



## **Executive Summary**

### ***Background & Objective***

The markets for functional and luxury foods offer potential opportunities for South Australian (SA) companies to expand and grow their businesses, especially in the large and growing markets of Asia. The South Australian Government has commissioned a study to explore the opportunities for these high value markets for the South Australian food, beverage and wine industries. The VTT Technical Research Centre of Finland, together with ESSEC Business School, Frost & Sullivan (Australia) and the Mondelez Innovation Centre, will carry out the study and present the final report in December 2015.

This report summarises the first stage of the project, comprising a literature review to provide all stakeholders with a summary of information available on these markets in publicly-available literature. Given that the objective of the project is to identify market opportunities for SA companies, the literature review has focused on market rather than scientific-related literature, including articles in journals, magazines and newspapers, published reports and statistics and online sources such as company websites and online publications.

The literature review is intended to identify potential opportunities, identified or inferred from the literature, for SA-based companies in functional and luxury foods. Opportunities in packaging that could support value-addition in functional and luxury foods have also been identified. However, the opportunities identified in the literature are not comprehensive or complete, and significant further research in the project will be needed to evaluate these, as well as to identify further opportunities.

### ***The Rationale for Functional and Luxury Foods***

Although a number of market estimates exist for functional food, data on the luxury food market is scarce. However, based on available data the cumulative global size of the functional and luxury foods markets is estimated at US\$220 billion, about 3% of the total global food market (at end-user prices). Although accounting for a relatively small part of the global food industry, the markets for functional and luxury foods are growing faster than overall food demand. For example, demand for functional foods is estimated to be growing at 7-8% per year. Demand for functional and luxury foods is likely to grow particularly strongly in Asia, driven by the strong economic development in Asia, stimulating rapid growth in the size of the middle-class which in turn will drive spending on “premium” food products. The high growth in the number of high net worth individuals (HNWIs) in Asia is similarly driving the consumption of luxury foods.

Functional and luxury foods generally command higher margins and consumer price sensitivity is lower than for general food. This makes these appropriate for regions such as SA, which is likely to have a much higher cost of production for general food items when compared to Asia, Africa or even Europe and the Americas, as well as higher logistics costs.

Consumers generally place a much higher importance on factors such as product quality, proof of origin, etc. for functional and luxury foods than for general food and beverage items. This plays to one of SA's strengths as a producer of relatively higher priced, yet high quality food items.

### ***Functional Foods***

Functional foods are a continuation of the long standing tradition of "health and healing" foods in Eastern cultures, and are typically defined as foods that provide a health benefit to the consumer beyond adequate nutritional effects in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. While definitions for functional foods tend to vary from country to country, the focus is on the merging of health and nutrition, thereby following the trend of healthcare focus moving from treatment to prevention.

The global functional food market is variously estimated at US\$160 – 180 billion. Once supplements are excluded, the market is estimated at ~US\$122 billion, with Asia accounting for over one-third of this. The largest markets in Asia presenting opportunities for functional foods are China, Japan, South Korea, Singapore and Malaysia.

Potential opportunities exist for South Australia (SA) across the functional food category, but the key focus is where SA possesses the raw material base to produce a number of functional ingredients which have growing demand in the Asian functional food market, or SA may provide functional "end-products" such as "free-from foods".

Additionally, SA also possesses a large repository of native foods which are believed to have health benefits and which offer a potential opportunity to provide exclusive functional food and beverage products with a uniquely Australian flavour, as New Zealand has done with Manuka honey-based products and Korea has done with red ginseng. Development of these industries is a potential opportunity to add value to these primary products.

## *Luxury Foods*

Luxury foods are defined as those possessing three characteristics – limited availability / rarity, high price and symbolism (i.e. their consumption in contemporary Asian societies has a symbolic effect as an indicator of social status). The largest opportunities for luxury foods are therefore in countries where there are significant numbers of high net worth individuals, a relatively high degree of social stratification and where symbolism in food consumption is important (for example, at formal events such as banquets and weddings). Based on analysis of this data for the countries in Asia, the top five markets in Asia presenting opportunities for luxury foods based on these criteria are China, Japan, Hong Kong SAR, Singapore and Malaysia. Other markets with potential include India and Indonesia.

A number of food products are widely recognised as luxury foods in these markets, including various seafood (abalone, fugu, beche-de-mer, live reef fish (especially Napoleon Wrasses), rock lobster and sharks fin), mushroom products (matsutake and truffles), Kobe beef (especially A grade), caviar, chocolates, red wine (premier cru Bordeaux), Cognac (vintage) and other distilled or fermented alcoholic drinks. These foods cumulatively have a market value in Asia estimated in excess of US\$10 billion. The market opportunity purely for foods currently widely recognised as luxury is therefore very large.

Potential opportunities exist for SA in some of these luxury foods. These opportunities exist in foods that are currently produced in SA, and where opportunities may arise from enhanced production or greater value-addition (e.g. luxury chocolates, red wine, Southern rock lobster and abalone); where production is currently limited or nascent (e.g. truffles, wagyu beef); or where SA may have appropriate conditions for development of production subject to further evaluation (e.g. caviar, matsutake mushrooms).

Whilst these opportunities are for foods that are currently widely recognised as luxury, there may also be opportunities for SA to convert or evolve other foods (which are currently not recognised as luxury) into luxury foods in future. This could potentially be done, for example, by creating a symbolism in their consumption. A theoretical example could involve premium red wine from SA which could be positioned in a similar way to premier cru Bordeaux. Although this approach has not been documented in the literature (and hence is not included in the literature review) it will form a subsequent part of the project.

In addition to potential opportunities in the specific foods identified above, there may be more generic opportunities for SA at different parts of the luxury food value-chain, in many cases by potentially co-ordinated initiatives with stakeholders. These potential opportunities include enhanced online sales

(especially into China), gift packs, airport sales, enhanced regional luxury food branding, and luxury food inbound tourism.

### ***Functional and Luxury Food Packaging***

Packaging is integral to many food products and performs many vital roles that ultimately serve to both protect and effectively distribute the product to the consumer. As such, packaging of functional and luxury foods must protect the functional and premium qualities of its contents, and communicate these qualities to the consumer. With rising demand for higher quality processed foods and consumers becoming ever more discerning about their purchases, overall packaging trends closely follow trends in functional and luxury foods. Consequently, market drivers identified for foods, such as convenience and health and wellness, translate to packaging solutions that are able to protect product integrity. Similarly, market restraints in food, such as high costs, and concerns over safety and traceability, also present challenges to the packaging industry.

Most importantly, as packaging technologies continue to develop, these products are increasingly becoming recognised not only as a container for food, but a value-added feature that enhances food, from farm to fork.

Based on the literature review, there are some areas where packaging offers a number of potential opportunities to add-value to luxury or functional foods, addressing issues such as traceability, sustainability, presentation, convenience and enhanced freshness / shelf-life. A number of technologies are potentially available to address these issues, including flexible modified atmospheric packaging (MAP), vacuum skin packaging, smart labelling, sustainable (recyclable, and environmentally friendly) packaging, and laminated plastics with antioxidants. Producers in SA could potentially adopt some of these approaches or technologies to add more value to their products.

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## Abbreviations

APAC	Asia-Pacific
CAGR	compound annual growth rate
CPG	consumer packaged goods
CHD	coronary heart disease
CVD	cardiovascular diseases
FTA	free trade agreement
GDP	gross domestic product
GNI	gross national income
HNWI	high-net-worth individual
IBS	irritable bowel syndrome
MAP	modified atmosphere packaging
NFC	near field communication
NFU	need for uniqueness
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
PET	polyethylene terephthalate
PDI	power distance index
QR	quick response
RFID	radio frequency identification
TCM	traditional Chinese medicine
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

# **PART I**

# **INTRODUCTION**

## 1. Introduction

### 1.1 Research Background

Evidence suggests that the highest growth areas in terms of returns are in the value-add domains of functional and luxury food. To investigate this opportunity, the South Australian Government has commissioned a study to explore the opportunities for these high value markets for the South Australian food & beverage industries. The VTT Technical Research Centre of Finland together with ESSEC Business School, Frost & Sullivan (Australia) and the Mondelez Innovation Centre will carry out the study and present the final report in December 2015.

### 1.2 Definitions

**Functional food:** Since the definitions of functional food vary depending on each country and its regulatory environment, this report uses the EU definition which is the most commonly-used definition of functional food: *a food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern* (Roberfroid 2002).

Food and beverages which are marketed on a general wellness platform (lower in fat, energy or sugar) are excluded from this review. However, the “free-from” category (e.g. lactose, gluten) is included since these products have clear target groups (such as lactose intolerant people and people suffering from coeliac disease). Many active agents in functional foods are also commonly sold as supplements (e.g. omega-3, probiotics). When market data is given, the total market for the ingredients is reported, since no separate figures for the ingredients in supplements or foods are often available. Due to variations in the definition of functional foods, different market reports can give disparate data on market size. The Market Analysis phase of this project will involve a more detailed analysis of markets for functional foods. In this literature review, market data provided is derived only from existing publicly-available sources.

**Luxury foods:** Luxury foods include foods that are scarce, symbolic, high priced and of consistently high quality. These foods are often consumed by wealthy / high status individuals and endorsed and used in high-end restaurants. Their consumption generally follows cultural cues, ethnicity, purchasing power parity, tastes, indulgence, habits and the historical evolution of tastes of inhabitants of a particular country, and has a high perceived value by them (modified from Som, 2015).

It is important to note that what is luxury to some can be perceived as a basic need by others. Luxury is a relative concept in general and particularly when it comes to luxury foods. In this review we consider luxury from the point of view of the Asian consumer, which is not necessarily the same as consumers in other parts of the world.

### ***1.3 The Global Food and Beverage Market***

The total global food & beverage market (at consumer prices) is estimated at around US\$ 7.6 trillion (Frost & Sullivan estimates based on World Bank Global Consumption Database). This is about 30% of global GDP.

There are varying estimates on the total global expenditure on functional foods (and hence on the size of the global functional foods market). These variances are generally the result of different definitions of functional foods being used. At the lower end of the estimates, Leatherhead Food Research (2014) estimated the global market at US\$60-70 billion in 2013. This includes only products that make specific health claims, and excludes products marketed on general health and wellness grounds. Other analysts generally estimate the global market size as within the US\$160 billion to US\$180 billion range (e.g. US\$168 billion in 2013 (Research and Markets 2014), US\$176.7 billion in 2013 (Hennessy 2013), and US\$175 billion in 2013 (Nutraceuticals Market 2015). These analysts are presumably using a broader market definition and are including dietary supplements. Frost & Sullivan has estimated the functional food market at US\$177 billion. This market size for functional foods includes both functional foods and beverages and dietary supplements. Dietary supplements are estimated to account for around 31% of market revenue, and functional foods and beverages approximately 69% (i.e. a global market size of approximately US\$122 billion) (Frost & Sullivan estimate). The global functional foods sales split by region can be estimated to be 25% North America, 30% Europe, 37% APAC and 8% Rest of the World (Frost & Sullivan estimate).

Whilst there is a range of data sources that quantify the size of the functional food market, and its split by product category, similar data on luxury foods is virtually non-existent. Published reports that do attempt to quantify the size of the luxury food market do not indicate what foods are included, and therefore are of limited use. One source quantifies expenditure on luxury foods (including beverages) at US\$109 billion (D'Arpizio 2014). Using this estimate for the value of luxury foods, functional foods and luxury foods therefore account for around 3% of the global food & beverage market. Functional and luxury foods combined provide a global market opportunity of approximately US\$220 billion.

### **1.4 The Attractiveness of Functional and Luxury Foods for South Australia**

Although functional and luxury foods account for a relatively small part of the global food and beverage market, there are some clear reasons for SA to focus on these;

1. Demand for functional and luxury foods is growing faster than overall food demand. For example, demand for functional foods is estimated to be growing at 7-8% per year (Hennessy 2013).
2. Demand for functional and luxury foods is likely to grow particularly strongly in Asia, which is a relatively adjacent market opportunity for Australia when compared to Europe or the Americas. This growth is driven by the rapid economic development in Asia, stimulating rapid growth in the size of the middle-class which in turn will drive spending on “premium” food products (Ait-Sahalia et al. 2004). The very rapid growth in the number of high net worth individuals in Asia is similarly driving the consumption of luxury foods.
3. Functional and luxury foods generally command higher margins and consumer price sensitivity is lower than for general food (Van der Veen et al. 2007, Leatherhead Food Research 2014). This makes these appropriate for regions such as SA, which is likely to have a much higher cost of production for general food items when compared to Asia, Africa or even Europe and the Americas as well as higher logistics costs.
4. Consumers generally place a much higher importance on factors such as product quality, proof of origin, etc. for functional and luxury foods than for general food and beverage items (Van der Veen 2007, Leatherhead Food Research 2014). This plays to one of SA’s strengths as a producer of relatively higher priced, yet high quality food items.

### **1.5 Research Objective**

This literature review summarises the information available in published literature on functional and luxury foods market in Asia and Australia. Since the objective of the project is to identify *market* opportunities, the focus is on a review of literature that describes markets and trends for functional and luxury foods, rather than on scientific and technical literature. The intention of the literature review is to summarise the existing data that can be used as a basis for further investigation in the project, and to assist in focusing on opportunities that have already been identified in literature. For example, the literature review includes a summary of the foods that are widely identified in literature as functional or luxury, and assessment of data on these foods based on information available in published literature. Based on published data and assessment by the authors, the main opportunities

for SA in *existing* functional and luxury foods are identified, as well as identification of the most attractive geographical opportunities (for example, the countries or regions with the strongest existing demand for luxury and functional foods). An overview of markets (e.g. size, drivers, restraints and regulatory environment) is given, again based purely on information available in published literature. Opportunities for SA in functional and luxury food markets are also discussed where these can be obtained or inferred from the literature.

## **1.6 Research Method**

This literature review utilised various sources of publicly-available information:

- Articles in academic, trade or professional journals.
- Books.
- Articles in magazines and newspapers, generally published online.
- Publicly-available reports, such as those produced by government agencies.
- Available excerpts or data from proprietary market research reports (e.g. Frost & Sullivan, Leatherhead Food Research). Since these reports are not publicly-available in-full, generally only excerpts or published data releases have been used.
- Company, association and government websites.

The project team identified and reviewed a broad range of the above sources. The available literature is voluminous, especially for functional foods, and the team has been selective in reviewing only sources that are directly relevant to the objectives of the project. The key findings from the literature review are included in this report.

# **PART II**

# **FUNCTIONAL FOOD**

## 2 Functional Foods

### 2.1 Introduction to Functional Foods

As demands of global nutrition continues to rise, the focus on understanding the relationship between nutrition and health has resulted in the development of the concept of functional foods (Siro et al. 2008), which is a continuation of the long standing tradition of “health and healing” foods in Eastern cultures (Shi et al. 2010). Functional food is not a single well defined/well characterised entity. Indeed, a wide variety of food products are, or will be in the future, characterised as functional foods, with a variety of components affecting a variety of body functions relevant to either a state of well-being and health and/or to the reduction of the risk of a disease. Functional foods are and must be foods, not drugs. Moreover, functional food will in most cases be used to ‘reduce the risk’ of disease rather than ‘preventing’ disease. Some of the characteristics of functional food that are commonly used in literature include:

- Foods that may provide health benefits beyond basic nutrition.
- Foods or food products marketed with the message of the benefit to health.
- Food similar in appearance to conventional food, which is consumed as part of the usual diet and has demonstrated physiological benefit and/or reduces the risk of chronic disease beyond basic nutritional functions.
- Food that encompasses potentially helpful products, including any modified food or food ingredient that may provide a health benefit beyond that of the traditional nutrient it contains.

The most commonly used definition of functional food comes from the European Union (EU): *“A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern.”* (Roberfroid 2002).

Functional foods are not medical foods and are not drugs. Functional foods differ in definition from medical foods and drugs as indicated in Table 1.

**Table 1: Comparison of Functional Foods, Medical Foods and Drugs**

	Functional Foods	Medical Foods	Prescription Drugs
<b>Typical uses</b>	Energy enhancement; weight management; bolster gut, bone or heart health; disease risk reduction; memory improvement	Dietary management of a disease or condition with distinctive nutritional requirements (e.g. difficulty swallowing, loss of appetite, nutrition repletion post-surgery )	Treatment of disease, symptom or condition
<b>How obtained</b>	Selected by consumer, no prescription or medical direction	Used with medical supervision	Prescribed by health professional
<b>Distribution channel</b>	Supermarkets, drugstores, online, major retailers	Hospitals, pharmacies	Hospitals, pharmacies
<b>Regulatory body</b>	Subject to food regulations. May be regulation on health claims that can be made	Subject to food regulations, may require pharmaceutical registration	Pharmaceutical regulatory body
<b>Amount consumed</b>	As wanted	As needed	As prescribed

Source: PwC 2009

Functional foods can include fortified products (fortified with additional nutrients), enriched products (with added new nutrients or components not normally found in a particular food), altered products (from which a deleterious component has been removed, reduced or replaced with another substance with beneficial effects) or enhanced commodities (in which one of the components has been naturally enhanced through special growing conditions, new feed composition or genetic manipulation (Kotilainen et al. 2006). Nutraceuticals and dietary supplements form the two main segments in the functional food category. The nutraceutical segment is defined as foods, or parts of food that provide medical or health benefits, including the prevention and treatment of disease (Kalra et al. 2003, Pandey et al. 2010). Dietary supplements also provide medical or health benefits but differ from functional food in their form (capsules, liquids, powders, pills). They are also consumed in addition to regular food (Kalra 2003). However, as they are not a food product or an ingredient, they are considered out of scope for this report.

Global health patterns that drive the functional food market include increasing incidence of lifestyle and metabolic diseases (heart and cardiovascular diseases, obesity, diabetes, etc.), cancer, osteoporosis, mental conditions and digestive problems. Increases in lifestyle/metabolic diseases and cancer are linked to ageing populations in the US, Europe, Australia and Japan (Barzilai et al. 2012, Leatherhead Food Research 2014). The rise in the incidence of these diseases, and growing concern to prevent them, is one of the main factors stimulating consumption of functional foods.

## ***2.2 Consumers Attitudes and Preference towards Functional Food and Health Claims***

An important aspect of functional foods is the implicit health claims that functional foods make (given that explicit claims are generally not permitted). An understanding of the attitudes of consumers towards functional foods and the role that the health claims in functional foods can make in the purchase decision is important to understand from the perspective of marketing products that address evolving consumer needs. A recent summary of consumer attitudes toward functional foods and health claims (Lähteenmäki 2013) has identified that some of the main aspects of consumer attitudes are:

- For consumers, health claims seem to carry the message of increased healthiness, but not necessarily making the product more appealing. The wording of the claim seems to have little impact on claim perception, yet the healthy image of food products is important. In other words, consumers are more affected by an overall healthy image of a food than any specific claim that it implicitly makes.
- Socio-demographic factors (besides differences between countries) have only a minor impact on attitudes, and the impact seems to be case-dependent. Although it has been considered that women have a more positive attitude towards health claims and a healthy diet than men, studies on the gender effect have shown contradictory results (Nocella & Kennedy 2012). However, the benefits that are gender dependent are perceived more positively by the relevant gender, e.g. claims on bone health and calcium by women and cholesterol lowering claims by men.
- Familiarity with claims and functional foods increases the perceived healthiness and acceptance of these products. Adding health claims to the product has typically increased perceived healthiness, but the impact has been small or moderate at best.
- Health claims are more accepted on products that are already considered as having a healthy image. However, adding health claims to existing wholesome products can be tricky as consumers may question the rationale of making healthy products even more wholesome.
- Consumers tend to prefer foods that are perceived as natural, and any new characteristics (even functional ingredients) in a product may signal decreased naturalness to consumers.
- Claiming health in products seems to suggest lower expected pleasantness and thereby lower hedonic value to consumers. Consumers are unwilling to compromise taste for health benefits.

The challenge in promoting products with health claims is to overcome this negative expectation barrier.

- The most important demographic factor in responses to health claims seems to be differences between countries; differences can be quite large, even between neighbouring countries. Apart from country effects, socio-demographic factors do not seem to be strong predictors of consumer responses to health claims.
- Using an ingredient/component that is already widely marketed with health-related arguments seems to create a bigger benefit perception than a new component. With an unfamiliar component these associative links do not exist and any additional positive piece of information is likely to improve the perception. However, with unfamiliar component consumers tend to be cautious about the novelty per se to a varying extent.

### ***2.3 Global Functional Foods Market***

Functional food includes both products consumed in solid form, and as beverages. The demand for convenient healthy options has driven demand for functional beverages, from fortified fruit juices to isotonic drinks. The functional beverage market has steadily increased over the past decade (Fortitech Strategic Nutrition 2011) and has now overtaken solid functional foods in sales value (Feder 2014).

Most analysts estimate the global functional food market at US\$160 – 180 billion. Leatherhead Food Research makes a lower estimate at US\$60 – 70 billion, presumably due to different definitions of functional food. However, since Leatherhead has the only publicly-available market data split by product category, their data has been used in this section.

Demand for functional foods is rising in emerging economies such as China, India, parts of Latin America and the wider Asia-Pacific region. Continued growth is forecast to occur in the global market, despite the problems caused by health claim regulations. This is because many global regulators are becoming stricter on the health claims that can be used on functional foods. Regulatory issues may lead manufacturers to change emphasis to foods with softer health and wellness claims (Leatherhead Food Research 2014). Potentially, this could slow market growth as health claims become less explicit.

In terms of the functional food product sector, dairy products are the biggest segment (US\$15.25 billion in 2013). The dairy matrix is a suitable carrier for many functional ingredients (e.g. probiotics) and the growing consumption of dairy products also makes dairy-based functional foods more interesting to consumers. Functional dairy products typically target gastrointestinal and bone health.

The bakery and cereal products sector is the second biggest after dairy (US\$13 billion). In this category breakfast cereals with heart health benefits and weight management products are popular. The third largest sector is beverages (US\$7.25 billion in 2013), which largely consists of fruit-based beverages, supplemented bottled waters and teas targeting health and bone health, and anti-ageing and beauty categories. Fats and spreads form a category worth US\$ 2.5 billion (in 2013). These products generally target heart health (via cholesterol-lowering). The remaining 12% of the market consists of products such as dairy alternatives, eggs, confectionery and baby foods (Leatherhead Food Research 2014).

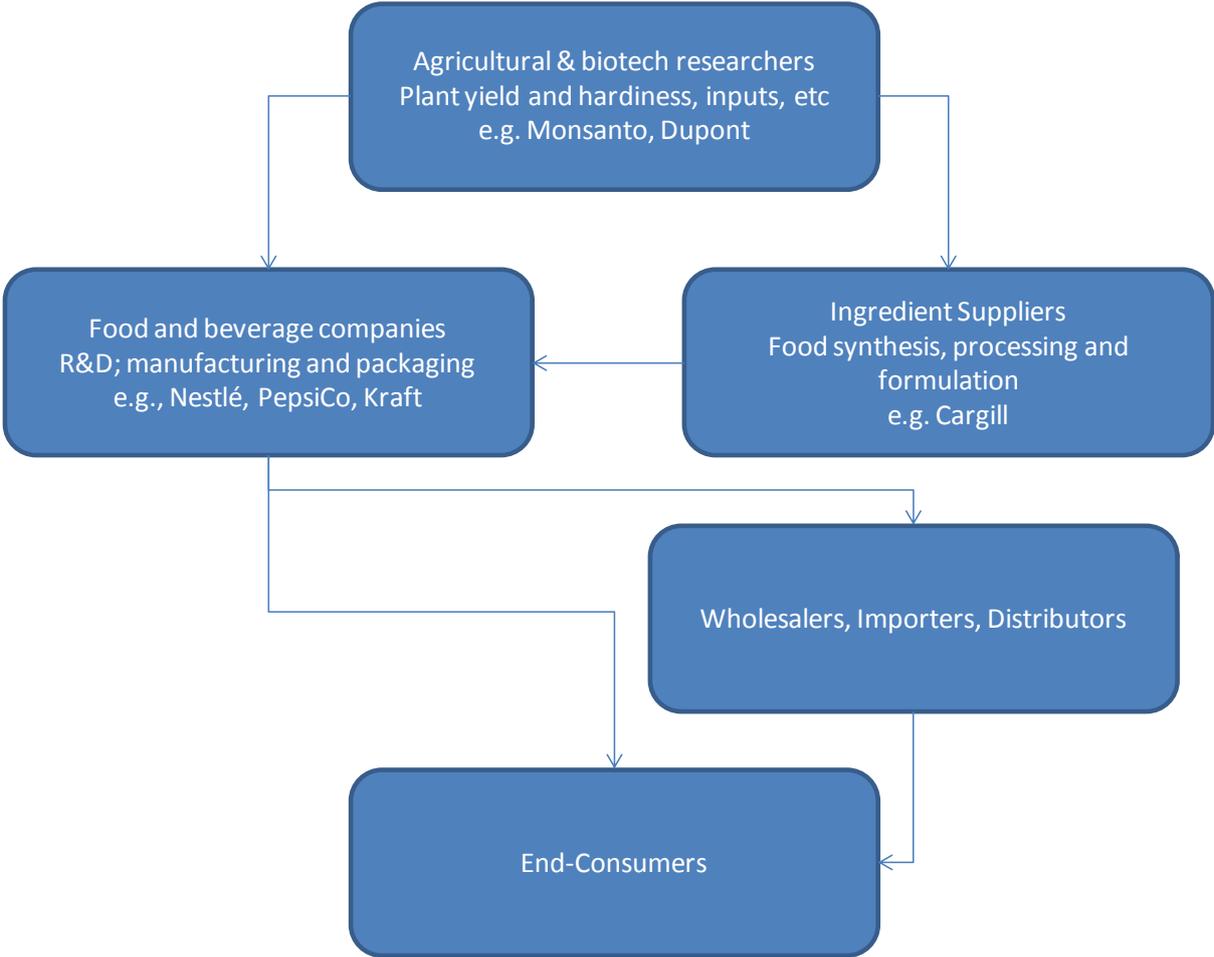
There are some clear differences in functional food markets in different countries and regions. In Japan, fortification of food and beverages is very common and has a long history. Use of probiotics, prebiotics, vitamins and calcium is commonplace. The functional food market focuses on beauty and anti-ageing, as well as improved gastrointestinal health.

In China, Traditional Chinese Medicine (TCM), with its holistic approach to health, is still commonly practised. Some aspects of TCM like herbal medicine and dietary therapy are linked to the functional foods approach (Traditional Chinese Medicine: An Introduction 2013). However, the functional food market has also developed well in the areas of functional dairy and cereals and vitamin and mineral fortified foods. Both in Japan and Australia, the ageing population is an important consumer group of functional foods (Leatherhead Food Research 2014).

#### ***2.4 Supply Chain for Functional Foods***

The generic supply chain for functional foods is illustrated in Figure 1. Typically there are three main types of organisations participating in functional food supply chains; research organisations, ingredient manufacturers and food product (end-product) manufacturers. This indicates that value-chain opportunities for SA could lie in research, ingredient development and supply or supply of finished functional food products to consumers, via retail or direct channels.

**Figure 1: Supply Chain for Functional Foods**



Source: adapted from PwC 2009

**2.5 Key Functional Food Product Areas**

The earliest form of functional food products began with foods fortified with vitamins and minerals, such as vitamin C, zinc, iron, and calcium etc. (Sloan 2000). However, as the market developed newer more focussed ingredients began to make their appearance. This focus was amplified by a growing interest in micronutrients, driving the introduction of omega-3 fatty acids, phytosterol and soluble fibres to promote overall health and reduce incidence of targeted health problems (Sloan 2002) and focus on multiple solutions to health issues via a single product (Sloan 2004). Specialty nutritional ingredients (such as fish oil, antioxidants, probiotics, prebiotics, choline, polyphenols and flavonoids), the emergence of a health-oriented market segments (e.g. Hispanic consumers in the US, kid-specific products), pharma foods (foods that aim at preventing a specific disease / reducing the risk of disease), performance nutrition (mainstream version of sports nutrition) and consumers’ ongoing interest in protein consumption, are driving new opportunities for functional foods and drinks.

Functional foods can be categorised in two main ways; either by the ingredients that they contain (such as omega-3, phytosterols, polyphenols, etc.) or by the conditions that they address (such as heart health, eye health, cognitive health and so on). In this literature review, both approaches have been used to categorise the main functional food opportunities. The first approach lists the top five key functional ingredients, while the second lists the main conditions which are currently addressed by functional foods.

## 2.6 Functional Food Ingredients

Functional food ingredients arise primarily from natural sources such as phytochemicals, omega-3 and beta-carotene, and typically contain bioactive components that could have a significant benefit in helping prevent or manage diseases or health conditions (Wang and Bohn 2012). While the list of functional food ingredients is potentially endless, a number of ingredients now have global markets of close to or over US\$1 billion. Table 2 below lists these ingredients, their estimated global market size, the main diseases or conditions which they are believed to address and the major raw material sources in which they are found. The market size data includes use of these ingredients in both functional foods and supplements (although supplements are out of scope, separate data on functional food ingredients only is not available).

**Table 2: Main Functional Ingredients**

Ingredient	Market Size (US\$ billion (Bn))	Disease Benefit	Major Raw Materials
<b>Polyunsaturated/Mono-unsaturated Fatty Acids (PUFA/MUFA)</b>	2.8 Bn (Frost and Sullivan 2012)	Cardiovascular health (Lemaitre et al. 2003, Tavazzi et al. 2008), Brain Health (Birch et al. 2000, Denis et al. 2015), Immunity (Calder 2001, Miles and Calder 2012)	Algal Oil (Dunstan et al. 1993; Medina et al. 1998) Marine Oil (Kris- Etherton et al. 2002) Flaxseed Oil (Bucher et al. 2002)
<b>Carotenoids</b>	0.9 Bn (Ribeiro et al. 2011)	Eye health (Britton et al. 2009) Antioxidant (Vilchez et al. 2011) Immunity (Chew & Park 2004, Pechinskii & Kuregyan 2014)	Algal/Fungal (Lee & Schmidt-Daniel 2002) Synthetic (Bernhard 1989) Vegetables (Maiani et al. 2009) Marigold (Villar-Martinez et al 2013)
<b>Protein Ingredients</b>	4.2Bn (Frost & Sullivan 2014b)	Anti-cancer (whey) (McIntosh et al. 1998, YF Chen et al. 2014), Sports Nutrition/weight management	Milk Protein (Playne et al. 2003) Egg Protein (Layman and Rodriguez 2009) Soy Protein

Ingredient	Market Size (US\$ billion (Bn))	Disease Benefit	Major Raw Materials
		(Tang et al. 2009, Escobar et al. 2015), Heart Health (soy), (Nagata et al. 1982, Rebholz et al. 2013)	
<b>Probiotics</b>	2.2 Bn (Frost & Sullivan 2013a)	Digestive health (Marteau et al. 2001, Sanders et al. 2013). Immune health (Yan & Polk 2011, Sanders et al. 2013)	Lactic acid bacteria and Bifidobacteria (Naidu et al. 1999, Klein et al. 1998, Salminen & Wright 2004)
<b>Dietary Fibre/Prebiotics</b>	2.3 Bn (Olivo 2014)	Digestive health (Anderson et al. 2009, Brownlee 2011), Heart health (Sanchez-Muniz 2013, Threapleton et al. 2013), Immune health (Schley & Field 2002, Brownlee 2011), Weight management (Clark & Slavin 2013)	Chicory Roots (Roberforid et al. 1988)  Cereals (Ahmada et al. 2012, Patel 2015)  Other vegetable sources (Rodriguez et al. 2006)

## 2.7 Health Conditions

Table 3 below lists the main medical or health-related conditions which functional foods currently address. While the list is not exhaustive, it provides a perspective on the main conditions that functional foods address, and the ingredients that are used to address them.

**Table 3: Main Health Conditions for Functional Foods and Associated Ingredients**

Condition	Typical Ingredients
<b>Energy</b>	Guarana extract (Schimpl et al. 2013)
<b>Heart Health</b>	Omega-3 (Kris-Etherton et al. 2002) Plant sterols (Law 2000, Hu 2003, Ras et al. 2014) Probiotics; lactic acid bacteria or bifidobacteria (DiRienzo 2014) Dietary fibre, typically cereal fibres/brans and beta-glucan (Smith & Tucker 2011, Daou & Zhang 2012, Threapleton et al. 2013)
<b>Digestive &amp; Immune Health</b>	Probiotics; lactic acid bacteria or bifidobacteria ((Borchers et al. 2009, Sanders et al. 2013) Dietary fibre, typically cereal fibres/brans and beta-glucan (Daou & Zhang 2012, Poutanen 2012)
<b>Bone Health</b>	Calcium (Flynn 2003) Milk components (calcium, protein...) (Toba et al. 2001, Rizzoli 2014) Soy protein (Xiao et al. 2008)
<b>Eye Health</b>	Carotenoid pigments (lutein, zeaxanthin, astaxanthin) (Guerin et al. 2003, Ma & Lin 2010, Abdel-Aal 2013)

Condition	Typical Ingredients
Weight Management	Protein (Westerterp-Plantenga et al. 2009) Fibre (Kristensen & Jensen 2011, Wanders et al. 2011)

## 2.8 Trends in Functional Foods

Some of the main trends in the global functional food industry are listed below:

**Naturalisation:** Globally, functional food consumers are increasingly opting for natural, organic and non-GMO ingredients as they believe the bioavailability of these products is higher, while the risk of side effects is significantly lower than pharmaceuticals (Vo & Kim 2013).

**Expansion in emerging markets:** The global market is currently experiencing a period of growth, post-Global Financial Crisis, driven by emerging markets, such as ASEAN countries, India, China and Brazil, with China likely to become the world's largest nutraceutical market by 2030 (Ken Research 2014).

**Condition nutrition:** Customisation (modification to suit a particular individual or a group of individuals) and personalisation (differentiation between individuals and providing products for specific individual and situational needs, and use of other diagnostics such as metabolomics or protein-omics or epigenetics) (Boland 2008) is important for functional food, specifically in ethnic markets such as Asia. However, while complete personalisation (based on the individual's genetic profile) is a long way off, companies are looking at new and innovative ingredients and/or delivery mechanisms to suit specific target groups.

**Demographic focussed innovation:** While product development in developed markets will focus on specific demographics and their key health concerns (for instance Gen-Y with cholesterol reduction (Sloan 2010), in emerging markets product development will focus more on diversifying product offerings to gain greater penetration amongst the Gen-Y population (born 1979 through 1994) focussing on the broader trends of health concern and convenience (Kavitha & Prabhu 2011). Similarly, women and children will continue to grow as key functional food consumers as seen from the growing incidence of products targeting them, driving innovation catering to these two demographics.

**Industry consolidation:** There will be an increasing trend of larger functional food manufacturers taking over smaller players in order to gain better market positions. This will change the level of competition across the globe as more companies try to expand their global positions. For instance, Japanese companies are looking to dominate the global nutraceutical market, as can be seen by some of their synergistic acquisitions worldwide (e.g. the acquisition of Jasmine,

a leading Brazilian Health Food Company in 2014). This will also be driven largely by increasing raw material costs which will drive backward integration to maintain value chain efficiency (Kulkarni 2015).

## **2.9 Asian Functional Food Market**

### **2.9.1 Market Overview**

In Asia, functional food is a more established and refined concept than other regions such as Europe and the Americas (Verschuren 2002, Leatherhead Food Research 2014). This is primarily because Asians believe that both nutrition and health are complementary and hence have great influence over each other (Arai 2002).

Within Asia, the leading countries in functional food are China and Japan, based on these countries long history of traditional medicine (Basu et al. 2007, Leatherhead Food Research 2014).

In 2012, Japan was the largest functional food market in Asia and the second largest globally by value with an estimated market size of US\$22 billion (Daniells 2014). Japan was the first country to initiate the concept of functional foods (Giannetti et al. 2009) and continues to be a global leader in the sector (Bloise 2014). China is slightly behind Japan with an estimated market of US\$21 billion.

In the overall Asia region, the growth rate in the functional foods market has been around 7% year on year, and the total market size in 2014 was estimated at about US\$ 55 billion (Frost & Sullivan 2013b). Growth has been partly driven by government initiatives towards addressing health concerns such as micronutrient deficiencies and malnutrition (Akhtar et al. 2013), as well as growing consumer interest (Leatherhead Food Research 2014). Overall, the Asian functional foods market is expected to have a higher than average growth due to an increasing disposable income region wide.

The scope of this project includes identification, based on literature, of the most attractive markets so that these can be the focus of the subsequent market analysis. The largest five functional food markets in Asia have been selected for further evaluation in the report (see Table 4). These are China, Japan, Korea and Malaysia & Singapore (due to their geographic and economic contiguity Malaysia and Singapore are combined).

**Table 4: Ranking of Functional Foods Markets**

Rank	Market	Functional Food Market Size (US\$ billions)
1	China	21
2	Japan	22
3	Korea	1.5
4	Malaysia & Singapore	1.3
5	Thailand	1.2
6	India	1.0
7	Indonesia	0.25

Source: Frost & Sullivan, 2014a

### **2.9.2 Key Markets**

A summary of the main functional foods used and country-specific trends for the short-listed markets is given below.

#### **China**

China's health food market first emerged in the 1980s. Health food refers to food products which claim to have specific health functions or supplement one's vitamins or minerals. Health food is suitable for the consumption by specific groups of people and has the effect of regulating human body functions, but is not used for the purpose of treating diseases. Traditionally, a large part of health food in China is classified as traditional Chinese medicine (TCM), which is plant/animal-based food with positive health effects. China has introduced 'Regulations on Supervision of Functional Foods'. The main aim of these regulations is to regulate foods that have any functional or health claims associated with its consumption (Petry & Liting 2009).

The Chinese Health Food Regulations system defines functional foods or "health food" as food with specific health functions that is suitable for consumption by specific groups of people and that has the effect of regulating human body functions, but is not used for the purpose of treating diseases (Yao et al. 2012).

Approvals for health food are to be obtained from the Institute of Nutrition and Food Safety (INFS), the State Food and Drug Administration (SFDA), and the Chinese Centre for Disease Control (Beijing). The government requirement is that full evidence be provided to show efficacy of health claims, with

each product only allowed certification for no more than two health functions out of a total of 27 listed health claims. Upon approval, an Imported Health Food Certificate is granted for the functional food product (Patel et al. 2009). As of 2012, the State Food and Drug Administration (SFDA) had approved a total of 14,745 health food products, of which, 14,020 were domestically made and 725 were imported. According to estimates, in China's health food market, functional food accounts for about 65% while nutritional supplements account for the remaining 35% (China's Health Food Market 2014).

While the Chinese market for health foods may have emerged only in the past 30 years, the concept of functional foods is an ancient one that is based on a long-term understanding of the concept of food as a medicine. Unlike other functional food markets, China views functional foods from a completely holistic, health based perspective, as opposed to the awareness of specific ingredients as is seen in the West (Roux n.d.).

There are some regional differences in functional food preferences in China: probiotics are especially popular in Beijing; traditional Chinese cooling herbs in Guangzhou; and tonic herbs in Guangzhou and Chengdu. The ageing population (and the accompanying increase in chronic diseases) is an important driver for buying functional foods, as well as concerns about the safety of standard food (especially dairy) in China. Functional infant formula and dairy, especially flavoured milks and yoghurt, have strong sales in China (Fortified/Functional Foods in China 2014). Although obesity is an increasing problem in China functional foods in the weight management category are not yet common. However, China, as in many other developing countries, has to shoulder a "double burden" — the persistence of under nutrition, particularly among children in rural areas, and a rapid rise in obesity and related diseases such as cardiovascular disease, hypertension and stroke, diabetes and certain forms of cancer. Hence, interest in weight management related foods may grow.

The three main types of functional food in China are:

- Traditional health food: products prepared using traditional Chinese methods and based on the concept of regulation and balance in traditional Chinese medicine.
- Modern health food: health products using nutrients or supplements as major ingredients.
- Condition-specific health foods: these products include focussed products aimed at specific nutritional challenges such as heart, liver and digestive health (China's Health Food Market 2014).

The majority of products tend to focus on heart and immune health, along with a growing focus on energy supplementation products (see Table 5) as the population begins to age.

#### **Table 5: Main Health Conditions Addressed by Functional Foods in China**

Health			
Rank	Conditions	Comments	Key Ingredients
1	Cardio-vascular health	<p>Currently the cardiovascular disease (CVD) death rate is still low, but clearly higher than in e.g. Japan (Coronary Heart Disease 2011).</p> <p>Annual CVD events projected to increase by &gt;50% between 2010 and 2030 (Chinese Heart Disease n.d.)</p> <p>About 28% of the adult population is overweight or obese. (Ng et al. 2014)</p> <p>Prevalence of diabetes and pre-diabetes is nearly 10% and 16%, respectively. Obesity and diabetes are increasing in children. (French 2015)</p>	<p>Omega-3</p> <p>Soy based foods (Zhang et al. 2003)</p> <p>Green tea extract (Cheng 2006)</p> <p>Functional ingredients for weight management (protein, fibre) are just emerging</p>
2	Immune/ Digestive Health	<p>22% of the Chinese population struggles with digestive immune health diseases. Prevalence of IBS is about 5-6% (Dolcera 2008; Liu &amp; Hou 2011; Li &amp; Li 2015). China has the 5<sup>th</sup> highest rate of stomach cancers in the world whereas colorectal cancer rates are lower than in Europe and Australia (Stomach Cancer Statistics 2015)</p>	<p>Traditional Herbs (Heskett &amp; Zhu 1997)</p> <p>Fermented dairy foods (Liu et al. 2011)</p>
3	Energy development	<p>Over 6% of Chinese population struggles with Chronic Fatigue (Son 2012)</p>	<p>Green tea extract (Liang et al. 2004)</p> <p>Traditional medicine (Chen et al. 2010)</p> <p>Vitamins and minerals (Xiao et al. 2012)</p>
4	Bone health	<p>26% of the Chinese population at risk of osteoporosis (China 2013)</p>	<p>Soy foods (Ho et al. 2004)</p> <p>Calcium &amp; Vitamin D, Dairy foods (Kruger et al. 2012, Prentice 2014)</p>

\* References indicate only some examples of local ingredients/studies. A comprehensive literature review on the health benefits of various ingredients is beyond the scope of this review.

As of 2012 China's state Food and Drug Administration has approved over 14,000 health food products of which over 90% were locally produced. Over 40% of the Chinese market is dominated and will continue to be populated by traditional medicine options (Abbott 2014). However, there is growing scope for international manufacturers in the packaged functional food and beverage segment as China continues to be a fast growing market.

## Japan

Japan is the world's most developed and regulated functional food product markets (Leatherhead Food Research 2014). Japan defines functional foods as a distinct category of food, distinguished from

foods simply fortified with vitamins or minerals and from dietary supplements (sold in pill or capsule form). Foods with functional ingredients are defined as “Foods for Specified Health Use,” or “FOSHU”.

In 1991, the Japanese government instituted the current system with the intention to help promote the manufacture of food designed to remedy serious health problems, such as inadequate fibre and calcium consumption (Shimizu 2003). The establishment of such a regulatory framework would limit misleading claims.

For a product to be approved as FOSHU, companies need to go through an estimated one year application process. Applications are reviewed by local prefecture authorities and the Ministry of Health and Welfare (MHW). Applications must include scientific documentation demonstrating the medical or nutritional basis for a health claim, the basis for the recommended dose of the functional ingredient, information demonstrating the safety of the ingredient, information on physical and chemical characteristics, relevant test methods, and a compositional analysis (Japan the Inventor of Functional Foods - Regulatory Requirements n.d.).

The labels of FOSHU products must include the approved health claim; recommended daily intake of the food; information on its nutritional composition; guidance on healthy eating; a warning against excessive intake (if necessary); any other special precautions relating to intake, and preparation or storage (Yamada et al. 2008). The FOSHU approval system is a voluntary system. “Health foods” can be marketed without FOSHU approval if they do not make express claims that the product causes a reduction in disease risk. This has resulted in an influx of products with suggestive packaging toward health, but no health claims (Health Functional Foods n.d.).

FOSHU foods form part of a broader ecosystem of health-related food products:

- **Health Foods:** these include foods and beverages prohibited to make health claims of functional claims but known to be beneficial for health.
- **Nutrition Foods:** these are foods and beverages allowed to make nutrition claims, mainly consisting of vitamins and minerals as their key ingredients. They are allowed to indicate the nutritional benefits of the foods.
- **Food for Specified Health Uses (FOSHU):** these include functional ingredient based foods such as dietary fibres, oligosaccharides and isoflavones which are allowed to make claims for specific health benefits (Food for Specified Health Uses (FOSHU) n.d.).
- **Food for Special Dietary Uses (FOSDU):** these are medical food for specific demographics with definitive nutrition supplementation requirements, such as pregnant women and infants.

These foods include products such as lactose-free, low protein infant formula amongst other with health claims permitted to be made (Consumer Affairs Agency 2011).

Functional foods in Japan had sales of US\$ 22 billion in 2012. The main health conditions that functional foods are used to address, and the number of individual product approvals for each condition are listed in Table 6.

**Table 6: Main Health Conditions Addressed by Functional Foods in Japan**

Rank	Health Conditions	Comments	Key Ingredients	Number of approvals (2011)
1	<b>Digestive Health</b>	Japan has the 3 <sup>rd</sup> highest rate of stomach cancers in the world; colorectal cancer rates are clearly lower than in Europe and Australia (Stomach Cancer Statistics, 2015).  The prevalence of IBS in Japan is high (about 20%) (Zhen et al. 2014)	Oligosaccharides	350
2	<b>Cardiovascular Disease</b>	Heart disease is the second most prominent cause of mortality in Japan, and coronary heart disease (CHD) accounts for approximately half of heart disease-related deaths (Iso 2008). However, in global comparison the CVD death rate is very low in Japan (Coronary Heart Disease 2011).  Only about 3.5% of Japanese adults are obese. When overweight is also included then the figure is 15-17% (Ng et al. 2014)	Chitosan Omega-3 Polyphenols Peptides Dextrin	473
3	<b>Bone Health</b>	11.6 million Japanese (10% of total population) suffered from osteoporosis in 2007, a figure that will increase as the population ages (Japan n.d.)	Mixture of xylitol, calcium monohydrogen phosphate and fukuronori extract	53

## Korea

In South Korea, functional food regulation is focused on the regulation of specific ingredients. The Korean Health/Functional Food (HFF) Act came into effect in 2004. Today, there are 37 ingredients listed in the Act for generic HFFs. If an HFF contains a new active ingredient that is not included in the generic 37 products, it is considered a product-specific HFF. The safety and efficacy of a new active ingredient is reviewed by the Korean Food and Drug Administration (KFDA) in order to receive approval as a product-specific HFF (Kim et al. 2006).

Applicants have to submit data on the special characteristics of the functional ingredient, and state the yield and change in content of functional component resulting from the main manufacturing processes. Submitted data should also include that on the history of use, manufacturing processes, amount to be consumed, results of toxicity tests, results of human study, and results of nutritional evaluation and bioavailability. The KFDA then evaluates the adequacy of this data (KFDA News n.d.).

The safety of the active ingredient should be validated scientifically with reference to a decision tree. When the safety and efficacy have been evaluated, the KFDA notifies the result of the evaluation. The KFDA issues the certificate of the functional ingredient contained in the HFF to the applicant, and the applicant may use this certificate and samples of the product to apply for final approval.

The applicant has to submit samples of the product with documentation on the method used to analyse the functional component to the KFDA, which validates the method, determines the contents of the functional component and, if the decision is made to grant approval for the product as an HFF, confirms the period of conformity and hygiene specifications (Kim et al. 2006).

Functional food in South Korea has become a major trend since the 1990's, with a functional food market estimated at US\$ 1.2 billion in 2010. Drivers for the functional food market in South Korea include the ageing population, busy lifestyles and long working hours, the well-being boom, low unemployment, and rising disposable incomes. The increase in stress has sparked an increase in the incidence of lifestyle related diseases, especially cancer and cardio-vascular disease. Therefore, functional foods aimed at preventing or alleviating such diseases will grow in popularity. Functional drinks, such as vitamin water, sports drinks and smoothies are well received in South Korea (Functional Food Market Brief Update – Republic of Korea 2012).

South Korea is a highly ingredient focussed market with red ginseng dominating the market overall as the top-selling ingredient. With its numerous presumed health benefits, especially its energising qualities, red ginseng sales are continually increasing. However, many of the presumed health benefits of red ginseng do not have robust scientific backup (Shergis et al. 2013). Aloe, vitamin and mineral supplements, glucosamine, and omega-3 fatty acid are all ingredients which have significant sales as well. Herbal ingredients are often considered more “trustworthy” among Koreans, as Korean traditional medicine utilises only natural ingredients (Functional Food Market Brief Update – Republic of Korea 2012). Although Korea is witnessing increasing mortality due to stomach cancers (International Agency for Research on Cancer, 2015; Stomach Cancer Statistics 2015), digestive health has not been an important target condition for functional foods. The CVD death rate is relatively low in Korea (Coronary Heart Disease, 2011). However, over one-third of men are overweight or obese, the corresponding figure for women is 27% (Ng et al. 2014). Child obesity rates are relatively high,

especially in boys. Overweight rates as well as diabetes in adults are projected to increase further. Hence there may be an increased interest in products that address CVD.

The Korean Food & Drug Administration (KFDA) regulates ingredients that can be used, and typically most products tend to consist of a blend of the 37 currently approved ingredients in various formulations. The overall product market for Korea is divided into two types of functional foods - generic and product-specific (Shen 2015).

**Generic:** generic products in Korea account for the bulk of the market and consist of various formulations of KFDA approved ingredients. Table 7 lists the approved generic ingredients currently available in Korea.

**Table 23: Thirty-seven Generic Functional Ingredients in South Korea**

Alkoxy-glycerol-containing product	Red yeast rice product
Octacosanol-containing product	Fructo-oligosaccharide-containing product
Lecithin product	Phytosterol-containing product
Embryo bud product	Soy-protein-containing product
Embroy bud oil product	Green-tea-extract product
Gamma-linolecnic acid-containing product	Propolis-extract product
Spirulina product	Glucosamine-containing product
Chlorella product	Chitooligosaccharide-containing product
Probiotics-containing product	Chitosan-containing product
Yeast-containing product	Beta-carotene product
Squalene-containing product	Soft-shelled-turtle product
Pollen product	Japanese apricot-extract product
Yeast product	Aloe product
Royal jelly product	Mushrooms product
EPA/DHA containing product	Chlorophyll-containing product
Eel oil product	Mucopolysaccharide product
Red ginseng product	Fermented vegetable-extract product
Ginseng product	Grape seed oil product
Nutritional supplement	

(Functional Food Market Brief Update – Republic of Korea 2012)

**Product specific foods:** Any products that make specified health claims come under this category (see Table 8). These products have a different system of certification and require much higher levels of scientific verification (Shen 2015). This sector is witnessing increasing growth as more companies apply for product-specific recognition so their product can boast health benefits, which attract consumers (Functional Food Market Brief Update – Republic of Korea 2012).



**Table 8: Main Health Conditions Addressed by Functional Foods in South Korea**

Rank	Health Conditions	Comments	Key Ingredients
1	Mental health, Cardiovascular Health (Shergis et al. 2013)	Red ginseng is the top selling health ingredient in Korea with sales at US\$ 1.2 billion in 2009 (59% of overall market for health foods) (Baeg & So 2013), and addresses health issues such as mental health	Red Ginseng (Choi et al. 2013)
2	Healthy lifestyles	Korean consumers tend to prefer herbal extracts over other types of functional ingredients (Functional Food Market Brief Update – Republic of Korea 2012)	Herbal Extracts (Aloe, vitamin and mineral supplements) (Functional Food Market Brief Update – Republic of Korea 2012)
3	Digestive Health (Bang et al. 2007, Hong et al. 2009, Park et al. 2012) Immune Health	Approval of Korea’s first probiotic claim driving increased interest (Grebow 2014)  Dietary fibre is an emerging segment in functional foods driven mainly by imported products	Probiotics & prebiotics

\* References indicate only some examples of local ingredients/studies. A comprehensive literature review on the health benefits of various ingredients is beyond the scope of this review.

The Korean functional food market is well developed, and as a result presents opportunities for international manufacturers, a fact that is apparent with the influx of probiotic products in Korea since the health claim was approved. While traditional ginseng demand will remain stable, the demand for western products such as omega-3 and probiotics is expected to rise (Jung et al. 2014).

## Malaysia

The Ministry of Health of Malaysia has assigned three bodies - the Department of Food Quality, Malaysian National Codex Committee, and The National Pharmaceutical Bureau - to participate in the implementation of laws for functional foods. Results from clinical trials have to be presented before health claims can be made regarding a particular product. Malaysia has formally commenced and executed its dietary guidelines, but functional food claims are not included in the guidelines (International Life Sciences Institute 2014).

At present in Malaysia, there is no official definition for functional foods (Stanton et al. 2011). While the mechanisms have been put into place to govern functional foods, the actual governance is still quite vague and nebulous.

The Committee for the Classification of Food-Drug Interface Products provides official guidelines to determine whether a product is a food or a drug (Ministry of Health Malaysia, n.d.). Food products contain 80% or more of food ingredients, 20% or less of biologically active ingredients of natural

products with pharmacological and/or therapeutic properties, and are regulated by Food Safety and Quality Division (FSQD). Drugs contain less than 80% of food-based ingredients and more than 20% of the active ingredients, and are therefore governed by the National Pharmaceutical Control Bureau (NPCB).

Functional food in Malaysia typically comprises traditional functional food, which is essentially conventional food known to have healing properties, and modern functional food (see Table 9) (Tan 2008).

**Traditional functional foods:** Malaysia has a variety of ethnic populations (Malays, indigenous tribes, Indians and Chinese) (Hassan & Mustapha 2010, Rezai et al. 2012) and each of these populations tend to focus on various traditional foods for their health related properties. For example, the Malay population consume functional foods that supposedly can boost vitality and preventing aging, cancer, diabetes and hypertension, such as mengkudu/noni juice (*Morinda citrifolia*) (Wang et al. 2002, Nandhasri et al. 2005), petai (*Parkia speciosa*) (Wong et al. 2006), pegaga (*Centella asiatica*) (Mohd Ilham et al. 1998). The Chinese population consumes functional foods claiming to have antioxidant effects and prevent cancer, such as ginseng (Yi 1999), soybean (*Glycine max*) (He & Chen 2013) and green tea (Fujiki et al. 1996) and the Indian population consumes functional foods such as turmeric (*Curcuma longa*) that helps suppress multiple myeloma and blood cancer (Krishnaswamy 1996), or cumin (*Cuminum cyminum*) for the treatment of diarrhoea and jaundice (Iyer et al. 2009). However, for many traditional functional foods the actual scientific substantiation of the health claim can be weak or sometimes even non-existing.

**Modern Functional foods:** These functional foods contain nutrients and possess functional benefits that are scientifically validated and based on academic verification (Tan 2008). These typically include (Lau et al. 2012):

- **Fortified Foods:** Foods fortified with additional nutrients such as vitamin fortified fruit juices
- **Enriched Foods:** Foods with added new nutrients or components not naturally occurring such as enriched phytosterol spreads
- **Altered products:** Foods from which a deleterious component has been removed, reduced or replaced with another substance with beneficial effects e.g. fibres as fat releasers in meat or ice cream products

- **Enhanced products:** Foods such as eggs with increased omega-3 content which has been naturally enhanced through special growing conditions, new feed composition, genetic manipulation or otherwise.

**Table 9: Main Health Conditions Addressed by Functional Food Opportunities in Malaysia**

Rank	Health Conditions	Comments	Key Ingredients*
1	Cardiovascular disease	34% of overall mortality in Malaysia is due to cardiovascular disease (CVD). CVD is the leading cause of mortality, followed by stroke (Health Profile Malaysia n.d.)  Malaysia's obesity rate is the highest in Asia (49% of women and 44% of men are obese or overweight) (Ng et al. 2014)	Omega-3 (Yashodhara et al. 2009), Phytosterols, Beta-glucan (Kanagasabapathy et al. 2013), Soy Isoflavones (Gil-Izquierdo et al. 2012)
2	Digestive health/ immune health	Immune health is driven by increasing incidence of pneumonia. Influenza and pneumonia are the 3 <sup>rd</sup> common cause of mortality (Health Profile Malaysia n.d.). Colorectal cancer (CRC) is the most common cancer in Peninsular Malaysia among men and the third most common among women. It is twice as common in Chinese compared to Indian and Malay (Ghee 2014). The prevalence of IBS in ethnic Malays is around 10% (Lee et al. 2012).	Probiotics (Shah 2013), Dietary fibre (Aida et al. 2009), Traditional Chinese Medicine (Chang & Lee 2004)
3	Cancers	Cancer prevention is a key focus area as over 10% of mortality is due to cancer (Health Profile Malaysia n.d.).	Tea catechins (Ghasemzadeh et al. 2010), Lycopene (Shahar et al. 2011), Flavones (Ghasemzadeh et al. 2010), Other carotenoids (Ooi et al. 1994)

\* References indicate only some examples of local ingredients/studies. A comprehensive literature review on the health benefits of various ingredients is beyond the scope of this review.

Currently, in Malaysia, more consumers are trying to include healthy and nutritious food in their diet as consumers become more aware of food choice and the link between food and health. The greatest concentration of functional foods is seen in energy drinks, infant and other milk formulae, dairy-based drinks, and sports drinks. Others functional foods include fruit juices, breakfast cereals, energy bars, biscuits and baked products, drinks containing Asian herbs, fresh eggs with omega-3 / selenium, and fresh chicken enhanced with DHA (Stanton et al. 2011). Trade sources estimate that between 30% and 40% of the total processed and retail packed food and drinks market in Malaysia is marketed as functional food (Stanton et al. 2011).

## Singapore

Singapore has no separate regulations on functional food. The *Sale of Food Act* and the Food Regulations, administered by the Agra-Food & Veterinary Authority (AVA), govern the import and sale of food in Singapore including food fortified with nutrients and food with added herbal ingredients. The Act prohibits the sale of foods unsafe for human consumption and pre-packed food improperly labelled or labelled in a misleading manner (Marketing Health Supplements, Fortified & Functional Foods in Asia: Legislation & Practice 2009).

These regulations define standards on food safety and specification, labelling and advertising (including the use of claims); permitted additives and their maximum limits, and tolerable limits for chemical residues. While there is no legal definition for fortified foods and functional foods under the *Sale of Food Act* and the Food Regulations, the AVA in 2009 allowed an additional five new nutrient specific diet-related health claims on certain food products.

According to AVA's "A Guide to Food Labelling and Advertisements", food products which have vitamins and minerals, and other health claims (nutrient function, application for use of nutrient specific diet-related health etc.) are required to have a special label. However, these food products have to first be approved by the Singapore's Health Promotion Board (HPB) as worthy of the Healthier Choice Symbol (HCS). Only then will the products be allowed to use AVA's new health claims (International Life Sciences Institute 2014).

In Singapore, there is currently no official legislative definition of the term "functional foods" (Tee 2004). However, the country is witnessing an increasing number of initiatives to stimulate the industry, such as the Health Promotion Board (HPB) and SPRING Singapore providing grants worth more than S\$10,000 to Singapore's functional foods industry (10k Grant for Manufacture of Functional Foods that Fight Disease, 2012). At present, functional food in Singapore can be broadly categorised into two main forms of products; **enriched products** (a food with added new nutrients or components not normally found in a particular food, e.g. margarine with phytosterols) and **fortified products** (a food fortified with additional nutrients, e.g. omega-3 enriched milk powder).

The main health conditions in Singapore that may provide opportunities for functional foods are listed in Table 10.

**Table 10: Main Health Conditions Addressed by Functional Foods in Singapore**

Rank	Health Conditions	Comments	Key Ingredients*
1	Cardiovascular disease and weight management	30% of overall mortality in Singapore is due to CVD (Singapore 2014).  44% of men and 33% of women are overweight or obese (Ng et al. 2014). Obesity and diabetes rates are rising in Singapore.	Omega-3 (Koh et al. 2013), Phytosterols (Chen et al. 2010) Functional ingredients for weight management (protein, fibre) are just emerging
2	Digestive Health	Colorectal cancer is now the most common cancer in Singapore (National Cancer Centre Singapore n.d).  Irritable bowel syndrome (IBS) affects one in 10 Singaporeans (Ng 2011).  Stomach cancer rates are not very high (compared to colon cancer), but they vary based on sex and ethnicity (National Cancer Centre Singapore 2014)	Probiotics, Dietary fibre, Traditional Chinese Medicine (Lim et al. 2005)

\* References indicate only some examples of local ingredients/studies. A comprehensive literature review on the health benefits of various ingredients is beyond the scope of this review.

Overall, ingredients are broadly classified into vitamins and minerals, other bioactive substances and herbs. There is a growing awareness for functional food in Singapore, but the market is still at a very nascent stage.

### 2.9.3 Market Drivers for Functional Foods in Asia

Functional food consumption tends to be influenced by a variety of demographic and social factors. In Asia in particular, health concerns are a major influence. Some of these factors are mentioned below that are relevant to most markets in Asia.

However, there are differences within markets, especially in large countries like China. Literature which would enable the qualification of the differences in food habits in particular regions in the same market is not available. Thus the market drivers described are more general.

**Increasing academic validation spurring awareness:** Various studies and published research services have highlighted the benefits of using different functional ingredients in food and beverages, resulting in an increased awareness of these ingredients among end users (Van Kleef et al. 2005). Consumers are known to purchase products with nutritional and functional ingredients for their preventative, rather than curative, claims (Leatherhead Food Research 2014). Technological advances have helped

to identify ingredients for fortification, creating further opportunities for stressing the health benefits of functional foods. The growing scientific basis of these ingredients is acting as key market drivers for the industry.

**Ageing population:** According to the United Nations Population Division, over 50% of the world's elderly (65+) live in the Asia-Pacific (APAC) region. This is increasing the burden of chronic diseases. The number of older persons in the region is expected to triple from 438 million in 2010 to more than 1.26 billion by 2050. By then, almost two thirds of the world's elderly will be living in APAC, with one in four people in the region expected to be over 60 years old (ESCAP 2013).

This large elderly population will lead to a significant increase expenditure on healthcare, and this is driving a focus on preventative medication. This factor is driving investment and research into how nutrition can play a role in managing the health of elderly people, and a greater focus on providing functional foods to this demographic group is likely to result (Kuzuya et al. 2005, Soon et al. 2008, Kim et al. 2012).

**Growing incidence of overweight, obesity and metabolic disorders:** Overweight, obesity and related metabolic disorders are rising in APAC (Asia Pacific Cohort Studies Collaboration 2007; Ng et al. 2014). Over 40% of Malaysian adults are overweight or obese, and in other countries, especially China, the number of overweight or obese people is also growing, and exceeds 30% of the population, although Japan has the lowest level of obesity both in young and in adults (Ng et al. 2014). 12-23 % of children and adolescents (under 20 years) are typically overweight or obese in APAC countries. Typically boys are more overweight than girls. There is an increasing trend of diabetes, hypertension and CVD in Asia (Ramachandran & Snehalatha 2010, Danaei et al. 2011).

Similarly to the growth in the ageing population, obesity and metabolic disorders will drive expenditure on healthcare. Preventive measures in various countries have included dietary and physical activity guidelines, social programmes (e.g. at schools, in working places), and collaboration with parents (for example see Soon et al. 2008).

**Growing incidence of allergies and intolerance:** As incidence of intolerances and allergic reactions continues to increase in Asia, demand for foods designed to address these conditions such as gluten-free and lactose free foods has grown. For instance, around 90% of the Chinese adult population is deemed to be lactose intolerant (Wang et al. 1984), making this a growing market for products such as soy milk and for lactose-free dairy products.

Coeliac disease (gluten intolerance), which is still rare amongst Asian populations (Cummins & Roberts-Thompson, 2009), has increased, now affecting about 1% of the population, particularly as populations

move from a predominantly rice-based diet to one that involves greater consumption of wheat (Perkins n.d.). Non-coeliac gluten sensitivity (NCGS) is a condition where a non-coeliac person reacts negatively to gluten containing grains. However, this condition is still relatively rare and does not explain the increase in the consumption of gluten-free products. Instead of coeliac disease and NCGS, the main driver for the consumption of gluten-free products is the self-diagnosed gastrointestinal symptoms related to the consumption of highly processed cereals (Leatherhead Food Research 2014). Lately it has been speculated that the perceived symptoms are actually due to carbohydrates, not protein (gluten) in cereals (Watson 2015). Gluten-free diets can also have a negative impact on health. Whole grains and their fibres have protective effect against heart disease, type two diabetes and weight gain (Okarter & Liu 2010).

Another factor driving occurrences of allergies, especially of respiratory allergies, is increasing pollution in the overcrowded and highly urbanised Asian cities (Nicolaou et al. 2009). Additionally, while nut allergies tend to be rare in Asia, unlike Australia there is a growing incidence of shellfish allergies (Lee et al. 2013).

These factors will drive the growth of demand for specific products to address these conditions as awareness and incidence of allergies continues to rise across the region. For example, the Asian market for gluten-free foods is forecast to exceed US\$500 million by 2018, a CAGR of 8% from 2013. Over the period 2001 to 2010 gluten-free has been the fastest growing health and nutrition-related claim on new food products (APFI 2014).

**Rising healthcare costs:** Healthcare expenditure has been rising in APAC because of the increased chronic disease burden (Tsui 2008), growth of medical tourism (Laing & Weiler 2007), and implementation of the latest technologies in healthcare (WHO 2009).

In some Asian countries (such as Singapore) medical costs are increasing at 10% every year. Consumer spending on insurance or business spending on the healthcare costs of employees is increasing steadily in countries such as Japan and Singapore (Taylor & Blair 2003, EY 2013). If the current trend holds, by 2050 most Asian economies will spend 20-30% of GDP on healthcare alone. This will be a huge burden on the economies and is stimulating investment into preventive healthcare that can include the consumption of functional food.

#### ***2.9.4 Market Restraints for Functional Foods in Asia***

The following market restraints are affecting overall market growth in functional foods:

**High raw material costs:** Increasing raw material costs are affecting many food producers. The cost of these raw materials tend to travel down the supply chain and results in rising costs in an already price sensitive food market. This factor is expected to restrain growth especially for products without health claims (Phuah et al. 2015).

**Consumer uncertainty around functional foods:** Functional food consumers are not a uniform consumer group, and therefore their attitudes can vary and can even be contradictory. Some of the issues and concerns that consumers can have with functional foods can include:

- Health claims, although conveying the message of increased healthiness, do not necessarily make the product more appealing to consumers.
- Any new characteristics (such as functional ingredient) in a food may signal decreased naturalness to consumers.
- Consumers are often cautious with any novel/unfamiliar ingredients in foods.
- Claiming health in products seems to suggest lower expected pleasantness and thereby lower hedonic value to consumers. (Lähteenmäki 2013).

**Inability to provide “quick fix” solutions:** Functional food products for the most part do not have immediate benefits, and typically any improvements are a result of sustained consumption (Leatherhead Food Research 2014, Mellentin 2014). The effects of functional foods vary from person to person depending on genetic and environmental conditions (Ferguson 2014). Many consumers of products with functional ingredients believe that these ingredients will quickly cure certain conditions or diseases. However, functional foods are not marketed as a “cure” but rather implicitly as a preventive option. However, some consumers who find that consumption of functional foods is not treating an existing condition may consequently lose faith in the entire functional food concept.

**Lack of consistency and complexity in regulatory approval across countries:** The approval process for functional foods generally differs by country and is often complex and time-consuming (Khan et al. 2013). The time and investment required to gain approval can often deter companies from going through a formal regulatory process (Hobbs 2002, Spence 2006, Bech-Larsen & Scholdered 2007, Mariotti et al. 2010). This has resulted in a large array of products on the market with suggestive packaging but no actual scientific validation or academic credibility and health claims, further affecting the reputation of safety and efficacy of functional food (Tee 2002).

### **2.9.5 Technology Trends in Functional Foods in Asia**

Advances in scientific research and technologies are providing a number of new opportunities for functional food products. Opportunities offered by technology to SA-based firms to exploit the functional food market will be examined in more detail in another stage of the project. Hence, the comments below are restricted to some of the main areas of scientific and technological research that are relevant to functional food.

Japan and Korea tend to lead functional food technology research in the Asian region. Japan has been one of the pioneers in functional food development (Arai et al. 2002); and is well known for its probiotic products, seaweeds, and other algae-based health food. Most Japanese functional food research tends to focus on gastrointestinal, cancer and cardiovascular diseases. In addition to technology being researched in Japan, Korea is also focussing on development of better delivery of bioactive products by microencapsulation and polymer technology.

Some of the main areas of research and technology development in Asia include;

- Anti-oxidative factor database research: as the links between oxidative stress and diseases such as cancer and diabetes continue to become understood, there is growing focus on anti-oxidative research in Japan, such as biomarker technology to produce antibodies that can link to oxidative damaged sites and help inscribing of new antioxidant products from plants (Yeum et al. 2010). A system is currently being built in Japan, using the latest technology for the screening of food components, to identify candidate cell signalling pathways of antioxidants or other factors (Ha et al. 2014).
- Hypoallergenic wheat and soybean products: utilisation of enzymatic decomposition, sugar moiety introduction, molecular engineering to retract allergic molecules from flour and allowing for retention of nutritional content of the product (Yang et al. 2012).
- DNA microarray techniques: the DNA chip microarray technique is currently the most popular technique in analysis and understanding systematic screening of gene expression. Previous experiments on aging and apoptosis of cultured cells that used microarrays has provided useful data and continues to be the technology of choice in new ingredient research (Carey & Kostrzynska 2010).
- Functional biopolymers: there is growing use of microbial technology to synthesise bio based polysaccharides for use in functional food such as dextrans. Microbial synthesis allows better

control of environmental conditions and therefore overall production efficiency (Giavasis 2014).

- Enzyme based absorption technology: Utilisation of enzymes to help in absorption of ginseng into the body allowing for the maintenance of other nutrients and increasing bioactivity significantly (Watson 2012).

### ***2.9.6 Competitive Scenario in Functional Foods in Asia***

The competitive environment for SA in the functional food products and markets selected for further evaluation will be assessed in the Market Analysis phase of the project. Hence, the commentary below focuses on the overall structure of the functional food industry in the main markets that can be obtained from published sources.

**China:** The Chinese functional food industry mainly consists of small and medium sized companies, with the market share of large corporations (top 10 industry players) currently less than 25%. However, China's 12th Five-Year Development Plan for the Food Industry is aiming to develop at least ten enterprises with product sales revenue exceeding RMB10 billion in functional foods. Functional food manufacture is concentrated in the six coastal provinces/cities, including Beijing, Guangdong, Shandong, Shanghai, Jiangsu and Zhejiang, which account for about half of the national total of production. As the economy grows, there is also a growing influx of multinational health food enterprises, such as Amway, Johnson & Johnson, and Herbalife. The traditional health food market is dominated by enterprises including Wangji, Golden Sun, Hong Fu Loin and Joincare. Other large manufacturers include Hangzhou Wahaha, Want Want Holdings Ltd, Inner Mongolia Yili Industrial Group Co Ltd, Bright Food (Group) Co Ltd, China Mengniu Dairy Co Ltd, Mars Inc, Yakult Honsha Co Ltd, Orion Group, Mondelez International Inc. and Shanghai Jiaoda Onlly (Market Access Secretariat 2014, Wong 2014).

**Japan:** Large corporations that specialise in functional foods are common in the Japanese market. The main participants are generally large corporations with multiple product portfolios that produce functional foods as part of a broader range of food products. These include Suntory Holdings, Meiji Milk, Otsuka, Yakult, Morinaga, Meiji Seika, etc. Almost all the bestselling functional food products in Japan are drinks or in format that are easily incorporated into drinks (Aoki & Meade-Frazier 2014).

**Korea:** Like Japan, the Korean functional food market is also dominated by well-established and large corporations. This is largely because of the regulatory process where the mandatory KFDA recognition process for functional foods is costly and time-consuming, therefore allowing only established

companies to be able to afford it. However, there is also a large base of smaller companies. As of 2009, the number of functional food companies stood at 63,601 including manufacturers, importers and distributors. Local producers tend to dominate the overall industry, while imports cater primarily to the weight management market (Shim 2012). Overseas companies active include Amway, Herbalife, Susana, Melaleuca, and Sunrider. CJ Corp, Daesang, and Lotte, are large domestic manufacturers, while other functional food businesses include Nam Yang Aloe, Kim Jung Moon Aloe, Pulmuone etc. (Fogarasi 2010).

**Malaysia and Singapore:** The functional foods markets in Malaysia and Singapore include many smaller enterprises, while large enterprises are mostly multinationals who compete mainly in the beverages market. The large manufacturers are generally food & beverage companies moving to value added production as opposed to pharmaceutical companies moving to less regulated markets. Typically manufacturers include dairy processors, followed by the baked goods manufacturers, with companies such as Nestlé, F&N (Fraser & Neave), Mamee Double Decker (MDD) group of companies, Yakult, Kraft, Permanis, Yeo Hiap Seng, etc. (Stanton et al. 2011).

There is a growing demand for local functional food industry development as seen with the Singapore government's aim to fund local companies who enter the market, and is driving increased international interest in developing local partnerships (New Zealand Trade and Enterprise 2012).

### ***2.9.7 Routes and Channels to Market in Asia***

Market sales and distribution channels for functional foods will be examined in more detail in the Market Analysis stage of the project. The following section will aim to provide an overview of the distribution channels in the key markets, based on information from published sources.

**China:** Distribution of health foods in China involves a fragmented network of connections (see Figure 2) at both national and regional levels, resulting in many layers of distribution (RedFern Associates 2010).

Manufacturers or importers typically supply to national distributors who in turn sell to sub-distributors or via e-commerce options. The sub/regional distributors supply to retailers (Asian Food Regulation Information Service, 2014).

Distributors: typically distribution companies in tier-one cities (Beijing, Guandong, Shenzen and Shanghai) gain distribution rights from foreign companies, and then select provincial sub-distributors to penetrate local markets. Typical distribution channels tend to be highly specialised in nature,

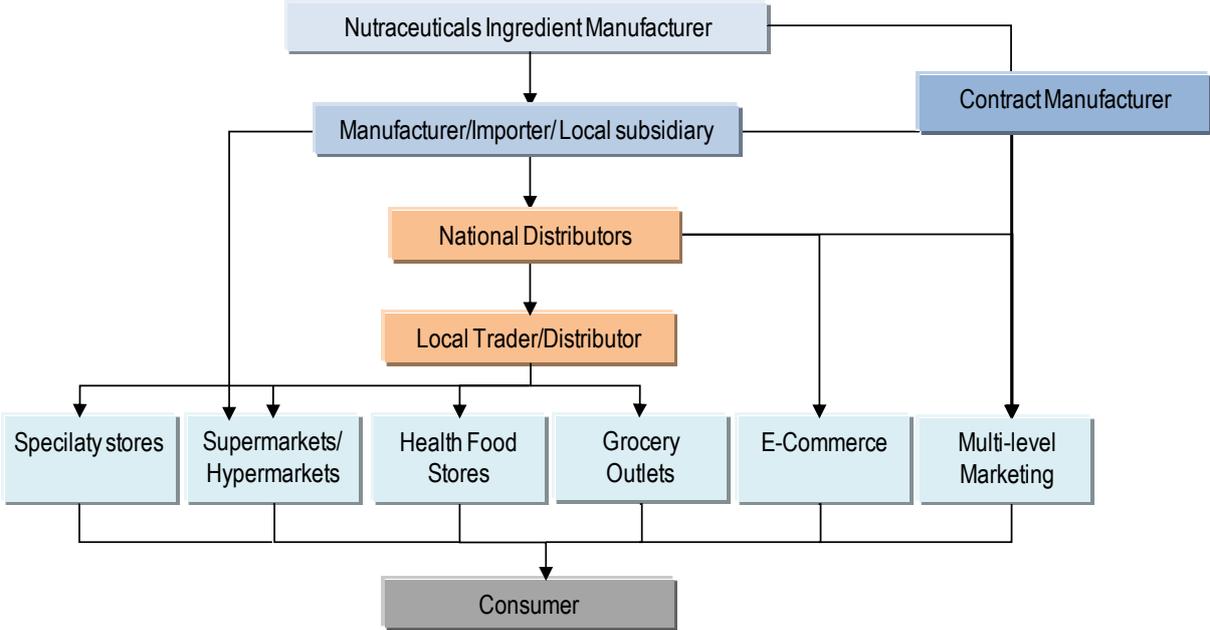
resulting in multiple partners to cater to focussed end user segments such as children and sports & fitness. Distributors face the toughest market scenario in China, with large pressures on margins due to a consolidated retailer base and additional fees for listing, promotion, and festival fees all borne by the distributors. Sub-distributors are usually employed for specialist channels and receive a lower margin compared with master distributors (Wong 2014).

Multi-level marketing: this channel involves direct selling, conference marketing, academic marketing and other models. Enterprises using the direct selling and conference marketing models achieve higher sales revenue due to their increased levels of consumer interaction, and therefore better clarification of value addition of their products. In addition, the implementation of the Regulations for the Administration of Direct Selling in 2005, granted legal status to direct selling of health food, giving it much popularity and reducing middle-men and consequent operating costs.

E-Commerce: As internet use grows rapidly, online is becoming an increasingly important sales channel, with many companies selling through their websites or through main aggregator sites such as Tmall (Alibaba). E-commerce allows lower overhead costs and therefore cheaper prices to consumers. Two major sales models operate in China for functional food e-commerce:

1. An enterprise may establish its own e-commerce platform, or partner with third-party platforms such as Tmall.com and Taobao.com.
2. Many large suppliers of health products now have their own online platforms in addition to operating brick-and-mortar stores. Consumers are encouraged to try the products in the in store before buying them online (Market Access Secretariat 2014, Wong 2014). Also there is a growing focus on word of mouth advertising and using websites to evaluate consumer feedback before purchasing (C to C sales).

**Figure 2: Market Distribution Channels – China**



Source: Frost & Sullivan, 2014a

**Japan:** There are six distribution channels for functional foods in Japan – including speciality stores, supermarkets and hypermarkets, health food stores, general grocery outlets, e-Commerce and multi-level marketing (Aoki & Meade-Frazier 2014).

The overall sector is characterised by a split between store and non-store channels. While store sales are typically focused on pharmacies, health food stores and traditional food stores, the non-store sector is characterised by channels such as e-Commerce and multi-level marketing (including door to door sales and mail order sales). Key participants in the non-store channels are Miki Corporation and Amway Japan (door to door sales), and in mail order sales Suntory Japan and Yazuya Corporation (Yano Research Institute 2009).

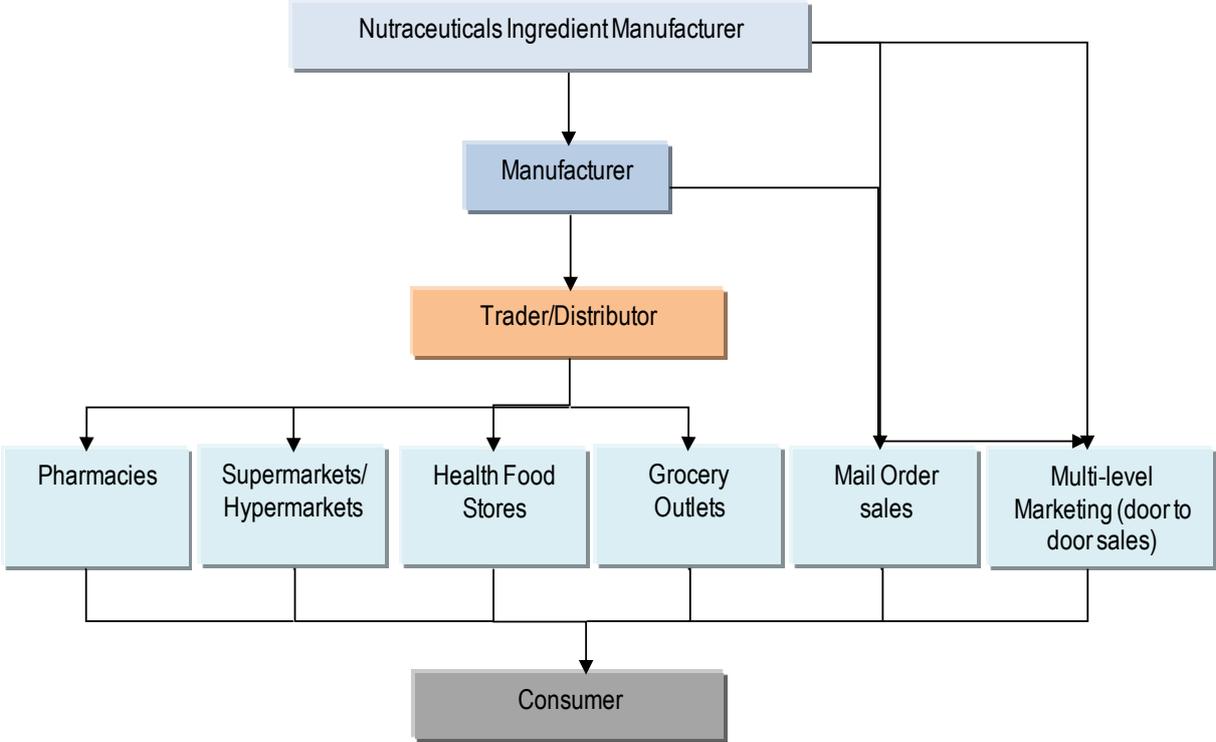
Door to door sales: Multi-level marketing and door to door sales is a popular way to sell expensive products or introduce new ingredients to consumers as the value proposition is easily conveyed.

Mail order sales: this is the fastest growing segment for functional food sales (New Zealand Trade & Enterprise 2011). The main consumers are young and middle aged internet users. The focus is on convenience and easier decision making with a large product portfolio.

Retail stores: Consumer focus varies depending on whether the product being purchased is well known or a new ingredient. Well-known ingredients such as amino acids tend to sell better at retail stores, while lesser known ingredients (e.g. propolis) are preferably purchased from health food stores (New Zealand Trade & Enterprise 2011).

Most functional food manufacturers tend to follow the distribution channel depicted in Figure 3 below to address routes to market in order to ensure they reach the optimal penetration in the Japanese market.

**Figure 8: Market Distribution Channels – Japan**



Source: Frost & Sullivan, 2014a

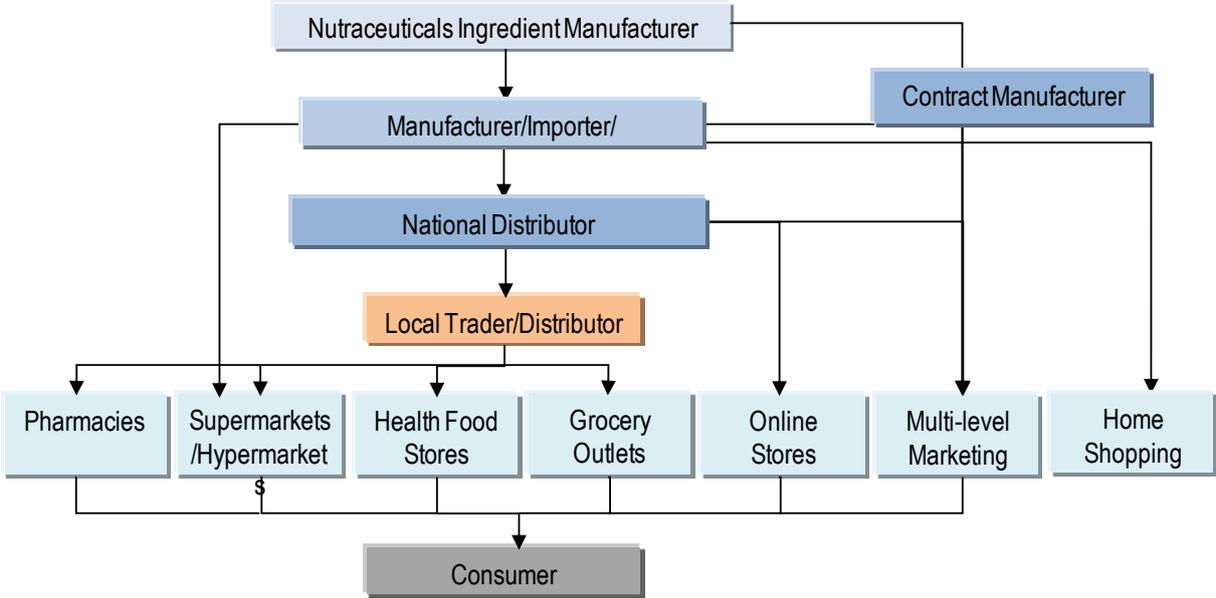
**Korea:** The route to market in Korea varies from that of Japan due to a larger role played by distributors across the country (See Figure 4). Most distributors tend to have smaller regional distributors who help them penetrate the market further. However, all advertising and marketing is conducted on the budget of the large distributors or the company subsidiary. The primary distribution channels across Korea are drug stores, large retail stores, online stores, and home shopping cable TV channels (Shim 2012).

Of these channels, online sales account for over a fourth of the market. This is followed by specialised stores, hypermarkets, health food/drug stores, TV home-shopping channel and department stores (New Zealand Trade and Enterprise, 2011).

While both large local and international companies sell either through multi-level marketing or use direct sales with their own sales network, smaller to medium-sized local importers tend to open a website and use it as a test bed for imported items. Once a brand is established in the market, expansion then occurs into department stores, pharmacies, or TV home shopping. TV home shopping

is becoming an increasingly popular medium, though this is attributed to the fact that many health food manufacturers, such as CJ Corp, also have their own TV channel and aggressively promote these products (Heller 2010).

**Figure 4: Market Distribution Channels – South Korea**

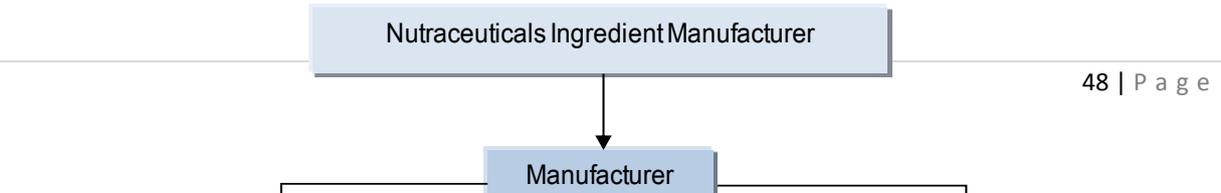


Source: Frost & Sullivan, 2014a

**Malaysia and Singapore:** Distribution channels include health food shops, hypermarkets and supermarkets, as well as traditional Chinese medical shops and grocery outlets. The fragmented situation in the channels arises because products are available across most retail formats, for instance functional drinks such as isotonic drinks, energy drinks and, even cultured milk drinks have very broad distribution channels that range from street side drinks stalls through to large hypermarkets.

Distributors typically provide functional foods as an additional high value product to retailers, who either purchase locally or directly from the foreign manufacturers.

**Figure 5: Market Distribution Channels – Malaysia and Singapore**



*Source: Frost & Sullivan, 2014a*

## **2.10 Australian Functional Food Market**

### **2.10.1 Market Overview**

The burden of disease in Australia, and the economic costs associated with it, is an increasingly top-of-mind issue among policymakers. In 2013, over AU\$140 billion was spent on health care services, which is nearly 9% of Australia's total gross domestic product (The World Bank 2015). This has led to an increasing recognition of the importance of preventative medication and health management (Shanahan & de Lorimier 2014). The Australian population is also developing a growing awareness of lifestyle diseases and the role of functional food and beverages in aiding in the prevention or management of these diseases (Turton 2013). The Australian functional food and beverage market was valued at US\$ 2 billion in 2009 (Sharma 2010) growing from US\$ 790 million in 2003 (Tapsell et al. 2005).

### **2.10.2 Key Sectors**

Functional foods in Australia are categorised into two types (Tapsell et al. 2005):

- Minimally transformed foods containing known bioactives (such as dairy, fruits and vegetables). These include natural foods such as grains and meat that can capitalise on their intrinsic health benefits and bioactive properties.
- Substantially and elaborately transformed food products including:
  - Food ingredients with known bioactive ingredients
  - Foods containing added bioactive ingredients
  - Beverages with known bioactive ingredients
  - Beverages with added bioactive ingredients

Table 11 lists some of the major health conditions addressed by functional foods in Australia.

**Table 11: Main Health Conditions Addressed by Functional Foods in Australia**

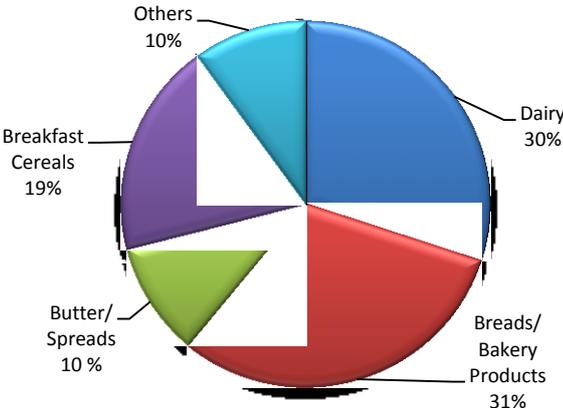
Rank	Health Conditions	Comments	Key Ingredients
1	Cardiovascular health	Cardiovascular disease is the leading cause of death in Australia (Australian Bureau of Statistics 2015a)	Omega-3 (Mori 2006); Soy based foods (Scheiber et al. 2001); Folic acid, Vitamins B6 and B12 (Eichholzer 2006); Dairy ingredients (Rice 2014)
2	Weight management	69% of Australian men and 57% of women are overweight or obese. For boys and girls under 20 years the corresponding figures are 25% and 24%. These figures are at same level as in the USA (Ng et al. 2014)	Protein; Fibre (especially viscous/soluble) (Westerterp-Plantenga et al. 2009, Kristensen & Jensen 2011, Wanders et al. 2011)
3	Brain health	Number of deaths due to Alzheimer's and dementia conditions has increased 137% since 2004 (Australian Bureau of Statistics 2015a)	Green tea extract (Shimbo et al. 2004)
4	Immune health/ digestive health	Digestive disease healthcare expenditure is forecast to go up 238% from 2003 to 2033 in Australia (Goss 2008)	Probiotics (Marteau et al. 2001, Yan & Polk 2011, Sanders et al. 2013); Prebiotics (Roberforid et al. 1988, Ahmad et al. 2012, Patel 2015)
5	Bone health	Osteoporosis is listed as a significant health factor affecting the care needs in 12% of people receiving permanent residential aged care (Crisp et al. 2014)	Calcium & Vitamin D (Sanders et al. 2009) Magnesium (Orchard et al. 2014)

**Functional Food by End Product:**

**Solid Functional Food:** Bakery products and dairy hold almost even shares of the solid functional food market. This is followed by breakfast cereals, spreads and others (See Figure 6) (Frost & Sullivan 2014).

The functional dairy segment is anticipated to grow due to high demand for probiotics to maintain gut health (Probiotics Australia n.d.). All other segments exhibit moderate growth. The breakfast cereal segment is exhibiting low-to-moderate amount of growth, as many people are unable to make time for breakfasts in their fast-paced lives (Kellogg’s Nutrition Advisory Service 2009).

**Figure 6: Functional Food Revenue by Product Type, Australia**

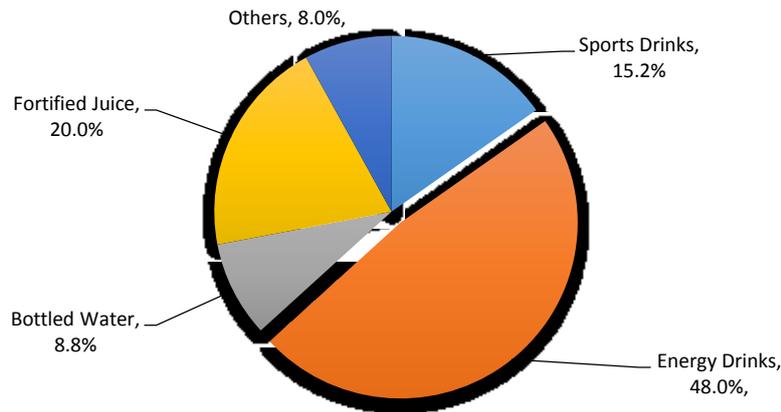


Source: Frost & Sullivan, 2014a

**Functional Beverages:** Energy drinks are the dominant product in the Australian functional beverage market (see Figure 6). This segment will continue to experience high growth rates due to its popularity among the younger generation (Australian Medical Association 2013).

Sports drinks and dairy drinks are expected to see high growth rates, whereas fortified juices and bottled water are expected to see moderate growth. Others, such as soy drinks, are anticipated to grow as more consumers opt for the health benefits offered from soy (FJA 2013). Overall, energy drinks will continue to maintain their dominant position at the expense of other slower growing product sections (Bowling 2014).

**Figure 7: Functional Beverage Revenue by Product Type, Australia, 2014**



Source: Frost & Sullivan, 2014a

### 2.10.3 Regulations of Functional Food in Australia

There are two main bodies – Food Standards Australia and New Zealand (FSANZ) and the Therapeutic Goods Administration (TGA) - that regulate the Australian market. Australia tends to treat functional foods as more therapeutic (drug based) than food based, and regulates natural health products differently than food, using a product-specific system with a more substantial level of evidence required (Malla et al. 2013). For functional foods, regulations currently restrict the use of claims to nutrient content and health maintenance claims (Williams et al. 2008). Claims regarding prevention or reduction of disease risk are currently prohibited (with one exception about folate) though in spite of this health claims are present on labels, in advertising and the internet.

**FSANZ:** this body regulates the food & beverage industry in the Australia New Zealand region to ensure that standards are met for all food and beverage products. A new standard was established on January 2013—Standard 1.2.7—Nutrition, Health & Related Claims and it has three new criteria (Food Standards Australia New Zealand 2014a):

- General Health claims must be made from the 200 pre-approved claims listed in the new standard.
- They must include a nutrient profiling score (NPSC), where claims cannot be made on foods high saturated fat, sugars or salt.
- Self-substantiation of health claims by producers must be registered with the FSANZ.

A new star rating on food packaging to indicate its nutrition value has been introduced (Health Star Rating System). This will aid consumers in identifying genuinely healthy functional food/beverages.

**TGA:** The Therapeutic Goods Administration regulates the pharmaceutical products, and nutraceutical /dietary supplements, which are classified as complementary medicines. Manufacturers require an approved health claim before they can advertise a health benefit on their packaging.

FSANZ allows two main types of claims:

- **General-level Health Claim:** The nutrient present and its effect on the overall health.
- **High-level Health Claims:** Those that make reference to a serious disease or biomarker, and need pre-approval from FSANZ through an application process.

#### ***2.10.4 Market Drivers for Functional Foods in Australia***

Some of the factors that are stimulating consumption of functional foods in Australia are summarised below;

**Increasing cost of healthcare and increase in lifestyle diseases encourages uptake:** The rise in lifestyle diseases (i.e. diseases resulting from lifestyle issues such as poor nutrition), is stimulating interest in foods that are perceived as helping to prevent diseases. The three main health conditions impacting the Australian population are diabetes, cardiovascular diseases and obesity (Australian Bureau of Statistics 2015a; Monash University n.d.). Obesity is typically caused by sedentary, unhealthy lifestyles which turn into a significant risk factor for diabetes and cardiovascular diseases. Consumers who wish to reduce their likelihood of contracting these diseases continue to drive demand for functional food (Williams et al. 2008).

**Increase in ageing population drives demand:** The ageing population in Australia drives demand for functional food. As older people are more susceptible to chronic illness, the increase in the ageing population translates into a greater proportion the population with chronic illnesses. Functional food will be seen as one way of preventing or managing such chronic conditions.

**Growing interest in preventative treatment:** there is growing interest in preventative measures (i.e. approaches and activities aimed at reducing the likelihood that a disease or disorder will affect an individual, interrupting or slowing the progress of the disorder or reducing disability (WHO Technical Report Series 2003). The growing interest in preventative approaches rather than treatment-based methods after a condition is incurred is increasing interest in functional food (Vella et al. 2014).

**Closer economic ties between Australia and Asia drives interest in Australian produce:** Australia is a large primary product exporter, and many Asian countries prefer Australian products for their known quality. In addition, the weakening of the Australian Dollar acts as an added incentive for Australian

products to be imported into Asia. This growing interest in Australian products and their more competitive costs are stimulating growth in functional foods. (Nolan 2014).

**Reliability of Australian science:** One of the strongest drivers for Australian functional food products is the fact that the academic verification provided by Australian universities is extremely well regarded, as is evident by a growing influx of research institutes tying up with Australian universities (Asian Correspondent 2011). This supports Australian functional food manufacturers, especially in Asian markets, where they provide products that have some degree of academic-based verification.

#### ***2.10.5 Market Restraints for Functional Food in Australia***

Some of the factors that are restraining growth of the functional food industry in Australia are summarised below.

**Limited product differentiation:** The Australian market is perceived as including various functional food products with little differentiation (Rowland 2010). This restricts market growth as products lack exclusivity (Frost & Sullivan 2014a). The key to overcome this challenge is by introducing more innovative product ideas; the more unique the product the higher the premium can be demanded.

The lack of clarity around the term functional food also creates confusion for the consumer. The ability of the products to provide true health benefits is often doubted, with many believing functional food to be a fad.

**Lack of differentiation against the US and EU:** The Australian food industry has benefited in Asian markets from the fact that its foods are safe (clean and green). However, since EU and the US also use the same argument, this is no longer a differentiating factor for Australian food products. Unique selling points are needed (FOODSA 2014a).

#### ***2.10.6 Technology Trends in Functional Foods in Australia***

Key technology trends in Australia revolve around formulations such as micro- and nano-encapsulation and ethnic ingredient profiling.

**Microencapsulation:** Microencapsulation involves the packaging of a core, i.e. bioactive or functional ingredient, within a secondary material where the secondary material, known as the encapsulant, matrix or shell, forms a protective coating or matrix around the core, isolating and protecting it from its environment until its release is triggered by changes in its environment (Smith & Charter 2010). Dairy food manufacturers tend to be major end users of microencapsulation technologies in fortifying their formulations and production of functional dairy foods (Augustin 2003).

**Nanoscience:** Nano-encapsulation and nanomaterials science is an emerging technology area to ensure bioactivity is maintained and controlled release managed at a much more specific level than microencapsulation (Sanguansri & Augustin 2006).

**Emulsification:** several techniques are utilised within the food industry, such as in the dietary fibre space with ultrasound emulsification. Ultrasound emulsification occurs when two immiscible liquids are introduced into an ultrasonic energy field in the presence of a surfactant, for instance in dietary fibre formulations an ultrasound emulsified liquid shortening composition containing dietary fibre gel, water and lipid can be produced to which a functional food ingredient may be added (Shukla 2010). Other popular technologies also include nano-encapsulation via reverse osmosis and enzyme filtering through to microbial consortia engineering.

**Ingredient profiling and synthesis:** Australia has well developed dairy and meat industries, whose by-products such as whey protein are often key providers of functional ingredients. As processing technologies increase in efficiency there is a growing demand for such by-products of agricultural waste, particularly in the sports nutrition industry. For example, preparation and exploitation of new whey protein fractions to produce functional food ingredients,  $\alpha$ -lactalbumin and  $\beta$ -lactoglobulin as nutritional and specialised physically functional food ingredients, and minor protein components as specialised food ingredients and as important biotechnological reagents.

### ***2.10.7 Competitive Scenario in Functional Foods in Australia***

Leading manufacturers of functional food in Australia include Kellogg's, Goodman Fielder, George Weston Foods, Nestlé Australia, Lion Co., Fonterra, Jalna Dairy Foods, Unilever Australia, General Mills, Sanitarium etc. (Frost & Sullivan 2014a). There is a large overlap with traditional food categories that typically tend to use some form of functional ingredients. Fonterra Brands is a key player with its fortified dairy products, while Kellogg's is another major player thanks to its breakfast cereals. In the beverage segment, the market is dominated by two major players; Coca Cola Amatil (CCA) and Asahi, a global beverage giant. CCA dominates the market via its prominence in the sports drinks and fortified juice market. Frucor is the fastest growing company in the industry, and has quickly grown from a local NZ company to be owned by Suntory (multinational company), acquiring third place in the functional beverage market (O'Donoghue 2014).

### ***2.10.8 Routes and Channels to Market for Functional Foods in Australia***

Functional food manufacturers in Australia often form joint ventures or strategic alliances to enter the market (Hassall & Associates 2004). For example, SoNatural Foods has demonstrated that alliance relationships could allow the manufacturer access to new product concepts in exchange for access to the brand name capital and market position of the manufacturer.

Large distributors handle supermarkets, as major supermarket chains have their own distribution centres with national coverage, while smaller distributors cater to non-franchise stores or convenience stores. Pharmacies are another major outlet. The supermarket sector is dominated by Coles (Wesfarmers Group) and Woolworths. These have a strong influence on the market and an increasing influence on the retail pricing of these products (IBISWorld 2015).

Functional food & beverage manufacturers such as Frucor, Coca Cola Amatil, and Fonterra Brands dominate the supermarket channel due to existing relations through non-functional food/beverage products. Online retail is growing in prominence as consumers find it more cost effective in comparison to traditional distribution channels (PwC2012a). However, the caveat is the credibility of these channels as they are often not regulated. Direct online retail from manufacturers is a relatively newer trend and growth will be observed in this distribution channel as manufacturers can reduce the influence supermarkets and pharmacies currently have on them (Frost & Sullivan 2014a).

### ***2.11 Opportunities for South Australia in Functional Foods***

Opportunities in the functional food value chain for SA may lie in supply of ingredients and / or finished functional food products.

#### **Functional Ingredients**

Based on the literature review, an assessment of the potential opportunity for SA in the main functional food ingredients has been made (See Table 12), based on existing understanding of SA's capability for production of each type of food or its possession of raw materials that can be processed to produce these foods (FOODSA 2014b). In some cases, the ingredient is assumed to offer opportunities for SA, in other cases, it has been assumed that SA does not have appropriate conditions for development or growth of an industry (e.g. green tea). This list of opportunities is purely based on information from the literature review, and would need to be refined based on information developed in other workstreams of the project (e.g. SA actor mapping which involves more detailed analysis of SA's current ecosystem of companies).

**Table 12: Functional Food Opportunities for SA**

Ingredient	Health Benefit	Opportunity for SA?	Comments
<b>Poly-unsaturated fatty acids</b>	Cardio-vascular health, brain health, general health	√	SA's large aquaculture industry (Regional Development Australia, 2014b) is a prime sourcing point to provide marine based fish oil to the industry. The region also produces sizeable quantities of flax for development of the vegetarian omega-3 space. However global company DSM controls the global market for omega-3 products and is an aggressive competitor.
<b>Dairy based ingredients - proteins, bioactive peptides, oligo-saccharides, calcium, vitamin D (Regional Development Australia 2014 updated)</b>	Digestive health, bone health, weight management blood pressure	√	Downstream processing of SA's dairy exports provides a large market opportunity for functional dairy ingredients such as proteins and peptides (Regional Development Australia, 2014a). Dairy companies such as Fonterra are revamping their dairy ingredients business to offer fortified dairy products.
<b>Probiotics</b>	Digestive Health, immune health	√	Probiotics are usually added into dairy products. However yoghurt, the primary end use segment, is an aggressively competitive market with most traditional food manufacturers also competing. Product differentiation will be key for probiotics. Probiotics can be added also into non-dairy foods (fruit juices etc.) (Saarela 2011).
<b>Fibres/Prebiotics</b>	Weight management digestive health, immune Health, cardio-vascular health	√	SA has a large grain industry (Regional Development Australia, 2013b) which is a key source for dietary fibre. Oats and beta-glucan are trendy functional ingredients (Mellentin 2014), but currently the production of oats in SA is small. Fruit and berry processing side streams are a potential source of especially soluble fibre (Regional Development Australia, 2013c). Jerusalem artichoke is a key source of prebiotics. However the prebiotics market is also witnessing an influx of new raw material sources such as avocado extract and Manuka honey to compete with the ethnic prebiotic trend. Aggressive competition will be observed.
<b>Plant Extracts</b>			
<b>Red Ginseng</b>	Digestive Health, cardio-vascular health, immune health, bone health	X	No production in SA
<b>Aloe Vera extract</b>		√	Aloe vera can be produced in SA, but it is currently a minor crop. SA could benefit from growing demand for aloe vera beverages globally.
<b>Green tea extract</b>		X	Green tea mainly grown in New South Wales (NSW)
<b>Soy based-derivatives</b>		X	No cultivation of soy in SA but downstream processing using existing technology is an option on importing soy from other states.
<b>Phytochemicals</b>			

Ingredient	Health Benefit	Opportunity for SA?	Comments
<b>Physterols</b>	Digestive Health, cardio-vascular health, immune health, bone health	√	Utilise the canola oil industry (Regional Development Australia, 2013b) to develop phytosterol extraction capability.
<b>Carotenoids</b>		√	SA has a variety of agricultural sources of carotenoids (Regional Development Australia, 2013c) and in addition has a growing algal carotenoid production industry (Curtain 2000)
<b>Polyphenols and Flavonoids (aside from those in soy)</b>		√	Large wine industry provides key raw material source for polyphenols and flavonoids in addition to the presence of these products in other fruits and vegetables grown in the region (Regional Development Australia, 2013a)

Other opportunities include producing ingredients from by-products of established South Australian industries such as dairy, wine, seafood and grain processing:

**Dairy based ingredients:** globally fortified dairy is a key growth area, with companies such as PepsiCo and Coca Cola, both entering the dairy market to gain access to this sector (Leatherhead Food Research 2014). In addition, dairy protein ingredients and probiotic yoghurts are key growth areas in Asia (Nachiket 2015). Increasing osteoporosis incidence in Asia, particularly in women, is a growing concern and dairy based ingredients such as calcium, vitamin D and proteins have the potential to address these problems and therefore gain access to the Asian consumer (Mithal et al. 2009). Dairy protein is also interesting from the weight management point of view (Mellentin 2014).

**By-products of wine processing:** SA has a well-established wine industry (Regional Development Australia 2013a). However, the wine industry also provides downstream opportunities via the processing of its by-products and waste products into polyphenol and flavonoid components (Dreosti 2000). The potential for development of these antioxidants out of processing waste is a key growth opportunity for the local industry, and could act as a valuable entry point into the high value markets for polyphenol ingredients such as resveratrol (Connor 2014).

**Phytochemical and plant extract production:** There are various phytochemical and plant extract-based ingredients that could potentially be supplied from SA to meet Asian needs. For instance, Aloe Vera extract form the second largest market for functional food ingredients in Korea (Earls 2013), but currently production in SA is low with Aloe Vera mainly grown in Queensland.

Similarly, the grain industry (oats) is a valuable source for functional polysaccharides such as beta-glucan. Oat and its soluble fibre beta-glucan are trendy functional ingredients (Mellentin 2014) with the potential to attenuate blood postprandial glycaemic and insulinemic responses, to lower blood total

cholesterol and low-density lipoprotein (LDL) cholesterol, and to improve high-density lipoprotein (HDL) cholesterol and blood lipid profiles as well as to maintain body weight. Thus, oat beta-glucan intake is beneficial in the prevention, treatment, and control of diabetes and cardiovascular diseases (Daou & Zhang 2012). Oats are grown in SA, but the production levels are low (Regional Development Australia 2013b).

Carotenoids are another potential opportunity, though at present SA has minimal production. However, as beta-carotene production from algal sources continues to be of interest to functional food manufacturers, this could offer SA a potential entry point into the world carotenoid market, which is the second largest functional ingredient market globally. The vegetable and fruit sectors in SA could also provide access to phytochemicals, such as carotenoids.

**Potential for Australian indigenous ingredients in Asian markets:** Australia possesses a wide expanse of indigenous ingredients with existing small scale production of functional food extracts. These ingredients vary from Lemon Myrtle, typically used as a flavouring but with high sources of dietary calcium (possible bone health drinks), to Anise myrtle with high lutein concentrations (eye health potential) (Zhao & Agboola 2007).

However, the success of this opportunity depends on the development of research for the local industry to world standards. These include methods such as:

- Developing the technology needed to grow Australian plants commercially.
- Creating an analytical program to identify the active ingredients of Australian plants.
- Developing a breeding program to increase the active ingredients of Australian plants.
- Conducting clinical trials to prove the efficacy of these ingredients to improve health outcomes.

Table 13 is a list of potential native foods that could be developed into functional food and beverage ingredients (Bryceson 2008, Konczak et al. 2009).

**Table 13: Potential Native Functional Food Ingredients**

Native Ingredient	Bioactive Components	Potential Health Benefit	Key Suppliers
<b>Lemon myrtle</b>	Polyphenols, Vitamin E, Folate (vitamin B9) Calcium	Cardiovascular health, bone health	Australian Rainforest Products
<b>Anise myrtle</b>	Polyphenols, Vitamin E, Folate, Calcium Magnesium, Lutein	Cardiovascular health, immune health, bone health eye health	Australian Rainforest Products
<b>Tasmanian pepper berry</b>	Polyphenols, Vitamin E, Folate, Iron	Cardiovascular health, immune health	Diemen Pepper (Tasmania)
<b>Queensland Davidson’s plum</b>	Polyphenols, Vitamin E, Folate	Cardiovascular health, immune health	Australian Rainforest Products
<b>Bush tomato</b>	Polyphenols, Vitamin E, Folate, Iron, Selenium	Cardiovascular health, immune health, micronutrient supplementation	Outback Pride
<b>Wattle seed</b>	Polyphenols, Vitamin E, Folate, Magnesium, Calcium, Zinc, Iron, Selenium	Cardiovascular health, immune health, bone health, micronutrient supplementation	Outback Pride
<b>Quandong</b>	Polyphenols, Vitamin E, Folate, Magnesium, Iron	Cardiovascular health, immune health, bone health, micronutrient supplementation	Outback Pride
<b>Australian desert lime</b>	Polyphenols, Vitamin E, Folate, Potassium, Sodium	Cardiovascular health, immune health, bone health	Australian Desert Limes (Queensland)
<b>Kakadu plum</b>	Polyphenols, Vitamin E, Folate, Potassium, Sodium	Cardiovascular health, immune health, bone health	Australian Produce Company Pty Ltd.
<b>Lemon aspen</b>	Polyphenols, Vitamin E, Folate, Iron	Immune health, micronutrient supplementation	Australian Produce Company Pty Ltd.
<b>Riberry</b>	Polyphenols, Folate, Manganese, Calcium	Cardiovascular health, immune health	Woolgoolga Rainforest Products, (NSW)

### End-Products and Other Value Chain Opportunities

In end-products, there may be opportunities for SA in categories such as free-from and weight management products, as well as more downstream opportunities such as gift packs:

**Free-from products:** As food allergies and intolerances continue to witness increasing incidence rates, SA is well-placed to cater to these issues by providing options such as lactose and gluten free products particularly to Asian markets, where consumers doubt the credibility of their own traditional products that claim similar benefits. Since the gluten avoidance consumer trend is very strong in Australia,

Australian manufacturers are far ahead of their Asian counterparts in development and marketing of free-from foods, and this is a potential opportunity for the grain and dairy industries in particular. However, for the production of high quality free-from ingredients sophisticated and expensive technologies are often needed which may not be easily available to smaller SA-based producers. Lactase-treatment of milk to produce low lactose milk is a commonly used simple technology, whereas for the production of lactose free milk with good sensory properties much more advanced technologies are needed (Valio n.d.). Gluten-free products face other challenges since gluten-free products often have poor structure, short shelf-life and bland taste. They can also be high in sugar and have poor nutritional value compared to their gluten containing counterparts (IFT 2013).

One example of a product that covers several current trends is chia. It is a gluten-free specialist grain (“ancient grain”) which is considered naturally healthy. The pioneer in this area, Melbourne based The ChiaCo, have found much success in Europe and North America (Mellentin 2014).

**Weight management products – fibre and protein:** The incidence of obesity and overweight is increasing all over Asia (Ng et al. 2014). In the US and EU fibres (especially cereal fibres) have for a long time been used for weight management (Mellentin 2014). In Asia, this trend has not been so strong due to different consumption patterns of foods, and especially cereals (Haard 1999). Introducing fibres in the form of functional ingredients may be a way to Asian markets, since in many countries the consumption of fibre rich cereals is low. SA has considerable production of cereals, fruits and berries (Regional Development Australia 2013*b, c*), all potential sources of fibre.

Protein is another functional ingredient important in weight management. As a functional ingredient dairy protein is of special interest (Mellentin 2014, Leatherhead Food Research 2014). However, plant-based materials are also a potential source for fibre ingredients.

**Health & wellness gifts:** Gifts in the form of functional foods and beverages are a growing trend in Asia, particularly over festivals such as Chinese New Year (Group M Knowledge 2013). These gift packs are a popular mode of introduction into the concept of functional food and beverages. Occasion-specific packaging and sizes are major purchasing factors that drives uptake in these markets.

There may be opportunities for SA producers to package and sell these health and wellness gift packs with the “made in Australia” label to indicate quality and Australia’s ancient history with medicinal plants similar to China.

**E-commerce:** Online sales and home shopping are quickly becoming the distribution mode of choice in Asia due to consumers’ ability to make informed decisions and compare prices (PwC 2012*b*). There may be opportunities for SA producers to increase online sales, for example through opening e-

Commerce sites on Tmall, China's largest merchant e-Commerce site and one used by many overseas vendors.

**Demographic marketing:** Consumers are increasingly concerned with ageing and interested in preventative measures to slow it. In addition, in Asia children's nutrition is a key area of investment as evidenced by the growth of the baby milk powder industry. There is a growing demand for child specific and geriatric specific nutrition based on the demographics of the country (New Food for Older People n.d., APFI 2015).

Understanding these factors and packaging and formulation functional ingredients to be specific to a particular demographic is a key opportunity for South Australian providers of functional ingredients, for instance omega-3 fortified infant formula will sell at a premium in China (Stones 2010). In Australia, the rising incidence of intolerances and allergies provides a new opportunity for functional food manufacturers to introduce "free-from" products to consumers with such health issues.

**Adapting products for Asian markets:** Many Australian producers tend to focus only on developed Western markets, often due to a lack of understanding of opportunities in Asia. However, adaptation of Australia's offerings to Asian markets is a large opportunity area, and companies such as Blackmore's Australia are key examples of those that have done this and achieved success (Porter 2014). In order to cater to Asia, it is important to understand the consumer requirements from country to country. Taste profiles, cultural identification and packaging often help to decide whether Asians choose a particular product over others. For instance, using an ingredient that is native to Asia or familiar (such as coconut water which is widely used in the Philippines and its benefits known across Asia) is a way to instigate interest. Another example is to understand individual Asian consumer needs, for example Otsuka Pharmaceuticals managed to grow its Pocari Sweat brand in Indonesia purely by emphasising its isotonic benefits during the month of Ramadan (Izawa 2011).

Another major factor is packaging. Children's packaging, especially for functional beverages, is an emerging trend in Asian markets as children are encouraged to move away from sugary drinks. Manufacturers are thus putting a lot of effort into customising their products for various demographics (Letona et al. 2014). Within packaging, the colours and formats are also of primary importance, for example packaging in red is attractive in China (Tornetta et al. n.d.).

# **PART III**

# **LUXURY FOODS**

## 3. Luxury Foods

### 3.1 A Framework for Defining Luxury Foods

An initial challenge in reviewing luxury food is identifying how luxury food is defined, and specifically what foods can be defined as luxury. The market reports (on sales of luxury goods) do not disclose the types of foods and beverages that are included within the reports, and a luxury definition is not given. However, luxury food is a subset of the broader luxury market and some definitions for luxury products are given in the literature; for example, luxury products are sometimes defined as possessing six characteristics: price, quality, aesthetics, rarity, extraordinariness and symbolism (Heine 2012).

However, generally there is little academic evidence as to what constitutes luxury products, and no standard definition of luxury products (or luxury foods), although a number of specific food products are widely referred to in literature as luxury foods. The scope of this review excludes *luxury meals* and focuses on original food items (which may be included as part of a luxury meal).

Based on the literature review, there are a number of food products that can clearly be currently categorised as luxury. Within these existing luxury foods, there are potential opportunities for SA to increase value-addition, increase production or develop new categories or new industries (e.g. caviar production). However, there is also a range of additional food products from SA that may have the potential to be developed into luxury items, or at least take on some luxury characteristics. These potential luxury food products could have characteristics such as:

- Highly-priced (e.g. costing hundreds of dollars per kilo or litre)
- Endorsed (for example, by Michelin star restaurants)
- Be relatively rare or scarce
- Providing a compelling narrative of creation or heritage, that differentiates the product and provides a point of interest to consumers
- Be perceived as exclusive.

Opportunities in luxury food therefore fall into two categories;

- Foods which are commonly agreed to be luxury foods currently (i.e. they meet the criteria of luxury foods as outlined below). As these existing luxury foods are described in the literature, these are profiled in more detail in this review.
- Foods which are not currently agreed to be luxury, but where a luxury status could be developed in the future, e.g. through branding or marketing. As specific foods in SA that could take this approach are not described in the literature, this review does not analyse specific foods but rather a general approach to developing a luxury image or brand.

Additionally, there may be broader value-chain opportunities not limited to specific foods, such as increasing e-commerce sales or developing inbound luxury food tourism.

### **3.2 Definitions of Luxury Food in the Literature**

There is no standard or even common definition of luxury food, and no agreed or commonly used list of foods considered luxury. Terms such as “gourmet”, “premium”, “rare” or “fine” foods have often been used interchangeably, which further complicates the definition, as these terms do not necessarily mean the same thing. Over 30 definitions for luxury products have been identified in literature (Sjostrom 2014).

Some authors have used the terms “premium” and “luxury” interchangeably (Sjostrom 2014) as representing any products at the prestige end of a brand scale. For example, one brand scale categorises brands into “Other” and “Prestige”, with three sub-categories within Prestige – Upmarket, Premium and Luxury (Vigneron & Johnson 1999). However, this broadens the definition considerably as every product category would therefore have luxury products within it.

Several authors attribute the ability to satisfy psychological needs to luxury products, as well as separating premium products from luxury products, with luxury products occupying the highest position within a brand scale (Vigneron & Johnson 1999). An important differentiator for luxury products is symbolism, with the product symbolising more to the owner than its functional properties (Heine 2012). The presence of luxury products is therefore limited by most authors to relatively few product categories (such as jewellery, bags, shoes and clothes, food & beverages, cars, furniture, yachts and jets) as only in these product categories does this symbolic effect exist (Bain & Co 2014).

The few definitions that have been used for luxury food tend to have both an economic and social aspect. For example, one author defines luxury foods as *“not specific items of food, but rather those foods that in any particular place and time are regarded an indulgence and a status indicator. They are*

*those foods that a society deems extravagant and unnecessary; as such, both needs and luxuries are relative concepts*" (van der Veen 2003). Identification of luxury foods therefore firstly requires an identification of the societies in focus (which in the case of this project is Asia), followed by identification of the foods in these societies whose consumption is regarded as a status indicator.

In some cases, luxury foods can be identified as those to which luxury taxes are applied (since, by definition, luxury taxes are applied only to luxury products). In China, for example, abalone and shark's fin is subject to luxury tax (Zhou, 2013).

Another approach to identifying luxury foods is to identify those characteristics that consumers commonly attribute to luxury foods, and then to identify foods that have those characteristics. Research specifically on wines and spirits has identified three attributes that consumers generally attach to the concept of luxury products within this category. These attributes are limited availability, antique / vintage and high price. Similar research specifically on wines identified attributes of limited production, antique / vintage, premium, luxury and premium price to wines at the highest price point (defined as US\$100 / bottle and over) (Sjostrom et al. 2014). The antique / vintage attribute however is likely to be specific to alcoholic drinks and may not be applicable to other foods (such as fresh seafood) in characterising luxury products.

The literature suggests that luxury foods as a group therefore have three main characteristics; high price, rarity and symbolism, with some additional characteristics such as antique / vintage applying to sub-sets of luxury foods, specifically alcoholic beverages. The most useful definition for this review is based on foods that are both relatively rare, high priced and whose consumption in current Asian societies is seen as a sign of elevated social status (i.e. their purchase or consumption has a highly symbolic effect). This comprises both luxury food items and luxury beverages. The rarity aspect may emerge because the food itself or its ingredients are relatively rare (such as caviar), a restriction of production to specific area(s) is in place thus limiting supply (e.g. Champagne, Cognac). These appellation rules can often help to promote a food as luxury, by limiting production and creating a strong narrative for the product.

In other luxury foods, specialist production techniques or limited production occurs, for example, chocolate is not manufactured from rare ingredients itself, but certain chocolate brands may be regarded as luxury.

Luxury foods will generally have high prices (based on per kilo or per litre) and extremely high gross margins (although the investment in branding and distribution may be significant). However, not all high priced / high gross margin or rare foods can necessarily be regarded as luxury, as their

consumption may not be linked to a perception of elevated social status (i.e. the symbolism characteristic is absent). For example, Crocodile meat is rare (global trade in crocodile meat is less than 1,000 tonnes per year (Caldwell 2010), but its consumption in Asian societies is not currently symbolic). Similarly, high price itself is not necessarily enough to define a luxury food, but rather the attributes found to be of importance to luxury products (such as limited availability) increase the acceptance of a high price (Sjostrom et al. 2014).

It has to be kept in mind that what is luxury to some can be perceived as a basic need by others. Luxury is a relative concept in general and particularly when it comes to luxury foods. In this review we consider luxury from the point of view of the Asian consumer, which is not necessarily the same as in Europe or the US.

### ***3.3 Consumer Attitudes to Luxury Foods***

Attitudes to luxury food consumption are often determined by the prevailing cultures and dietary tastes prevailing in each country. In China, for example, many types of luxury seafood are consumed partly because of their links with a range of Chinese cultural ideas, such as traditional Chinese medicine (TCM), interest in which has strengthened over recent years. Of particular relevance for the consumption of seafood is the concept of 'bu' foods, which are seen as strengthening or tonic-like and are typically exotic and unusual in appearance. Beche-de-mer (sea cucumber) and shark's fin are examples of bu foods (Anderson 1988). Linked to this exoticism is a preference for rare foods as manifested in the high price of Napoleon wrasse (Klein 2007).

As many markets outside China (such as Singapore and Malaysia) have large Chinese populations or draw cultural cues from China (such as Korea), these Chinese cultural ideas regarding luxury foods are present in a broad range of markets.

For example, Shark's fin soup is commonly held to promote general health; and the common name for bêche-de-mer in Chinese, hai shen, translates as 'sea ginseng'. Perceived 'wild' foods are also culturally important as they are considered to be more bu than non-wild (or cultivated) foods; wild food is considered to be 'unpolluted,' 'precious' and 'special' (Coggins 2003).

Bu foods also are also seen to promote sexual potency and virility (Anderson 1988). Consumption of these luxury foods therefore has a gender aspect, correlating with surveys that show wildlife consumption is more popular among men than women (Zhang et al. 2008).

Given the importance of symbolism in luxury food consumption, such consumption typically occurs at public events such as banquets and weddings. In China and Asian societies more broadly, banquets

involving consumption of luxury food are an important part of economic life (Osburg 2013). Banquets are important for building and maintaining social relationships at the elite realm of business and government. Consumption of luxury foods is an “expression of economic power in an era of rapid economic growth” (Fabinyi & Liu 2014). The emphasis on status, prestige and luxury in such banquets is how food has been used as a luxury for complex societies around the world over hundreds of years (van der Veen 2003). Luxury seafood is often consumed at banquets in China or other Asian societies. Banquets are used to establish social trust through the performance of various social norms that honour the guest, indicate their status and provide them with “face”. These norms extend to the actual consumption of specific types of seafood, which at the highest level include Napoleon Wrasse, rock lobsters and shark’s fin (Fabinyu & Lui 2014).

Nowadays, marketers can use brain imaging technologies to test how the amount of grey matter a person has affects how he or she makes decisions about products, including luxury foods (neuromarketing). One example is a study performed on wine consumption where functional MRI scanning showed that those who had a higher grey matter volume in the striatum (the part of the brain involved in processing rewards) responded more easily to the marketing placebo effect (i.e. these people were more responsive to perceived rewards; if the wine is expensive it is perceived as good); those who had a higher grey matter volume in their prefrontal cortex (involved in decision making, social behavior, and personality) were also pretty susceptible to the placebo effect, whereas those who had more grey matter in the posterior part of the insula (a brain region involved in sensory processing), aren’t quite as easily influenced. These people know when they taste good wine and can’t easily be tricked by a price tag (Plassman et al. 2008). It is likely that neuromarketing will never replace more traditional consumer studies, instead it we be used as an additional tools. The reason for this is the high price of the scanning technologies (thus limiting the number of volunteers that can be involved) and also the fact that grey matter in brain doesn’t stay constant throughout person’s lifetime.

### ***3.4 Developing Luxury Products***

As well as exploiting opportunities in existing luxury foods, there may be opportunities for SA companies to develop other products into luxury foods through a focus on developing the characteristics of a luxury product. Research on the characteristics of luxury food brands has identified four components of a luxury product or brand (Beverland 2004). These are;

- Culture / history – luxury products generally emphasise the historic nature of their product, often encapsulated in stories or narratives about the creation and development of the brand. Even in “new world” wine producing countries (such as Australia), wineries placed a greater

emphasis on their pioneering history, focusing on how they were the first to pioneer a regional style and/or varietal of wine.

- Endorsements – although many luxury food brand producers claim to eschew “marketing”, they do undertake promotional activities specifically designed to gain endorsement of their products from people likely to be seen as influential, e.g. leading chefs or wine critics.
- Product integrity – luxury food producers have a rigorous emphasis on product integrity, including aspects such as “product quality”, “attention to detail”, “credibility”, and “product/production integrity”.
- Exploiting emerging situations – in some cases, producers do not deliberately set out to produce luxury products, but rather exploit emerging situations to evolve their products into ones seen as luxury.

By developing these characteristics, foods could potentially take on a luxury aspect. Hence the opportunity in luxury foods is not necessarily only limited to existing luxury foods, but could also involve the development of new luxury foods.

### ***3.5 Global Luxury Market***

The luxury market is growing rapidly, particularly in Asia, driven by trends such as rapid growth in the number of high net worth individuals (HNWIs) and increasing tourism. Consumption of luxury products is particularly prevalent in East Asia where group norms and goals frequently emphasise public and visible possessions. Because economic status is a central social concern in hierarchical and newly industrialised (or industrialising) societies, publicly visible markers are needed to communicate individual financial achievement (Wong & Ahuvia 1998).

The demand for luxury products such as food is likely to be highest in countries where individuals tend to engage in self-distinguishing behaviours that manifest in a Need for Uniqueness (NFU), and NFU refers to the trait of pursuing differences relative to others. Because material possessions are often extensions of the self (Belk 1998), one way to differentiate oneself from others is to acquire and possess unique products. Chinese consumers, for example, have been found to be more motivated by the social than practical aspects of luxury products (Zhana & He 2012). Luxury product consumption in China is seen as an indicator of elite status (Lu 2008). In other markets with large Chinese populations (such as Hong Kong, Singapore, Malaysia and Taiwan) similar attitudes exist.

Similarly in Japan, the more expensive the luxury articles worn the higher the status of the person wearing them, with many Japanese believing that to gain social stature they have to let the world know that they have that status (Degen 2010).

The global luxury market is estimated at €850 billion (billion) (AU\$1,174 billion) in 2014, of which luxury foods comprise €39 billion (AU\$53.9 billion) and luxury wines and spirits €58 billion (AU\$80.1 billion) (Bain & Co 2014). Another source estimates the luxury food market at US\$48.6 billion (AU\$62.5 billion) (McCarthy 2015).

Some of the major trends in the luxury market described in the literature are summarised below.

- Greater accessibility: the luxury consumer has diversified, with luxury purchases no longer limited to the elite and super-rich. Luxury goods have become more attainable and consumers have developed an appreciation of luxury brands, driven by the increasing presence of these brands. The younger demographic have taken a keen interest in luxury goods purchases, which has led to luxury companies refocusing their marketing efforts to this group of consumers (Euromonitor International 2015).
- Asia is the fastest growing market for luxury, with average annual growth of 15% from 2009 to 2014. Four markets in Asia (Japan, China, Hong Kong and Korea) are amongst the world's top 10 luxury markets (Euromonitor International 2015).
- South-east Asia (especially Singapore and Malaysia) are also developing as significant luxury markets (Bain & Co 2012);
- European products generally dominate the luxury category, possibly a result of the long heritage of many European luxury product suppliers, and their success in developing product narratives;
- The online channel is accounting for a rapidly growing share of the luxury market (Bain & Co 2014).

### ***3.6 Luxury Food Market***

Although there is limited data at an aggregate level on luxury foods markets, these are variously estimated at US\$50 to US\$140 billion globally, and Asia can be realistically expected to account for around 30% of the total, based on its share of the overall luxury market (Frost & Sullivan estimate based on Bain & Co, Luxury Goods Market Report, 2014). Growth in the value of luxury food is slower than the growth of the luxury category overall. In 2014, the market value of luxury food increased by 2% and luxury wines and spirits by 5%, slower than the overall growth of the luxury market at 7% (Bain & Co 2014);

Based on data of levels of income disparity, power distance index (PDI) (which is used a proxy for relative social distinction) and the number of HNWIs per country the main markets in Asia for luxury foods are likely to be China, Japan, Hong Kong, Singapore and Malaysia. However, no specific data has been identified in literature that provides data on the size of the luxury food market by country.

### ***3.6.1 Key Product Areas in Luxury Foods***

Many literature sources provide lists of “the most expensive foods”, but in many cases these are processed foods or meals sold only in specific restaurants or shops and not primary food items (e.g. the Westin Hotel in New York reputedly sells a \$1,000 bagel, and Le Meridien Hotel in New York a \$1,000 lobster frittata) (therichest.com, 2015). These are often produced for promotional reasons and do not represent a sustainable market opportunity.

Globally, a number of foods are often categorised as luxury, although their consumption can often be highly country-specific. These include caviar (Kemp 1998), foie gras (Heath & Menerley 2010), truffles (Gugino 2012), saffron, some types of seafood such as lobster, beche de mer, Shanghai hairy crab, abalone and shark’s fin (Fabinyi 2011), yubari melons (Gunnison 2012), chocolate (heavily dependent on the branding of the manufacturer as chocolate per se is not a luxury food), certain cheeses and alcoholic beverages such as Champagne, Bordeaux wine (Dubois 1995), Cognac (van Westering 1994) and Scotch Whisky (Mandhachitara & Lockshin 2004).

However, all these products may not necessarily be considered as luxury in all countries. There is only a small number of foods whose consumption in current Asian societies is widely seen as an indicator of elevated social status. These foods therefore need to be widely perceived as luxury / exclusive, since the symbolic nature of their consumption is intrinsic to the definition of luxury.

### ***3.6.2 Trends in Luxury Foods***

There seem to be no special trend studies for luxury foods, but some indication about what is happening in this area can be obtained via culinary forecasts. In one of these (Natural Restaurant Association 2015) some emerging trends that are linked to the luxury area were indicated, including artisanal alcoholic beverages and dairy products (cheese, ice cream), ethnic and local foods, and non-traditional (but sustainable) fish. Another trend possibly linked to luxury is 3-D printed food (Tice 2015).

Some of the major trends in luxury foods identified in the literature in Asia include;

- Increasing “westernisation” of luxury food consumption in Asia, with growth in non-local categories such as chocolate and wine. For example, China is now regarded as the world’s largest market for Bordeaux wine (The Wine Cellar n.d.).
- Increased focus on sustainability and methods of production evaluated as cruel – for example, campaigns to eradicate the use of shark’s fin, foie gras and development of sustainable production methods for caviar. Whilst these issues are more prominent in Europe and North America, they are also beginning to impact Asia.
- Increased focus on traceability - the high prices of many luxury foods has encouraged counterfeiting or illegal supply, which will drive a greater focus on traceability to mitigate consumer concerns.
- Increased differentiation – even within the luxury category, manufacturers seek to differentiate through activities such as product enhancement. For example, a caviar supplier is seeking to develop a caviar product infused with the spawn of an African clawed frog, which reputedly has health benefits.
- Driving and enhancing a “narrative” for the product, for example in the way it is produced, the history of the producer or the uniqueness of its ingredients.

### ***3.7 Asian Luxury Food Market***

#### ***3.7.1 Market Overview***

Asia is the fastest growing luxury market globally<sup>1</sup>, with a compound annual growth rate (CAGR) in luxury sales of 15% from 2009-2014. Major Asian cities such as Tokyo, Hong Kong, Beijing, Shanghai and Seoul are among the world's top 10 luxury markets (Bain & Co 2014). Consumption of luxury foods in Asia is likely to be most significant in countries with large numbers of relatively wealthy individuals (offering a large market of individuals with the appropriate purchasing power) and where social ranking is institutionalised (where consumption of luxury foods is symbolic and creates or enhances social exclusivity and distance) (van der Veen 2003). As there is no data on the size of luxury food markets in different countries or regions, in the interests of identifying the most attractive markets a ranking of markets in Asia Pacific was created based on their likely opportunity for luxury foods, as indicated by the parameters of Gini coefficient, Power Distance Index (PDI)<sup>2</sup> (as a proxy for social stratification) and the number of high net worth individuals (HNWIs)<sup>3</sup>. The higher the Gini coefficient, the greater degree of social stratification, and the higher the PDI the greater the acceptance of a hierarchical order.

Using these criteria, the most attractive country for luxury foods is assessed to be China. China has a high (and growing) social stratification as indicated by its Gini coefficient and PDI. China has a high number of HNWIs, with other predominantly ethnic Chinese markets such as Hong Kong and Singapore also in the top five. These countries have generally high PDIs (for example, Malaysia at 100 and China at 80, compared to Australia at 36 and New Zealand at 22) (The Hofstede Centre n.d.). These societies also have social structures where providing "face" is important, and this is often achieved through consumption of luxury food at banquets or other formal events such as weddings (Wong & Ahuvia 1998). India and Korea feature relatively further down the list, as a result of lower levels of income inequality and relatively smaller numbers of HNWIs (Frost & Sullivan analysis based on World Bank and Cap Gemini, World Wealth Report, 2014).

#### **Table 14: Ranking of Countries by Luxury Food Opportunity**

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<sup>1</sup> Defined as comprising luxury cars, furniture, food, wines & spirits, cruises, hospitality, yachts and jets

<sup>2</sup> Power Distance Index (PDI) expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalise the distribution of power and demand justification for inequalities of power (<http://geert-hofstede.com/national-culture.html>). The higher the PDI, the greater the acceptance of a hierarchical order

<sup>3</sup> HNWIs are defined as those having investable assets of US\$1 million or more, excluding primary residence, collectibles, consumables, and consumer durables. Source: Cap Gemini, World Wealth Report, 2014.

Rank	Country	Gini Coefficient <sup>4</sup>	Number of HNWI's (millions)	Power Distance Index
1	China	37	0.76	80
2	Japan	32	2.31	54
3	Hong Kong	53	0.12	68
4	Singapore	46	0.10	74
5	Malaysia	46	0.07	100
6	Thailand	39	0.08	64
7	Indonesia	38	0.04	78
8	Australia	34	0.21	36
9	India	34	0.15	72
10	Korea	31	0.18	60

Sources; World Bank, Cap Gemini World Wealth Report 2014, geert-hofstede.com. Gini coefficient data is for latest available year

### 3.7.2 Current Luxury Foods in Asia

Food items that are commonly referred to in literature as luxury are listed below. The focus is on foods currently regarded as luxury in Asia.

Other food items, which may have potential to become luxury foods in the future, are not listed, such as cheeses, as these are not currently categorised as luxury foods in the literature. Additionally, even the highest priced products in these potential luxury food categories do not exceed US\$100/kg in Asia and so are considerably cheaper than the luxury foods that are recognised currently. However, some may offer future opportunities for SA, if their consumption in the target countries starts to become symbolic.

For example, specific cheeses could potentially be developed into a luxury status in countries such as China. In Europe, certain cheeses can sell at over \$100/kg (therichest.com, 2013). However, demand for cheese in general, and luxury cheese in particular, has yet to develop in Asia. China imported only 47,000 tonnes of cheese in total in 2013 (Daxue Consulting 2015). Imports of French cheese (which may generally be regarded as premium, if not luxury) accounted for less than 5% of cheese imports,

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<sup>4</sup> Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. Source: <http://data.worldbank.org/indicator/SI.POV.GINI?page=1>

which are dominated by NZ cheese. Consumption of premium French cheeses is growing, albeit from a small base, which may indicate a potential opportunity for luxury cheeses (Red Luxury 2013). However, at this stage the consumption of premium cheese does not probably have the perceived social status in the key countries to be classified as a luxury food.

**Table 15: Luxury Foods in Asia**

Luxury Foods	Comments	Global Availability (tonnes)	Typical Price
<b>Chocolates</b>	Belgian luxury chocolatier Godiva has opened 50 stores in China (Food.be n.d.)	N/A	Up to US\$120/kg (Codiva Chocolates n.d.)
<b>Red wine (especially Bordeaux)</b>	China is largest export market for Bordeaux, at €240 million (AU\$ 333 million) in 2014 (De Beaupuy & Connan 2014)	100,000 – 150,000 cases (premier cru) (Latife n.d.)	>US\$100 / bottle
<b>Caviar</b>	Significant demand growth in China, estimated to have doubled in 2013 (Asian Hotel & Catering Times 2013)	260 (Bronzi & Rosenthal 2014)	~US\$1000/kg (Ruvinsky V 2011)
<b>Shanghai Hairy Crab (mitten crab)</b>	An autumn delicacy in Shanghai cuisine and eastern China	~2,000	~\$105/kg
<b>Shark's fin</b>	China is the leading market for this (Fabinyi 2011)	8,000 (Sea Shepherd n.d.)	Up to US\$650/kg (Shark Truth n.d.)
<b>Lobster (especially live Southern Rock Lobster)</b>	China is fastest growing and largest market for rock lobsters (Sackton 2014)	80,000 (spiny lobster) (Southern Rocklobster Limited n.d.)	Up to US\$100/kg (Seafood New Zealand n.d.)
<b>Live reef fish (groupers, wrasses, etc.)</b>	Hong Kong and China account for 60% of the global market (Fabinyi 2011)	~10,000 (Fabinyi 2011)	Up to US\$250/kg (Fabinyi 2011)
<b>Cognac</b>	Third largest Cognac market in the world		
<b>Abalone</b>	Japan market has switched from frozen to live abalone	7,500 (wild only)	Up to US\$1200/kg (premium dried abalone) (Hoshino 2013)
<b>Kobe / Wagyu beef, particularly A5 grade</b>	Australia is largest exporter of wagyu beef to Japan (Meat & Livestock Australia 2014)	~100,000	Up to US\$300/kg (Passary A 2014)
<b>Truffles</b>	Japan has largest number of truffle consumers in the world (Delectations 2015)	~150 (Carter 2011)	Up to \$3,000 / kg (Canterbury Truffles n.d.)
<b>Yubari King melons</b>	Prized in Japan, and often given in pairs as gifts. Melons have been auctioned for up to \$26,000, but typically cost around \$100 in retail stores	N/A	~\$100 per piece
<b>Fugu</b>	A highly poisonous fish that needs to be specially prepared for human consumption	1,700 (Japan's "Fugu" or Puffer Fish Market 1989)	Up to \$125/kg
<b>Matsutake Mushrooms</b>	Tradition of giving as luxury gifts	~1,000 (Frater 2007)	Up to \$2,000/kg (Frater 2007)
<b>Beche-de-mer</b>	Hong Kong is world's largest beche-de-mer importer (though much may be for	30,700 (Anderson et al. 2011)	Up to US\$385/kg

Luxury Foods	Comments	Global Availability (tonnes)	Typical Price
	re-export to China). Main source is Indonesia (Berry Bros. & Rudd n.d.)		
<b>Distilled and Fermented Alcoholic Beverages (e.g. Moutai)</b>	Demand for vintage liquors has increased strongly in recent years, particularly for Chinese liquor Moutai and Wuliangye, which are the two super-premium liquors in China	23,000 of luxury liquors produced in China (Credit Suisse 2011)	Cheapest vintage Moutai is \$340 / 500ml (Hilgers 2012)

### 3.7.3 Market Drivers in Luxury Foods in Asia

Some of the main factors that are stimulating growth in consumption of luxury foods in Asia are summarised below;

**Rapidly growing number of HNWI:** Asia Pacific has the second highest number of HNWI after North America, and is by far the fastest growing region globally. In 2013, the HNWI population in Asia Pacific reached 4.3 million, growth of 17.3% since 2012. Asia Pacific was expected to overtake North America in 2014 (Cap Gemini 2015). As the consumption of luxury foods is most common amongst wealthy individuals, the growing number of HNWI is likely to stimulate markets for luxury foods in Asia.

**Growing interest in fine dining:** Rapidly growing wealth levels in Asia has spurred growth of fine dining restaurants, and this is likely to stimulate demand for luxury foods consumed in these restaurants. Japan has the most Michelin starred restaurants in the world, with China in sixth place.

**Reduced taxes on luxury items:** Countries such as China have often placed a luxury tax on items defined as luxury. The term “luxury tax” is actually a composite of different taxes, being made up of import duties, VAT and consumption tax (Devonshire-Ellis 2012). These rates vary from product to product, but for foods defined as luxury such as shark fin and beche-de-mer, taxes can be up to 35% (Zhou & Young 2013). Recent free trade agreements (FTAs), such as the one recently signed between Australia and China, are resulting in these taxes being abolished or reduced, and this is likely to spur demand for imported luxury food items.

**Growth in luxury travel:** Asia Pacific is the fastest growing region globally for outbound travel and is expected to grow by an annual growth rate of 7.9% over the forecast period of 2014-2020. The largest outbound markets in 2020 will be China, followed by South Korea and Japan (Choong & Hedrick-Wong 2014). A growing segment of the outbound travel market is luxury travel, with China the largest outbound luxury travel in Asia. Tourism remains supreme as the number one leisure pursuit for China’s wealthy, with 56% of surveyed HNWI listing travel as their preferred form of leisure activity. 42% of these travellers spend more than US\$ 1,000 per day whilst travelling. Luxury travel generates demand

for luxury food both during the travel itself (on aircraft, cruise ships and hotels) but also once travellers return home. For example, red wine is the most common gift item bought by Chinese HNWLs during travel (Hurun Report 2014).

Food tourism is a growing market, comprised of travellers seeking the authenticity of the places they visit through food. In Europe, an estimated 600,000 trips are made annually for the main purpose of enjoying food and wine. These types of tourists are concerned about the origin of products and recognise the value of gastronomy as a means of socialising, as a space for sharing life with others and for exchanging experiences. *“These types of tourists have higher-than-average expenditure, they are demanding and appreciative and they eschew uniformity. Therefore, food tourism cannot offer a bland and anonymous product; it must have personality and uniqueness otherwise it will become subject to commoditisation”*. Regions that are marketing themselves actively as destinations for luxury food tourism include the Basque Region, French regions, etc. (UNWTO AM 2012).

**Growth in gifting culture:** Gifting is an integral aspect of many Asian societies, especially Chinese, and food items that are commonly given as gifts, such as boxed chocolates and wine, have shown strong growth. This is likely a result of the rapidly increasing Chinese middle-class which has the financial ability to afford such gifts, although highly expensive gift giving may be restricted by the clampdown on corruption and extravagance (see Market Restraints below). Gifting is regarded as essential for establishing and maintaining relationships (“guanxi”), and luxury foods play an important role in the gifting culture. The attraction of imported food and beverages is often in their perceived value as status symbols; they are ornaments to display, rather than food products to consume for enjoyment. Branding and packaging are particularly important to this market. In the wine industry, the gift giving market is dominated by direct sales to large corporations and government ministries. Gift wines are usually individually presented in elegant wooden boxes often accompanied by a pair of matching wine glasses or other gifts to complement the wine (EU SME Centre 2011).

#### **3.7.4 Market Restraints in Luxury Foods in Asia**

Some of the factors that are restraining growth in consumption of luxury foods in Asia are summarised below;

**Chinese Government clampdown on corruption / extravagance:** At the end of 2013, Communist Party Secretary Xi Jinping introduced concrete measures for the increased investigation and punishment of corruption. Relative to previous anti-corruption campaigns, this effort focuses on corruption at all levels of government (Qian & Wen 2015). This crackdown has spread to the state-funded banquets at which luxury food is consumed. A significant portion of luxury food consumption in China is undertaken at official or semi-official banquets, with annual expenditure on state-funded banquets estimated at

US\$49 billion (Ge 2013). Some preliminary estimates indicate that the crackdown has had an impact on imports of luxury jewellery (Qian & Wen 2015); however data on the impact on imports and production of luxury food is so far only anecdotal, with a reduction in sales of luxury seafood such as shark's fin and abalone attributed to the crackdown. The crackdown may also be responsible for the decline in sales of Cognac which fell 19% in 2013 (Cognac Expert 2013).

**Counterfeiting / illegal channels:** Counterfeiting is a major issue in many Asian markets, where intellectual property protection can often be problematic. Chinese consumers of counterfeit luxury products have a more positive attitude toward counterfeiting and tend to have better experiences with counterfeit luxury products consumption. This means that suppliers of products at risk of counterfeiting may need to emphasise non-price attributes such as the quality, legality and ethical nature of their products, and customer services where counterfeits have poor performance, as well as investing in authentication technology (Wang & Song 2013). There is growing concern in China over counterfeit food, such as that served at banquets, for example selling fake shark fins (using gelatine) is frequently practiced, resulting in concerns among seafood consumers about the authenticity of shark fin soup and a corresponding decline in consumption (Fabinyi & Liu 2014). Use of illegal channels for product supply can also be widespread, for example a significant portion of abalone supply in Asia is estimated to come from illegal catches (Cook 2014). Whilst Australian-derived food has an association with fresh, high-quality natural products in China, there is growing concern over whether the reported origin is correct, damaging consumers' faith and impacting consumption (Fabinyi & Liu 2014).

### ***3.7.5 Competitive Scenario in Luxury Foods in Asia***

The competitive scenario in Asia for the luxury food opportunities listed above is summarised below.

**Luxury chocolates:** Consumption of chocolate is growing in Asia, for example China imported 23.42 million kilograms worth of chocolates and chocolate products in 2011, representing an increase of 44% from the previous year. There are more than 70 brands of chocolates in China with imported chocolates being perceived as having higher quality. Almost 90% of the chocolate market in China is currently being controlled by foreign non-luxury brands such as Dove, Ferrero, Cadbury, UHA, Meiji, Nestle, Hershey's and Lindt & Sprüngli. The four top brands are Dove, Ferrero, Cadbury and Le Conte which collectively secure almost 70% of the market share. Except for Le Conte, which is a local brand, the others are imported (GSME News Network 2012). However, these brands are focused at the non-premium end of the market, which is dominated by European chocolatiers such as Lindt & Sprüngli and Godiva. Belgium and Switzerland dominate luxury chocolate production – Belgium, for example, is home to over 100 chocolatiers that cumulatively export €1.2 billion of chocolates (Flanders

Investment & Trade n.d.). Luxury is the fastest growing segment of the chocolate market in Asia (KPMG 2014).

**Red wine:** France is the largest producer of premium red wine, for example which accounting for 43% of China's bottled wine imports in 2014, and is likely to account for dominant positions in the luxury wine segment in other Asian countries. Australia is in second position in China, though roughly equal with Spain and Chile with 13% each (Yang n.d.). French winemakers have targeted the domestic industry in China as a platform to develop a reputation in the market as the 'source' of wine excellence and they have very effectively used the space as a means to dominate the imported wine market. Each of the top three Chinese industry leaders in wine, Changyu, Great Wall and Dynasty, have had strong connections with France at the technical level, demonstrated by Dynasty launching as a joint-venture between a government entity and Remy Martin (PIRSA 2012). France in particular dominates at the premium end of the market with the Bordeaux brand, which has not been matched in status by any other wine region to date. Bordeaux is synonymous with wine and, in particular, fine wine. Bordeaux is one of the largest wine producing regions in the world with a current production of 900 million bottles per vintage and is home to a number of iconic "first growth" brands such as Chateau Lafite-Rothschild, Margaux, Latour, Haut-Brion and Mouton-Rothschild. The presence of these brands has had a "halo" effect: association through regional identity infers a sense of quality on lower classed wines (Lacey 2012). To date, no other wine region has been able to match the status of Bordeaux as providing an elevated status to all wines from the region in the minds of Asian consumers.

**Lobster:** The largest lobster producers are the USA and Canada, followed by Australia (Sackton 2010). However, rock lobsters are the most popular for live imports into Asia (particularly China, HK and Japan) and Australia and NZ dominate this market (Tropic Seafood 2012).

**Truffles:** Truffles are unique, edible, underground mushrooms. They have a pungent aroma and taste that can permeate and enhance many foods such as soups, dips and pâtés, salads, sauces and dressings, omelettes and main meals. They may also be served whole. The mystique and gourmet experience associated with their unique aroma, flavour and taste accounts for their demand by consumers and high market value. The estimated market demand of truffle in Asia is approximately 10-15 tonnes per annum, compared to less than 10 tonnes per annum in the US. This projection shows that the Asian market has high potential for truffle exporters. Truffle production is dominated by France and Italy, but Australia has a small but growing truffle industry (Lee 2008).

**Caviar:** Over recent years, the caviar industry has switched from wild fishery to farming. Nonetheless, global production has declined markedly from over 3,000 tonnes in the mid-1980's to less than 300 today largely due to the collapse of the Soviet Union which was the leading producer globally. In 2012,

the total caviar output from aquaculture is estimated at 260 tonnes, a production that could increase to 500–750 tonnes within the next 10 years, based on the number of farms now operating. The main producing countries are China (56 tonnes), and Italy, France, Russia and the USA (20-30 tonnes each). Over recent years, a large number of sturgeon farms have been developed, with around 640 estimated to be operational globally, including several in non-traditional producing countries such as Vietnam, Thailand, Portugal, Malaysia and Chile (Bronzi & Rosenthal 2014).

**Abalone:** Abalone is primarily sourced from farmed sources, accounting for over 90% of global production of approximately 110,000 tonnes. China accounts for the majority of global abalone supply. In China there were over 300 operating abalone farms in 2013, with the largest individual farm producing over 1,000 tonnes per year. In contrast, Australia produced 950 tonnes in 2013, and is the fourth largest producer after Korea and South Africa. Korea is now a major supplier of abalone to the world market, the majority of production is farm produced in Korea. Korean production is estimated to have increased by over 60 times over the past 10 years, totalling about 4,500 tonnes in 2007 and 6,288 tonnes in 2010, and is estimated to reach over 10,000 tonnes by 2015 (Cook 2014).

**Wagyu Beef:** Outside Japan, Australia is the largest exporter of wagyu beef. There is also a significant and growing industry in NZ (New Zealand Wagyu Association n.d. c). No data was found in the literature on the current volume of production, however.

**Matsutake Mushrooms:** Matsutake is a wild mushroom that has a symbiotic relationship with certain pine species (e.g. Japanese red pine) and was traditionally harvested in pinewood forests in Japan. Over recent years, matsutake mushroom production in Japan has declined to virtually zero, with most supply being met by imports of about 1,200 tonnes per year. This decrease is due to households switching to gas from firewood, including reducing use of Japanese red pine (*Pinus densiflora*) that is the host tree for matsutake, which has reduced human intervention in the host pine tree forest and other species have taken over (Nagasaka 2003). China is a major producer of matsutake mushrooms, with estimated production of 3,000 tonnes on 2012, of which 400 tonnes was exported at a value of US\$16.7 million (South-East Asia & South Asia Infoport 2012). Matsutake has been found in Sweden and Finland, and also in Korea, Canada and Mexico from where some small scale exports to Japan have occurred. Investigation is also occurring in NZ as to whether matsutake can be cultivated.

**Distilled and Fermented Beverages:** luxury liquors have grown significantly in consumption in Asia over recent years. An example is the production in China of the luxury white spirits Moutai and Wuliangye which account for over 60% of sales of luxury liquors in China. These products typically retail at over \$200 for a 500ml bottle. Luxury products account for less than 1% of liquor sales in China, but have been growing at a strong rate over recent years with 18% CAGR in production volumes and a 31%

CAGR in value between 2004 and 2010. Sichuan province accounts for over 50% of luxury liquor production in China (Credit Suisse 2011).

### ***3.7.6 Routes and Channels to Market for Luxury Food in Asia***

End distribution of luxury food uses two channels – retail (including purchase of gifts) and restaurants (including airlines, cruise ships, etc.). The retail sector can be further divided by retail type – online, mono-brand and multi-brand stores (Bain & Co 2014). Mono-brand stores are particularly applicable in the luxury chocolate market with luxury chocolate brands such as Lindt and Godiva having retail outlets in China (Askew 2013). Multi-brand outlets are used for most other categories of luxury food and include both speciality food stores and department stores. Stores located at airports are growing in importance, as is online purchasing (Bain & Co 2014).

Distribution to both the retail and restaurant sector can involve several layers, including licensed importers and local wholesalers or distributors. Distribution can often be fragmented, for example in China there is no nationwide network of trucks, highways and cold storage warehouses to efficiently deliver supplies from the manufacturer or importer to the store shelf. Cold chain management is important for many luxury foods and is an area where infrastructure is often lacking. For seafood, wholesale markets are generally the main distribution channels for imported products. Food service operators and many retailers purchase their products through wholesale markets. Most leading importers and distributors have a presence and tend to sell to distributors who have a resident booth in these markets. There are over 300 seafood markets in large cities and coastal cities in China, with major markets acting as distribution hubs (Chen 2013).

Some major retailers, including Carrefour and Tesco, have a central distribution centre, but no large regional distribution centres. Distribution is generally handled on a store-by-store or city-by-city basis, with stores receiving most imports through a series of local distributors (EU SME Centre 2011). This therefore adds significant cost and complexity to distribution.

## ***3.8 Australian Luxury Food Market***

### ***3.8.1 Market Overview***

The Australian luxury goods market is valued at A\$2.7 billion in 2013, with growth of 7.8% over the previous year. Australia represents slightly less than 1% of the global luxury goods market of A\$301 billion (MO Report 2013). However, this definition is restricted to personal luxury goods only, and excludes luxury food and beverages. Assuming Australia accounts for a similar portion of the global luxury food and beverage market, then sales in Australia are around A\$1.2 billion (Frost & Sullivan calculation based on Bain, Worldwide Luxury Goods Report (2013)). The key drivers of growth in the

Australian luxury market are: increasing disposable income, an increase in a more educated population, increased exposure to multiculturalism and a global cultural shift, heightened access to luxury products through additional points of sale and an enhanced range of products (MO Report 2013). Along with overall growth in luxury goods consumption, the Australian market for luxury food is assumed to be growing. However, there is no information that has been identified in literature on the market for luxury food in Australia, nor what foods are considered luxury in Australia.

### ***3.8.2 Current Luxury Foods Production in Australia***

Given that there is no literature that describes or lists luxury foods specific to Australia, the foods described below are consistent with those listed in Asia, although it is debatable whether rock lobster can be included as a luxury food in Australia. Profiles of the status of production in Australia, and SA more specifically, of the luxury foods identified in Asia are given.

**Luxury chocolates:** Speciality chocolate retailers in Australia are estimated to have revenue of approximately A\$300 million. This sector includes chocolate cafes and speciality stores selling solid chocolate, often as part of a vertically integrated business (i.e. companies both manufacture and retail). Victoria accounts for the largest share of chocolate stores. Although the state has a smaller population than New South Wales, Melbourne's vibrant and diverse cafe culture has attracted a significant number of speciality chocolate stores that also sell beverages and food (IBIS World 2014).

**Red wine:** Australia is one of the world's leading "new world" wine producers, with 2,481 wine companies producing 1,202 ML in 2014, of which approximately 58% was exported at a value of A\$1.8 billion (Winetitles media n.d.). Australia is the seventh largest wine producing country globally. SA is the top wine-producing state in Australia producing almost 75% of Australia's premium wines. Gross Wine Revenue for SA increased by 7% (AU\$119 million) to reach AU\$1.87 billion in 2012-13 (Regional Development Australia 2013a). However, Australia has no meaningful exposure to the luxury sector (50% of wine consumed in Australia is from cask wine, and relatively few brands such as Grange and Henschke are sold at more than \$100 per bottle, with each brand producing less than 50,000 cases a year) (Demeter Group 2013). Within Australia, SA is home to the small number of perceived luxury wine brands, such as Penfold's Grange brand and Henschke. Penfold's is one of the world's most admired wine brands. Penfold's and Henschke are the only two Australian wine brands that can be regarded as luxury, at least domestically. Although data specifically on Penfold's is not available (Penfold's is a brand of Treasury Wine Estates), sales in Asia are estimated to be relatively small, as Asia only accounted for 4% of TWE's wine sales in 2014 (Australia accounted for 26%) (Treasury Wine Estates 2014).

**Lobster:** Southern rock lobster is one of Australia's main fishery products, with total production of about 10,000 tonnes per year, and exports valued at A\$400 million (Australia Bureau of Statistics 2012). Although WA accounts for about half of Australian production, SA has a significant Southern rock lobster industry. In 2010/11 1,557 tonnes of southern rock lobster was produced in SA, valued in excess of \$82 million (GVP) (South Australian Rock Lobster Advisory Council 2015). Southern rock lobster is Australia's largest seafood export by value with about 84% of production being exported annually. Over 90% of exports of southern rock lobster are live products. China is the largest export market for Southern rock lobster, accounting for 85% by volume of total exports per annum. In 2011/12, Australian rock lobsters accounted for over 10% by value of all Australian food exports to China, significantly more than either the Australian wine (\$240 million) or dairy (\$233 million) industries (Australian Southern Rocklobster 2015).

Research is underway in Australia into commercial farming of Southern rock lobster. This may offer an opportunity to expand production, given that the natural fishery production is likely to be restricted by sustainability factors.

**Truffles:** Australia has a developing truffle industry, now the fourth largest truffle producer after France, Italy and Spain. Current production capability is estimated at about nine tonnes per annum with a value of A\$60 million (Brown 2014). There are an estimated 160 commercial growers in Australia. Truffle production is currently coming from the south of WA, many areas in NSW, the ACT, many parts of VIC and TAS, where the first truffle plantations were developed in the early 1990s. There are also plantations in SA and QLD; however these plantations are not old enough to commence production yet.

**Caviar:** Australia has no current sturgeon farms, although some aquaculture facilities are marketing caviar from salmon. There has been a recent proposal to establish a sturgeon farm in SA (Australian Government 2015).

**Abalone:** The wild-harvest abalone industry exists in the five producing states of TAS, VIC, SA, WA and NSW. Collectively these state-managed fisheries produce 4,500 tonnes of wild harvest product a year, valued at approximately \$180 million at the beach (i.e. at first point of sale). To avoid overfishing, diving for abalone is a heavily regulated industry which requires a quota and a license. Only 32 quotas / licenses exist in SA and each are worth millions of dollars (Discovery Channel n.d.). In addition to wild abalone, a farming industry exists in Australia. There are an estimated 20 abalone farms in Australia (International Abalone Society n.d.). In SA, commercial abalone farms currently operate near Port Lincoln and Streaky Bay on the Eyre Peninsula and on Kangaroo Island. There are currently nine land-

based abalone farms in SA and also one mobile abalone farming system is currently licensed to operate in SA waters (Marine Education Society of Australia 2013).

**Wagyu Beef:** Australia has had a wagyu beef industry since the importation of steers in 1991. Wagyu beef now represents 3% of Australia’s primary herdbook (i.e. a herdbook of about 6,150). Current production in SA is limited, with most feedlots in NSW and QLD (Australian Wagyu Association n.d. c). However, SA does have one of the few boutique wagyu producers in Australia (Mayura Station). This could form the basis of larger wagyu beef production in SA.

**Matsutake Mushrooms:** There is no evidence in literature to indicate whether harvesting of matsutake occurs in Australia. However, SA has significant pine plantations, potentially offering sites for cultivation of matsutake.

**Distilled and Fermented Spirits:** Australia has a relatively small amount of distilled and fermented spirit production, with the largest local company being the Bundaberg Rum company (producing in QLD and owned by Diageo). However, 60% of local consumption of distilled spirits is from imported products. There are 24 operating whisky distilleries in Australia, with the largest concentration in TAS. The value of local production from distilled spirits in Australia is around \$500 million with exports of around \$190 million. SA has a small position in distilled spirits, with fewer operating establishments than any other Australian state (IBIS World, 2015).

The leading producers in Australia in the food items listed above are summarised in Table 16.

**Table 16: Australian Industry Participants in Luxury Foods**

Product	Industry Participants
Luxury chocolates	<ul style="list-style-type: none"> <li>Max Brenner Australia (owned by Strauss Group, Israel). Chocolates manufactured in Israel. Operates 55 stores including Australia, Singapore and Japan</li> <li>Theobroma – Food of the Gods, franchise network of 17 stores in Australia, with number 18 soon to open</li> <li>AE Haigh – SA based manufacturer and retailer with 14 stores in SA</li> <li>Hills 100 – owns Koko Black, a retailer specialising in artisan chocolates and hot beverages and desserts with 12 stores (IBIS World 2014).</li> </ul>
Red wine	<ul style="list-style-type: none"> <li>Penfold’s – subsidiary of Treasury Wine Estates</li> <li>Henschke – family owned SA based winery</li> </ul>
Lobster	<ul style="list-style-type: none"> <li>Production of Southern Rock Lobster relatively fragmented with nine producers of wild lobster in SA, including MORI Seafood, Ferguson Australia etc.</li> </ul>
Truffles	<ul style="list-style-type: none"> <li>~160 separate truffle growers, largest is Truffle &amp; Wine Company (WA)</li> </ul>
Caviar	<ul style="list-style-type: none"> <li>No sturgeon caviar production in Australia</li> </ul>
Abalone	<ul style="list-style-type: none"> <li>Largest abalone farms in Australia are GSW (WA), KIAB and SAMAB (SA) (<a href="http://abalonecouncil.com.au/wp-content/uploads/2014/08/12-COOK-Current-situation-future-trends.pdf">http://abalonecouncil.com.au/wp-content/uploads/2014/08/12-COOK-Current-situation-future-trends.pdf</a>)</li> </ul>

Product	Industry Participants
Wagyu Beef	<ul style="list-style-type: none"> <li>Several feedlots and commercial breeders including AA Co, JBS, Mort &amp; Co</li> </ul>
Matsutake Mushrooms	<ul style="list-style-type: none"> <li>No current production</li> </ul>
Distilled and Fermented Spirits	<ul style="list-style-type: none"> <li>Bundaberg Rum Company</li> <li>Various small distilleries</li> </ul>

### 3.8.3 Luxury Food Regulations in Australia

The Australian luxury food industry is regulated via both general food standards and labelling regulations and specific regulations applicable to some categories, particularly where there are sustainability or bio-protection issues. A summary of the main areas of regulations per product category is given below.

**Table 17: Luxury Food Regulations, Australia**

Product	Regulations
Luxury chocolates	No specific regulations believed to exist beyond standard food industry regulations
Red wine	Label integrity, compliance with Food Standards Code, geographical indication rules, export regulations (Wine Australia 2014). Compliance with production regulations (Wine Australia, 2014 Compliance Guide)
Lobster	Licensing and fishery management regulations on professional fishermen and processors. Regulations on numbers of lobsters caught by recreational fishermen (Government of South Australia n.d.)
Truffles	No specific regulations believed to apply to truffle farming or processing, although there is a certification program for trees (Australian Truffle Growers Association n.d.)
Caviar	Live imports of sturgeon (for farming) require an import permit (Australian Government n.d.)
Abalone	Quotas and licensing for professional fishermen (Government of South Australia 2015)
Wagyu Beef	Breed verification and integrity (Australian Wagyu Association n.d. a)
Matsutake Mushrooms	Biosecurity regulations that may impede import of spores

### 3.8.4 Market Drivers for Luxury Foods in Australia

The key market drivers for growth in Australia's consumption of luxury foods are listed below, which differ in some instances from those in Asia;

**Growth in HNWIs:** long periods of economic growth in Australia, coupled with rapidly rising property prices have resulted in significant growth in the number of HNWIs. The population of HNWIs in Australia increased by 5.8% in 2013 to reach 219,000, while wealth grew by 7.7% in 2013 to US\$ 674 billion (A\$875 billion) (Cap Gemini 2014).

**Growth in the ethnic market:** a significant driver for luxury food consumption in Australia is likely to be strong growth in the population of Asian (especially Chinese) ethnicity. As mentioned above, consumption of luxury foods in an Asian cultural context is particularly strong. The Chinese-born population of Australia has increased from 3% of the population (118,000) in 1996 to 6% (387,000) in 2011 (Australian Bureau of Statistics 2015b).

**Strength in the Australian dollar:** up to 2013, the Australian dollar was at historically high levels against the US\$, and continues to be so against the Euro. This has helped to reduce the prices of imported luxury goods in Australia.

**Growth in inbound tourism:** growth in inbound tourism particularly from Asian countries with domestic consumption of luxury foods is likely to stimulate consumption in Australia. In 2014, tourist arrivals from China and Hong Kong reached almost 1 million, almost 15% of total tourist arrivals and growth of 12% on 2013 (Tourism Australia n.d.).

**Enhanced availability:** the attractiveness of the Australian market has prompted entry over recent years by a number of global luxury food brand owners, further stimulating the local luxury market (MO Report 2013).

### ***3.8.5 Market Restraints for Luxury Foods in Australia***

Some of the main factors that may restrain consumption of luxury foods in Australia are given below;

**Lower importance of luxury food consumption from a social perspective:** although there is no specific evidence from the literature, a hypothesis is that amongst Australians of European origin there is less emphasis on evidencing social distinction through luxury consumption than in contemporary Asian societies.

**Weak consumer confidence:** over the past four years, consumer confidence in Australia has broadly declined and has been in negative territory since 2013 (The University of Melbourne 2012). This is likely to have a weakening effect on purchases of non-essential items such as luxury foods.

### ***3.9 Technology Trends in Luxury Foods***

Some of the technology developments underway in the production of the luxury foods identified in the literature are summarised in Table 18.

#### **Table 18: Luxury Food Technology Trends**

Product	Technology Trends
<b>Luxury chocolates</b>	Processing technology, including customisation and personalisation through 3D technology (KPMG 2014).
<b>Red wine</b>	Irrigation, precision viticulture, harvesting and processing technology and new varieties. Packaging, bioscience
<b>Lobster</b>	Hatchery technology - commercial hatchery production of spiny lobster juveniles is expected to become existent over the next 10 years (Food and Agriculture Organisation of the United Nations 2015).
<b>Truffles</b>	Maintenance and irrigation techniques, including moisture monitoring. Propagation techniques (Carter 2011), processing and packaging technologies to extend shelf life, quality and consistency of truffle yields (RIRDC 2013).
<b>Caviar</b>	Development of farming technology including recirculation systems to improve yield (Cenakva, Czech Republic, Research Programs n.d.). Production from ovulated stripped sturgeon's eggs which avoids the need to kill the fish (Alfred-Wegener-Institut 2015).
<b>Abalone</b>	Farming technology including recirculation technology; the role of water movement and gas and acidity regulation with abalone culture systems addressed through improved understanding of these environmental requirements and development of innovative designs that can deliver high quality water at a commercial scale; and selective breeding (NIWA Taihoro Nukurangi n.d.).
<b>Wagyu Beef</b>	Genetics and breeding technologies (Australian Wagyu Association n.d. b).
<b>Matsutake Mushrooms</b>	Artificial growing techniques (Shimbun 2003), sustainable management (Yang et al. 2006).

### 3.10 Opportunities for South Australia in Luxury Food

There is no published literature which identifies or discusses opportunities for SA (or Australia more generally) in luxury food. Hence, the opportunities described in this section have been inferred by the project team and are not taken from literature. In many cases, available data in the literature on markets is not comprehensive and more detailed analysis will be required to assess the viability of the opportunity.

Opportunities in luxury food can be broadly classified into three types;

- Established luxury foods, i.e. foods that are commonly recognised as being luxury in Asia and Australia. In some cases, SA is already participating in the production of these foods (e.g. abalone, Southern rock lobster, red wine). In other cases, SA is not participating, but could potentially be able to do so.
- Developing luxury foods, i.e. activities to create a luxury connotation for a food product that is not currently defined as luxury.
- Broader value chain opportunities that are not specific to an individual food item, e.g. new distribution or marketing approaches.
- Developing integrated supply chains / co-products.

### 3.10.1 Established Luxury Foods

Some existing luxury foods are produced in SA (e.g. abalone, lobster). In other cases, it has been assumed that SA does not have appropriate conditions for development or growth of an industry (e.g. Napoleon Wrasses, beche-de-mer, Cognac), for example due to lack of appropriate climatic conditions or due to legal constraints on production or export. A summary of potential opportunities in existing luxury foods is given below.

**Table 19: Potential Luxury Food Opportunities for SA**

Product	Feasibility for SA	Comments
Luxury chocolates	√	Dominated by European brands (Lindt, Godiva, etc.). SA has local capability (Haigh's is one of Australia's leading premium chocolatiers)
Red wine	√	Dominated by European brands (especially Bordeaux). SA is home to several premium red winemakers, including Treasury Wine Estates
Lobster	√	SA already has a significant export business in live Southern rock lobster to China
Truffles	√	Limited existing cultivation in SA
Caviar	√	Sturgeon farms now operate in 32 countries. Proposal to establish a caviar and sturgeon fish production facility in the state of SA.
Abalone	√	Existing wild caught abalone fishery in SA and several abalone aquaculture farms, both greenlip and blacklip abalone
Wagyu Beef	√	Existing wagyu beef industry in Australia, and in SA
Fermented and Distilled Spirits	√	Potential for greater export push, especially into Asia
Matsutake Mushrooms	?	Unclear whether cultivation in SA is viable
Shanghai Hair Crab	?	Unclear whether cultivation in SA is viable
Beche-de-Mer	x	Beche-de-Mer not native to SA
Wrasses, Live Reef Fish	x	Napoleon Wrasse is a protected species in Australia
Cognac	x	Production limited to Cognac region
Scotch Whiskey	x	No domestic industry
Yobari melons	x	Unlikely to be cultivated in SA
Fugu	x	Species not native to SA
Sharks Fin	x	Regulated against

More commentary on potential opportunities is given below.

**Luxury chocolates:** Although per capita chocolate consumption in Asia is tiny compared to Europe, America and Australia, it is growing with particularly strong growth at the premium / luxury end of the chocolate market. Companies such as Lindt and Godiva are making major investments in the Chinese market, and the appetite for luxury is reflected in a surge in single-origin products which equate simplicity with quality, naturalness and health. Other major trends include the growth in the importance of traceability and personalisation (KPMG 2014). Australia does not currently have a major

position in the luxury chocolate market, but SA does have an existing ecosystem of premium chocolate production through the presence of AE Haigh, one of Australia's leading premium chocolate producers. Luxury chocolate market may thus represent an opportunity for SA.

**Red wine:** Luxury red wine represents a large market in Asia, with China now the largest consumer of Bordeaux wines. This market is currently dominated by French wines, especially from Bordeaux, and Australia's current presence in the luxury wine market is very limited as most producers focus on the mass market. However, two of Australia's leading premium wine producers are based in SA and the opportunity may exist to develop a luxury branding around SA (or more possibly Barossa) wines that could mimic the halo effect that Bordeaux has on all wines produced there.

**Lobster:** Australia is currently the dominant supplier of Southern rock lobster into Asia, and this is considered a luxury food in Asia. SA already has an established wild Southern rock lobster industry; however, its growth is limited by sustainability. However, research is well advanced into rock lobster farming which may be technically and commercially viable shortly. Consequently, SA may have an opportunity to expand its existing lobster industry significantly through farming.

**Truffles:** Australia has a growing truffle industry which has developed in the past 15 years, and offers complementarity to the European industry, for example through seasonality. The sales potential for the Australian industry is estimated to be significant; however, SA has lagged behind other states in developing local production. SA may have the potential to develop a larger truffle industry which could have significant market potential in Asia.

**Caviar:** Over recent years, global caviar production has declined by almost 90% due to the decline in wild production. However, sturgeon farms are being developed in many countries which are likely to meet the global demand. Although there are sturgeon farms in 32 countries, there are none in Australia. The status of a 2013 proposal to establish a sturgeon farm in SA is unknown.

**Abalone:** SA has an established wild and farmed abalone industry. Currently farmed abalone is growing rapidly, especially in China, and the rapid production growth may devalue abalone's status as a luxury food. The opportunity for SA is likely to lie in differentiation and premiumisation, perhaps based on an emphasis on quality and traceability.

**Wagyu Beef:** SA has a relatively small wagyu beef industry with most wagyu feedlots in NSW or QLD. SA has an opportunity to grow its wagyu beef industry.

**Matsutake Mushrooms:** There is no current harvesting of matsutake mushrooms in Australia, with supply largely coming from China, Canada, Korea and parts of Scandinavia. Whilst it is unclear whether SA has satisfactory conditions for cultivation of matsutake, they could offer a potential opportunity.

**Fermented and Distilled Spirits:** SA has a small number of businesses operating in this industry, with 10 indicated in a report by IBIS World, although no SA-based business are listed in Australian Whisky Distilleries (n.d.).

### ***3.10.2 Developing Luxury Foods***

The development of “new” luxury foods, i.e. creating a luxury connotation for food items that are not currently regarded as luxury, can occur at the overall food level, or at the individual producer level. For example, a luxury connotation could be developed for “South Australian lamb” or more specifically “Hill Farm’s Lamb”. Developing a luxury connotation to a product is likely to require action on four main factors;

- Emphasising the heritage / culture and history of the product – luxury products generally emphasise the historic nature of their product, often encapsulated in stories or narratives about the creation and development of the brand.
- Gaining endorsements – although many luxury food brand producers claim to eschew “marketing”, they do undertake promotional activities specifically designed to gain endorsement of their products from people likely to be seen as influential, e.g. leading chefs or wine critics.
- Focusing on product integrity – luxury food producers have a rigorous emphasis on product integrity, including aspects such as “authenticity”, “product quality”, “attention to detail”, “credibility”, and “product/production integrity”. The use of technology, such as packaging, to build the integrity story or to guarantee traceability can assist.
- Exploiting emerging situations – in some cases, producers do not deliberately set out to produce luxury products, but rather exploit emerging situations to evolve their products into ones seen as luxury.

The development of luxury characteristics at a food level is likely to require co-ordinated industry action, whereas individual producers can undertake unilateral actions for their specific brand. For example, within the general category of Bordeaux wines, not every producer is recognised as luxury, only those whose products have the characteristics above.

### 3.10.3 Broader Value Chain Opportunities

**Gift Packs:** Gift packs are a significant form of distribution of luxury foods in Asia. There may be opportunities for SA producers to include their products in gift packs, or for the aggregation of an “SA luxury food” gift pack, i.e. involving various luxury foods from SA.

**Online sales:** Online sales are a rapidly growing channel for distribution of luxury foods in Asia. Few SA producers probably have e-Commerce channels into main markets such as China today. There may be opportunities for SA producers to increase online sales for example through opening e-Commerce sites on Tmall, China’s largest merchant e-Commerce site and one used by many overseas vendors.

**Airport sales:** The airport channel is another rapidly growing channel for luxury foods. There may be an opportunity for SA producers to further exploit this channel, perhaps via “South Australian Luxury Food” outlets at key international airports.

**Branding:** Branding is generally critical in luxury markets, with brand (either of a product or a broader location) often critical to the symbolism aspect of luxury food consumption. Overall, there may be a branding opportunity for SA to position itself as the “luxury food region” in Asia, given that this overall branding does not seem to be undertaken by any region currently, with branding (such as Bordeaux) done on a category basis. This outbound promotion could be accompanied by inbound tourism-related promotion of SA as the luxury food region. SA is already promoted as a luxury food region with luxury food tours incorporating the Barossa Valley, Clare Valley, etc. (Exsus Travel Tonic 2015). Enhanced promotion of SA as a luxury food destination could expand the inbound tourism opportunity.

**Luxury food tourism:** SA has the potential to expand its positioning as a luxury food tourism location, which would require a range of initiatives including a definition of the product, better definition of the cultural heritage, co-operation of industry stakeholders (producers, hotels, travel agents etc.), sustainability and maintenance of high quality (Exsus Travel Tonic 2015). A potential option may be to enhance the existing Wine Centre into an expanded luxury food centre, aiming to support the development of SA as a luxury food region. An example of a co-ordinated body focused on luxury food tourism is the Basque Culinary Centre (Basque Culinary Centre n.d.), which aims to convert the Basque Culinary Centre into a world reference for gastronomic tourism, aligning tourism strategy with the overall strategy of the centre.

# **PART IV**

# **PACKAGING**

## 4. Part IV Packaging

### 4.1 Introduction to Packaging

Packaging may offer value chain opportunities to SA in functional and luxury foods. The use of packaging, for example, can help in product differentiation. Hence, this section covers opportunities that packaging may offer specifically for functional and luxury foods.

Packaging is commonly defined as “the science, art, and technology enclosing or protecting products for distribution, storage, sale and use.” It is also widely accepted to be “a coordinated system of preparing goods for transport, warehousing, logistics, sale and end use. Packaging contains, protects, preserves, transports, informs, and sells” (Soroka 2009). However, “food packaging” is a broad term that encompasses a diverse array of products. These products take on a number of forms and functions, each developing out of the unique set of conditions required to house its respective contents. Therefore, most definitions tend to centralise around the purposes of packaging, over its forms. The purposes of packaging generally include several key objectives that relate to the containment, protection and delivery of the product, including its presentation and accessibility to the consumer (Get Ready to Launch – R2launch n.d.):

- **Physical protection** (from mechanical forces such as shock, vibration, compression, temperature, etc.)
- **Barrier protection** (from oxygen, water vapour, and dust, where permeability is also a critical factor in determining shelf life)
- **Containment or agglomeration** (the grouping of small objects into packages for efficiency in handling and storage)
- **Information transmission** (communicating information on how to use, transport, recycle or dispose of the product and package, and also offering information about the product, such as their nutrition facts and health disclaimers)
- **Marketing and presentation** (designed to encourage potential buyers to purchase the product. Presentation for consumer appeal is particularly important for functional and luxury foods, where visual elements can establish trust and communicate the benefits and quality the product embodies)
- **Security** (reducing the security risks of shipment, such as pilferage and tampering, as well as traceability and authentication seals for credibility)

- **Convenience** (in distribution, handling, display, sale, ease of opening, closing, use and reuse)
- **Portion control** (single serving or single dosage packaging with precise content amounts to control usage. Bulk commodities can be split into packages more suitable for single consumption or individual households. Also helps inventory control).

Another useful definition of food packaging is a “*structure prepared to contain a commercial food product, i.e. enabling it to be easier and safer to transport, protecting the product against contamination or loss, degradation or damage, and maintaining a convenient way to dispose of the product*” (Sacharov & Griffin 1980). Particularly for food, it is important to recognise that packaging is not merely a container, but a tool for delivering a food in its best condition for consumption (Hine 1995). Food packaging is important for food quality and perception, and is often regarded as a highly integrated attribute that is related to the product, generally without forming part of the physical product itself (although, in the case of edible capsulation, it can be consumed together with the product, as a way of agglomerating the active agent) (Olson & Jacoby 1972; Richardson et al. 1994). It can be regarded as being the bridge between the brand and the product, as it is often the product-related attribute that consumers choose to perceive as surrogate indicators of product quality (Olson & Jacoby 1972). In other words, packaging represents the product it contains, and also serves to function accordingly, by defending product integrity.

With respect to most food products, the primary objective of food packaging is therefore to ensure the safety of the product and preserve it in good condition for its anticipated shelf life. This includes providing protection, tampering resistance or evidence, minimising product losses (waste) throughout the handling and distribution chain, and providing special physical, chemical or biological needs. It may also bear information, such as nutritional facts, on the label, about the food being offered for sale (Food Packaging Technology 2011, Bix et al. 2003).

## **4.2 Key Packaging Types**

In categorising packaging types, it is helpful to describe them at the layer or level of application. There are three widely accepted levels of packaging:

1. **Primary packaging:** The retail or consumer pack that contains the sales unit and is often most proximal to the product (Verghese et al. 2013). This directly envelopes the contents and is often the smallest unit of distribution or use and is the packaging that consumers interface with. Examples include bottles, cans, closures, lids, labels and wrappers.

2. **Secondary packaging:** Additional layer to protect and contain the primary packs (Verghese et al. 2013). This is often used to group primary packages, and is thus directly outside the primary packaging; for example, boxes, and shrink wraps/films (that consist of smaller single units grouped together).
3. **Tertiary packaging:** Additional layer to protect and contain the primary packs, during distribution ((Verghese et al. 2013). Also known as transit or transport packaging, these are used for bulk handling, warehouse storage, and transport shipping (using crates and pallets to pack units efficiently into a container, for example). The materials and design used in this type of packaging are often optimised for warehousing and distribution to retail stores, and is typically used to package the units that are sold to an industrial consumer.

Based on these levels, packaging can therefore be developed to focus on objectives that are relevant to the respective level of application, and address the prominent challenges at each level. Many levels of food packaging may exist for one food product. For example, a single sweet may have 'wrapping' (primary packaging), which belongs to a 'bag' of sweets (secondary packaging), transported in a 'box' (tertiary/transportation packaging).

### **4.3 Main Trends in Food Packaging**

Principal trends in food packaging include:

**Aesthetics:** Packaging design is focusing on visual authenticity. Consumers are constantly looking for honesty, transparency and real information about the products they purchase (Creative Bloq 2015). Successful packaging aesthetics are therefore about communicating trust and a narrative or personality that encourages a human connection. This could be in the form of a hand illustration that tells a narrative, or declares the personality of the product and its brand through design. In the case of luxury goods, this often means packaging that is stripped down to the pure essence of what the brand represents by focusing on subtle and minimal designs that create a strong sense of composure (The Dieline 2015). For food products, clear packaging and transparent or photographic designs establish a sense that 'what you see is what you get', particularly important for functional products; these help consumers make informed decisions and can provide direct visual and tactile information, letting the product speak for itself, and reduces uncertainties about what to expect. These considerations play a crucial role in determining consumer purchasing decisions (Quartz n.d.) with package colour and picture labelling being one of the highest influencing factors to willingness to purchase (Ares et al. 2010). However, it has to be kept in mind that transparency of packaging materials is not necessarily valued as much in Asia as, for example, in the EU and the US. Visual elements seem to dictate the

perception of product quality (Abdalkrim & Al-Hrezat 2013) and functional benefits (Ares et al. 2010), which are core to luxury and functional foodstuffs.

**Traceability and authentication:** Consumers are becoming more discerning about the products they purchase and their origins. Particularly with the rise of ‘value-added’ products (Hoorfar et al. 2012), where additional quality attributes often command premium pricing, the ability to verify the origins of and authenticate products has become critical in allaying the fears of consumers about counterfeits, contamination and sustainable sourcing (Anica-Popa 2010). Barcodes, Quick Response (QR) codes and Radio Frequency Identification (RFID) have all been instrumental in supporting product identification and traceability (Nightingale 2011).

**Digital packaging:** Physical packaging has increasingly incorporated digital elements into its design for numerous purposes. QR codes and hashtags on packaging continue to bridge the offline and online worlds to encourage consumers to interact with their products through online channels. Given the prevalence of mobile devices in the modern consumer market, QR codes are a cheap and consumer-friendly way to provide information about the product (The Drinks Report 2014). Packaging that uses digital technology to offer more interaction and information to the modern consumer is developing rapidly, with more and more consumers engaging in mobile activities in-store (Sena 2014).

**Active packaging/intelligent packaging:** An integral role of packaging is to preserve product integrity. Active packaging is a class of technologies in which “subsidiary constituents have been deliberately included in or on either the packaging material or the package headspace to enhance the performance of the package system” (Robertson 2006). Typically, active substances are either released from the packaging to the food or the head space to enhance the food quality and shelf life, undesirable substances are absorbed from the food or the headspace, or the activity is based on direct contact with the surface of the active packaging and the food without actual release (AIPIA & ITENE 2014). Examples of active packaging include antimicrobial, antioxidant and antifungal features, gas emitters or scavengers, and humidity controllers, and in some cases even temperature control (Kerry 2006, AIPIA & ITENE 2014). Antimicrobial packaging are typically fixed onto a surface as a separate coating or treatment, provided as a separate sachet or incorporated as an additive into the packaging material to be released later (Kerry 2006). Much attention is being paid today to the use of biopreservatives and plant extracts as antimicrobial agents (Lagaron, Ocio & Lopez-Rubio 2011). They can also be designed responsively such that the system releases antimicrobial compounds, activated upon detection of bacterial growth. Packaging is also able to communicate information about its internal and external conditions in the form of intelligent packaging. Intelligent packaging “contains an external or internal indicator to provide information about aspects of the history of the package and/or the quality of the food” (Kerry 2006, Robertson 2006) or – according to the EU regulations – “monitors the

*condition of packaged food or the environment surrounding the food”* (Yildirim 2011). Indicators and sensors monitor the condition of the packaged food or the surrounding of the food, such as storage conditions (time-temperature indicators), integrity of the package (leakage indicators) and product quality (freshness indicators). Indicators are an under-group of sensors, but they cannot provide quantitative information, store data of measurement and time. Indicators are typically based on colour change, diffusion etc. However, sensors can detect the presence of substances, change coating property, and convert the data into a proportional output signal by the transducer. Intelligent sensors and indicators come in many shapes (prints, labels, devices, tags). Packaging is thus able to communicate this key information to the consumer visually, or the data can be read with smartphones near field communication (NFC) reader or detected optically using a smartphone camera. This helps to monitor the supply chain, provide evidence of tampering, or indicate possible changes in the food , which tell the consumer whether or not the food is safe to consume. Whilst several of these technologies are not entirely recent inventions, active and intelligent solutions are far from saturated in the food packaging sector, and are often restrained e.g. by technical, economical, marketing and regulatory issues (Kerry 2006, Yildirim 2011).

**Modified Atmospheric Packaging (MAP) and gas scavengers:** Modified atmosphere packaging (MAP) is a technique that can extend the shelf-life of fresh foods, while preserving the raw appearance, texture and odours. MAP generally refers to packing a food product within an enclosed chamber where a manipulation of atmospheric gases is applied to extend the shelf-life (Arvanitoyannis 2012). Three gases are predominantly used: carbon dioxide (CO<sub>2</sub>), oxygen (O<sub>2</sub>) and nitrogen (N<sub>2</sub>). CO<sub>2</sub> inhibits the growth of moulds, yeasts and highly aerobic bacteria by extending the lag phase and reducing growth rates during the exponential phase. Correct barrier materials must be used to ensure that full benefit of the technique can be achieved. Also, highly specialised films can be used that allow correct respiration of the product and the selective permeability of gases through the packaging material. Gas scavengers (often called oxygen scavengers) absorb gases that would otherwise cause oxidation of the food product can also be used in packaging to help extend shelf life. Various biochemical spoilage indicators have been identified, such as pH, trimethylamine, and total volatile basic nitrogen (TVB-N) (Siripatrawan et al. 2009). Similarly, sachets, such as those filled with silica gels and other moisture absorbers, also help modify the packaged atmospheric environment and in turn help preserve food in ideal conditions for longer (Huff 2008).

**Packaging for the urban, elderly, disabled and young:** Airtight seals, strong physical and barrier protection, vacuum packing and tamper/theft resistance are all integral to the preservation of product integrity. However, packaging as a medium for consumers to interface with must be accessible. This is particularly a concern for the elderly, disabled and young, who may lack the dexterity or strength to

open protective packaging, but are often the main consumers of functional foods. This also translates to the visual aesthetics of packaging; print should be large and clear, with intuitive markings to indicate openings and any instructions. Similarly, packaged foods that are ideal for the busier urban population require packaging that is conveniently accessible and resealable. Mylar Cook and Mylar Bake, for example, were developed by DuPont and Multivac as a thermoformable cook-in-bag solution, offering convenient cooking within the safety of its sealed packaging until consumption (Spinner 2013). Furthermore, it must take into consideration the portion sizes that characterise most urban-dwelling households offering packaging sizes that are appropriate for the common one- or two-person households, and resealable for portioned consumption (Verghese et al. 2013).

**Sustainable packaging:** In accordance with purity and transparency demands in design, consumers are also demanding packaging that is environmentally-friendly (UL Product Mindset 2011). These consumers can be responsive to sustainably packaged products that alleviate their guilt of purchasing an environmentally harmful product. Resealability, biodegradability and even the edibility of packaging are growing trends as a result. Interestingly, as more luxury goods also incorporate the concept of the 'luxury of less', sustainability also becomes more relevant and more applicable to these premium products.

#### ***4.3.1 Main Trends in Food Packaging in Australia***

The Packaging Council of Australia identifies the cost of government provided services to be a significant determining factor in the price of packaging (Packaging Council of Australia, n.d.). The South Australian State Government has recognised this need, and has demonstrated its commitment in initiatives such as the 'Innovation Voucher Program', which in 2013, injected funding into a packaging project to improve export opportunities for Pipi (Stewart 2013). Similar government-backed efforts could be made in other areas also, with technology translating across to luxury seafood such as lobsters and abalone, to render further food export opportunities.

Credited with the birth of the MAP in the 1930's, Australia is now home to packaging giants like Amcor, the third largest packaging manufacturer in the world, and one of the largest in flexible plastics, MAP and PET packaging (Amcor n.d.).

Natural resources such as coal, bauxite, iron, and gas are integral to the production of packaging such as glass, aluminium, steel, PET and other flexible plastics. With a relatively high recycling rate lowering energy consumption in production, combined with its technological capabilities and abundance of natural resources, SA has significant potential for its packaging, and as one of the world's leading countries in flexible plastic packaging.

Additionally, the move to custom / bespoke packaging is gathering pace.

**4.4 Functional and Luxury Food Packaging Market**

**4.4.1 Market Overview**

A number of packaging considerations and trends are particularly applicable for functional and luxury foods which cumulatively form a global market in excess of US\$200 billion (Frost & Sullivan estimate). These are described in more detail below.

**4.4.2 Functional Food Packaging**

Examples of packaging considerations in functional food packaging (Shi et al. 2006b) are listed in Table 20.

**Table 20: Examples of Packaging Considerations in Functional Food**

Product	Packaging Considerations
<b>Polyunsaturated fatty acids</b>	The high degree of unsaturated fatty acids, such as omega-3, makes them susceptible to oxidation, which can result in rancid flavours that make incorporation into foods a challenging task. Microencapsulation has been proven to be a successful technology in packaging such sensitive ingredients and accommodating them in food items. Leveraging this technique continues to show potential for further stabilisation and delivery of functional but sensitive ingredients through easily consumable food formats (Shi 2006a).
<b>Probiotics</b>	Viability of probiotic microorganisms in foods depends on many factors. Probiotics are typically anaerobic bacteria and therefore sensitive to oxygen. Thus MAP and airtight containers are the main priorities for maintaining probiotic cell viability through storage to consumption (Shi 2006c). Microorganisms are also sensitive to light, and if stored in dry form also to humidity. Temperature fluctuations are also harmful to probiotics (Saarela 2007).

The basic packaging choices for functional foods are driven by the product characteristics. Various products are differently sensitive to factors such as fluctuating temperature, humidity and oxygen. Conveying the correct message about the target consumer groups, health benefits, dosage and nutritional value sets high demands on the label information of functional foods.

### 4.4.3 Luxury Food Packaging

Examples of packaging considerations for luxury foods are outlined in Table 21. The list of products and corresponding packaging considerations are based on the key luxury foods identified in the luxury foods section.

**Table 21: Examples of Packaging Considerations for Luxury Foods**

Food Product	Packaging Considerations
<b>Luxury chocolates</b>	Fine chocolates are highly sensitive to storage temperature, sunlight, humidity and air, which can cause them to melt and oxidise, altering their original flavours. Dark chocolate is more resistant due to its antioxidant constituents, but is also best stored in an airtight container below room temperature. As chocolates easily absorb other scents, it is important that chocolates are isolated from other scents to maintain their product integrity. The migration of packaging substances into high fat content food products, such as chocolates, through diffusion has been studied, and reveals that temperature, water and protein content must also be controlled for to mitigate detrimental migration of packaging substances (Silva et al. 2007). Furthermore, chocolates are often given as gifts. Therefore, a more recent trend in luxury chocolates has been to offer customisability, with consumers willing to pay premium prices for personalised packaging (KPMG 2014).
<b>Red wine</b>	Wine is a time and temperature dependent product (Hopfer et al. 2013), as it can age inside its packaging and can thus change in its taste and aroma profile. Packaging must therefore consider the rate and extension of ageing related reactions, and how it alters each unique wine (Ghidossi et al. 2012). Whilst glass is the dominant primary packaging for wines, polyethylene terephthalate (PET) bottles with oxygen scavengers (PETA; antioxidant PET bottles) have also been shown to closely follow the total oxygen barrier properties of glass, slowing the oxidation process (Giovannelli & Brenna 2007). Another important consideration, particularly in Asia, is cork (natural or synthetic) versus screw top. For ageing wines, screw top is perceived to be inferior, possibly due to strong Bordeaux influence, which has been commonly associated with corks with quality. There have also been claims that the air ingress allowed by corks are absent in screw tops – a claim countered by filter layers implemented in screw tops to control air ingress. However, too much oxidation (as well as too little) is also detrimental to the taste and aroma of wine, and oxygen ingress through the traditional cork has been found to be unreliably varied. TCA (2, 4, 6-trichloroanisole) cork taint can also affect 1-3% of wines, spoiling the wine. In response to these issues, synthetic cork solutions have been introduced, along with the convenient and cheaper screw top. However, it should be noted that many Asian consumers still typically associate the authenticity of wine with the more traditional (and thus more familiar) cork. Screw tops, in spite of their superior slowing of oxidation processes, added convenience, resealability, and reduced risk of contamination, are conventionally associated with cheaper wines, undermining the actual quality of the wine itself. Counterfeiting of wines is a serious problem in many countries. To prevent this various packaging solutions have been developed.
<b>Lobster</b>	Ambient temperature, holding time in export packaging, water quality in holding facilities, packing densities, and shock are all influential in determining morbidity and mortality in the highly sensitive live transport of lobsters (Spanoghe & Bourne 1997, Vijayakumaran & Radharishnan 1997). Dry storage approaches for tertiary packaging can be thermoformed, insulated trays and air cartons; insulated and isolated transportation of live lobsters to minimise shock and cumulative stress, thereby reducing mortality and shrink throughout the distribution channel (Coia 2003). Whilst numerous solutions, such as fish boxes,

Food Product	Packaging Considerations
	sprinkle tanks, tube matrices, and cardboard boxes have been used, best practices for dry transport share in providing common ideal conditions: dark, cool, damp, and protected from physical distress and drying out.
<b>Truffles</b>	Truffles are highly valued due to their aroma, flavour and nutrients. However, their high microbial population leads to high perishability (Miao et al. 2014). Antimicrobial packaging and Modified Atmosphere Packaging (MAP) (Rivera et al. 2010 & 2011) can help prolong shelf life by eliminating microbes and preserving sensory qualities.
<b>Caviar</b>	Packaging caviar is a highly delicate and high maintenance process and even when airtight packaged, caviar will remain fresh for two to four weeks maximum. Salted caviar (malossol) can keep for three months when salted up to 10%, but sacrifices taste for prolonged shelf life. Fresh caviar must be constantly chilled when shipped, and some may require frequent attention through shipping, needing to be turned often so that the fat settles evenly on each egg (U.S. Department of Homeland Security 2008). Fresh vacuum-packed jars of caviar can also be pasteurised through immersion in hot water, allowing them to keep for up to a year of unrefrigerated storage and shipment.
<b>Abalone</b>	Abalone quality is highly dependent on freshness. TVB-N content has been found to be slowed down by modified atmospheric packaging, extending the sensory quality of abalones up to 15 days, whereas those stored in atmospheric or vacuum-packaged environments were not acceptable after 3 days (Sanguandeekul & Siripartrawan 2008).
<b>Wagyu Beef</b>	Modified Atmosphere Packaging (MAP), vacuum packing and gas flushing are all common methods of keeping fresh meats for preservation. However, a large proportion of case ready packaging goes to waste before reaching the consumers due to lack of presentability and poor identification via labelling. Particularly in the case of wagyu beef, distinct labelling is important to help distinguish its premium quality over other standard beef products. Skin packing is a more recent method that enhances presentability and preservability, keeping fresh meat for up to 5 extra days. A consideration for all vacuum packaged (including skin packaging) red meat is the absence of a bright red coloured meat expected by consumers. In MAP, high oxygen environments can be used to maintain the bright red colour; however, this can in turn lead to oxidation in lipid phases of the meat.

The basic packaging choices for the listed luxury foods are driven by the product characteristics. Various products are differently sensitive to factors such as fluctuating temperature, humidity and oxygen. Keeping these limitations in mind, different packaging choices can be made to show the premium/luxury quality of the foods. The main elements of luxury packaging are tactile quality (the feel of the packaging), anticipation (unwrapping of layers of packaging), quality control (uniform quality), and responsibility (environmentally friendly). New trends in luxury packaging include matte finishes, simple and clear over the top designs, subtle sustainability, and transparent packaging (Graphic Packaging International 2014). The packaging can be both luxurious and sustainable when for example fewer ink colours and recycled materials are used. In addition, minimalistic high-quality packaging can be used to convey the required luxury effect. In luxury packaging glass is favoured over plastic. New, unusual shapes of containers have been developed especially for luxury foods (Connolly 2013).

Since consumer preferences vary in different countries, it is of utmost importance to recognise the local preferences, for example regarding packaging material, colour and finish as well as labelling information. Consumer studies, which currently start to utilise neurosciences, are often performed to identify the local preferences (Harvard Business School n.d.).

**4.5 Packaging Regulations**

Regulations and standards pertaining to food packaging across the Asia Pacific region are varied, country to country, and are often not well-defined. These regulations apply to all food products, and not specifically just to functional and luxury foods.

However, most are outlined under Food Contact Material or Food Contact Substance regulations that are primarily concerned with the migration of harmful chemicals from the packaging into the food substance, and prescribe quantitative restrictions on the presence of such substances (restricted or prohibited lists). Countries also sometimes have ‘positive lists’ of approved materials, although the challenge of unifying these standards across countries for cross-border trade, and updating them for new and innovative materials, remain. Key data on the food contact substances (FCS) and materials (FCM) regulations across key countries in the region is summarised below:

**Table 22: Packaging Regulations in Selected Countries in the Asia Pacific Region**

Market	Regulations	Standards	Positive List (PL) of approved FCS	Restricted or Prohibited List
Japan	Japanese Food Sanitation Law.		Although specifications exist for packaging materials, Japan does not have a specific PL.	Included within the existing regulations and standards.
China (Misco 2012) (Eldred et al. 2010)	‘Food Safety Law of the People’s Republic of China’ under the Chinese Ministry of Health.	‘Guo Biao’ Mandatory national standard, and ‘Guo Biao Technical (GB/T)’ exist as recommended and voluntary national standards.	‘Hygienic Standards for Uses of Additives in Food Containers and Packaging Materials’ covers resins, coatings, polymers, adhesives and additives allowed in packaging materials. New packaging materials are governed by ‘the Management Rules for the Administrative Approval of New Varieties of Food Related Products’.	General requirements on levels of materials exist.

Market	Regulations	Standards	Positive List (PL) of approved FCS	Restricted or Prohibited List
<b>India</b> (Hill & Rubistein 2012)	‘Food Safety and Standards Act’ (FSSA), under the Food Safety and Standards Authority of India (FSSAI), alongside the Bureau of Indian Standards (BIS), is undergoing reformations to encompass the supply chain and material safety of food and food contact materials. The ‘Packaging and Labeling’ title of these regulations broadly cover FCMs.	BIS, FSSAI’s FSSA serve to integrate standards into a harmonised regulatory scheme.	PL for additives exist within the BIS standards.	Like the PL, the BIS standards include a restricted list.
<b>Singapore</b>	‘Sale of Food Act’ governs the supply chain and packaging materials of food. Specifically, ‘Food Regulations’ and ‘Sale of Food (Food Establishment) Regulations’ cater to food packaging, under the Agri-Food and Veterinary Authority (AVA)’s Food Control Division.	None specifically; regulations generally mandate licensees to ensure that packaging are “not likely to contaminate the food”.	None specifically; Pre-market approval is not required for the import and sale of food packaging materials if they do not migrate harmful substances to the food.	“Containers for food” (Part III, No. 37 of the Food Regulations) includes broad specifications for prohibited packaging materials.
<b>Thailand</b>	Food Act (1979) under the Ministry of Public Health, ‘Thai Food and Drug Administration’ (FDA) department.	Ministerial Notifications specify standards and requirements with respect to levels of materials. New standards are also proposed by the Thai Industrial	Some specifications exist under Ministerial Notification No. 295 for milk product packaging and plastic packaging.	Some bans on reusing certain types of food containers under Ministerial Notification No. 92.

Market	Regulations	Standards	Positive List (PL) of approved FCS	Restricted or Prohibited List
		Standards Institute.		
<b>South Korea</b>	Food Sanitation Act under the Ministry of Health and Welfare, and the Ministry of Food and Drug Safety (MFDS).	'Korea Standards and Specifications for Utensils, Containers and Packaging for Food Products' under the MFDS (Food Additive Standards Division).	Standards contain specifications of compliance of individual materials.	Included in the Standards to ban specific substances, printing and certain colorants.
<b>Taiwan</b>	Act Governing Food Sanitation, under a Department of Health agency, the Taiwan Food and Drug Administration (TFDA).	Sanitary Standard for Food Utensils, Containers and Packages.	No; Although the standard prescribes limits for materials, it is not a positive list.	The 2011 version of the Act includes prohibited limits of the final article.
<b>Australia</b> (Food Standards Australia New Zealand 2014b)	'Food Standards Code', under Food Standards Australia New Zealand (FSANZ). Also, the National Packaging Covenant is a voluntary agreement that establishes an environmental policy and life cycle management framework of consumer packaging (Packaging Council of Australia 2008).	Food Standards Code includes Standards 1.4.1. Contaminants and Natural Toxicants, 1.4.3. Articles and Materials in Contact with Food, 3.2.2. Food Safety Practices and General Requirements, and Standard for Plastic Materials for Food Contact Use.	None specifically; general guides and restrictions are given in the Standards. However, FSANZ has included in its recent proposal (P1034) to approve some international legislations such as the EU and the US Food and Drug Administration Legislations on packaging regulation, which include positive lists that must be complied with by both manufacturers and imports (FSANZ 2014).	Maximum level restrictions for contaminants and toxicants are given in Standard 1.4.1.

Source: Clark & Nielsen (2013)

Whilst some form of regulation exist in all countries in Asia, a common criticism is that, except China, Japan and Korea, most countries only have broad regulations applicable to final articles (i.e. regulations

only addressing the resulting packaging product produced from the various constituent FCMs), and thus lack specificity in regulating raw materials. Globalisation and foreign trade also prompts regulators to update their regulatory frameworks to encompass new FCMs and achieve greater consistency of the varying regulatory specifications between the importing and exporting countries.

#### **4.6 Market Drivers for Packaging**

The food packaging industry closely follows the trends identified for luxury and functional foods, and is further developed from the general packaging trends discussed earlier. The following factors have been identified as key market drivers in luxury and functional food packaging:

**Demographic shifts and urbanisation stresses the importance of appropriate packaging for the effective delivery of both functional and luxury processed food:** Increasing disposable income of the consumer, and a rising demand of the emerging middle class towards high quality, protein based food products, in large markets such as China (Kerschner & Huq 2011) have increased functional and luxury food demand, as well as its accompanying packaging. Packaging is integral in dictating purchasing decisions, particularly in functional foods, where packaging colour and pictorial labelling were found to be critical in communicating the functional intentions of the food product, and influencing consumers' perception (Ares et al. 2010).

Likewise, packaging of luxury goods are cues for “non-conscious priming” of consumers, that create the product differentiation and shelf appeal that distinguishes premium products (Quartz n.d.). Thus, as demand for functional and luxury foods increases, packaging will become increasingly recognized as a critical medium to provide product differentiation. Furthermore, packaging plays an important role in intuitive portioning and delivery for consumption. Major producers such as Tetra Pak have recognised globally declining birth-rates, and have launched smaller pack sizes in anticipation of the single person or two person households that are growing most quickly across the world. Concurrently, the ageing of Asia Pacific populations, such as in Australia (Packaging Council of Australia 2005), continues to drive demand for easy-opening, high readability packaging, particularly in functional foods often consumed by this strata. Convenience, ready-to-consume, and single serve packaging are similarly increasing in popularity, as spreading urbanisation creates increasingly complex lifestyles across the Asia Pacific region (Packaging Council of Australia 2005).

**Growing consumer sensitivity towards sustainability and food wastage drives demand for sustainable and active packaging in luxury and functional foods:** Whilst low-cost has been a determining factor for packaging, for both consumers and producers in the past, environmental impact has increasingly taken precedence with consumers becoming more aware of their purchasing options,

and demanding manufacturers engage in environmentally sustainable practices (Szaky 2013). In Australia, Container Deposit Legislations (CDLs) have been implemented in the NT and SA, where a 10 cent refund scheme for bottles and cans has seen 87% recovery rates on beverage containers in SA (Dowling 2012). Some 52% of global consumers in a survey by Nielsen report that sustainability is a deciding factor in purchases, checking labelling for environmental impact before buying, with consumers in the Asia-Pacific showing even higher interest at 63% (The Nielsen Company 2014). In fact, of a wide range of product categories, packaging alone shows the greatest acceptance of 'green premiums', with approximately 15% of consumers showing robust willingness to pay for value-added packaging with up to 25% surcharge (other categories, such as electronics, building, automotive and furniture, show less than 10% willingness at the same surcharge) (Miremadi et al. 2012). Similarly, a multinational survey by Ipsos revealed that global consumers were most inclined to pay more for packaging that is environmentally friendly. Approximately 55% of the 19,883 respondents from 26 different countries reported a willingness to embrace higher costs for sustainable packaging. Key Asian countries such as Indonesia and China reported an even greater interest than the global average, with 67% and 64% of respondents inclined to pay more for environmentally-friendly packaging (Ipsos Inno Quest n.d.). In the same survey, consumers reported an equally high interest in packaging that keeps food fresh for longer (55%, globally), with 67% and 65% of respondents in India and Shanghai, respectively, reporting willingness to pay premiums. As a result, packaging solutions that effectively increase shelf life and/or are environmentally friendly not only win over consumers, but can even be leveraged to charge a premium, justified by conscious consumers who place higher regard for preservability and sustainability in their purchasing decisions (Progressive Grocer 2013). This is particularly relevant for functional and luxury food products, which are often highly perishable, such as polyunsaturated fatty acids, probiotics (Shi 2006b), truffles (Rivera et al. 2010, 2011), chocolates (Chocolat Madagascar n.d.) and caviar (U.S. Department of Homeland Security 2008). Active packaging, modified atmosphere packaging, gas scavengers and other packaging that reduce food wastage are thus expected to be integral to these food sectors.

**More informative experience demanded:** traceability and product information instigates demand for packaging solutions to meet consumers' requirements, as they become more health aware and status conscious. Traceability is also important to prevent counterfeiting especially of premium and luxury food.

**Globalisation and trade:** Globalisation and FTAs drive demand for more imported goods that are perceived as functionally beneficial or exotic/luxury. Packaging must be able to protect the products across storage and shipping to deliver the functional benefits or premium quality demanded. Packaging also communicates the origin (traceability) and quality of the product - it influences purchasing

decisions and provides an interface for consumers to interact with and appreciate the product. It establishes trust and commitment – a key component in products that claim health benefits or demand premium pricing. In luxury goods, it must also exude premium quality – consumption must transfer these qualities to the consumer. Packaging that is culturally and lifestyle sensitive is key to successful market penetration.

The ability to provide fresh produce to foreign markets is critical to export performance. Whilst air freight is a fast solution to time-sensitive perishable goods, the high cost of transport often renders products competitive disadvantaged in pricing. Modified atmosphere packaging is able to extend product life significantly, allowing sea freight of exported goods at a reduced landed cost (Packaging Council of Australia, n.d.). The increased transportability and reduced costs on cold-chain technology (e.g. reefers), with better packaging, opens opportunities for trade of highly perishable foods common to luxury and functional categories, and thus such packaging solutions are highly valued.

#### ***4.7 Market Restraints for Packaging***

**Competition from counterfeit products:** Fraudulent counterfeits of functional and luxury foods can often introduce illicit competition into the market. One estimate by ‘Sud Ouest’, a French Newspaper based in Bordeaux, claimed that up to 20% of the wine traded internationally is fraudulent (Taylor 2013). Australian fine wines are no exception to counterfeits, with Penfold’s, one of Australia’s oldest wine labels, found to be faked on the Chinese market (Steinman 2010). Functional foods, such as royal jelly, sheep placenta, Japanese seaweed and collagen, were also target to fraudulent imitations, with 10 tonnes of the fake functional products seized early this year in Vietnam (Nhu 2015). Most of these imitations rely on re-packaging in both counterfeited packaging and labels, or refilling of original packaging to pass off as genuine products, and can often have a negative influence on product values, with vintage wines such as the 1900 Chateau Margaux experiencing price drops due to excessive counterfeiting (Bell 2014). Such counterfeits undermine the value of the packaging and continue to challenge anti-tampering and anti-theft measures implemented in packaging.

**China’s crackdown on corruption slows luxury retail and imports:** China’s crackdown on corruption and lavish gifting has had significant economic consequences, slowing down luxury retail sales and restaurant trade as Xi Jinping’s reforms significantly reduced luxury banquet dishes, such as imported beef, abalone, shark fin soup (Qian & Wen 2015). Luxury food packaging is also experiencing collateral declines, as demand for symbols of status and premium goods wane, costing the economy up to US\$ 100 billion in 2014, alone (Sudworth 2014)

**Glass packaging presents high costs of shipping and handling:** The properties of glass, being odourless, chemically inert, recyclable, impermeable, transparent and easy to shape, make it a highly attractive material for food packaging. It is typically regarded the standard for premium food packaging (Connolly 2013) and conveys quality and purity. However, whilst glass is a highly common medium for food product protection, its weight escalates transportation and handling costs, that must accommodate to also cater for its fragility (Marsh & Bugusu 2007).

**Difficulties in foreign market access:** High import tariffs, import licensing and complex regulatory standards governing food contact materials and sanitary standards in several Asian countries place prohibitively high barriers for foreign exporters of food products (Packaging Council of Australia, n.d.). Furthermore, food and nutrition labelling regulations are varied in the South East Asian region, and these variations are the root of concern with regards to cross-border food trade and access. Whilst a harmonisation of standards through the formation of benchmarks for preparing national standards (for example, a 'Guiding Principles for Food Control Systems') has been proposed to allow freer movement of food products between countries, the region has yet to conform to a common regulatory system (Jasapila & Shaarani 2011).

**Contradictory trends:** There are several trends in packaging that pose challenging opposites for producers to compromise between. For example, there is a demand to design easy-opening containers for elderly consumers; at the same time, demand for tamper evident, and child resistant closures can conflict with the former design. Similarly, light weighting, or the reduction of materials used to produce packaging, contrast with the trends for convenience and single serve packaging, which often result in individually packaged food products that use more packaging per food unit. Also, some evidence suggests that the newer packaging materials used by innovating companies may be less compatible with the existing recycling services, putting innovation against sustainability (Packaging Council of Australia 2005).

**Growing sophistication and innovation leads to increased cost of packaging:** As packaging becomes more sophisticated, the cost of innovation can also increase (Packaging Council of Australia. 2005). Whilst sustainability and other various functions of packaging were considered, cost was the determining factor for most packaging companies (Satya 2014) and innovation is not readily seized without first assessing its costs versus benefits. In a survey by Packaging Digest in 2013, respondents identified 'managing costs' as the factor of greatest impact on strategic directions (McTigue Pierce 2013).

#### ***4.8 Counterfeiting of Luxury Food***

Roughly 7-10% of the global trade is in counterfeit goods, half of which is in luxury goods (El Amin 2005). Food frauds involve, for example, wine and other spirits, milk, fish and caviar, olive oil, truffles and truffle oil, saffron, honey, cheese, ham and balsamic vinegar. Counterfeiting and tampering undermines consumers' trust in the product, leading to a loss of market share, and even risk the health of consumers (Correa 2015). For example, sales of Canadian ice wine and Italian chocolate dropped due to incidence of counterfeit products (Package Printing 2008; Merret 2007).

Counterfeit French wines in Asia are common (Wines & Wines 2013), although counterfeiting and tampering is today a global issue. Roughly 5% of the wine sold globally is not what the label claims. Empty (and fake) bottles are sold on the internet and filled with inferior products, labels are photocopied and new chateaux names are created (Fake enough? N.d., Fitzgerald 2014). Sometimes the contents are changed with syringes, while there are also indications of large scale bottling (Merrett 2007). The main question for producers is whether they want such publicity and if they can afford either the technologies or the expensive lawsuits to prevent counterfeiting of their wines.

Packaging plays often a key role in preventing both counterfeiting and tampering. Typical solutions to tackle counterfeiting and tampering are based on "layered" solutions or different combinations of visible and hidden security features, and different coding and forensic technologies combined with smartphone apps and detectors (Packaging Digest 2011). Regardless of the actual technologies used, maintaining supply chain integrity is of high importance.

Packaging material is the first line of defence. Although certain specialty materials can be simply difficult to obtain, embedded fibres, security threads and other particles, watermarks created during papermaking, and embossing or surface texturing are often extremely efficient tools against counterfeiting (El Amin 2005). There are for example paper labels for wine bottles with a unique fibre patterns that can be scanned at point of purchase with a smartphone to validate product authenticity (Steeman 2014). In addition, various materials are also employed as shrink wraps, capsules, seals, tapes and labels to provide evidence of first opening or tampering. An intact anti-tampering concept is a sign that the product is likely to be genuine.

Inks and dyes are suited for various anti-counterfeiting technologies (Agheyisi 2011). The most common inks for this purpose are colour-shifting, thermochromatic and holographic inks. While these inks are typically based on the angle of observation or a response to a specific external stimulus, certain inks are only visible at specific wavelengths or by special tools. Developments in nanotechnology, such as quantum dots, have also resulted in new inks. Fluorescent dyes have also been suggested as a tamper-evident solution revealing if a polymer film has been damaged (Bertrand 2005).

Holograms printed on seals, patches, foils or labels are often used as an anti-counterfeiting feature hard to copy (Agheyisi, 2011). 2D/3D holograms are readily available today. Dot-matrix holograms, on the other hand, are built from an array of diffractive gratings arranged at certain angles. These holograms require decoders and mathematical algorithms. Holographic images can also be embedded with covert text, security codes or digital data, logos, UV prints, etc. Advanced holographic images are used in anti-counterfeiting labels of e.g. Spanish wines. Holograms have also a strong market share in Asia (Agheyisi 2011).

Drawing on forensic technologies, taggants such as micro particles are complex and generally undetectable by eye (Agheyisi 2011). Printable taggants can be customized and then added to printing ink. Embedded botanical short genetic markers (DNA) can provide covert protection embedded into inks, varnishes and laminates (Linge 2014). One Australian vintage wine producer blended DNA from a grape vine into its label ink (Werblow 2009). Markers detected only by a unique recognition molecule have also been developed. Forensic technologies often require laboratory tools, specific decoders or at least microscope for detection.

Anti-counterfeit strategies often combine the use of product and packaging authentication technology with various product track and trace technologies. Tracking and tracing technologies are used to fight unauthorized distribution, which is frequently linked to counterfeiting. For example, wireless chips and radio frequency tags (RFID) can serve as anti-counterfeit and anti-tampering tools (Asanghanwa 2007). Active chips can alarm about possible tampering or the performance of passive RFID chips is interrupted due to related damages.

#### ***4.9 Technology Trends in Functional and Luxury Food Packaging***

The technology trends in the functional and luxury food packaging market commonly seek to address the restraining factors or capitalise on the driving factors discussed above:

**'Reduce'**: Light weighting, or the thinning of material without sacrificing performance, will continue to reduce packaging weight and raw materials in manufacturing. Similarly, there has been a significant transition from rigid to flexible packaging, which also helps to reduce packaging weight (Zero Waste SA 2012). Reduction of packaging weight continues to generate savings in the value chain with the maximisation of efficient material use and minimisation of transportation costs.

**Smart labelling to address traceability and tamper evidence:** Consumers are becoming increasingly influential in the supply chain. They are demanding more information and take interest in understanding their products. As supply chains become increasingly global, traceability takes centre

stage in informing consumers where a product originates from (UL Product Mind Set 2011). Particularly with several food scares in China, Asian consumers are more wary of food production and look to foreign sources for safety. In annual reports by global safety science company, UL, consumers reported an increasing desire for traceability, rising from 54% in 2011 to 61% in 2013. However, manufacturers have yet to effectively provide sufficient information to consumers with regards to where a product comes from, and traceability continues to become a rising priority to be addressed (UL 2013). With fears over fraudulent products, to which functional and luxury foods are most prone to, tamper evidence and verifiability of a product's origin are especially important in these categories. INSIDE Secure, an embedded security company, and Selinko, an object identification company, have come together to address this issue in wine, with their 'CapSeal' device. The embedded Near Field Communication (NFC) chip can verify the authenticity and provide tamper evidence of the bottle (Inside Secure 2014), and exemplifies the extent to which smart labelling is advancing to offer integrated solutions and information to their consumers.

**Convergence of packaging technologies for value-added multi-functionality:** Modified Atmospheric Packaging (MAP), gas scavengers and skin packaging have all been highly successful in improving preservation and shelf life of products, and addressing food losses in value chains (FAO 2014). Multi-layered or laminated plastics with a blend of different films have diversified the range of different barrier properties manufacturers can create to protect different food products with varying conditional requirements (Zero Waste SA 2012). Skin packaging has also improved shelf display and presentability. However, with a lot of these barrier materials, the protective benefits are lost when opened (Farmer 2013). Also, traditional PET bottles compare poorly with the impermeability of glass (Giovanelli & Brenna 2007). Therefore, the convergence of MAPs with resealability for convenient, portion controlled consumption (Farmer 2013), and PET bottles with antioxidant laminates (PETAs) (Giovanelli & Brenna 2007) as a lighter and cheaper alternative to glass, are trending developments of great significance in offering multifunctional packaging with the convergence of various packaging technologies.

#### ***4.10 Australia's Packaging Industry***

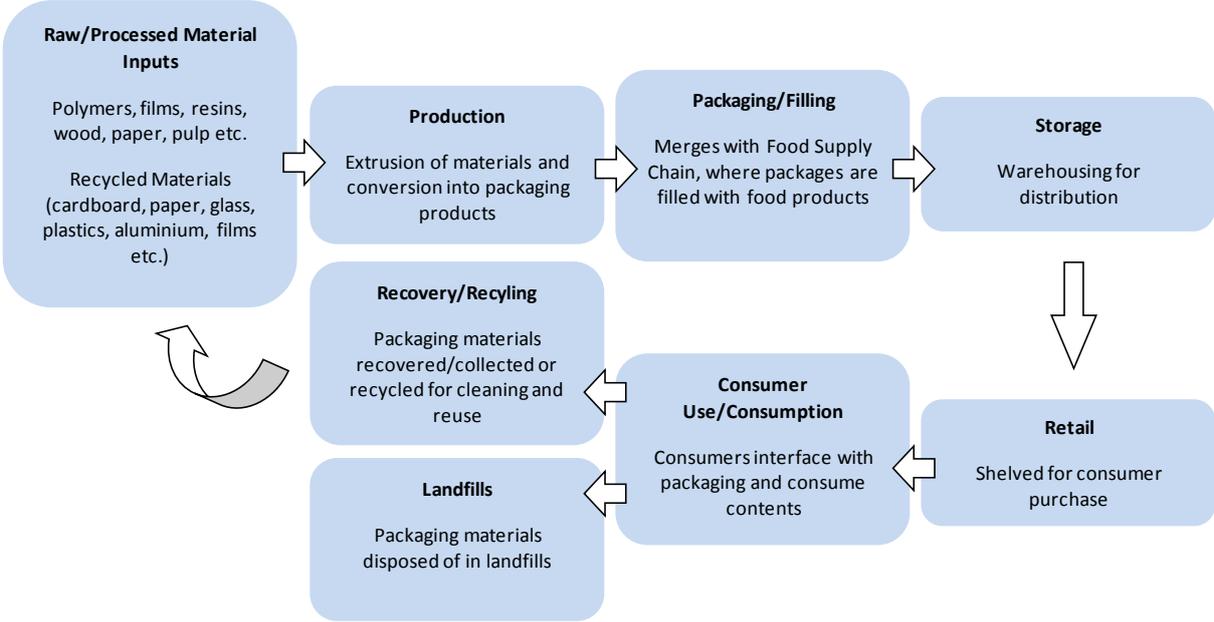
Australia's packaging industry is dominated by increasingly global companies with significant export markets that accompany similarly multinational processed food producers that need packaging that meets international standards. The packaging industry of Australia is characterised by high concentration and consolidation across the market, competing intensely in a variety of packaging materials (Packaging Council of Australia 2005).

- **Glass:** O-I and Orora (formerly Amcor) are the two major glass container manufacturers in Australia, with Orora producing wine bottles from its Gawler plant in SA since 2002.
- **Corrugated boxes:** 95% of the country's corrugated board production comes from three companies: Orora, Visy and Carter Hold Harvey. These corrugated boards are amongst the lightest in the world and have are significantly competitive in the international market (Packaging Council of Australia, n.d.).
- **Aluminium cans:** Orora, Ardagh and Visy dominate the Australian aluminium can production.
- **Paperboard cartons:** Orora, Visy Packaging, Detmold, Scholle and Colorpak are the main producers of paperboard packaging (about 75% of the production)
- **Liquid paperboard cartons:** Tetra Pak and Visy dominate all liquid paperboard cartons produced in Australia.
- **Steel cans/drums/aerosol containers:** Ardagh, Huhtamaki, Irwin & Sheehan, Morris McMahon, National Can and Visy are key players in the production of steel packaging in Australia.
- **Plastics:** Interestingly, plastics are the least concentrated sector in packaging materials, with the exception of PET bottles, which are dominated by a few notable companies: Visy, Amcor and Brickwood. This sector also has the lowest barriers to entry, with numerous small producers still operating.

#### ***4.11 Packaging Value Chain***

The value chain of food product packaging is relatively simple and generic, with raw material suppliers feeding into packaging manufacturers, who coordinate with food producers who fill the packages, and then transport for distribution and retail. Post-consumer disposal can either go to landfills or be recycled for efficient reuse of materials that greatly reduces energy and resource consumption in future manufacture. The following value chain map can be similarly applied for most packaging industries in various materials (Figure 8):

**Figure 8: Indicative Value Chain Map for Packaging**



Source: Frost & Sullivan 2014a

**4.12 Opportunities for South Australia in Packaging**

Paired with SA’s potential export of functional and luxury foods to major overseas markets in Asia, locally-based packaging solutions support the potential to open new trade opportunities through significantly reduced costs via enhanced packaging; as mentioned previously, MAP, for example, can be used to markedly reduce transportation costs by extending product life and resilience to be viable for sea freight, which can be much more cost-efficient than airfreight. Furthermore, Australia’s packaging industry receives synergy from Australia’s “clean food” reputation in the processed food sector, and shows headroom for better labelling and traceability to better market this selling point to consumers in the Asia Pacific (Packaging Council of Australia. n.d.). Recent free trade agreements (FTAs) are expected to further liberalise trade and facilitate tariff eliminations and reductions (Food Magazine 2014) over the coming years, increasing demand for Australia’s packaging industry to further conform to the regulatory standards of FTA markets, and accompany forecasted increases in processed food exports.

To summarise, the following key areas of focus in the value chain were identified or inferred from literature that may present opportunities for SA:

**Flexible plastic Modified Atmosphere Packaging:** Light weighted flexible plastics are already a major focus area for large packaging companies in Australia. Forthcoming developments should focus on incorporating these pouch packages with active and MAP technology and resealability, to improve shelf life and portion controllability. As the plastic packaging sector further consolidates, these value-added active packaging solutions are key to offering competitive advantages as trade enablers, by preserving perishable food products across longer transportation times and at reduced landed costs.

**Smart labelling and informative design:** With a highly safety-conscious export market in mind, Australia's packaging solutions should integrate informative labelling (with descriptions of functional benefits and ingredients, and pictures, where possible), and traceability and authentication devices such as QR codes, RFID and NFC, to deter counterfeiting and offer consumers greater understanding and trust in their product's origins.

**Continued efforts towards sustainability:** Australia should continue to leverage and further encourage its high recycling rates to further reduce costs in the production of packaging. Whilst lightweighting and other measures are quickly seeing limits to reduction, recycling is a phase in the packaging life cycle that has yet to be fully realised. Significant energy and resources can be conserved using recycled materials, particularly in plastics.

**Laminated plastics with antioxidants:** Gas scavengers can be paired with multilayered plastics such as PET to offer ever lighter, cheaper, less fragile packaging solutions that improve the barrier properties of conventional PET to match that of even glass. Although glass is still considered premium packaging, due to its inertness and impermeability, its fragility and weight (even when thinned) are qualities that still offer headroom for improvement. Innovative alternatives such as PETA (antioxidant PET) seem to circumvent these structural shortcomings whilst maintaining the desired antioxidant properties of glass, extending shelf life with increased physical protection, and reduced cost and weight.

**Packaging to support exports of luxury foods:** In light of a trifecta of free trade agreements (FTAs) secured in 2014 with key Asian markets – China, Japan, and the Republic of Korea – Australia is in an ideal position to see unprecedented export trade growth, particularly in its luxury food product sectors, including wagyu beef (eliminating 40% tariffs by 2028 in Korea) and rock lobsters (20% tariff eliminated by 2016 in Korea). With 95-99.8% of Australia's exports (by value) entering these countries duty free with full implementation of the FTAs, Australian manufacturers and suppliers will continue to see an escalating need for local and advanced packaging solutions to accompany and protect these exports. As the inventor of Modified Atmospheric Packaging, Australia still has much to offer in the area of premium and advanced packaging. Its overseas clients are expanding their horizons to recognize the quality of Australian luxury goods, beyond conventionally popular markets such as Canada or the U.S.

Preserving product integrity across air and sea freight, and satisfying consumer appeal will be paramount to taking advantage of this preferential trade access, which places Australia at a level, if not even better, playing field to competing interests such as the U.S. or Canada. Opportunities for SA in packaging are concentrated particularly around the preservation of fresh seafood and beef, which are two of the country's major export sectors, along with an increasing focus on the traceability and consumer appeal of its wine.

**Packaging to support luxury foods presentation:** To be perceived as “luxury”, foods generally need to be perceived by consumers as having a heritage (Sjostrom, 2014), and packaging can play an important role in imbuing a food item with heritage. Use of high quality materials, packaging design and packaging content can all play a role in providing a heritage to a food item.

# **PART V**

# **CONCLUSION**

## 4. Conclusion

Functional and luxury foods offer potential opportunities for the SA food & beverage industry to grow, in particular by serving these fast-growing markets in the Asia region. Globally, functional foods are estimated to be a US\$160 – US\$180 billion market. This includes supplements (which, since they are not foods, are excluded from scope). Without supplements, the global functional food market is estimated at around US\$120 billion. Asia is the largest global market for functional foods, accounting for around 37% of global demand. Luxury foods are more difficult to estimate, since there is very limited existing data. However, what data that does exist suggests a global market of around US\$100 billion. When combined, functional and luxury foods are therefore a global market of ~US\$220 billion, about 3% of the total value of the global food market.

These sectors are attractive because they are growing faster than other sectors of the food and beverage industry, they offer higher margins, and they are suitable for regions such as SA, which has relatively small production capacity and high costs. Hence, they provide niche (but still quite large) market opportunities for SA's food & beverage industry.

The literature review has included an analysis of information on these markets available in publicly-available literature. Additionally, the project team has identified or inferred potential opportunities in the functional and luxury food value chains for SA. These opportunities are only based on the literature review and therefore at this stage are only preliminary. Further work will be required in the project to assess the viability of these potential opportunities (as well as identifying other opportunities not included in literature), and where appropriate to develop strategies for SA to exploit them.

Functional foods are foods that can be satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. They differ from medical foods or drugs in that they do not require medical supervision or approval. Hence, they are consumer products, but are differentiated from standard food products in that they beneficially affect health beyond providing basic nutrition. Asia is a receptive market for functional foods, because they are effectively a continuation of the long-standing Asian tradition of “healing foods”, and the potential link between certain foods and health is long-established in many Asian cultures. However, there are also more recent factors that are combining to stimulate greater interest in functional foods in Asia. These include growing wealth levels and a rapidly increasing middle-class (a growing number of individuals able to afford foods that are often significantly more expensive than basic food items); a growing incidence of chronic diseases (which functional foods can be seen as helping to prevent); an ageing

population, and consequent demand for foods which manage age-related conditions; and increasing scientific validation of many functional ingredients and products.

Functional foods are available both in various forms and to address various health related conditions. The largest segment of functional foods is dairy-related products, whereby functional ingredients are added to standard dairy products such as milk and yoghurts. Bakery products are the second largest category. The health conditions that functional foods address are many, but cardiovascular disease and bone related conditions are among the most common.

The functional food supply chain includes suppliers of both ingredients and end-products. Whilst supply of end-products is often dominated by large food manufacturers, ingredient supply is often more fragmented. Opportunities for SA may arise in supply of either ingredients or end-products.

Asia is the largest global market for functional foods, with sales estimated at US\$55 billion. Japan and China account for 80% of this market. The other largest markets are Korea and Malaysia & Singapore. Each country has different regulations governing functional foods and the claims that they can make. This complexity in local regulations often creates a challenge in marketing functional foods across multiple markets. The longest-established and most developed regulatory structure is in Japan, through its FOSHU regulatory process, under which hundreds of functional food products are FOSHUI approved.

In addition to the general science that evaluates links between specific ingredients and health, other areas of technology advancement are also helping to stimulate functional foods. For example, developments in micro-encapsulation can support inclusion of ingredients in products where this may not have previously been viable (for example, fish oil in dairy products). Nanotechnology and ingredient profiling and synthesis are other areas of technology development.

In the literature review, a number of potential opportunities were identified for SA to play a greater role in the US\$55 billion Asian functional food market. These opportunities include the supply of specific ingredients for food manufacturers to incorporate in functional foods, supply of end products and broader value chain opportunities.

Ingredient opportunities could involve supply of established ingredients such as PUFA, sourcing ingredients from the domestic industries such as dairy or wine; and development of ingredients derived from native plants.

End product opportunities could exist in supplying free-from foods or weight management foods, drawing on Australia's reputation as a source of high-quality and high-integrity food products.

Broader value chain opportunities could involve aggregation (such as SA-themed functional food gift packs) or supporting SA producers to address the growing e-commerce opportunity (especially in China).

Luxury food is a harder concept to define than functional food, as there is very little literature specifically on the topic of luxury foods, as compared to functional foods. There is no agreed definition of luxury foods, and whilst there are plenty of lists of expensive foods, these are not necessarily the same as luxury foods. However, there is a reasonable amount of literature on the broader luxury goods markets (of which luxury foods form a part), and some definitional characteristics of luxury foods can therefore be implied.

Luxury products are sometimes thought to comprise the characteristics of (high) price, quality, rarity, aesthetics, extraordinariness and symbolism. The symbolism aspect is generally seen as an inherent characteristic of luxury products, and by inference also of luxury foods. Hence, a luxury food can be seen as one that fulfils a psychological need in the consumer, generally around demonstrating status. Therefore, luxury foods are particularly relevant in societies where the psychological need to display status is strong, and this is particularly the case in China and other Chinese societies, or countries that take cultural cues from China.

Although luxury foods are rare and high priced, not all rare or high priced foods can be assumed to be luxury, as the symbolic aspect of their consumption may be absent. Price itself does not necessarily define a luxury food, but rather the presence of other aspects such as symbolism make consumers more willing to accept a high price. High price, along with limited availability and antique heritage are attributes that consumers typically associate with luxury alcoholic beverages.

As well as the symbolism aspect, luxury foods can also address other cultural cues. For example, some luxury foods such as beche-de-mer can be defined in China as “bu” foods, that is foods that are strengthening and tonic-like, as well as impacting positively on sexual potency. Bu foods are typically exotic and unusual.

As well as foods currently perceived as luxury, individual food items can evolve (or be developed) into luxury items. This can occur at the level of the overall food item or the individual producer. Characteristics that need to be developed for a product to be perceived as luxury include culture / history, endorsement and product integrity, as well as the ability to exploit specific market conditions or events.

Globally, the overall luxury market (incorporating products such as jewellery and watches as well as foods) is estimated at around US\$1,000 billion, of which food (including luxury beverages) is around US\$100 billion. Asia is the fastest growing luxury market globally. Although no specific data exists on the size of the luxury food market by region, the project team has inferred (based on factors such as

the number of HNWIs) that the biggest opportunities for luxury foods are likely to be in China, HK, Japan, Malaysia and Singapore, and the foods identified as luxury are based on those carrying that status in these markets (other markets, (such as India and Indonesia) may also have specific luxury foods opportunities and these will also be examined in the Market Analysis stage of the project).

Factors that are stimulating consumption of luxury foods in Asia include the rapid growth in the number of HNWIs, creating a larger market of individuals with the capacity to buy luxury foods; growing interest in fine dining and especially Western fine cuisine; reduced taxes on luxury imports; the growth in luxury travel; and the growth in the gifting culture, with luxury food items a typical item for gifting.

Some of the major trends in luxury foods in Asia include: the growing “Westernisation” of luxury foods, i.e. non-traditional Asian foods are taking a luxury status, with chocolates and red wine (especially premier cru Bordeaux) two examples; increased concern over traceability given the rapid growth of counterfeiting; growing concern over sustainability which can apply to some luxury foods such as shark’s fin; an increasing drive to differentiation within specific food items; and the growing importance of a compelling and interesting narrative, history or heritage to a food item.

Products that are widely perceived as luxury in China, HK, Japan, Malaysia and Singapore include various seafood (such as beche-de-mer, abalone, rock lobster, reef fish, etc), alcoholic beverages (such a premier cru Bordeaux and vintage distilled beverages) and other items such as truffles. Very approximately, the market size for these products can be estimated at ~US\$10 billion.

Opportunities for SA in luxury food products have been inferred from the literature (since there is no literature specifically on this topic). However, this identification is preliminary only. Other opportunities may also exist, and some of the opportunities identified may not be viable. Further project work is therefore required.

The opportunities can broadly be divided into four categories: expanding or enhancing production or value-add for a product already produced in SA; creating new industries in SA to produce products already characterised as luxury; developing or enhancing existing non-luxury products to take on luxury characteristics; and broader value chain opportunities.

In products currently produced in SA (such as abalone or Southern rock lobster), opportunities may derive from use of technology to enhance or increase production, or value add. For example, hatchery technology to allow farming of lobsters, or packaging technology to improve the condition of exported products.

New industries to produce luxury foods not currently available in SA could include caviar farming, truffle production or harvesting matsutake. The technical and commercial viability of these opportunities would need to be assessed in more detail.

The development or enhancement of non-luxury products could occur in categories such as red wine (where arguably SA does have brands such as Grange that are seen as luxury in Australia, but not in Asia), in distilled beverages or in other foods such as cheese.

Broader value chain opportunities could exist in supporting SA producers to exploit the e-commerce channel, especially in China: in addressing the gift pack market; and in stimulating and encouraging luxury food tourism into SA.

The final area researched in the literature view was packaging, and in particular whether packaging offers value chain opportunities in functional and luxury foods. Packaging has a range of functions, and a broad range of types of packaging are available, broadly classified into primary, secondary and tertiary. Some of the general trends in food packaging include an increased focus on aesthetics; the growing use of technologies that support traceability / authentication; use of digital packaging (e.g. QR codes); the use of active / intelligent packaging; and the adoption of MAP across a broader range of products.

Packaging-related opportunities identified in the literature review that may be appropriate for SA to add value to functional and luxury foods include greater use of MAP, use of smart labelling and more informative design, a greater focus on packaging sustainability and enhanced use of antioxidants. These technologies are worthy of further evaluation, as they may enable the creation of greater value for functional and luxury food producers in SA.

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