

Functional and Luxury Foods Market Analysis

Market Analysis – Functional Foods

November 2015

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Background and Objective

The Market Analysis phase of the *Study into the Functional and Luxury Food Value Chains in Asia and Australia including Foresights* project involves an assessment of markets for selected functional and luxury foods in specified Asian countries and in Australia. As the Market Analysis is based on markets for specific foods in specific countries, an initial phase to assess and agree upon the specific foods to be analysed was undertaken before commencement of the Market Analysis.

The initial work identified a short-list of 12 functional foods that would be the focus of the Market Analysis. These foods include both ingredients (that could be incorporated into end-products) and end-products themselves. These 12 foods are:

Ingredients

- Polyunsaturated fatty acids (PUFA)
- Proteins and peptides
- Vitamin D
- Probiotics (health promoting live bacteria; typically lactobacilli or bifidobacteria)
- Prebiotics (fibre products with support beneficial bacteria in the gut)
- Aloe vera
- Phytosterol (a collective term for plant-derived sterols and stanols)
- Carotenoids
- Polyphenols

End-Products

- Gluten free food
- Lactose free food
- Other “free from” foods

Eight countries were identified as the most attractive markets for functional foods, and form the focus of the market analysis. This attractiveness is based on the size, maturity and growth potential of their functional food markets. These countries are;

- Australia
- China (including Hong Kong)
- India
- Indonesia
- Japan
- Korea
- Malaysia
- Singapore

Due to their geographic and cultural congruity, Malaysia and Singapore have been analysed jointly in this report. Although each country is at different levels of economic development, the main drivers for functional food consumption are cultural and ethnic factors, which are common between both countries. Hence, to avoid repetition, these countries have been analysed jointly, with differences indicated where appropriate.

The objective of the Market Analysis is to identify opportunities for South Australia's (SA) food & beverage (F&B) industry to exploit value chain opportunities in Asia Pacific, based on a more detailed understanding of the functional food market opportunity in the selected countries. This report therefore includes data on key trends in functional food consumption in each country, distribution channels for functional food, and for each product, analysis of market size and growth, demand trends and product preferences. Examples of end-products incorporating functional ingredients available in each market are given wherever possible.

Approach

There is very limited published statistical information on markets for functional foods and functional ingredients. What information that exists is largely from proprietary sources (e.g. published market research reports from industry analysts that are only available for purchase), and often use different definitions and categorisations of functional foods. For example, some reports include market sizes at end-product (retail) prices, whilst other data is based on the market for functional ingredients only. However, sales of functional ingredients are a business-to-business sale (B2B) between an ingredient supplier and a food manufacturer, and prices are generally confidential. Hence, the sales value of ingredients is usually at best an estimate.

Given the absence of available data, in calculating market sizes for functional foods, Frost & Sullivan has made estimates based on interviews with industry participants, individual country industry associations, extensive in-house Frost & Sullivan reports (both as seen on our website as well as based on existing information from consulting projects), industry publications and expert interviews.

Summary of Functional Foods – Asia Pacific

Functional food products can be segmented into two main categories: functional ingredients, which are used in finished end-products that have functional benefits; and finished end-products themselves, comprising food products that claim or offer functional benefits to consumers.

It should be noted that the functional ingredients included in this report have significant opportunities in applications outside functional foods, and in many cases the functional food

market accounts for a small proportion of ingredient sales. For example, there are large markets in dietary supplements (which are not categorised as functional foods), pharmaceuticals, cosmetics and animal feed. Sales into these applications are excluded from the scope of this report.

The market value (at retail prices) of finished end-products is significantly higher than the market value just of functional ingredients, due to the significant value-add in the supply chain. For example, whilst the estimated market value of functional food end-products in Asia Pacific exceeds US\$50 billion, the estimated market value of the main functional food ingredients included in this report is around US\$4.8 billion. The relative value of functional ingredients can differ widely, dependent on factors such as availability and manufacturing complexity. For instance, while algal oil can be procured at US\$80 per kg, prices of lutein (pure extract) can cost up to US\$2,800 per kg.

The functional food products assessed in this report include nine ingredients and three end-products. The three end-products included have relatively niche, but growing, markets in Asia Pacific.

The main functional end-product markets exist in major food categories such as dairy products, baked goods, confectionery, etc., which are markets dominated largely by major food and beverage manufacturers. Opportunities for SA therefore lie in supply of ingredients for food manufacturers to use in end-products, or in supply of end-products in niche markets which have good growth prospects, but which have not yet been addressed by major global F&B manufacturers.

Across the Asia Pacific region (comprising the eight countries in the scope of this report), the total functional food market is valued at US\$5.1 billion in 2014, and is forecast to grow at a CAGR of 7.5% from 2014 to 2020. The size of the functional food market by product type across Asia Pacific is illustrated below. The market sizes quoted for ingredients are an estimate of sales of each product only in functional foods. As mentioned above, usage of these products in other applications, such as dietary supplements, cosmetics, animal feed etc., which can be very significant, is excluded from the market size estimates.

Table 1: Functional Food Market in Asia Pacific by Product Category, 2014

Product	Market Size (US\$ millions)	CAGR 2014 – 2020
Functional Ingredients		
PUFA	329.5	6.6%
Proteins and Peptides	2185.0	6.2%
Vitamin D	70.2	4.1%
Probiotics	713.5	9.7%
Prebiotics	518.6	8.4%
Aloe Vera	39.2	10.0%

Product	Market Size (US\$ millions)	CAGR 2014 – 2020
Phytosterol	286.0	6.4%
Carotenoids	146.0	7.1%
Polyphenols	537.2	6.4%
Functional Food End-Products		
Gluten Free Food	175.4	8.8%
Lactose Free Food	165.0	8.7%
Other Free From Foods	Not available (N/a)	N/a

Source: Frost & Sullivan

The largest markets in Asia Pacific are therefore for proteins and peptides, probiotics, polyphenols and prebiotics. The strongest growth opportunities are in aloe vera, probiotics, gluten free food and prebiotics.

Across the countries in Asia Pacific, China, Japan and Australia are by far the largest and most developed functional food markets. However, all markets are forecast to see growth in demand for functional foods well ahead of GDP growth over the next few years, except for Indonesia, where consumer purchasing power for the bulk of the population will largely remain too low for functional food products.

Table 2: Market Size and Forecast Growth for Functional Foods, by Country

	Functional Food Market Size (US\$ millions)	Forecast Growth Rate 2014 - 2020
Australia	1067	8.4%
China & HK	2082	7.9%
India	142	9.8%
Indonesia	145	3.9%
Japan	1540	3.8%
Korea	105	9.0%
Malaysia & Singapore	85	9.6%

Source: Frost & Sullivan

Summary of Functional Foods – by Country

Australia

With rising obesity rates, an ageing population, an increase in sedentary lifestyles and increased interest in health and nutrition, demand for functional food in Australia is increasing. As the market develops, it will become more sophisticated and follow closely patterns of the established functional food and beverage market in Japan (many Australian health food manufacturers today have Japanese investors). The demand will grow, particularly in functional beverages, as Australians look for better quality “on-the-go” nutrition, for example in the breakfast foods industry.

Opportunities in Australia

Free from foods will be a major export opportunity. Australia will be the largest market for free from foods across APAC. There is growing international demand that can be exploited based on Australia’s perceived elevated understanding of this sector.

With many food by-products being converted into functional ingredients, both in Australia and globally, there are many opportunities to add value to primary products such as rice, wine (grapes), olives, cereals, and fruits.

For example, South Australia is one of the largest producing regions of almonds in the country. South Australia’s Riverland and the Adelaide Plains along with Sunraysia (Victoria) and Riverina (NSW) make up the primary almond growing regions along the Murray River corridor. Aside from raw almonds as snacks, there is also growing market for products such as almond milk, and other delivery formats such as almond butter, almond oil and almond meal/flour, that present a variety of opportunities to Australian producers.

Dairy will be the main fortification vehicle for heart health ingredients. Phytosterols will be a key growth sector, and will merge with the protein ingredients and PUFA sectors to focus largely on adding value to dairy products.

Antioxidant fortified beverages (including water) will be another key growth area. Carotenoids and polyphenols have large potential in the beverages category, focussed on antioxidant beverage products.

Growing digestive health issues in Australia’s ageing population will drive a focus on prebiotics and probiotics. Traditional formats will give way to differentiated products, such as yoghurt smoothies and fortified kefir and lassis, including zero calorie probiotic ice creams.

China and Hong Kong

The Chinese functional foods market is a result of factors such as an ageing population and development of lifestyle diseases, such as Type 2 diabetes and cardiovascular diseases,

breast cancer, osteoporosis, and mental health problems that are driving demand for functional food. In addition high pollution levels, increasing nutritional awareness and an overall perceived awareness of issues in food processing methods (food scams, antibiotics in meat, etc.) has increased awareness of the benefits of healthy food.

Opportunities in China and Hong Kong

Food safety concerns will drive healthier food choices. As China grapples with a wave of food safety scams, several industries have benefitted from the consumers' unwillingness to buy local food. One such industry is the free from food sector, which is witnessing growing uptake among China's affluent. The allergen free food sector will continue to witness growth as more and more Chinese consumers make the shift to free from foods, driven by safety concerns. This will also drive demand for imported free from foods; a key opportunity for Australia. Another sector to benefit from this will be the omega-3 category, where fortified baby milk powder demand continues to grow in sales, driven by a female population that is often unwilling to breast feed. This sector is also seeing demand for lactose free milk powder options that several European providers are capitalising on.

Heart health concerns will drive beverage demand. China has high rates of heart health issues, and this will drive demand for heart health ingredients, particularly omega-3 and polyphenols. Additionally, the trend towards fortifying functional ingredients with dairy bases will be important in the heart health sector. For example, the drink Minute Maid Pulpy, which claims to include heart healthy fruit extracts, is now a billion dollar brand in China.

Micronutrient concern is driving interest in fortified foods. China, like India, has a micronutrient crisis. Deficiencies start from an infantile stage, with 2.38% of all births registering low birth weights in 2012. Whilst this has roots in a history of declining breast-feeding rates and breast-milk substitutes, along with inappropriate medical substitutes, recent evidence has also linked this to environmental factors such as air pollution and Bisphenol A (BPA¹), resulting in greater susceptibility to disease. Iodine deficiency has also been frequently mentioned as a consequence of low iodized salt intake, with China accounting for an estimated 40% of the world's iodine deficient population. Anaemia, Vitamin D, Vitamin K, zinc and iron deficiencies are also amongst those commonly mentioned in literature. This is driving a focus on products that can claim micronutrient benefits, even in baked goods and protein bars. This will drive a merging of several ingredient industries in order to address the growing number of Chinese parents concerned about their children's health.

¹ BPA is an endocrine disruptor, but a widely used manufacturing raw material. There is growing concern in China about it leaching, and causing public health impacts

India

India is witnessing a growing public and private industry focus on changing food consumption habits. However, Indians are especially unwilling to compromise taste for health, and ethnic flavouring still drives a majority of health food markets, playing a pivotal role in product uptake. Customisation of western products to suit Indian palates is a key market requirement for these products. However, the Indian mentality that places imported products in a premium bracket can be used to Australian exporters' advantage – for example, fortified dairy beverages with an Australian story and Australian antioxidant ingredients will prove popular in India. Indians thrive on aspirational living, and this factor drives purchasing decisions. Key consumer target segments are young urban Indians and children, who tend to be the most prolific users of international brands. However, local competitors and a lack of a strong IP protection will mean that first comer advantages will be short lived, unless brand equity is quickly built.

Opportunities in India

Convenient fortified dairy demand will continue to rise. While India has a large dairy consumption, little of this has been developed into an established functional dairy industry, particularly for beverages. The provision of fortified milk drinks is a key growth area in India, particularly if using well known ingredients such as omega-3 and probiotics.

Digestive issues will drive demand for digestive health ingredients. One of India's most famous problems is the high incidence of digestive upsets (infections) due to unhygienic conditions. Stomach upsets are a country wide phenomenon, with Indians being constantly concerned about digestive problems across all demographics and age groups. Products such as probiotics and prebiotics need to capitalise on this concept, and focus on marketing themselves to address these specific issues, as opposed to maintaining the general digestive health claims that they use in other countries.

Heart health will drive most fortification demand. Heart health ingredients, such as polyphenols, omega-3 and proteins, will be increasingly incorporated in products ranging from fortified edible oils to baked goods. The demand for heart healthy foods is a key growth area in India.

Micronutrient claims will dominate new products. India is undergoing a micronutrient crisis, with over 50% of the nation's population reportedly under-nourished, and the world's highest proportion of low birth weight infants. In 2012, 45% (7.4 million) of its children were diagnosed with micronutrient deficiency and an even higher rate in pregnant women. Deficiency types were highly varied, with Vitamins A, B, and D, Zinc, Calcium, Iron, and Iodine, making up the top seven deficiencies. Causal factors and epidemiological trends are complex, given the cultural diversity, culinary spectrum and varied geographical features. For example, Bitot's

spots (an indicative symptom of vitamin A deficiency) declined following a supplementation programme, but not uniformly throughout India. Lifestyle disparities also contributed to deficiency profiles, with unhealthy eating habits and physical inactivity raising concerns for urban populations, also. However, overall deficiencies were most prevalent in rural areas, and amongst Scheduled Caste or Scheduled Tribes (historically disadvantaged groups). With the World Health Organization (WHO) stepping in to ensure better micronutrient fortification in the value chain, many companies will aim to capitalise on this trend by introducing products claiming micronutrient benefits especially in drinks, for example Coca Cola's Vitingo powdered drinks.

Indonesia

Indonesia will remain a niche market for functional foods, thanks to rising inflation, a dominant Japanese owned local industry and a lack of affordability for the majority of the population. There is a general focus on functional beverages in the country, with local manufacturers such as Sinar Sosro and Kalbe Indonesia (Japanese owned) dominating the market. However, the market remains quite underdeveloped beyond the beverage sector. Uptake of health foods in Indonesia will continue to be driven by price, which might make market participation challenging for international importers.

Opportunities in Indonesia

Convenience will drive demand in Indonesia. Indonesia will witness growing interest in convenient and low-cost health foods and beverages. This will particularly be seen with omega-3 fortified and probiotics options. Beverages are already a popular intake choice in the country, and fortification is a popular concept.

Children's nutrition will focus on digestive health. Indonesian consumers who aim to protect their children from the unhygienic environmental conditions will drive a demand for probiotic children's products. Product innovation and differentiation in this sector will be a key growth prospect, driven by the young population in the country.

Japan

Japan's ageing population will drive most food related decisions over the forecast period towards "gentle foods" for the elderly who have trouble chewing and swallowing, and packaging designs for single-person households and the weaker elderly. Japan's 'Food for Specified Health Uses' (FOSHU) thus continues to find greatest popularity with health claims for the elderly: for example, joint and mobility related ingredients such as glucosamine, and youthful skin health ingredients such as collagen and placenta. However, the strong local market for fortified foods and beverages means that focus must be placed on areas where

Japan is known to depend on international imports such as dairy, honey etc. While Japanese beverage companies aim to focus on export strategies, there is a growing demand for westernised health foods in the country, such as Greek yoghurt (see Morinaga Milk's Partheno), and non-dairy milk alternatives (such as soy, rice and almond milks).

Opportunities in Japan

Products for the ageing population dominate demand in Japan. Aged care products are a key functional food growth area. However, the target segment in this case would need to be people between the ages of 35-50, as older Japanese than this tend to be extremely biased towards products with ethnic ingredients. Key products targeted at this sector would be carotenoids, polyphenols and phytosterol based products that are Western in formats and are offered in convenient formats. Digestive ingredients, such as probiotics and prebiotics, will face aggressive local competition, resulting in narrow margins, but newer formats such as probiotic bars aimed at the Japanese women's segment, will drive potential growth.

Dairy will continue to drive product category growth. With Japan's continued dependence on imported dairy there will be a growing market for dairy products across the country, focussing mainly on heart health benefits. The growth in café culture in Japan has also driven new outlets for fortified dairy products to be sold. Beverages will be a key format, with fortification ingredients such as carotenoids, omega-3 and proteins dominating growth.

Korea (South Korea)

Korea is one of the fastest growing health food markets across the region, driven by an extremely image conscious urban population, high dependence on imported food and an overall trend towards unhealthy lifestyles driving a greater focus on healthy eating. Korean consumer preferences, especially for functional beverages, are highly influenced by the media, with television channels such as Arirang frequently touting the latest health trend. The market also has significant local participants, particularly in the carotenoid and polyphenol categories. Similarly, Korean manufacturers control the value chain, making entry difficult unless the products are obviously Western in their brand and fortification benefits, for example, protein bars are popular products focussed on the weight management sector, where international companies tend to have an advantage. The key strategy in Korea will be to focus on products where Australia's story and brand is a key product differentiator, as opposed to trying to compete with local players.

Opportunities in Korea

Free from foods are likely to see growth in Korea. As the benefits of gluten free foods are emphasised by availability in high end department stores such as Shinsegae, there is a

growing trend among Gen-Y to adopt gluten free products as a lifestyle choice, in spite of not having a gluten allergy. This is key in driving demand for these products, as general focus on health rather than incidence of allergies will drive gluten and allergen free food markets.

Dairy will continue to be a key growth area within children's nutrition. As protein continues to be a key concern for Koreans, dairy demand will continue to rise. There will be a continued investment in dairy products, though fortified with ingredients such as polyphenols, vitamin D, and carotenoids to ensure that value is seen. There is also a trend towards using local Korean extracts to fortify international dairy products; a factor that will drive increasing multinational partnerships

Café culture will drive demand for healthy baked goods. Seoul has one of the highest per capita number of coffee shops in the world. One of the key growth industries as a result of growing coffee consumption has been baked goods. There is growing demand for fortified baked goods, such as antioxidant or omega-3 fortified products, in the healthy baked goods sector. This also includes protein bars, which are witnessing much interest in urban Korea, driven by a focus on whey protein for weight management

Demand for nutricosmetic² products will grow in Korea, where over 1 in 4 women invest in some sort of plastic surgery, and this will drive demand for beauty drinks. This factor will result in combinations of polyphenols, probiotics and carotenoids being used in dairy /soy based formats to cater both to the emerging men's beauty drink market as well as the substantial women's beauty drinks market.

Malaysia and Singapore

Malaysia and Singapore are niche markets for functional food products. However, the lack of established local options makes them profitable import markets for products that have verified health benefits, especially products from countries such as Japan and Australia that are considered premium. Both markets have affluent customers with a willingness to spend on health foods, but restricted by taste profiles. The focus is therefore on providing strong brand stories coupled with convenient intake formats to encourage customers to purchase these products. As is the case in several markets, potential import segments would be the baked goods and functional beverage markets, where consumer willingness to experiment is at its highest. However, aggressive competition will be seen in the beverage segment, as local manufacturers such as Yeo Hiap Seng begin to further exploit the opportunity.

Opportunities in Malaysia and Singapore

Gen-Y dominates weight management focus. As weight management takes precedence in the Malaysian and Singaporean dietary choice, sectors such as gluten-free foods will witness

² Nutricosmetics are products that purport to assist the health of the skin

growing interest. Similarly, the protein ingredient category will see increasing activity, particularly in breakfast foods, as manufacturers aim to target this key product sector.

Dairy will continue to be a key growth area within ethnic populations. Fortified dairy and milk powder will remain key growth areas, in particular with the Chinese and Indian populations. This is because the highly competitive education system will drive growing interest in products for children's nutrition, such as omega-3 and antioxidant products, which will further drive end product demand. Malaysia, in particular, will witness growing interest in palm carotenoid fortified beverages which will drive overall market awareness, as Sime Darby the producer of these carotenoids, has not penetrated beyond edible oils at present.

Healthier ready to eat products will also become more popular. Singaporeans and Malaysians have a strong focus towards dining out as part of their culture. As demand for healthier food service options grows, healthy processed foods, especially beverages, will witness growing demand in restaurants. This will drive a focus on providing healthy dairy fortified or antioxidant beverages to large restaurants aiming to reinvent themselves as healthy eating joints.

Australia

Overview of the Functional Food Market

One of the earliest functional foods available in Australia was bread fortified with iodised salt to help overcome iodine deficiency in the 1960's. From then on, the development of food and beverages fortified with vitamins, minerals, and other functional ingredients such as amino acids and omega-3, has increased and diversified in Australia.

As Australia faces issues such as an ageing population, growing incidence of lifestyle diseases and a growing awareness of healthy living, this has added focus on preventative nutrition.

Functional foods (end products) account for the largest share at 64% of the total nutraceutical market in Australia, i.e. a market estimated at around US\$ 1.1 billion at end-product prices. However, Australia also has an extremely significant supplements industry, indicated by the rapid growth of local companies such as Blackmores and Swisse.

Key Trends in Functional Foods

Demographic trends: Like other developed nations, Australia is experiencing an increase in its ageing population. Lifestyle diseases such as cardiovascular, diabetes and obesity have had the most impact on the Australian population. About 4% of the population has diabetes, 35% of mortality is caused by cardiovascular diseases, and 23% of the population is overweight.

In addition the trend towards LOHAS – Lifestyles of Health & Sustainability - is another factor driving growth in consumption of functional foods. It is estimated that 25% of Australians identify with the LOHAS lifestyle, and spend approximately \$12 billion per year on LOHAS goods and services. Functional food forms a part of LOHAS, and is likely to be a key growth area as individuals demand health benefits beyond traditional nutrition from their food.

Origin and safety: Food safety in Australia has great importance, especially in maintaining high food standards for the country's exports and imports. There have been a number of food safety scandals in Australia. For instance, in 2012 Brazilian imports of orange juice concentrates were found to contain the carcinogenic pesticide carbendazmine, a finding that revitalised the local fruit juice sector. In 2015, there was a hepatitis A scare linked to frozen berries processed in China, namely Nanna's and Creative Gourmet brand raspberries and mixed berries that affected more than a dozen individuals. In addition, there was also another food scare after seven people were affected with scombroid poisoning after consuming canned tuna associated to a Thai factory. Australian producers are no exception to food safety incidents, with salmonella poisoning in raw almonds causing product recalls in six states and territories in 2012, raising concerns for major almond producers concentrated in South Australia. Such events have driven a growing willingness to pay more for traceable, local origin products. One such example is retailers such as Woolworths committing to source

over 90% of their produce from Australia. The focus on origin, Fairtrade and traceability is expected to be a major trend moving forward, especially for health foods where the “made in Australia” tag often helps command premium prices.

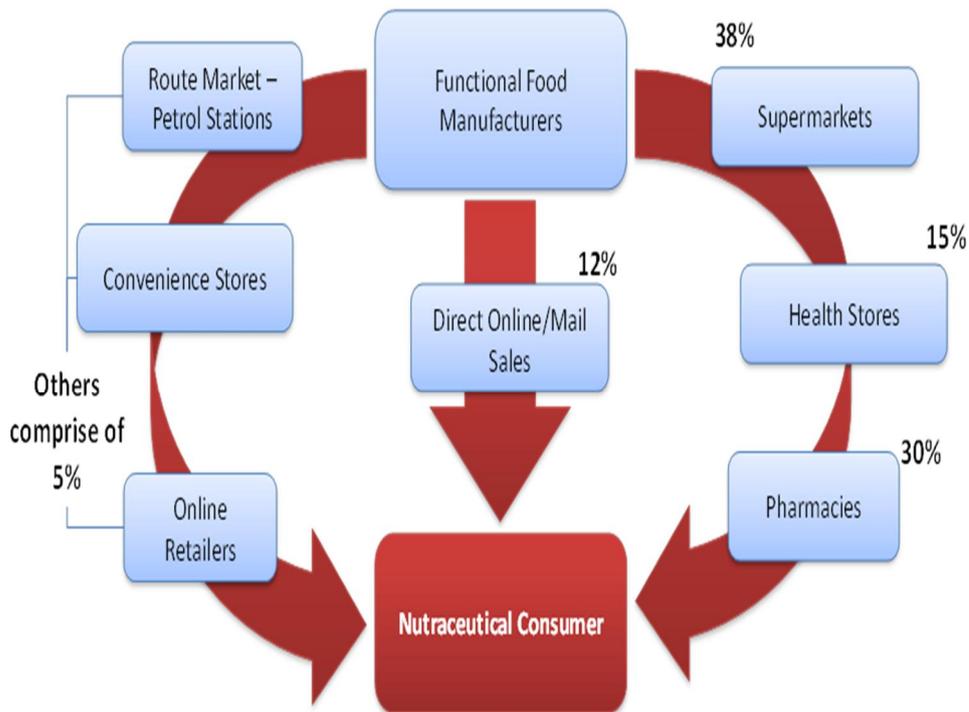
Convenience drives growth: Australia tends to follow a different path from the rest of APAC in following US and European nutrition trends, rather than trends based on indigenous cultures. Convenience continues to be a major purchasing factor, even in the health food sector, and products such as ready to drink (RTD) beverages and liquid breakfasts have benefitted from this demand. The continued focus on convenience will require manufacturers to provide consumer ready product formats in order to establish loyalty and repeat purchasing.

Personalised nutrition: Growing awareness of hereditary health concerns and access to greater media coverage on the benefits of certain health choices are driving Australians to make more personalised and informed nutritional decisions. For example, women with families prone to osteoporosis are known to be the largest consumers of calcium fortified dairy products in Australia, while brain health foods have witnessed growing demand, driven by an increasing focus on the incidence of diseases such as dementia and Alzheimer’s. This factor is driving a focus on more specific health claims, for instance digestive health labelling in Australia has become much more focussed, using terms such as “high in fibre” and “wholegrain” as opposed to just saying “good for digestion”.

Distribution Channels for Functional Foods

Distribution channels for functional foods in Australia are illustrated below.

Figure 1: Distribution Channels for Functional Foods in Australia



Source: Frost & Sullivan

The Australian distribution channel for functional foods is dominated by the store based retailers, comprising 83% of the total retail value. Supermarkets typically dominate most store sales, and with Australia’s consolidated retail market this means that sales of functional foods are dominated by Coles, Woolworths, ALDI and IGA stores.

Health stores tend to focus on the more premium foods, such as proteins and peptide options, as do pharmacies. Convenience stores are emerging as popular indulgence stops for health food options, with products such as protein bars and fortified biscuits gaining traction in these segments. However, overall the concentrated nature of the Australian food and beverage retail industry often act as a barrier to entry for health food products, often due to the low prices offered by retailers and the difficulties in getting products listed. This factor is expected to change, as health food stores and independent retailers begin to stock these products, thereby providing further competition.

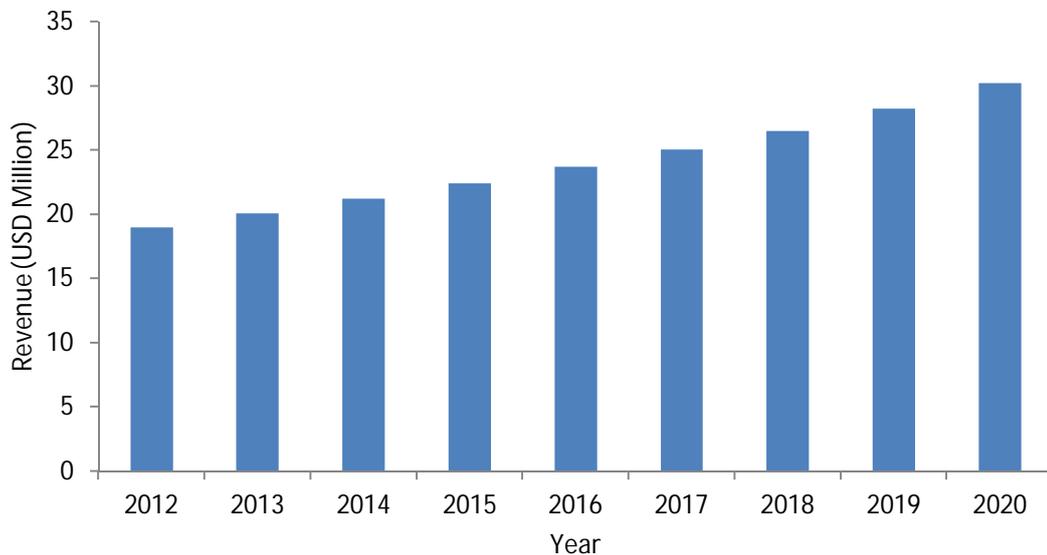
Market Analysis of Key Product Categories

PUFA

Market Size and Growth

Omega-3 ingredients form one of the most well established classes of functional products in Australia, with relatively high consumer awareness of the product’s benefits. The PUFA functional food market in Australia competes aggressively with the more well established pharmaceutical and dietary supplements sectors. However, a growing trend towards incorporating these ingredients into food and beverage products is driving growth in this segment. In 2014 the PUFA ingredient market in functional foods is estimated at US\$21 million and is forecast to grow at 6% to 2020.³

Figure 2: Australia PUFA Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Over 70% of Australians acknowledge the benefits of omega-3, or “fish oils” as they are often called. However, some academic organisations have questioned the actual validity of these claims and their benefit to health in reality, a factor that is now affecting demand for the fledgling functional food and beverage sector by association. Many Australians are knowledgeable about the health benefits of fish, and in particular about the fact that docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) in fish oil is beneficial for their

³ Throughout this report, market size data for ingredients relates to estimated consumption in functional food applications only. Usage in other applications (e.g. dietary supplements, pharmaceuticals, cosmetics, animal feed) is excluded

heart health. However, questioning of the real benefits has slowed growth of PUFA in the functional food sector, though increased manufacturer-created awareness is expected to drive demand moving forward.

Product Preferences

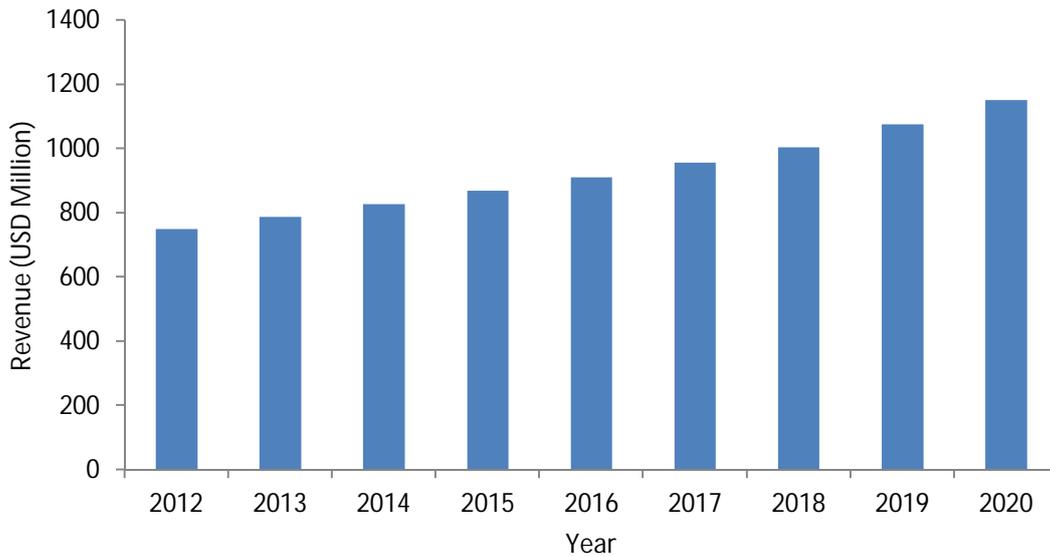
Food manufacturers have focused on certain demographics with flavoured omega-3 variants, especially in products such as gummies (omega-3 sugar candies). Demand is largely focused around marine oils, with major food demand being from the powdered form as a fortification ingredient in infant nutrition, such as A2 Platinum Premium Infant Formula and baked goods such as Tip Top Sunblest UP with Omega 3. Beverages are also growing as a key demand area, driven by an increasing focus on water soluble omega-3 formulations as the omega-3 dairy fortified beverage category begins to mature. As an example, ProGel Industrial Scale Microgels has the technology and application to create probiotic and omega-3 drinks.

Additionally there is growing demand for omega-3 fortified vegetable oil, cereals and other baked goods, as easier formulation capability continues to drive use in food, such as Brookfarm's Cold Pressed Macadamia Oils and Uncle Toby's Plus Omega 3 cereal.

Proteins and Peptides

Market Size and Growth

Australia forms the second largest dairy exporter in APAC, and is a key producer of proteins and peptides, mainly dairy based. The domestic Australian protein and peptides market is highly influenced by the growing focus on quality nutrition provided via proteins. The various protein sources available in the market today are milk proteins, gelatin, egg proteins, fish proteins, meat proteins, single cell proteins, soya proteins, pulse proteins, etc. The Australian market for protein and peptides was estimated at US\$826 million in 2014, forecast to grow at 5.6% per year up to 2020.

Figure 3: Australia Protein and Peptide Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Australia is a traditional dairy consuming and producing nation, and as a result supply of proteins to the population has been a large market. The growing dietary fad towards increased protein and less carbohydrate consumption has also driven demand. Additionally, the growth of the dairy ingredient and sports nutrition sectors has further driven consumer interest. Demand is expected to be driven by a growing interest in fitness, as well as development of the protein beverage sector.

Product Preferences

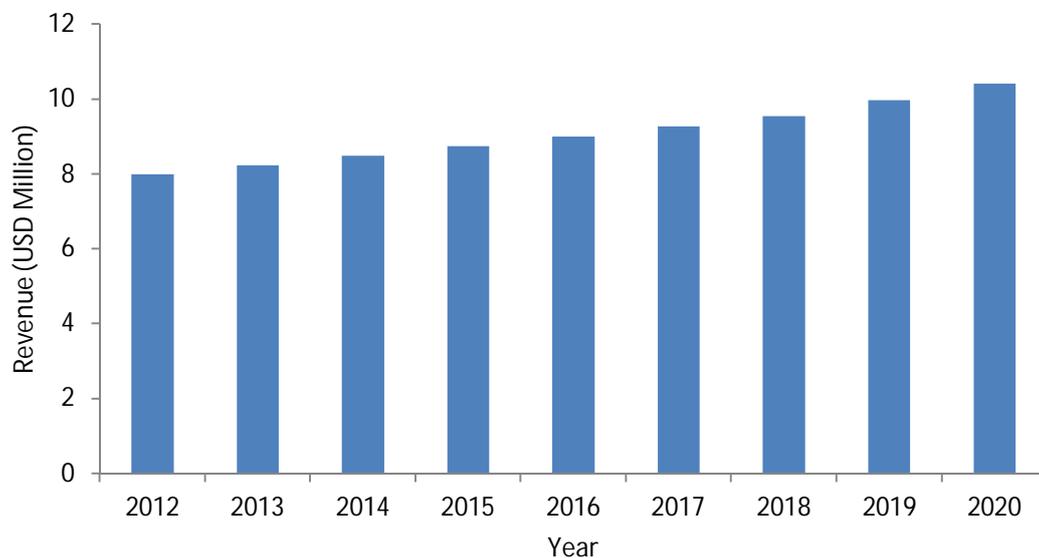
The market for protein products in Australia will be driven by a traditional focus on milk based proteins. However, the growing women's health market will drive demand for soy based protein, while the sports nutrition segment will focus on whey and egg based protein ingredients for usage in protein bars and beverages. Milk based protein ingredients will dominate market demand, such as Muscle Milk Protein and Milk Active Protein Bar, though vegetarian ingredients are also fast gaining interest among consumers, such as Ezyprotein's Brown Rice Protein Range and Allyouneedislove's Vegan Raw Protein Powder Range.

Vitamin D

Market Size and Growth

Lack of vitamin D is a particular area of concern in Australia, as its ageing population faces bone and joint health issues. Vitamin D is a well-known ingredient in the bone health sector. Often known as calciferol, it contributes to the maintenance of normal levels of calcium and phosphorus in the bloodstream, which are required for healthy bones. Vitamin D is frequently used in combination with calcium, and a plethora of clinical evidence illustrates the bone health benefits of vitamin D. In 2014 the Australian market for vitamin D was valued at US\$8.5 million, forecast to grow at 3.4% up to 2020.

Figure 4: Australia Vitamin D Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Vitamin D consumption is expected to increase in line with a growing incidence of bone health issues and calcium deficiencies. The increase in preventative health care awareness in Australia is driving not only the sale of vitamin D supplements, but also the sale of fortified food products. Companies will continue to develop new products and refine existing products in the vitamin D sector. The increase in the number of designer "calcium, magnesium, vitamin D blends" and supply-manufacturer partnerships is likely to result in an increase in the number of calcium-fortified food in the market.

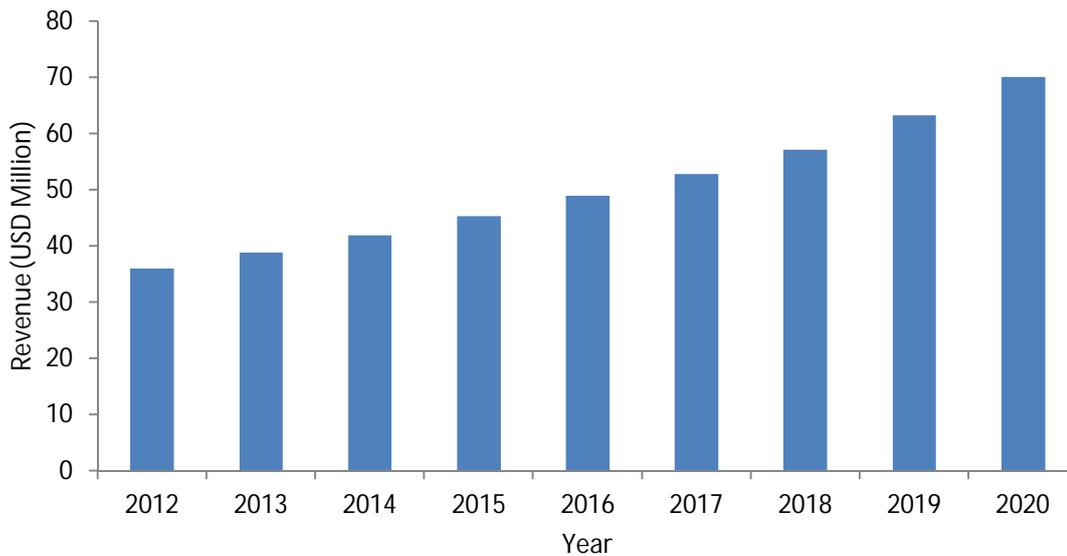
Product Preferences

Osteoporosis has been a major bone problem for many Australians. Around 1.2 million Australians are affected, the vast majority of whom are women. Osteoporosis is estimated to cost the Australian economy more than \$7 billion per annum. Limited exposure to sunlight, resulting in low vitamin D intake, is a key contributing factor for osteoporosis. 'The great Aussie paradox,' as it has been described, reports up to 58% of Australians being deficient in Vitamin D (conducted on 24,000 people over a two year study period), in spite of the country's generally sunny weather. Whilst winter seasons and sun exposure were varied depending on the season, location, skin type and exposure area, the main causal factors were an increase in sedentary lifestyles and unhealthy diets, placing the housebound elderly, indoor workers, and those with dark or covered skin, at greatest risk of deficiency. Hence, there is an increasing demand for bone health fortified food from those suffering from bone diseases, and also those willing to take preventative measures. In particular, post-menopausal women are the key target consumers. Dairy products and vitamin D fortified beverages will be the key vitamin D products positioned for this sector. Non-dairy categories such as fortified beverages and vitamin D fortified baked goods will also witness growing interest, especially for children and young adults, such as Vitasoy Calci-Plus and So Good Soy Milk range.

Probiotics

Market Size and Growth

Probiotics are Australia's leading digestive health ingredients. Under the Food Standards Code, fermented milk beverages and yoghurts that claim to be probiotic must have a minimum of 1 million live bacteria per gram of the product. Typically used bacteria are lactobacilli and bifidobacteria, and probiotic yoghurt constitutes the largest segment in the probiotic market. This dominance is forecast to continue. In 2014 the market was estimated at US\$45 million, and is forecast to grow at 8.9% up to 2020.

Figure 5: Australian Probiotic Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Probiotics in Australia are positioned both as digestive and immune health ingredients. Probiotics are Australia's leading digestive health ingredients. In Australia, probiotic products are considered either functional foods (regulated by Food Standards Australia New Zealand (FSANZ)), or complementary medicine (regulated by the Therapeutic Goods Administration (TGA)). Under the Food Standards Code, fermented milk beverages and yoghurts that claim to be probiotic must have a minimum of 1 million live bacteria per gram of the product. The increasing awareness of probiotic products, its ease of ingestion via products such as yoghurts and a focus on digestive health as Australia ages will drive demand. Demand will be stimulated as more and more dairy manufacturers in Australia begin to offer probiotic products in their portfolio, thereby increasing penetration.

Product Preferences

Approximately 20% of the population (four million Australians) suffer from heartburn issues. Similarly, 3.2 million Australians have irritable bowel syndrome (IBS). These digestive problems have driven the demand for digestive health products. Traditionally, dairy foods have proved the best delivery mechanism for the introduction of probiotics. Probiotic yoghurt constitutes the largest segment in the probiotic market. This dominance is forecast to continue. As manufacturers aim to increase validity of their claims, probiotic usage is expected to grow, especially via the yoghurt category. The success of probiotic yoghurt products such as Yoplait and Yakult means that Australian consumers are more aware of the

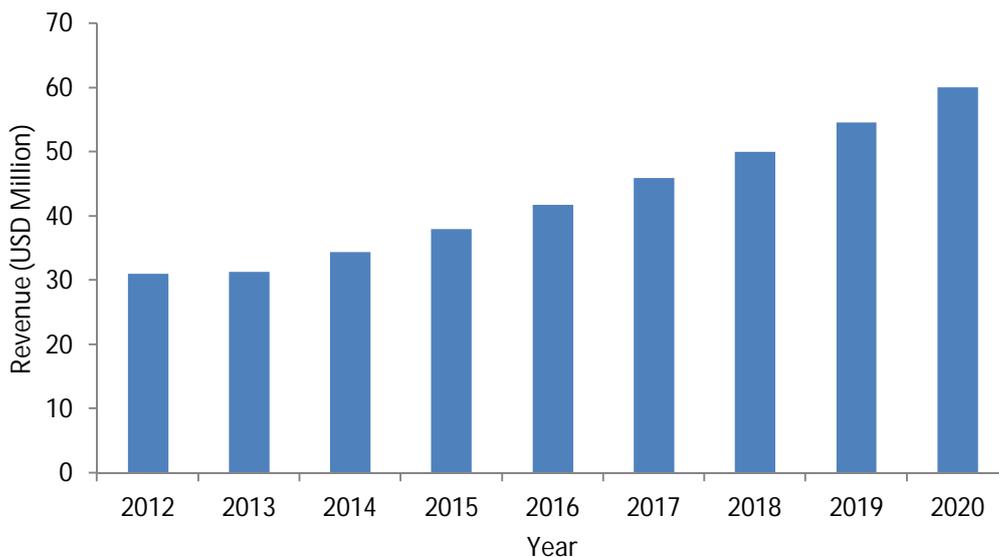
importance of digestive health issues than ever before, offering a great opportunity to food and beverage firms such as Symbio Yoghurts, No Udder Coconut Probiotic Drink, and Innergy Biotic Probiotic Drinks.

Prebiotics

Market Size and Growth

Like in most other APAC markets, the Australian prebiotic market has grown in line with probiotics. Most prebiotic products are provided in combination with probiotics, and this has driven demand for fibre based foods, particularly in the functional food and beverage segment, aiding growth. The most commonly used prebiotics include inulin, fructose oligosaccharide and galacto-oligosaccharide. Today, the market for prebiotics is increasingly carving its own market sector and moving beyond traditional dairy products. In 2014 the Australia prebiotic market was valued at US\$38 million, and is forecast to grow at 9.7% up to 2020.

Figure 6: Australia Prebiotics Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

With growing incidence of IBS in Australia, consumers are increasingly responding to messages surrounding prebiotic products, but prebiotics are still less well-known than probiotics. Future growth will be driven by innovations in probiotic and prebiotic formulations and increasing consumer awareness of the relation between digestive health and immunity and overall wellness.

Product Preferences

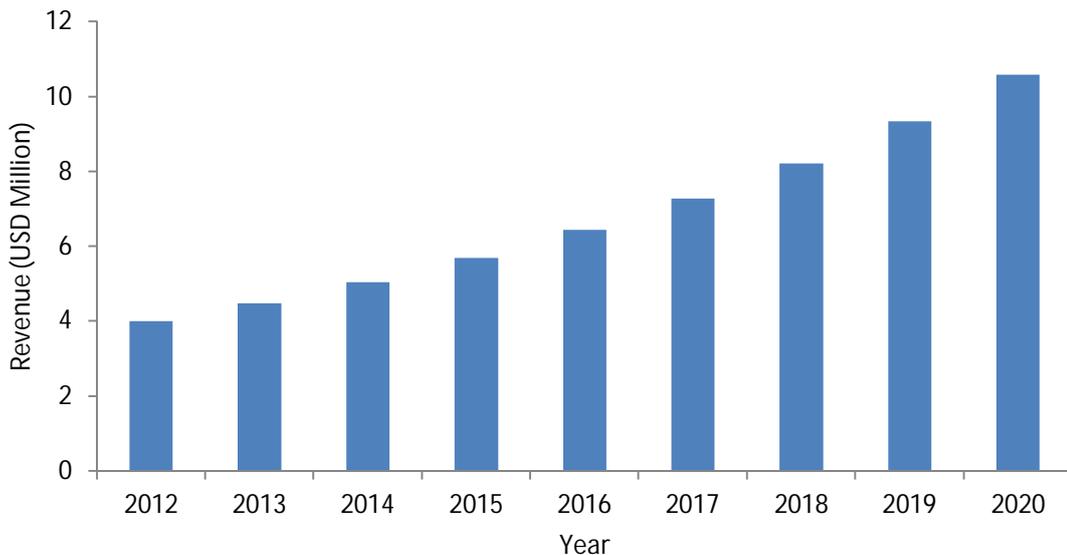
Unlike probiotic products, prebiotics have penetrated extensively into the functional food and beverage sector. From fibre rich beverages to breakfast foods to nutritional bars and baked goods, prebiotics are one of the easiest categories of functional foods to obtain in Australia, a fact that is driving its demand. Moreover, several prebiotic ingredients are now emerging from local products such as avocados and whole grain, a fact which is driving more Australians to increase the fibre and thereby prebiotics in their diets, such as the cereals from Freedom Foods and Kellogg's Sustain Cereal.

Aloe Vera

Market Size and Growth

Australian production of aloe vera extracts is a largely export focused market which caters firstly to cosmetics and secondly to functional beverages. In 2014, the Australian aloe vera extract market was estimated at US\$5 million, forecast to grow at a CAGR of 13% to 2020.

Figure 7: Australia Aloe Vera Extract Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

Aloe vera demand in Australia is mainly focused on beverage products. Australia produces aloe vera extracts, and while over 60% of this is exported, the balance is formulated by local manufacturers to distribute to health stores and supermarkets around the country. Demand is being driven by a growing interest in the plant's native medicinal properties and its antioxidant

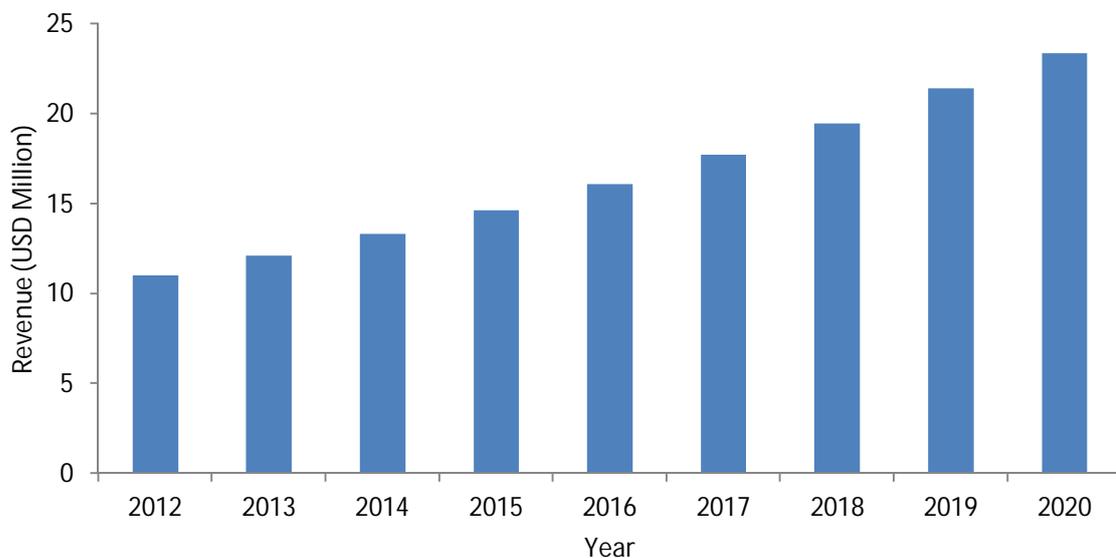
capabilities. Additionally, the factor that it is locally sourced contributes much of its product appeal in Australia, such as aloe vera juices from Aloe Vera of Australia.

Phytosterols

Market Size and Growth

Phytosterols are fat-like compounds with a chemical structure that is very similar to cholesterol. However, during digestion, phytosterols compete with cholesterol for absorption, thus leading to less cholesterol being absorbed, and more being secreted out of the body. Unlike most markets in APAC, Australia has a traditional phytosterol market born of its long association with European natural products. The market for phytosterols in Australia has, however, been the subject of scrutiny for several years with regard to its verified health claims. However, support from emerging clinical validation is driving renewed interest in this market. The Australian phytosterol market is expected to increase from US\$13 million in 2014 to US\$23 million in 2020, at a CAGR of 9.8%. The increasing demand for phytosterol is likely to be driven by increasing concerns about cardiovascular disease.

Figure 8: Australia Phytosterol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

Phytosterol demand in Australia tends to revolve around its use as a heart health ingredient and a growing focus on its potential to lower cholesterol. Demand for these products has grown as the heart health sector has continued to grow, resulting in a stable market demand.

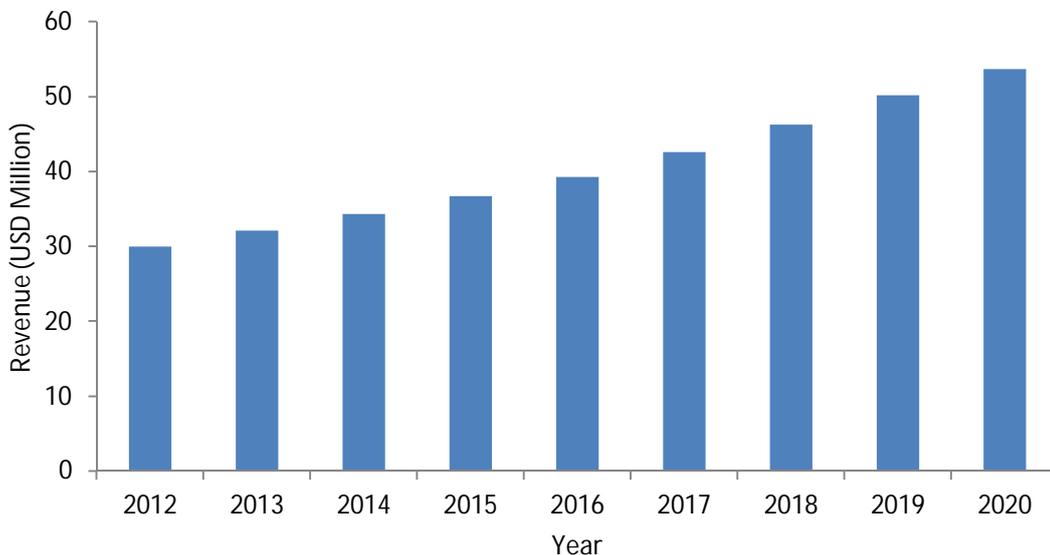
Soy based phytosterols tend to be the most popular ingredients used, and, since there has been a growing usage of these products in dairy products such as enriched milk as well as fortified spreads, the awareness levels have also subsequently increased. Most margarine in Australia now claims heart health benefits, based on incorporation of plant sterols and stanols, such as Flora Pro-Activ and Nuttelex Pulse.

Carotenoids

Market Size and Growth

Carotenoids are a class of over 600 fat-soluble substances. They are naturally produced and are found principally in plants, algae, phytoplankton, bacteria, yeasts and molds. Chemically the carotenoids can be split into two groups; carotenes such as beta-carotene, alpha-carotene and lycopene; and xanthophylls such as lutein, zeaxanthin and astaxanthin. Carotenoids in Australia are a well-established industry that began with Cognis (now BASF) introducing its beta-carotene (from algae) production in Western Australia. The market has had a domestic supply of these ingredients which has helped drive usage of these products. The Australia market for carotenoids was estimated at US\$ 34 million in 2014, and is forecast to grow at 7.3% CAGR to US\$56 million in 2020.

Figure 9: Australia Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The carotenoid market in Australia is largely dominated by natural beta-carotene for its usage both as a health ingredient as well as a natural food colour. The optimal growing conditions for algal based carotenoids are driving a growing market for these products, particularly in Western Australia. With natural carotenoids finding scientific validation in reducing cancer causing cells, there has been a growing focus on developing this arm of the functional food and particularly beverage sector. These factors will continue to drive demand over the forecast period.

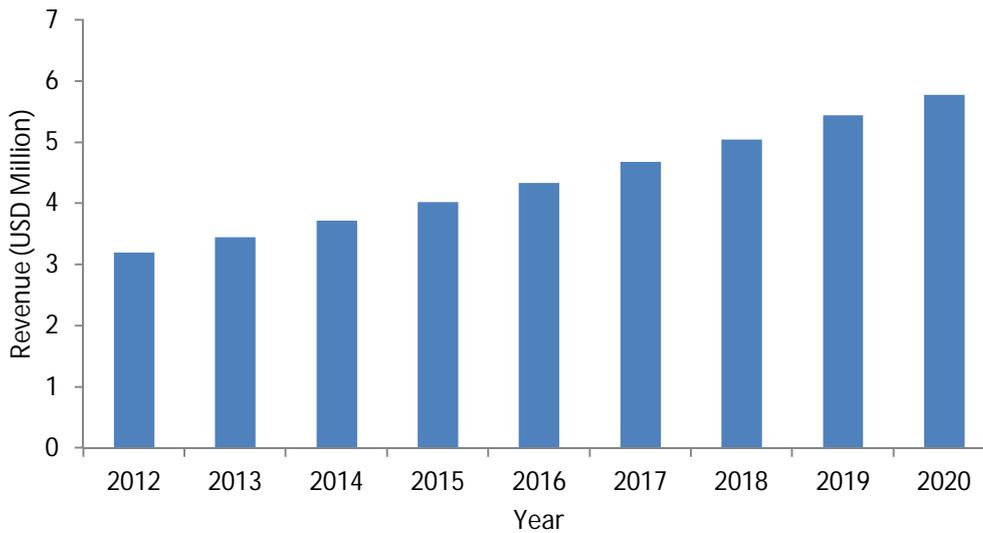
Product Preferences

Carotenoid based beverages are the major end use sector for functional food products in Australia, which includes fruit and vegetable juices, such as Naturex Craft Soda and Berri's Super Juice range. However, increasing formulation stability and development of better processing aids is driving a focus on product differentiation. Although growth will be confined to beverages in the short-term, the dairy and baked good sectors will also see penetration over the forecast period.

Polyphenols

Market Size and Growth

In spite of possessing a wide raw material base for polyphenol development, Australia only has a nascent polyphenol market, largely restricted to green tea polyphenol imports and apple polyphenols. The market for polyphenol ingredients in Australia in 2014 was estimated at US\$3.7 million forecast to grow to US\$5.7 million by 2020.

Figure 10: Australian Polyphenol Market Revenue, 2012-2020

Source: Frost & Sullivan

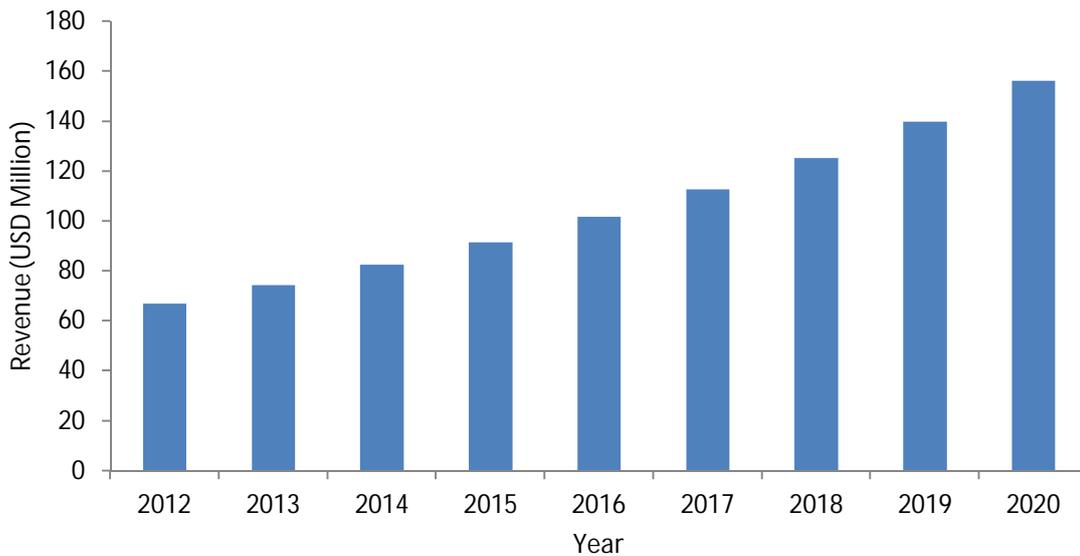
Demand Trends and Product Preferences

Australia's polyphenol industry is mostly import dependent, and is focused on the beverage sector. The lack of awareness of these products has traditionally restricted growth, while there has been an influx of substituting products, such as carotenoids and other plant antioxidants. As a result, demand has grown largely from the wine and apple industry to supply products such as resveratrol and apple and olive based polyphenols in small quantities. These include brands such as Wine Doctor resveratrol enhanced wines and McEvoy Ranch Organic oils. The focus is now changing, as more and more Australian manufacturers begin to tout polyphenol's antioxidant benefits, and the market is moving from just a beverage focus to look at use in a broader range of functional foods.

Gluten Free Food

Market Size and Growth

Australia is APAC's largest and most established gluten free market, and is also a key exporter of gluten free products to the US and Western Europe. The market for gluten free foods in Australia in 2014 is estimated at US\$90 million, forecast to grow at 11.2% to US\$156 million in 2020.

Figure 11: Australia Gluten Free Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Gluten free foods in Australia are no longer a niche but a growing market segment in the food and beverage market. The products are endorsed by the country's top health organisations such as FSANZ and Coeliac Australia, not just for coeliac sufferers, but also the benefits of a low wheat / no wheat diet are being more widely promoted, e.g. by Coeliac Australia. Coeliac disease is thought to affect more than 1% of the Australian population, although it is possible that as many as 80% of sufferers are undiagnosed. This means more than 150,000 Australians may suffer from coeliac disease or gluten allergies at different levels.⁴ In addition, Australia has one of the highest per capita incidences of anaphylactic reactions, particularly among children, driving an overall focus on food allergens.

Product Preferences

As gluten free awareness continues to grow there is a growing trend towards the "glutenswitch" which means cutting gluten out of the diet. This factor has driven a significant rise in gluten free consumption. Some of the more established product sectors in the Australian market include biscuits/cookies, savoury snacks and meat products, while pastas and even gluten free bread are key emerging areas, such as Country Life Gluten Free Bread and Latina Fresh Gluten Free Lasagne Sheets. For instance, Australia now has GlutenSwitch, a new mobile phone app developed by Bupa and the George Institute. The app enables gluten-intolerant consumers to make healthy food choices by scanning the barcodes

⁴ Walter and Eliza Hall Institute of Gastroenterology, Melbourne

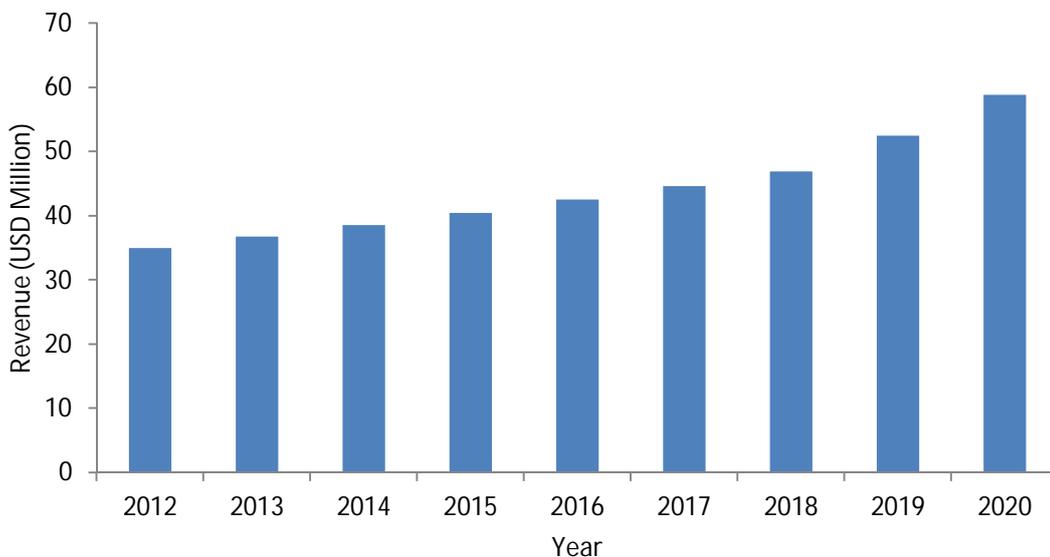
of packaged foods to provide information on gluten content and salt and fat levels. Such applications will continue to drive gluten free foods further in Australia.

Lactose Free Food

Market Size and Growth

True lactose free foods in Australia are a category that is still restricted largely to liquid milk and infant milk powder options. There is widespread consumption of dairy alternatives such as soy and almond milk, which although lactose-free are largely consumed because they are perceived as less-fattening and easier to digest, rather than due to a concern over lactose intolerance. Dairy alternatives (such as soy milk, almond milk, rice milk, etc.) have therefore not been included within the lactose free category. The Australia market for lactose free foods is estimated at US\$39 million in 2014, forecast to grow at 8% CAGR until 2020.⁵

Figure 12: Australia Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Lactose intolerance (inability to digest lactose, a sugar in milk) in Australia, while prevalent among the European community, is much more widely spread among ethnic groups such as Chinese. Diagnosed lactose intolerance has continued to grow, driving the demand for lactose free products. This has given rise to a new category of lactose free dairy products. The continued development and launch of lactose free options will continue to drive this market, especially for addressing digestive-related issues.

⁵ In this report, market sizes are only for products specifically marketed as lactose free, and excluding dairy alternatives

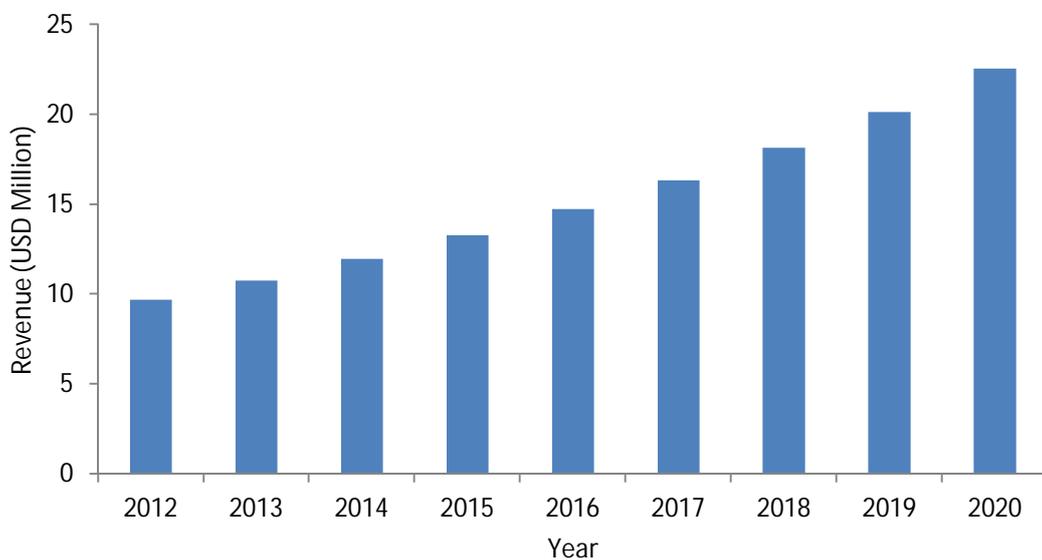
Product Preferences

The dairy company Valio has just launched its first lactose free milk into Australia, a fact that is driving growing consumer interest as dairy continues to be a major concern, especially for parents with lactose intolerant children. Australian mainstream dairy group Paul's produces lactose-free milk under the Zymil brand, and lactose-free yoghurt under its Vaalia brand. There is a growing demand for lactose free foods to move beyond just dairy into the baked goods and confectionery sectors, such as Valio's Eila lactose free range. This factor is driving product differentiation, and a wider market for lactose free products is expected to emerge over the forecast period.

Other Free From Foods

Australia has one of the world's most developed "free-form" food markets, which consists of products claiming to be pesticide free, dairy protein free, nut, sugar free etc. and even soy-free products (GMO free), aside from just gluten and lactose free. The market in 2014 was estimated at US\$12 million, forecast to grow at a CAGR of 12% to 2020.

Figure 13: Australia Other Free From Foods Market Revenue, 2012-2020



Demand Trends and Product Preferences

Australia has amongst the world's highest prevalence of allergic disorders. Almost one in five people (19.6% in a 2007 report) report at least one allergic disorder, and 78% of this

population is in the working age range (15 to 64 years).⁶ With the Australasian Society of Clinical Immunology and Allergy (ASCIA) estimating an increase in the burden of allergic diseases to 26.1% of the population by 2050, this segment is becoming increasingly important due to the associated economic cost burdens. Many Australian manufacturers are now using the local market to springboard their export products. Typical products available on the Australian market today range from a variety of traditional food options that are allergen free to the more specialised baby food options claiming both non-allergenic and organic status. These include Woolworth's Macro range of health products, Freedom Foods Norganic, Pana Chocolate (unrefined, raw chocolate bar, free from dairy, refined sugars, vegetable fats and using all organic ingredients) etc. All these factors are expected to drive growth in the "free from" value added food segment that Australia has the potential to dominate.

⁶ Access Economics Report (for ASCIA) see <http://www.allergy.org.au/ascia-reports/economic-impact-of-allergies>

China and Hong Kong

Overview of the Functional Food Market

The Chinese functional food market is APAC's second largest after Japan. Traditional Chinese Medicine (TCM) has a longstanding presence in China, favoured by local older consumers, whereby consumption of natural foods is not only perceived as providing nutrition but also plays a central role in healthy lifestyles. TCM has created a strong platform for the growth of the modern functional food market, which is also stimulated by busy lifestyles due to rapid westernisation, unbalanced diets, and lifestyle illnesses.

In an effort to combat these challenges, and as a result of increasing health awareness and disposable incomes, consumers are increasingly buying health-promoting foods that target specific nutritional needs. Functional food industry players are continually researching and developing new ways to educate consumers and promote their products. The total value of the Chinese nutraceutical (comprising functional foods and dietary supplements) is estimated at US\$38.09 billion in 2014 with a 19% growth rate. Functional food specifically (end products) has an estimated market value of US\$24 billion in 2014 and a 16% CAGR expected over a three year forecast period. For Hong Kong, the market is estimated at US\$ 259 million, with 20% growth over 2013. The Hong Kong functional food market is expected to grow 12% over the forecast period.

Key Trends in Functional Foods

Demographic trends: Rapid modernisation of China, along with its ageing population, has driven the demand for functional food. The ageing population and development of lifestyle diseases, such as Type 2 diabetes and cardiovascular diseases, breast cancer, osteoporosis, and mental health problems, are driving demand for functional food. In addition to older consumers, couples with children add to the increasing demand for functional food and beverages. Urban affluent cities in China are saturated with functional ingredients and foods, which has led to an increase in demand for functional foods such as dairy products, and which are becoming an essential part of the urban Chinese daily diet.

However, Chinese consumers, especially from rural areas, have limited knowledge and awareness of modern functional ingredients, which is partly reflected by the lack of enforcement over unsubstantiated health claims of the ingredients. Educating consumers and verifying health claims of functional ingredients will be needed to further cultivate demand, as more people are seeking preventative health measures through functional food products.

Key product trends: Functional products, such as baby food (milk formula), dairy products, dairy-based yoghurt (spoonable and pro/pre biotic varieties), calcium-fortified biscuits,

slimming meal replacements, oils and fats, and snack bars (energy and protein types), have experienced sales growth of over 100% from 2009 to 2014. Demand for infant formulas, biscuits, dairy products and yoghurts is driven specifically by the desire of consumers to provide nutritious food to improve their children's overall growth and health. Furthermore, the increase in disposable income and the promotion of fortified functional food and beverages have encouraged and attracted consumers to use these products for improved body image and better health benefits.

Traditional Chinese Medicine: The functional food industry in China will continue to face strong competition from Traditional Chinese Medicine (TCM), as this is a central part of Chinese cultural heritage. TCM's theories, methods and techniques are still being used today for preventative and curative health measures. TCM includes the use of natural products that come from plants and animals, and stresses the importance of holistic and treatment diagnosis for chronic diseases and preventative health measures. TCM accounts for over 40% of health care treatments, especially in rural areas, and is the preferred method for older consumers who tend to rely on TCM. However, the product qualities of traditional herbal ingredients used in TCM are a key concern for consumers, as product efficacy and potential unknown side effects after long-term use impede consumers' confidence in traditional herbal products. The recent development of health foods and dietary supplements has led to incorporation of TCM formulations with western additives into functional products, and these combined products have seen growing demand among Chinese consumers.

Food safety: The Chinese market has an elevated concern for food safety, plagued by a history of food safety incidents. A melamine contamination of infant formula in 2008 which caused hundreds of thousands of infant hospitalisations, and six infant deaths, has particularly left the local dairy industry in a state of fragility. In response, the Chinese government has expressed numerous statements and legislations that have placed food safety a top-most priority, for example in its Economic Work Conference for 2014, above even corruption and growth. Chinese Vice Premier, Li Keqiang stated, "Food is essential, and safety should be a top priority. Food safety is closely related to people's lives and health and economic development and social harmony." A 2014 consumer confidence survey by New Zealand's Massey University reported that 85.1% of respondents deemed imported Australian dairy products to be very safe, placing Australia in a unique position to satisfy consumer demands for food safety, and fortify trust in China, where product integrity is now paramount.

The Ministry of Health of the People's Republic of China has defined functional food as "a food that has special health functions, suitable for consumption by special groups of people and has function of regulating human body functions, but is not used for therapeutic purposes. It should also not cause any harm, whether acute, sub-acute or chronic". The State Food and Drug Administration is responsible for the regulation, registration, examination and approval

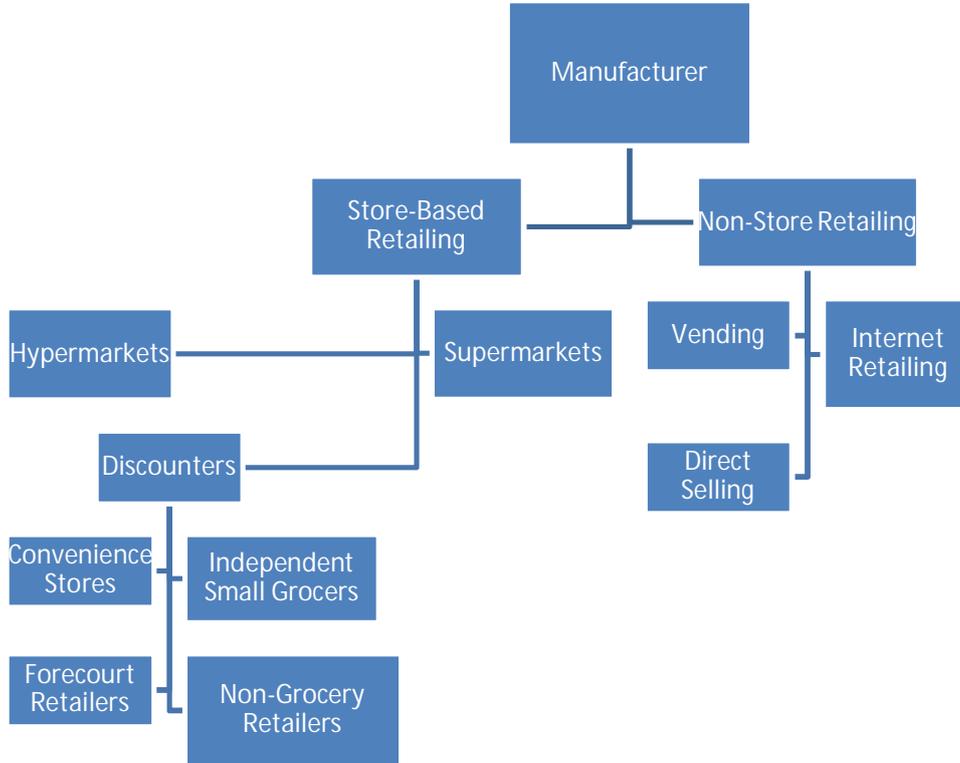
of health food in China. There are 27 health benefits that can be claimed by health food products, but a nutraceutical product can only claim two benefits at a time. Manufacturers often do not register their products as a health food due to the time needed for approval, complexity of the registration process, rigid censoring and the fact that products that fall outside the listed 27 health food benefits cannot have claims on the packaging. This gives rise to false advertising and exaggerated claims in China's health food market, which has led to consumer mistrust and confusion as manufacturers claim that their products can function as a drug and cure diseases such as diabetes, coronary heart diseases and high blood pressure. A new revised law of the "Food Safety Law of People's Republic of China" was passed in April 2014, which improves the supervision of special food safety issues including health food, food formula for medical use, infant formula, etc. The new regulation will help strengthen consumer confidence in nutraceutical food, beverage and dietary supplements in the future.

Regional trends: In China, regional differences exist as demonstrated by the consumption of functional products across the country. East China is the centre of China's economic growth, and residents have an established perception on the importance of functional food products and higher awareness of health. With higher standards of living and disposable incomes, East China consumers purchase products to balance nutritional intake and disease prevention, such as calcium supplements for the older generation and paediatric vitamins for children (vitamin A, B, C and D, with a promotional focus on strong, healthy growth). Central China is an area focused on agriculture, but with the government's support for the region's economic growth, there is an increase in purchasing power and health awareness. Consumers in this area tend to purchase vitamins, dietary supplements and sports nutrition products. Due to the highly polluted environmental conditions and growing health awareness, there is an increasing demand for functional food products from North and Northeast China, specifically for vitamins and dietary supplements. Northwest China is seeing growth in herbal or traditional products, with the influence of Chinese and Tibetan medicine practices. Body building and weight loss are popular in South China, inspired by international and Hollywood influences. With the increase in fitness centres in the area, functional sports nutrition products, such as protein shakes, are also witnessing growing popularity. With its geographical location and large ethnic communities, Southwest China still largely prefers traditional herb medicine over foreign products.

Distribution Channels for Functional Foods

Distribution channels for functional foods in China and Hong Kong are illustrated as below.

Figure 14: Distribution Channels for Functional Foods



The Chinese distribution channel is dominated by store based retailing which accounted for 95% of sales in 2014. Supermarkets tend to dominate these products, as most of them focus on urban areas. Convenience stores are a key growth area for the beverage industry, particularly as demand for convenience products fortified with nutraceutical ingredients continues to grow. Non-grocery retailing is also an emerging sector, with health stores being an emerging end use sector for products such as protein shakes while internet retailing tends to dominate this space.

Online retailing of products is a key growth area for China, with many manufacturers, especially international ones, supplying directly through websites such as Tmall in China, as opposed to selling through physical stores.

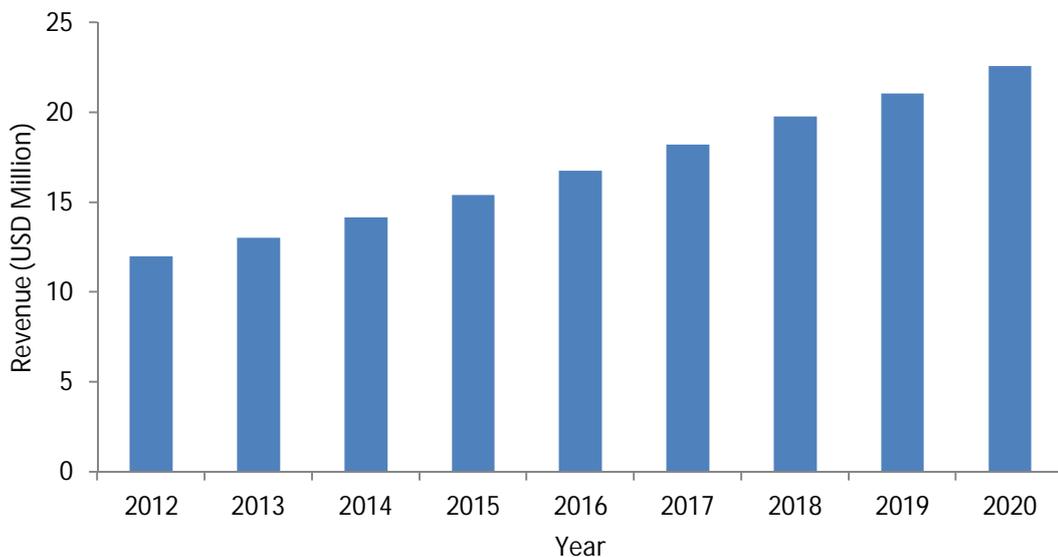
Market Analysis of Key Product Categories

PUFA

Market Size and Growth

China has one of the highest uses of omega-3 ingredient, according to the Global Organisation for EPA and DHA omega-3's (GOED) which is committed to developing, expanding, promoting awareness and consumption of omega-3s around the world, and ensures that manufacturers are producing high quality omega-3 products that consumers can trust. The awareness levels of omega-3 in China according to GOED was over 70% in 2013, indicating that the demand for omega-3 products will increase as awareness of the product and its benefits become known to consumers. The PUFA functional food market in China competes aggressively not only with the more established pharmaceutical and dietary supplements sector, but also with the animal feed sector, which is a large growth market for omega-3 ingredients. However, increased awareness of the scientific benefits of these ingredients is driving growth in functional food products. In 2014, the PUFA ingredient market in functional foods is estimated at US\$15 million, and is forecast to grow at 8% to 2020.

Figure 15: China PUFA Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

China has one of the highest awareness levels in Asia of the benefits of omega-3 ingredients. In addition, the country is the world's third largest producer of EPA and DHA oils. GOED lists three Chinese producers among its top omega-3 ingredient providers in the world, and in total there are over 20 Chinese omega-3 ingredient providers. However, the sales of omega-3

products in China have traditionally focused on pharmaceuticals, while consumption in food and beverages ingredients is only the fourth largest application, after dietary supplements and infant products. However, as more food and beverage options are introduced this will stimulate demand in food products, although from a much smaller base than supplements, which will continue to dominate demand over the forecast period.

Product Preferences

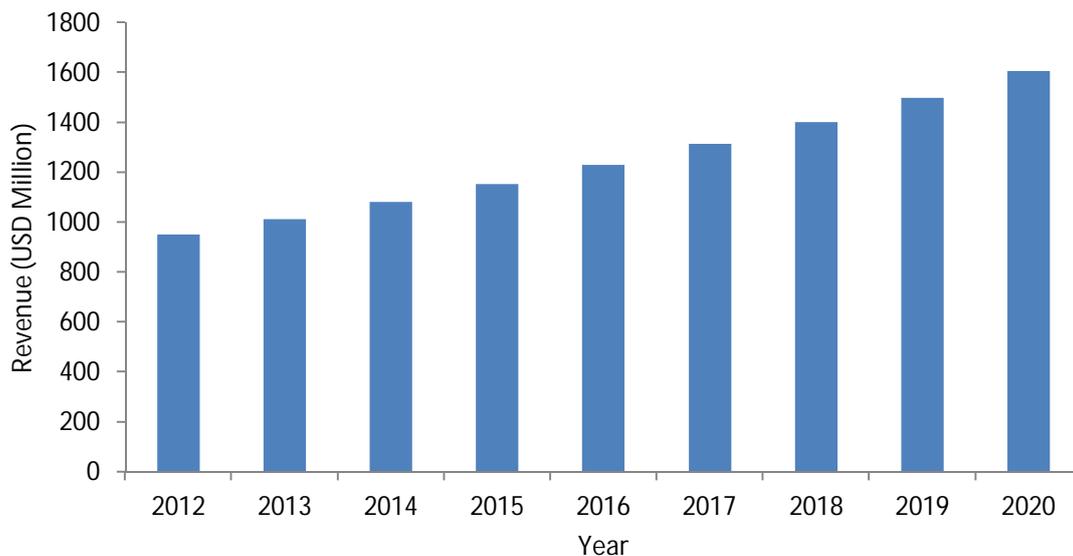
Functional food and beverages fortified with omega-3 ingredients are still a nascent market in China. However, there is growing interest in dairy fortification, led by the dairy giants in China, such as Yili, Mengniu, Sanlu and Bright Dairy, which are driving omega-3 ingredient demand. While demand is expected to focus on dairy fortification for the interim, the development of non-dairy beverages, such as vitamin water, sports beverages, fruit and vegetable juice that are fortified with omega-3, will drive a growing focus in China to emulate these products.

Proteins and Peptides

Market Size and Growth

China has traditionally been a market with significant consumption of plant proteins, but growing affluence, increasing incidence of bone health diseases and the general trend towards dairy products have driven growing demand for animal protein. The Chinese market for protein and peptides was estimated at US\$1,081 million in 2014, forecast to increase at 6.8% per year up to 2020.

Figure 16: China Protein and Peptide Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

China is a non-traditional dairy consuming nation, with a traditional focus on plant proteins, such as soy based foods. The general shortage of meat has also meant that animal protein consumption has traditionally been reserved for special occasions. However, the growing affluence has driven demand for animal protein containing products such as dairy and meat. The Chinese are becoming more aware of the benefits that dairy products can bring. Dairy products, like milk and yoghurt, have become part of the daily diet, and many see these products as important sources of protein. China is now one of the world's largest dairy protein importers, and also produces a large range of protein drinks based on botanical sources. These factors are expected to drive growing protein consumption.

Product Preferences

The market for protein products in China will be largely driven by dairy protein. Milk powders enriched with protein will be the primary growth area, catering to both the pediatric and adult segments. Amway (China) Company is the leader in China's protein powder market with its Nutrilite brand providing an all plant protein powder for optimal health. Botanical protein drinks will also witness growing interest, driven by a demand for on the go protein consumption, particularly among weight conscious youth who consider dairy a source of fat. Soy based foods will stay popular, particularly among the more traditional populace, and also in the emerging women's wellness segment, which uses soy based foods as a key marketing strategy to drive uptake. Protein ingredients are thus expected to witness growing demand, driven by increasing product penetration across various food and beverage sectors. VV group is a dominant player in snack bars, accounting for over 70% of market share in China. The company's flagship brand, Soy Joy, provides a range of soy bean nutrition bars and soy drinks that tailor to consumers in different groups and regions. Protein-based snack bars are hindered by limited product awareness, as there are only a few companies that have a strong presence and invest little in advertising or educating consumers about snack bars. Snack bars face fierce competition from protein powders, but are more convenient to carry and eat, and are a popular choice of snack for young urban women who opt for snack bars as a weight management medium.

Vitamin D

Market Size and Growth

Vitamin D deficiency is a particular area of concern in China as the majority of its population does not get enough sun through natural exposure. However, the majority of vitamin D sales in China are sold as supplements, resulting in a small to non-existent market for vitamin D fortified foods at present. However, this is a significant opportunity for international

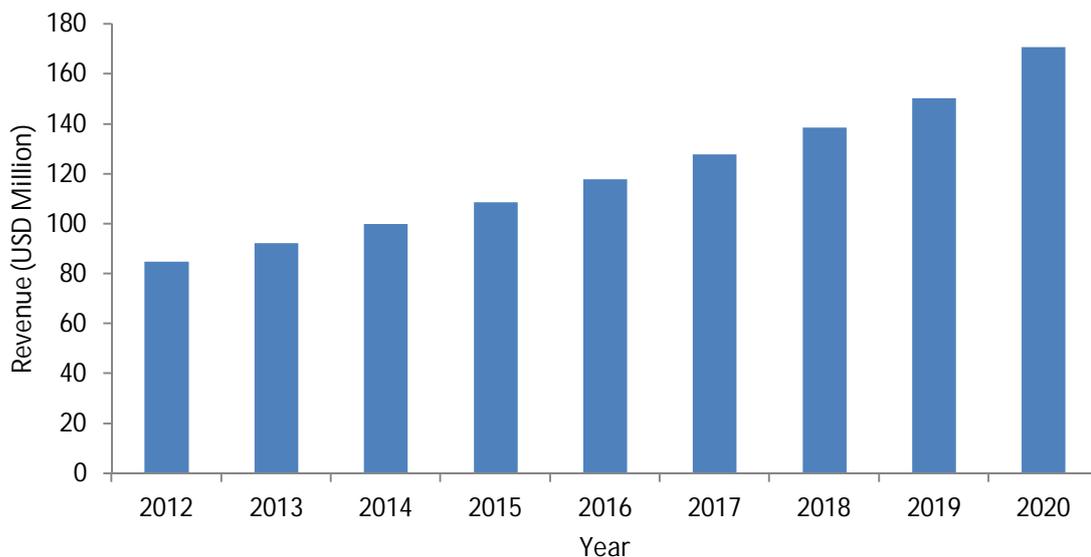
manufacturers as there are presently no local suppliers of functional fortified vitamin D food in China. Consumers tend to prefer products in a beverage format as it is easy to consume, aside from being the dominant version of supplements.

Probiotics

Market Size and Growth

While the Chinese dairy market is growing rapidly, competition between the dairy-based products manufacturers is very fierce. Probiotics have emerged as key differentiating ingredients for functional dairy product manufacturers in China, and probiotic sales are growing at impressive rates. In 2014 the market was estimated at US\$100 million, and is forecast to grow at 9.5% up to 2020.

Figure 17: Chinese Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

Nine types of probiotics approved by the Ministry of Health in China are being employed in end products (foods and supplements) that cater to the digestive health concerns of the Chinese population. Probiotics in China are an emerging market, mainly witnessing growth as part of the dairy sector. Urban Chinese tend to consume more probiotics, as opposed to rural areas where awareness is extremely low to non-existent. The growth of the dairy and yoghurt industry will spur further demand for dairy based foods. In particular, probiotics in functional dairy drinks are a key sector in China, and are witnessing strong growth rates. Probiotic sales

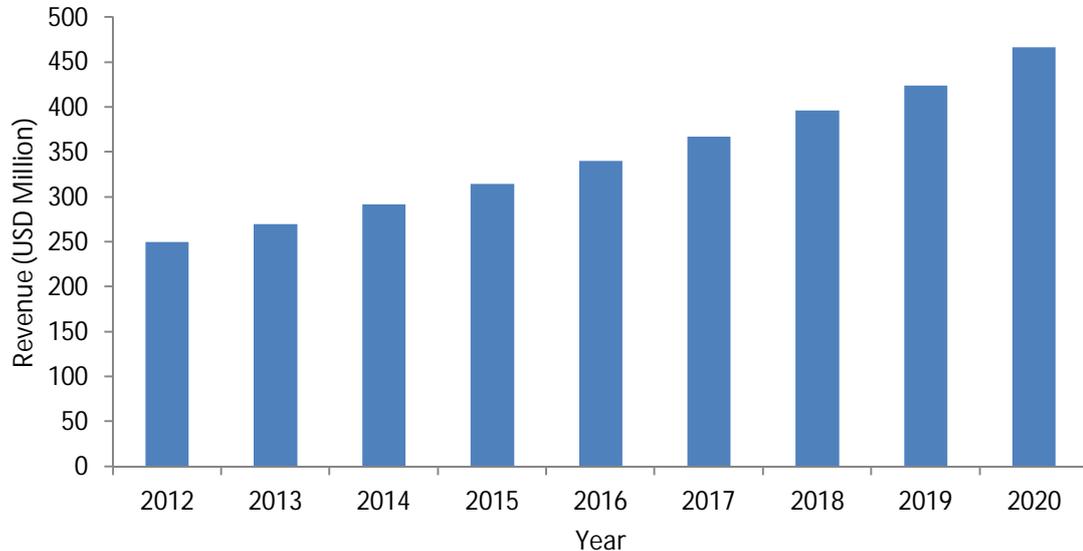
are expected to continue to be focused on dairy and not move beyond this sector over the forecast period. Yakult China remains a key competitor in China, and holds a core position in the probiotic industry, although facing strong competition from domestic Chinese companies such as Inner Mongolia Mengniu Dairy Group (Mengniu) and Bright Dairy & Food, which are starting to introduce similar products to that of Yakult. A premiumisation trend evident in yoghurt products is set to boost the overall demand for the industry, with Mengniu and Bright Dairy & Food launching health and wellness yoghurt products that cater to affluent consumers concerned with their health and wellbeing.

Prebiotics

Market Size and Growth

There has been very strong growth of functional food products with digestive claims. Nearly 458 new functional food products, including dairy products, beverages and confectionery, were launched in the Chinese market in 2012 (almost double that of 2010), of which around 50% made claims around digestive benefits. Digestive health was the leading functional claim in the Chinese functional food market. In 2014, the China prebiotic market was valued at US\$292 million, and is forecast to grow at 8.2% up to 2020.

Figure 18: China Prebiotics Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Enhanced efficiency of ingredients and increasing scientific evidence about the advantages of prebiotics are the major factors influencing consumers to buy digestive health foods. Prebiotics are a much more mature market in China than probiotics, due to a deeper consumer understanding of their benefits thanks to efforts by local dairy companies. The

prebiotics segment accounts for over 75% of the total Chinese digestive health ingredients market. Fructans (inulin and FOS) command the largest share in the prebiotics market, with revenues of US\$151 million. However, Isomalto-oligosaccharide (IMO) also accounts for a large share, with sales of 40,000 tonnes to the functional beverage industry. About 20 to 30 companies are active in the Chinese digestive health ingredients market. Jiangmen Quantum Hi-tech is the leading domestic supplier of prebiotic ingredients, followed by Shandong Baolingbao and Yunnan Tianyuanjian.

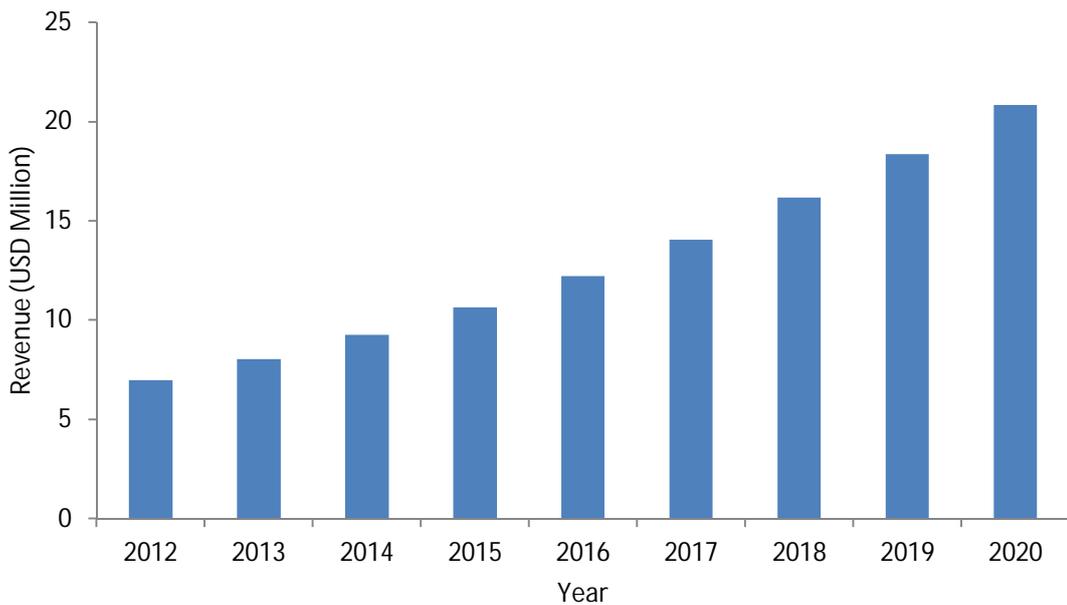
Product Preferences

Prebiotics are the most widely accepted ingredients used in foods, beverages, and dietary supplements. The main prebiotic products in the market are dairy drinks and yoghurt. Bright Dairy & Food Co, Hangzhou Wahaha Group, Inner Mongolia Mengniu Dairy Group (Mengniu) and Inner Mongolia Yili Industrial Group (Yili) are widely recognised as key players in the industry, and have launched prebiotic yoghurt and drinking yoghurt. However, the product range is broadening, as manufacturers add prebiotics to milk powder, nutrition bars, cereals and bread. The application of prebiotics in non-dairy beverage and bakery currently accounts for less than 10% of total volume.

Aloe Vera

Market Size and Growth

Chinese production of aloe vera extracts is growing, but largely export focused. China accounts for 10% of the world's production of aloe vera. In 2014 the Chinese aloe vera extract market was valued at US\$9.3 million, and is forecast to grow at a CAGR of 15% to 2020.

Figure 19: China Aloe Vera Extract Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends and Product Preferences

Aloe vera demand for food use in China, as in most other countries, is mainly focused on use in beverages such as aloe vera juice with aloe pulp, aloe vera drinking gel and concentrated aloe vera juice. There is a growing demand and interest in aloe vera derivative products which contain aloe vera ingredients. It is primarily focused on the cosmetic sector, including body and skincare lotions, body wash and hair gels. China has an ideal environment for large-scale aloe vera planting. Hainan Island and the southwest province of Yunnan are climatically favourable regions for aloe cultivation. As well as aloe pups, young aloe plants supplied by US farmers, there is a specific Chinese variety of aloe vera (*Aloe barbadensis* var. *chinensis*), which is replicated using micropropagation techniques to increase the quantity of that particular aloe plant. Demand is being driven by a growing interest in the plant's native medicinal properties and its antioxidant capabilities, typically in supplement and capsule form. Additionally, the factor that it is locally sourced contributes much of its product appeal in China.

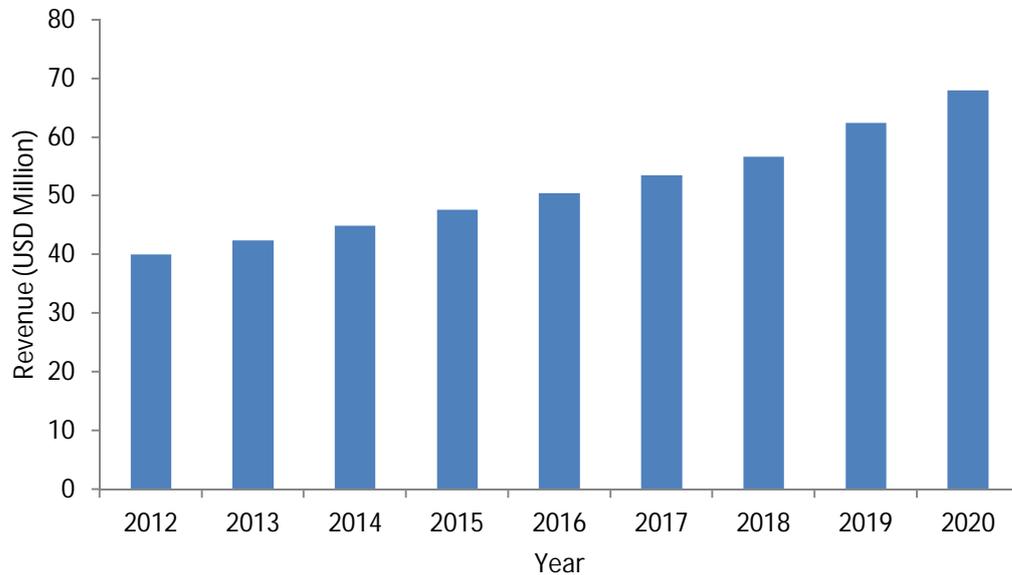
Phytosterols

Market Size and Growth

With a traditional focus on soy based foods, the Chinese phytosterol market is a key growth area, especially in the fortified food and beverage segmented. With APAC emerging as the world's major growth area for phytosterol fortification, China is leading the way and is attracting interest from many international players, with its large population and their

awareness of plant sterols and its heart health benefits. The Chinese phytosterol market is expected to increase from US\$45 million in 2014 to US\$68 million in 2020, at a CAGR of 7.0%.

Figure 20: China Phytosterol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The Chinese market mainly focuses on soy based phytosterol and plant stanols. Companies such as Shanxi Tianwei Biological Products and Fenchem not only supply domestic companies with phytosterol ingredients, but are also key exporters to Europe, the world's largest phytosterol market. These products are mostly derived from soy bean oil, of which China has a large local industry resulting in stable raw material supply. Additionally, growing concerns of genetic modification (GM) issues with US soy (the world's other large provider) is driving demand for Asian-sourced soy based phytosterol. This factor is also driving growth within China, where phytosterol fortified functional food is a key growth market, driven by the rising incidence of heart health disease across the Chinese.

Product Preferences

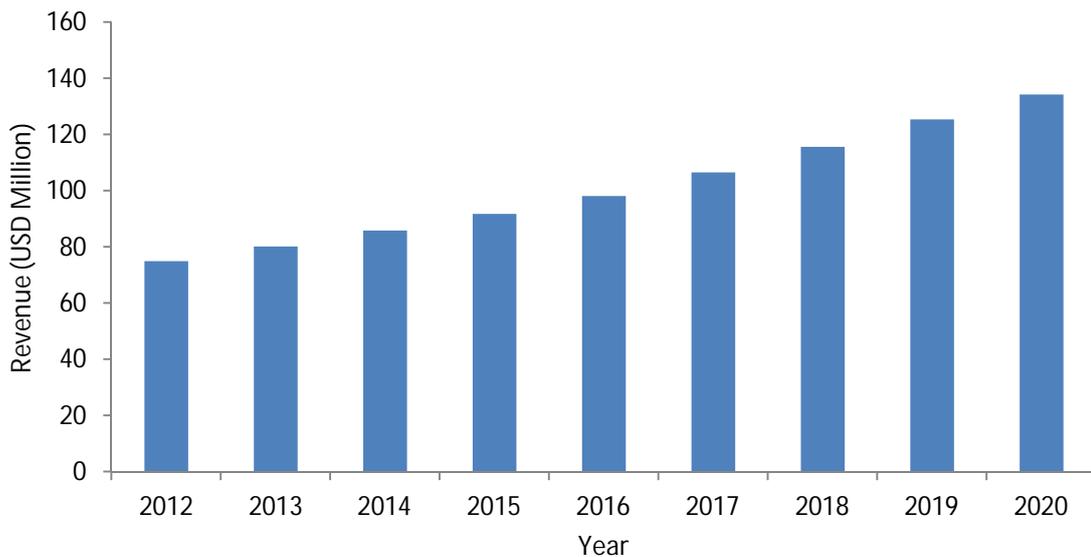
As with most other functional food products, phytosterols have entered the fast-moving consumer goods (FMCG) market via the dairy sector. Cognis Nutrition & Health, a leading supplier of natural phytosterols scientifically proven to help reduce cholesterol, launched China's first sterol-enriched milk by Mengniu Dairy Company in 2010. Other popular phytosterol categories include functional beverages, dairy products, such as spreads and margarines, and phytosterol enriched milk powder for infants with brands such as Benecol.

Carotenoids

Market Size and Growth

Carotenoids are popular in China as traditional understanding of the importance of botanical extracts has driven greater awareness of the benefits of plant derived antioxidants. The China market for carotenoids was estimated at US\$86 million in 2014, forecast to grow at 7% CAGR to US\$134 million in 2020.

Figure 21: China Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

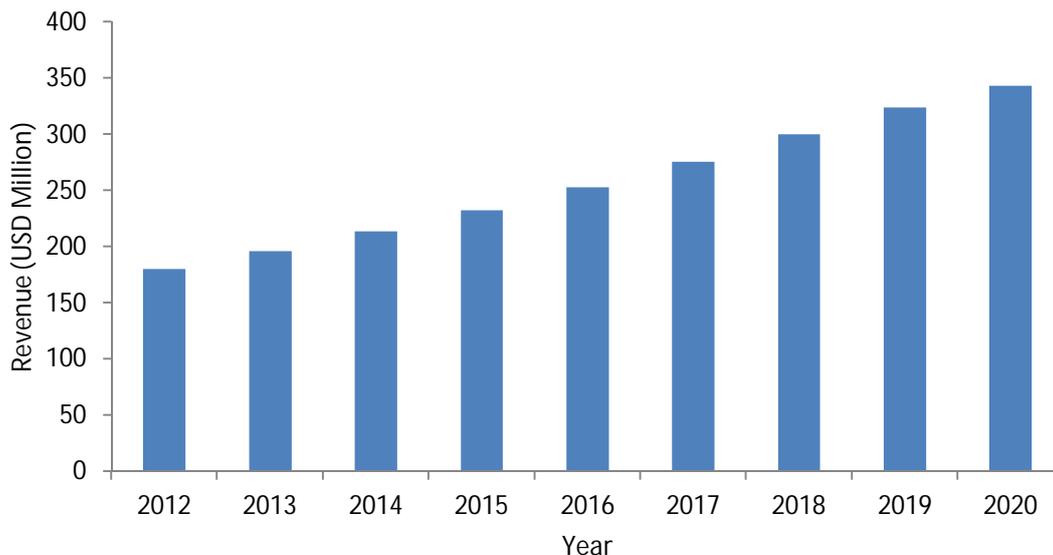
The carotenoid market in China is a growing market that is expected to be one of the largest carotenoid markets along with India and Malaysia after Europe and the United States. This is because the potentially large capability for local carotenoid production and growing demand for antioxidant products will drive local demand, especially from the functional beverage sector. Carotenoid based beverages are the major end use sector for carotenoids in China, primarily functional juice such as Gac-G3 juice. With rising health consciousness, consumers are seeking products offering health benefits such as those fortified with functional ingredients. Growth in functional juices caters to this trend, however, increasing formulation stability and development of better processing aids will drive potential penetration into the dairy and baked goods sector, though from a small base over the forecast period.

Polyphenols

Market Size and Growth

With a traditional focus on consumption of green tea, the Chinese understanding of polyphenols is one of the most mature in the world, driven by an array of traditional Chinese extracts claiming polyphenol benefits. The market for polyphenol ingredients in China in 2014 was estimated at US\$213 million and is forecast to grow to US\$344 million by 2020.

Figure 22: Chinese Polyphenol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

Over 90% of China's polyphenol industry is dominated by green tea polyphenols. Green tea is a traditional Chinese drink and, unlike its neighbours where green tea extracts have tended to mature as a result of commoditisation, tea polyphenols in China are a growing market, especially for functional beverages but with use in the confectionery sector as well. The second type of polyphenols in China is soy based extracts such as isoflavones. Soy-based milk teas and beverages are finding growing demand within the women's health drinks sector, one of the functional beverage market's fastest growing segments. Additionally, the fruit polyphenol sector, which includes fruit and herbal RTD tea, is also witnessing increasing interest for children's and ageing nutrition, both due to their natural flavoring as well as antioxidant profiles. Overall, awareness of the antioxidant benefits of these ingredients will continue to drive demand over the forecast period. Vitasoy is a leading player in the market, and has 22% of market share value for soy-based beverage products. The brand offers diversified packaging formats and flavours that appeal to a wide range of consumers for different consumption occasions. Other than soy milk, growth in non-dairy milk alternatives is

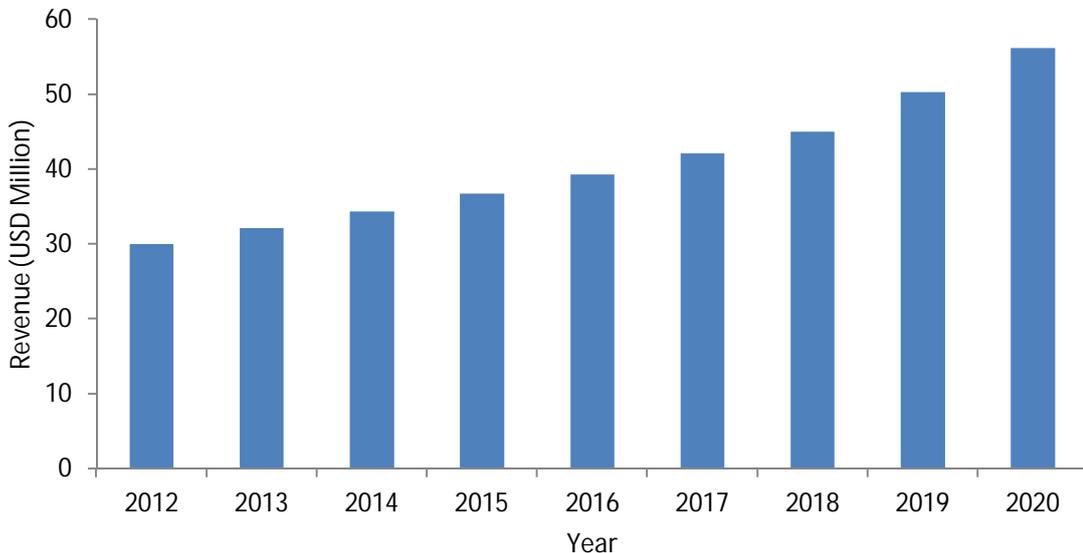
constrained by the healthy image of dairy milk products as alternatives, and their higher mineral content.

Gluten Free Food

Market Size and Growth

China remains a largely untapped market for gluten free products, although it offers significant potential, especially as growing awareness of gluten allergies across the country is driving future interest. The market for gluten free foods in China in 2014 is estimated at US\$34 million and is forecast to grow at 8.5% to US\$56 million in 2020.

Figure 23: China Gluten Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Gluten free foods in China are a niche sector, with less than 1% of the population suffering gluten allergies. However, a growing trend amongst the urban elite towards substitution of gluten in their diets is driving consumption of gluten free foods. However, this is largely limited to the urban regions, particularly around Shanghai and Beijing, and is driven by consumption by expats and tourists, who have a better understanding of gluten allergies.

Product Preferences

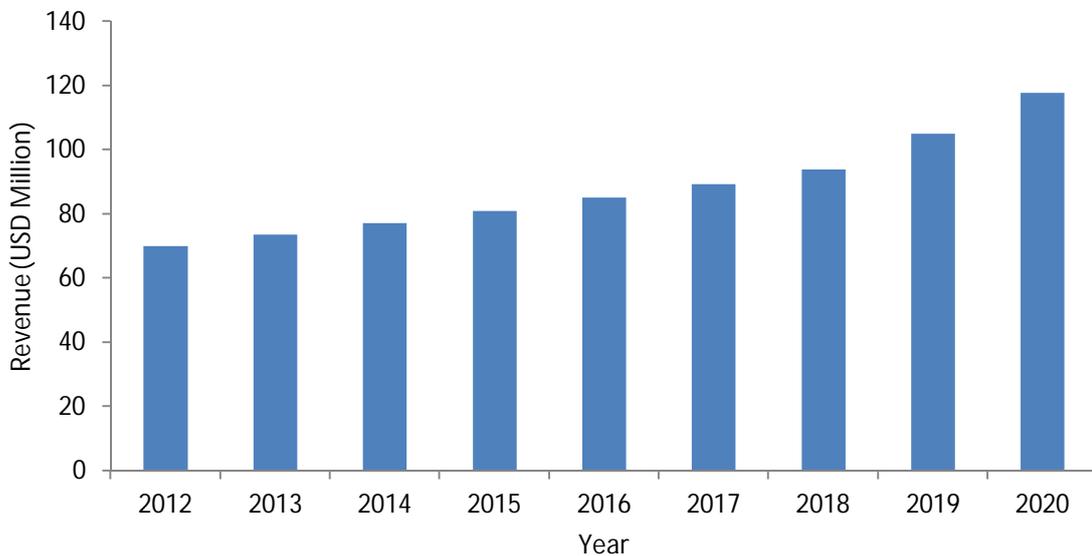
As awareness of gluten free foods continues to grow among the Chinese urban population, there is an equally strong focus on avoiding Chinese-made “gluten-free” food due to the image of a lack of quality. Most gluten free food in China is therefore imported, and tends to be processed food such as noodles, pastas and Asian sauces, including soy sauce, dipping sauces and marinades. San-J, a popular Japanese brand, is the major player in the Chinese market for gluten-free sauces. The lack of local production in China has resulted in little to no availability of gluten free bread or fresh produce. However, as demand continues to grow, the baked goods and beverages sector is expected to offer products, as profit margins are high and imported products can charge a premium based on both availability and quality.

Lactose Free Food

Market Size and Growth

In spite of the fact that almost 95% of Chinese consumers have some degree of lactose malabsorption, the market for these products remains small. The Chinese market for lactose free foods is estimated at US\$77 million in 2014, forecast to grow at 7.2% CAGR until 2020.

Figure 24: China Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

China is expected to become the world’s largest dairy market by 2018, in spite of the fact that the large majority of Chinese are lactose intolerant to some degree. This, however, has not held back parents from providing dairy products to children, thereby changing their capability

to digest lactose. Lactose-free products are currently largely restricted to the infant formula sector and growing up milks. However, as consumers begin to understand the relative importance of finding substitutes for digestive health, this will drive demand for lactose free foods. These products are expected to grow from a small base to form a stable market, though it will primarily be driven by imports due to a lack of local confidence in Chinese produce. Chinese mothers, in particular, who are known to spurn breastfeeding, will be key drivers of this trend, looking for healthier alternatives to provide nutrition to their babies.

Product Preferences

Infant formula and powdered milk will be key entry sectors for lactose free foods. Additionally yoghurts and fermented dairy products will grow in popularity, as they are known to have little to no lactose left. However, in the medium term, lactose free foods will remain focused on the dairy sector, with little to no penetration beyond this area. Inner Mongolia Yili dominates the lactose-free market, with a market share of over 60%. It is one of the largest dairy companies in China and was one of the first to launch a lactose-free dairy product, Yili ShuHua Milk in 2009. Nestle's Nan and Mead Johnson's Enfamil brand are other significant players in the market, as their lactose-free infant formula are notable for their quality and strong brand reputation.

Other Free From Foods

The lack of awareness of allergen free foods has resulted in a barely existent other free from food market in China.

India

Overview of the Functional Food Market

With changing lifestyles, growing affluence and increasing disposable incomes, India is transitioning from a country with significant malnutrition to one that is now combating the double challenge of malnutrition along with obesity. It is largely the obese and diabetic population that is driving the health food industry in India. The total value of the Indian nutraceutical market (comprising functional foods and dietary supplements) is estimated at US\$3 billion in 2014, and is growing at 7-8% per year. Functional foods (end products) account for the largest share of this at 70% of the total market, i.e. a market estimated at around US\$ 2.1 billion. This market size is based on the value of functional food products at retail prices (i.e. end-products). The value of the market for ingredients used in functional food end-products is considerably smaller than this.

Key Trends in Functional Foods

Demographic trends: The functional food industry in India caters primarily to an urban affluent population, and hence the product focus is primarily on urban health issues or concerns, such as weight management and diabetes. While nutrition addressing the needs of the elderly is still an emerging sector in India, mainly due to low market awareness, children's nutrition is now an established sector for functional food manufacturers, as Indians from all economic classes are willing to invest in their offspring's nutritional wellbeing.

Key product trends: Traditionally nutraceuticals in India have struggled to combat the aggressive competition from ethnic medicines such as Ayurveda. Ayurveda is a 5,000-year-old system of natural healing that has its origins in the Vedic culture of India, which is based on using native herbs as a form of alternative medicine and nutritional aid. Ayurvedic options have continued to grow in popularity in India, and today account for an industry estimated at US\$2 billion. However, while the dietary supplement sector's growth has been slowed by this competition, demand for functional food and beverages has grown due to incorporation of these local ingredients, such as mango extract, millet grain etc., into western formats such as cookies and cereal bars.

Customisation: India is a market that requires cultural understanding before launching products. For instance, the probiotic industry in India has faced different challenges than elsewhere in the world. This is primarily because yoghurt, the primary mode of intake of probiotics, is an essential part of the Indian diet and is normally home-made. Convincing consumers to pay a premium for something so easily available, without creating product awareness of the benefits of branded probiotic yoghurt, has been a major stumbling block for marketers. However, the growing focus on customisation of products for the Indian audience is stimulating demand for functional foods. For example, omega-3, a traditionally non-vegetarian product, has been developed for the Indian market with vegetarian variants

obtained from algae and flaxseed oil. The potential for cultural customisation and inclusion of natural ingredients is high in India, given the acceptance of alternative herbal medicines. Moreover, India has emerged as a key sourcing destination for natural ingredients, thereby allowing manufacturers easy access to local ingredients.

Natural trend: With increasing concerns about chemical side effects and the introduction of synthetic additives into foods, consumer demand for natural alternatives in India has increased dramatically. The food industry has responded by focusing on customising products to offer natural alternatives for established variants. For instance, concerns about increasing level of carcinogens and the high sugar content of fruit juice concentrates has resulted in mango pulp based fruit juices being sold as premium fortified juices in India. Natural variants are one of the most important aspects of the functional food market in India.

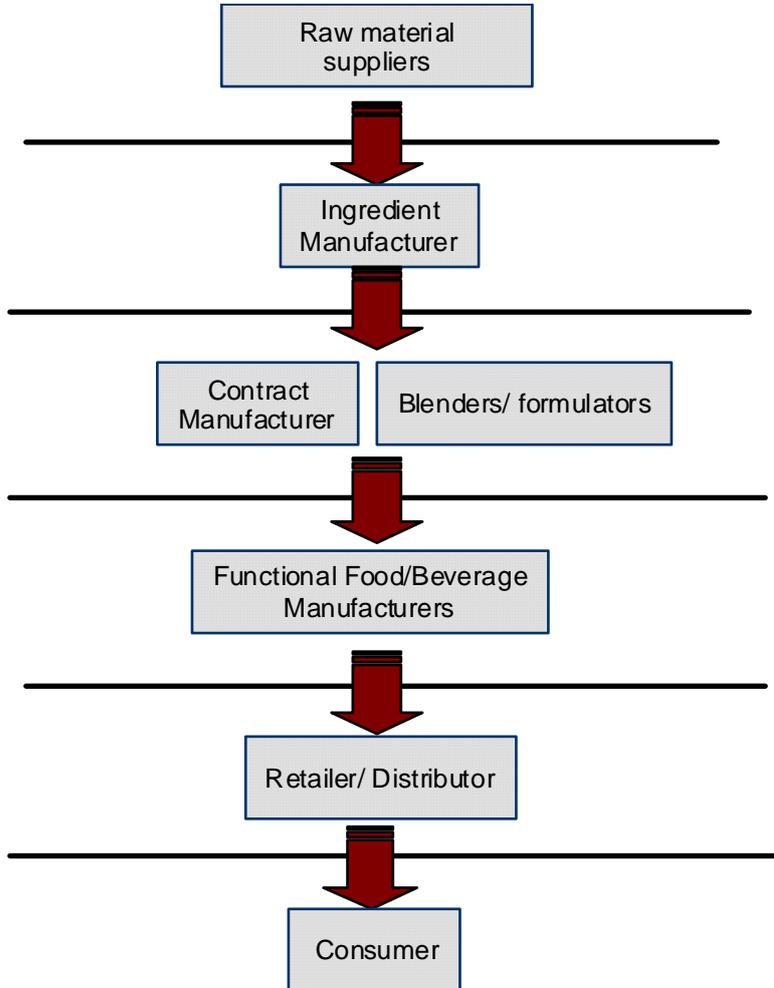
Innovative delivery formats: India is an extremely snack friendly market that tends to shy away from products in pill or capsule formats, viewing them as pharmaceuticals. Formulation challenges for adding health ingredients into traditional food formats have driven innovative product presentation to ensure ingredient viability and stability. Flavour masking has been one of the primary modes of supplying nutraceutical ingredients in India, where consumers are particularly found to show a preference for instant mixes and fortified regular foods with camouflaged supplements, over tablets and tonics, to fulfill daily nutritional requirements. Major flavour and fragrance companies, such as Givaudan, are working on using technology to increase flavour masking in functional food products. The prime examples of such masking have been for omega-3 and soy products, both markets that were hindered by the unpleasant taste of the ingredients. Manufacturers have fortified popular snacks with ingredients, such as native grains, dietary fibres and vitamins, thereby allowing them to address both the nutraceutical as well as the convenience foods market. A prime example of cultural customisation as well as innovative delivery is the introduction of five grain cookies that are now one of the most premium health products in India. Introduced by Britannia Corporation, the cookies, branded as Nutrichoice, are prepared from locally sourced wheat, millet, corn, oats and rice flour and accounted for 7% of the company's total sales in 2014.

Condition marketing: With increasing sophistication among nutraceutical consumers and the demand for personalised medicine growing, consumer demand for products with specific health benefits has also increased. The trend of condition marketing has given rise to a whole new avenue of product differentiation in India, where sectors such as heart health, eye health, digestive health and joint health are popular with manufacturers focused on specific health conditions. For instance, India's education demands have driven growing interest into functional foods for children claiming brain health benefits, such as Horlicks, Complan and Bournvita's malt drinks. Manufacturers have therefore focused their products on the most common non-chronic diseases in a particular region. An emerging example is that of micronutrient deficiency, which affects a large portion of the Indian population. Coca-Cola has addressed this by launching a micronutrient fortified drink under the brand Vitingo.

Distribution Channels for Functional Foods

Distribution channels for functional foods in India are illustrated below.

Figure 25: Distribution Channels for Functional Foods in India



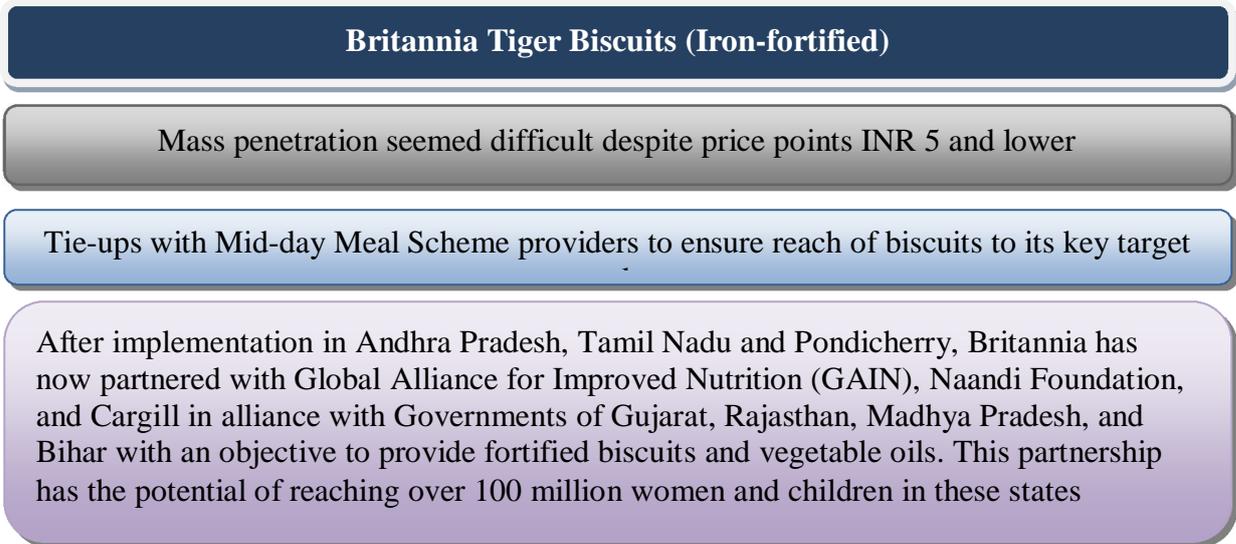
The Indian distribution channel for functional foods is largely controlled by the functional food manufacturers, as these are typically large FMCG companies that have high bargaining power across the value chain. Ingredient manufacturers source raw materials either locally or import them. Often ingredient manufacturers utilise contract manufacturers or designated blenders and formulators to help develop ingredients into a food ready format which is then supplied to the food manufacturer. The final products are sold either to distributors or to retailers. A multi-layer structure is observed at the distributor level, depending on the region in question. For example, regional distributors and smaller distributors often form two layers in the case of rural distribution, whereas the regional distributor supplies directly to the retailers

in the largest (Tier-I) cities. Typical retail distribution channels are grocery stores and supermarkets in urban areas where functional foods are in most demand.

Emerging alternative distribution channels: An efficient method of reaching the masses in India would be by using the government's public distribution system (PDS) to distribute functional food products. Traditionally, the PDS (or Targeted PDS (TPDS) as it is currently called) has been focused on providing subsidised food commodities to the country's poor since 1997, thereby, theoretically at least, limiting the access of this system only to "eligible families". With the advent of the *Food Security Bill* the role of the TPDS has been sufficiently widened to reach most families that do not currently have access to functional food products due to affordability. Under the Food Security Bill, the Government is looking to meet the nutritional needs of various sections of the population and provide "Take-home Rations" that are "energy-dense fortified foods that meet at least 50% of the Recommended Dietary Allowance" for each member of the targeted population. This move holds great potential for functional food manufacturers to partner with the Indian Government and increase the penetration of these products in India.

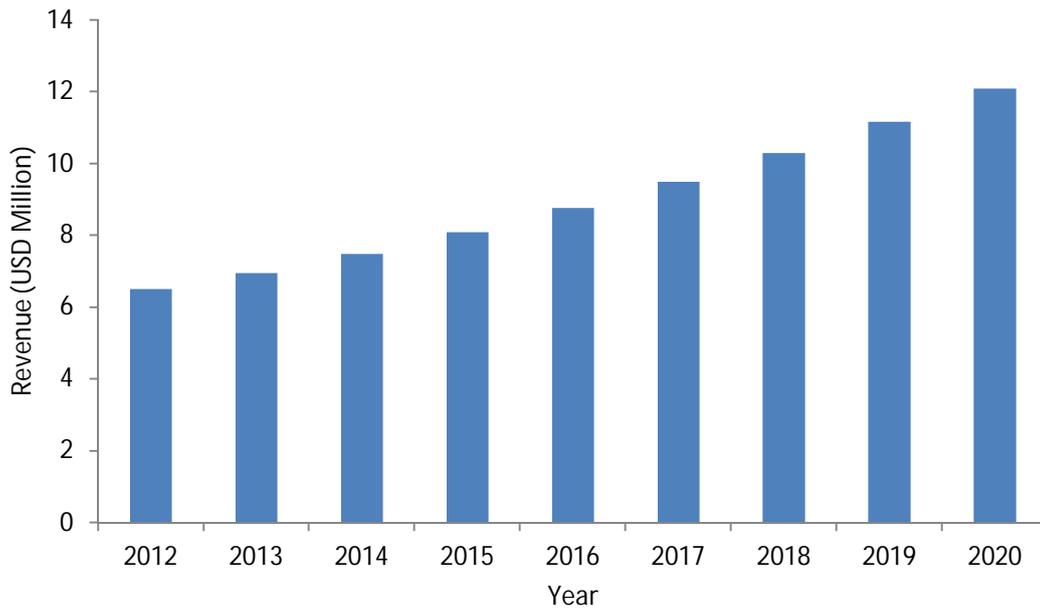
An example of how this scheme works is depicted below with Britannia's brand of iron fortified Tiger biscuits. By tying up with Indian's extensively distributed school mid-day meal scheme (introduced to encourage poor families to send their children to school as opposed to work) the company has significantly penetrated rural markets and helped provide iron fortification to the poorest sections of society. Over 40% of children and 50% of women in India suffer from iron deficiency.

The success of this scheme has resulted in more states wanting to partner with Britannia and companies such as Cargill to ensure that these products reach a target of at least 100 million women and children in India.

Figure 26: Britannia Tiger Biscuits Distribution**Market Analysis of Key Product Categories****PUFA****Market Size and Growth**

In spite of being the most established functional food ingredient in India, sales of PUFA ingredients to the food industry account for less than 5% by volume and 15% by revenue of functional food ingredients in 2014, primarily due to technological and sensory barriers in fortification of food. Pharmaceutical manufacturers who control the dietary supplement chain tend to command most of the sales of PUFA as used in soft gelatin PUFA capsules.

In 2014 the PUFA ingredient market in functional foods is estimated at US\$7.5 million and is forecast to grow at 8.3% to 2020.

Figure 27: Indian PUFA Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

In India, PUFA application is restricted largely to powder forms as there are technical/sensory barriers for other food applications, with the Indian health ingredients market still highly dictated by taste profiles. Three types of PUFA ingredients are used in food applications; algae oil, fish oil powder and flax powder.

Demand is growing for products catering to infants and pregnant women. This market is considered premium, and imported omega-3 ingredients are generally used, mainly of algal sources due to a lack of local options.

Flax oil and algae oil are in demand in India for food applications, as vegetarian omega-3 products are a key requirement. Algal omega-3 is generally imported, with only Avesthagen providing locally sourced vegetarian omega-3. Fish oil powder is used as a source of omega-3 in products such as health drinks and snack bars, such as Glaxo Smithkline's Omega-3 Horlicks brand, while deodorised fish oil powder is used in applications where there is no issue of non-vegetarian source but sensory problems with the fishy odour, such as Venky's omega-3 fortified eggs

Product Preferences

Malt beverages dominate omega-3 food products in India. The key players in omega-3 fortified products are Nestle, GSK and Wockhardt. The market is mainly split between the following brands; Junior Horlicks, Mother Horlicks, Protinex Mama, Nan-1 and Impact.

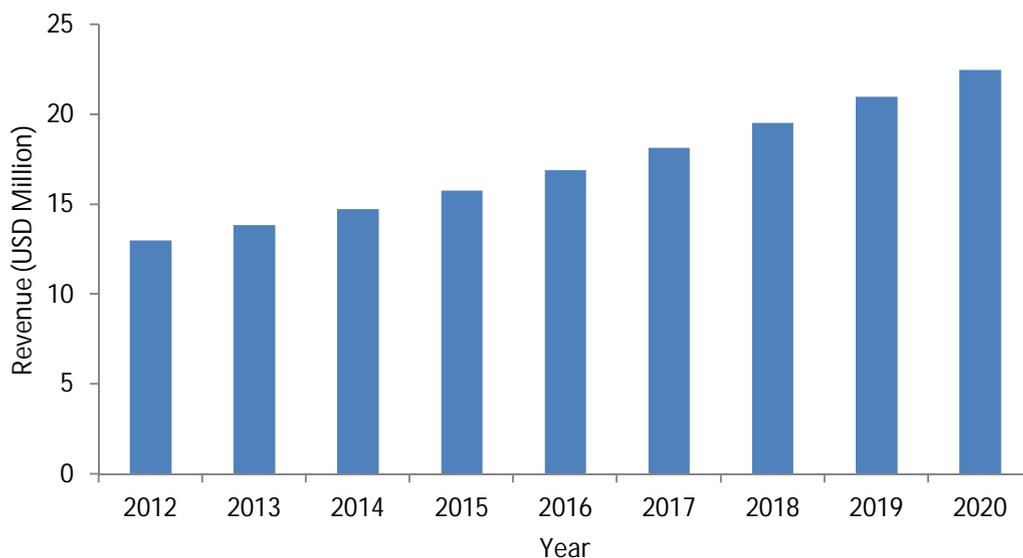
There is a growing demand for omega-3 fortified egg, cereals, biscuits, and beverages. Flax oil based food products are expected to grow as flax oil is cheaper than algal sources (which are typically used only for high value end applications) and due to its vegetarian nature.

Proteins and Peptides

Market Size and Growth

The Indian market for proteins and peptides is dominated by local manufacturers focusing mainly on milk, soy and egg proteins. With a large portion of the Indian population being vegetarian, there is a growing interest in protein supplementation via functional foods, particularly in the sports nutrition segment. The Indian market for protein and peptides was estimated at US\$15 million in 2014, forecast to grow at 7% per year up to 2020.

Figure 28: Indian Protein and Peptide Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Milk proteins account for 40% of the overall protein market. Soy is also a major protein area, driven by the country's large soy industry, which is increasingly entering the processed food and convenience food sector. Manufacturers such as Ruchi Soya have soy protein based brands such as Nutrela that are a popular protein source for vegetarians. Milk protein demand is expected to grow as Indian milk protein production increases and manufacturers increase efforts to use proteins in the fortified baked goods and dairy sectors. However, the market itself is plagued by a lack of clarity in labeling for protein ingredients owing to the lack of specific regulations. This will hinder the growth of the protein market unless addressed. While

a smaller portion of the market, egg protein is witnessing growing demand in the functional bakery and sports nutrition sector, with protein bars such as Kellogg's Special K bars as well as Herbalife's protein powder brands. The Indian egg protein market is highly fragmented, since the manufacturing is done on a small scale by the poultry owners.

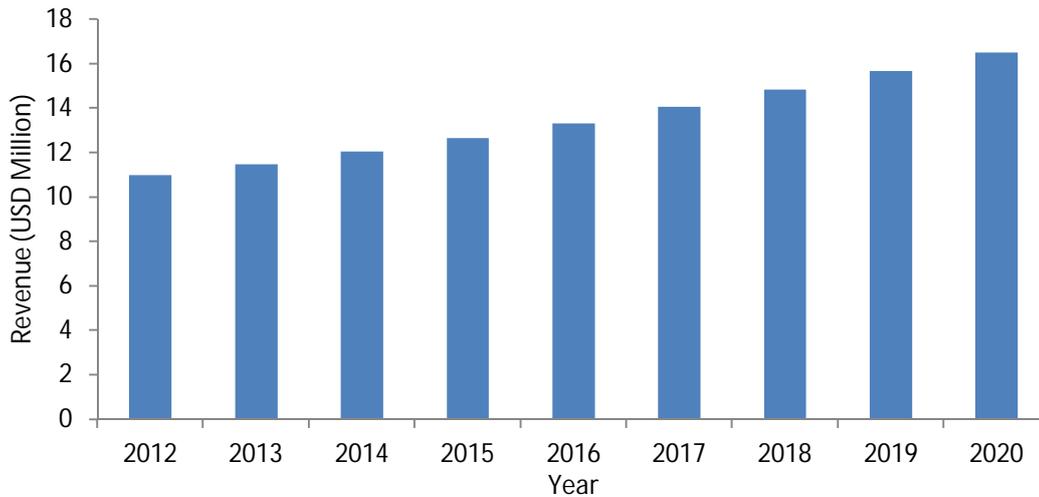
Product Preferences

With growing investment in the fitness industry, sports nutrition is emerging as a key end use area for the protein ingredient industry. Protein enhanced beverages and cereals are the primary products used by consumers, and both tend to cater to the premium segment. Within milk proteins, whey protein dominates demand for enriched powders for sports beverages. Local manufacturer Ruchi leads the market for soy protein based convenient foods, focusing on the vegetarian population as a meat substitute. However, protein ingredient demand in India tends to be restricted to Tier-I cities, due to a lack of affordability for much of the population and lack of awareness elsewhere.

Vitamin D

Market Size and Growth

Vitamin D deficiency forms one of the biggest problems for Indians today, in spite of living in a country that gets year round sunshine. A recent study in the Nutrients- Human Health Journal by the Rockwell Medical Centre claimed that up to 80% of Indians suffer from vitamin D deficiency, which has caused huge bone health concerns in the country. This has driven an increased interest in vitamin D fortification, particularly in food and beverages. In 2014 the Indian market for vitamin D was valued at US\$12 million and is forecast to grow at 5.3% up to 2020.

Figure 29: Indian Vitamin D Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

The Indian market currently has few foods fortified with vitamin D as the focus tends to be on vitamin supplements. Vitamin D supplements are currently India's most popular single vitamin supplement, and hence foods struggle to compete on the same nutritional platform. However, rising levels of osteoporosis in women and vitamin D deficiency in children is spurring interest in vitamin D fortified foods, particularly in beverages. The market is thus witnessing an influx of beverage options with vitamin D fortified claims.

Product Preferences

Vitamin D fortified malt and health beverages such as the Bournvita brand are a key growth area, particularly targeting the children's nutrition sector in India. The women's health sector also has an array of vitamin D fortified products, particularly aimed at pregnant women and mothers of young children. Fruit juices such as Tropicana and Minute Maid fortified with Vitamin D and cereal bars such as Horlick's Nutribar are also emerging products that compete on a much lower price point.

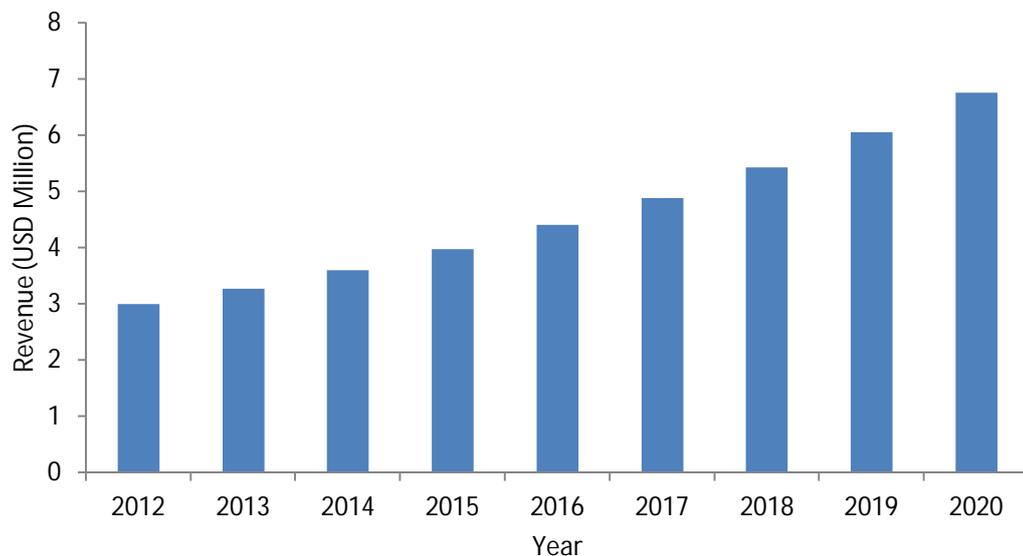
Probiotics

Market Size and Growth

Traditional fermented dairy products, naturally containing live and active bacterial cultures in the form of home-made yoghurt, as well as milk drinks such as lassi and buttermilk, are considered healthy and have been consumed in India for decades. Probiotics is a nascent segment in the food industry, and is currently largely focused on the animal feed and

pharmaceutical sectors, unlike the rest of the global market. The Indian market for probiotics in food and beverages is still a niche sector, accounting for less than 10% of the overall Indian probiotic sales. In 2014 the market was estimated at US\$ 4 million, forecast to increase at 11% up to 2020.

Figure 30: Indian Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The Indian market for food ingredient probiotics is largely import driven, with Chr-Hansen and Danisco contributing nearly 90% of the probiotic culture market value. The main applications are in yoghurt such as Yakult Danone India, and in ice cream such as Amul Prolife. Traditionally, growth in the probiotic culture market is in line with end product market growth, and probiotic yoghurt is the largest end-use application for probiotics in India. However, since 2012 new entrants have entered, in particular regional dairy co-operatives. Moreover, awareness building activities of global companies, such as Yakult, have driven consumer awareness about probiotic products, further fueling market growth.

Product Preferences

Dairy products dominate probiotic usage in India. The country has many native dairy cooperatives, which, in recent years, have started to launch a variety of probiotic products, such as yoghurts, lassis (buttermilk drinks), curds and dahi. Multinational companies are focusing on value added probiotic products, such as flavoured yoghurt (brands include Danone, Nestle, etc). Lassis such as Amul Probiotic Lassi are emerging as a major investment sector for probiotics in India, primarily due to its national as well as global appeal

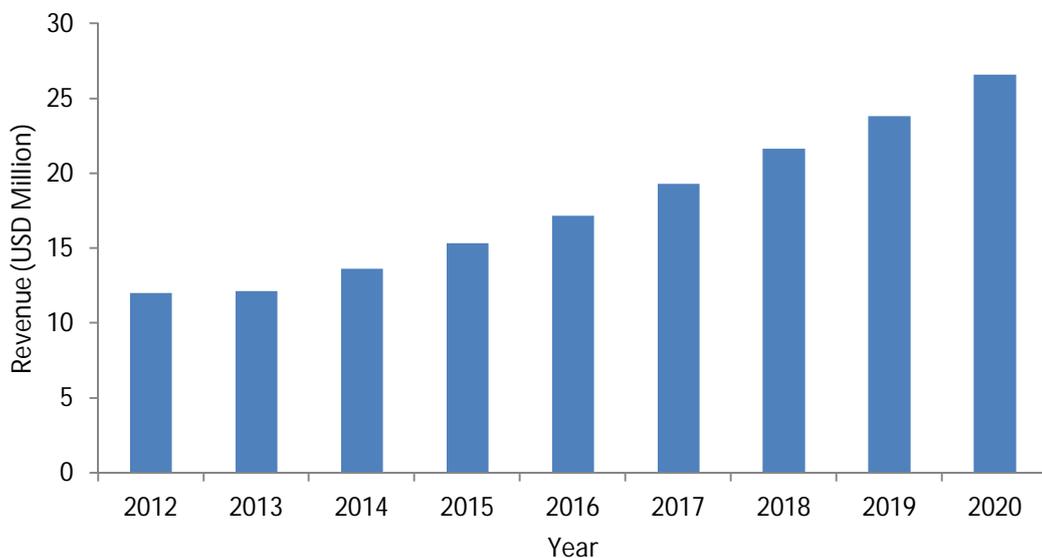
and ease in incorporation of the strains in the end product. Multinational companies have found the Indian market very challenging in the past, owing to supply shortages, poor cold chains, storage facilities and infrastructure, and underdeveloped and complicated distribution channels. However, dairy corporates, such as Nestlé S.A., Mother Dairy India Pvt Ltd and Yakult Honsha Co. Ltd., have launched probiotic dairy products in an effort to establish a probiotic spoonable yoghurt consumption market in India, valued at US\$140 million in 2014.

Prebiotics

Market Size and Growth

Prebiotic usage in India, like probiotics, is a nascent market with growing interest particularly for the use of prebiotics as digestive health ingredients. Traditionally, prebiotics were approved for use only in bakery products in India, but since 2011 the country allowed regulatory approval for usage in a number of additional food categories, including sweets, dairy products, frozen desserts, ice cream, cereals, chocolates, as well as in meat applications. This will stimulate market growth, from US\$14 million in 2014 to US\$27 million in 2020, at a CAGR of 12%.

Figure 31: Indian Prebiotics Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Unlike probiotics, which struggle with aggressive competition from dietary supplements and animal feed as alternative markets for ingredients, prebiotics are primarily used in food products. The main ingredients used in India are fructose oligosaccharides (FOS) and inulin, mostly used as an additive. This has largely been driven by the demand for low sugar foods.

India has seen rapidly growing incidence of diabetes and obesity, with approximately 400 million overweight people and 37 million diabetics.

Product Preferences

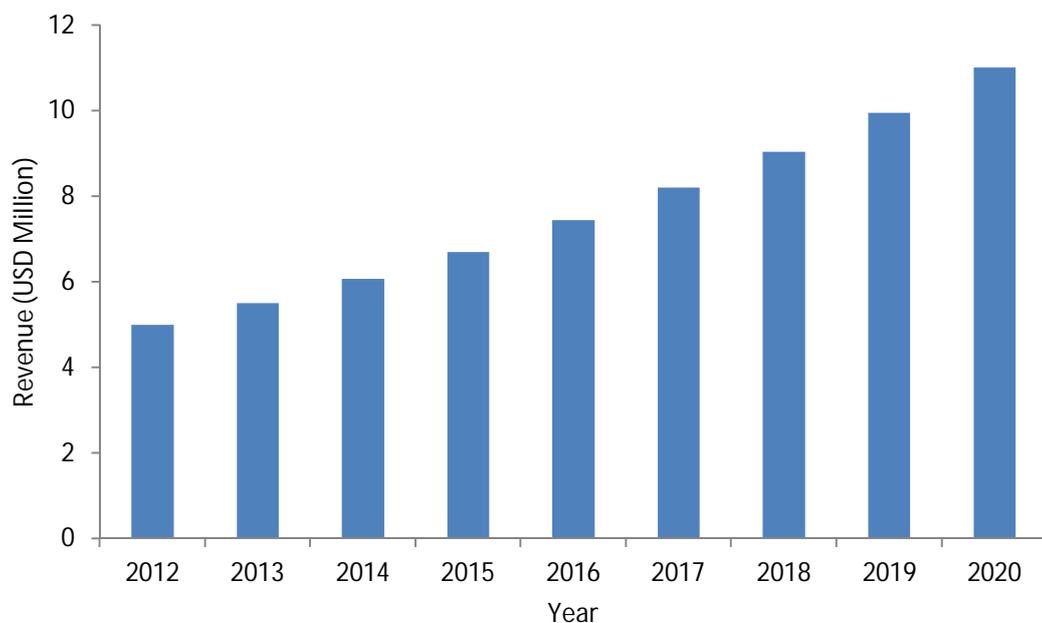
The largest market for prebiotic ingredients in India has traditionally been baked goods, mainly sugar free biscuits. However, growing awareness of the benefits of prebiotics has driven the incorporation of these ingredients into other products, such as cereal bars, ice creams, fortified wheat flour, jams and preserves and beverages. Examples include brands such as Britannia, Parle, Anmol, GAIA etc. Soy prebiotic beverages such as Soyvita are a growing market in India, due to increasing consumer awareness of the benefits of soy based ingredients, especially in weight management.

Aloe Vera

Market Size and Growth

The Indian market for aloe vera extracts is a niche market with several state governments driving increasing production of aloe vera due to its high profit margins for small scale farmers. India's demand for aloe vera extract currently stands at US\$6 million and is forecast to increase at a CAGR of 10% to US\$11 million in 2020.

Figure 32: Indian Aloe Vera Extract Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Aloe vera demand in India is largely focused on local aloe vera products, grown typically in the northern regions of the country. Demand is stimulated by growing usage of aloe vera in the cosmetic sector, due to its potent antibacterial and antioxidant properties, which is now also stimulating use in the food sector. The focus is primarily on the delivery of aloe vera and its extracts in convenient processed food formats. As more retail chains begin to stock aloe vera products, demand is expected to continue to grow from urban India.

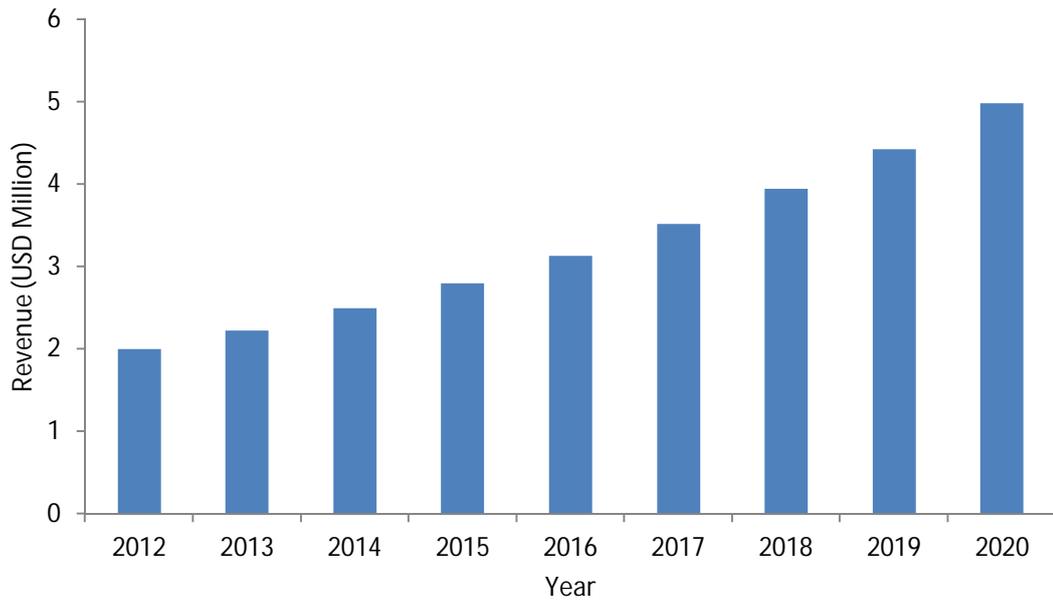
Product Preferences

Currently aloe vera in India is primarily found in beverage formats either in juice or dairy forms such as Apollo Pharmacy and Arogyam Juice or Emmi Aloe Vera Yoghurt. These companies have conducted significant research on understanding the taste profiles of consumers, and have established a loyal consumer base on the back of these products. In addition, several RTD tea manufacturers are now also looking at adding aloe vera extracts to functional tea, thereby increasing demand in the premium segment. Beverage usage is expected to continue to drive demand, as the food industry often finds aloe vera's taste profile difficult to incorporate in baked goods and processed foods.

Phytosterols

Market Size and Growth

The Indian market for phytosterols is small with very limited use, primarily in baked goods and processed dairy products. The market is dominated by importers such as Raisio and Benecol, and is largely focused on the high end premium segment with minimal penetration into the wider Indian populace. The market was estimated at US\$2.5 million in 2014, forecast to grow at a rate of 10% until 2020.

Figure 33: Indian Phytosterol Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Demand for phytosterols is largely driven by the heart health sector. Increasing awareness of the benefits of sterols in lowering cholesterol and positively impacting heart health has driven interest in processed foods claiming sterol fortified heart health benefits, such as breakfast cereals and dairy spreads. These factors are driving increasing consumer awareness of the benefits of sterols and allowing penetration into other end uses, though from a very small base.

Product Preferences

Baked goods producers, such as Kellogg's, continue to dominate overall demand for phytosterol applications, though there is an increasing array of fruit juices, biscuits and dairy products also claiming these benefits, such as Minute Maid's heart health series of juices. India's large dairy market is looking to fortify its products further, and this serves as a key opportunity for phytosterol manufacturers to supply these ingredients.

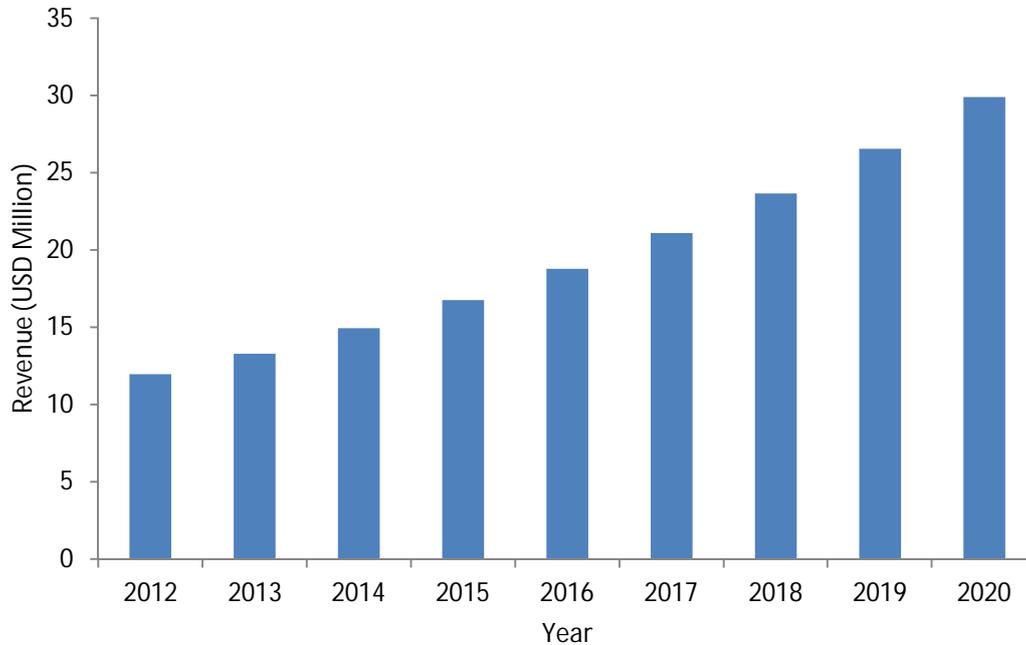
Carotenoids

Market Size and Growth

The Indian market for carotenoids is a fast growing one, being driven by a growing awareness of antioxidants and demand for healthier food options. Algal based carotenoids are a native Indian industry, and the growth of this sector is the prime reason for increased penetration in

the food industry, especially via carotenoids such as beta-carotene. The Indian market for carotenoids was estimated at US\$15 million in 2014, forecast to grow at 12% CAGR to US\$30 million in 2020.

Figure 34: Indian Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The market for carotenoids in India is split between beta-carotene, lutein, lycopene, asthaxanthin and zeaxanthin. Beta-carotene forms the largest segment, at over 60% of the food carotenoid market, and is primarily used in beverages and juices, both for its colourant properties as well as its antioxidant nature. Most of the other carotenoids find significant usage in the dietary supplement sector, along with mineral and vitamin complexes. Usage in the processed food sector is still minimal, aside from usage as a colorant which has slowed further growth of these products.

Product Preferences

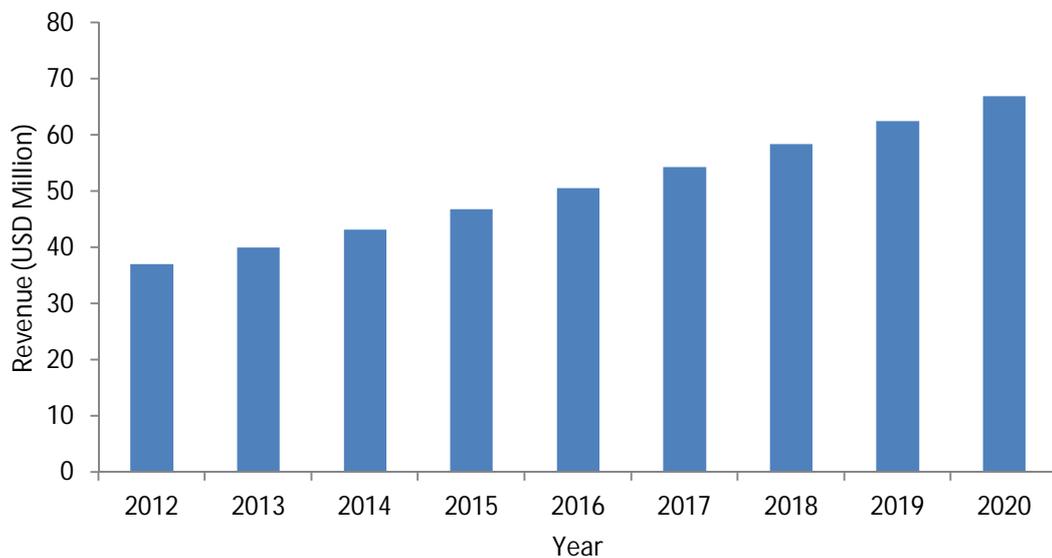
Beverages account for the largest segment of this product market. Beverages and fruit juices such as the Tropicana and Minute Maid brands are easy modes of antioxidant delivery, and will continue to influence demand over the forecast period. Dairy and confectionery are also emerging as a fortification sector for carotenoids, spurred by the growing phytosterol usage in dairy. However, for the next few years demand will come mainly from beverages.

Polyphenols

Market Size and Growth

India has a large polyphenol raw material industry, but much smaller use of polyphenol ingredients themselves. Most polyphenol ingredients produced in India are exported to other Asia Pacific markets, however the local market has demand for two kinds of polyphenols, namely green tea extracts and soy isoflavones. The market for polyphenol ingredients in India in 2014 was estimated at US\$43 million forecast to grow at 7.5% CAGR to 2020 to US\$67 million.

Figure 35: Indian Polyphenol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Green tea polyphenols are the largest segment of the Indian polyphenol ingredients market and are witnessing growing demand because of their weight management benefits, with products such as Nestea. Soy isoflavones, though a very small segment in functional foods, are used mainly in the women's health segment, such as in Women's Horlicks. Polyphenols in India, like carotenoids, are popular for their antioxidant properties and are largely derived from the tea industry, which is a major producer of these ingredients. Polyphenol ingredients are expected to continue to struggle with aggressive substitution within the industry for antioxidant extracts unless they can create a niche for themselves, as soy isoflavones have done in women's health.

Product Preferences

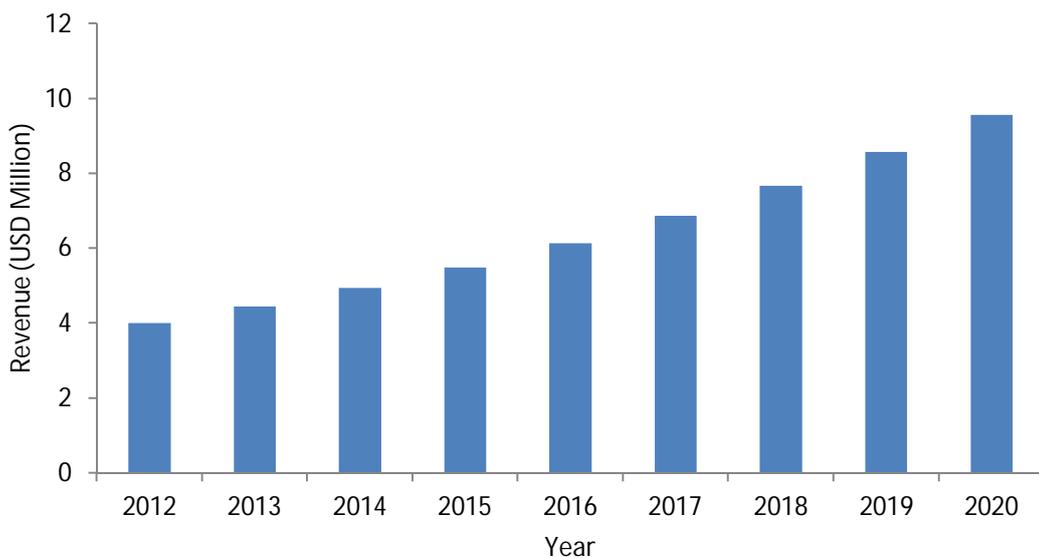
Most green tea polyphenols (over 70%) are used in beverages such as brewed and RTD teas, as well as other beverages in India. Hindustan Unilever's Ltd Lipton tea and Nestle India's Ltd Nestea are the key brands for RTD teas in the Indian market. However, popularity of RTD is primarily restricted to urban areas due to the limited distribution and low awareness of RTD tea as a product. There is, however, a growing interest in using these extracts in dairy products such as ice cream, and a niche market for green tea extract usage in confectionery is also emerging. In contrast, soy isoflavones have an even more limited end use, mainly in women's health focused beverages and cereal bars. The limited usage, aggressive competition and lack of product differentiation tend to restrict further polyphenol growth.

Gluten Free Food

Market Size and Growth

As opposed to the United States and Europe, the usage of gluten-free products in India is primarily after a person is diagnosed with coeliac disease. The awareness of coeliac disease and of gluten-free products is very low. However, with improved diagnostic processes, there has been a considerable increase in the diagnosis of coeliac disease, especially in North India, the region with predominantly wheat-based diets. The incidence of (diagnosed) coeliac disease has increased by 25% to 30% during 2010 and 2012. This is driving the demand for gluten-free products. The market for gluten free foods in India in 2014 is estimated at US\$5 million and is forecast to grow at 12% to US\$10 million in 2020.

Figure 36: Indian Gluten Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

With the increasing incidence and diagnosis of coeliac disease, the demand for gluten-free food is expected to grow. The increase in the gluten-free market will also drive the use of sugar-free and other 'free-from' product categories, which are currently not present in India. Awareness continues to be minimal, as most food and beverage giants are yet to offer gluten-free products in the Indian market. The presence of companies such as Nestle and ITC, and a direct presence of global gluten-free product suppliers such as Dr. Schar, is essential, as it will help increase product awareness and increase penetration. Additionally, gluten-free products are priced substantially higher than normal foods. For staple foods, prices for gluten-free products are higher by more than 300% when compared to normal food. Such a high price makes it unaffordable to most people and the product usage is largely limited to medically-supervised nutrition.

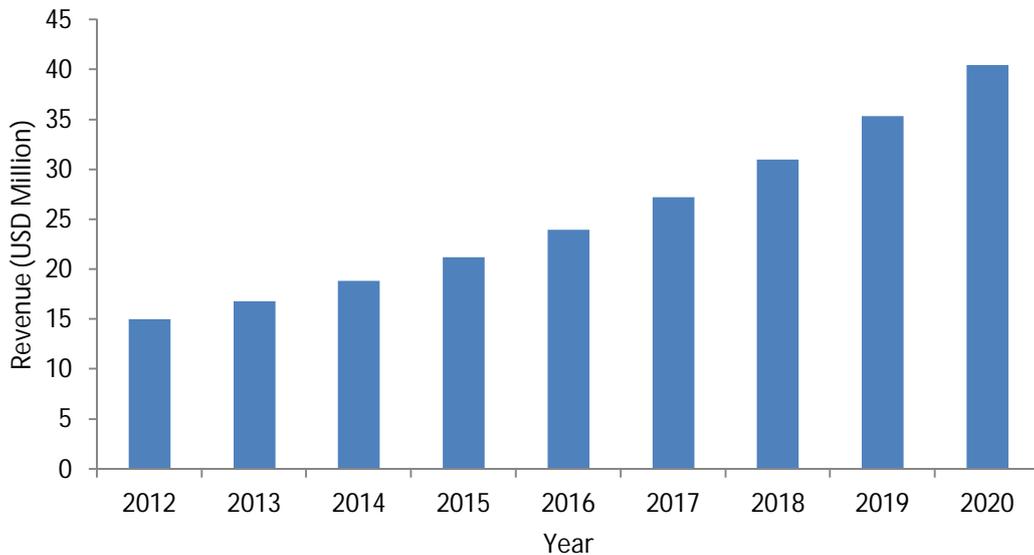
Product Preferences

Bakery and confectionery products with gluten-free ingredients account for around 40% of the total gluten-free market. Staple foods account for 25% of the total gluten-free products market, followed by gluten free snacks at 15% of the market. The highest consumption of gluten-free products in the Indian market is through typical health food channels. At the retail stage, health stores account for most of the gluten-free sales. Sales at retail grocery stores are picking up in some cities in the Punjab and a few areas in Delhi which are traditional wheat consuming regions. These include brands such as 24Mantra Organics, Sai Food products, A Taste of India etc. Some of the suppliers also offer product through direct online sales for a broader reach.

Lactose Free Food

Market Size and Growth

While India is one of the largest dairy markets in the world, there is growing evidence that up to 40% of the Indian population and over 60% of the south Indian population could have some level of lactose malabsorption. This is driving an increasing call for more lactose free foods in a country where these products are extremely hard to find. The Indian market for lactose free foods is estimated at US\$18 million in 2014, forecast to grow at 14% CAGR until 2020.

Figure 37: Indian Lactose Free Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

As diagnosed lactose intolerance continues to rise within the Indian population, there is a growing focus on dairy alternatives, such as soy milk, tofu and almond milk. Levels of lactose intolerance have risen to a point where India's largest dairy co-operative, the Amul Group, launched India's first branded lactose free milk in September 2015, priced at a premium. This is set to pave the way for international companies to enter the market and drive increasing competition in this sector.

Product Preferences

The primary product preference for perceived lactose free foods in India is in the form of dairy alternatives as mentioned above, although these foods cannot truly be classified as lactose free as they do not naturally contain lactose. Companies such as Vimal Group have also launched whole lines of dairy alternatives since 2013. These products are perceived by consumers as having no lactose in comparison to the product they are substituting. These products under the Vimal brand include tofu to substitute paneer (Indian cottage cheese), soya cheese and rice cheese to replace cheese, margarine to replace butter, soya cheese spreads to substitute cheese spread and soya mozzarella instead of mozzarella. The plant milk that goes into the manufacture of dairy alternative products could be derived from soy, oats, nuts, seeds, legumes, hemp, rice or a mix of all. These local options are now causing global manufacturers, such as Hershey with its Sofit brand, to identify that there is an emerging market in India, and encourage them to enter the market, thereby driving supply.

Other Free From Foods

The Indian free form foods market is still comparatively nascent and as a result, aside from gluten free and lactose free, there is little penetration of other free form foods unless you count the large demand for vegetarian meat free options. As a result this sector holds little significance at present for the Indian market.

Indonesia

Overview of the Functional Food Market

Indonesia's health food sector is a comparatively young market, with interest growing as a result of rising affluence of the 250 million population. However, the concept of functional foods and beverages is a novel concept in a country still focussing on obtaining food security, and as a result the market is growing from a small base.

However, as lifestyle diseases, particularly those related to obesity, continue to rise there is a growing demand in Indonesia to use food as a medicine, especially due to the sparse healthcare facilities available outside of Jakarta. This factor is driving increasing interest in functional food, particularly for functional beverages which tend to dominate consumption in Indonesia. Functional foods are estimated to account for 70% of the total nutraceutical market, i.e. a market estimated at around US\$ 2 billion at end-product prices. However, the value of the market for ingredients used in functional food end-products is considerably smaller than this, especially considering that Indonesia does not have a stable supply of most nutraceutical ingredients at present.

Key Trends in Functional Foods

Demographic trends: In Indonesia, functional foods are mostly aimed at the younger generation, which includes children, young men and young women. Examples of ingredients being promoted in Indonesia include essential fatty acids such as omega-3 and omega-6, iron and calcium. Traditional herbs, such as ginseng and ginger, are purchased by young men and women to increase stamina. The prevalence of malnutrition and nutritional deficiencies has been influential in shaping the views and demands of consumers for fortified and functional food products, as they remain a key widespread health concern, particularly for women, children and infants. Continued shifts towards urbanisation and an increase in economic development have increased the number of urban ailments, such as obesity, diabetes and cardiovascular-related illnesses. The increasingly urbanised Indonesian population has led to consumers seeking functional food that focus on preventative health measures, which is facilitated by the rise in disposable income and a greater awareness of functional food benefits.

Functional beverages demand drive interest: The functional beverages sector in Indonesia has been a key growth market for manufacturers, as it addresses both convenience and nutrition. The market has developed a level of sophistication which now allows for demographically segmented drinks. For instance, functional beverages are specifically targeted at infants, children and adolescents as malnutrition is prevalent among this age group. In addition, convenience, ease of use and willingness to take nutritional supplements in the form of beverages accounts for growing use, particularly among lower to middle income

consumers. Fortified milk and milk powder products are highly sought after, with flavoured milk products being the most popular choice of functional beverage. This is apparent with Indonesian company PT Frisian Flag Indonesia launching a range of fortified flavoured milks aimed at various age groups. Additionally, parents tend to give infants milk formula as they perceive it to be more healthy and fortified with important nutrients than breastfeeding, due to the lack of confidence of mothers on the quality of their breast milk and pressure from formula milk manufacturers.

Convenience is king: Even within the profitable functional beverage segment, the main beverages tend to focus on the single trend of convenience. For instance, fortified RTD tea sales, which account for over 35% of the Indonesian functional beverage market, have grown on the back of the trends towards convenience and ease of use. In 2013 and 2014, drinking milk manufacturers continued to compete by launching products fortified with calcium, targeting adult consumers with or at risk of osteoporosis, dietary fibre for female consumers, and omega-3, omega-6 and other minerals for pregnant women, nursing mothers and young children. Different flavours are infused in the milk beverages to heighten the consumers' experience in drinking the product. The concept of providing consumers with products that are easy to ingest and yet high in nutrition will drive the premium segment in Indonesia. This is also apparent in functional foods, where convenient options such as gum, yoghurt, and slimming meal replacements are the leading types of functional food to claim specific health benefits for oral, respiratory, and digestive health and weight management in 2014.

Focus on natural: As food safety scams and fears over quality continue to grow, Indonesian consumers are going back to basics. The demand for natural ingredients has been an indicator of this trend, particularly as Indonesia has a vast untapped potential as a nutraceutical sourcing hub for ingredients. Older Indonesians tend to opt for herbal remedial products as a source of healthy functional food, as herbal ingredients are widely used in traditional Indonesian medicine and their benefits are well known. However, consumers remain wary about organic food and beverages, as they are sceptical of the true health benefits of organic products. They perceive that the healthiest foods are those that are "natural", and often organic foods are not perceived as natural.

Condition marketing: As Indonesia enters the functional food market much later than most countries, it also has a different level of sophistication. While most other markets are focussed on general health, Indonesia has a developed understanding of the need for condition nutrition. For instance, micronutrient deficiency (in particular, iron, iodine, zinc, folic acid for pregnant mothers and vitamin A for children) is a key concern within Indonesia as it affects a large portion of the population due to malnutrition and lack of access to clean and nutritious food sources. To address the nutritional needs, functional foods and beverages are heavily marketed with the micronutrients and the benefits they provide, and are mainly sold at

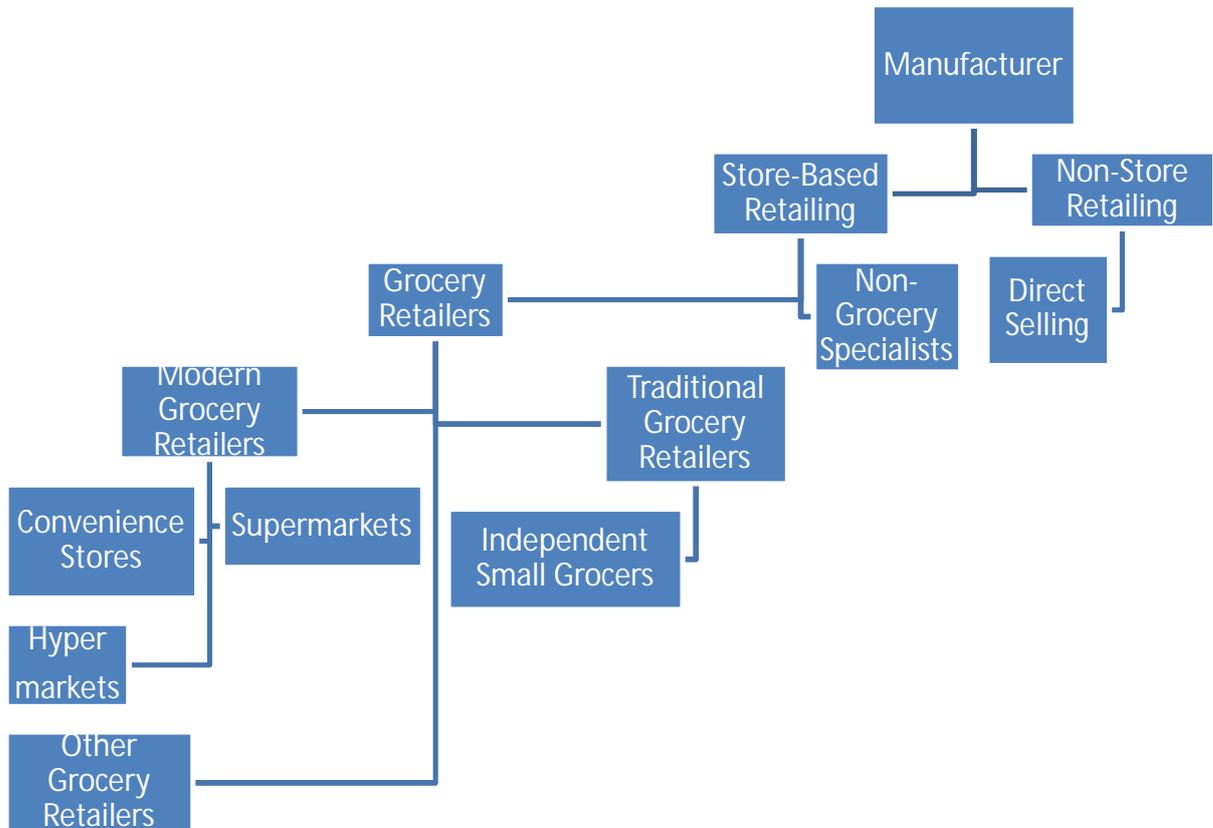
premium prices in urban modern retail outlets. Moreover, the development of more sophisticated and value-added products will provide manufacturers with opportunities to boost revenues and increase margins, despite the wider trend towards more intense price competition in packaged food. Focus on such Indonesian specific health concerns aids in driving home the message of fortification, and is helping drive growth.

Growing focus on weight management: A decade ago Indonesia embraced the entry of fast food into the country. However, there is now rising obesity and growing heart health concerns. This has given rise to a new weight management sector to combat these issues, especially among the middle and upper classes. In 2014, the fortified meal replacement slimming category witnessed strong growth, with retail volume and current value sales growing by 35% and 45% respectively. This was largely due to growing concerns among Indonesians about the health risks associated with being overweight or obese. These concerns are particularly prevalent among consumers who had irregular or poor eating habits, and little time for exercise due to busy lifestyles. Demand for meal replacement slimming products is also strong among weight conscious female consumers, driving an influx of new launches and promotional activities by leading players such as Herbalife Indonesia.

Distribution Channels for Functional Foods

Distribution channels for functional foods in Indonesia are illustrated below.

Figure 38: Distribution Channels for Functional Foods in Indonesia



Grocery retail outlets dominate functional food and beverage sales in Indonesia. These include modern grocery retailers such as convenience stores, hypermarkets and supermarkets. Traditional grocery stores, such as *apotik*, contribute to 16% of functional food sales. Only a small portion of functional food products are sold through direct selling.

The functional food market is currently limited to middle to upper income consumers. In an Indonesian context, multi-level marketing is a favoured method of spreading awareness and increasing sales, as consumers are family-oriented and have a tight-knit community. Positive product testimonials from families and friends is a major factor encouraging purchase, for instance sales of infant milk formula by midwives to young mothers.

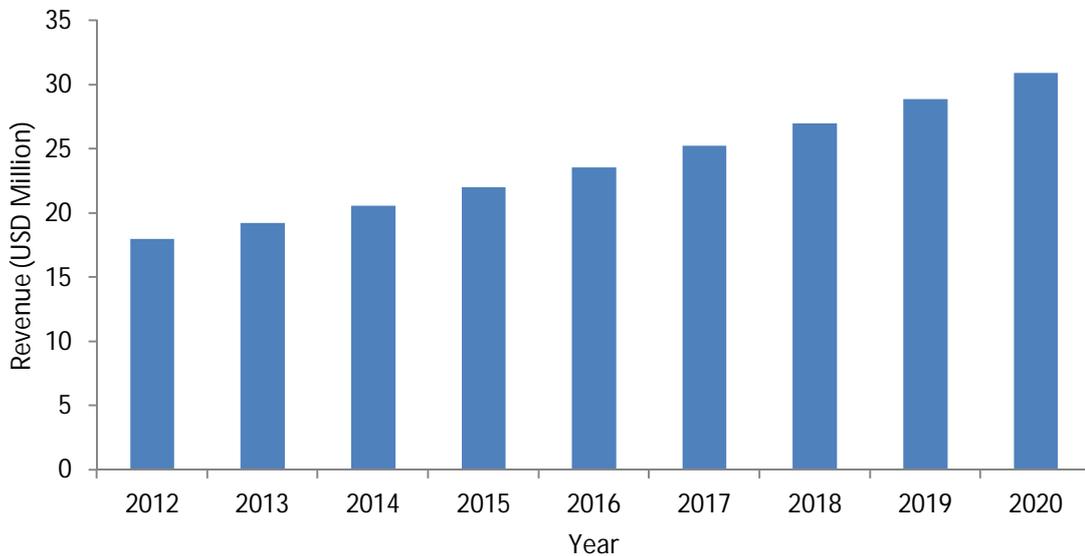
Market Analysis of Key Product Categories

PUFA

Market Size and Growth

The Indonesian PUFA market is an emerging market, but is one of the largest nutraceutical ingredients used in the country by revenue. Growing awareness of the many health benefits of PUFA has driven demand for these products. However, the market remains largely import dependent, due to the lack of established omega-3 suppliers and formulators in the country. In 2014, the PUFA ingredient market in functional foods is estimated at US\$21 million and is forecast to grow at 7% to 2020.

Figure 39: Indonesian PUFA Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Indonesian demand for PUFA ingredients is growing on the back of increasing awareness amongst the population. While Indonesia has little omega-3 ingredients production of its own, its large tuna industry (primarily skipjack, yellowfin and bigeye) is a potential raw material source for fish oil based ingredients. Currently, the few Indonesia companies producing omega-3 ingredients do so from fish oil, and supply it mainly to pharmaceutical and dietary supplement manufacturers.

However, the growing demand for these ingredients in milk and fortified milk powder markets is driving an increase in functional food and beverage requirements for PUFA ingredients. This fact is being underpinned by the growing emphasis on Indonesia by global PUFA

ingredient manufacturers, such as Denomega and DSM. In addition, Indonesia's large vegetarian population is also driving interest in algal and flax seed PUFA ingredients.

Product Preferences

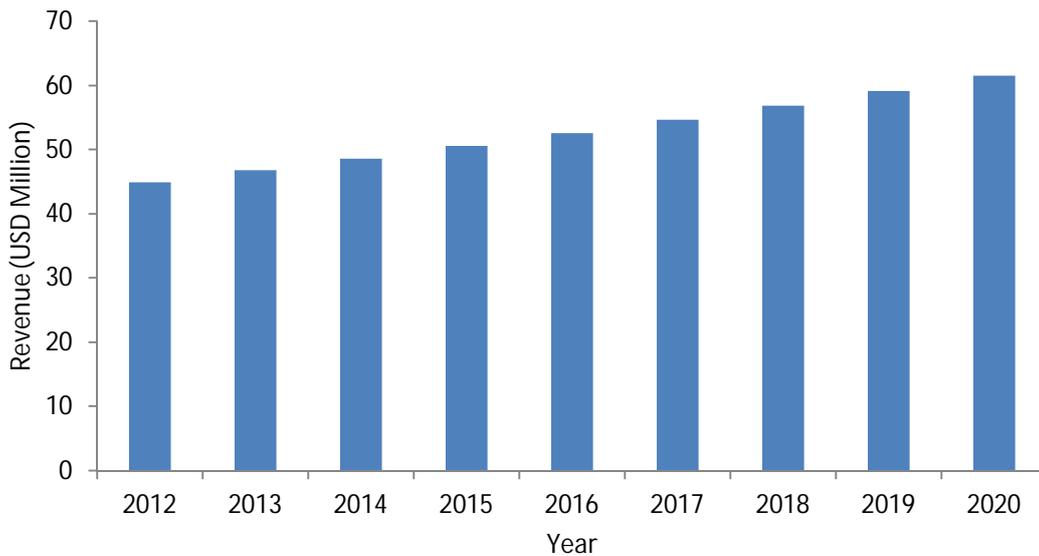
Supplements are the largest PUFA product markets in Indonesia, dominated by companies such as PT. Simex Pharmaceutical Indonesia, whose omega-3 capsules are provided along with its range of multivitamin supplements. However, functional beverages, mainly in the dairy sector, continue to be the key consumer requirement as omega-3 fortified milk and milk products drive demand, especially among the urban young. Key brands include Dancow, Batita and Datita infant formula, Indomilk, HiLo Joint+, Milna, Promina and Friso Gold.

The fortified omega-3 milk powder segment caters to the infant nutrition sector and is a fast growing market, with manufacturers lobbying to gain the most market share by driving awareness of PUFA ingredients and their benefits. Emerging product markets are cereal bars and baked goods claiming omega-3 heart health benefits.

Proteins and Peptides

Market Size and Growth

The Indonesian protein and peptides market is highly influenced by the nutrition needs and fears of malnutrition and a lack of dairy supply. The market for protein products is mainly focused on dairy based protein products, such as whey protein and casein, with a small market for egg protein which caters mainly to the body building segment. The Indonesian market for protein and peptides was estimated at US\$49 million in 2014, forecast to grow at 4% per year up to 2020.

Figure 40: Indonesian Protein and Peptide Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Indonesian consumers tend to focus on protein supplementation in one or two areas, dairy protein supplementation for children and working adults, and protein supplementation for the fitness and weight management industry. The growing trend towards weight management is driving demand for whey protein isolates and caseinates, all of which are focusing on weight reduction and protein meal replacement.

The whey protein industry is also a big part of the functional beverage sector, as most functional milk products are made from milk powder with fortified whey protein isolates and collagen peptides. These two industries will drive overall demand in the future.

Product Preferences

The demand for protein ingredients in Indonesia is expected to grow, based largely on the growing fortified milk industry. However, the growing demand for these products will drive competition and supply will be tight. There is a growing interest within the upper class for protein bars and meal replacement products focused on weight management and body building, but this sector of the market is expected to remain a niche. L-Men and Twinlab are key dominant brands in the market, with Twinlab being a well-established imported brand whose long-standing presence in Indonesia continues to grow. Nutrifood's L-Men, as the only domestic player in the market, is the only brand available with RTD format products such as beverages and nutrition bars. The market is expected to witness a growing trend towards

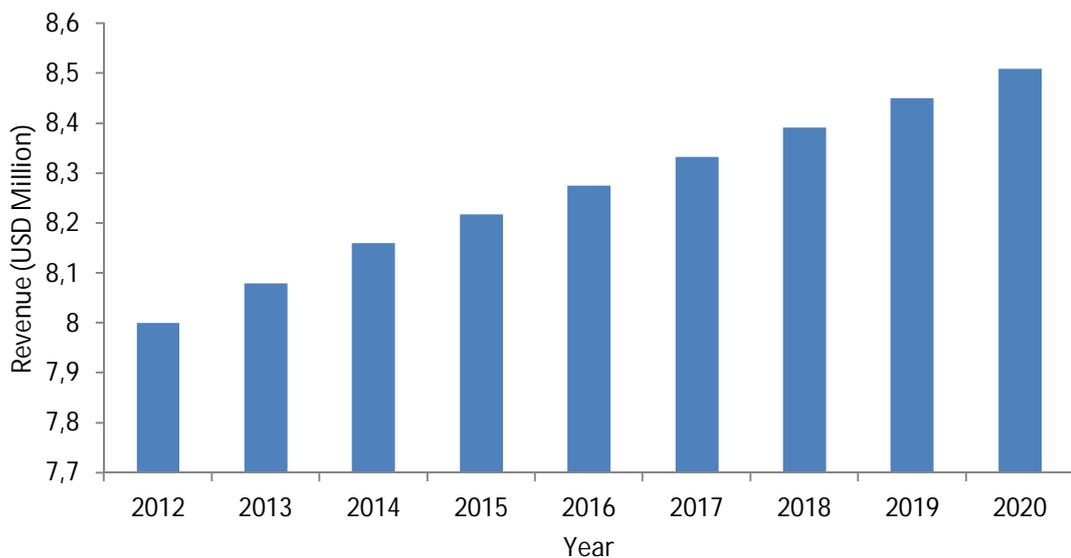
protein drinks focused on the women's health sector, particularly those aimed at the vegetarian market in Indonesia.

Vitamin D

Market Size and Growth

Vitamin D is a particular area of concern in Indonesia, driven by an increasing awareness of the role of calcium in maintaining and improving health. With increasing cases of osteoporosis in Indonesia, calcium fortified foods have become very popular and this is driving interest in vitamin D. While this demand has traditionally been largely supplement based, there is a growing interest in vitamin D and calcium fortified food products as well. In 2014, the Indonesian market for vitamin D was valued at US\$8 million and is expected to grow at 7% CAGR up to 2020.

Figure 41: Indonesian Vitamin D Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Indonesia is categorised as a lower middle income country, where a large number of the population still live in the rural areas and are deficient in certain nutrients due to a poor diet. The Indonesian Government has thus been encouraging food fortification, particularly that of calcium and vitamins, as a way to address malnutrition deficiencies.

As Indonesians begin to work longer hours with less exposure to sunlight, bone health concerns have begun to grow. The drive towards vitamin D fortification is largely focused on obtaining significant amounts of calcium which again links back to dairy demand in the country. Marketing and advertising activities for calcium fortified foods have become

increasingly common. As a result, awareness of calcium fortified foods has increased among consumers, driving demand for calcium.

Product Preferences

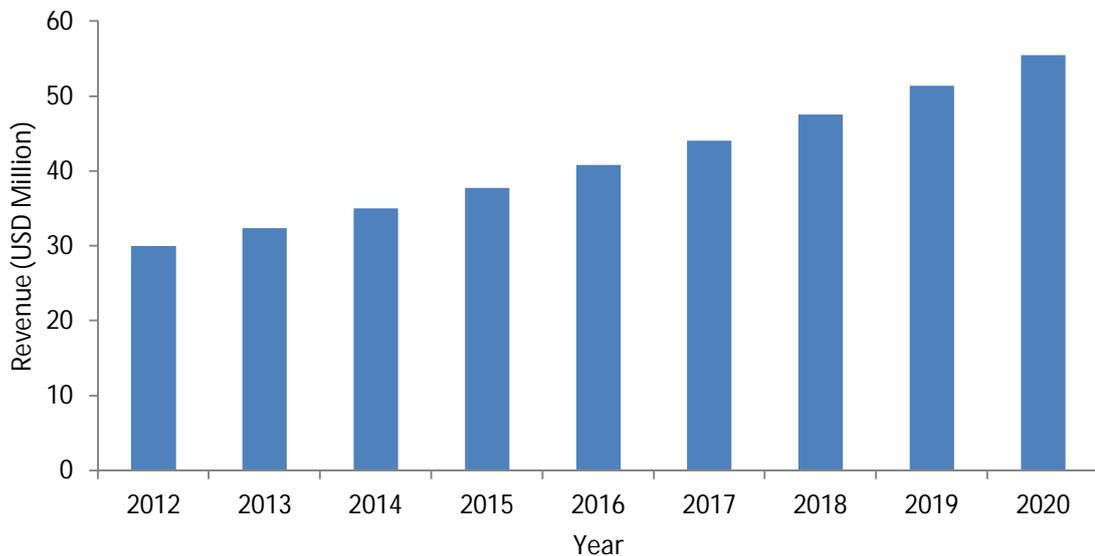
Dairy products and vitamin D fortified functional drinks are the primary mode of consumption of these products in Indonesia, apart from calcium supplements which are extremely popular. The lactose intolerant population tends to prefer vitamin D via fruit juices and RTD beverages, a fact that is driving increasing focus on newer formats of delivery for these products, aside from dairy. However, in the interim, aside from supplements, dairy products are forecast to be the primary mode of vitamin D delivery.

Probiotics

Market Size and Growth

Indonesia has been proactively using probiotic-fortified functional food for the last 5-6 years based on growing appeal. In Indonesia, probiotics are focussed mainly on improving digestive health and boosting immunity in children, besides claiming to augment cardiac health. People allergic to milk proteins and those mindful of the cholesterol content in milk products are driving the usage of probiotics. In 2014 the market was estimated at US\$35 million, forecast to increase at 8% up to 2020.

Figure 42: Indonesian Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Probiotics in Indonesia are considered validated health products; these validated health claims of probiotic cultures are improving gut health and enhancing the immune system. The current market focus in Indonesia is to address specific conditions like allergies and travellers' diarrhoea, and lower the risk of nosocomial infections in children. Additionally, the growing fears over digestive diseases are driving local consumers to invest in probiotic fortified products to ensure that infants' and toddlers' risks of bacterial infections are minimised. The overall growth in awareness of these products is thus expected to drive uptake over the forecast period.

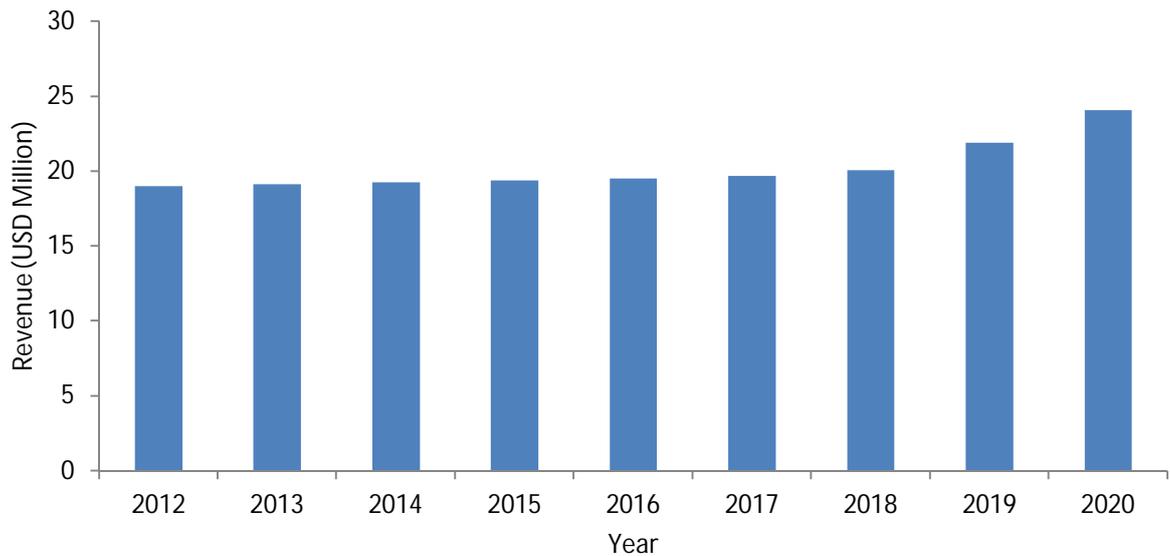
Product Preferences

Dairy foods continue to dominate the Indonesian probiotics market due to the ease of application of these products into dairy options. Typical probiotic products include yoghurt, fermented milk drinks, juices, milk formulae and soy drinks. Chinese Indonesians are more prone to lactose intolerance; as a result, there will be a move toward non-dairy foods during the forecast period. Fruit juices are the ideal means of incorporating probiotics, as their nutritional value is high and as they are already a part of consumers' daily diet routine. Yakult Indonesia Persada dominates with 39% of the market share in the probiotic sector. Yakult's drinking yoghurt fuels the sector's growth as it is perceived to be more practical and convenient as compared to spoonable yoghurt. Yo! Yoghurt by Heavenly Blush is a notable new product as it is an ambient drinking product that does not need to be stored in a refrigerator. Not only that, but it is the first yoghurt product in the country containing fruit and vegetables, namely banana, berries, broccoli, mango and carrot. Danone Dairy Indonesia, Milkkuat and Frisian Flag Indonesia's Yes! brand are other leading players in Indonesia's probiotic sector.

Prebiotics

Market Size and Growth

Prebiotics' role in maintaining digestive health is well-known in Indonesia. The market has emerged primarily for the dairy segment as a support to probiotic intake, and continues to witness growth as a result of its penetration into non-dairy segments and baked goods. In 2014 the Indonesian prebiotic market was valued at US\$22 million and is expected to grow at 6.5% to 2020.

Figure 43: Indonesian Prebiotics Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Only two types of prebiotics are prominent in Indonesia; fructans (Inulin and Fructo-oligosaccharide (FOS) also called Oligofructose) and Galacto-oligosaccharide (GOS), due to their ease of incorporation into end use products. These are supplied by importers from the EU and Japan. The competition is intense in the prebiotics market as players are present in more than one product and are also vertically integrated. Prebiotics and probiotics are synergistically combined to form another segment called synbiotics, which is a fast emerging sector. Demand is growing as prebiotics have now proven documentation claiming to aid digestive, immune and cardio vascular health a fact that manufacturers use to drive consumption.

Product Preferences

Infant nutrition (milk powder) and other dairy foods (yoghurt) and beverages (milk drinks) are the leading applications for prebiotics in Indonesia. Fructans continue to be manufacturer favourites, especially in the dairy sector. Indonesian consumption of different forms of prebiotics varies, with powders taking the lead (because of their incorporation into infant formulas and dairy foods and beverages and cereals). Frisian Flag's Friso Gold, Nutricia's Nutrilon brand and Nestle Indonesia's Dancow brand are the leading market players in the infant formula market. Nestle and Frisian Flag have a longstanding presence in the market, and consumers therefore know and trust their brands. Liquid forms take a small share, as these are mostly used in beverages, which is an emerging market as of now. The non-dairy

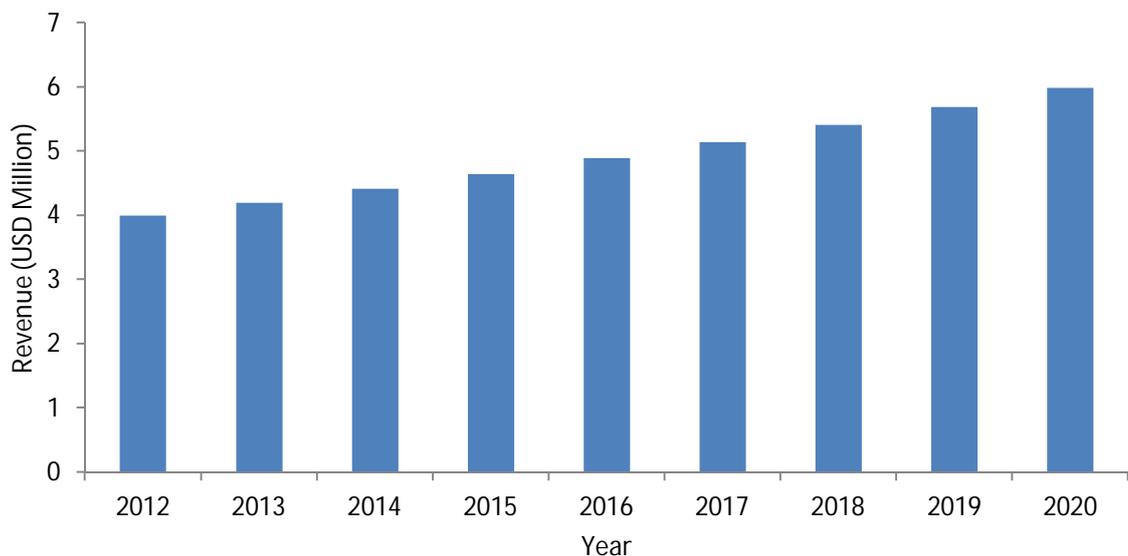
foods and beverage application such as bakery, cereals, desserts, ready to eat drinks, energy drinks, nutritional waters, and powdered drinks form a smaller portion of the overall market as of now.

Aloe Vera

Market Size and Growth

Aloe vera is a native plant in Indonesia and is grown locally. The market itself is quite unorganised and underdeveloped, unlike Korea or the USA, and is largely locally focused towards beverage manufacturing. In 2014 the Indonesian aloe vera extract market was valued at US\$4.3 million and is expected to grow at a CAGR of 5.2% to 2020.

Figure 44: Indonesian Aloe Vera Extract Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

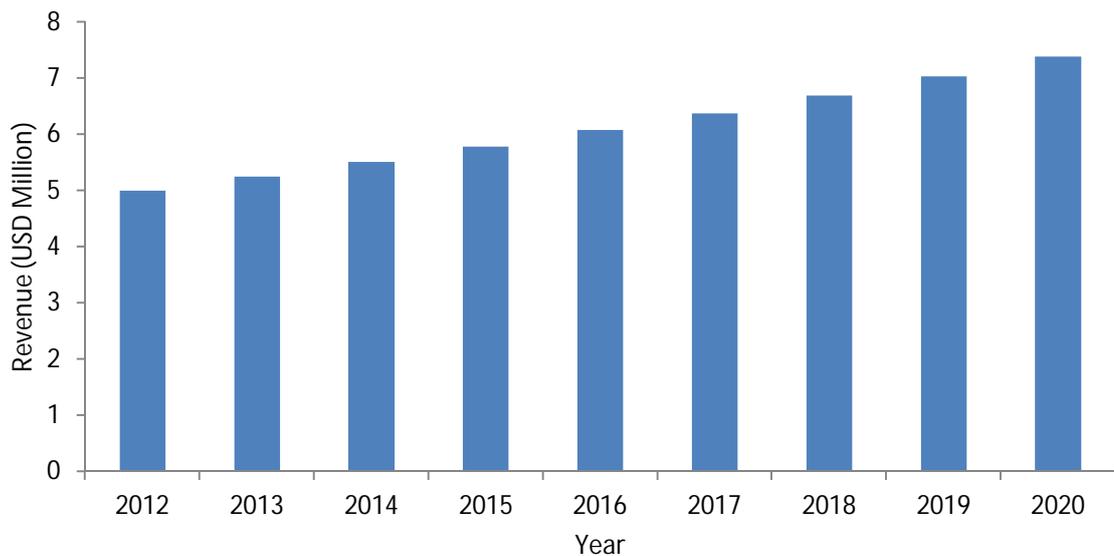
Like with all other aloe vera markets, most demand is split between cosmetics and beverages. The functional beverage sector for aloe vera extracts is a primarily local dominated sector with little to no export focus. Most aloe vera juices are sold as such and not really fortified, with local knowledge of the extract expected to drive its sales. Coca Cola's Minute Maid brand and Fanning's aloe vera juice Lidah Buaya are among the few aloe vera juices sold in the market. The lack of ingredients, such as polyphenols, carotenoids or phytosterols, in Indonesia also restricts any major fortification opportunities for aloe vera beverages.

Lactose Free Food

Market Size and Growth

The Indonesian market for lactose free foods and dairy alternatives is estimated at US\$5.5 million in 2014, and is forecast to increase at 5% CAGR until 2020.

Figure 45: Indonesian Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Food intolerance in Indonesia is driving demand for lactose free products. These products are aimed largely at the infant and toddler sector at present, due to growing digestive disturbances being caused by the inability to digest lactose. In addition, a large segment of older Indonesians are also lactose intolerant and geriatric products tend to focus on lactose alternatives to cater to this segment as well. The combined pediatric and geriatric fortified food segments is thus a profitable opportunity for lactose free products, and is expected to witness increasing competition over the forecast period .

Product Preferences

Baby milk powder will continue to dominate lactose free product demand in Indonesia. This will be more apparent as several dairy manufacturers begin to introduce lactose free options as well. The importance of milk powder to the Indonesian dairy consumer (due to difficulty in accessing fresh milk) will drive easier uptake of these lactose free foods. However, product

preferences are, for the interim, expected to be geared towards powders, beverages and meal replacement solutions, with little to no penetration into other segments.

Other Free From Foods

Free from foods in Indonesia tend to focus only of lactose free foods. Hence, the broader free from foods in Indonesia are not a viable commercial market at present.

Japan

Overview of the Functional Food Market

Japan is the world's oldest and most developed functional food market. With an ageing population, slowing economy and increasing dependence on food imports, the Japanese have had to change the way they approach the concept of nutrition, and this has further driven demand for functional food across the nation. The strong demand for functional food will continue as the ageing population increases and the focus on improving and maintaining health and beauty continues to grow.

Japan, with its functionally aware and affluent consumers, continues to be a trend setter in the functional food industry and is an extremely sophisticated market. The total value of the Japanese nutraceutical market at end-product prices (comprising functional foods and dietary supplements) is estimated at US\$35 billion in 2014, and is growing at 3% per year. Functional foods account for the largest share of this at 63% of the total market, i.e. a market estimated at around US\$22 billion.

Key Trends in Functional Foods

Demographic trends: Japanese have the longest life expectancy globally, with women at 87 years and men at 80 years. With the population over the age of 60 predicted to rise by at least 25% in 2025, the functional food industry in Japan caters to both the ageing population as well as the working population that needs to stay healthy and combat ageing. In line with concerns over ageing, the functional food market has tended to focus on issues such as mobility, cardiovascular, digestive, and cognitive health. Lifestyle diseases, such as obesity, heart diseases and stroke, are the second leading cause of death in Japan, following cancer. Additionally, the demand for functional food is also driven by consumers' focus on preventative healthcare to improve their quality of life and avoid expensive health and medical care services. This is apparent in the growing demand for functional foods that improve general health, while actively aiding in disease prevention.

Key product trends: The Japanese focus on the idea of food as a medicine began with the first probiotic product launched in the 1930's. The concept of functional food has been legally defined by the Japanese since the 1990s and authorisation bodies were established, such as the Foods for Specific Health Uses (FOSHU) and Foods for Special Dietary Uses (FOSDU), in an aim to ensure market regulation. Initially developed to focus on alleviating malnutrition after the Second World War, functional foods in Japan have modified their goals to now include the idea of nutrition to enhance disease prevention, address ageing concerns as well as addressing beauty and youthfulness, in addition to a general focus on improved health. In 2014, the average Japanese household is estimated to spend up to 5% of its monthly income

solely on functional foods such as antioxidants, “zero-kei” (zero-type products with zero calorie, carbohydrate or fat content), or healthy indulgences, such as by mixing vegetables in desserts.

Convenience drives growth: With a highly functional food aware population, Japanese manufacturers tend to focus on providing specific education on ingredients and benefits, as opposed to generalised health claims. This has resulted in manufacturers focusing on meeting their consumers’ nutritional needs, coupled with shorter preparation times, convenient purchase options, and unique flavours and packaging. Being a highly urbanised country, the Japanese are focussed on incorporating health with convenience, which has placed significant influence on functional foods. Urban lifestyle is fast-paced and tends to be unhealthy with the popularity of Western fast-food chains.

Today, functional food products tend to be customised for convenience living (simple and quick cooking, meal replacements, and longer shelf life). This is driving increasing sales through the online channel, particularly for functional beverages. Functional food manufacturers are developing innovative foods and beverages that are appealing, tasty, convenient and nutritious. Consumers are keen on new food experiences, especially with regard to flavours and packaging. This demand is met through customising product formulations and incorporating unique tastes and textures to create a wide and novel range of delivery formats. As examples, Wakodo’s Health Care Soft Food Diet meals caters to old people who are having difficulty eating, swallowing and preparing normal food, and Kirin’s Kirin Mets Cola is a carbonated drink with dietary fibre for weight loss and xylitol gum for strong and healthy teeth.

Origin and safety: Japan has a consumer segment that places great emphasis on food safety and quality. This focus has driven a growing demand for traceability, particularly in the functional food sector, where products are expected to have a direct effect on consumer health. The growing cosmopolitisation of the Japanese palate, and increasing dependence on food imports, has further stimulated this trend, with strong interest in consuming a diverse range of high-quality food that contributes to maintaining healthy diets. This factor has driven demand for sustainable supply chains, organic raw materials and natural ingredients with credible and well-known origins, such as fortified dairy products from New Zealand and fish oil from Australia. Consumers are careful of and concerned about food safety, and most importantly willing to pay a premium for traceable products. This has driven an increasing demand for certified, approved and scientifically validated functional food products.

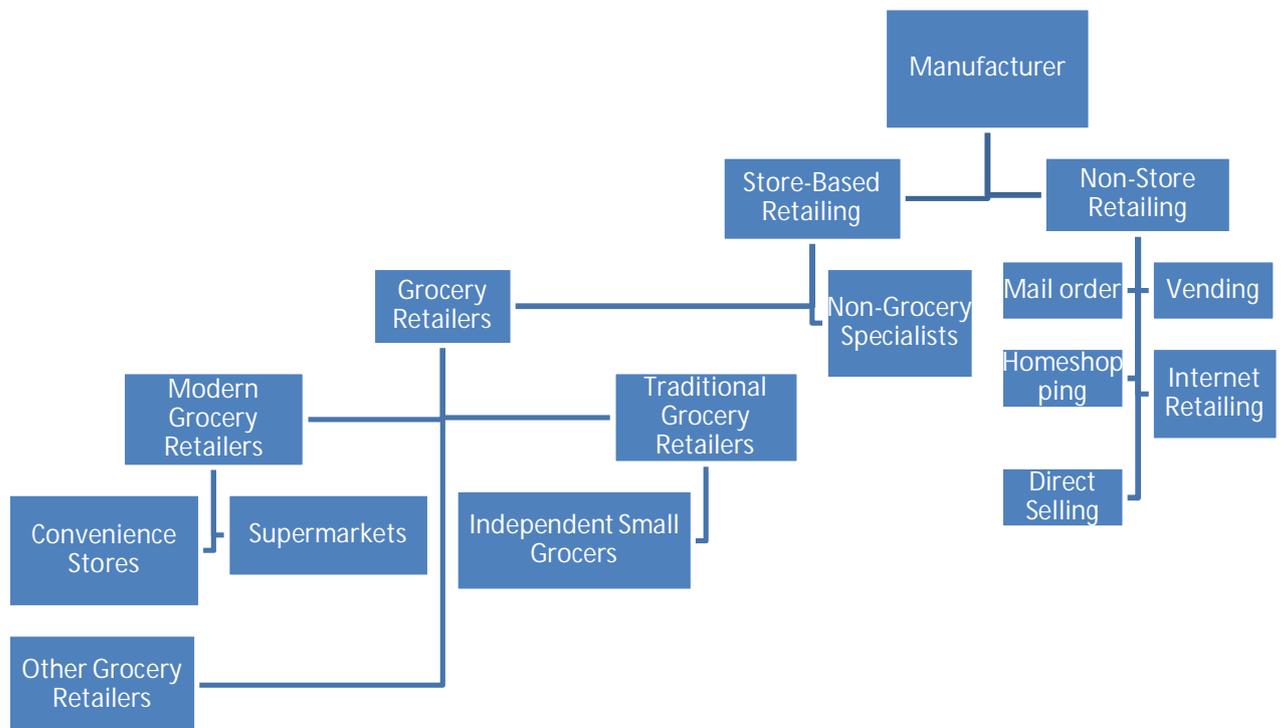
Driven by technology: The Japanese functional food market is a highly technology driven sector, with a growing emphasis on product delivery and better optimisation of ingredients to ensure yields and optimum product efficiency. For example, Japan has pioneered the development and regulation of herb extracts, plant and algae-based food, and probiotic products, such as Yakult, targeting leading diseases such as gastrointestinal, cancer and cardiovascular ailments. Japanese companies are constantly investigating and developing

new technologies, from nutrigenomics to synthetic biology to the more traditional sciences, such as biochemistry and molecular biology, to ensure that functional food delivery is at state of the art standards. For instance, a focus on condition nutrition has driven usage of diagnostic technologies such as DNA chips, biomarkers, and total gene expression profiles. An example of such a technology is Suntory's Iyemon Tokucha, which capitalises on metabolic factors that assist in the breakdown of stored body fat, rather than just preventing the absorption of additional fat, thereby providing a sustainable weight loss solution

Distribution Channels for Functional Foods

Distribution channels for functional foods are illustrated below.

Figure 46: Distribution Channels for Functional Foods



Japan is a highly competitive and saturated market for functional food and beverage manufacturers. Therefore, it is important to be able to effectively promote and distribute products to consumers. Most specialised manufacturers are large food and beverage companies with large capital investment capability. For instance, Yakult holds the largest market share of 20% of the functional food market in 2014 with its well-known pre/probiotic yoghurt drinks assisting in immunity and digestive functions, followed by other large players such as Meiji Co Ltd (12.7%) and Lotte Co Ltd (6.8%) that have wide ranges of products.

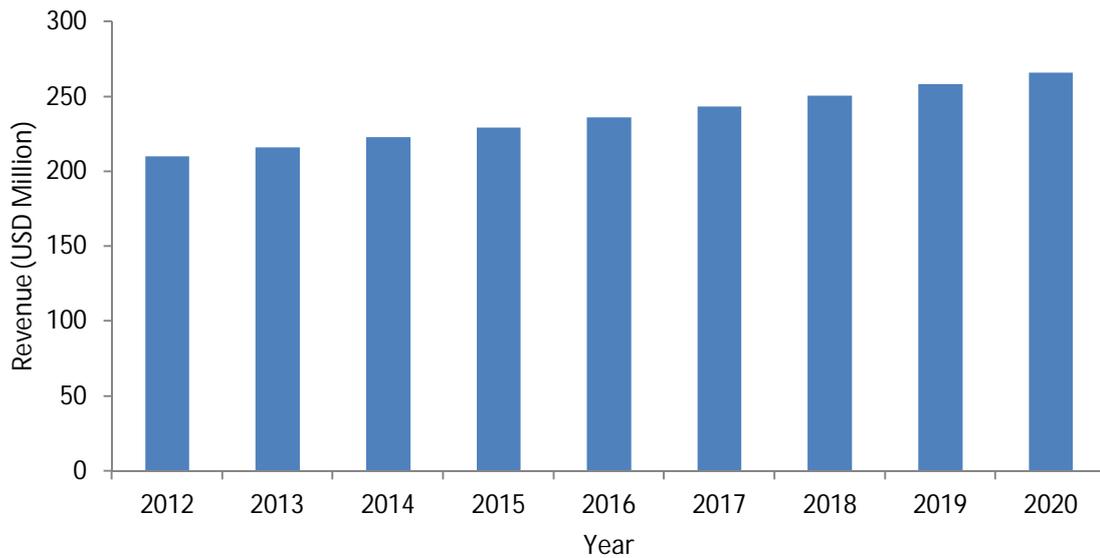
The main distribution channels for functional food are store-based retailers which account for over 80% of functional food sales. This sector is comprised of grocery retailers, which include modern grocery outlets such as convenience stores and supermarkets. RTD products are the most popular type of functional food. Well-known branded products are typically sold in store-based retailers, while lesser-known brands are often found in specialised and niche stores, such as pharmacies and traditional or health stores. Non-store retailing, which encompasses vending, home shopping, door-to-door sales, internet retailing, and direct selling, is witnessing growth as consumers opt for convenience over face to face interactions. Mail-order is gaining popularity due to its convenience and high penetration rates for older consumers. Suntory Japan is an example of a large company that follows this distribution channel.

Market Analysis of Key Product Categories

PUFA

Market Size and Growth

The Japanese omega-3 market is an established market with a highly aware consumer base. While most markets generally recognise PUFA as omega-3 ingredients, Japanese consumers are well versed in the eicosapentaenoic acid (EPA) docosahexaenoic acid (DHA) concentrations as well, indicating the extent of the awareness in this market. The PUFA functional food market in Japan competes aggressively with the more established pharmaceutical and dietary supplements sectors. However, increasing customisation of PUFA into food is driving a growing interest in these products. Fish oil accounts for the largest share of the Japanese omega-3 ingredient market. In 2014 the PUFA ingredient market in functional foods is estimated at US\$223 million, and is forecast to grow at 3% to 2020.

Figure 47: Japan PUFA Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Many Japanese are knowledgeable about the health benefits of fish, and in particular about the fact that DHA and EPA in fish oil is beneficial for their brains. Japan is traditionally a market that focused on high concentrate omega-3 ingredient variants from pharmaceutical and dietary supplements used for specific purposes. This is because the Japanese diet has a high concentration of fish, causing consumers to think that their omega-3 consumption is already over the recommended daily intake, and hence supplementation in normal foods is unnecessary.

Demand is largely focused on marine oils, and dietary supplements dominate this market resulting in major food demand being from powdered forms of PUFA as a fortification ingredient in infant nutrition and baked goods. Beverages are also growing as a key demand area, driven by an increasing focus on water soluble omega-3 formulations.

However, alternatives to fish oil are expected to witness growth as fears over mercury contamination in fish oil, higher costs and a lack of scalable production capacity drives demand for options such as flax seed based oil.

Product Preferences

Supplements are the largest PUFA product market, in Japan dominated by Suntory Wellness, whose omega-3 capsules are considered a Japanese staple. However, food manufacturers have revamped their food offerings to focus particularly on certain demographics with flavoured omega-3 variants, especially in beverages. For instance, the "Kodomo No Mikata" DHA drink from Nissui is targeted at children. It contains 167mg of DHA/EPA - almost the

same amount as the Recommended Daily Allowance (RDA) for children ages 3 to 7, which is around 150mg to 200 mg. For adults, Nissui also offers IMARK, a 100 ml bottled drink that contains 600mg of EPA and 260mg of DHA, which has FOSHU (Foods for Specified Health Use) approval for decreasing serum triglyceride levels.

Other products include "Umi no Genki" DHA+EPA fish sausages containing 850 mg DHA and 200 mg EPA per fish sausage.

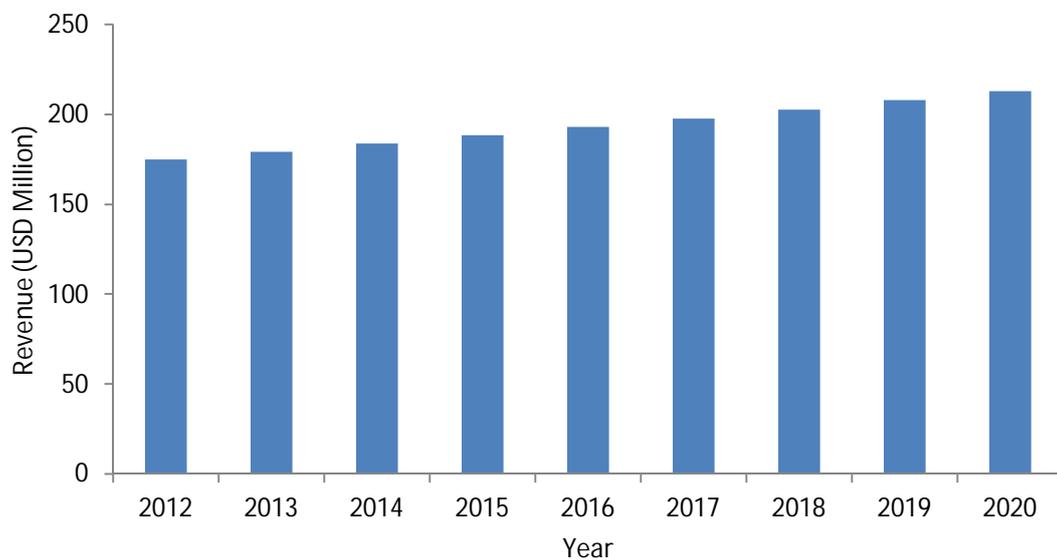
Additionally, there is growing demand for omega-3 fortified vegetable oil, cereals and other baked goods as easier formulation capability continues to drive food penetration

Proteins and Peptides

Market Size and Growth

The Japanese protein and peptides market is highly influenced by the nutrition needs of the country’s ageing population. The market for protein products is split into protein supplements and protein products. While the former accounts for over 60% of the total market by revenue, protein products are also witnessing increasing growth, driven by the growing interest in protein drinks and bars. The Japanese market for protein and peptides was estimated at US\$184 million in 2014, forecast to grow at 6% per year up to 2020.

Figure 48: Japan Protein and Peptide Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Japanese consumers are divided into a number of distinct segments for protein consumption. These are consumers focusing on weight and muscle management, ageing consumers focusing on healthy lifestyles, women consuming beauty drinks using peptides, and snack foods aimed at the children's market.

Broadening use of protein ingredients, away from just the sports nutrition sector, has helped drive growth much faster. All end use sectors where demand is being observed are driving protein food product sales, and thereby further investment into product differentiation. This is apparent by the growing influx of collagen based peptide drinks aimed at the nutricosmetic market for women in Japan. In addition, while whey protein based products focus on lean muscle building aimed at men and women, especially the growing population of Japanese mountaineers, egg protein is focused on bulk building for Japanese males, thereby driving demand from multiple avenues.

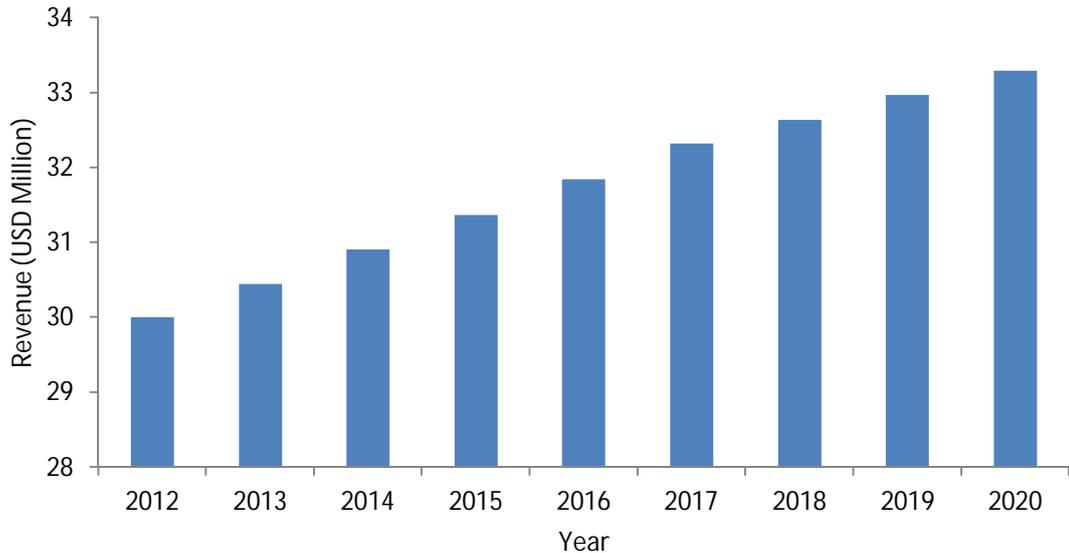
Product Preferences

While sports nutrition drives the majority of product preference in the Japanese protein ingredients sector, there is a growing demand for differentiation of these products. These include use of protein bars and RTD drinks as well as protein baked goods to drive use in the non-sports nutrition segment. Whey and soy protein tend to dominate overall protein ingredients consumed in food products. However, the beauty drink segment is also fast emerging as a key end use sector, therefore driving demand for collagen peptides in the premium category, with products such as DHC's Collagen Beauty Drinks, Shiseido's The Collagen Drink range and Suntory's Precious Collagen infused beer.

Vitamin D

Market Size and Growth

Vitamin D is a particular area of concern in Japan, taking account of its role in bone health maintenance in correlation with the ageing population. Japanese incidence of osteoporosis and bone disease among its geriatric population is one of the highest in the world, and this drives interest in vitamin D. While this demand is largely supplement based, there is a burgeoning interest in vitamin D fortified food products as well. In 2014 the Japanese market for vitamin D was valued at US\$31 million, forecast to grow at 1.2% up to 2020.

Figure 49: Japan Vitamin D Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Vitamin D consumption is expected to increase in line with a growing incidence of bone health and calcium deficiencies across the population. However, intensive competition from the supplement sector will restrict growth as consumers often prefer supplements over foods when it comes to vitamins in Japan. Products positioned for anti-ageing will continue to attract strong support from middle-aged and elderly consumers. The market for children's vitamins is also expected to expand, driven by the demand among parents for products to maintain and improve children's health.

Product Preferences

Dairy products and vitamin D fortified beverages will be the key vitamin D food products, positioned to attract mainly geriatric and pediatric consumers in Japan. Growing interest in maintaining joint health, as well as helping to absorb sunlight, will drive a focus on the need for vitamin D usage. Additionally, the usage of vitamins in the nutricosmetic sector will drive interest in these fortified products, pushing differentiation into the baked goods sector as well.

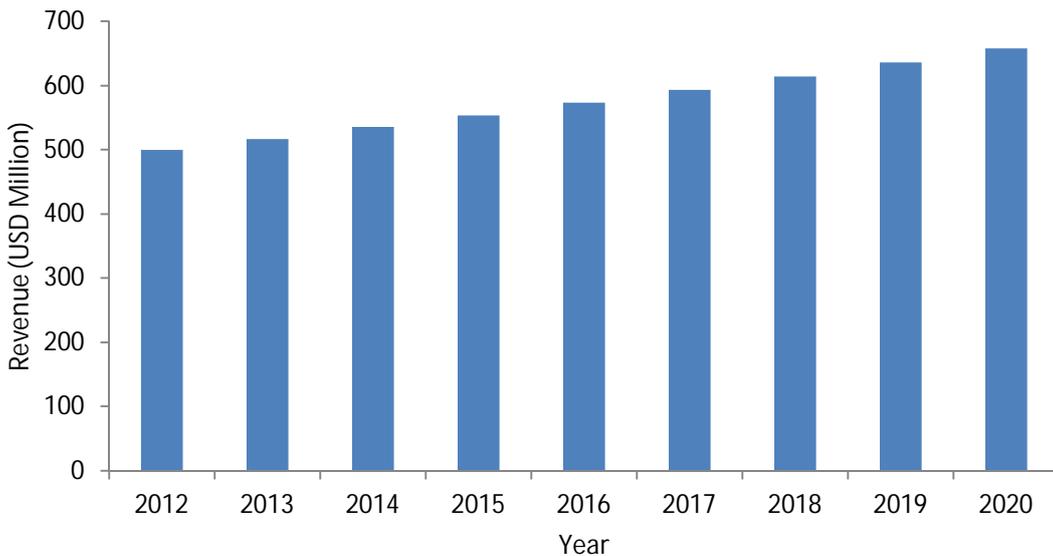
Probiotics

Market Size and Growth

In the 1930's Dr Minoru Shirota, the founder of Yakult Honsha, developed a fermented milk drink that contained a probiotic culture for intestinal health. Since then, millions in Japan have made it their daily drink. Morinaga introduced the first bifidobacterial product in Japan in 1977, fermented milk with *Bifidobacterium longum*. Yakult followed in 1978 with yoghurt containing *Bifidobacterium breve*, *Bifidobacterium bifidum*, and *Lactobacillus acidophilus*.

For several decades digestive wellbeing has been a national obsession in Japan. And the marked increase in consumer demand for functional foods in general has helped the probiotics market substantially. More westernised food consumption patterns have been coupled with an increased desire to compensate for nutritional deficiencies with balanced and healthy diets. Probiotics accounts for the largest functional ingredient market in Japan, accounting for 45% of APAC probiotic ingredient sales. In 2014 the market was estimated at US\$536 million, forecast to grow at 3.5% up to 2020.

Figure 50: Japanese Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Probiotics have moved beyond being just intestinal health ingredients to now coming with the promise of prevention of antibiotic-related diarrhoea, reducing the risk of certain cancers and heart disease, treating uro-genital infections, stimulating the immune system and producing vitamins. The growing array of benefits promised by these products, high awareness of their

benefits in Japan and an increasing number of product options are all driving demand. Additionally, Japanese food manufacturers have also provided a wide range of options to help consumption. Major manufacturers involved in probiotic foods in Japan range from locals, such as Yakult, Calpis and Morinaga, to multinationals like Coca-Cola and Nestlé.

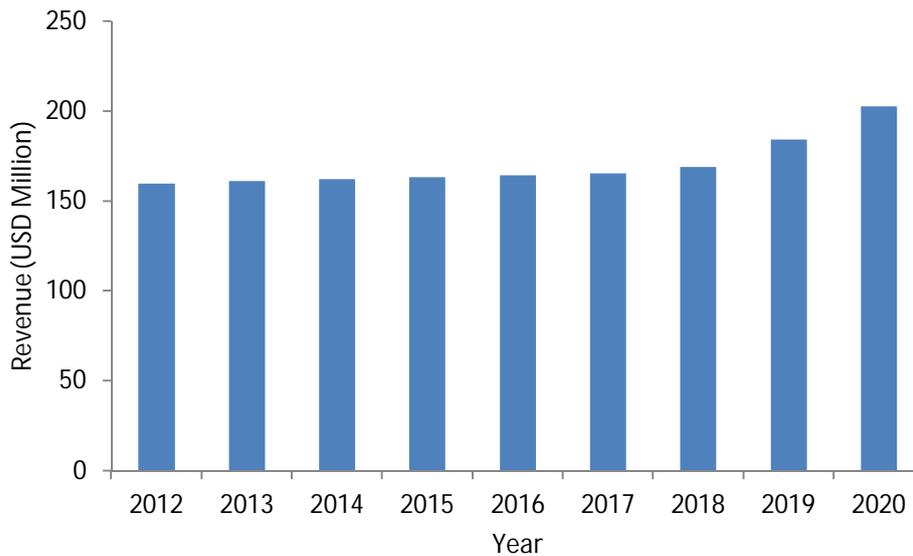
Product Preferences

Traditionally, dairy foods have proved the best delivery mechanism for the introduction of probiotics into the human body. This is because they act as a buffer in the acidic conditions of the stomach and help the useful bacteria to reach the gut alive. Today, probiotic dairy foods account for the largest segment of the Japanese nutraceutical market (which is the largest in the Asia-Pacific region and one of the most advanced in the world), with products such as Morinaga's Bifidus BB536 yoghurt Caldus Milk and Glico's Breakfast Bifix Yoghurt. Further innovations from different manufacturers have brought 'friendly' bacteria" to a whole range of products, from chewing gum to candy, yoghurt to jelly drinks. Latest entrants include probiotic ice creams, puddings, carbonated drinks, chocolates, meats and pickles containing lactobacilli and bifidobacteria.

Prebiotics

Market Size and Growth

Prebiotics in Japan emerged as a natural step post probiotic usage, to not only control healthy bacteria in the gut but to also help in fostering their growth in the first place. Today the market for prebiotics is an independent market of that of probiotics, but unlike probiotics, prebiotics is largely dominated by the consumer food industry. In 2014 the Japan prebiotics market was valued at US\$162 million, and is expected to grow at 3.7% to 2020.

Figure 51: Japan Prebiotics Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Prebiotic food ingredients supporting the growth of “friendly” bacteria in the gastrointestinal tract have been marketed in Japan for decades. Consumer awareness and acceptance of the prebiotic concept is thus one of the highest in the world, with more and more Japanese manufacturers are entering the market and helping drive both product and market proliferation. Typical prebiotic products in Japan are based on oligosaccharides; the first FOSHU approved functional food ingredients ever. In addition, established science backing these products in Japan has also helped and continues to aid in demand growth.

Product Preferences

Prebiotic oligosaccharides such as inulin and FOS dominate ingredient demand in Japan. These include several prebiotic beverages from local companies, for example, Suntory’s “Yogurina” lactic acid bacteria drink with xylo-oligosaccharide as the functional ingredient. Other prebiotic products have been launched by Meiji Seika, Morinaga etc. While prebiotic yoghurt continues to dominate Japanese sales, there is a growing demand for prebiotics in cereals, nutrition bars and the wider baked goods sector. Among ingredients, starch oligosaccharides⁷ dominate demand, while fructooligosaccharides accounts for less than 10% of the market, and are used in highly specified prebiotics products.

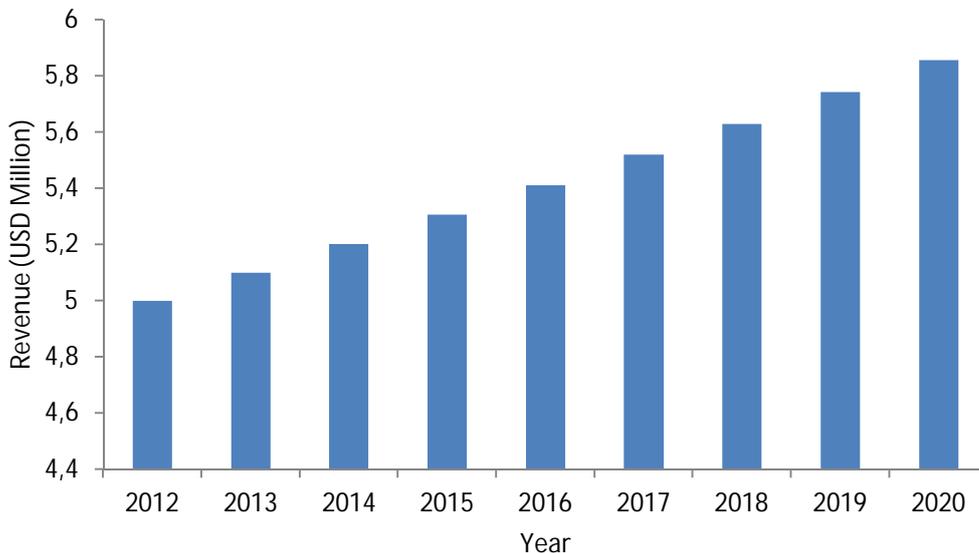
⁷ <http://pac.iupac.org/publications/pac/pdf/2002/pdf/7407x1245.pdf>

Aloe Vera

Market Size and Growth

The Japanese market for aloe vera extracts is a niche market with the main focus on aloe vera based drinks. Unlike neighbouring Korea, the Japanese aloe vera focus is largely on herbal medicine and cosmetics with a very small beverage market. In 2014, the Japanese aloe vera extract market was valued at US\$5.2 million and is forecast to grow at a CAGR of 2% to 2020.

Figure 52: Japan Aloe Vera Extract Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

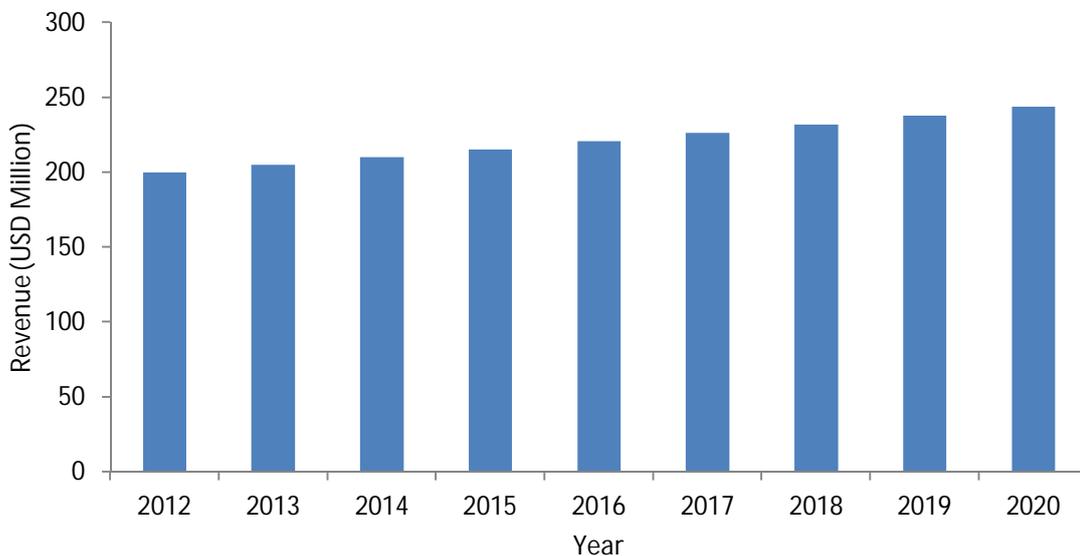
Aloe vera demand in Japan is mainly focused on the beverage sector. Almost all aloe vera extract in Japan is imported from Korea, China and India, and either used as a base for beverages or as a flavourant. There has been a growing trend towards validation of these products in Japan by providing scientific backing. Currently, studies in Japan have proved the benefits of aloe vera on the digestive system, particularly in dealing with peptic ulcers. These factors are driving demand, though from a very small base. Typical aloe vera juices available in Japan today include the Fremo brand, Ryukyu Aloe Drinks, Forever Aloe Juice etc.

Phytosterols

Market Size and Growth

The Japanese market for phytosterols is one of the largest in the world, with phytosterol consumption one of the highest per capita intakes (400-500mg/day) globally. This is largely due to the high intake of soy based foods in the Japanese diet. The Japan phytosterol market is expected to increase from US\$210 million in 2014 to US\$244 million in 2020 at a CAGR of 2%. The increasing demand for phytosterol is due to the growing concern about cardiovascular disease related deaths across the Japanese population.

Figure 53: Japan Phytosterol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Phytosterol demand in Japan is based on its presence in soy ingredients. The high soy consumption in Japanese diet has ensured much higher phytosterol consumption in Japan. This has been further developed by Japanese companies focused on developing soy based functional food products, ranging from soy milks to cooking oils. The growing awareness of the benefits of these ingredients has also helped move phytosterols into the more mainstream processed food sectors, and has helped drive demand. Future demand is expected to increase from processed goods as opposed to traditional options such as miso (fermented soy bean) pastes.

Product Preferences

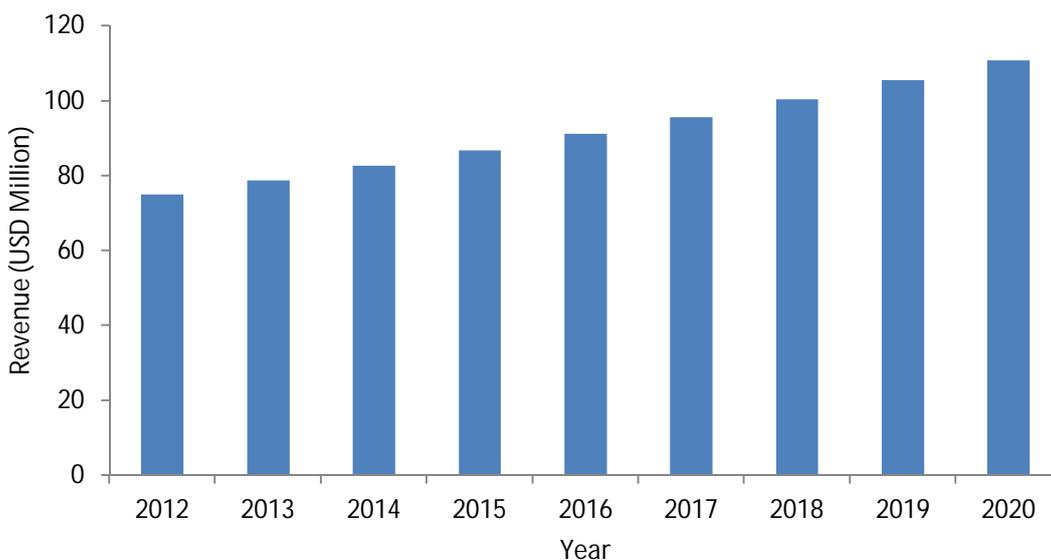
Phytosterol ingredients have found applications in an increasingly wide range of products across Japan. Current product preferences range from phytosterols in yellow fat spreads (margarines), fermented milk-type products, soy drinks, low-fat cheese-type products, yoghurt-type products, spicy sauces and salad dressings. In addition, Japanese firm the Kao Corporation has introduced cooking oil made from soybeans and canola that has been processed to include higher concentrations of the naturally occurring component called diacylglycerol (DAG) — at 80%. (A majority of the DAG, 70%, appears in the (1,3) form, which, studies show, is less likely to be stored as body fat.) Kao then blended this oil with four per cent plant sterols, sold under the Econa brand, which is currently on the market in Japan. The entry into fortified oils will emerge as a key growth opportunity to drive consumer product acceptance over the forecast period.

Carotenoids

Market Size and Growth

While the US and EU dominate the global carotenoid market, Japan is one of the key Asian countries witnessing a growing interest in these ingredients along with China, India and Malaysia. With a large focus on antioxidants in the Japanese consumer segment, carotenoids have benefitted from their known antioxidant effects to become a popular ingredient in Japanese functional food products. The Japanese market for carotenoids was estimated at US\$4 million in 2014, forecast to grow at 7% CAGR to US\$6 million in 2020.

Figure 54: Japan Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The carotenoid market in Japan is largely dominated by beta-carotene, for its usage both as a health ingredient as well as a natural food colour. Lycopene is another major ingredient that has been approved for use in Japan, driving increasing incorporation into functional foods for these products. Growing awareness of carotenoid benefits and its usage in functional foods as an antioxidant is driving increasing interest across the country, and encouraging manufacturers to not only incorporate them in functional foods but also to co-brand these products.

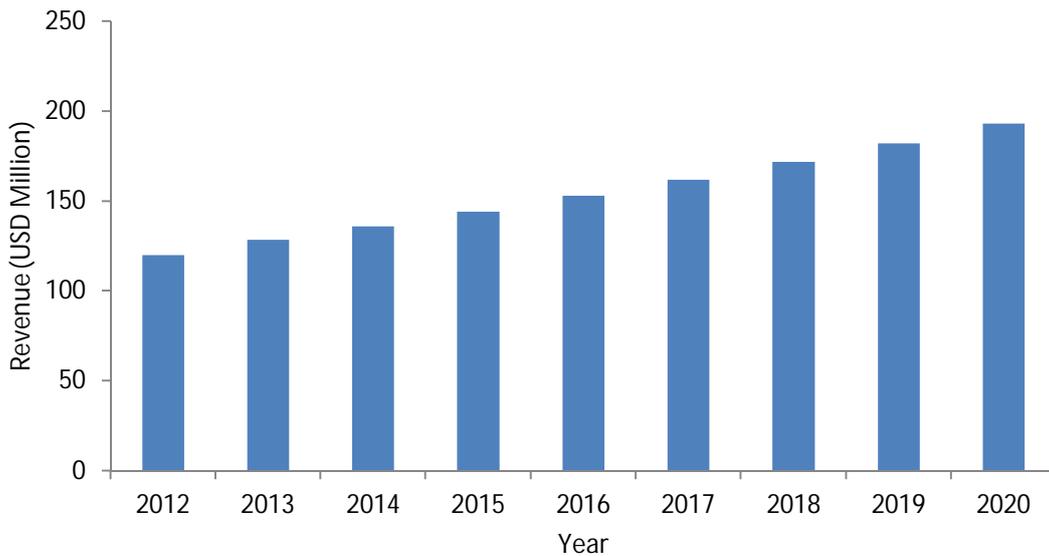
Product Preferences

Beverages are the primary end use sector for carotenoids, though they are also used in several newer end use markets such as instant noodles and baked goods, driven by increasing formulation ability and scientific research. While beverages continue to dominate, options such as Otsuka Pharmaceutical's Energen range and newer segments, such as Slim up Tomato Lycopene soups from New Japan Functional Foods, are continuing to emerge.

Polyphenols

Market Size and Growth

The ageing Japanese population has driven a buoyant market for anti-ageing ingredients. Leading this market is polyphenols, which are the largest class of natural antioxidants ingredients used in Japan. The market for polyphenol ingredients in Japan in 2014 was estimated at US\$136 million and is expected to increase at 6% CAGR to 2020 to US\$193 million.

Figure 55: Japan Polyphenol Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Antioxidant-rich foods are popular and consumed on a large scale by Japanese consumers in a bid to preserve optimal health. Polyphenols in Japan are a key ingredient aimed at combating the effects of ageing, and are consumed in large quantities from fruits, vegetables and extracts such as coffee and tea. These options are wide and varied in the Japanese market, especially from green tea. Tea polyphenols are a growing global market, and Japan tends to lead with RTD tea drinks such as Ayataka being the first ever billion dollar drink brand to emerge for Coca Cola out of Japan. Such a focus on polyphenols will continue to drive demand for these products across Japan.

Product Preferences

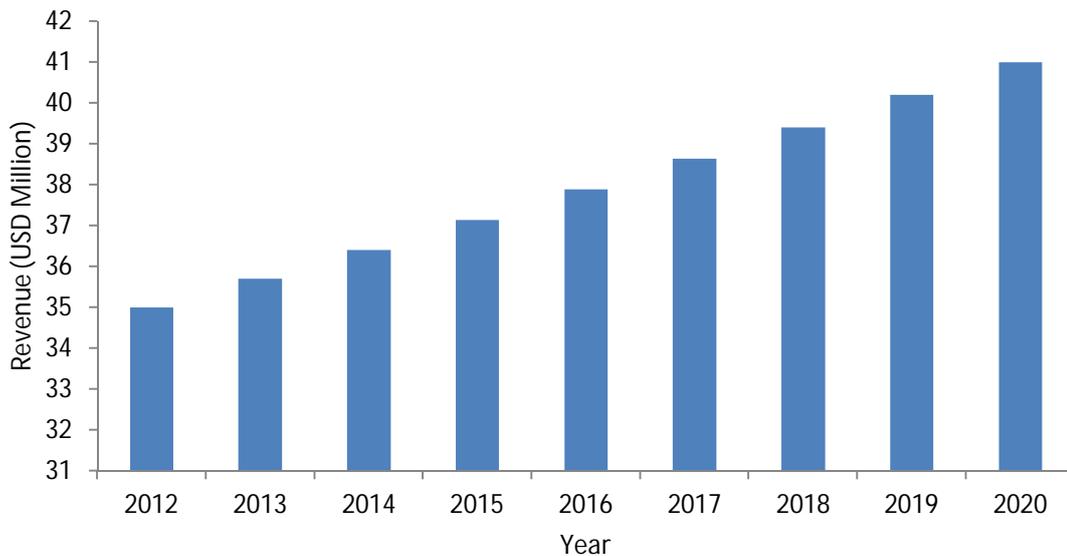
Polyphenol antioxidants are mainly sourced from produce such as most legumes, fruits such as apples, blackberries, blueberries, cantaloupe, cherries, cranberries, grapes, pears, plums, raspberries and strawberries, and vegetables such as broccoli, cabbage, celery, onion and parsley etc. Processed foods, such as red wine, chocolate, green tea, coffee, olive oil, fruit and plant-derived beverages, and many grains and pulses, are also good sources. In Japan, polyphenol based functional food is preferred mainly in the beverage format. However, within beverages they can be obtained as Asian specialty drinks, hot drinks (tea and coffee), RTD drinks and fruit juices. Common polyphenol based drinks include Ocean Spray cranberry juice, Kagome's range of vegetable life juices, Mizkan's blueberry and vinegar drinks etc.

Gluten Free Food

Market Size and Growth

The demand for gluten free foods in Japan is still an extremely niche one. The market for gluten free foods in Japan in 2014 is estimated at US\$36 million and is expected to grow at 2% to US\$41 million in 2020.

Figure 56: Japan Gluten Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Almost all gluten free produce in Japan is imported, and most products are sold mainly via online stores due to the limited demand. Countries such as USA, Canada and the EU are major exporters of gluten free products such as non-gluten soy sauce to Japan. The market for gluten free products is largely driven by expats who are more likely to want to consume foods normally containing gluten, and is thus a premium product that is stocked at specialty stores. However, growing focus on eating gluten free food, not only for coeliac disease but also as a health trend, is driving a focus on bringing these products into the mainstream.

Product Preferences

Gluten free food in Japan is mainly imports of pastas and baked goods. In the production of soy sauce wheat is used and therefore it contains gluten. However gluten-free soy sauce is available from companies such as Kikkoman. San-J also produces a range of gluten free

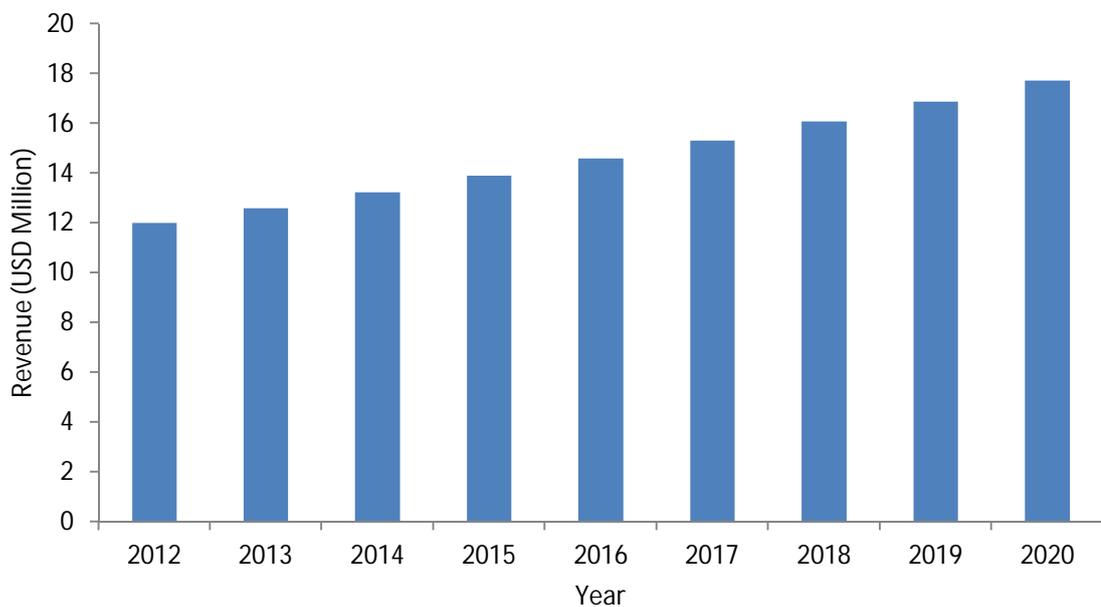
Tamari (soy sauce substitute) and dressings that can be purchased for people with gluten free diets. However, as awareness increases there will be a continued focus on more gluten free foods.

Lactose Free Food

Market Size and Growth

The Japan market for lactose free foods and dairy alternatives is estimated at US\$13 million in 2014, forecast to grow at 5% CAGR until 2020.

Figure 57: Japan Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Lactose free foods are witnessing growing interest in the baby milk powder market, which accounts for 90-94% of value sales of lactose free foods in Japan, and is expected to continue to drive demand

Product Preferences

As baby milk powder continues to dominate demand by value, at least for lactose free products, most innovation tends to occur in this space. Typical Japanese dairy manufacturers, such as Morinaga Dairy, now also supply lactose free alternatives. The local market is monopolised by domestic brands. Morinaga Milk Industry leads in lactose free baby milk with over 40% per cent market share due to its Morinaga MA-mi and Morinaga Non Lacto brands. Other leading brands are from Meiji and Wakodo.

Other Free From Foods

Other free from foods in Japan are mainly split between gluten and lactose free foods with a minimal market share for shrimp allergies. Hence the other free form foods market in Japan is currently a more theoretical rather than a commercial market.

Korea (South Korea)

Overview of the Functional Food Market

As Korea witnesses growing challenges with health and wellness, such as obesity and other lifestyle diseases, the market has responded by investing significantly in combating these issues and educating consumers on the benefits of healthy living. With an ageing population, rising affluence and increasing westernisation, food consumption in Korea is changing dramatically, from a traditional culture to one that is increasingly influenced by global health and wellness trends. As non-communicable disease deaths continue to burden healthcare systems in Korea, there has been a growing focus on the idea of condition nutrition and diseases that tend to affect the Korean demographic more than its other Asian neighbours. For instance, joint health diseases such as arthritis are witnessing much higher growth rates in Korea than other Asian countries, thereby driving the growth of functional foods aimed at this sector.

The total value of the Korean nutraceutical market at end-product prices (comprising functional foods and dietary supplements) is estimated at US\$2 billion in 2014, and is growing at 5-6% per year. Functional foods (end products) account for the largest share of this at 60% of the total market, i.e. a market estimated at around US\$1.2 billion.

Key Trends in Functional Foods

Demographic trends: The functional food industry in Korea tends to focus largely on the urban affluent consumer for western ingredients while driving penetration of traditional ingredients such as ginseng into the rural and older consumer segment. Functional food awareness is quite high in Korea, and this gives manufacturers a much easier access to the market due to easier consumer acceptance for products. Drivers for the functional food market in 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 disease, 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 Korea.

Key product trends: Functional foods are widely recognised in Korea due to the traditional acceptance of the idea of food as medicine. However three factors tend to drive product trends across the country.

- Nutrition for the ageing population: Korea has a significantly ageing population. By 2050 over 30% of the Korean population is expected to be over the age of 65, thereby driving huge healthcare costs and burdens on the economy as a result of age-related diseases. This factor is driving an influx of products aimed at this sector

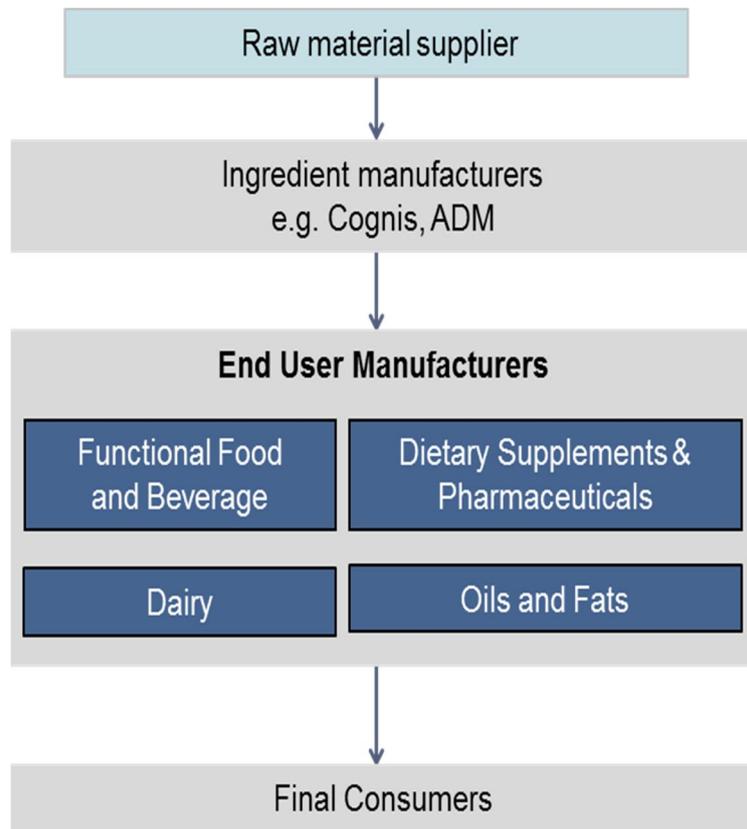
of the population as younger and younger Koreans begin to focus on healthy aging as a key focus area for functional foods. This factor was highlighted by a 2013 KCCI (Korean Chamber of Commerce) study that claimed that over 59% of surveyed Koreans consume blueberries and nuts on a daily basis for their anti-ageing properties.

- **Focus on convenience:** As Korean consumers continue to focus on healthy options, purchasing decisions are still often dictated by the demand for convenient food options. This trend towards convenience has now penetrated into the health food sector as well, driving a growing interest in new product formats and options aimed primarily at convenient consumption and longer shelf lives of functional foods. The younger, urban Koreans in particular are major end users of these products - a fact that is apparent within the Korean functional beverage market. This has driven almost all major Korean Chaebol⁸ manufacturers to invest in functional beverages, such as Micho Collagen and Innerb Eat Beauty (CJ).
- **Condition marketing and premium care options:** Koreans continue to be one of the most “beauty driven” markets in the world, with health and beauty seen as necessary companions. This thought process has driven the nutricosmetic sector within the functional foods market, and continues to assist in growing product margins as these products are most often priced at a premium. Skin care has now entered the functional food segment, and growing levels of affluence, especially among the urban workers, has driven an influx of demand for beauty focused foods. This again is apparent by the introduction of such premium functional food options by almost all major food manufacturers and a growing import market for international options. For instance, food manufacturer Samyang Group introduced a functional drink called BDIab Skini designed to help people lose weight and detoxify, only to be quickly followed by another manufacturer Pulmuone launching a breakfast drink - She Love Pomegranate & Cherry – which targets young female professionals focused on its antioxidant benefits. All these products will continue to drive functional foods as a premium product segment, and especially into the idea of products aimed at a particular condition, further spurring the trend towards condition nutrition.

Distribution Channels for Functional Foods

Distribution channels for functional foods in Korea are illustrated below.

⁸ Chaebols are large domestic conglomerates in Korea

Figure 58: Distribution Channels for Functional Foods in Korea

The Korean distribution channel for functional foods is largely controlled by the functional food manufacturers. These manufacturers typically include the large food and beverage family run companies that form part of Korea's Chaebols, including companies like CJ Corporation, Samyang, Hyundai, etc. These companies, due to their integrated value chains and large capital capabilities, tend to have high bargaining powers across the value chain. Ingredient manufacturers source raw materials either locally or import them. However, there is an increasing trend towards importing ingredients, due to Korea's lack of raw material capability, especially in primary produce. Often ingredient manufacturers utilise contract manufacturers or designated blenders and formulators to help develop ingredients into a food ready format, which is then supplied to the food manufacturer. The final products are sold either to distributors or to retailers. Typical retail distribution channels are grocery stores and supermarkets where functional foods are in most demand.

Market Analysis of Key Product Categories

PUFA

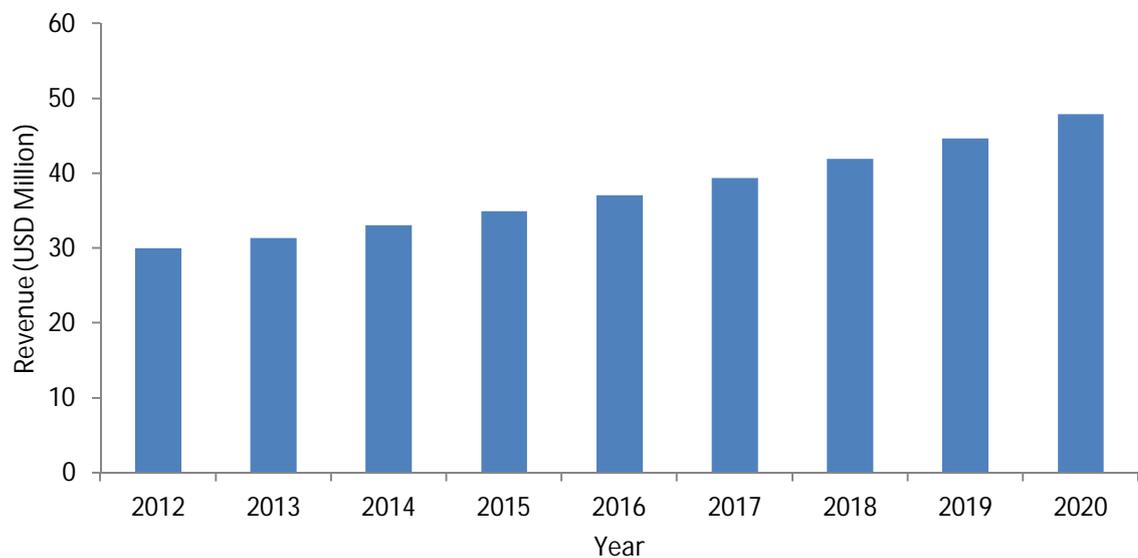
Market Size and Growth

The Korean omega-3 market is a burgeoning market with growing consumer demand. PUFA is the fifth largest health ingredient market in Korea. The PUFA market in Korea competes

aggressively with more well established nutraceutical products such as Red ginseng and local medicine. However, with growing awareness Korea has emerged as a key growth market due to rising consumer demand. Over 88% of the oil used in Korea is fish oil based, and a large portion of this is dominated by concentrate production. The use of local ingredients has ensured a small but growing market for plant based omega-3, though it is unlikely that it will match fish oil. Pharmaceutical manufacturers who control the dietary supplement chain tend to command most of the sales of PUFA as used in concentrate production.

In 2014 the PUFA ingredient market in functional foods is estimated at US\$33 million and is forecast to grow at 6.3% to 2020.

Figure 59: Korean PUFA Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The Korean market is also characterised by a large high concentrate omega-3 demand, though demand is increasingly focused at end product imported consumer goods rather than Korean processed oils.

Demand is largely focused around marine oils, and dietary supplements tend to dominate this market resulting in major food demand being from the powdered form as a fortification ingredient in infant nutrition and baked goods

Algal oil demand is expected to go up, though current usage is minimal mainly due to a lack of vegetarian based demand, high awareness of fish oil, higher cost as compared to fish oil, lack of scalable production capacity and similar fears over algal contamination with mercury and heavy metals to fish oils.

Koreans in general prefer to import PUFA based products directly as opposed to those processed in Korea. Consumers tend to be highly focused on source of PUFA, for instance Scandinavian suppliers are often preferred to those from the USA due to perceptions of better quality.

Product Preferences

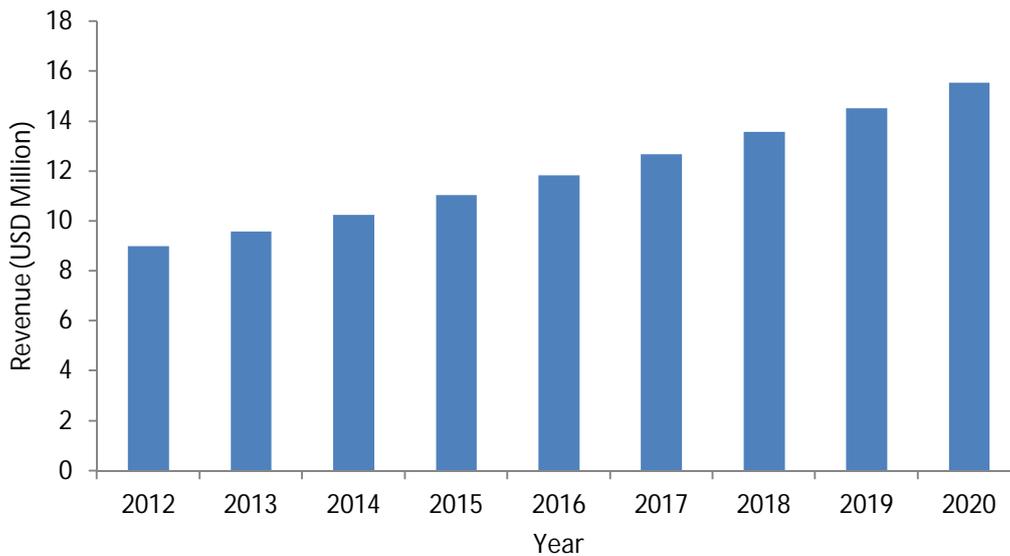
Supplements are the largest PUFA product markets in Korea, though a growing interest in functional drinks is now driving increasing introduction of omega-3 fortified drinks into the market. These include drinks from manufacturers such as CJ Corporation, Pulmuone Co Ltd, and Daesang Co Ltd.

There is a growing demand for omega-3 fortified vegetable oil, cereals and other baked goods, though at present the dominance of the supplement market restricts any major investment into the food sector.

Proteins and Peptides

Market Size and Growth

The Korean market for proteins and peptides is largely focused on traditional foods as a high source of soy protein which forms the cornerstone of the protein market in the country. Other protein sources, such as milk and eggs, are also growing in popularity. However, in terms of functional foods, whey protein dominates due to its popularity in the sports nutrition sector and is witnessing continued growth rates, driven by a healthy living trend especially among men. The Korean market for protein and peptides was estimated at US\$10 million in 2014, forecast to grow at 7.2% per year up to 2020.

Figure 60: Korean Protein and Peptide Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Soy based foods act as the major protein functional food market in Korea. Soy milks have continued to witness a growing consumer uptake, especially among the younger generation, focused on its health and wellness aspects as well as its traditional perception of being a healthy protein source. The trend towards fitness and lean bodies among Korean celebrities has driven demand for whey protein products, particularly in the functional milkshake and protein bar segments. Many local manufacturers, such as Boryung Pharmaceutical Co Ltd and Sang-A Pharmaceutical Co Ltd, dominate the whey protein sector with their sports nutrition powders. The high concentration of meat and soy in local Korean cuisine, however, tends to restrict the overall protein and peptides market and causes it to remain a niche, driven largely by the demand of its end use sectors, such as sports nutrition.

Product Preferences

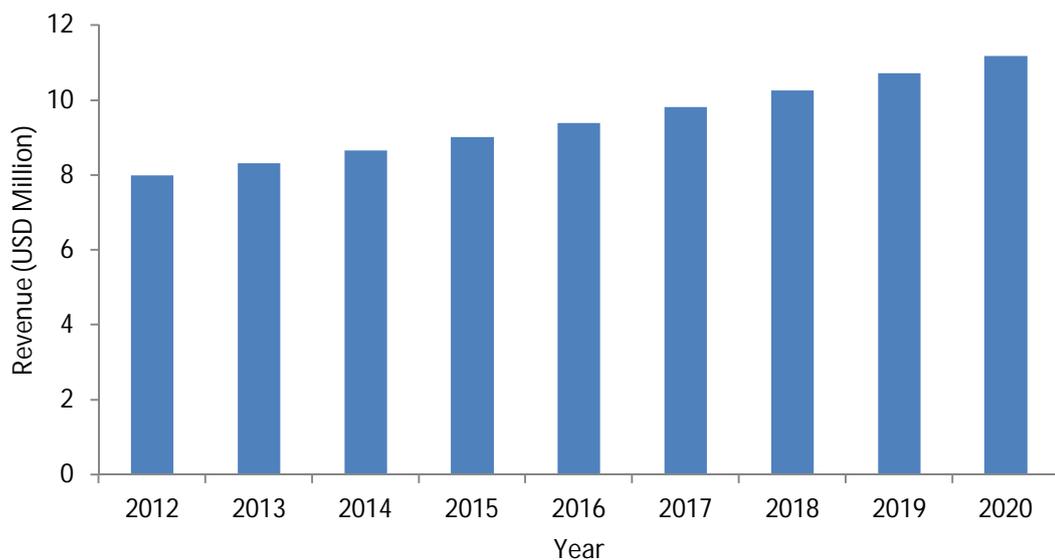
With growing investment in the fitness industry, sports nutrition is emerging as a key end use area for the protein ingredient industry. Korean males are often focused on remaining lean with a focus on fitness, and this is driving sports nutrition interests as well as weight management products amongst women. Protein enhanced beverages and cereals are the primary products used by consumers, and both tend to cater to the young urban consumer. Children's nutrition is focused on fortified milk protein infant formula, and this is a growing sector for imported products claiming both protein and other ingredient benefits.

Vitamin D

Market Size and Growth

Vitamin D is a well-known ingredient in the bone health sector. The Korea National Health and Nutrition Examination Survey IV 2008 showed that the prevalence of vitamin D insufficiency, defined as a serum 25-hydroxyvitamin D [25(OH)D] level below 50 nmol/L, was 47% in males and 65% in females. The study also found that vitamin D deficiency in Korea, surprisingly, is witnessed in higher levels amongst younger people as opposed to the older generation, due to longer work hours resulting in much reduced exposure to the sun. This has driven an increased interest in vitamin D fortification, particularly in food and beverages. In 2014 the Korean market for vitamin D was valued at US\$9 million, forecast to grow at 4% up to 2020.

Figure 61: Korean Vitamin D Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Lack of vitamin D has just been raised as a key health issue by the Korean Government. The market at present is a niche area with most demand arising from vitamin water and multivitamin products, as opposed to demand for any actual individual vitamin. However, growing awareness of the need for better vitamin D fortification will drive market growth and interest over the forecast period, though the market is likely to remain a commoditised product as opposed to witnessing any real premium potential.

Product Preferences

Dairy products are currently the main vitamin D product options in Korea, with several dairy products mentioning the added vitamin D potential in the product. There are also soy milk products that are fortified with vitamin D, such as Dr. Chung’s Food CO., Ltd’s Vegemil A and Maeil’s Soybean Milk range. Women’s health beverages focus on vitamin D’s ability to keep osteoporosis at bay as a key purchasing driver. However, beyond the dairy sector the vitamin water sector is witnessing growing interest, though at present from a very small base for the product.

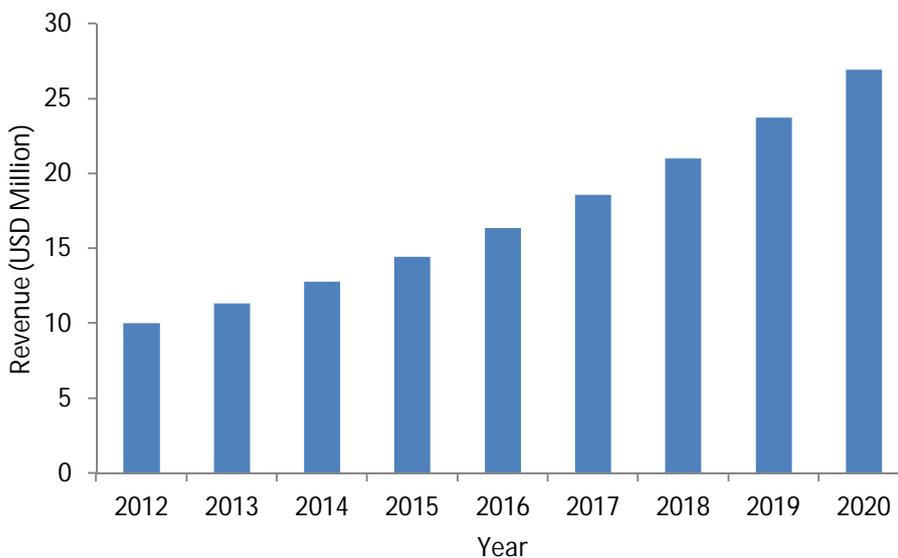
Probiotics

Market Size and Growth

The Korean probiotic market is in its growth stage and is expected to grow to US\$27 million in 2020. Within Asia-Pacific, Japan and Korea have the largest markets for probiotics.

Additionally, with an ageing population and growing incidence of dietary disorders, the demand for probiotics is surging. Probiotic growth is driven by the “convenience” factor and the increase in consumer awareness about the health benefits of probiotics. Hence there is strong demand for probiotic products that are quick, easy and healthy. In 2014 the market was estimated at US\$13 million, forecast to grow at 13% up to 2020.

Figure 62: Korean Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The Korean market for probiotics is largely dominated by demand for yoghurt. While several of these products are imported, one local manufacturer has managed to carve a niche in the industry both domestically and globally. Cellbiotech is the largest manufacturer in the Korean probiotics market. Its revenue has increased at a CAGR of 15%. About 80% of its revenues are from probiotics sales, and it continues to invest 10% of its revenue in R&D. Cellbiotech supplies its probiotics globally, and Amway also sells the products under the name of Duolac in 30 countries. In Korea, probiotics are marketed not only for digestive health but also focused on irritable bowel syndrome (IBS), leaky gut syndrome (LGS), inflammatory bowel disease (IBD), atopic dermatitis, acne, and osteoporosis.

The media also drives probiotic product awareness, for instance VSL#3, developed by VSL PHARMA and manufactured by Danisco in the USA, has witnessed growing popularity in Korea, particularly after being featured on Korean TV programs. In addition, it has been recognised for its reliability and functionality from the Korean Ministry of Food and Drug Safety (MFDS), and is the only probiotic that MFDS has confirmed, further driving its premium product demand.

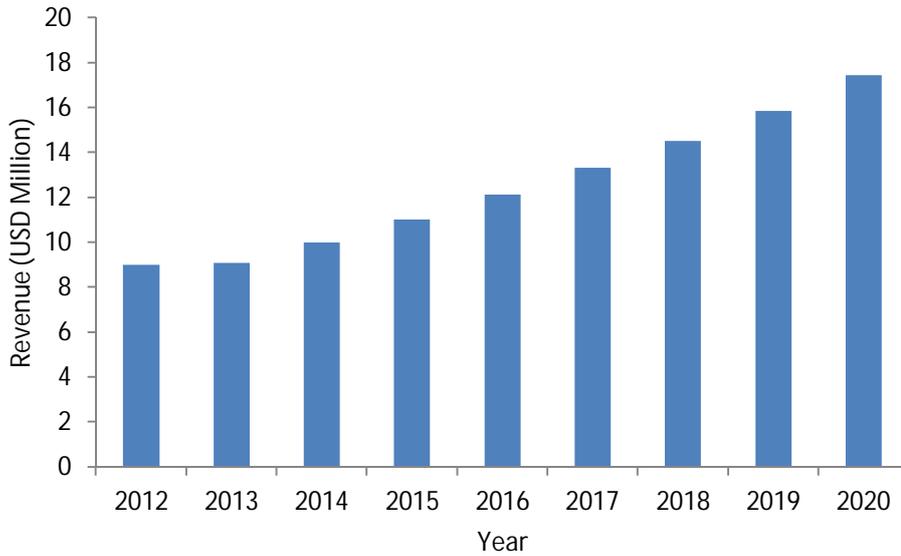
Product Preferences

Dairy products dominate food probiotic usage in Korea, aside from probiotic supplements which claim the majority of the revenue. Yoghurt consumption remains the key end use sector, and drives increasing entry of both local and international dairy companies. There is a growing interest in other probiotic formats, such as functional beverages, though at present these are niche markets as most players tend to focus on the supplement area, including Chr. Hansen which was the first to obtain a probiotic health claim in Korea.

Prebiotics

Market Size and Growth

Prebiotic usage in Korea, like probiotics, is a market largely dominated by supplement usage due to a growing interest particularly for the use of prebiotics as digestive health ingredients. Prebiotics are gaining increased popularity in Korea amongst baked goods and other processed foods, though it has traditionally struggled as Koreans find that their fermented side dishes, such as kimchi, are rich in fibre and hence such added fortification in their diet is not needed. However, a growing influx of westernised prebiotic products has driven growth. In 2014 the Korean prebiotic market was evaluated at US\$10 million, forecast to grow at 9% up to 2020.

Figure 63: Korean Prebiotics Market Revenue, 2012-2020

Source:

Frost & Sullivan

Demand Trends

Korea has approved health claims for prebiotics, however the market has remained largely underpenetrated due to a lack of local FMCG options and overall awareness. This factor is fast changing as prebiotic ingredient based products appear on Korean supermarket shelves. At present, in spite of local FOS and GOS production, most prebiotic products are imported as finished products into the market.

Product Preferences

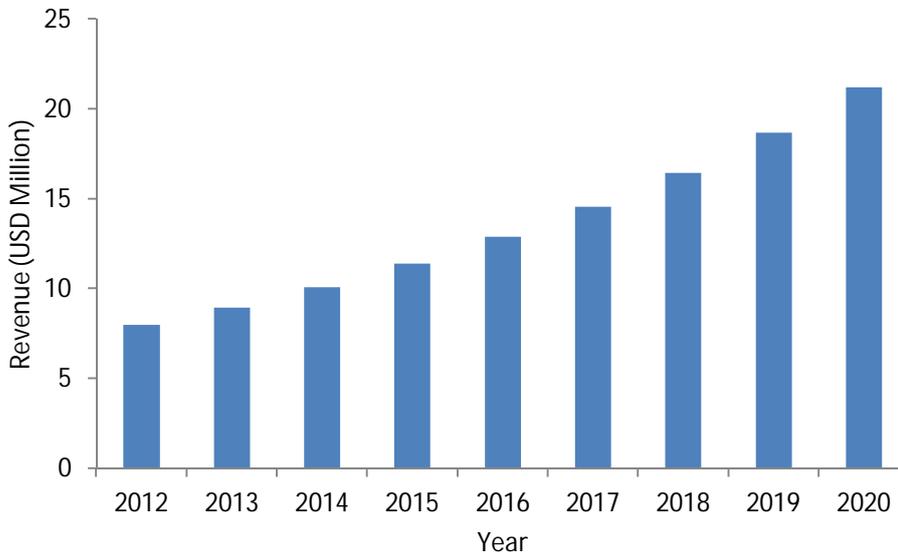
The largest market for prebiotic ingredients in Korea has traditionally been cereals, and increasingly digestive biscuits. However, growing awareness of the benefits of prebiotics is expected to drive demand for these ingredients into other products, such as cereal bars, ice creams and beverages. However, penetration will remain low unless several awareness campaigns with regards to end product and ease of consumption are pushed ahead.

Aloe Vera**Market Size and Growth**

The Korean market for aloe vera extracts is a high growth market with a large focus on aloe vera based drinks. The market is increasingly witnessing growing demand, both locally and in the export sector, thereby allowing for a revamping of local production catering to increasing

export demand particularly from China. Korea’s demand for aloe vera extract currently stands at US\$ 8million, forecast to grow at a CAGR of 13% to US\$21 million in 2020.

Figure 64: Korean Aloe Vera Extract Market Revenue, 2012-2020



Source:

Frost & Sullivan

Demand Trends

Aloe vera demand in Korea is in the beverage sector. Korea has several local players who tend to dominate the market and provide consumers with a wide array of aloe vera drink options. In spite of having no certified health benefits, aloe vera juices have continued to witness growing demand across the country. This is evident by the increasing international footprint of local aloe vera producers such as Namyang Aloe (accounts for 40% of the world’s aloe raw materials, also owns companies in the US), OKF Corp, Keumkang B&F, Lotte Chilsung and Tulip International, all of whom are rated among the top ten fast growth aloe vera drink manufacturers in the world.

Product Preferences

Beverage usage is expected to continue to drive demand in South Korea for aloe vera products. Dairy products flavoured with aloe vera extract are an emerging market, however the primary focus remains on methods of increasing existing aloe vera beverage portfolios to cater to the changing demands for convenience and health in the Korean functional beverage market.

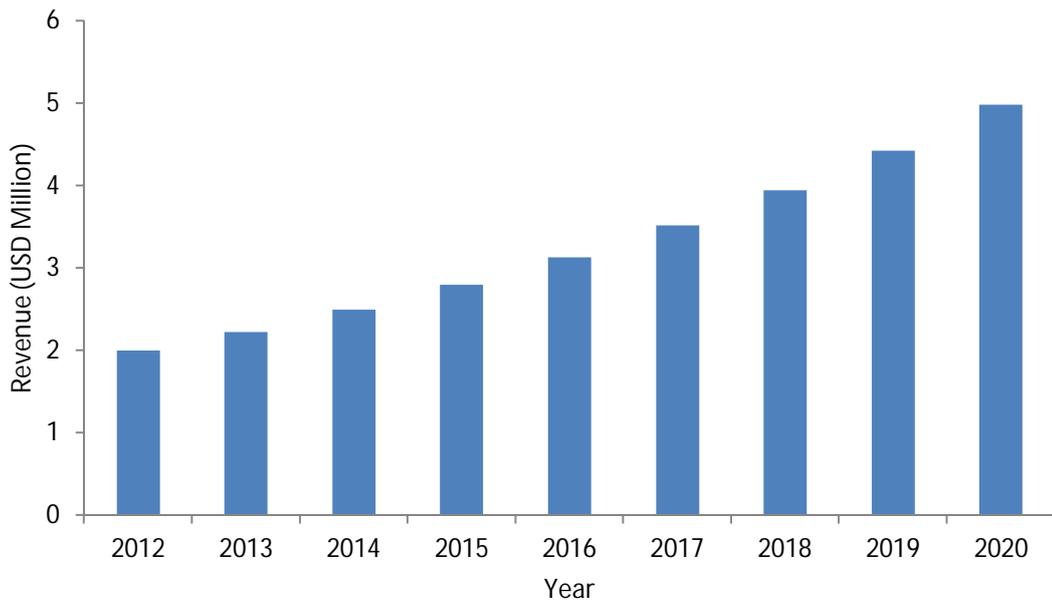
Phytosterols

Market Size and Growth

The Korean market for phytosterols is small, with very limited usage at present. The South Korean phytosterol market is expected to increase from US\$5.4 million in 2014 to US\$9.5 million in 2020, at a CAGR of 9.8%. The increasing demand for phytosterols is likely to be due to the increase in cardiovascular related diseases in Korea and fears over rising obesity levels.

Eugene Science, a Korean biotech company, along with ADM, has developed and patented a manufacturing technique that allows phytosterols to be added to foods that have high-fat content, such as ice-cream, mayonnaise, cheese spreads and soups. This incorporation of phytosterols into a wider array of foods is expected to drive growth.

Figure 65: Korean Phytosterol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Phytosterol demand in Korea, as elsewhere in APAC, is largely driven by the heart health sector. Increasing consumer awareness of the benefits of sterols in maintaining blood pressure, cholesterol reduction and positively impacting heart health has driven interest in processed foods claiming sterol fortified heart health benefits, such as functional beverages, fortified spreads and baked goods. These factors are driving increasing consumer awareness

of the benefits of sterols and allowing penetration into other end uses, though from a very small base.

Product Preferences

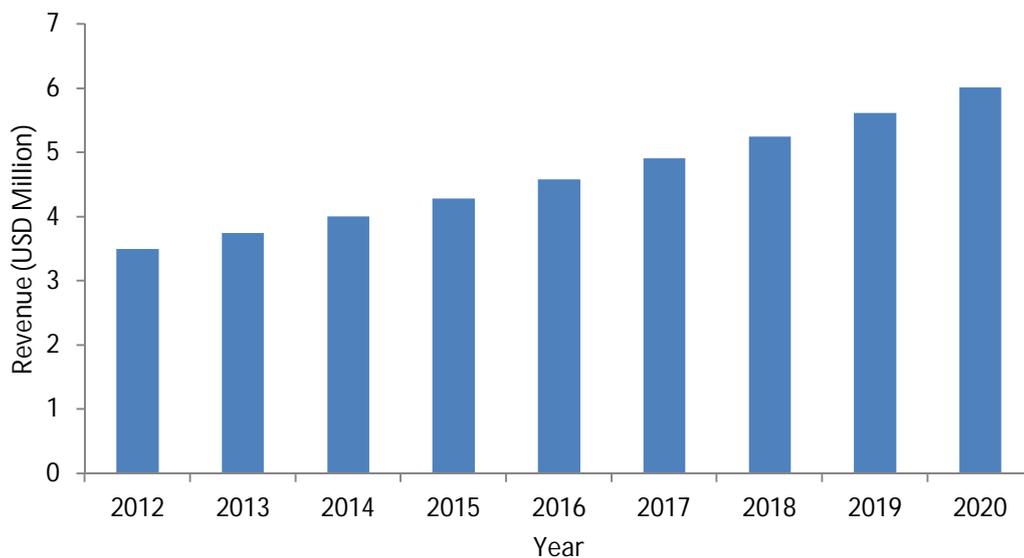
Phytosterol applications in Korea are mainly in functional drinks, such as Ucole, which consists of unesterified plant stanols. Other popular products include international imports, such as cereal bars, dairy spreads, margarines and baked goods. Imports tend to dominate this market, though local players are increasingly looking at the functional heart healthy beverage market as an entry point.

Carotenoids

Market Size and Growth

The Korean market for carotenoids is a subset of the antioxidant market and is a niche segment, being driven by a nutricosmetic aware population worried about free radical effects on the skin and demand for healthier food options. Beverages with beta-carotene are a major area within this segment and are helping drive penetration in the food industry. The Korean market for carotenoids was estimated at US\$4 million in 2014, forecast to grow at 7% CAGR to US\$6 million in 2020.

Figure 66: Korean Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The market for carotenoids in Korea is split between beta-carotene, lutein, lycopene, asthaxanthin and zeaxanthin. Beta-carotene forms the largest segment, at over 50% of the food carotenoid market, used mainly in beverages. Both lutein and lycopene are witnessing increasing growth from small bases in Korea. Lutein is used for its eye health benefits and lycopene for its usage in protecting against prostate cancer. Key companies involved locally are Yuhan Co. Ltd., Korea Arlico Pharm. Co. Ltd, Jeju Buckwheat Farmers Association Corp, HJ Corporation, K.Y.C., Hammi Medicare and Nutribiotech Co. Ltd, D-BIO, Do Be Ind Co and Regen Medicos Co.Ltd, and MEDIANS Co.Ltd, who manufacture supplements but also provide ingredients to end use manufacturers for use in processed foods.

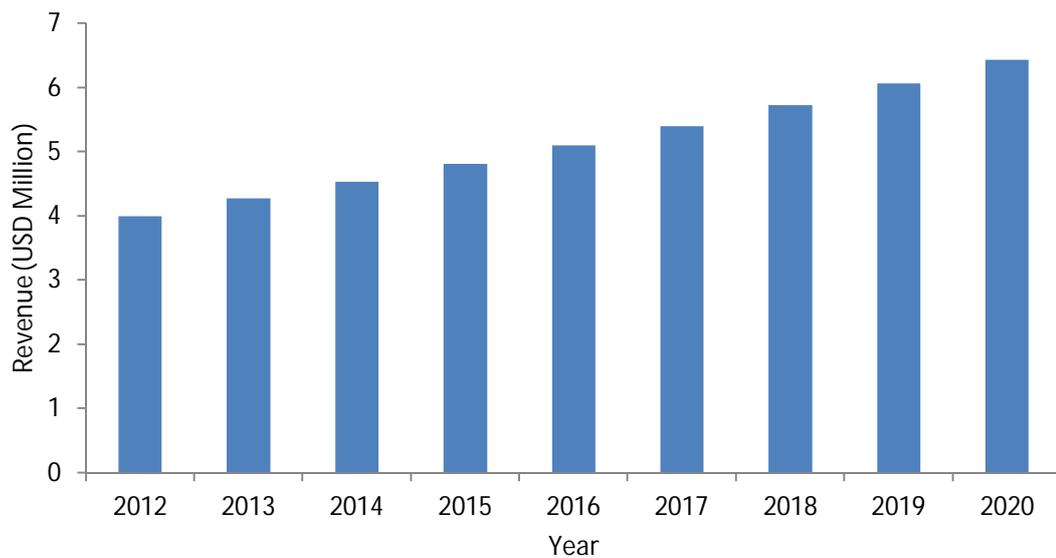
Product Preferences

Beverages dominate usage of carotenoids in functional food in Korea. While manufacturers of dietary supplements aim to provide ingredients to functional food manufacturers, there will be increasing efforts to increase the end use product sector. However, continued growth is expected to come mainly from the beverage sector over the forecast period.

Polyphenols

Market Size and Growth

Korea has a niche polyphenol ingredient market, focusing mainly on usage of the products as flavourants and antioxidants in the beverage segment. The main polyphenols used in Korea are green tea polyphenols and resveratrol. The market for polyphenol ingredients in Korea in 2014 was estimated at US\$4.5 million, forecast to grow at 6% CAGR to US\$6.5 million by 2020.

Figure 67: Korean Polyphenol Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

While green tea polyphenols are the most used polyphenols in Korea, this is still a small market due to the relative high consumption of green tea in the natural diet. In addition, the frequent appearance of seaweed also contributes to polyphenol intake, resulting in a smaller demand for any extra fortification for these ingredients. Resveratrol is witnessing growing interest driven by awareness of its benefits in diabetes, cardiovascular health, and cancers, which will allow it to expand its applications in the future thereby, increasing demand.

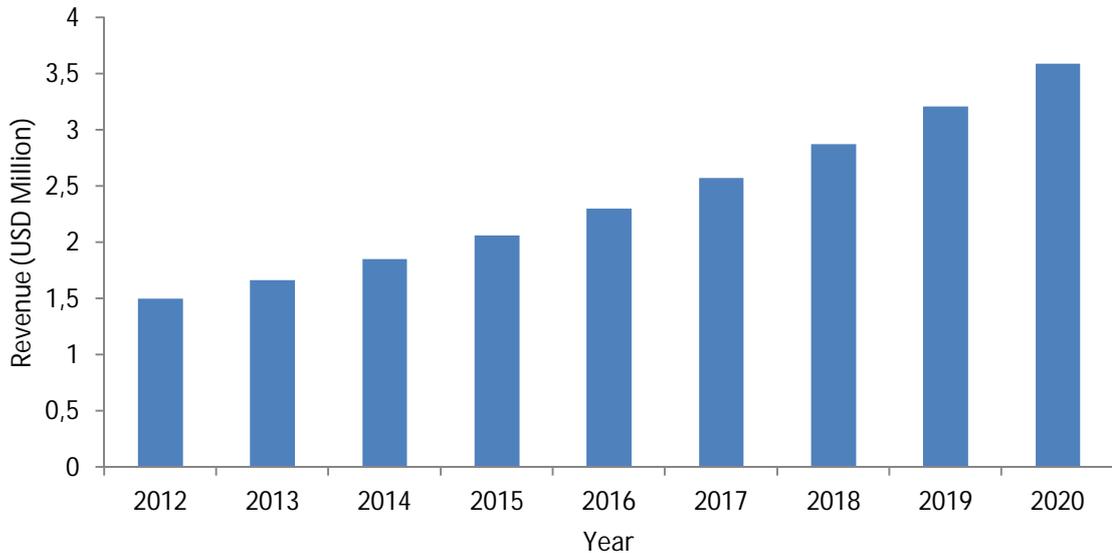
Product Preferences

Most polyphenols (over 90%) are used in beverages, such as polyphenol fortified drinks. Over recent years, polyphenol manufacturers, especially importers, have been aiming to introduce non-beverage foods into the market, but these have tended to stop at fortified baked goods. The limited usage, aggressive substitution potential and lack of product differentiation tend to restrict further polyphenol growth.

Gluten Free Food

Market Size and Growth

The concept of gluten free foods is an alien one at present in Korea. Awareness of coeliac disease is very low, resulting in gluten free food being primarily focused at the expat / tourist population. The market for gluten free foods in Korea in 2014 is estimated at US\$1.9 million, forecast to grow at 12% to US\$3.6 million in 2020.

Figure 68: Korean Gluten Free Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Korean producers such as CJ Corporation are increasingly investing in their breads and bakery businesses. Looking to the future, these businesses are also looking at gluten free rye based options to sell at premium retail stores. As bread is not native to the Korean diet, the majority of Korean foods can be consumed gluten free, resulting in little native demand for these products. However, there is a growing influx of premium chains such as Shinsegae selling small quantities of gluten free breads and pasta, including the OURHOME brand. These factors, driven by increasing tourism to South Korea, are expected to drive demand but from a very low base.

Product Preferences

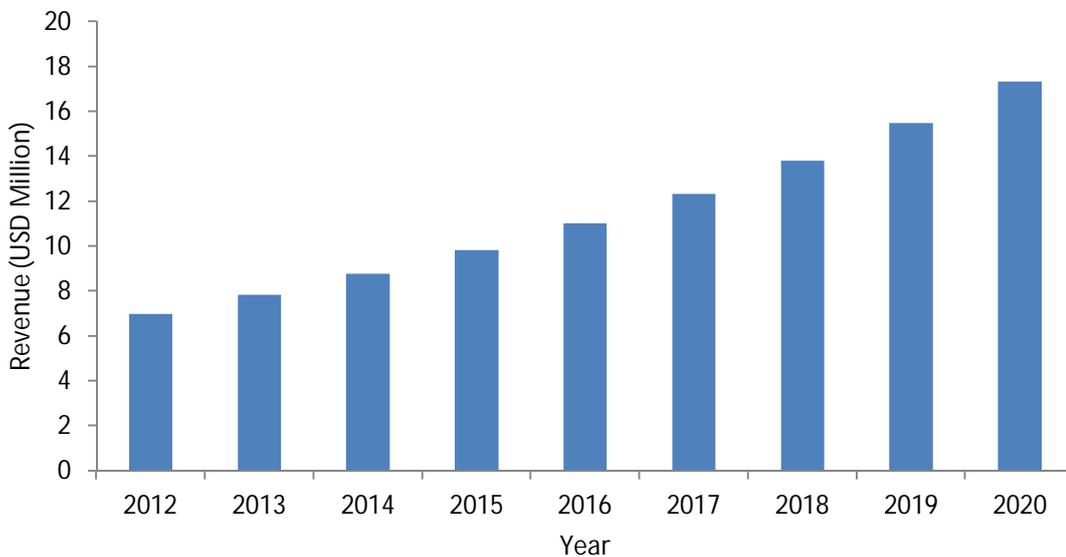
Bakery products with gluten-free ingredients account for around 80% of the total gluten-free market. There is a growing market for gluten free processed foods and snacks, though from a very small base. The highest consumption of gluten-free products in the Korean market is through large premium retail stores such as Shinsegae and Lotte Mart. However, the market is expected to remain at best a profitable niche and largely expat focused.

Lactose Free Food

Market Size and Growth

In spite of being a non-traditional lactose consuming market, dairy demand in Korea has witnessed continued growth over the last decade, spurred by FTAs with Australia, NZ and the US. The lactose free market has emerged as a result of rising diagnosed lactose intolerance in the country, though again from a small base. The Korean market for lactose free foods and dairy alternatives is estimated at US\$9 million in 2014, forecast to grow at 12% CAGR until 2020.

Figure 69: Korean Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

As diagnosed lactose intolerance rises, Valio has introduced the first Asia certified lactose free milk in Korea and is a key entrant into this market, which until now provided dairy alternatives as opposed to lactose alternatives. This is expected to change the awareness levels of lactose intolerance and drive great consumption of these foods across the sector.

Product Preferences

The major product preference for lactose free foods is in the form of liquid consumption. Korea has limited dairy product portfolios, with dairy mainly focusing on the urban youth and children across the country. Increasing demand for lactose free dairy however will drive premium product potential for this sector though this will largely be confined to urban Korea.

Other Free From Foods

The Korean other free from foods market is still comparatively non-existent, and as a result, aside from gluten free and lactose free, there is little penetration of other free form foods. While not traditionally classed as a free from food, there is a growing interest in non-allergen food options in Korea and this is an increasingly important factor required on food labels. However, overall other free from foods are more a concept than an actual market in Korea today.

Malaysia & Singapore

Overview of the Functional Food Market

As multi-cultural countries, Malaysia and Singapore have three main ethnic groups; Malays, Chinese and Indians, and each group has their cultural own beliefs about food and wellbeing, and each has its own popular foods with functional properties.

Food and beverage categories with the highest prevalence of functional products in these markets include infant and other milk formulas, dairy-based drinks, energy drinks, sport drinks, fruit juices, drinks with Asian herbs, cereals, energy bars, biscuits, baked products, and eggs with omega-3. Most functional food products in these categories are locally produced (in Malaysia) or imported from neighbouring ASEAN countries. Imports from developed countries, such as the USA and Australia, are limited primarily due to the higher prices that they are sold at.

The growing levels of higher education, income and health-consciousness in the urban population in Malaysia and Singapore sees more consumers demanding new functional foods which promise enhanced health and wellness, reduced risk of diseases or which address specific nutritional needs or lifestyle preferences. Consumers in these markets are particularly keen on new products that will deliver health benefits, such as age-fighting antioxidants and enhanced brain function. However, it should be noted that the average consumer in both countries is extremely price and taste sensitive. If a product's price is significantly higher or the taste is less intensive, customers can often recoil from buying health benefitting products instead of normal ones.

Another factor driving the market for functional foods is the long working hours which are the norm in Singapore and Malaysia (particularly in urban areas), thus leading time-poor consumers to seek alternative ways, as opposed to exercising, to improve their health wellbeing, i.e. consuming health enhancing foods. The concept of "eating for health" is well entrenched in both nations, stemming from historic cultural ties to nations such as China and India.

Packaged food product manufacturers in these markets are introducing healthy and convenient products as a means to remain competitive. Driven by growing sophistication, consumers in these markets are increasingly health conscious and are gradually becoming more accustomed to reading the nutritional information labels which are printed on all packaged food packaging. For instance, Lee Kum Kee (M) Sdn Bhd has developed its Less Salty Soy Sauce, which contains 25% less sodium in comparison with regular soy sauce, in order to cater to the demand of the health conscious consumers.

Malaysia

Increased interest in functional foods is a relatively recent development in food consumption patterns among Malaysian consumers. Malaysians are showing growing interest in healthy or herbal types of food which have medicinal properties that can prevent or cure some diseases. Among the most popular types of functional food which have been promoted and commercialised in Malaysia are herbal drinks such as Tongkat Ali and Kacip Fatimah for Malays and Ginseng for Chinese.

Singapore

Singapore is heavily dependent on food imports, due to its virtual absence of agriculture and livestock farming. More than 90% of the country's food supplies are from abroad, especially from the Asian region. However, thanks to strong government support the functional food industry in Singapore has grown steadily in the recent past.

Research in food and nutrition has been identified as a key priority for Singapore in the biomedical sciences. In addition to forming partnerships with leading companies, the Agency for Science, Technology and Research (A*STAR) has also embarked on several initiatives to establish itself as the research collaborator of choice for the global food and nutrition industry. For example, A*STAR and New Zealand's Ministry of Business, Innovation & Employment (MBIE) recently announced that they will together invest almost SGD\$3.8 million in joint research projects to investigate various aspects of food and nutritional science. The FINEST Food Programme was established in partnership with Singapore Food Manufacturers' Association (SFMA) and SPRING Singapore with the aim to develop healthier food products to address the nutritional and health concerns of Singapore's population.

Key Trends in Functional Foods

Demographic trends: Like many markets globally, women in these markets demonstrate a higher acceptance and awareness of functional foods. While weight management tends to be the primary motivation for functional foods, increasing health concerns are also becoming a decision factor. Women with children are more likely to eat and or prepare meals that are more in accordance with dietary guidelines. Consumers of functional foods in these markets are also typically more educated than the average consumer.

Product trends: Functional foods in these markets can be segmented in two categories. The first is foods enriched with an increased amount of a particular nutrient that is naturally found within it. For instance, biscuits and cereals enriched with fibre. The second, and growing in popularity, is foods fortified with nutrients that are not typically contained in them. This includes food and beverages fortified with omega-3 fatty acids, wholegrain noodles and "healthy snacks" such as wholegrain chips and crackers with added calcium or iron. Also included is food made with specially chosen ingredients which claim to provide a certain

health benefit. For example, yoghurt drinks with prebiotics and dairy products such as margarine and milk fortified with plant sterols that aim to reduce cholesterol levels.

Distribution trends: Given the lack of strong distinction in the market between functional and regular food products, functional foods have extremely fragmented distribution channels in Malaysia and Singapore, including both large format retail outlets and small shops. For instance, functional drinks such as isotonic drinks, energy drinks and cultured milk drinks are available at street side drinks stalls as well as large scale hypermarkets.

Functional foods are generally placed on retail shelves right next to their conventional counterparts, thus diminishing the perception of additional benefits they offer in the eyes of the typical consumer. Larger format hypermarkets and supermarket have begun to introduce organic product aisles, which offer the opportunity for certain functional food products to distinguish themselves from regular foods.

Malaysians and Singaporeans have a very strong dining out culture. For instance, 64% of Malaysians eat at least one meal per day outside of home; while of the remaining 36% who eat at home, 12.5% have at least one “take-away” meal a week. As the health consciousness of consumers grows in these markets, the demand for healthier food service options is expected to grow consequently.

Regulations: Singapore's regulations pertaining to functional foods are relatively uncomplicated. Singapore does not have a mandatory labelling for general foods as per current national regulations except for foods for special dietary use, foods enriched or fortified and foods making nutrient claims.

Nutrient content claims are allowed in Singapore, and have the same format and criteria as Codex. The requirements for protein, energy and RDAs for vitamins and minerals are given in regulations. For other nutrients, industries have to follow guidelines established by the Health Promotion Board. Singapore which allows disease risk-reduction claims for selected nutrients, such as the ability of calcium to reduce the risk of osteoporosis.

In Malaysia, however, regulations governing functional foods are more stringent. While functional claims for bioactive components are permitted in the current food regulations, a “positive list” approach is adopted by the authorities, thus limiting food products to only make claims that are on this list. For example, some of the permitted function claims include reducing or lowering cholesterol; maintaining a good intestinal environment; increasing intestinal bifidobacteria; lowering rise in blood glucose; improving intestinal immune system of babies; and contributing to visual development.

Even for approved functional claims, additional conditions need to be met before the claims can be made. For example, all claims require a minimum amount of the relevant functional food component be present in final food product.

A major portion of bioactive components with approved functional claims are non-digestible carbohydrates or dietary fibres, such as inulin, galactooligosaccharide (GOS),

fructooligosaccharide (FOS), oligofructose-inulin mixture, beta-glucan, polydextrose, resistant dextrin and High Amylose Maize Resistant Starch. Additionally, bioactive components such as sialic acid, isomaltulose, soy protein, plant sterols/sterol esters, *Bifidobacterium* and lutein are also approved.

Functional claims for oats beta-glucan from (helps lower blood cholesterol) and that calcium (essential for bone and teeth formation) are allowed. However, disease risk reduction claims for these two components e.g. that beta-glucan helps to reduce risk of heart disease and calcium reduces the risk of osteoporosis, are not permitted in Malaysia.

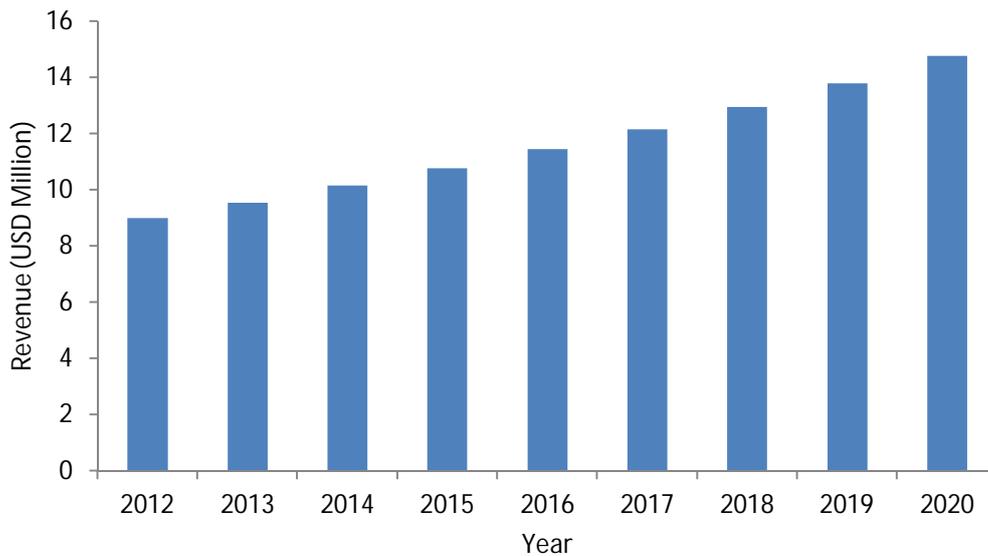
While progress is being made by the food industry in applying for new functional claims through the Food Safety and Quality Division of the Health Ministry, the regulatory conditions in Malaysia are nevertheless a hurdle for the development of the functional food market.

Market Analysis of Key Product Categories

PUFA

Market Size and Growth

The market for PUFA ingredients in Singapore and Malaysia is at a nascent stage and largely held back by the fact that health claims are not allowed in these countries. This has resulted in PUFA relying on its international reputation. However, as market awareness continues to grow the market will witness growing demand from US\$10 million in 2014 to US\$15 million in 2020

Figure 70: Malaysia and Singapore PUFA Ingredients Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

PUFA usage is mainly from fish and fishery products. Fish oil is the main source of omega -3 fatty acids, and is increasingly demanded in the form of pharmaceutical products, food additives, functional food and dietary health supplements. These have perceived benefits in prevention of atherosclerosis, heart attack, hypertension and cancer.

Seafood is a major part of the average Malaysian and Singaporean's diet. For example, the per capita consumption of fish in Malaysia is almost 60 kg per annum. Even though fish and their by-products contain fish oils, there is limited production of fish oils in Malaysia. The commercial scale industries are export-oriented and encompass large scale packaged fish exports as a general food, leaving behind a very small amount of fish for extraction of fish oil. Thus, only small and few medium scale enterprises undertake fish oil production in Malaysia. Most of the fish oils available in market are imported.

The Malaysian and Singaporean market for omega-3 is concentrated towards enriched eggs and processed products rich in omega-3 such as infant formulations and other omega-3 rich nutraceutical products.

Product Preferences

The market for omega-3 products is growing rapidly. One of the primary reasons for the continued development and progression of the omega-3 market is the fact that new application areas of omega-3 are increasing, while existing applications are finding new markets. For instance, infant formula is an important market for omega-3 that has found growing interest in the recent past. Large numbers of infant formulations are being developed

using EPA/DHA as they have significant health benefits. Companies like Nestle and Similac (Abbott Nutrition) have a significant portfolio of omega-3 enriched infant formulations, and have been progressively increasing product lines for this segment in recent years. LTK Omaha Plus from LTKM Bhd., QL Omega from QL Poultry Farms Sdn. Bhd. and Nutriplus with omega-3 from Lay Hong Bhd. are some of the popular egg brands that have garnered a majority of market share in the omega-3 enriched eggs market. Additionally, increasing consumer awareness regarding the benefits of omega-3 is further expected to boost the growth of the omega-3 market in Malaysia over the next couple of years.

Singapore has a relatively smaller PUFA consumption compared to Malaysia. Fish oils are mostly imported from China, including products from companies like Nutrifynn, AnHui Chempro Biochemical Limited and Hill Pharmaceutical Co., Ltd.

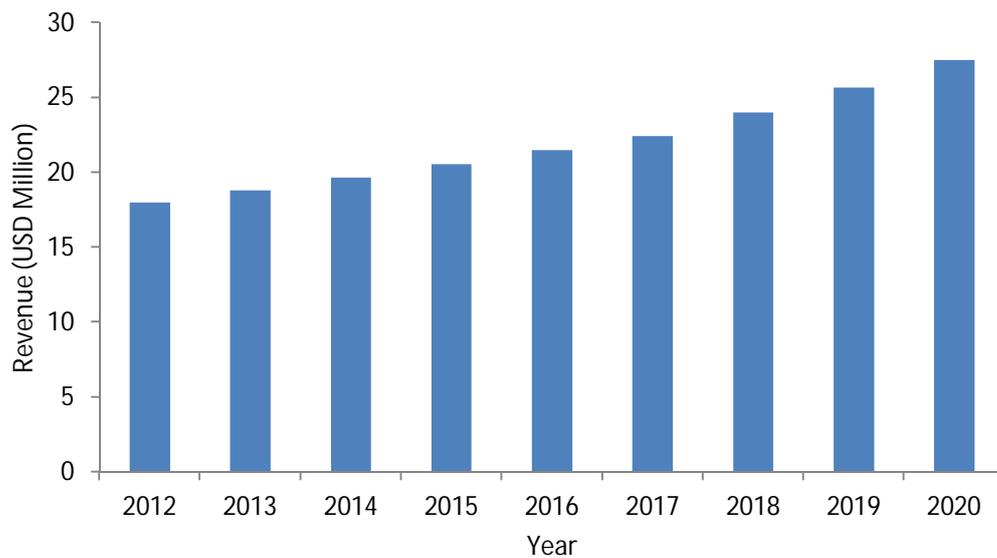
The Agri-Food & Veterinary Authority of Singapore has introduced the Singapore Quality Egg Scheme (SQES), which is a quality assurance scheme that ensures local chicken farms produce quality shell eggs that are fresh. Local farms such as Seng Choon Farm Pte Ltd. and Chew's Group Ltd, are some of the leading producers of fresh eggs in Singapore, specialising in the production and sale of designer eggs rich in omega 3 content.

Proteins and Peptides

Market Size and Growth

Both Singapore and Malaysia are emerging protein and peptide ingredient markets, being driven by growing interest in health heating, weight management as well as nutricosmetic benefits. The market is witnessing growing demand from manufacturers aiming to import these products for utilisation in end use food products. In 2014 the market was valued at US\$20 million, and is anticipated to grow to US\$28 million by 2020

Figure 71: Malaysian and Singaporean Protein and Peptide Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Demand for protein in Malaysia and Singapore tends to focus on the dairy segment as well as an emerging egg protein and soy based protein sector. Soy products are popular in the market as a complementary product for animal protein products. Most of the soy products are consumed in the form of soy drinks, soy beans and tofu.

In Singapore, more than 75% of the population is Chinese, resulting in a high demand for soy based protein.

Product Preferences

The functional drinks market in Malaysia and Singapore is mainly driven by products from Nestle, such as Nutren, Cerelac, Power Bar and Milo, alongside Marigold, Vitagen and Dutch Lady. Soy products, such as soy bean and tofu, have gained an increased popularity in the Malaysian and Singaporean market, especially amongst vegetarians who consider tofu as an alternative to chicken. Mass gainer products from GNC and Optimum Nutrition have also gained increased popularity amongst youngsters for body building and gymnastics.

The market for peptides is underdeveloped in Malaysia and Singapore at present. However, the market is growing steadily, mainly driven by factors such as the rise in incidence of metabolic and cardiovascular diseases and technological developments in the field of peptide manufacturing. The market is likely to achieve good growth as a result of enhancements in technology pertaining to the introduction of methods such as solid phase peptide syntheses

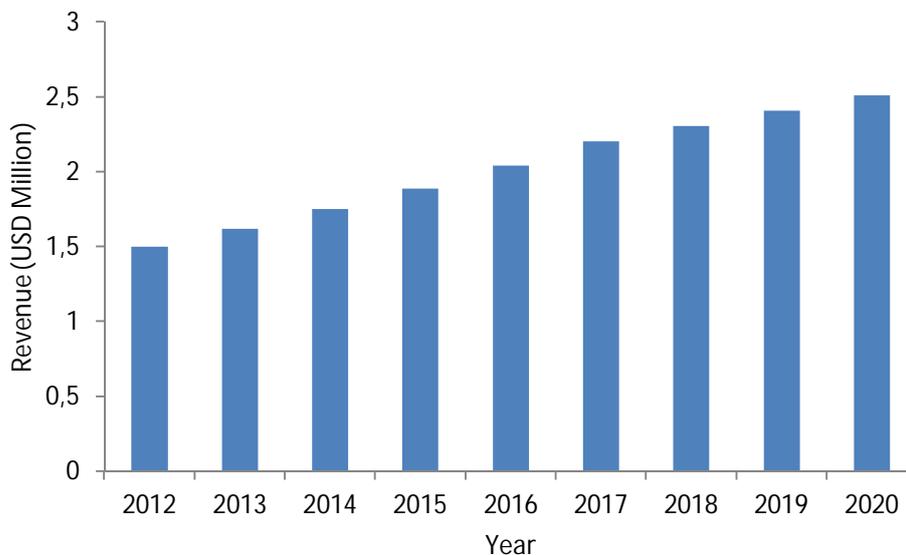
and introduction of many hybrid methods that are set to provide the best of both solid and liquid syntheses.

Vitamin D

Market Size and Growth

As demand for bone health ingredients continue to grow in South East Asian markets, Malaysia and Singapore will witness a growing focus on vitamin D and calcium. The trend towards this fortified food will drive vitamin D demand a fact that is already being observed from a small base. In 2014 the market for vitamin D ingredients was estimated at US\$1.7 million and is forecast to grow to US\$2.5 million by 2020.

Figure 72: Malaysian and Singaporean Vitamin D Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

While both Malaysia and Singapore are tropical countries with year-long sunshine, the increasing rate of urbanisation and long work hours reduces the amount of time residents of these countries spend outdoors during the day time. As such, vitamin D deficiency is expected to be prevalent, particularly amongst the South Indian population in these countries. South Indians are typically darker skinned owing to high pigmentation that inhibits the absorption of the Sun's rays.

Product Preferences

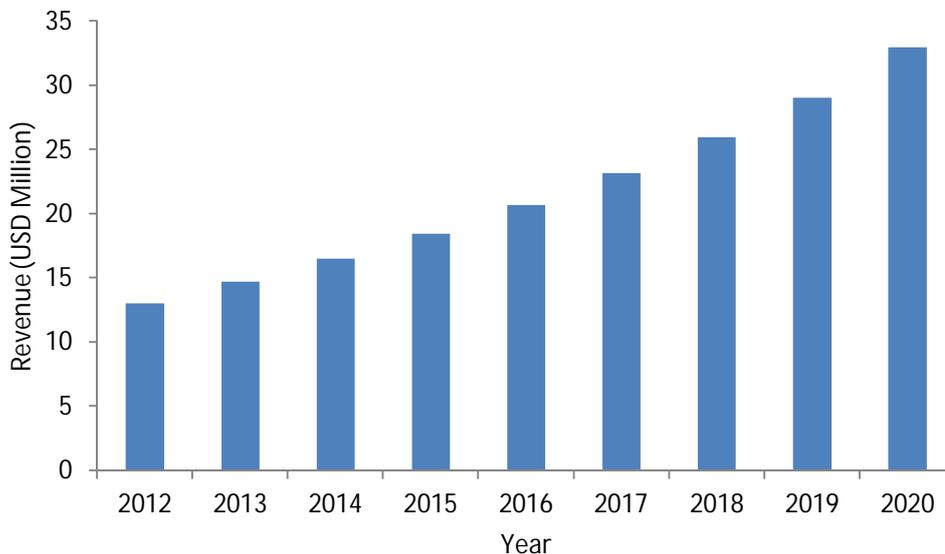
Natural sources of vitamin D for consumers in these markets include fatty fish such as salmon and tuna, canned sardines and mackerel, egg yolks and certain mushrooms. Many dairy products in these Southeast Asian nations are fortified with calcium as a result of consumer demand, resulting from an increased awareness of bone health. Another reason to fortify foods with vitamin D is to ensure that they have the same nutrient level as another food they may replace. For instance, vitamin D and calcium is added into soymilk to match the level of vitamin D and calcium found in cow's milk, which is evident in brands such as Marigold Soya Milk and Nutri Soy Milk. Another example is margarine, with brands such as Buttercup and Naturel that are fortified with Vitamins A and D.

Probiotics

Market Size and Growth

The awareness of probiotics in Malaysia and Singapore has grown largely due to the strength of market leading probiotic cultured milk brands Yakult and Vitagen. Marketed as the “friendly bacteria”, supplements are also popular source of probiotics for consumers in these markets. In 2014 the market for probiotic ingredients is estimated at US\$16.5 million, and is forecast to grow to US\$33 million by 2020.

Figure 73: Malaysian and Singaporean Probiotic Ingredients Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Malaysia has the highest number of diabetics among ASEAN countries and the sixth highest in the Western Pacific region. Recent researches internationally suggest that probiotic

consumption may aid in the management of both Type 1 and 2 diabetes. As awareness of probiotics ability to combat diabetes increases, the demand for probiotic enriched products is expected to grow, despite the fact that scientifically the links are far from proven..

Product Preferences

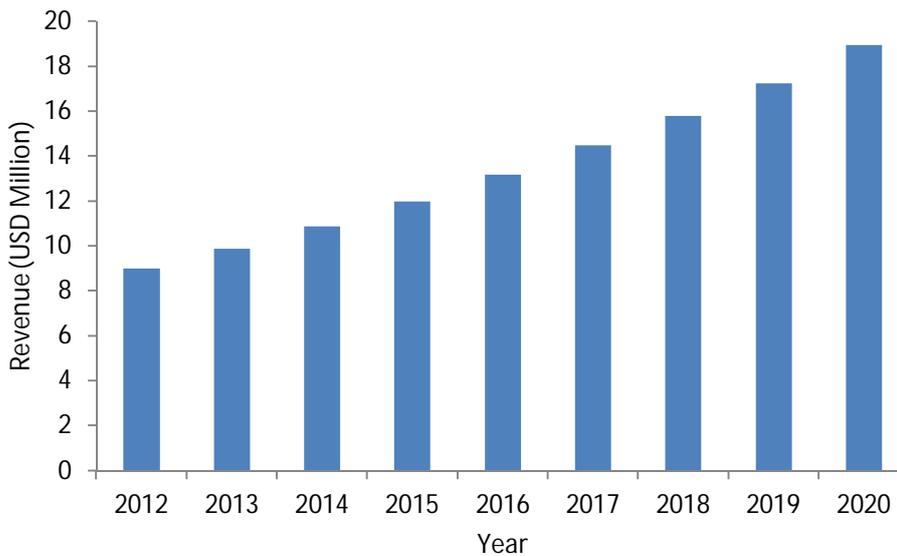
Probiotic enriched soy milk has been introduced recently in to the market. Nestle's spoonable probiotic yoghurt range is a popular source of probiotics for consumers in Malaysia, while Marigold probiotic yoghurt drink is popular among Singaporean women as a slimming and weight management product.

Cultured milk remains the most prevalent probiotic centric product in the market in both countries. Probiotics are increasingly being consumed by babies and children to aid digestion. Parents are willing to pay an extra premium for products with added health benefits, like probiotics. As such, marketing of the product is frequently targeted as a healthy beverage for kids. Vitagen for example, comes in many kid friendly flavours. Probiotic enriched milk formulas for babies and young children are also heavily marketed and supported by the local pediatricians.

Prebiotics

Market Size and Growth

The prebiotic ingredients market is a nascent yet popular sector in Singapore and Malaysia as awareness of the importance of dietary fibre continues to grow. The market has traditionally "piggy-backed" off that of probiotics, but is now coming into its own as a large fortification sector. In 2014, the market for prebiotics was estimated at US\$11 million in 2014 and is forecast to grow at a CAGR of 9.7%.

Figure 74: Malaysian and Singaporean Prebiotics Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

Prebiotics, such as inulin and FOS, are not as widely understood in terms of their health benefits, compared to probiotics. Given the high fibre content in Malaysian and Singaporean diets, the perceived need for dietary fibre as a formulated ingredient is low. However, both Malaysia and Singapore have an entrenched formula feeding culture, which are typically enriched with prebiotics. Prebiotics enjoy greater visibility in the health supplement markets, which should have a positive spillover effect into the mass consumer market.

Product Preferences

Children's milk formula suppliers are the most prominent marketers of prebiotic as an active ingredient in these markets. For adults, prebiotic enriched soymilk powder and high fibre shakes are marketed as a means to improve digestive health. Certain brands, such as Marigold, enrich their yoghurt and yoghurt drink products with both probiotic cultures and prebiotic fibres. Recently, both Malaysia and Singapore have seen the introduction of Gum Arabica, the resin of an acacia tree, as a prebiotic supplement. Gum Arabica is considered the richest natural source of prebiotics in the world⁹ and is growing in popularity particularly in Malaysia. Emerging products are baked goods in Singapore, such as Auric Pacific Group Ltd's Sunshine brand, which is one of the first brands to fortify its bakery products with prebiotics.

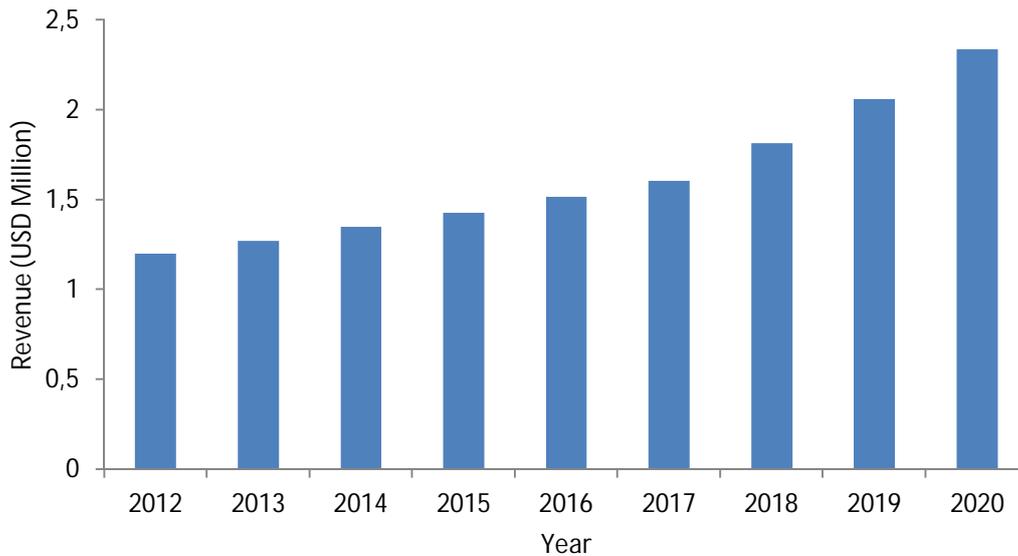
⁹ up to 85% prebiotics by weight, compared to other dietary sources such as chicory roots at 64.6%, Jerusalem artichokes at 31.5%, dandelion greens at 24.3%, garlic at 17.5%, leek at 11.7%, and raw onions at 8.6% etc.

Aloe Vera

Market Size and Growth

Aloe vera is a rather common ornamental house plant in Singapore and Malaysia. While in Malaysia aloe vera is commercially farmed, both Singapore and Malaysia import the plant both as raw for use in the beverage and cosmetic industries as well as in finished products.

Figure 75: Malaysian and Singaporean Aloe Vera Extract Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

In Malaysia and Singapore, aloe vera is commonly used in two categories; in the beverage market and in the personal care segment. Aloe vera used in the personal care segment is far more developed than its use in beverage formulated products. Due to its ability to increase metabolism, aloe vera juices are increasingly marketed as a weight loss product in these markets.

Product Preferences

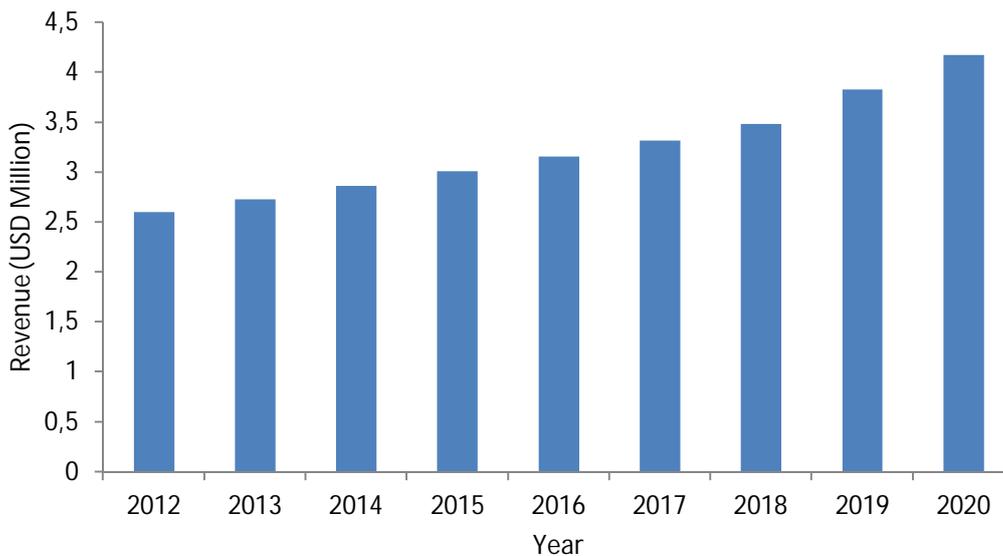
Compared to many other cultures globally, the South East Asian palate is more accepting of aloe vera's distinct taste. Besides juices and other beverages, another popular food format for aloe vera is in flavoured yoghurts. Meiji and Marigold are the most popular brands of aloe vera flavoured yoghurt, while the Chobani brand remains a niche aloe vera yoghurt product in Singapore due to its high price. F&N's Alive brand is also a key competitor with its aloe vera flavoured yoghurt.

Phytosterols

Market Size and Growth

In 2014 the market for phytosterols was estimated at US\$3 million and is forecast to grow at a CAGR of 6.5% up to 2020.

Figure 76: Malaysian and Singaporean Phytosterol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

The awareness of health issues arising from high cholesterol is high in both Malaysia and Singapore. It is estimated that 35% of Malaysians suffer from hypercholesterolaemia (high cholesterol level). It is the primary risk factor for cardiovascular disease, which is the leading cause of death in Malaysia for the past 30 years. In Singapore, high cholesterol accounted for one in three deaths in 2010. As such, the markets are very perceptive to foods and supplements that claim to reduce cholesterol levels.

Product Preferences

Soy bean products, a rich source of phytosterols, are a common component in the diet of Malaysian and Singaporean consumers. Phytosterols, particularly plant sterols, are often added to dairy products such as milk, yoghurts and margarine and marketed as food products that assist in the reduction of cholesterol levels.

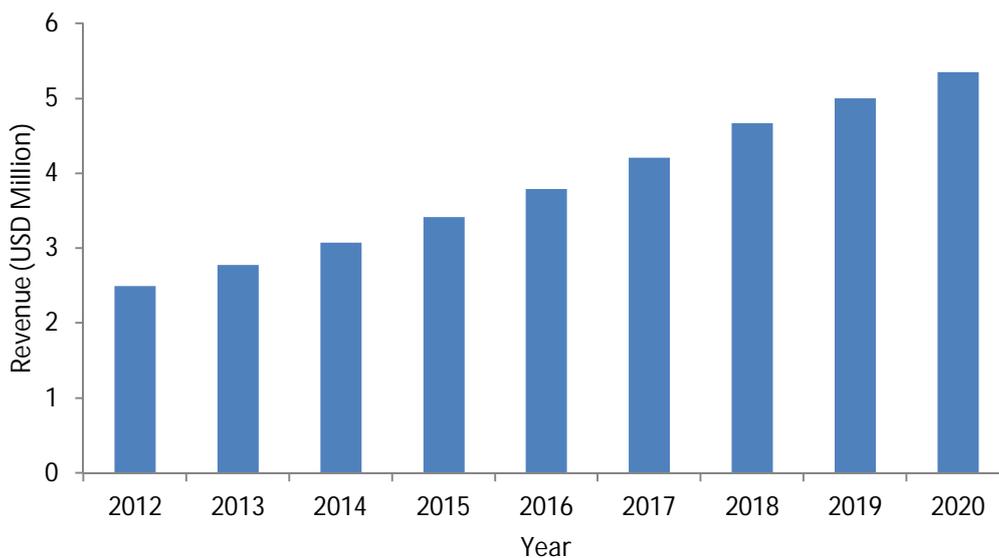
Recently, Malaysia has seen the introduction of cooking oils incorporating plant sterols in order to make the claims of assisting in reducing cholesterol levels. Nestle’s Omega plus adult milk is a high calcium milk with the phytosterol Acticol that reduces cholesterol levels. Marigold’s HL Low Fat Milk contains plant sterols that help lower and reduce cholesterol levels, but it also caters as a slimming product and ideal for lactose intolerant consumers.

Carotenoids

Market Size and Growth

While Singapore does not have a commercial carotenoid market, Malaysia is considered one of the emerging markets to watch for carotenoids, particularly from its palm oil industry. The rise of locally produced carotenoids is a key factor driving interest in this small market. In 2014 the Malaysian carotenoid market was estimated at US\$3 million, and is forecast to grow at a CAGR of 9.6% up to 2020.

Figure 77: Malaysian and Singaporean Carotenoids Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends and Product Preferences

Red palm oil, which is the richest natural plant source of carotenoids, is a popular food additive in Malaysia. Palm carotenoids have 15 times the retinol equivalent of a carrot and 300 times more than a tomato. Red palm oil is appealing to food manufacturers who want label their products as “additive free” yet not compromise on the colour of the food that appeals to consumers. Red palm oil is also growing in acceptance in the baking world. Companies such as Sime Darby Jomalina have invested in carotenoid production from palm oil, and this is expected to drive demand for carotenoids in this area. Malaysia is a key growth

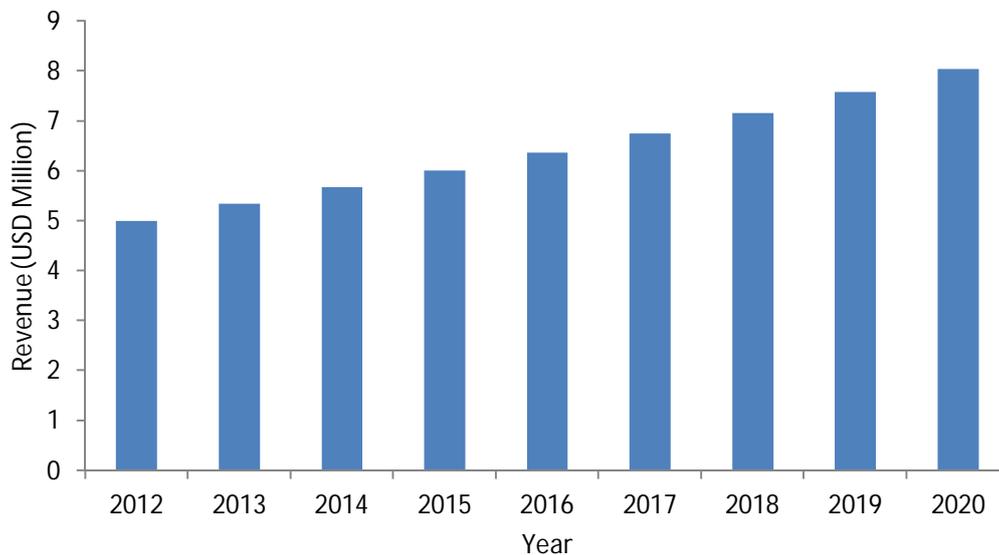
market for carotenoids, and one that if successful will provide South East Asia with much easier access to these ingredients.

Polyphenols

Market Size and Growth

The Malaysian and Singaporean polyphenol market is a traditional sector dominated by the consumption of tea based polyphenols. While the ingredient market itself is quite nascent, it is witnessing interest driven by growing end-use demand for these products, particularly in the RTD drinks segment. In 2014 the market for polyphenols was estimated at US\$6 million and is forecast to grow to US\$8 million by 2020.

Figure 78: Malaysian and Singaporean Polyphenol Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

Polyphenol is not marketed as an active ingredient in food products in either country. However, polyphenol based cosmetic products, such as apple polyphenol face mask, have grown in popularity in recent years. It should be noted that polyphenols have yet to be approved as a bioactive component under Malaysian regulations.

Product Preferences

The consumption of polyphenol rich green tea is particularly popular amongst the Chinese population in both Malaysia and Singapore. The less polyphenol-rich black tea, on the other

hand, is popular amongst Malays and Indians. Bubble tea (aka pearl milk tea) is a new tea beverage that has grown very rapidly in both Malaysia and Singapore over the recent years and is an emerging carrier for polyphenols. Most bubble tea recipes contain a tea base mixed/shaken with fruit or milk, to which chewy tapioca balls and/or fruit jellies are often added. This format has increased the popularity of tea amongst young urban adults in these markets.

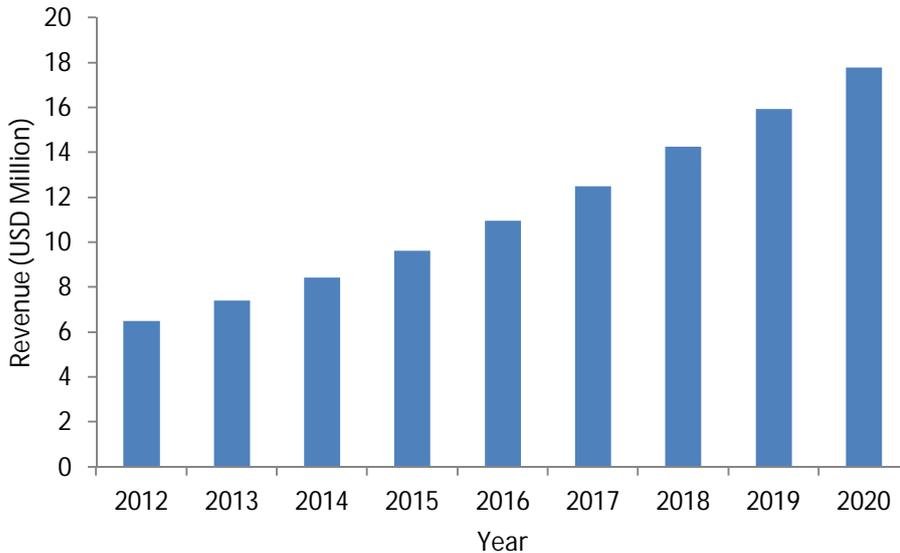
Soy bean is a popular source of soy isoflavones in both markets. Soy bean is regularly consumed either in the form of soy milk or tofu. Tofu in particular is a staple in many Chinese dishes in both countries. Nutrisoy, Viitasoy and Marigold Soya Bean Drink are a few of the most popular brands of soy milk in the market. Soy milk based beverages are widely available in Singapore as there are many street stalls and kiosks selling soy milk. Mr Bean and Jollibean are popular choices for soy milk consumption among young adults.

In Singapore, Kale has become very popular in recent years and is imported directly from Australia. Touted as a “super food”, kale is a rich source of antioxidant polyphenols rating higher than other Brassica vegetables. In terms of polyphenol supplemented foods there is an emerging market in Singapore for polyphenol fortified waters as well as dairy drinks.

Gluten Free Food

Market Size and Growth

Both Singapore and Malaysia are witnessing growing demand for gluten free products, both from the large expat community as well as locals. Though from a very small base currently, this market is expected to witness increasing interest and grow from a small US\$8.5 million in 2014 to US\$18 million in 2020.

Figure 79: Malaysian and Singaporean Gluten Free Market Revenue, 2012-2020

Source: Frost & Sullivan

Demand Trends

White rice forms the staple for both Malaysians and Singaporeans, which is a gluten free source of carbohydrates. Wheat-based carbohydrates are typically consumed through baked goods, such as breads and certain processed foods.

The prevalence of coeliac disease is extremely low in both Malaysia and Singapore, hence awareness of the disease in these markets is almost negligible. Nevertheless, the gluten free diets promoted in Western countries have gained some traction in these countries, thus spurring demand, particularly among fitness orientated individuals.

Product Preferences

Thanks to the rise of the organic and health food trend in Malaysia and Singapore, gluten free food can now be found in regular grocery stores. Certain high end bakeries in the countries are promoting a gluten free range of products, targeted largely to the expatriate population in. For example, 2015 saw the establishment of Jonathan's, the first purely gluten free cafe in Singapore.

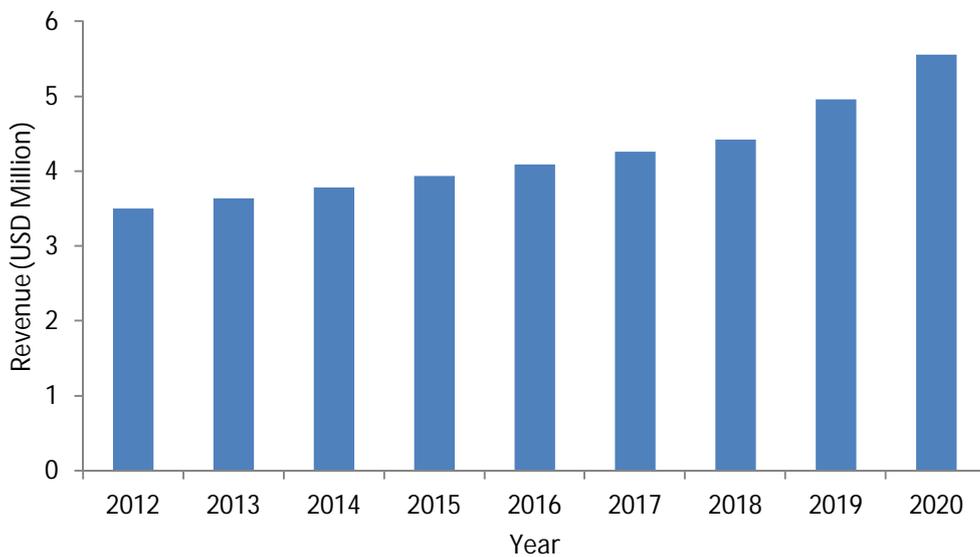
Given the significant premium gluten free products command in these markets, there is a tendency for them to be viewed as a luxury food product, particularly in Malaysia. Gluten free products primarily consist of baked goods and pasta, with brands such as Kez's Kitchen, Udi's, Healthy Life and Food for Life.

Lactose Free Food

Market Size and Growth

Dairy products do not form a major portion of the typical diet of Malaysians and Singaporeans. Milk consumption data from Malaysia indicates that the average per capita intake of milk in Malaysia (30 litres per person) is less than a quarter of that in parts of Scandinavia (e.g. Finland is at 127 litres per capita). The lactose free dairy market, while being a niche sector in both countries, is expected to witness rising growth rates, particularly driven by the infant and toddler milk segments. In 2014 the lactose free foods market was estimated at US\$3.5 million, and is anticipated to US\$5.5 million in 2020.

Figure 80: Malaysian and Singaporean Lactose Free Market Revenue, 2012-2020



Source: Frost & Sullivan

Demand Trends

While lactose intolerance is relatively common, particularly the mild form, in Malaysia and Singapore, awareness of the condition remains low, thus diminishing the demand for lactose free products.

Product Preferences

Abbott Laboratories' Isomil brand dominates the lactose-free dairy market, as the company has a broad product portfolio under infant formula with its Gain, PediaSure, Similac and Grow brands. The strong brand presence and equity is trusted by parents, and demand for infant formulae is increasing as parents are becoming more sensitive to their baby's health and

wellbeing. Bristol-Myers Squibb (Enfalac) is also a notable lactose-free infant formula supplier whose presence and demand is growing in Malaysia.