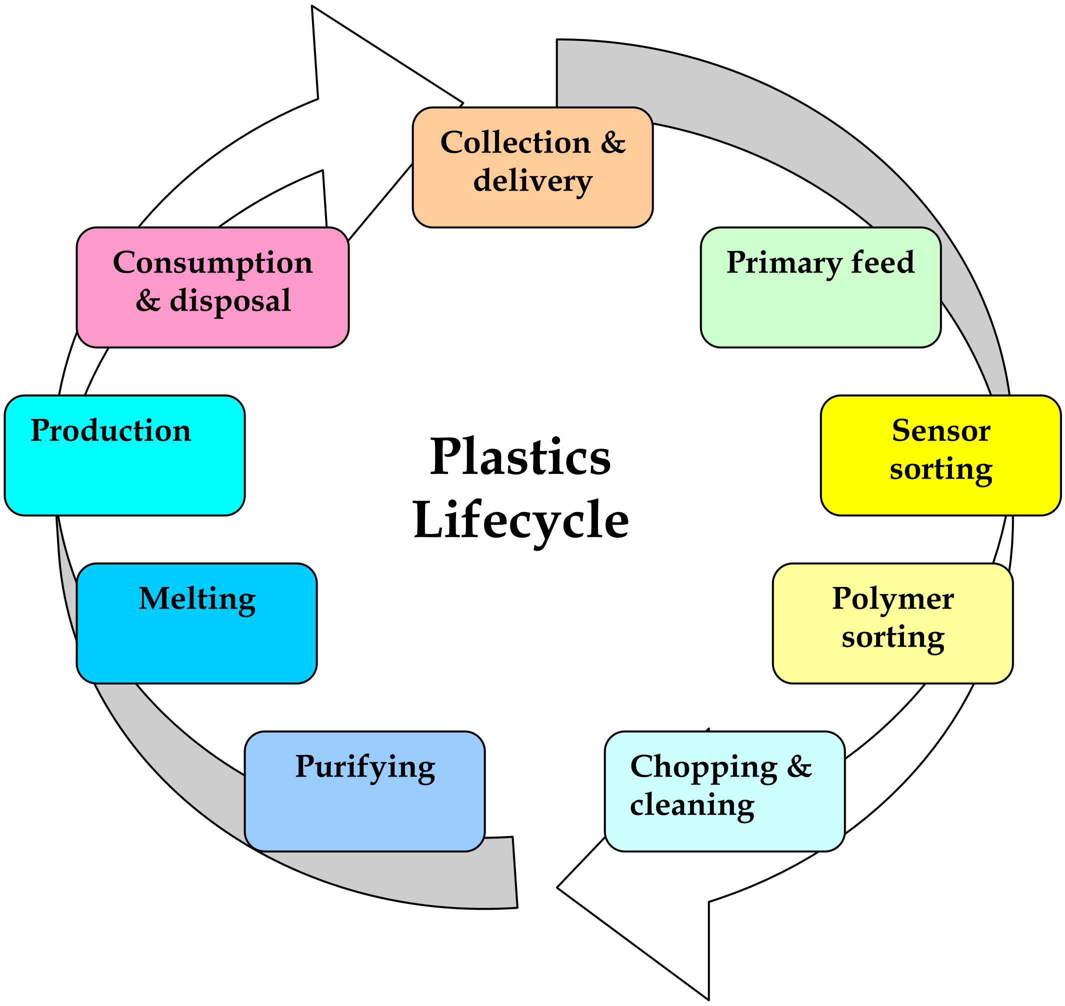
Plastics recycling

As mentioned previously, the range of plastics most commonly consumed by the red meat industry are expanded polystyrene, rigid polystyrene and various types of over-wrap, vacuum bags and liners, none of which are currently viable in terms of recycling. The range of issues which cause the recycling of such plastics to be problematic are discussed in the previous sections.

With the introduction of the Packaging Covenant's target of a 25% recycling rate for non-recyclable plastics, research is currently being undertaken to find ways to improve rates. Of particular focus has been the recyclability of rigid polystyrene from which MAP systems are derived. While most councils are currently only accepting plastic codes 1 -3, there is pressure to accept other material types and it is expected that in the near future polystyrene (code PS6) will be recycled to a greater extent.

The lifecycle of plastic and the plastic recycling process is detailed in figure 16.

Figure 16: Plastics lifecycle



Source: Adapted from Visy Plastics recycling process, 2006

1. Collection & Delivery Plastics collected from households and businesses are sorted by MRFs and delivered to plant for recycling. Unsuitable materials are diverted to landfill by the MRFs.

2. Primary feed The plastics collected are fed into the recycling system by a central conveyor belt.

3. Sensor sorting Material specific sensors automatically sort the material into different types of plastics, or polymers.

4. Polymer sorting	Sensors direct the plastics into the right recycling stream using infra-red light to identify the polymer type.
5. Chopping & cleaning	Each of the sorted polymer groups are granulated into flakes and intensively washed, and then dried in a centrifuged hot air machine.
6. Purifying	During the washing process further purification and separation is carried out to remove any residual labels and caps.
7. Melting	Plastics are melt-filtered to remove any final traces of contamination. The melt is then extruded into strands that are chopped into pellets.
8. Production	Final resins are produced ready to be manufactured into new plastic products.

Part F

Input-output Model

Section 18

Introduction

A core objective of this project is to make a quantitative estimate of the cost and volume of packaging consumed by the Australian red meat industry in the domestic market. In addition, the project aims to determine the fate of end-point packaging use in the meat industry in terms of recycling and landfill waste and the associated cost of disposal. In order to achieve this, a quantitative input-output model has been developed.

The input-output model as detailed in this section provides an estimate of all packaging used in the domestic meat industry including cardboard, various plastic films and polystyrene retail trays.

Packaging quantities on a per kg basis have been traced downstream of abattoirs through the supply chain to the various links including boning rooms, case ready operators, processors, retailers and foodservice. As per the brief, the model stops short of measuring packaging throughput from retailers and food service to consumers, although some consumer end retail packaging has been quantified where data was available.

For each supply chain link, estimates have been made of the packaging that comes onto the premises, and how it goes out in its various forms (i.e. input versus output). The model estimates outputs including packaging being trans-shipped to the next link in the supply chain, recycled, or disposed of in landfill.

Section 19

Methodology

The quantitative estimates developed by the input-output model have been determined through spreadsheet modelling.

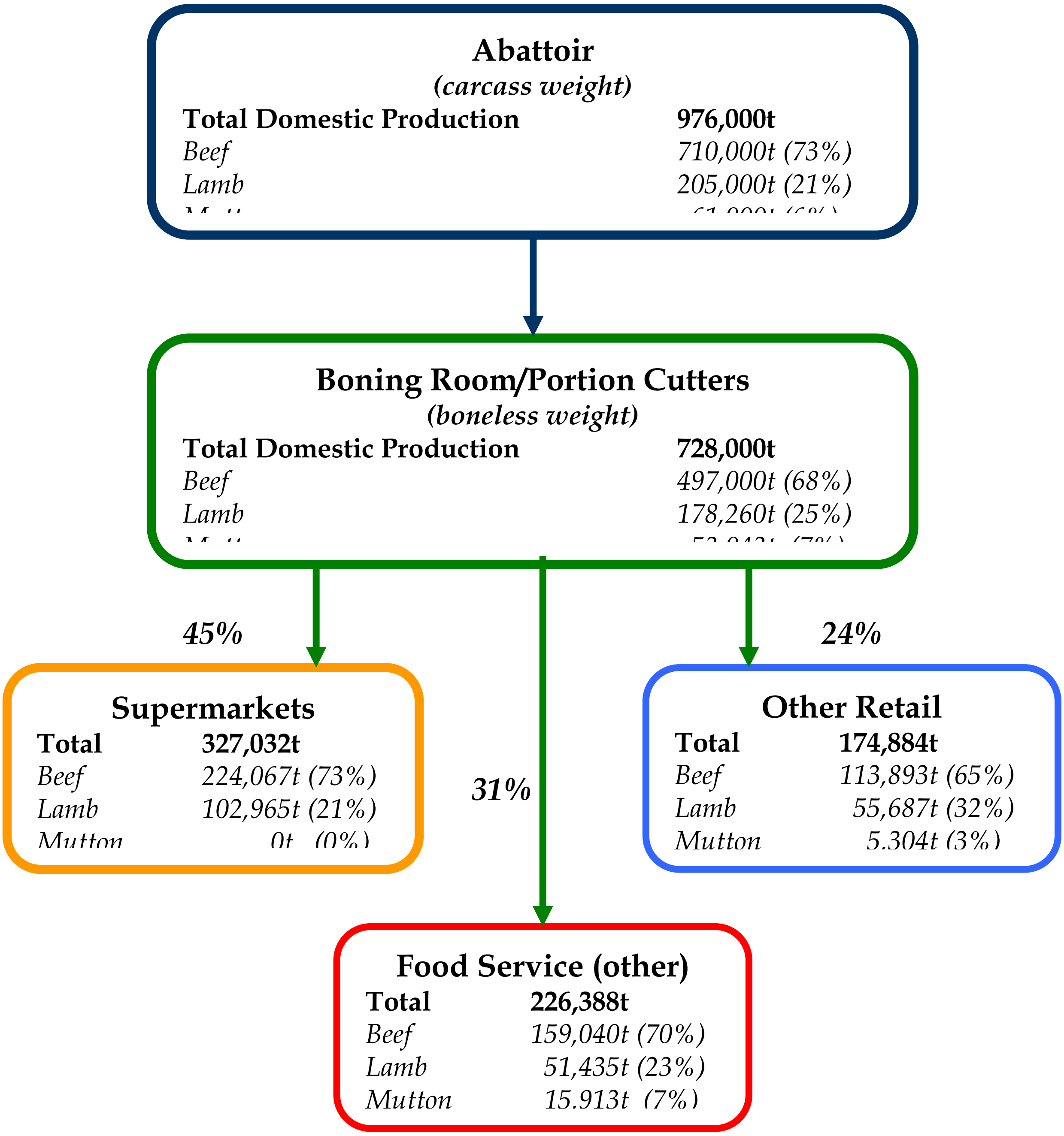
The spreadsheet model is based on four data inputs:

1. Total domestic red meat production and volume throughputs to major market channels.
2. Identification of the various packaging systems used by each link in the supply chain.
3. Estimations of the various volumes of meat distributed through each supply chain link and through the various packaging forms.
4. The cost of the individual packaging components averaged out on a per kg of meat basis.
5. The weight of the individual packaging components averaged out on a per kg of meat basis.

1. Production volumes

Provided by MLA, the domestic production and volume throughput data forms the central platform on which the input-output model is built (figure 17). The volumes are broken down in three channels, i.e. supermarkets, other retail and food service. The data is further separated into beef, lamb and mutton.

Figure 17: 2005 Red meat production and throughput to major domestic channels (tonnes)

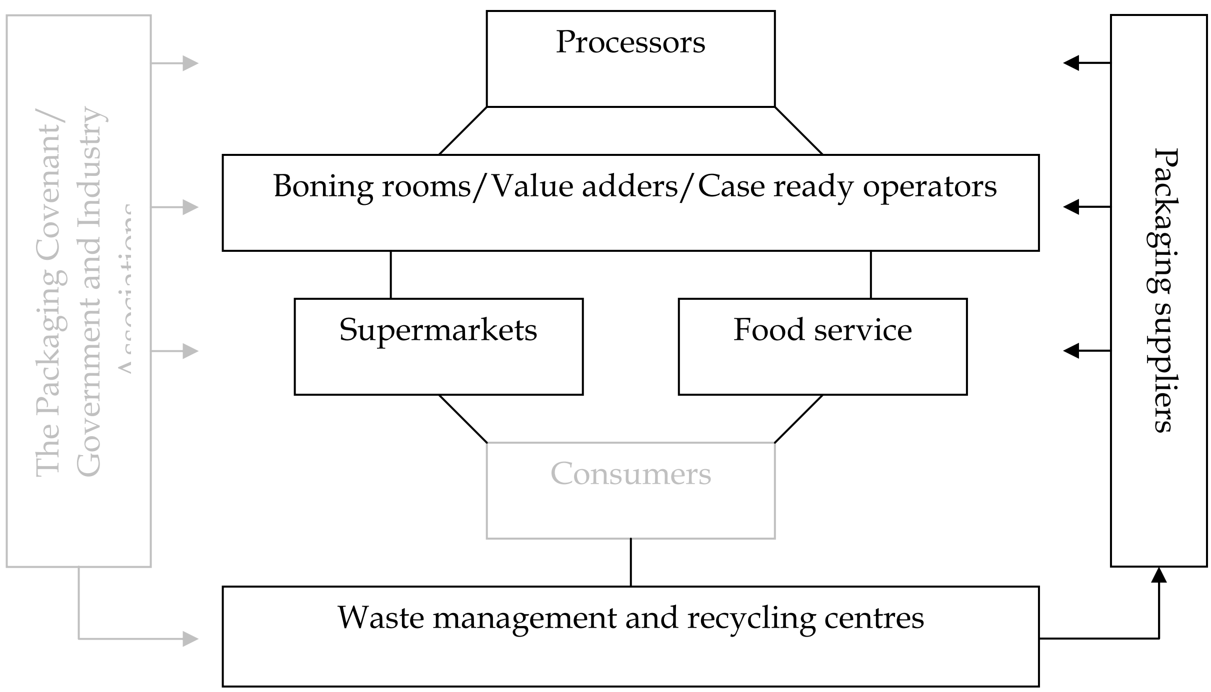


Compiled in collaboration with A. Lugsdin (MLA, 2006)

2. *Packaging systems*

During the stage of qualitative research, participants were asked to provide data specifying the volume of product throughput of their operation; the packaging form in which product entered and exited their premises; and the supplier(s) of the outbound packaging used. A detailed checklist of packaging components eg. cartons (including weights), inner liners, vacuum bags, boneguard, motherbag MAP, etc. was provided to ensure that all relevant components were recorded. We found that, in the main, processors and boning companies, particularly the larger operators, have good information records about the packaging they use and were able to provide the data with great detail. Key supply chain links surveyed for the model development are as per the diagram below.

Figure 18: Relevant supply chain links



3. Estimating meat distribution volumes by packaging form

In order to marry up the production and throughput volumes with their corresponding packaging forms, an estimation of the volumes of meat passing through the supply chain in the various packaging forms was required. The approach to establishing this breakdown was twofold. First, the packaging chain breakdowns from our 2003 report were used to develop the base model. The 2003 model was developed as the result of a detailed investigation.

Second, during the program of qualitative research, respondents were also required to make estimations of the volumes of packaging coming in and going out of their premises in the various forms. The 2006 data gathered through this process was then used to test the assumptions made in the 2003 report and adjustments were made accordingly. For example, packaging trends such as the move towards case ready systems which has increased MAP system throughput, needed to be accounted for.

4. Packaging cost

The cost of the individual packaging components were based on a per kg estimate and were entered into the input-output model to calculate the cost of various packaging materials to industry by channel (eg. supermarket), by segment (eg. beef) and by packaging type (eg. carton).

5. *Packaging weight*

The weight of the various packaging components were determined and then averaged out on a per kg basis. By and large this information was sourced from the relevant packaging companies including Sealed Air, Polystyrene Australia, Amcor and Visy. The per kg packaging weights and relevant assumptions are detailed below:

Packaging Component	**Assumptions**	**Packaging weight grams**	**Weight per kg**
Carton	Cartons are made to order and therefore there is no one uniform carton size. As a rule there are two general sizes: 60 pound carton (26kg) and a 30 pound carton (13kg). Around 60% of product goes out in the 60 pound and 40% in the 30 pound. Therefore, a 20kg carton has been used as the average. A 20kg carton has an average weight of 700g.	700g	0.035
Liner bag	Standard inner-liner per 20kg box weight.	60g	0.003
Vacuum bag	Standard vacuum bag weight 40g. Assumption of four vacuum bags per 20 kg carton.	160g	0.01
Bone guard	100 x 100 sheets	10g	0.005
Motherbag (MAP)	Standard size	300g	0.02
Rigid polystyrene tray (MAP)	Average tray content weight 665g. Average tray weight 24g. [2]	24g	0.360902
Lid film (MAP)	Estimated on per kg basis	1g	0.001
Absorbent pad	Estimated on per kg basis	6g	0.006
Expanded polystyrene tray	Average tray content weight 665g. Average tray weight 8g[3]	8g	0.012301
Overwrap	Estimated on per kg basis	2g	.002
Pallet wrap	6 metres of pallet wrap per pallet, covered eight times equals 48 metres of pallet wrap per pallet. At 15g per metre this totals 720g per pallet. Average pallet weight 900kg.	720g	0.0000008

[2] Based on estimation by James et al, 2002.
[3] Ibid

Section

20

Total packaging cost & volume

20.1 Total packaging cost

The packaging which accompanies red meat through the supply chain to the domestic market is estimated to cost the industry over $288 million. By segment, this amount is broken down as follows:

- Beef - $214 million
- Lamb - $56 million
- Mutton - $18 million

In terms of packaging components, cartons incur the highest cost to industry at $104 million, followed by vacuum bags at $84.8 million.

The total cost of packaging in the domestic market has increased by 15% from the $243 million reported in our 2003 report. This increase is largely due to structural changes in the supply chain such as the roll out of case ready packaging systems which increase the amount and cost of packaging materials required.

Breakdowns of packaging costs by packaging type and segment are provided overleaf.

Table 2: Total red meat packaging costs by packaging type

Packaging Component	Packaging cost $			Total packaging $
	Beef	Lamb	Mutton	
Carton base	$45,325,330	$8,989,609	$8,431,150	$62,746,089
Carton lid	$31,853,505	$6,018,714	$4,391,910	$42,264,129
Liner bag	$1,646,403	$266,415	$243,995	$2,156,813
Vacuum bag	$69,672,420	$11,509,128	$3,666,168	$84,847,716
Boneguard	-	$1,598,490	$509,190	$2,107,680
Weight label	$8,233,972	$3,293,586	$243,995	$11,771,553
Carton label	$1,690,768	$290,880	$243,995	$2,225,643
Pallet	$40,897	$6,618	$6,061	$53,575
Pallet wrap	$40,897	$6,618	$6,061	$53,575
Tray (MAP)	$7,905,072	$4,359,197	-	$12,264,269
Absrp pad	$5,599,434	$2,573,095	-	$8,172,530
Lid film (MAP)	$2,223,302	$1,226,024	-	$3,449,326
Gas	$889,321	$490,410	-	$1,379,730
Prod label	$6,587,570	$3,027,171	-	$9,614,741
Exp PS Tray	$22,397,743	$9,929,086	-	$32,326,829
O/wrap film	$4,199,577	$1,861,704	-	$6,061,280
Plastic bag/brown bag/butchers' paper	$5,694,550	$529,050	$265,200	$6,488,800
Separator Sheet	$67,230	-	$159,130	$226,360
Total Packaging Cost	**$214,067,989**	**$55,975,793**	**$18,166,855**	**$288,210,637**

20.2 Total packaging volume

The 976,000 tonnes of meat produced by the Australian red meat industry for domestic consumption is accompanied by over 40,860 tonnes of packaging. Of this, it is estimated that 22,490 tonnes is recycled and 18,369 tonnes is sent to landfill. Based on this model, the industry is estimated to have a 55% recycling rate for its packaging.

Fibre cartons make up the bulk of packaging used by the industry and account for around 60% of packaging used. It is estimated that 90% of all fibre cartons are recycled. Based on the qualitative research, we estimate that 10% of cardboard is not recycled. There are two reasons for this. The first is that some cardboard material is rejected by recyclers because it is soiled with extensive blood or moisture. The second issue is that in remote areas, recycling services aren't available because the volumes make it uneconomical for recyclers to provide collection.

Of the plastics used, vacuum bags account for the greatest volume at 3,266 tonnes. For various reasons, as described in the previous sections, all plastic packaging used by the red meat industry is believed to go to landfill.

The total cost of disposing of waste that is not recycled is estimated to be around $1.4 million. This is based on a standard per tonne disposal cost of $78.00.

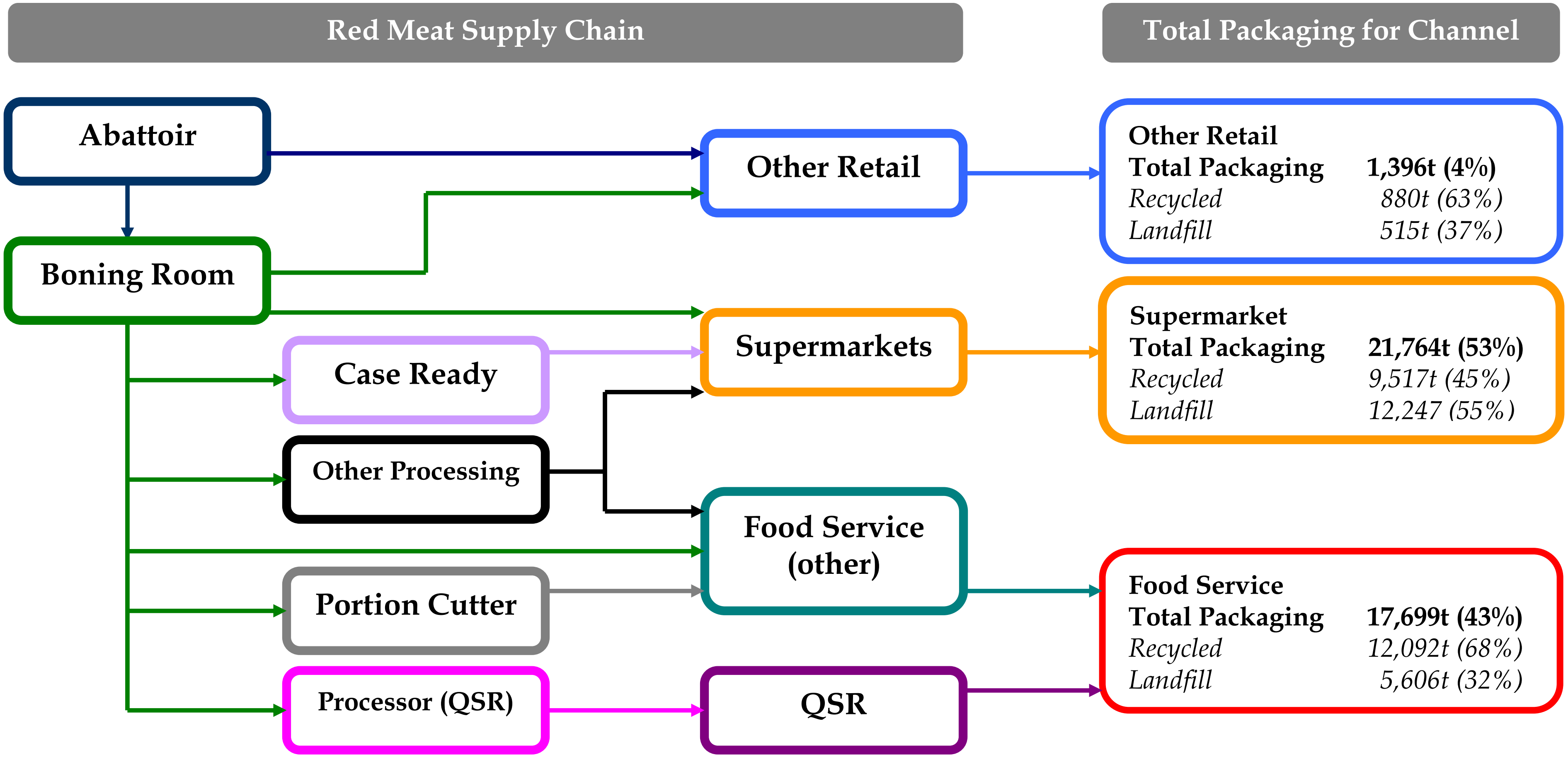
A breakdown of the total packaging volumes is provided in table 3.

Table 3: Total red meat packaging volumes by packaging type

Packaging Component	Packaging (kg)			Total packaging (kg)
	Beef	Lamb	Mutton	
Carton	17,671,513	3,846,579	3,471,696	24,989,788
Liner bag	1,380,261	274,106	297,574	1,951,940
Vacuum bag	4,350,919	685,102	355,391	5,391,412
Pallet wrap	404	88	79	571
Rigid PS Tray (MAP)	1,212,996	401,332	-	1,614,328
Absrp pad	1,324,239	573,311	-	1,897,549
Lid film (MAP)	33,610	11,120	-	44,730
Exp PS Tray	2,250,788	1,015,720	-	3,266,507
O/wrap film	374,193	168,863	-	543,056
Boneguard	-	456,843	98,130	554,973
Motherbag (MAP)	-	605,436	-	605,436
Total Packaging	**28,598,922**	**8,038,498**	**4,222,871**	**40,860,291**
Recycled	*15,904,362*	*3,461,921*	*3,124,526*	*22,490,808*
Landfill	*12,694,560*	*4,576,577*	*1,098,345*	*18,369,482*
Cost of collection	$253,891	$91,532	$21,967	$367,390
Cost of tipping	$736,285	$265,441	$63,704	$1,065,431
Total cost of disposal for landfill waste	**$990,177**	**$356,973**	**$85,671**	**$1,432,821**

A breakdown of total packaging used by channel to market is provided in figure 19 overleaf.

Figure 19: Packaging throughput to major domestic channels by the red meat industry (tonnes)



NB: Consumer end packaging has not been considered eg. plastic bags, butchers paper, takeaway containers, etc.

Section

21

Supermarkets' packaging costs and volume

21.1 Packaging cost - supermarkets

Packaging used by the supermarket supply channel is estimated to cost a total of $161 million. This represents 56% of the total packaging cost despite the fact that the supermarket channel only accounts for 45% of all red meat throughput.

By segment, the cost of packaging is broken down as follows:

- Beef $116 million
- Lamb $45 million

In terms of the different packaging components used, cartons incur the greatest cost to industry at $44 million, followed by vacuum bags at $30.8 million and expanded polystyrene trays at $32.3 million.

A breakdown of packaging costs by packaging type and segment is provided overleaf.

Table 4: Red meat packaging costs by packaging type through supermarket channel

Packaging Component	Packaging cost $			Total packaging $
	Beef	Lamb	Mutton	
Carton base	$21,263,955	$6,474,459	-	$27,738,414
Carton lid	$12,301,275	$4,003,299	-	$16,304,574
Liner bag	$560,168	$154,448	-	$714,615
Vacuum bag	$24,199,236	$6,672,132	-	$30,871,368
Boneguard	-	$926,685	-	$926,685
Weight label	$7,147,737	$3,181,619	-	$10,329,356
Carton label	$604,533	$178,912	-	$783,445
Pallet	$13,915	$3,836	-	$17,751
Pallet wrap	$13,915	$3,836	-	$17,751
Tray (MAP)	$7,905,072	$4,359,197	-	$12,264,269
Absrp pad	$5,599,434	$2,573,095	-	$8,172,530
Lid film (MAP)	$2,223,302	$1,226,024	-	$3,449,326
Gas	$889,321	$490,410	-	$1,379,730
Prod label	$6,587,570	$3,027,171	-	$9,614,741
Exp PS Tray	$22,397,743	$9,929,086	-	$32,326,829
O/wrap film	$4,199,577	$1,861,704	-	$6,061,280
Plastic bag/brown bag/butchers' paper	-	-	-	-
Separator Sheet	-	-	-	-
Total Packaging Cost	**$115,906,751**	**$45,065,912**	**-**	**$160,972,663**

21.2 Packaging volumes - supermarkets

At the channel to market level, supermarkets account for the greatest volume of packaging with 21,764 tonnes. The supermarket channel is also the largest consumer of packaging, accounting for 45% of all domestic red meat throughput, but 53% of all domestic red meat packaging in terms of volume.

It is estimated that of the 21,764 tonnes of packaging that passes through the supermarket supply chain annually, 9,517 is recycled and 12,247 tonnes is sent to landfill. This converts to a 45% recycling rate.

The total cost of disposing of waste that is not recycled is estimated to be around $955,000.

The key reason that the supermarket channel consumes more packaging than any other channel is the fact that a significant proportion of product goes through value adders. This incurs double packing: once from boning room to the value adder; and then again from to the value adder to supermarkets. Moreover, as a result of demand for longer shelf life, safer and more presentable packaging, MAP systems are being used more and more. MAP barrier trays weigh three times as much as their traditional expanded polystyrene counterparts. As supermarkets continue the roll-out of case ready systems, the amount of packaging used by the supermarket channel is only predicted to increase.

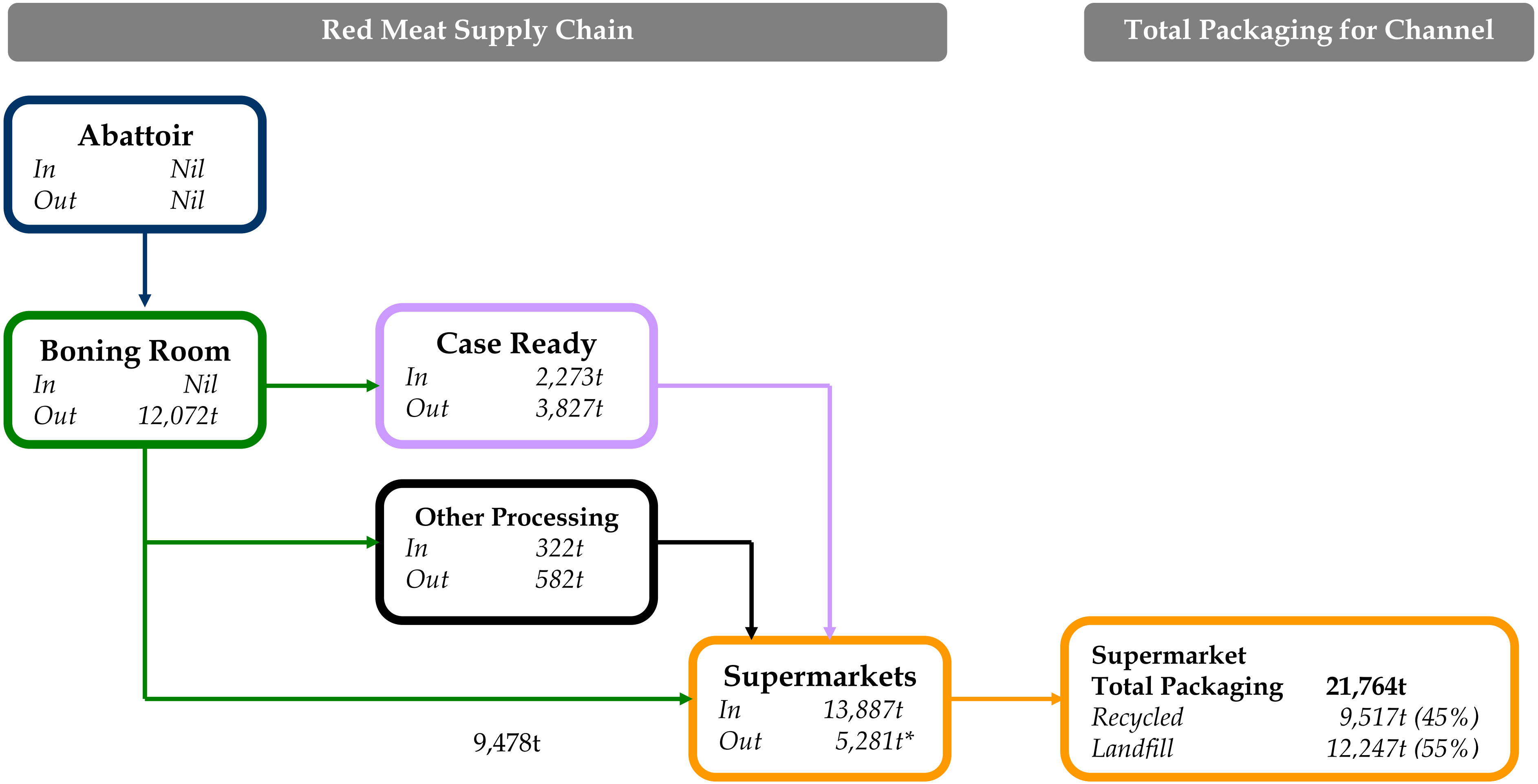
A breakdown of the total packaging volumes for the supermarket channel is provided in table 5.

Table 5: Red meat packaging volumes by packaging type through supermarket channel

Packaging Component	Packaging (kg)			Total packaging (kg)
	Beef	Lamb	Mutton	
Carton	7,763,938	2,810,952	-	10,574,890
Liner bag	531,040	185,337	-	716,377
Vacuum bag	1,803,743	389,209	-	2,192,952
Pallet wrap	177	64	-	241
Rigid PS Tray (MAP)	1,212,996	401,332	-	1,614,328
Absrp pad	1,324,239	573,311	-	1,897,550
Lid film (MAP)	33,610	11,120	-	44,730
Exp PS Tray	2,250,788	1,015,720	-	3,266,508
O/wrap film	374,193	168,863	-	543,056
Boneguard	-	308,896	-	308,896
Motherbag (MAP)	-	605,436	-	605,436
Total Packaging	**15,294,724**	**6,470,240**		**21,764,964**
Recycled	*6,987,544*	*2,529,857*		*9,517,401*
Landfill	*8,307,180*	*3,940,383*		*12,247,563*
Cost of collection	$166,144	$78,808	-	$244,951
Cost of tipping	$481,816	$228,542	-	$710,359
Total cost of disposal for landfill waste	**$647,960**	**$307,350**	**-**	**$955,310**

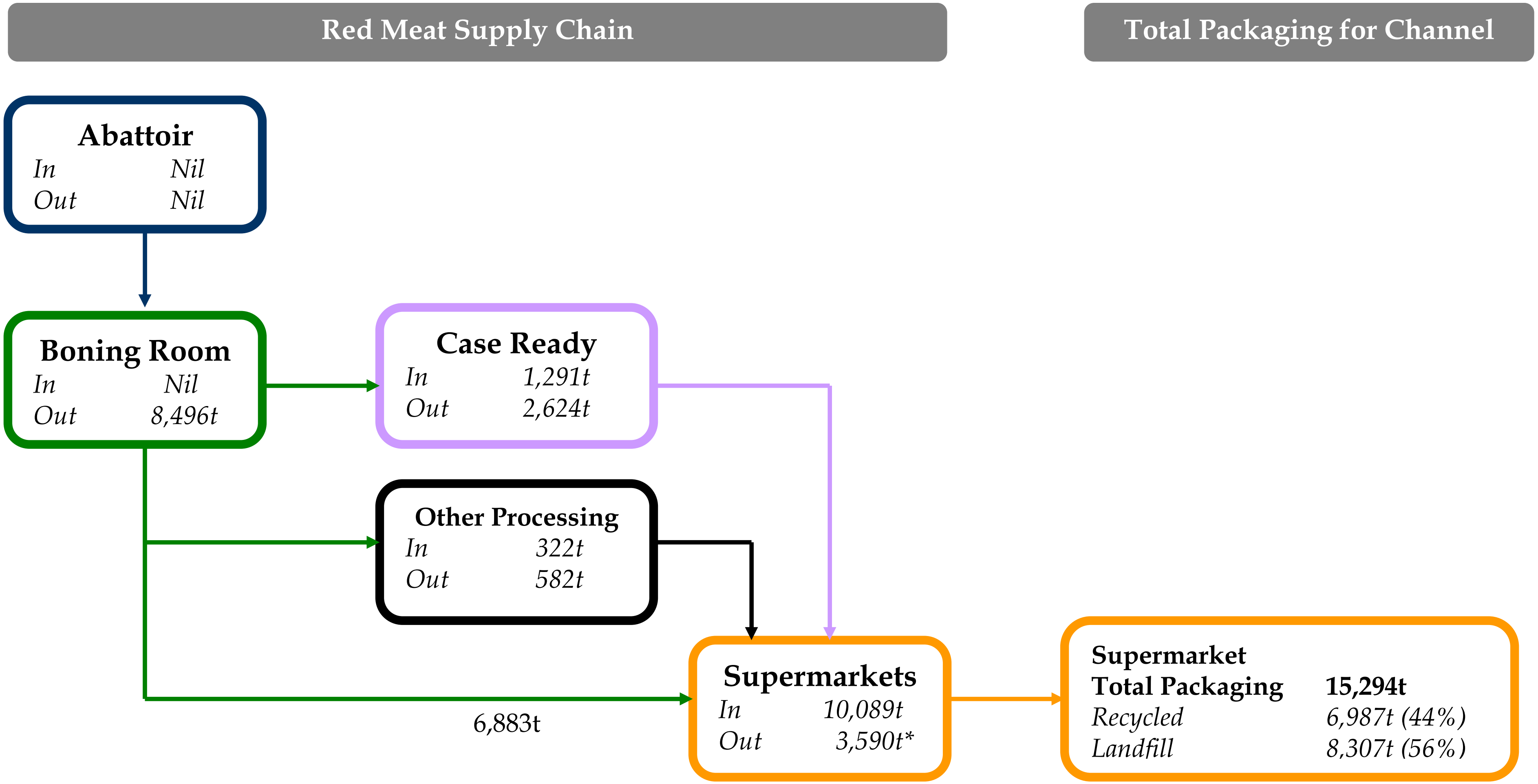
Input-output models for the supermarket channel covering red meat packaging in total, beef and lamb are provided in the following pages.

Figure 20: Total red meat packaging throughput to supermarkets (tonnes)



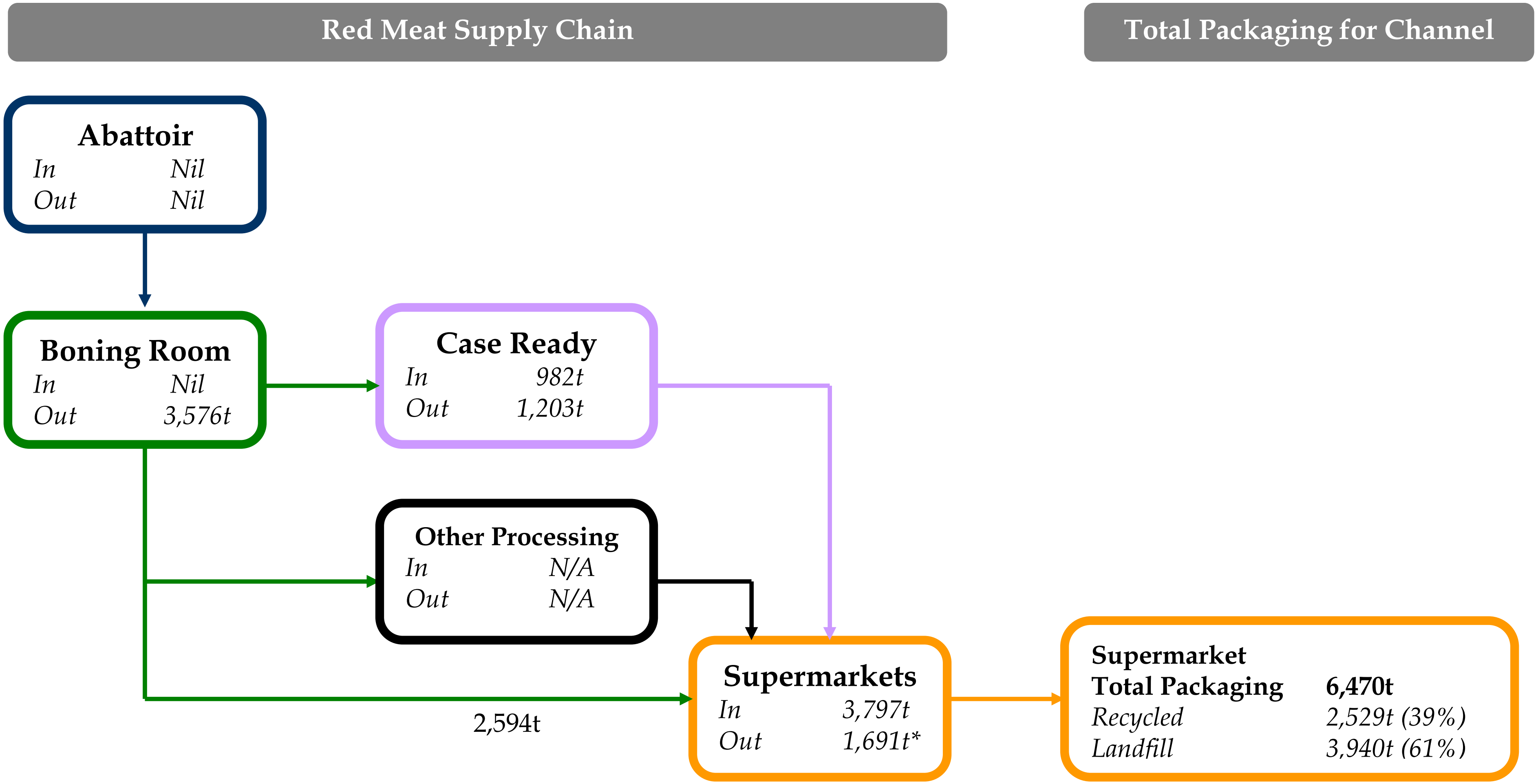
Refers to packaging originating from supermarkets, not total output to consumers.

Figure 21: Total beef packaging throughput to supermarkets (tonnes)



**Refers to packaging originating from supermarkets, not total output to consumers.*

Figure 22: Total lamb packaging throughput to supermarkets (tonnes)



Refers to packaging originating from supermarkets, not total output to consumers.

Section

22

Other retail packaging costs and volume

22.1 Packaging cost – 'other retail'

'Other retail' is mostly small independent butchers, however, the channel also includes markets, delicatessens and other retail stores. As a channel 'other retail' attracts the lowest packaging cost at $13.5 million. By segment, this can by broken down into:

- Beef – $9.9 million
- Lamb – $2 million
- Mutton - $1.6 million

As is the case for supermarkets, cartons are the highest cost item at $3.6 million followed by vacuum bags at $ 3 million. Although 'other retail' as a channel accounts for 24% of red meat throughput, it accounts for under 5% of industry expenditure on packaging as meat is transported directly either from the abattoir or boning room to the retail outlet. This obviates the need for meat to be repetitively repacked as it is in the case of the more complex supply chains used by supermarkets.

A breakdown of packaging costs by packaging type and segment is provided overleaf.

Table 6: Red meat packaging costs by packaging type through 'other retail'

Packaging Component	Packaging cost $			Total packaging $
	Beef	Lamb	Mutton	
Carton base	$1,452,140	$473,365	$450,840	$2,376,345
Carton lid	$768,780	$250,605	$238,680	$1,258,065
Liner bag	$42,710	$13,923	$13,260	$69,893
Vacuum bag	$1,845,072	$601,452	$572,832	$3,019,356
Boneguard	-	$83,535	$79,560	$163,095
Weight label	$42,710	$13,923	$13,260	$69,893
Carton label	$42,710	$13,923	$13,260	$69,893
Pallet	$1,061	$346	$329	$1,736
Pallet wrap	$1,061	$346	$329	$1,736
Tray (MAP)	-	-	-	-
Absrp pad	-	-	-	-
Lid film (MAP)	-	-	-	-
Gas	-	-	-	-
Prod label	-	-	-	-
Exp PS Tray	-	-	-	-
O/wrap film	-	-	-	-
Plastic bag/brown bag/butchers' paper	$5,694,550	$529,050	$265,200	$6,488,800
Separator Sheet	-	-	-	-
Total Packaging Cost	**$9,890,794**	**$1,980,466**	**$1,647,551**	**$13,518,811**

22.2 Packaging volume – 'other retail'

The 'other retail' supply channel accounts for 24% of red meat volumes but less than 5% of all red meat packaging. The channel has a 63% recycling rate.

'Other retail' uses the least amount of packaging of all the red meat channels considered. This is largely because of the fact that meat is delivered to the retail premises either directly from the abattoir or through a boning room. This situation means that the repacking phenomenon and additional supply chain links which occur for supermarkets channels is eliminated.

It is important to note that this model does not consider packaging throughput from the retail outlet to the consumer such as plastic bags, butchers' paper, etc.

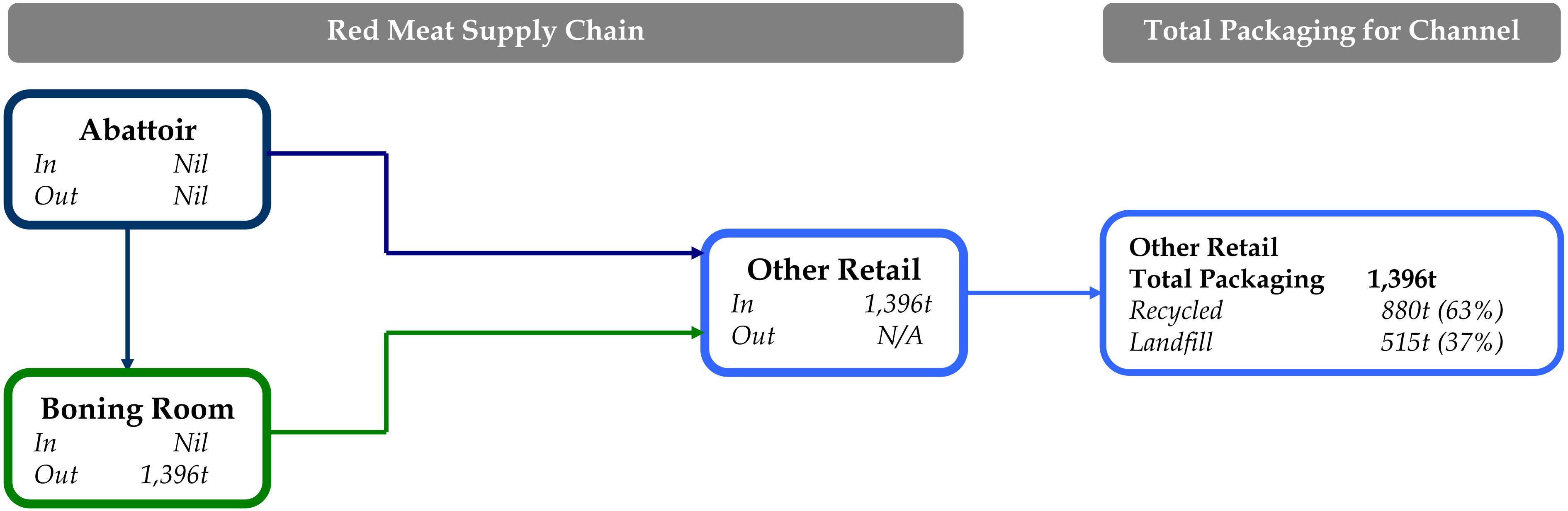
A breakdown of the total packaging volumes through the 'other retail' market channel is provided in table 7.

Table 7: Red meat packaging volumes by packaging type through 'other retail' channel

Packaging Component	Packaging (kg)			Total packaging (kg)
	Beef	Lamb	Mutton	
Carton	597,936	194,904	185,652	978,492
Liner bag	51,252	16,706	15,913	83,871
Vacuum bag	170,839	55,687	53,043	279,569
Pallet wrap	14	4	4	22
Rigid PS Tray (MAP)	-	-	-	-
Absrp pad	-	-	-	-
Lid film (MAP)	-	-	-	-
Exp PS Tray	-	-	-	-
O/wrap film	-	-	-	-
Boneguard	-	27,843	26,522	54,365
Motherbag (MAP)	-	-	-	-
Total Packaging	**820,041**	**295,144**	**281,134**	**1,396,319**
Recycled	*538,142*	*175,414*	*167,087*	*880,643*
Landfill	*281,899*	*119,730*	*114,047*	*515,676*
Cost of collection	$166,144	$78,808	-	$244,951
Cost of tipping	$481,816	$228,542	-	$710,359
Total cost of disposal for landfill waste	**$647,960**	**$307,350**	**-**	**$955,310**

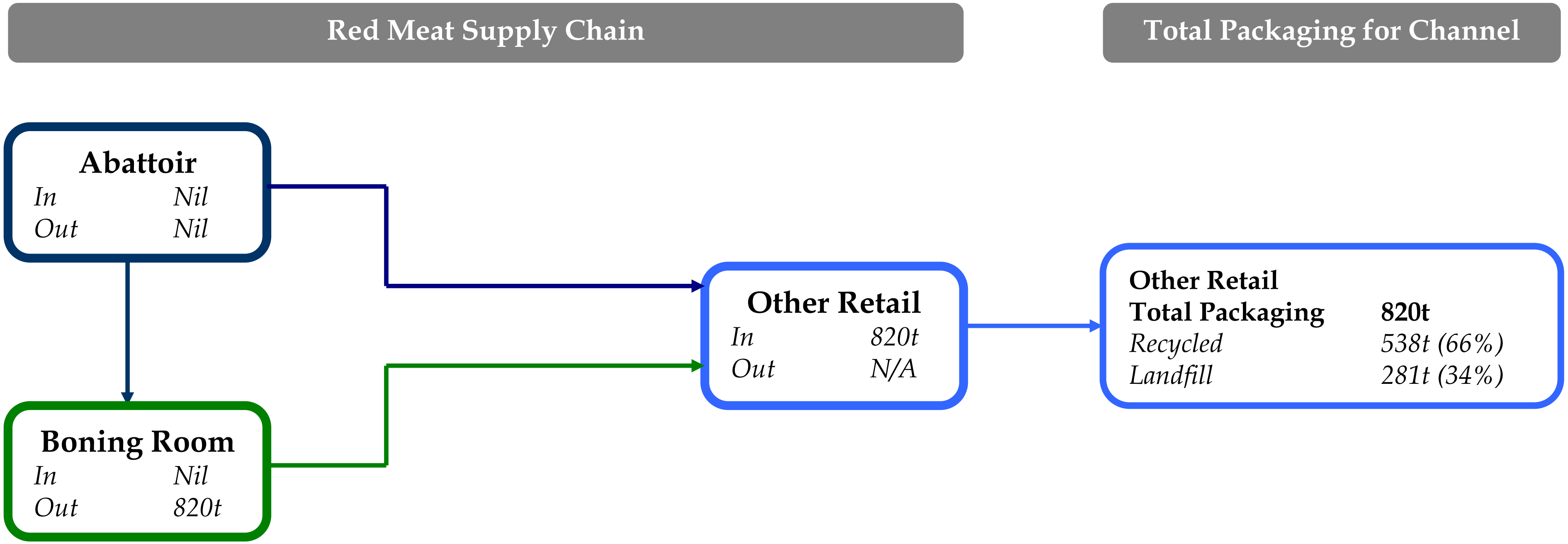
Input-output models for the 'other retail' channel covering red meat packaging in total, beef, lamb and mutton are provided in the following pages.

Figure 23: Total red meat packaging throughput to other retail (tonnes)



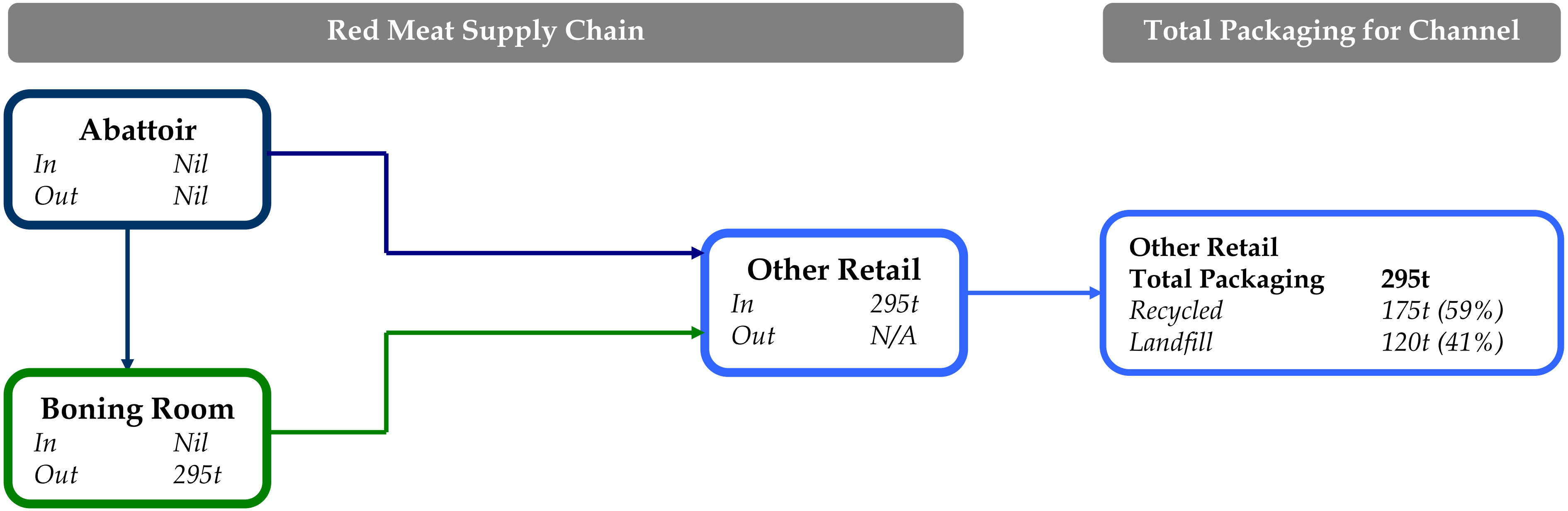
NB: Consumer end packaging has not been considered eg. plastic bags, butchers paper, takeaway containers, etc.

Figure 24: Total beef packaging throughput to other retail (tonnes)



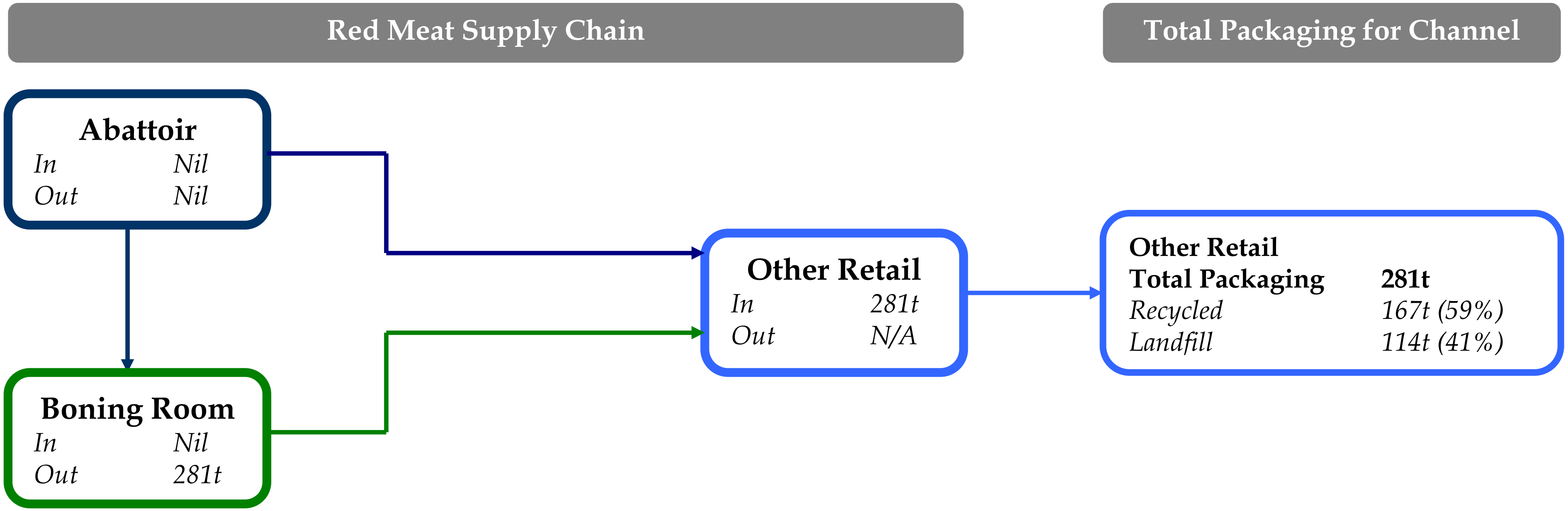
NB: Consumer end packaging has not been considered eg. plastic bags, butchers paper, takeaway containers, etc.

Figure 25: Total lamb packaging throughput to other retail (tonnes)



NB: Consumer end packaging has not been considered eg. plastic bags, butchers paper, takeaway containers, etc.

Figure 26: Total mutton packaging throughput to other retail (tonnes)



**Consumer end packaging has not been considered eg. plastic bags, butchers paper, etc.*

Section

23

Food service packaging costs and volume

23.1 Packaging cost – food service

The food service channel spends approximately $113.7 million annually on red meat packaging. By segment, this can be broken down into:

- Beef - $88.3 million
- Lamb - $8.9 million
- Mutton - $16.5 million

The packaging materials achieving the highest expenditure rate are cartons at approximately $57 million, followed by vacuum bags at $50.9 million.

A breakdown of packaging costs by packaging type and segment is provided overleaf.

Table 8: Red meat packaging costs by packaging type through 'other retail'

Packaging Component	Packaging cost $			Total packaging
	Beef	Lamb	Mutton	$
Carton base	$22,609,235	$2,041,785	$7,980,310	$32,631,330
Carton lid	$18,783,450	$1,764,810	$4,153,230	$24,701,490
Liner bag	$1,043,525	$98,045	$230,735	$1,372,305
Vacuum bag	$43,628,112	$4,235,544	$3,093,336	$50,956,992
Boneguard	-	$588,270	$429,630	$1,017,900
Weight label	$1,043,525	$98,045	$230,735	$1,372,305
Carton label	$1,043,525	$98,045	$230,735	$1,372,305
Pallet	$25,921	$2,435	$5,731	$34,088
Pallet wrap	$25,921	$2,435	$5,731	$34,088
Tray (MAP)	-	-	-	-
Absrp pad	-	-	-	-
Lid film (MAP)	-	-	-	-
Gas	-	-	-	-
Prod label	-	-	-	-
Exp PS Tray	-	-	-	-
O/wrap film	-	-	-	-
Plastic bag/brown bag/butchers' paper	-	-	-	-
Separator Sheet	$67,230	-	$159,130	$226,360
Total Packaging Cost	**$88,270,444**	**$8,929,415**	**$16,519,304**	**$113,719,163**

23.2 Packaging volume – food service

The food service channel accounts for 31% of all red meat volumes and 43% of all red meat packaging consumption. In total, the food service channel consumes 17,699 tonnes of packaging, 12,092 tonnes of which is recycled and 5,606 tonnes is sent to landfill. The food service channel is therefore estimated to have 68% recycling rate, the best of the three channels considered.

The QSR channel consumes 4,404 tonnes of packaging compared with 13,293 tonnes for all other food service operations. This is not surprising considering QSR outlets account for 30% of the Australian food service market (Euromonitor International, 2006) and 25% of all red meat throughput.

The food service industry's ability to achieve such a high recycling rate is attributed to the fact that 76% of its packaging consumption is cardboard, 90% of which is estimated to be recycled.

Moreover, as a significant quantity is distributed to food service outlets directly from the boning room, the problem of repacking is reduced. The industry does not have the same requirement for plastic packaging which is found in the supermarket sector as, in the main, meat is purchased in bulk and it is generally not packaged in individual portions.

It is, however, important to note that this model does not consider packaging from food service to consumer such as take away containers.

A breakdown of the total packaging volumes for the supermarket channel is provided in table 9.

Table 9: Red meat packaging volumes by packaging type through food service channel

Packaging Component	Packaging (kg)			Total packaging (kg)
	Beef	Lamb	Mutton	
Carton	9,309,640	840,723	3,286,043	13,436,406
Liner bag	797,969	72,062	281,661	1,151,692
Vacuum bag	2,376,337	240,207	302,348	2,918,891
Pallet wrap	213	19	75	307
Rigid PS Tray (MAP)	-	-	-	-
Absrp pad	-	-	-	-
Lid film (MAP)	-	-	-	-
Exp PS Tray	-	-	-	-
O/wrap film	-	-	-	-
Boneguard	-	120,103	71,609	191,712
Motherbag (MAP)	-	-	-	-
Total Packaging	**12,484,158**	**1,273,114**	**3,941,736**	**17,699,008**
Recycled	*8,378,676*	*756,651*	*2,957,439*	*12,092,765*
Landfill	*4,105,483*	*516,463*	*984,297*	*5,606,243*
Cost of collection	$166,144	$78,808	-	$244,951
Cost of tipping	$481,816	$228,542	-	$710,359
Total cost of disposal for landfill waste	**$647,960**	**$307,350**	**-**	**$955,310**

Input-output models for the ‘food service’ channel covering red meat packaging in total, beef, lamb and mutton are provided in the following pages.

Figure 27: Total red meat packaging throughput to food service (tonnes)

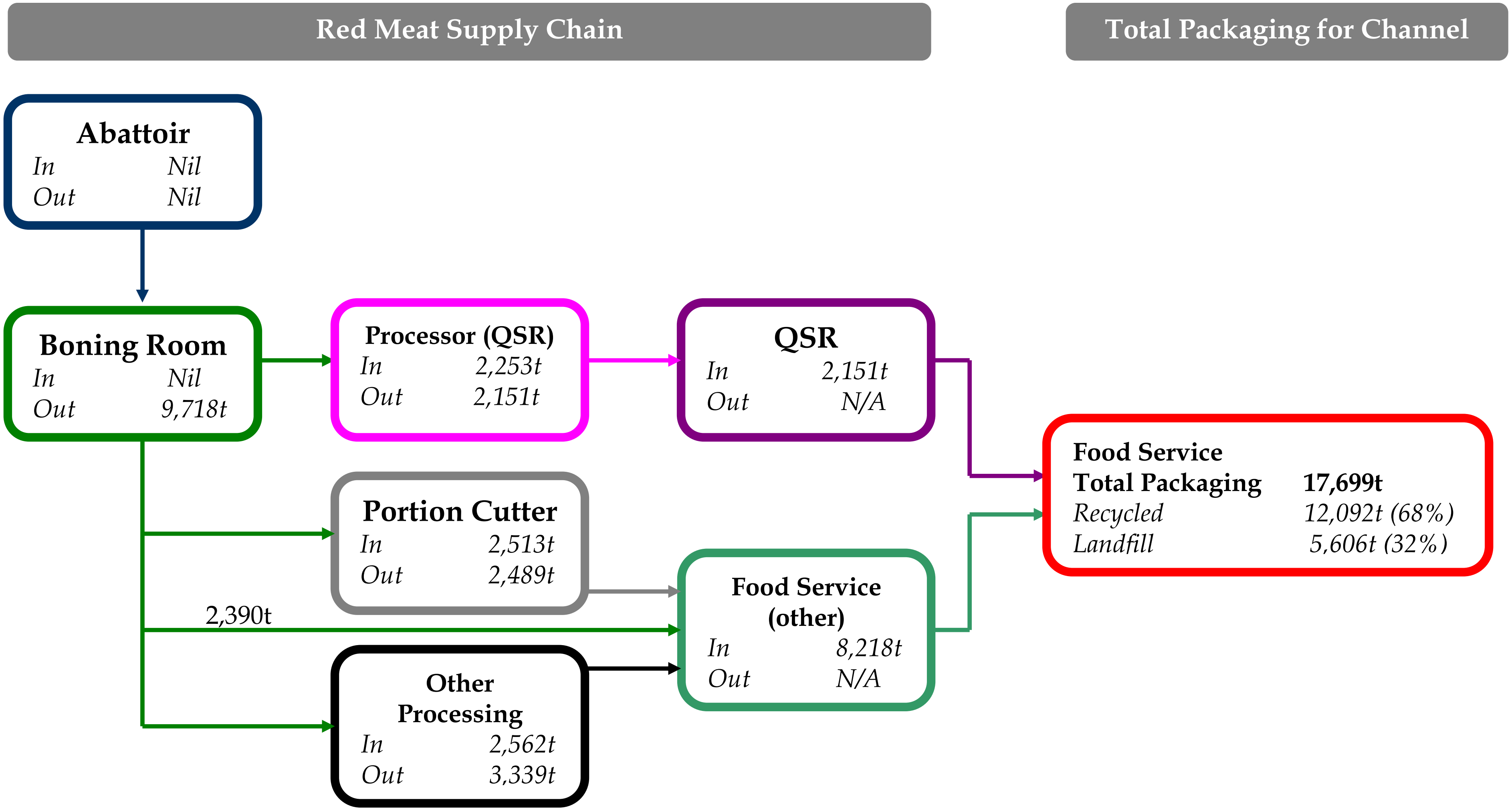


Figure 28: Total beef packaging throughput to food service (tonnes)

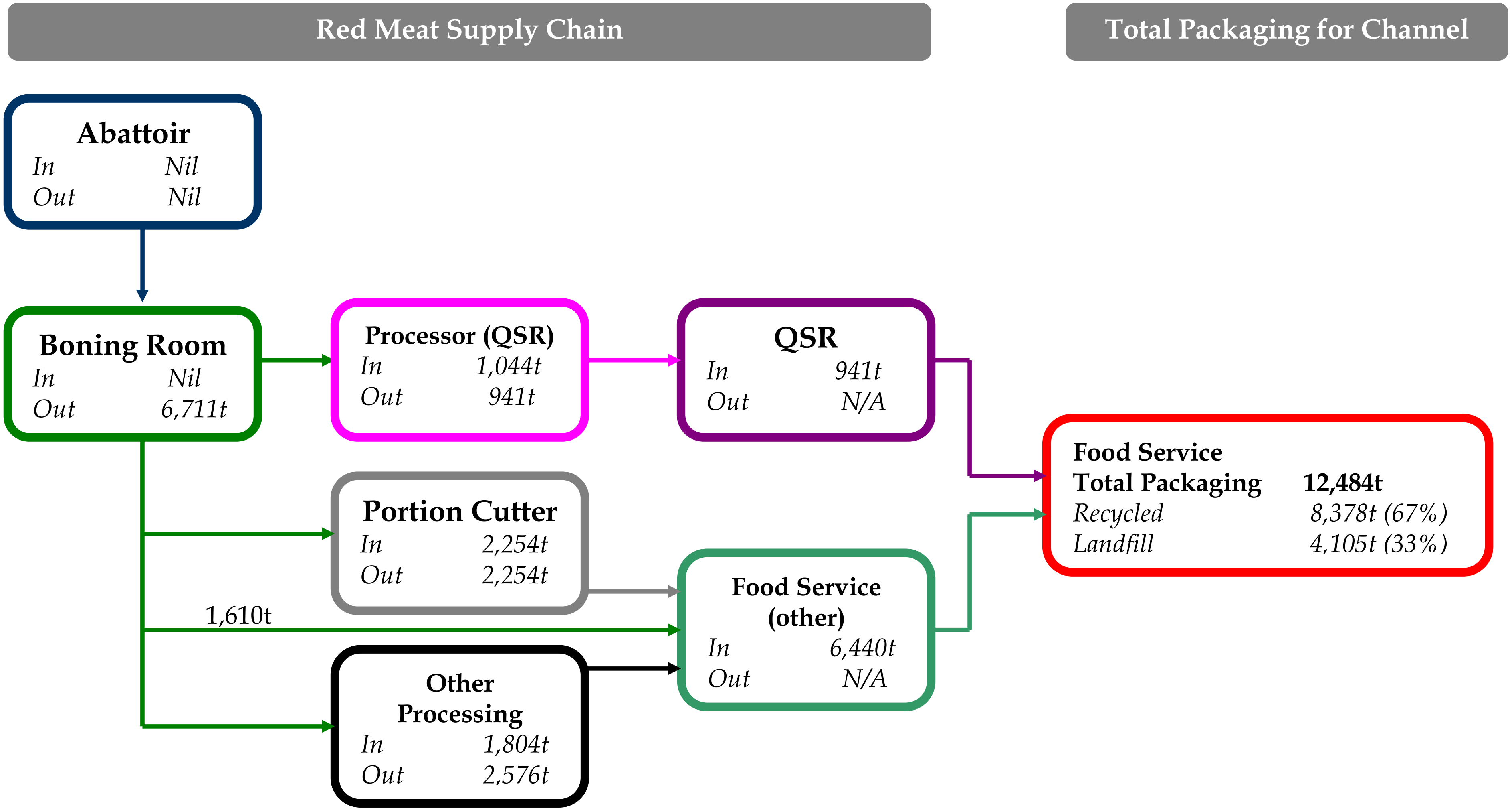


Figure 29: Total lamb packaging throughput to food service (tonnes)

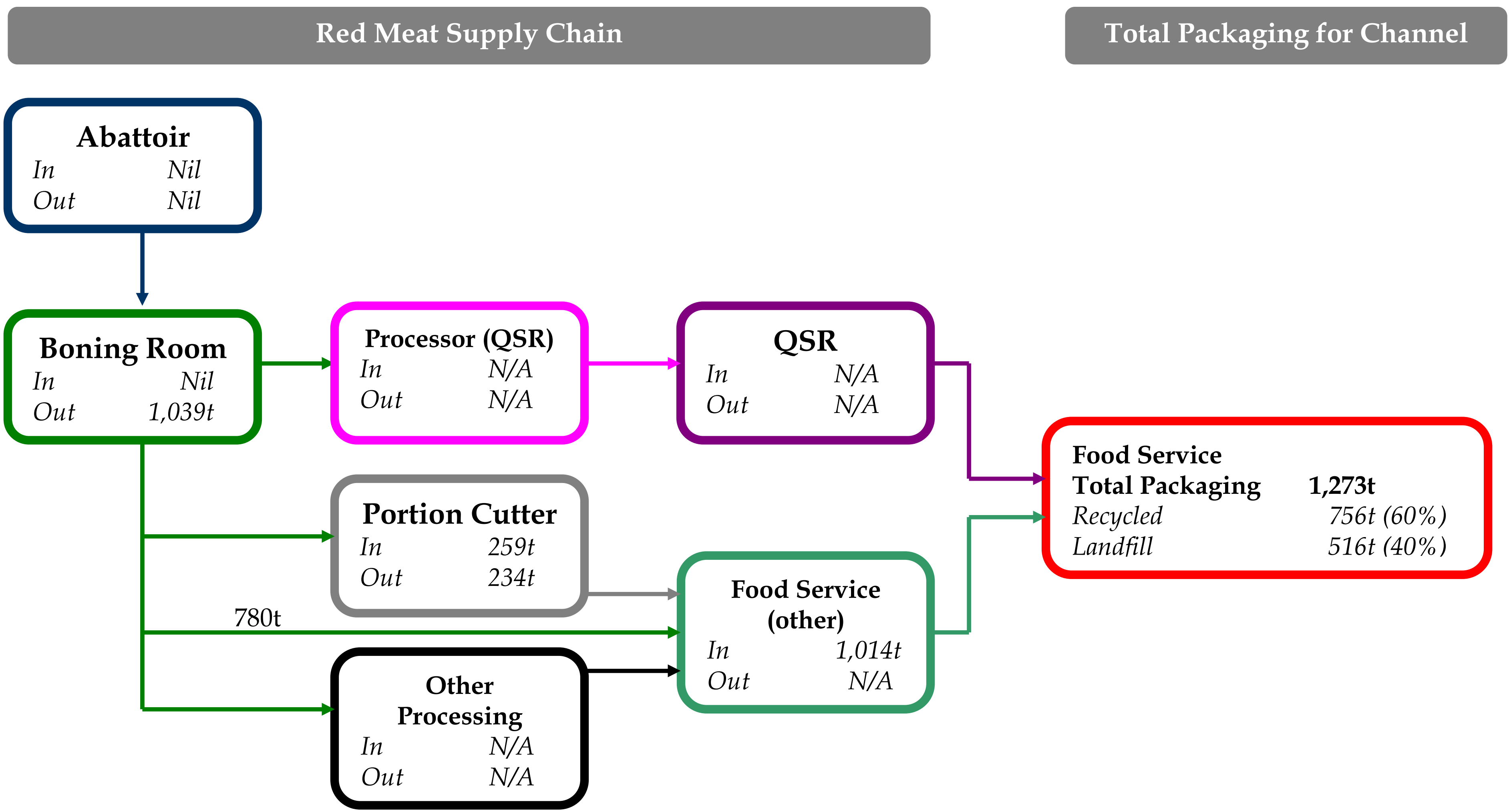
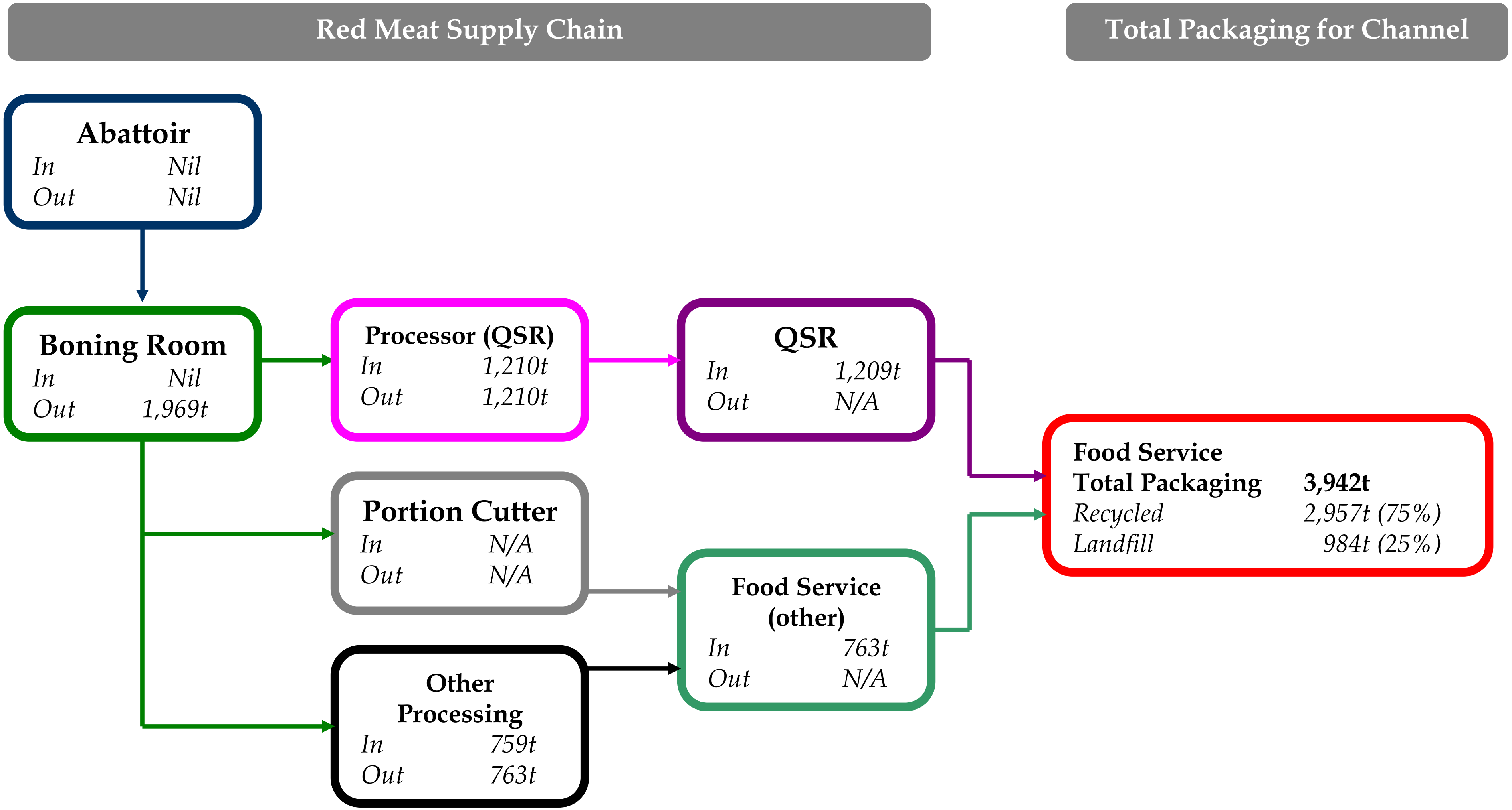


Figure 30: Total mutton packaging throughput to food service (tonnes)



Part G

Strategic Analysis

Section 24

Strategic situational analysis

This section summarises the key findings from the research around a strategic framework with the intention of identifying the key performance issues that the Australian meat industry needs to consider with respect to packaging.

24.1 National performance

Table 10 provides a breakdown of the estimated recovery rates for Australian packaging materials and is broken down into kerbside/municipal recovery and away from home recovery. The national recovery rate for paper and cardboard collected by means other than kerbside recovery is 94% and for plastics is 13%.

Table 10: Recovery rates for Australian packaging materials 2003

Material	Kerbside/Municipal Recovery	Away from home recovery	Overall recovery
Paper/cardboard	42%	94%	74%
Glass	68%	4%	30%
Plastics	28%	13%	21%
Steel Cans	44%	44%	44%
Aluminum Cans	79%	48%	63%
Total	**47%**	**54%**	**51%**

Source: National Packaging Covenant, 2005B

The recycling rates for various plastics is provided in table 11 overleaf. The national recycling rate for polystyrene (PS) is 5.1% and expanded polystyrene (EPS) is 7.0%.

Table 11: Australian plastic recycling rates

Material	**Recycling rate**
PET	31.5%
HDPE	23.1%
PVC	4.0%
Ll/LDPE	12.2%
PP	9.9%
PS	5.1%
EPS	7.0%
ABS/SAN	8.5%
Polyurethane	16.2%
Nylon	3.0%
Other	0.6%
Total	**51%**

Source: National Packaging Covenant, 2005B

24.2 Performance of the Australian red meat industry

It is not possible to make any direct assessment of the performance of the meat industry in terms of recycling or environmental performance. The available national statistics are collected on the basis of material type rather than by industry. Furthermore, the Packaging Covenant sets targets for brand owners rather than on an industry basis. However, based on this research it is fair to conclude that the Australian red meat industry is performing close to its potential in terms of recycling and reuse within the economic limitations of existing technology and supply chain management. There are two basic packaging material categories that account for over 90% of packaging used by the meat industry: fibreboard cartons and various types of plastics.

Fibreboard cartons

With respect to fibreboard cartons, close to the practical maximum is being recycled with an estimated rate of 90%. This is just below the national rate of 94% for non kerbside collection. It is impractical to believe that the industry will ever get to 100%. The last 10% which is not currently being recycled is due to three basic factors:

1. **Soiling and contamination:** Recyclers are not prepared to recycle cardboard cartons which are badly soiled or contaminated.

2. **Liner-less and glossy cartons:** Recyclers are not prepared to recycle cartons coated with clay or other preparations because they have to remove the coating before recycling.

3. **Lack of availability of recycling services:** Some remote areas do not have access to recycling services. This is because the volumes available do not make it economical for recycling companies to offer a collection service. There may be some small improvement in recycling rates over time, due to new technologies and increased recycling services in remote areas.

Plastic

As the report outlines, there is a wide range of plastic materials used by the meat industry, virtually all of which currently go into landfill. There are three major constraints preventing these various plastic materials from being recycled. These are:

1. **Moisture and contamination:** Characteristically, virtually all of the plastic material used by the meat industry is contaminated and contains moisture. This requires recyclers to first clean and dry the film before it can be recycled which is impractical and uneconomical.

2. **Economics:** Probably, the greater constraint to recycling of plastic material is sheer economics. Whilst there are relatively large volumes of plastic material used in packaging of red meat, the weight is relatively low. This means that it is uneconomical for a recycler to pick up and recycle. Moreover, whilst in a technical sense virtually all these materials can be recycled, the economics simply don't add up. The yield volumes relative to the cost of collection and recycling make it uneconomical to recycle most of the plastic materials used for red meat.

   It is certainly unlikely that it will be economical to recycle expanded polystyrene trays because of the low weight yield. However, as the use of case ready, rigid polystyrene trays increases, it may become more economical to recycle these. A very limited number of councils currently offer kerbside collection for rigid polystyrene and this is likely to grow as volumes increase. Indeed, the new target set by the National Packaging Covenant to increase the amount of plastics coded 4–7, which includes polystyrene, from the existing 10% recycling rate to 25% by 2010, may be an important driver for change in this area. As the amount of rigid packaging increases and foam polystyrene decreases (due to the growth of case ready systems) the recycling rate will increase. This will be conditional upon councils offering kerbside collection for rigid polystyrene. At present only a very small number of councils offer this service.

3. **Multilaminates:** There is also a situation where the performance requirements of some plastics used by the red meat industry in terms of oxygen permeability mean that they are made up of multiple layers of various plastics. This makes them unsuitable for recycling. There is some development work being done in New Zealand on single layer films which have the desired barrier qualities. If these can be perfected, it will remove one of the significant barriers to recycling laminated film.

24.3 Opportunity to improve re-use and recycling rates

There are a number of opportunities for the Australian red meat industry to reduce the amount of packaging materials used and increase recycling rates. These are predominantly in the form of reusable systems such as bulk bins and plastic totes. These are currently being used, but nowhere near their potential. Steel and plastic bins are being used predominantly to transfer trimming between boning rooms and value adders. There is the potential to use these bulk systems more widely for transfers of primal cuts. The main reason that bulk systems are not being used more widely is the cost of washing and transportation.

A second opportunity is the greater adoption of plastic totes for transferring case ready meat into retail outlets. At present, most retail ready meat goes to stores in fibreboard cartons. These cartons could be eliminated by the use of re-usable plastic totes which are extensively used for chicken meat and are currently being introduced by Coles for fruit and vegetables. They are widely used for red meat in Europe. Totes have been considered, however, supermarkets are yet to be convinced of their feasibility. The issues are the need for washing and transportation as well as pilferage. At some point in time, as the volumes grow, it would become economical for a company to introduce a tote hire, recovery and washing service similar to that which occurs with pallets in Australia and totes in Europe.

The total environmental impact of re-usable metal or plastic bins in a total life cycle sense needs to be evaluated. When the cost of transportation, water, chemicals and treating are taken into account, reusable bins may be less advantageous to the environment than recycled fibre cardboard.

24.4 Factors driving increased use of packaging

If anything, it is likely that the amount of packaging used by the meat industry per tonne of meat is likely to grow in the foreseeable future. There are a number of reasons for this:

1. Because of OH&S and inventory control purposes, there is a tendency toward smaller cartons which use more packaging material per kg of red meat.

2. There is a similar tendency towards smaller primal or cut sizes meaning that more vacuum/inner bags are used.

3. The steady growth of case ready systems which are more packaging intensive because the meat is packed from boning room to case ready operator; and then again from case ready to retail. Also, case ready systems tend to have smaller cartons which increases the amount of packaging material used per kg of meat. Opposing this, however, is the potential for using plastic totes and recycling rigid polystyrene which will improve the overall performance in an environmental sense.

4. There is a trend in the food sector towards increased primary packaging driven by consumer concern about food safety and demand for convenience in packaging. Moreover, the desire by retailers to increase the shelf life of products also tends to increase the amount of primary packaging used. This trend is likely to continue going forward.

Opposing these forces is the imperative to drive costs out of the supply chain by reducing the cost of transport packaging. As packaging systems become more complex, with the introduction of RFID systems and high performance plastic components such as motherbag MAP systems, the cost of packaging on a per kg basis is increasing. This situation has lead industry to try and counteract such cost increases by reducing in the amount of fibre used per carton as a cost saving measure.

24.5 Emerging technology

The report highlights a number of emerging technologies which have the potential to improve recycling rates within the meat industry. These are:

1. **Energy recovery from high temperature incineration**: This technology is proven and used overseas but has been restricted in Australia on environmental grounds.

2. **Diesel recovery:** This technology has the ability to convert most of the plastic materials used in the meat industry into diesel. This technology in being used successfully overseas. The economics for the Australian market are constrained by a government excise charge. The proponent of this technology argued that without the excise, this technology would be economically viable in Australia.

   NB: Both of the above technologies would require collection and separation. This capability exists. The only reason plastics are not currently separated is that there is no economic market outlet.

3. **Biodegradability:** There are major advances in biodegradability which could make a considerable contribution to the environmental performance of the red meat industry. Potentially, biodegradable packaging could be dumped in segregated landfill operations with potential for land reuse for other purposes. The major constraints of biodegradable trays currently on the market are economics, with biodegradable materials costing up to 20 times more. Moreover, the higher performance biodegradable trays available on the market today begin to breakdown after four weeks. This being the case, their ability to meet the performance requirements of the red meat industry is questionable. As the technology and economies improve, biodegradable packaging options may find applications in the red meat industry in the more distant future.

24.6 Long term supply

The long term supply situation for fibreboard is quite optimistic because of the high level of recycling and the fact that virgin fibre comes from sustainable sources. The very high recycling rate means that most cardboard cartons are recycled between 4 - 5 times. Furthermore, recycling facilities are widely available and will assure the long term economics. Virtually all of the virgin fibre comes from new growth timber which is renewable and economically viable.

The long term viability of plastics is dependent on the long term supply of oil with plastics currently consuming 4% of global oil production. One of the reasons oil based plastics are so popular as a packaging material is the fact that they are extremely cheap to produce compared with other types of packaging. The inevitability of rising oil prices is not considered to impact on the price of plastic films to a great extent. This is due to the fact that rising oil prices put pressure on plastic producers to develop technologies which make plastics more efficient. By using different additives, plastics producers can reduce the amount of polymers required and make high performing products that use less materials. This situation has been witnessed over the last decade, whereby despite increasing oil prices, the cost of plastics has not increased significantly. The major packaging suppliers are optimistic that this trend can continue into the future.

Should a situation arise where the price of oil based plastics increases substantially, it is likely that there will be an increase in plastics made from other organic inputs such as corn starch and soy protein. These technologies are currently available but the economics make them unviable for most applications.

24.7 Implications for the future

At present, the Packaging Covenant does not have specific procedures or guidelines for meat. The onus is on the brand owners, which in the case of red meat includes supermarkets, packaged food processors and quick service restaurants. At present, these brand owners are doing the best possible job within the limitations of technology and the economics of recycling. It is likely that in time, the plastic material used by the meat industry may be subjected to more intense scrutiny.

Most of the other industries that use plastic such as soft drinks, dairy products etc. are achieving good recycling rates because their packaging is made from plastics coded 1 -3, which are accepted by recycling plants. The fact that virtually all of the plastics used in meat go to landfill could mean, that in future this could become a target for further attention.

As landfill sites become more scarce, there will be further pressure to reduce dumping. Indeed, the 2005 Covenant has established a target of no new packaging to landfill. As was mentioned in the report, this means that any additional packaging will need to be recovered for recycling and not disposed of into landfill. As the meat industry grows and the trend towards smaller cartons and other systems which use more volumes of plastic on a per kg basis continues, it will be difficult for the industry to make a meaningful contribution to achieving this target. It is likely that if any action is taken, it will be at the kerbside collection and separation level.

Possible consequences of landfill scarcity and the imperative to divert waste to other end-of-life uses such as recycling are increased dumping fees or surcharges on different types of materials. Such penalties could improve the economics of reuse and recycling technologies by making landfill more expensive.

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Glossary

ABS	Acrylonitrile-butadiene-styrene.
EPA	Environmental Protection Agency
EPC	Electronic Product Code
EPS	Expanded Polystyrene.
HDPE	High-density polyethylene.
LDPE	Low density polyethylene.
MAP	Modified Atmosphere Packaging
MLA	Meat and Livestock Australia
MRF	Material Recycling Facility
OCC	Old Container Cuttings
OH&S	Occupational Health and Safety
PET	Polyethylene terephthalate.
PLA	Polylactic Acid
PS	Polystyrene.
PVC	Polyvinyl chloride
QRC	Quick Response Code
QSR	Quick Service Restaurant
RFID	Radio Frequency Identification

Appendix 1

Contact list

Processors & Boning rooms/value adders/case-ready operators

Name	Position	Position
David Foote	Chief Executive Officer	Australian Country Choice
Jim Hocking	Group Environmental Officer	Australian Country Choice
Michael Campbell	Environmental Officer	Australian Country Choice
Mark Richardson	Supply Chain Manager Asia/Pacific	OSI International
Robert Thompson	Export Sales Manager	Comgroup Supplies
Kathleen Jackson	Plant Manager	Comgroup Supplies Pty Ltd
Shane Gee	General Manager Operations Beenleigh	Teys Bros (Holdings) Pty Ltd
Phillip Evers	Group Production Manager	Teys Bros (Holdings) Pty Ltd
Greg Jordan	Operations Manager	Hans Smallgoods
David Beak	Director	Beak and Johnston Pty Ltd
Robert Cox	Operations	HW Greenham & Sons
Ian Dwyer	General Manager	Somerville Retail Services
Mike Scott	General Manager	Scorpio Meats
Mick Davidson	Production	Cleavers Organic Meats

Food Service

Name	Position	Organisation
Oliver von Vrun	Executive Chef	Crown Casino
Peter Wilkes	Operations Manager	Collex Pty Ltd (Crown Casino)
Dominic Egger	Food & Beverage Manager/Executive Chef	Stamford Plaza (Brisbane)
Nathan Hall	Purchasing Manager	Snapfresh Pty Ltd (Qantas)
Robin Parsons	Purchasing Manager	Qantas flight Catering Limited
Tony O'Brien	Executive Chef	Mater Hospital
Peter Tyrrell	Purchasing manager meat	Spotless Group Limited
Lisa Isaacs	Purchasing manager meat	McDonalds

Retail

Name	Position	Organisation
Paul Newton	Senior Category Manager – Red Meat	Woolworths
David Bevis	Senior Category Manager – Red Meat	Coles
Bret Pickering	Senior Category Manager – Red Meat	Metcash

Waste Management

Name	Position	Organisation
Peter Wilkes	Operations Manager	Collex Pty Ltd (Crown Casino)
David Ravlic	Project Manager – Kerbside collection	Sustainability Victoria
Lyndndley Taylor	Manager	Collex Pty Ltd

Packaging Suppliers and Recyclers

Name	Position	Organisation
Gary Bullen	Technical manager	Visy Board
Lina Goodman	Technical manager	Visy Recycling
Kevin Taylor	Case ready market manager	Sealed Air
Jim Selway	Technical manager	Amcor
Paul Dennison	Sales manager	Carter Holt Harvey (Auckland)
Murray Parrish	Environmental Officer	Carter Holt Harvey Full Circle (Auckland)

Packaging Covenant/ Government & Industry Associations

Name	Position	Organisation
Ed Cordener	Chief Executive Officer	Packaging Covenant
Peter Collins	Team Leader Waste Management and Recycling – Environmental Operations Division	Queensland Government Environmental Protection Agency (EPA)
Peter Bury	Director Industry Development	Plastic and Chemical Industries Association (PACIA)
Paul Reynolds	Manager	Polystyrene Australia
John Ride	Manager	Polystyrene Australia
Judy White	Manager	WSN Environmental Services
Paul Curtis	Chief Executive Officer	Packaging Council New Zealand (Auckland)
Ben O'Brien	Marketing Manager	Meat & Wool New Zealand (Wellington)
Nikki Webbington	Environmental Officer	Plastics Institute (Auckland)
Ashley Chisholm	Executive Officer	New Zealand Packaging Association (Wellington)

Appendix 2

Moderators' guide

Meat and Livestock Australia Packaging Study: Moderators Guide/Issue List

The actual format of this may vary, being tailored to account for the different links in supply chain. This guide is indicative only.

Preamble

Hello I'm (*'name'* from David McKinna et al Strategic Insights Pty Ltd). We have been engaged by Meat and Livestock Australia (MLA), the industry owned company responsible for marketing and R&D for red meat in Australia to conduct research into red meat packaging.

MLA invest a large amount of money in research and development aimed at improving the performance and profitability of the Australian red meat industry at every level of the supply chain for both domestic and overseas markets.

This study has been aimed at looking at the fate of packaging material used in the meat industry at every level of the supply chain. In particular, the study aims to collect information that will help the industry plan ahead in terms of improving its rate of recycling, reuse or use minimisation.

As an important player in the red meat supply chain your company has been selected to provide some information and any feedback to have an input into the study. I would appreciate an hour or so of your time to answer a few questions.

Questionnaire Guide

1. Can you please tell me a little bit about your company?

   - Its core business

   - Which markets it operates in

   - Other

2. Approximately how much beef and lamb do you use per year?

3. Which segment of the market do you mainly supply?

   O Domestic Retail
   O Domestic Food Service
   O Export Retail
   O Export Food
   O Manufacturing

4. Taking firstly the meat that comes into your premises, how does most of your red meat raw materials covering beef, lamb, mutton and goat come into the premises? Please take me through this one by one.

5. For each of the different types of packaging material, can you give me an estimate of what quantity would come into your premises on an annual basis?

   O Boxes____

   O Inner-liners_____________________________________

   O Vacuum Packs__________________________________

   O Straps____

   O Retail trays_____________________________________

   O Doy packs______________________________________

   O Other____

6. What happens to this packaging material once your have finished with it?

7. What steps have you taken to reduce the amount of packaging material going into your place?

   - Do you know of any technologies or business practices that could help you?

   - Have you instigated the implementation of these?

   - Do you intend to in the future?

8. Approximately what percentage of this would be:

    - Dumped in landfill________________________________

    - Recycled on premises______________________________

    - Recycled off premises_____________________________

    - Other____

9. Can you give me some estimate of what it would cost you to dispose of this packaging material?

10. What are the costs associated with disposing of the packaging material?

11. Are there any issues with respect to disposing of meat packaging material? Please explain what these are.

12. Do you find that there are more pressures placed on you with regard to recycling or disposing of packaging materials? What are they and where are they coming from?

13. Do you believe that there will be a general tightening up in terms of general disposal of packaging material in the near future? What do you believe the nature of this to be and who will be driving this?

14. Turning now to packaging used by you to send product out of the premises. What type of packaging material do you use? Can you provide an estimate of quantities for each year?

- O Boxes____
- O Inner-liners____________________________________
- O Vacuum Packs_________________________________
- O Straps____
- O Retail trays____________________________________
- O Doy packs______________________________________
- O Other____

15. What steps have you taken to reduce the amount of packaging material going out of your place?

    - Do you know of any technologies or business practices that could help you?

    - Have you instigated the implementation of these?

    - Do you intend to in the future?

16. Are there any trends with respect to the packaging that you use to market/ship your product?

    - Are there any packaging types that you are using more of?

    - Are there any your are using less of?

    - Why is this?

- What is driving this?

- Are you getting any pressures or requests from the customers with respect to packaging material?

- What is the nature of these?