



Australia's National
Science Agency

Growth opportunities for Australian food and agribusiness

Economic analysis and market sizing



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- What opportunities are going to emerge from these rapid changes?
- What science and technology should you prioritise and invest in to maintain or create a competitive advantage?

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1 Introduction

CSIRO produced the *Food and Agribusiness Roadmap* (the roadmap) in July 2017 to support Australian food and agribusiness in its transition to a collaborative, growth oriented, high value-adding and differentiated sector. The roadmap discussed industry trends and opportunities, and identified key science, technology and business enablers for industry. In considering Australia's competitive position in this global market, three growth opportunity themes and 10 opportunities were identified as part of the roadmap:

- Products for health and wellbeing:** Foods and beverages that provide specific health benefits above and beyond basic nutrition, and target consumers who are either health conscious or have specific medical/dietary needs. Key opportunities include free-from and natural foods, fortified and functional foods, vitamins and supplements, and personalised nutrition.
- Sustainable solutions:** Environmentally and socially responsible manufacturing processes and products, and the recovery of novel, value-added products from waste streams. Key opportunities include organic waste conversion, sustainable packaging and alternative protein sources.
- Premium interactions:** Products that yield a premium price due to quality and convenience, luxury status, novel attributes or their integration with food-based experiences. Key opportunities include convenience meals, luxury and novel products, agritourism and experiences.

This report builds on findings from the roadmap by providing an outlook on the market size of the growth opportunities described above. Economic analysis will focus primarily on domestic consumption and export opportunities for Australia. For secondary markets such as sustainable packaging and organic waste conversion, economic analysis will focus more on the value of waste recovery and expected environmental savings. Figure 1 provides an outline of the Food & Agribusiness value chain and how opportunities identified in the roadmap relate to it. Section 2 presents economic analysis and commentary on each opportunity. Section 3 provides an outline of resources for further reading and Section 4 describes the research methodology used in this report.

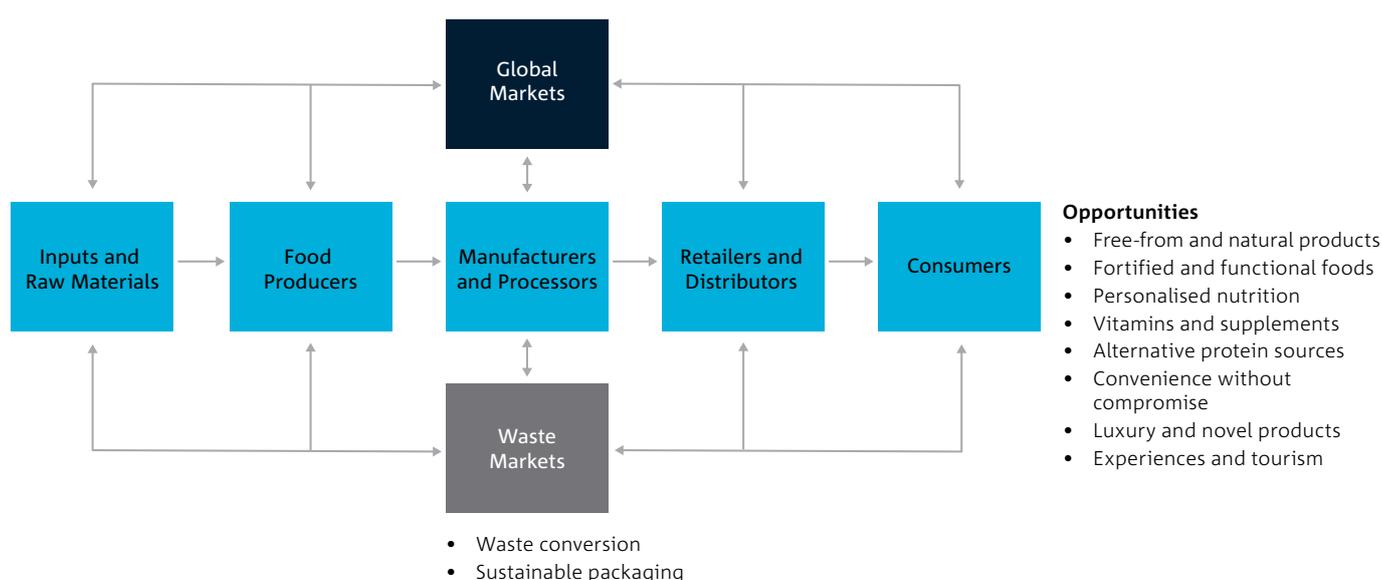


Figure 1: Simplified Value Chain of the Food and Agribusiness Industry



2 Valuations

In 2018, Australia’s gross domestic product (GDP) was \$1.8 trillion.¹ While the narrowly-defined Australian agriculture sector contributed 2.5% or \$46B towards GDP in 2018, the broader food and beverage manufacturing industry contributed another 1.5% or \$27B,² and the food and beverage wholesaling, retailing and services contributed a further \$65B or 3.6% to GDP.³ Combining these sectors, Australia’s food and agribusiness industry contributes approximately 7.6% or \$138B towards GDP. These can be compared with the contributions of other large sectors such as mining (8%), building and construction (8%) and electricity, gas and water supply (2.5%).⁴

There are several components that make up the total GDP figure, including domestic consumption, investment, government expenditure, exports and imports. This report focuses on the domestic consumption and export components of GDP as these are most relevant for Australian businesses seeking to pursue growth and new markets. These two components were estimated to contribute 11% or \$187B towards Australia’s GDP in 2018. (Figure 2)

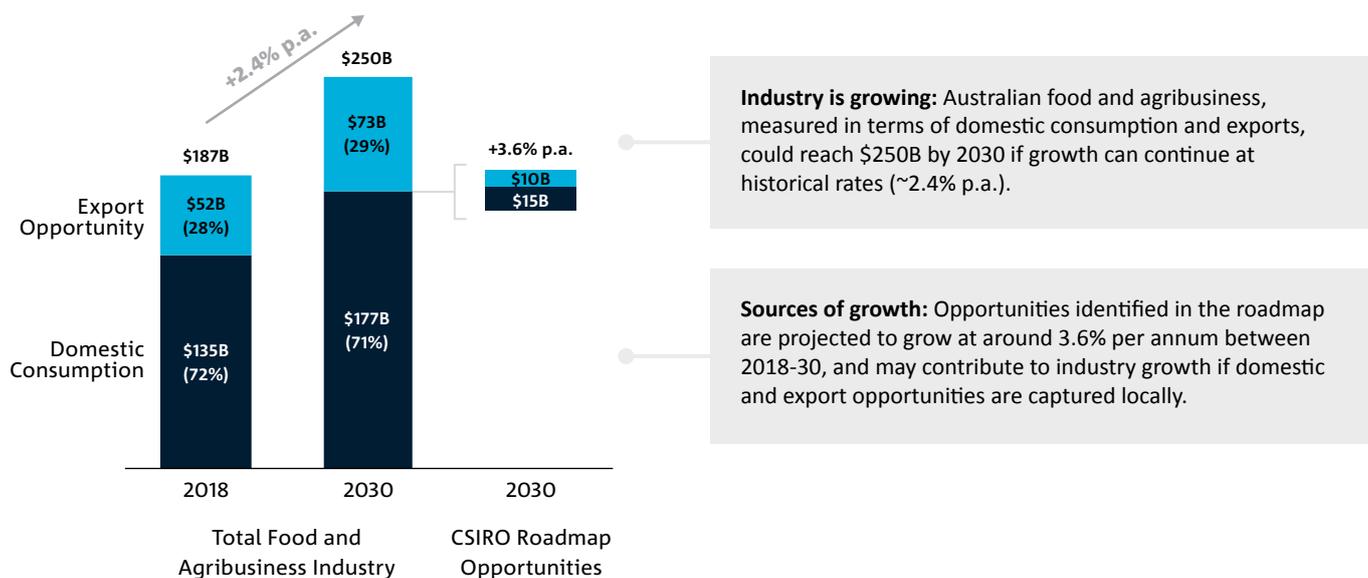


Figure 2: Australian Food and Agribusiness, Domestic and Export Opportunity, 2018-2030⁵

1 ABS (2018). 5206.0 Australian National Accounts: National Income, Expenditure and Product (Table 37).
 2 Agriculture is measured in gross value-added terms under the ANZSIC code: Agriculture, Forestry and Fishing (A); while food and beverage manufacturing refers to the ANZSIC code: Manufacturing (C); Food, Beverage & Tobacco Products. Source: ABS (2019). 5206.0 Australian National Accounts: National Income, Expenditure and Product (Table 37).
 3 Based on 2016-17 data due to availability of industry sub-division data. Source: ABS (2018). 8155.0 - Australian Industry, 2016-17. Economic Activity Survey.
 4 ABS (2019). 5206.0 Australian National Accounts: National Income, Expenditure and Product (Table 37).
 5 Estimates for total domestic consumption are based on Australian household expenditure trends in food, beverages and alcohol. This is broader than the gross value of production in agriculture and includes expenditure items in food services (e.g. takeaway, restaurants, cafes). Exports refer to Australian food and agribusiness exports in agriculture, fishery and forestry industries. Total values for the CSIRO Roadmap Opportunities are based on the summation of individual market sizes of opportunities estimated in this report. The total sum is discounted by 30% to account for potential overlap in product and market definitions. Estimates for sustainable packaging, waste conversion and international agritourism are also omitted from this calculation for comparability of estimates to total industry values. Please see the methodology section for details on data sources and growth assumptions.

Opportunities in wellness, sustainability and premium markets may contribute to industry growth

Australian domestic consumption and exports of food and agribusiness products may reach \$250B by 2030 if growth continues at historical rates (Figure 2). CSIRO analysis estimates that the opportunity for health and wellness foods, sustainable solutions and premium segments, as identified in the roadmap, to grow at around 3.6% per annum to a value of \$25B by 2030. These markets are likely to be important sources of growth for Australian food and agribusiness over the next decade if industry can capture the opportunities. This can be compared to the National Farmers' Federation strategic target to reach \$100B in farm gate output (defined as gross value of Australian farm production) by 2030, which similarly expects a growth rate of approximately 4% per annum.⁶

Demand from the Asia-Pacific is likely to underpin export growth in food and agribusiness

Exports to the Asia-Pacific are likely to be an important source of growth for businesses in wellness, sustainability and luxury markets. Australian food and agribusiness exports to China, Japan, Indonesia, Korea, India and Vietnam has grown from 42% of total food exports in 1997 to 57% in 2017 (Figure 3). These trends are likely to continue, particularly with exports to China, India, Indonesia, Philippines and Vietnam, based on projected income per capita and population growth over the next five years (Figure 4). Australia's track record for quality, safety and value in food and agribusiness, as well as current and incoming free-trade agreements, should support its competitiveness in global markets.

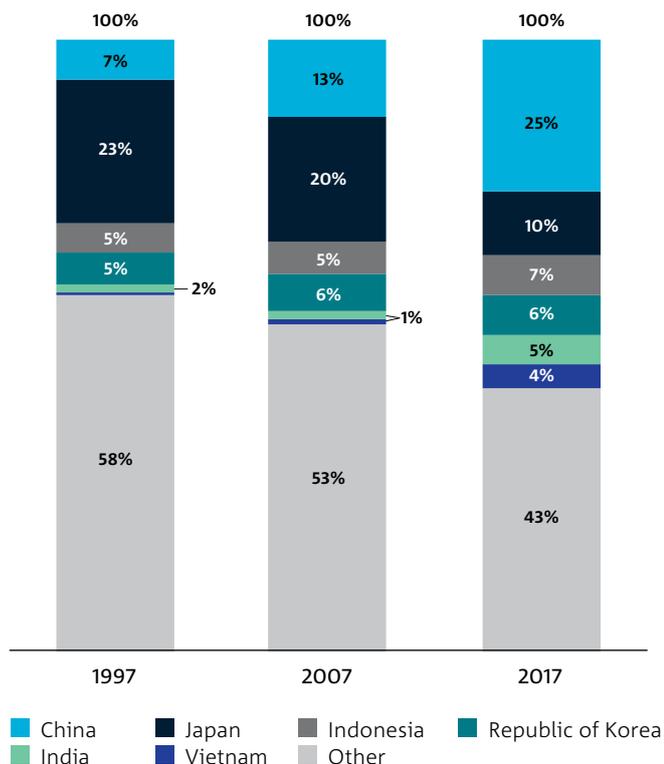


Figure 3: Australian Food & Agribusiness Exports by Selected Countries, 1997-2017⁷

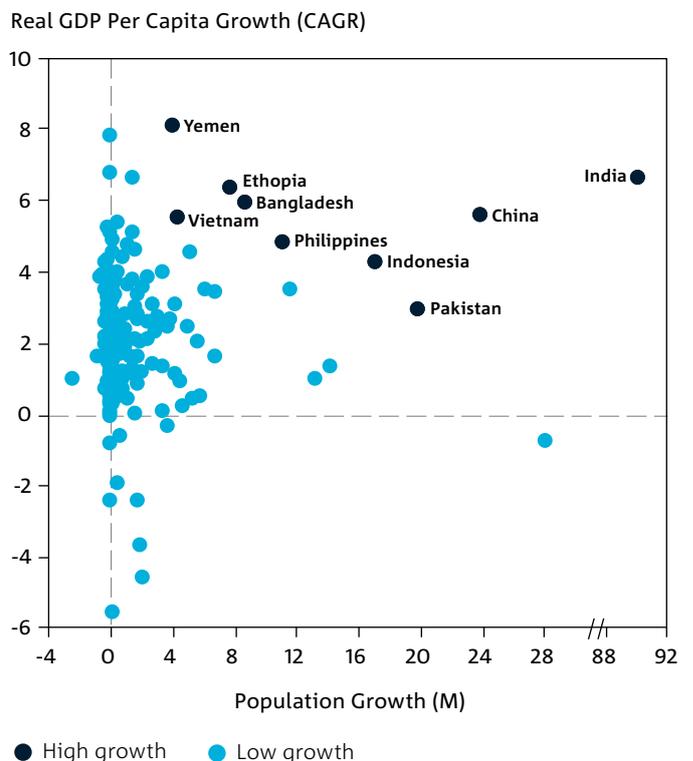


Figure 4: Income and Population Growth Forecast by Country, 2018-2023⁸

6 National Farmer's Federation & KPMG (2018). Talking 2030 – Growing Agriculture into a \$100 Billion Industry.

7 DFAT (2018). Australia's Merchandise Exports and Imports.

8 International Monetary Fund (2018). World Economic Outlook Database.



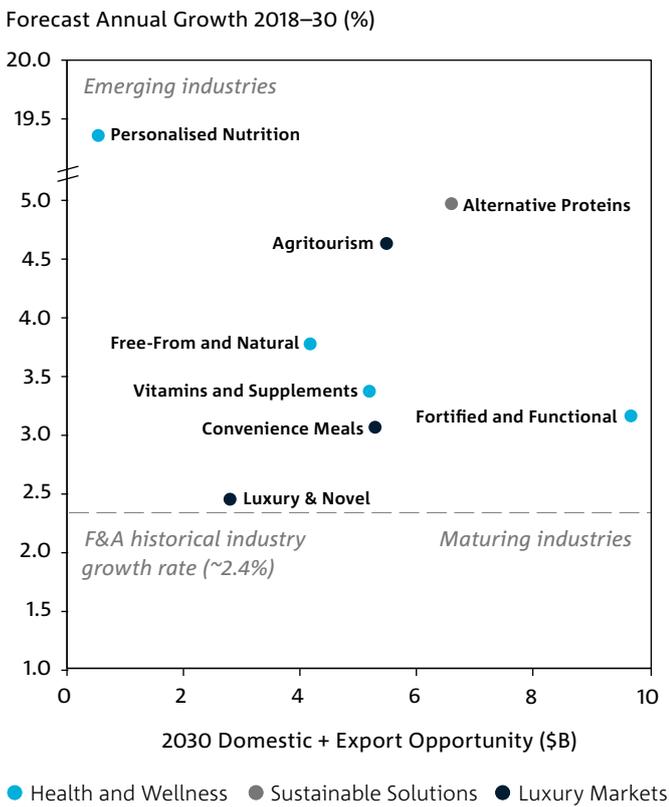


Figure 5: CSIRO Food and Agribusiness Roadmap, Estimated Domestic and Export Opportunity by 2030⁹

Common drivers

- **Global growth:** Population growth and real income per capita growth in Australia and key export markets will drive demand for food and agribusiness.
- **Changing preferences:** Consumers seek healthy and accessible foods that are naturally, ethically and sustainably sourced.
- **Brand and capability:** Industry’s reputation for clean and green, productivity in agribusiness, and integration with global markets should support conditions for growth.

Considerations

- **Industry maturity:** Emerging industries should experience relatively higher growth while maturing industries are more likely to converge towards total industry growth averages.
- **Substitutes:** Growth outlook is sensitive to relative changes in consumer preferences over time (e.g. convenience meals vs fast foods).
- **Competition and innovation:** Capturing growth and global market share is dependent on the supply and competitiveness of local industry.

9 CSIRO Futures (2019). See Section 4 for methodology.

Trends in consumer preferences and industry maturity will influence opportunity size and growth

Opportunities within wellness, sustainability and premium segments are projected to grow over the next decade but may vary in magnitude due to trends in consumer preferences and/or differences in industry maturity (Figure 5). Strong demand for alternative proteins for instance is expected to continue with rising consumer preference for sustainable and ethical foods, and strong population and income growth in key export markets with large vegetarian populations such as India.

Similarly, agritourism may be an increasingly important source of economic activity for rural and regional Australia as international and local visitor numbers grow. More mature industries such as vitamins and supplements, organic and free-from foods, and fortified and functional foods could experience moderate growth as consumer demand for natural and healthy foods increases, and if export demand from Asia continues.

The outlook for other opportunities is slightly more conservative. Demand for convenience meals for example will depend on how industry competes with alternatives such as fast-food, food delivery services and local eateries. For emerging opportunities such as personalised nutrition, research and development rather than commercialisation is likely to characterise near-term spending. Personalised nutrition may grow into a significant opportunity by 2030 or beyond as its efficacy, affordability and accessibility improves.

Sustainable solutions in the form of organic waste conversion and sustainable packaging will increase economic activity in secondary waste markets, deliver benefits across the value chain through new efficiencies, and meet consumer expectations for sustainable and ethical products (Table 1), see page 8. The opportunities have the potential to deliver significant environmental savings for Australia through net reductions in emissions, water and electricity usage, and land impacts.

Important analysis notes

It should be highlighted that 2018 to 2030 estimates of domestic and export opportunities in this report are based on underlying domestic and global demand-side drivers. The opportunity size for exports, where data is limited, also assumes that industry can capture market share of each global opportunity consistent with its historical average market share across food and agribusiness in general.

Opportunity sizes are not necessarily reflective of growth or realised value under business as usual. Attractive growth prospects are likely to attract significant competition overseas. Hence, it is possible that some or much of domestic consumption for each opportunity are met by overseas imports. Likewise, the export opportunity may not be realised if local industry supply does not exist or compete strongly with competition overseas. Conversely, it is also possible that the value captured by local industry exceeds what has been projected in this report. This could occur for instance if demand is greater than otherwise thought, or if Australian industry enjoys an even stronger market share of the opportunity (due to superior product quality, innovation, cost advantages etc.).

Comparing estimates with other public reports should also be undertaken with care as estimates could vary in definitions, scope and methodology selected for each opportunity. Similarly, while efforts were made to keep each opportunity mutually exclusive, estimates in this report should be aggregated with caution due to potential overlap. Finally, net environmental savings estimated in this report are not necessarily exhaustive. It is intended to provide an indication of the positive externalities (in orders of magnitude) that various opportunities may create. See Section 4 for further detail on the methodology and assumptions used in this report.

Table 1: CSIRO Food and Agribusiness Roadmap - Estimated Domestic, Export and Environmental Opportunity by 2030

F&A ROADMAP OPPORTUNITIES	DOMESTIC CONSUMPTION 2030 \$B	EXPORT OPPORTUNITY 2030 \$B	DESCRIPTION
Free-From & Natural	2.6	1.6	Markets include free-from gluten, lactose, allergens, dairy and meat products, as well as organic foods and beverages.
Fortified & Functional	5.5	4.2	Food and beverage products that contain added health ingredients and nutrients for intended nutritional benefits.
Vitamins & Supplements	2.0	3.2	Products to enhance or supplement an individual's dietary or nutritional needs. This includes protein powders, energy boosters and workout products.
Personalised Nutrition	0.6	NA	Technologies that provide bespoke nutrition solutions unique to individual's needs. Examples includes phenotype nutrition diagnostics and personalised nutrition e-tools.
Alternative Proteins	4.1	2.5	Foods that are consumed as substitutes to meat as part of one's diet. Potential products include plant proteins and emerging opportunities such as insect-based ingredients.
Convenience Meals	3.7	1.6	Pre-prepared or frozen packaged meals sold by supermarkets, grocery stores and other home delivery ready meal services.
Luxury & Novel Products	1.1	1.7	Food products purchased at a premium for desired characteristics such as brand, quality or innovation. Examples include luxury wines and high-end truffles.
Agri-tourism ¹⁰	1.9	3.6	Experiences that allow visitors to experience regional Australia and the agribusiness value chain. This includes tours and cuisines at farms, wineries and farm-gates.

F&A ROADMAP OPPORTUNITIES	WHOLESALE REVENUE 2030 ¹¹	ENVIRONMENTAL SAVINGS 2030	DESCRIPTION
Organic Waste Conversion	0.4	0.6	Technologies at the primary production and processing stage that generate useful inputs from organic waste streams. Examples include extraction of nutrients from plant waste.
Sustainable Packaging	0.9	1.7	Packaging materials that have lower emission, resource and ecological impacts than standard packaging materials. Examples include bioplastics and biodegradable packaging.
Alternative Proteins	See table above	5.4	Foods that are consumed as substitutes to meat as part of one's diet. Potential products include plant proteins and emerging opportunities such as insect-based ingredients.

¹⁰ Agri-tourism estimates count expenditure in food, drinks and accommodation. It excludes broader items such as airfares and travel. Please see Section 2.3.3 for additional information and estimates.

¹¹ This refers to the wholesale market value of secondary materials recovered through organic waste conversion and sustainable packaging.

What has changed since the roadmap?

The 2017 roadmap focused largely on high growth opportunities in final goods markets for the Australian food and agribusiness industry. Since the report's release, several trends have gained further interest from industry, governments and consumers, both domestically and globally. These include growth opportunities within Australia's supply chain, investment in food provenance and traceability, and the industry's transition towards the circular economy. While this report focuses on quantifying the opportunities identified in the 2017 roadmap, brief commentary on these trends are summarised below.

Growth in Australia's food supply chain

Rising global food demand should translate to growth opportunities across Australia's food and agribusiness supply chain. Australian business research and development expenditure in agriculture and food product manufacturing for instance has grown from \$406M in 2005-06 to \$723M in 2015-16.¹² Increased demand for personalised nutrition or vitamins may increase business investment in research and product development as industry looks for new innovations to meet changing consumer preferences. Significant growth opportunities are also expected in primary production, noting that the gross value of Australian agricultural commodities produced grew from \$43B in 2007-08 to \$59B in 2017-18.¹³ Growth in global food demand will increase demand for primary production, while demand in high growth markets such as fortified and functional foods may create new demand and applications for raw ingredients. These opportunities will contribute to overall industry growth and provide a source of diversification for the Australian supply chain.

Investment in food provenance and traceability

Food provenance and traceability is expected to become an increasing priority for industry and government over the next few years. Food fraud in the form of product adulteration, substitution, diversion, misrepresentation and/or identify theft will create safety risks to consumers and reputation risk to the Australian industry.¹⁴ The economic cost of food fraud to Australian agri-food exports was estimated at \$2.3B in 2017.¹⁵ This risk will increase with global industry growth. Since product quality, trust and security is critical to Australia's reputation and competitive advantage, industry is likely to invest more heavily in digital and chemical identifier technologies, sensor technologies and distributed ledger technologies over the next 5-10 years to manage risks.¹⁶ Improved food system traceability will help to validate sourcing claims; meet consumer demand for transparency in food production; enhance the ability of government departments and industry to identify, respond and prevent food safety issues; and create opportunities to optimise supply-chains and minimise food loss.¹⁷

Transition towards a circular economy

Economies across the world will have to use their productive resources more effectively and sustainably to manage the risks of climate change, resource scarcity and broader supply chain pressures. Growth opportunities in organic waste conversion and sustainable packaging (as discussed in the roadmap and this report) should attract greater investment as businesses seek better mechanisms to reuse, recycle, reprocess and recover waste and secondary materials for production. It is estimated that achieving circularity could yield \$489B USD in net material cost savings across global packaged food, fresh food and beverages industries annually.¹⁸ Achieving circularity in production would improve environmental productivity through improved utilisation of waste and bi-products.

¹² ABS (2017). 8104.0 - Research and Experimental Development, Businesses, Australia 2015-16.

¹³ ABS (2019). Value of Agricultural Commodities Produced, Australia, 2017-18 (Table 1).

¹⁴ FIAL (2017). Counting the Cost: Lost Australian Food and Wine Export Sales Due to Fraud.

¹⁵ FIAL (2017). Counting the Cost: Lost Australian Food and Wine Export Sales Due to Fraud.

¹⁶ World Economic Forum (2019). Innovation with a Purpose: Improving Traceability in Food Value Chains Through Technology Innovations.

¹⁷ World Economic Forum (2019). Innovation with a Purpose: Improving Traceability in Food Value Chains Through Technology Innovations.

¹⁸ WEF (2014). Towards the Circular Economy: Accelerating the Scale-Up across Global Supply Chains.

2.1 Health and wellbeing products

Health and wellbeing products refer to foods and beverages that provide specific health benefits above and beyond basic nutrition. Products typically target consumers who are health conscious and/or have specific medical/dietary needs.

Demand for health and wellbeing foods and beverages is expected to grow with ageing and growing populations and changing consumer preferences. Australia's population is forecast to grow from 25M persons in 2018 to 38M by 2050 (1.3% per annum),¹⁹ while global population is forecast to grow from 7.6B persons in 2018 to 9.7B by 2050 (0.8% per annum).²⁰ Populations will also experience relatively greater ageing, with the projected number of persons aged 60 years and above expected to grow from 0.9B persons in 2015 to 2.1B persons by 2050 (2.5% per annum).²¹ Consumer preferences for healthy foods and beverages should improve as they become increasingly knowledgeable and conscious of their wellbeing, and as preventative healthcare measures receive increased priority.²²

Today, more than 40% of Australians identify eating fresh fruit and vegetables as a top food priority, and around 24% identify reductions in sugar and fat intake, and eating healthier snacks as top health priorities.²³ Growth in real expenditure per person in health and wellbeing has grown at 1.7% per annum, a strong signal of society's investment and emphasis in health and wellbeing.²⁴ These factors combined reflect consumer appetite and willingness to pay for health and wellbeing products.

¹⁹ ABS (2013). 3222.0 Population Projections, Australia (Series B).

²⁰ United Nations Department of Economic and Social Affairs (2015). World Population Projected to Reach 9.7 Billion by 2050; The World Counts (2018). The Population of the World Today.

²¹ United Nations (2017). Global Issues - Ageing.

²² CSIRO (2018). Future of Health Report.

²³ Australian Institute of Food Safety (2016). Food Safety and Consumer Trends 2016.

²⁴ AIHW (2016). Health expenditure Australia, 2015-16.



However, global demand for Australian health and wellbeing products are also dependent on market and international trade factors, and how local industry fosters its competitive advantage over time. Free trade agreements such as the China-Australia Free Trade Agreement and the Indonesia-Australia Comprehensive Economic Partnership Agreement should support export demand.²⁵ Furthermore, trends towards stricter regulation on international food safety and quality, such as China's restrictions on infant formula,²⁶ should increase barriers to entry and protect the position of high-quality food producers and manufacturers in Australia. However, competitive advantages over the long term will depend on how Australian producers deliver better food safety and quality, nutrition and functional benefits, superior taste and freshness, and convenience relative to international competitors.²⁷

The following sub-sections present market analysis and commentary on the following opportunities:

1. Free-from and natural foods
2. Fortified and functional foods
3. Vitamins and supplements
4. Personalised nutrition

²⁵ Department of Foreign Affairs and Trade (2018). Indonesia-Australia Comprehensive Economic Partnership Agreement: Outcomes.

²⁶ Bloomberg News (2018). China removes 1,400 baby formula products from shelves. Accessed Jul 2018.

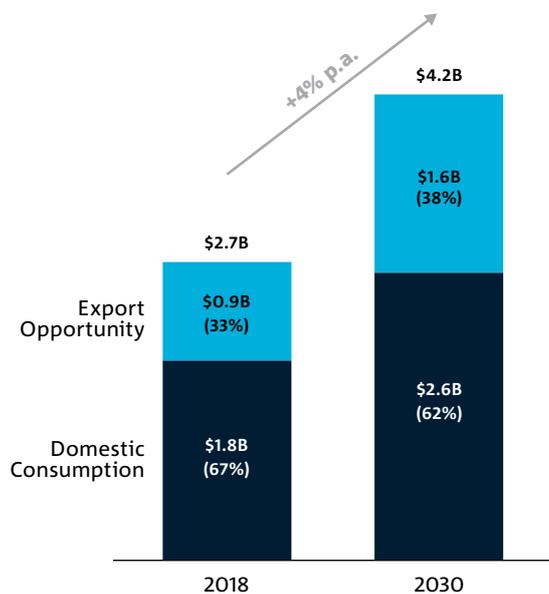
²⁷ CSIRO (2017). Food and Agribusiness Roadmap; Austrade (2018). Food and Beverages to China.

2.1.1 Free-from and natural foods

Free-from foods refer to products that are free from gluten, lactose, allergens, dairy and/or meat; while **natural and organic products** encompass packaged foods and beverages that have been produced, processed and marketed in accordance with international standards and certified as 'organic' by appropriate authorities.

Demand for free-from and natural foods is expected to continue with global population growth and higher rates of food intolerances and avoidance. CSIRO analysis estimates the domestic consumption and export opportunity for free-from and natural foods to reach \$4.2B by 2030 at around 4% per annum growth.²⁸ Key markets include soy milk and milk alternatives, gluten-free bread and lactose-free milk products.²⁹ This reflects changing consumer preferences and dietary requirements, where around 12% of Australians avoid wheat and/or gluten, and dairy/lactose due to intolerances or dietary preferences.³⁰

Demand for alternatives to milk, eggs, peanut, tree nuts, sesame, soy, fish, shellfish and wheat should be strong as 90% of food allergic reactions are attributed to these nine food groups.³¹ Emergence of future products such as natural sweeteners, natural preservatives and tolerable alternatives to lactose, gluten and allergenic free products may also contribute to this growth.³² The rise in demand for natural, sustainable and ethically sourced foods, as well as Australian industry's global reputation for 'clean and green' food,³³ should support growth in this opportunity.



Preferences for naturally, sustainably and ethically sourced foods, and Australia's brand for 'clean-and green' should contribute to demand for Australian free-from and/or natural alternatives.

Incidence of food intolerance and avoidance is on the rise, due in part to population growth. 12% of Australians avoid wheat, gluten, dairy and/or lactose due to intolerances or dietary preferences.

²⁸ CSIRO Futures (2019). See Section 4 for methodology.

²⁹ Euro Monitor (2018). Free-From and Organic Foods and Beverages.

³⁰ CSIRO Health and Biosecurity (2016). CSIRO Healthy Diet Score 2016;

Note also for instance that the rate of food anaphylaxis admissions observed in Australia has also risen from 2 to 8.2 per 100K population between 1998/99 and 2011/12 respectively and reflect the rising prevalence of food allergies. Source: Tang, M., & Mullins, R. (2017). Food allergy: Is prevalence increasing? Internal Medicine Journal, 47(3), 256-261.

³¹ ASCIA (2016). Food allergy, ASCIA Information for Patients, Consumers and Carers.

Broader demand is reflected in rising willingness to pay for free-from and natural foods. A recent study in Australia found that almost 70% of consumers are somewhat or highly willing to pay a premium (20% or more than the average price) for products that contain all natural and/or organic ingredients. Source: Nielsen (2017). Premium Potential: Grocery Categories Pacific Consumers Are Willing to Spend More On.

³² CSIRO (2017). Food and Agribusiness Roadmap.

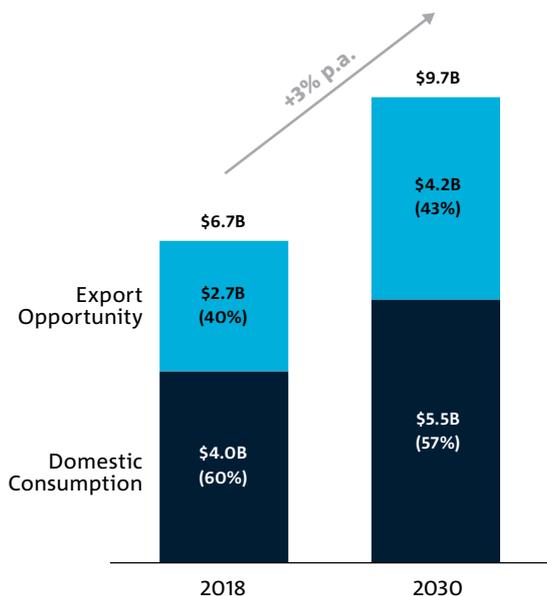
³³ Ibid.

2.1.2 Fortified and functional

Fortified and functional foods refer to packaged food and beverages that contain added health ingredients and/or nutrients, where enhancements are intended to produce a nutritional benefit. Examples include probiotics and omega-3 oils added to yoghurt and milk, and antioxidant rich breads, cereals and beverages.

Market demand for fortified and functional foods is expected to continue with global population growth and changes in consumer preferences. The industry is characterised by a diverse product mix, which range from foods for infant and child development, to nutritious meals for elderly digestive and cardiovascular health. Key segments in the domestic and international market include functional milk formula, fortified breakfast cereals, probiotic yoghurt and sports drinks.³⁴ The domestic consumption opportunity for fortified and functional products is expected to reach \$5.5B by 2030, while the opportunity for exports is expected to reach \$4.2B.³⁵ Lifestyle trends will shape consumer preferences.

Growing interest in sports nutrition and performance for instance has increased demand for whey protein, energy bars and related fortified/functional foods. However, the export opportunity is very much dependent on continued demand from key overseas markets such as fortified milk formula to China and South East Asia. While Chinese consumers value Australia's reputation for quality and food safety,³⁶ Beijing's announcement to increase local production and supply of baby formula may translate to increased competition for Australian industry in the medium term.³⁷ Emerging products such as high protein yoghurts, omega-3 enriched grains and cereals higher resistance starch may create new growth channels for this market over the next few years.³⁸ Product development will also be affected by changes to mandatory and voluntary fortification standards set by domestic and overseas regulatory bodies. For example, Australian millers must fortify wheat flour for bread-making with folic acid to help promote healthy growth and development, particularly in babies during early pregnancy.³⁹



Australia's brand for 'clean and green' should support growth in overseas markets, local industry could face greater competition in key export segments such as fortified infant milk formula.

Lifestyle trends will shape changes in consumer preferences. Growth in demand for sports drinks and whey proteins reflect trends in active living and sports performance.

Global food standards and regulation will influence growth. Changes in mandatory or voluntary requirements to food fortification would affect product and market development.

³⁴ Euro Monitor (2018). Fortified & Functional Foods and Beverages.

³⁵ CSIRO Futures (2019). See Section 4 for methodology.

³⁶ Dairy Australia (2018). Market Brief China – October 2018.

³⁷ Smith, M., and Thomson, J. (2019). China to Wean Middle Classes Off Foreign Infant Formula. The Australia Financial Review.

³⁸ CSIRO (2017). Food and Agribusiness Roadmap.

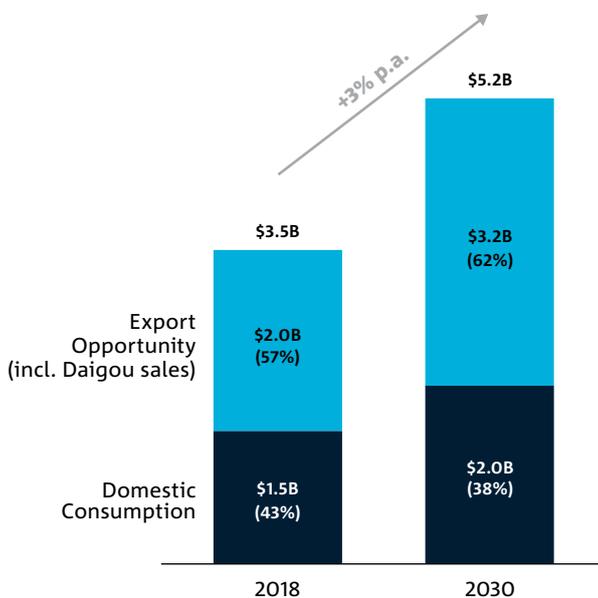
³⁹ FSANZ (2016). Folic Acid Fortification.

2.1.3 Vitamins and supplements

Vitamins and supplements describe manufactured pills, capsules, tablets and/or liquids designed to supplement an individual's dietary or nutritional needs. Examples include health and wellbeing products in the form of pills, oils, tablets and powdered mixes.

Vitamins and supplements are a growing opportunity over the next decade. Consumer health and wellness needs are wide-ranging. Current segments include vitamins and supplements for eye, gut, mobility and joint health, and comes in various forms such as pills, liquids or powdered mixes. CSIRO analysis estimates that the opportunity for vitamins and supplements may reach \$5.2B by 2030 under current growth trends. Estimates are predicated on continued demand for vitamins and health supplements from Asia. Strong demand from China for authentic and safe supplements has led to growth in Australia's 'Daigou' network, where personal shoppers buy on behalf of overseas consumers for resale in their home country.⁴⁰

With more than 40,000 Daigous operating across Australia,⁴¹ how the Chinese government responds to Daigou sales⁴² and how local businesses adapt their retail and e-commerce strategies to global consumers may affect near term growth in this export opportunity. For industry to meet consumer needs and compete effectively with low-cost producers overseas, continued investment in evidence, innovation and product development is important. Similarly, supplement and ingredient provenance and traceability will be important as the risk of product fraud can threaten the health and wellness of consumers, and the reputation of local industry. Policy, regulation and education will also have important roles in guiding consumption and industry growth in vitamins and supplements.



A significant export opportunity if demand from Asia continues, and Australian industry can maintain its leading reputation for quality, safety and efficacy in vitamins and supplements.

Evidence, innovation and traceability is important to industry's competitive advantage as competition with low cost producers and the threat of counterfeit increases.

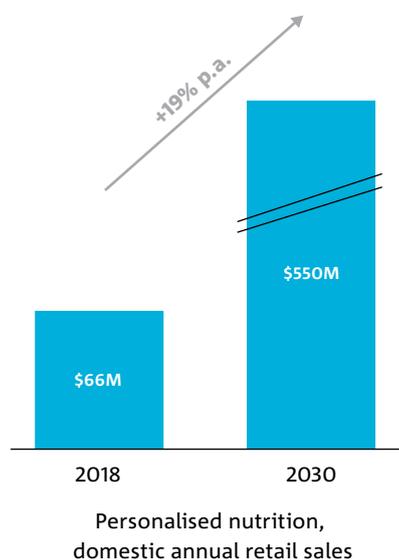
⁴⁰ Bloomberg News (2019). What's 'Daigou' and What's It to Gucci and Beijing?
⁴¹ Nielsen (2017). The Daigou Effect: How Brands Can Breakdown Chinese Borders and Drive Growth.
⁴² Bloomberg News (2019). What's 'Daigou' and What's It to Gucci and Beijing?

2.1.4 Personalised nutrition

Personalised nutrition describes the provision of targeted nutrition related advice, products and services to individuals based on their personal characteristics. Emerging products and services include phenotype, genotype and related diagnostic testing to identify nutritional needs; personalised nutrition e-tools that draw on mobile methods and real time sensor technologies.

Domestic demand for personalised nutrition is expected to gain significant momentum over the next decade.⁴³ While the market for non-personalised nutrition services is expected to grow at 2% per annum, driven largely by growth in population levels and real health expenditure per capita, CSIRO analysis estimates domestic expenditure on personalised nutrition services and solutions to reach \$550M by 2030 as consumer awareness improves and the price of services fall.⁴⁴ As an emerging opportunity, near term investment is likely to focus more on research and development, proof-of-concept and clinical trials than on commercialisation. International research has found that about 30% of consumers have expressed a willingness to pay for personalised nutrition services at an average premium of 50% relative to non-personalised nutrition products and services.⁴⁵

However, current trends in overseas markets suggest that high degrees of product and price differentiation will likely exist to meet the diverse needs of each consumer. For instance, personalised nutrition offerings in the United States range from DIY home-test kits (\$40 USD) to full program suites that combine genetics testing with personalised meal planning and coaching (\$3500 USD p.a.).^{46,47} However, realised growth and market share in Australia will be sensitive to changes in willingness to pay and consumer adoption rates. This includes the rate that Australia imports or develops such technologies.⁴⁸ Other factors include how service providers deliver and market personalised benefits; manage service effectiveness and information control; and manage privacy risk, information intrusiveness and their perceived integrity to consumers.⁴⁹ Estimates in this report are also conservative as it describes expenditure on services and solutions by dietitians, nutritionists and related specialists. Weight-loss programs, gyms and fitness centres, private health insurance providers, grocery stores and specialty stores are also expected to be important channels for personalised nutrition solutions.⁵⁰



Growth will depend on how and when industry develops and commercialises emerging science and innovation, and manages consumer concerns such as data privacy and service effectiveness.

Consumers exhibit high willingness to pay for personalised nutrition. Research found about 30% of consumers were willing to pay a premium for personalised nutrition services over generic nutrition products / services.

Industry is characterised by a high degree of product and price differentiation as businesses try to meet diverse consumer needs. Products may vary from DIY home-test kits to personalised meal planning and coaching programs.

43 CSIRO (2017). Food and Agribusiness Roadmap; CSIRO (2018). Food for Health, Trends and Opportunities in Health and Wellness for the ASEAN Region.
 44 Estimates have also excluded the potential export opportunity due lack of reliable data as an early-stage opportunity. The export potential for DIY home-test kits for example might also be significant over the next decade and beyond. Source: CSIRO Futures (2019). See Section 3 for methodology.
 45 Fischer, A., Berezowska, A., Van der Lans, I., Ronteltap, A., Rankin, A., Kuznesof, S., . . . Frewer, L. (2016). Willingness to pay for personalised nutrition across Europe. *The European Journal of Public Health*, 26(4), 640-644.
 46 LEK (2017). *The Customized Diet: Opportunities in Next-Generation Personalised Nutrition*.
 47 For comparison, standard consultation costs with nutritionists in Australia can vary from \$40 to \$200+ per visit.
 48 For example, CSIRO is developing a kit to predict food preferences based on someone's genes. Source: Noakes, M., Cole, C. (2017). *The future of food*.
 49 Berezowska, A., Fischer, A., Ronteltap, R., Lans, H., & Trijp, A. (2015). Consumer adoption of personalised nutrition services from the perspective of a risk-benefit trade-off. *Genes & Nutrition*, 10(6), 1-14.
 50 LEK (2017). *The Customized Diet: Opportunities in Next-Generation Personalised Nutrition*.

2.2 Sustainable solutions

Sustainable solutions describe environmentally and socially responsible manufacturing processes and products, and the recovery of novel, value-added products from waste streams.

Social, environmental and economic pressures are expected to increase demand for sustainable products and solutions from food and agribusiness industries over the next few decades. Australia generated 67M tonnes of waste in 2016-17, representing an increase of 6% (3.9M tonnes) over an 11-year period.⁵¹ Australia also records a higher material footprint per capita relative to other trade intensive economies such as China and the United States.⁵² This reflects the country's higher use of biomass, construction minerals, fossil fuels and metal ores for economic activities.⁵³ Such trends have increased the threat of climate change, resource scarcity and environmental productivity degradation.

Internationally, governments and intergovernmental agencies are responding to such risks with targets and initiatives to incentivise sustainable solutions. For instance, the United Nation's Sustainable Development Goals has set targets to halve per capita global food waste and substantially reduce waste generation through prevention, reduction, recycling and reuse by 2030.⁵⁴ Countries such as Sweden have since achieved a household recycling rate of 99% and a renewable energy usage rate of 54%.⁵⁵ Likewise, the Australian Government has committed to reductions in waste production, transition towards sustainable packaging and related sustainable solutions.

⁵¹ Department of the Environment and Energy (2018). National Waste Report.

⁵² PNAS (2015). The Material Footprint of Nations.

⁵³ PNAS (2015). The Material Footprint of Nations.

⁵⁴ UN (2018). The Sustainable Development Goals Report 2018.

⁵⁵ Sweden Institute (2018). Sweden Society Facts.





However, the uptake of sustainable solutions in food and agribusiness industries in Australia will depend also on various supply side factors such as the adoption rate of new technologies. Firms are more likely to pursue sustainable solutions if there is clear national or global consumer demand. Improving consumer awareness of and desires to address global challenges such as climate change should contribute supply-side developments. A global survey conducted by Nielsen found that 66% of consumers around the world were willing to pay more for sustainable brands in 2015, compared to 50% of consumers in 2013.⁵⁶ Similarly, industry incentives to adopt and commercialise more sustainable processes should improve if new technologies can provide net benefits and savings to businesses.

This might be in the form of new productivity gains, improved supply chain efficiencies or through increased brand equity due to more environmentally or ethically friendly practices. It should be noted that annual food and beverage capital investment has since fallen from almost \$3.5B in 2007-08 to \$2.9B in 2016-17 in real terms, reflecting tougher trading conditions, economic pressures and industry consolidations underway.⁵⁷

The following sub-sections present market analysis and commentary on the following opportunities:

1. Alternative protein sources
2. Organic waste conversion
3. Sustainable packaging

⁵⁶ Nielsen (2015). The Sustainability Imperative – New Insights on Consumer Expectations.

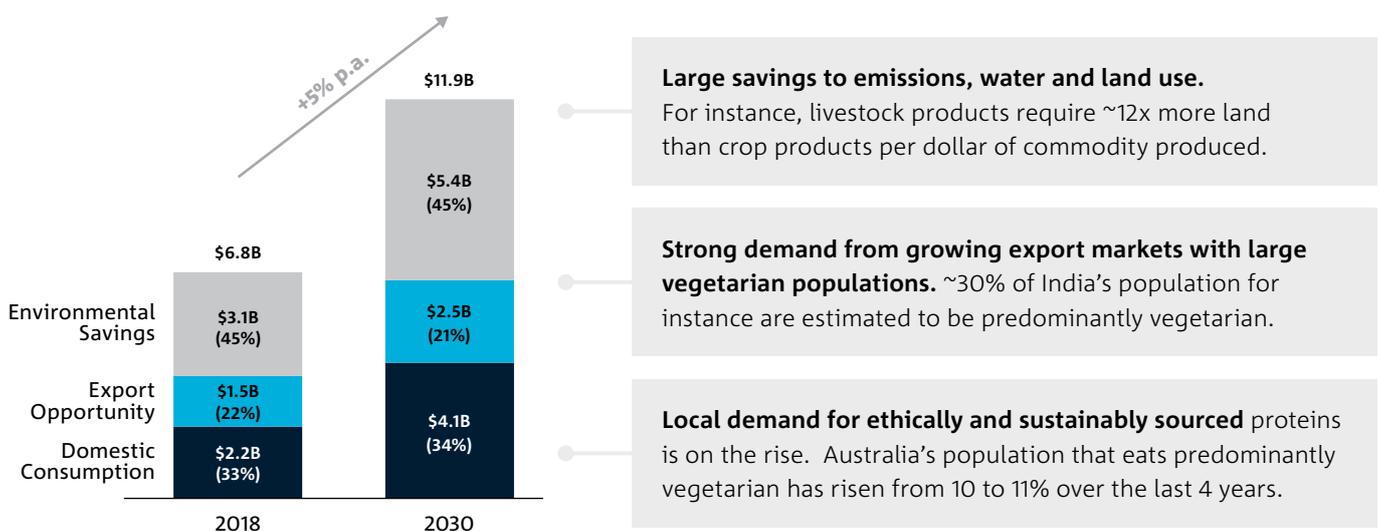
⁵⁷ Australian Food & Grocery Council (2018). State of the Industry 2018 – Resilience through Challenge.

2.2.1 Alternative protein sources

Alternative proteins describe foods that are consumed as substitutes to meat and seafood as part of an individual's diet. This include plant proteins such as soy and pea, hemp seed and ancient grains such as quinoa, and emerging products such as insect-based ingredients and meat products produced in vitro.

Ethical, cultural, religious, environmental and dietary factors are expected to increase consumer demand for alternative protein sources over the next decade. The percentage of Australians that are vegetarian or eat predominantly vegetarian foods has risen from 10% in 2012 to 11% in 2016.^{58, 59} Similarly, other major export partners exhibit significant demand for alternative proteins. For instance, about 30% of India's population are estimated to be vegetarian.⁶⁰ Based on current demographic and consumer trends, CSIRO analysis estimates that the domestic and export opportunity for alternative proteins could reach \$4.1B and \$2.5B respectively by 2030.⁶¹

Research estimates that meat and dairy production accounts for 60% of greenhouse gas emissions produced by agriculture, and that even low-impact meat and dairy products are likely to cause more environmental harm than sustainably farmed vegetables.⁶² CSIRO analysis estimates that consumption of alternative proteins may create an additional \$5.4B in carbon emission and water savings annually by 2030.⁶³ Although not quantified in this report, significant savings in net land use could also be expected from increased consumption of alternative proteins over traditional livestock products. In 2016-17, Australian livestock products required twelve times more land for production than crop products per dollar of commodity produced.⁶⁴ Noting that around half of marginal agricultural land in Australia's intensive use zone can be used profitably for carbon sequestered forests, the Australian National Outlook 2019 identified carbon plantations and farming as a significant environmental and economic opportunity (in the form of sequestration exports) for Australia.⁶⁵ Land use saved through alternative proteins could help to open such opportunities by 2030 or beyond.⁶⁶



58 Roy Morgan (2016). The Slow but Steady Rise of Vegetarianism in Australia.

59 Similar trends are expected across advanced economies globally, where countries in the OECD forecast almost zero growth in meat consumption per capita over the next decade. Source: OECD (2018). Meat Consumption, OECD Data.

60 Based on average of three government surveys, including the National Family Health Survey. Source: Biswas, S. (2018). The Myth of the Indian Vegetarian Nation. BBC News.

61 CSIRO Futures (2019). See Section 4 for methodology. Results are potentially conservative in that estimates might understate demand from a segment of consumers who choose to eat more alternative proteins in place of meat but are not necessarily vegetarian.

62 FIAL (2018). Protein Market: Size of the Prize Analysis for Australia; Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987-992.

63 CSIRO Futures (2019). See Section 4 for methodology.

64 ABS (2018). 4627.0 - Land Management and Farming in Australia, 2016-17; ABS (2018). 7503.0 - Value of Agricultural Commodities Produced, 2016-17.

65 CSIRO (2019). Australia National Outlook 2019.

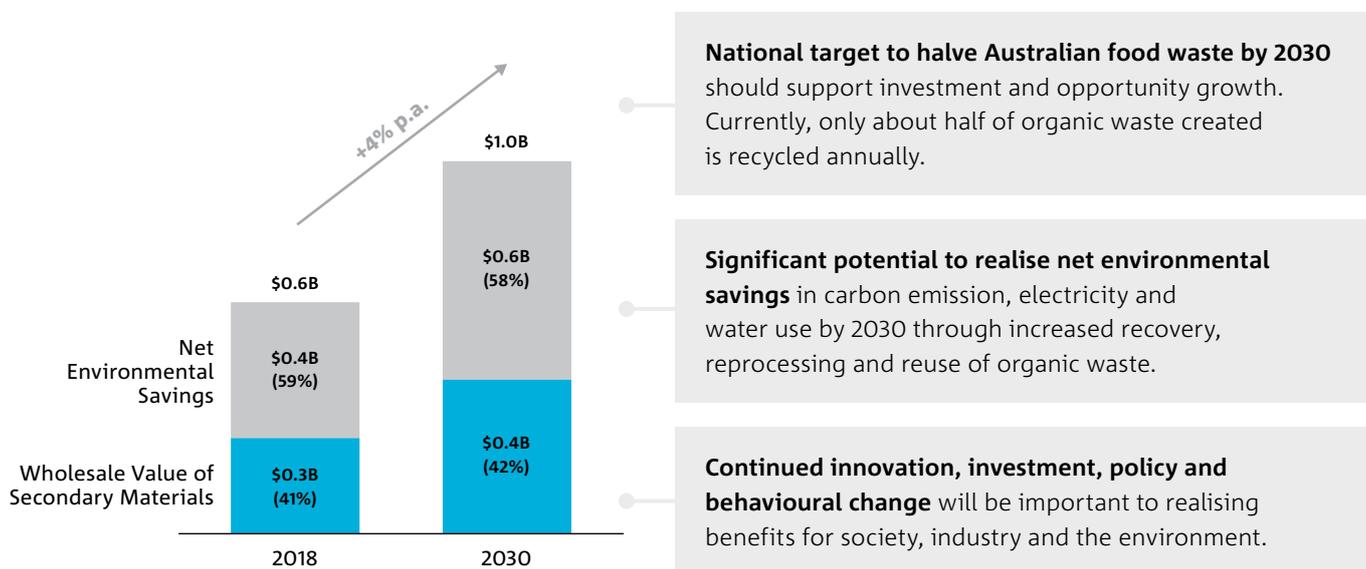
66 This analysis excludes alternative proteins for animal feedstock as well which is a potentially significant opportunity, noting that revenue from agriculture and aquaculture animal feed production was estimated at \$2.1B in 2018. It also excludes long term health benefits (and savings) that consumers might derive from alternative proteins, noting that around 40% of protein consumption today is obtained via processed meats, fast food and confectionaries. Sources: IBISWorld (2018). Farm Animal Feed Production in Australia. Accessed 02/07/2019; CSIRO Health and Biosecurity (2018). Protein Balance, New Concepts for Protein in Weight Management.

2.2.2 Organic waste conversion

Waste conversion describes practices and technologies at the primary production stage and processing stage to generate useful products and inputs from organic waste streams for agriculture and food manufacturing industries. Future products are likely to include higher value uses for crop residue; extraction of nutraceutical ingredients from plant waste; extraction of immunity boosting compounds from bovine blood for use in supplements and fortified ingredients; and closed loop production processes where waste streams are reutilised in other production processes.

Greater adoption of organic waste conversion processes and technologies within the agriculture and food manufacturing industry has potential to generate strong economic and environmental benefits. The Australian agriculture and fisheries currently produce about 16M tonnes of organic waste annually.⁶⁷ While about half of organic waste produced today is recycled, CSIRO analysis estimates that halving landfilled organic waste through conversion by 2030 could recover \$400M in wholesale revenue of secondary materials.⁶⁸

This would contribute to the Australian Government’s National Food Waste Strategy to halve food waste by 2030,⁶⁹ and create annual net carbon emission, electricity and water savings in the range of \$600M by 2030. This analysis also excludes the potential impact on other organic waste producing sectors, noting that municipalities and other commercial and industrial sectors accounted for an additional 13M tonnes of organic waste in 2016-17.⁷⁰ While waste conversion has potential to generate significant economic and environmental benefits, industry adoption rates will depend significantly on technology costs, market developments and behavioural changes. To garner continued investment in waste conversion, new technologies and processes will need to deliver lower costs (and other efficiency and productivity gains) across the waste extraction, processing, transportation and/or related stages.⁷¹ Further development of secondary markets to facilitate business improvements in waste conversion and/or facilitate better trading of recyclable materials might contribute to adoption.⁷² This is also dependent on policy support and expectations from consumers and shareholders to transition behaviour towards more sustainable solutions.



67 Material categories here include food organics, fisheries organics, garden organics, biosolids, manure, timber, bagasse, cotton gin trash and other food-derived wastes. Source: Department of Environment and Energy (2018). National Waste Report 2018.

68 CSIRO Futures (2019). See Section 4 for methodology.

69 Department of Environment (2017). National Food Waste Strategy, Halving Australia’s Food Waste by 2030.

70 Department of Environment and Energy (2018). National Waste Report 2018.

71 Hunt, D. (2018). An Investigation into Waste Management in Australian Production Nurseries; Department of Environment (2017). National Food Waste Strategy, Halving Australia’s Food Waste by 2030.

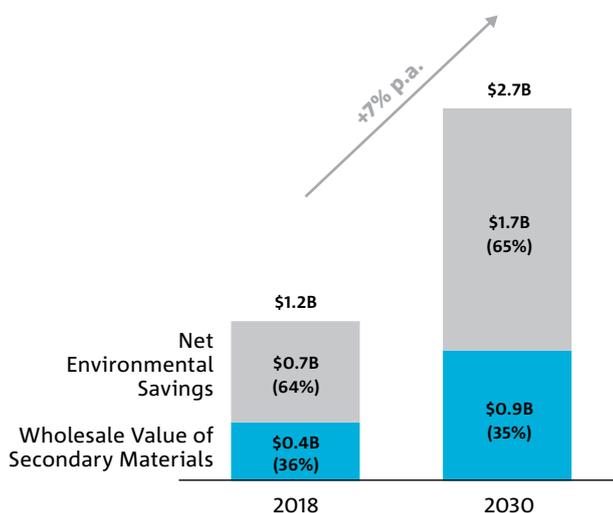
72 Ibid

2.2.3 Sustainable packaging

Sustainable packaging describes the use of packaging materials that have relatively lower emission, resource and ecological impacts than standard or traditional packaging materials. Current and emerging products include bioplastics and biodegradable packaging.

Adoption of sustainable packaging can deliver strong economic and environmental benefits to Australia. The Australian Government announced its commitment to ensure 100% of packaging to be reusable, recyclable or compostable by 2025.⁷³ The plan includes targets to ensure that 70% of plastic packaging is recycled or composted; increase the average recycled content of all packaging by 30% by 2025; and phase out single-use plastic packaging through design, innovation and alternatives.⁷⁴ CSIRO analysis projects that under these targets, Australia could recover \$900M in wholesale revenue of secondary packaging materials and deliver around \$1.7B in net carbon emission, water and energy savings annually by 2030.

Results also exclude potential gains from technological spill over into other waste-generating sectors and improved environmental conditions for global fauna and flora. Only 10% of global plastic packaging produced annually are recycled as secondary materials into similar or lower-value applications.⁷⁵ Industry adoption rates will depend on technology costs, market developments and behavioural changes. For instance, while global production capacities for bioplastics is expected to grow from 2.1M tonnes in 2017 to 2.6M tonnes by 2023 at a growth rate of 3.6% per annum,⁷⁶ it remains small relative to total world plastic production (335M tonnes in 2016).⁷⁷ Current challenges include the limited supply and high prices of raw materials such as liquid biofuels and bio-polymers for production. China and India have also announced in 2017 and 2019 respectively to ban imports on various categories of waste and recyclables.⁷⁸ While other economies such as Malaysia are expected to recapture abandoned waste import markets,⁷⁹ the environmental and economic pressures on advanced economies to adopt sustainable solutions is rising.



A national target to ensure that 100% of packaging is reusable, recyclable or compostable by 2025 should support investment and growth in this opportunity.

Strong potential to realise net environmental savings in carbon emission, electricity and water use through sustainable packaging, as well as benefits in environmental conservation not quantified.

Continued innovation, investment, policy and behavioural change will be important to realising benefits for society, industry and the environment.

73 Waste Management Review (2018). Meeting of Environment Ministers Revives National Waste Policy.

74 Waste Management Review (2018). New National Targets Set Within 2025 Packaging Plan.

75 Ellen Macarthur Foundation (2017). The New Plastics Economy: Rethinking the Future of Plastics & Catalysing Action.

76 European Bioplastics (2017). Bioplastics Market Data.

77 Statista (2019). Global Plastic Production Statistics.

78 World Economic Forum (2017). This is why China is Banning Foreign Waste; Sydney Morning Herald (2019). Australia Faces Deepening Recycling Crisis as India Bans Plastic Waste Imports.

79 Bloomberg (2018). China's Costly Ban on Foreign Trash.

2.3 Premium interactions

Premium interactions describe products and services that attract a premium price due to quality, convenience, luxury or novel attributes. Opportunities explored in this section include convenience foods, luxury and novel products, and agritourism.

Demand for premium goods and services from the food and agribusiness industry should remain strong with continued population growth and growth in consumer real purchasing power. Australia expects real income per capita to increase by 6% between 2018 and 2023.⁸⁰ The Asia-Pacific region expects even higher growth, particularly in China (31%), India (38%), Philippines (26%) and Indonesia (23%).⁸¹ This should support demand for premium products and services. Rock lobster exports for instance have increased by 14% between 2016/17 and 2017/18 to a value of \$772M, and now account for 53% of Australia's total seafood exports.⁸² Likewise, Australian wine exports grew by 20% during the same period, driven by an 11% increase in export

volumes and an 8% increase in average export price.⁸³ Such examples reflect the growing opportunity for premium food experiences and interactions.

Industry competition, various market risks and future investments will affect industry growth over the next few years. Domestic producers in premium food markets should expect greater global competition from producers in the United States, Netherlands, Germany, France, New Zealand, Japan and Canada.⁸⁴ Australia's food import levels have grown from \$12B in 2011/12 to \$18.5B in 2017/18, where wine, whisky, beer and prepared foods accounted for \$4.5B (~25%) of purchases during this period.⁸⁵

⁸⁰ International Monetary Fund (2018). World Economic Outlook.

⁸¹ Ibid.

⁸² Rural Bank (2018). Australian Agricultural Trade Annual Review 2017/18.

⁸³ Ibid.

⁸⁴ Australia China Business Council (2014). Premium Food and Wine Production – Background Paper; World Atlas (2019). Largest Food Exports by Country – Economics; Reuters (2016). Japan's New Recipe for Exports: Feed the World's Foodies.

⁸⁵ Ibid.



Broader market risks may also affect premium foods and experiences in Australia. For instance, an El Niño (periods of sustained warming) is forecast to form in Australia more frequently than it has in the past. This heightens the risk of reduced rainfall, fire danger and extreme weathers;⁸⁶ and is likely to affect yields, prices and consumer demand for Australian food and agribusiness. Growth will depend also on the timing and scale of public and private investment. For instance, Yarra Valley’s development of a \$120M multi-level hotel, which will feature an on-site gin distillery, lavender farm, amphitheatre and provedore, is expected to boost agritourism across the wine region.⁸⁷

Further investment in infrastructure, such as an improved regional road network as part of the \$3.5B Roads of Strategic Importance initiative, should also support the visitor economy.⁸⁸

The following sub-sections present market analysis and commentary on the following opportunities:

1. Convenience without compromise
2. Luxury and novel products
3. Experiences and tourism

⁸⁶ Bureau of Meteorology (2018). El Niño–Southern Oscillation Wrap-Up as at 4 December 2018, Current State of the Pacific and Indian Oceans.

⁸⁷ Australian Trade and Investment Commission (2018). Tourism Investment in Regional Australia.

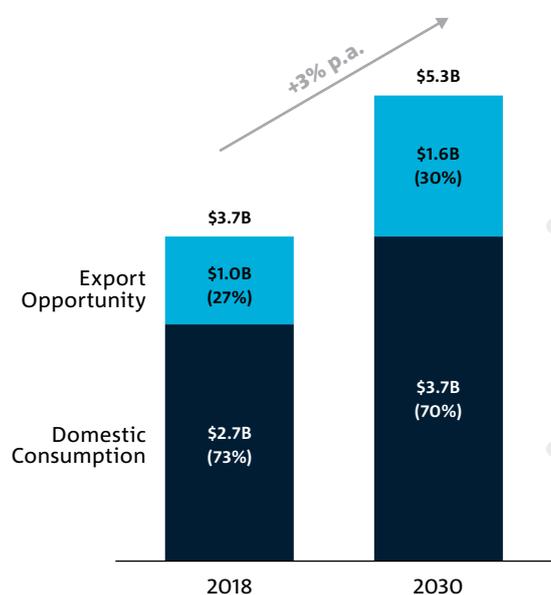
⁸⁸ Department of Infrastructure, Regional Development and Cities (2018). Strengthening Australia’s Cities and Regions, the Australian Government’s 10 Year Investment in Infrastructure.

2.3.1 Convenience without compromise

Convenience without compromise describe pre-prepared, and frozen packaged meals sold by supermarkets, grocery stores and home delivery ready meal services.

Convenience meals has potential for growth in domestic and export markets depending on how consumer preferences and work-life trends change over time. Based on current spending and demographic trends, CSIRO analysis estimates total domestic consumption of prepared and frozen packaged meals to grow from \$2.7B in 2018 to \$3.7B by 2030, and the export opportunity to grow from \$1.0B to \$1.6B during the same period.⁸⁹ Key product segments by market size today include pre-prepared salads, frozen pizza and frozen-ready meals.⁹⁰ However, the sector's outlook will depend on how the prices, quality, convenience and nutrition of convenience meals compare to competing alternatives such as restaurants and fast foods.

While pre-prepared and packaged meals might compete more strongly on price and convenience, growth in affordable food delivery services such as UberEats and Deliveroo might affect consumer behaviour. In 2015-16, the Australian average household weekly expenditure on meals out and fast food (\$80.4 per week) was around 15 times greater than expenditure on packaged prepared meals (\$5.4 per week).⁹¹ More generally, lifestyle trends will affect demand for convenience meals over the longer term. While labour participation rate of countries in the OECD have on average increased over the last few decades,⁹² average annual hours worked per worker has fallen during the same period.⁹³ Such trends are likely to influence consumer eating and purchasing decisions.



Industry's outlook depends on how convenience meals compete on price, taste, convenience and nutrition with alternatives such as fast-foods and local eateries. Australian households currently spend about 15x more on fast-food and meals out than packaged prepared meals.

Work-life trends will affect demand for convenience. For instance, while labour participation rates have increased over the last several decades, average annual hours worked per worker has declined on average for countries in the OECD.

⁸⁹ CSIRO Futures (2019). See Section 4 for methodology.

⁹⁰ Euro Monitor (2018). Ready Packaged Meals.

⁹¹ ABS (2011). Household Expenditure Survey 2009-10; ABS (2018). Household Expenditure Survey 2015-16.

⁹² The average labour force participation rate has increased from 68% in 1980 to 72% in 2018 for countries in the OECD. Source: OECD (2019). Labour Force Participation Rate – OECD Data.

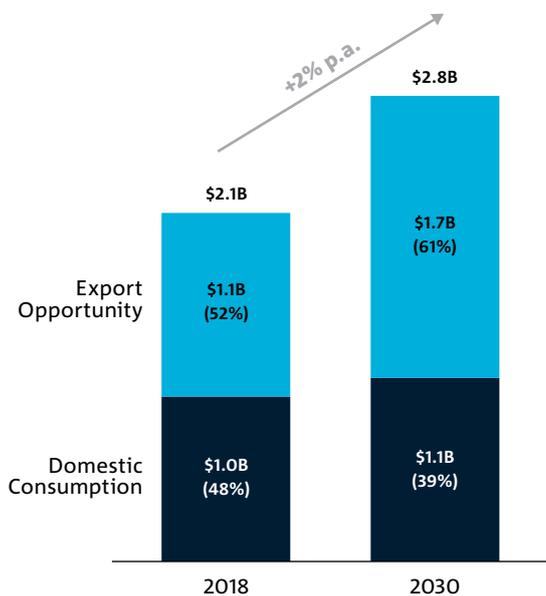
⁹³ The average annual hours worked per worker for countries in the OECD has fallen from 1,896 hours per year in 1980 to 1,746 hours per year in 2018. Source: OECD (2019). Hours Worked – OECD Data.

2.3.2 Luxury and novel products

Luxury and novel products describe foods that consumers purchase at a premium relative to comparable options for desired characteristics or form of differentiation such as brand, quality and/or innovation. Example products include premium items such as luxury wines and high-end truffles, and novelty foods such as miniaturised vegetables or carbonated fruits.

Demand for luxury and novel products is expected continue, driven largely by global markets due to population and real income per capita growth. CSIRO analysis estimates the export opportunity for Australian luxury and novel food products to grow from \$1.1B in 2018 to \$1.7B by 2030. Premium export markets for Australia include premium beef and lamb, counter-seasonal fruit and vegetables, seafood such as rock lobsters and abalone, premium alcohol and products from artisans such as gourmet cheeses and cultured butters.⁹⁴

Success in these markets is dependent on the sector’s reputation for value, high quality, safety and sustainability.⁹⁵ While real wage growth should improve the willingness of Australian consumers to pay for premium food products, historical growth in real expenditure per capita on food and beverages has remained relatively flat, and nearly unchanged as a proportion of household spending over the last five years.⁹⁶ This is attributed in part to growth in industry productivity and competition (i.e. higher quality foods at better prices), and relatively higher growth in expenditure in other household priorities such as education, healthcare and housing.⁹⁷ CSIRO analysis estimates domestic consumption of luxury and novel products to grow from \$1.0B in 2018 to around \$1.1B by 2030 under current demographic and market conditions.⁹⁸



Established luxury markets should position industry for growth. This includes Australian industries in fine wines, premium beef and lamb, and seafoods such as rock lobsters and abalone.

Real income growth, particularly in Asia, is a likely driver of export demand for luxury goods. IMF forecasts China’s real income per capita growth to reach almost 6% p.a. between 2018-2023.

Growth in domestic markets is more conservative as increased income is more likely to go towards education, housing and healthcare expenditure in the medium term.

94 Australian Trade Commission (2015). Premium Food.

95 CSIRO (2017). Food and Agribusiness Roadmap.

96 ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015-16.

97 Ibid

98 CSIRO Futures (2019). See Section 4 for methodology.

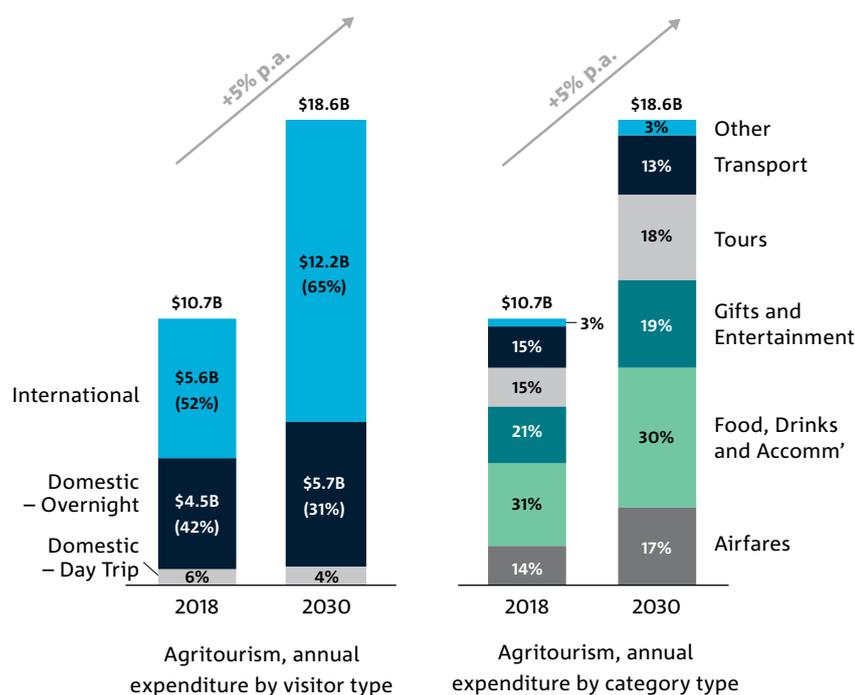
2.3.3 Experiences and tourism

Experiences and tourism, or agritourism, describe experiences and attractions that bring visitors to the regional and rural Australia and provides them with opportunities to experience and interact with elements across the food and agribusiness value chain. Examples include tours and cuisines at farms, wineries, breweries and farm-gates.

Agritourism will be an important growth industry for Australia’s regional and rural economy over the next decade. Domestic day-trip, domestic overnight and international visitors that experienced at least one agriculture related activity contributed around \$9.4B in expenditure to the Australian tourism industry in 2016.⁹⁹ CSIRO analysis estimates the annual opportunity for agri-related tourism, including accommodation, transport and retail sectors, to reach around \$18.6B by 2030.¹⁰⁰ Focusing on expenditure for food, drinks and accommodation (which most closely align with the food and agribusiness industry), the annual opportunity

is expected to reach \$5.6B by 2030, including \$3.6B spent by international visitors (export opportunity) and \$1.9B spent by domestic (day trip and overnight) visitors (domestic consumption opportunity).

International visitor demand is expected to drive the majority of this growth, with visitors from China, United States, United Kingdom, New Zealand, Japan and India expected to account for more than 60% of international expenditure by 2030.¹⁰¹ Only 4% of China’s population were estimated to own passports in 2015,¹⁰² but this figure is expected to reach 12% by 2025, resulting in a boom of outbound visitors.¹⁰³ Agri-tourism growth in Australia however will also depend on how existing regional barriers such as labour shortages and infrastructure quality (e.g. roads, signage, blackspots etc.) are addressed.¹⁰⁴ The threat of climate change, extreme weather events and natural disasters such as drought, bushfires and cyclones will also pose long term risks both to demand and supply of agritourism.¹⁰⁵



International visitors is expected to drive growth, particularly with rising income levels from China and India. Domestic spending would increase if more visitors stay overnight.

Agri-tourism should promote cross-industry growth. This includes accommodation, transport and retail sectors, valued collectively at \$18.6B by 2030.

Regional challenges may affect growth if unaddressed. This include labour shortages, infrastructure quality and environmental risks.

99 CSIRO Futures (2019). See Section 4 for methodology.

100 Ibid.

101 Tourism Research Australia (2017). Tourism Forecasts.

102 Goldman Sachs (2015). The Asian Consumer – The Chinese Tourist Boom.

103 Ibid.

104 Ecker, S., & Australia. Bureau of Agricultural Resource Economics Sciences. (2010). Drivers of regional agritourism and food tourism in Australia. Canberra, A.C.T.: ABARE-BRS.

105 Ibid.





3 Further reading

For additional research on the current state and outlook of the Australian food and agribusiness industry, this report recommends the following papers for further reading:

Industry outlook

- Australian Academy of Science. (2017). Decadal Plan for Australian Agricultural Sciences (2017-2026). Accessed at <<https://www.science.org.au/files/userfiles/support/reports-and-plans/2017/agricultural-decadal-plan-2017-26.pdf>>
- Australian Bureau of Agricultural and Resource Economics and Sciences. (2018). Food Demand in Australia: Trends and Issues 2018. Accessed at <<http://www.agriculture.gov.au/abares/research-topics/food-demand/trends-and-issues-2018>>
- Department of Agriculture, Fisheries and Forestry (2012). Food Demand to 2050, Opportunities for Australian Agriculture. Accessed at <[http://www.agriculture.gov.au/SiteCollection Documents/abares/publications/Outlook2012FoodDemand2050.pdf](http://www.agriculture.gov.au/SiteCollectionDocuments/abares/publications/Outlook2012FoodDemand2050.pdf)>
- Australian Bureau of Statistics. (2018). Household Expenditure Survey, Australia. Summary of Results, 2015-16. Accessed at <<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/6530.0Media%20Release22015-16>>
- Australian Food & Grocery Council. (2018). State of the Industry 2018 – Resilience through Challenge. Accessed at <<https://www.afgc.org.au/wp-content/uploads/AFGC-State-of-the-Industry-2018-Report.pdf>>
- Australian Trade and Investment Commission. (2017). Investment Opportunities in Australian Agribusiness and Food. Accessed at <<https://www.austrade.gov.au/ArticleDocuments/2800/Investment-opportunities-in-Australian-agribusiness-and-food.pdf.aspx>>
- Australian Trade and Investment Commission. (2018). Food and Beverage – Industry Capability Statements. Accessed at <<https://www.austrade.gov.au/International/Buy/Australian-industry-capabilities/Food-and-Beverage>>
- CSIRO. (2017). Food and Agribusiness – A Roadmap for Unlocking Value-Adding Growth Opportunities for Australia. Accessed at <<https://www.csiro.au/en/Do-business/Futures/Reports/Food-and-Agribusiness-Roadmap>>
- Food and Agriculture Organisation of the United Nations (2017). The Future of Food and Agriculture – Trends and Challenges. Accessed at <<http://www.fao.org/3/a-i6583e.pdf>>
- Food Innovation Australia Limited. (2017). Size of the Prize: An Overview of 16 Opportunities for Australian Food & Agribusinesses. Accessed at <<https://fial.com.au/size-of-the-prize-report>>
- Rural Bank. (2018). Australian Agricultural Trade Annual Review 2017/18. Accessed at <<https://www.ruralbank.com.au/assets/responsive/pdf/publications/trade-report-2018.pdf>>

Health and wellbeing

- Australian Institute of Health and Welfare. (2017). Health Expenditure Australia 2015-16. Accessed at <<https://www.aihw.gov.au/getmedia/3a34cf2c-c715-43a8-be44-0cf53349fd9d/20592.pdf.aspx?inline=true>>
- CSIRO. (2018). Future of Health – Shifting Australia’s Focus from Illness Treatment to Health and Wellbeing Management. Accessed at <<https://www.csiro.au/en/Showcase/futureofhealth>>
- CSIRO and KPMG. (2018). Food for Health – Trends and Opportunities in Health and Wellness for the ASEAN Region. Accessed at <<https://assets.kpmg.com/content/dam/kpmg/au/pdf/2018/food-for-health-trends-asean-region-csiro-kpmg.pdf>>

Sustainable solutions

- Commonwealth of Australia. (2017). National Food Waste Strategy: Halving Australia's Food Waste by 2030. Accessed at <<http://www.environment.gov.au/protection/waste-resource-recovery/publications/national-food-waste-strategy>>
- Department of Environment and Energy. (2019). National Food Waste Baseline, Final Assessment Report. Accessed at <<https://www.environment.gov.au/system/files/pages/25e36a8c-3a9c-487c-a9cb-66ec15ba61d0/files/national-food-waste-baseline-executive-summary.pdf>>
- Department of the Environment and Energy. (2018). National Waste Report 2018. Accessed at <<http://www.environment.gov.au/system/files/resources/7381c1de-31d0-429b-912c-91a6dbc83af7/files/national-waste-report-2018.pdf>>
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- Food Innovation Australia Limited. (2018). Food Waste Report. Accessed at <https://fial.com.au/Article?Action=View&Article_id=217>
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- Australian Trade and Investment Commission. (2017). Tourism Forecasts. Accessed at <<https://www.tra.gov.au/ArticleDocuments/257/Tourism%20Forecasts.pdf.aspx?Embed=Y>>
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4 Methodology

CSIRO Futures conducted desktop research, economic analysis and consultations with industry experts to value the opportunities presented in this report:

1. **Desktop research** was first undertaken to better understand the economic drivers of growth and potential impact for each of the opportunities identified in the roadmap. Recommended reports for further reading are summarised in Section 3.
2. **Economic analysis** was undertaken to quantify each the roadmap opportunities.¹⁰⁶ Data and assumptions were developed and drawn from a variety of sources such as the Australian Bureau of Statistics and Australian Institute of Health and Welfare. A high-level approach to estimations is generalised as follows:
 - a. **Domestic consumption** = Average price x Number of Australian consumers x Projected growth
 - b. **Export opportunity** = World export volumes x Australia's market share x Projected growth
 - c. **Environmental benefits** = Net emission, water and electricity savings from consumption (or recovery) relative to the alternative x Expected growth in consumption
3. **Consultations** were held with research scientists and industry experts across *CSIRO's Agriculture and Food* business unit to refine the methods and parameters. Feedback and revisions were incorporated into the final valuations presented in this report.

The valuations presented provide an indication on the magnitude and direction of each opportunity. However, it is important to acknowledge that results are characterised by high degrees of uncertainty and are sensitive to changes in industry conditions. The following sub-sections provide a summary of the methodology, parameters and sources used to value the growth or impact of each of the opportunities explored in this report.¹⁰⁷

¹⁰⁶ General details on cost benefit analysis approaches and principles can be found at CSIRO's Impact Evaluation Guide, available at https://www.csiro.au/~media/About/Files/Our-impact-framework/CSIROImpactEvaluationGuide_Nov2015_WEB.pdf?la=en&hash=B351D24FB3CE02CB34FB859F2C34AA3940EE6D1F

¹⁰⁷ Please note that the assumption values presented may not match the report results exactly due to rounding differences. Final numbers are also reported in 2018 prices with adjustments made for inflation where appropriate.

Figure 2 estimates

Total food and agribusiness opportunities = $A \times (1+B)$

PARAMETERS		VALUE
A	Australian domestic household consumption of food, beverages and alcohol ¹⁰⁸	\$135B in 2018
	Australian food and agribusiness exports ¹⁰⁹	\$52B in 2018
B	Forecast growth in domestic household consumption of food, beverages and alcohol ¹¹⁰	2.3% per annum
	Forecast growth in total food and agribusiness exports ¹¹¹	2.8% per annum

CSIRO roadmap opportunities = A

PARAMETERS		VALUE
A	Sum domestic and export opportunities analysed in this report ¹¹²	\$25B by 2030

¹⁰⁸ Based on the average weekly expenditure of Australian households on food, beverages and alcohol in 2016. 2018 estimates are based on an assumed 3.9% per annum growth between 2016 and 2018 in nominal terms. For context, total Australia household expenditure in food and beverages has grown historically at 3% per annum between 2019-10 and 2015-16, and at 4.9% per annum between 2003-04 and 2015-16. Source: ABS (2017). 6530.0 - Household Expenditure Survey, Australia: Summary of Results, 2015-16. See Table 1.1 and 1.2.

¹⁰⁹ DFAT (2019). Australia's Merchandise Exports and Imports Country and Commodity Pivot Table. 2005-06 to 2017-18. October 2018 data.

¹¹⁰ Based on historical household consumption growth in food, beverages and alcohol between 2003-04 and 2015-16 at 4.9% per annum with adjustments for inflation (2.6% per annum). Sources: ABS (2017). 6530.0 - Household Expenditure Survey, Australia: Summary of Results, 2015-16. See Table 1.1 and 1.2. IMF (2019). World Economic Outlook 2019. Between 2.1% and 2.8% per annum between 2019 and 2024.

¹¹¹ Based on historical export growth of Australian food and agribusiness products between 2012-13 and 2017-18 at 5.4% per annum with adjustments for inflation (2.6% per annum). Sources: DFAT (2019). Australia's Merchandise Exports and Imports Country and Commodity Pivot Table. 2005-06 to 2017-18. October 2018 data. IMF (2019). World Economic Outlook 2019. Between 2.1% and 2.8% per annum between 2019 and 2024.

¹¹² Estimates exclude sustainable packaging, waste conversion and tourism from international visitors to improve the comparability of numbers to total domestic consumption and export estimates. The summation is further discounted by 30% to account for potential overlap in product and market definitions.

Free-from and natural foods

Annual domestic consumption = $A \times (1+B)$

PARAMETERS ¹¹³		VALUE
A	Retail sales of free-from and organic foods and beverages, 2018	\$1.8B
B	Forecast annual growth in retail sales ¹¹⁴	3.1%

Annual export opportunity = $A \times (1 + B) \times C \times D \times E$

PARAMETERS		VALUE
A	Global market for free-from and organic foods and beverages ¹¹⁵	\$102B USD
B	Annual growth in global market for free-from and organic foods ¹¹⁶	4.6% per annum
C	Export share of global market ¹¹⁷	31%
D	USD to AUD ¹¹⁸	1.4
E	Australia's market share of food & agribusiness exports ¹¹⁹	2.1%

¹¹³ Euro Monitor International (2018). Free-From and Organic Foods and Beverages – Australia.

¹¹⁴ Growth is forecast at the average of Euromonitor Australian growth estimates and IMF forecasts for Australian real GDP growth between 2018-23. Growth is forecast at Australian real GDP growth from 2024 onward (2.6% p.a.). Source: Euromonitor International (2018). Free-From Food, Organic Foods and Beverages; IMF (2019). World Economic Outlook 2018-2024.

¹¹⁵ Euro Monitor International (2018). Free-From and Organic Foods and Beverages – Global

¹¹⁶ Growth is forecast at the average of Euromonitor global growth estimates and IMF forecasts for world real GDP growth between 2018-23. Growth is forecast at world real GDP growth from 2024 onward (3.7% p.a.). Source: Euromonitor International (2018). Free-From Food, Organic Foods and Beverages; IMF (2019). World Economic Outlook 2018-2024.

¹¹⁷ Based on the 5-year average of global exports as a percentage of global gross domestic product. Source: World Bank (2019). World Bank National Accounts Data and OECD National Accounts Data.

¹¹⁸ XE Corporation (2019). Live Market Rates, USD to AUD. Accessed on 2019-02-27.

¹¹⁹ Based on 2018 trade statistics. Sources: Department of Foreign Affairs and Trade (2018). Australia's Merchandise Exports and Imports; UNCTAD (2018). Merchandise Trade Matrix by Export Products and Groups; ABARES (2012). Food Demand to 2050: Opportunities for Australian Agriculture.

Vitamins and supplements, and fortified and functional foods

Annual domestic consumption = A × (1+B)

PARAMETERS		VITAMINS & SUPPLEMENTS	FORTIFIED & FUNCTIONAL FOODS
A	Australian consumption of nutraceuticals in 2018 ¹²⁰	\$1.5B	\$4.0B
B	Annual real growth in Australian consumption of nutraceuticals ¹²¹	2018-23: 3.3% 2023-30: 2.6%	2018-23: 2.6% 2023-30: 2.6%

Annual export opportunity = A × (1+B)

PARAMETERS		VITAMINS & SUPPLEMENTS	FORTIFIED & FUNCTIONAL FOODS
A	Australian exports of nutraceuticals in 2018 (incl. Daigou sales) ¹²²	\$2.0B	\$2.7B
B	Annual real growth in global market for nutraceuticals ¹²³	2018-23: 4.4% 2023-30: 3.7%	2018-23: 4.0% 2023-30: 3.7%

¹²⁰ Sourced from Euromonitor Statistics and IBISWorld. Sales estimates include vitamins, supplements, and fortified / functional foods and beverages. This includes sport nutrition and herbal/traditional related products. Adjustments were made downwards to account for potential exports through Daigou channels.

¹²¹ Growth is forecast at the average of Euromonitor Australian growth estimates and IMF forecasts for Australian real GDP growth between 2018-23. Growth is forecast at Australian real GDP growth from 2024 onward (2.6% p.a.). Source: Euromonitor International (2018). Vitamins and Dietary Supplements, Herbal & Traditional Products, Sports Nutrition, and Fortified and Functional Foods; IMF (2019). World Economic Outlook 2018-2024.

¹²² Triangulated from Euromonitor global consumption data for nutraceuticals, annual reports of ASX-listed nutraceutical companies, and Australia's historical market share of food and agribusiness exports (UNCTAD and DFAT databases). Adjustments from domestic consumption were made to account for exports through Daigou sales as well.

¹²³ Growth is forecast at the average of Euromonitor global industry forecasts and IMF forecasts for world real GDP growth (3.7% p.a.) between 2018-23. Growth from 2024 onward converges to forecast world real GDP growth at 3.7% p.a. Sources: Euromonitor International (2018). Vitamins and Dietary Supplements, Herbal & Traditional Products, Sports Nutrition, and Fortified and Functional Foods; IMF (2019). World Economic Outlook 2018-2024; Department of Foreign Affairs and Trade (2018). Australia's Merchandise Exports and Imports; UNCTAD (2018). Merchandise Trade Matrix by Export Products and Groups; ABARES (2012). Food Demand to 2050: Opportunities for Australian Agriculture.

Personalised nutrition

Annual domestic consumption = $A \times B \times C \times (1+D) \times (1+E)$

PARAMETERS		VALUE
A	Annual estimated health expenditure on dietitians and nutritionists: [Total annual health expenditure in Australia ¹²⁴] x [Percentage of health service usage with dietitians and nutritionists] ¹²⁵	\$54B AUD in 2016-17 2.5%
B	Consumer willingness to pay for personalised nutrition relative to non-personalised nutrition: [Percentage of consumers willing to pay for personalised nutrition] x [Average premium that consumers are willing to pay for personalised nutrition]	30% of population ¹²⁶ 45% premium ¹²⁷
C	Technology adoption rate	60% adoption by 2030 ¹²⁸
D	Annual growth in Australian population levels	1.5% ¹²⁹
E	Annual growth in real health expenditure per capita	1.7% ¹³⁰

124 Estimate excludes expenditure on hospitals, dental services, pharmaceuticals, transport services and research. Source: AIHW (2018). Health Expenditure Australia 2016-17, Supplementary Tables and Figures, Table A6.

125 ABS (2017). National Health Survey: Health Service Usage and Health Related Actions, Australia, 2014–15.

126 Fischer, A., Berezowska, A., Van der Lans, I., Ronteltap, A., Rankin, A., Kuznesof, S., . . . Frewer, L. (2016). Willingness to pay for personalised nutrition across Europe. *The European Journal of Public Health*, 26(4), 640-644.

127 Fischer, A., Berezowska, A., Van der Lans, I., Ronteltap, A., Rankin, A., Kuznesof, S., . . . Frewer, L. (2016). Willingness to pay for personalised nutrition across Europe. *The European Journal of Public Health*, 26(4), 640-644.

128 Prior research from CSIRO and KPMG anticipate general consumer demand for personalised nutrition (e.g. DNA testing, microbiome testing, diagnostic kits, etc.) to gain momentum in 5+ years as service awareness, affordability and accessibility improves. Source: KPMG & CSIRO (2018). *Food for Health, Trends and Opportunities in Health and Wellness for the ASEAN Region*.

129 ABS (2018). 3222.0 - Population Projections, Australia, 2012 to 2101 (Series B).

130 AIHW (2016). Health expenditure Australia, 2015-16.

Alternative protein sources

Domestic consumption = $A \times B \times D \times (1+E) \times (1+F)$

Net environmental savings = $A \times B \times (1+E) \times (1+F) \times G \times H$

PARAMETERS		VALUE
A	Australian population level in 2016 ¹³¹	24M
B	Estimated proportion of population that eat predominantly vegetarian in 2016 ¹³²	11%
C	Annual average expenditure per capita on meat and seafood in 2016 ¹³³	\$645
D	Annual average expenditure per predominantly vegetarian person on alternative protein sources in 2016 ¹³⁴	\$725
E	Annual projected population growth ¹³⁵	1.5%
F	Annual projected growth in population proportion that eat predominantly vegetarian ¹³⁶	3.7%
G	Annual net savings per person from alternative protein consumption to: ¹³⁷	
	Carbon footprint	0.54 TCO2e
	Water footprint	280kL
H	Value of environmental and resource savings (2018 prices)	
	Average carbon price ¹³⁸	\$77.4 / TCO2e
	Average water price ¹³⁹	\$2.1 / kL

Export opportunity = $A \times (1+B) \times (C / (1 - C))$

Net environmental savings = export opportunity x D

PARAMETERS		VALUE
A	Australia meat & seafood exports ¹⁴⁰	\$14.3 B
B	Global annual growth in meat demand ¹⁴¹	1.5%
C	Percentage of world population that eat predominantly vegetarian ¹⁴²	9% in 2016, 12% by 2030
D	Net environmental savings per dollar of alternative protein consumed ¹⁴³	0.83

131 ABS (2018). Australian Demographic Statistics, Jun 2018.

132 Roy Morgan (2016). The Slow but Steady Rise of Vegetarianism in Australia.

133 ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16.

134 This analysis estimates the per capita spend on alternative protein sources as the average budget an individual would allocate to meat or seafood if he/she did not eat predominantly vegetarian. This estimate is derived from the following formula: $D = C / (1 - B)$. This adjustment is required because ABS estimates for meat and seafood expenditure per capita counts the proportion of Australia's population that eats predominantly vegetarian as well.

135 ABS (2018). 3222.0 - Population Projections, Australia, 2012 (base) to 2101.

136 Roy Morgan (2016). The Slow but Steady Rise of Vegetarianism in Australia.

137 Rosi, A., Mena, P., Pellegrini, N., Turrioni, S., Neviani, E., Ferrocino, I., . . . Scazzina, F. (2017). Environmental Impact of Omnivorous, Ovo-Lacto-Vegetarian, and Vegan Diet. Scientific Reports (Nature Publisher Group), 7(1), 1-9.

138 Department of Environment and Heritage Protection (2017). Global Carbon Offset Markets Analysis.

139 Team Poly (2017). Water Prices in Australia.

140 Department of Foreign Affairs and Trade (2018). Australia's Merchandise Exports and Imports.

141 OECD, FAO (2016). OECD-FAO Agricultural Outlook 2016-2025.

142 Weighted by destination share of Australian exports in 2017. Sources: Various.

143 Based on the ratio of net environmental savings to domestic consumption calculated in the previous table.

Organic waste conversion

Wholesale revenue from organic secondary materials = $A \times (1+B) \times (C+D) \times E$

Net environmental savings from organic waste conversion = $A \times (1+B) \times (C+D) \times (F \times G)$

PARAMETERS		VALUE
A	Organic waste generated from agriculture and fisheries ¹⁴⁴	16.2MT per annum
B	Annual growth in organic waste generation ¹⁴⁵	0.8% per annum
C	Organic waste recycling rate ¹⁴⁶	52%
D	Waste conversion uplift ¹⁴⁷	+24% by 2030
E	Wholesale value of recycled organics ¹⁴⁸	\$31/T in 2018
F	Net savings from recycling of organic waste: ¹⁴⁹	
	Greenhouse gas emissions	0.4 TCO ₂ e/T
	Cumulative energy demand	0.9 GJ LHV/T
	Water use	0.6 kL/T
G	Value of environmental savings	
	Average carbon price ¹⁵⁰	\$73.7/TCO ₂ e
	Average wholesale electricity spot prices ¹⁵¹	\$16.2/GJ LHV
	Average water price ¹⁵²	\$2.2/kL

¹⁴⁴ Department of Environment and Energy (2018). National Waste Report 2018.

¹⁴⁵ Based on the average of historical organic waste generation growth (~0.2%) and forecast population growth between 2018 and 2030. Source: Department of Environment and Energy (2018). National Waste Report 2018; ABS (2018). 3222.0 - Population Projections, Australia, 2012 (base) to 2101.

¹⁴⁶ Department of Environment and Energy (2018). National Waste Report 2018.

¹⁴⁷ Department of Environment and Energy (2017). National Food Waste Strategy.

¹⁴⁸ Sourced from historical sales data from Victoria with adjustments for inflation. Source: Sustainability Victoria (2013). Recycled Organics Market Analysis.

¹⁴⁹ Department of Environment, Climate Change and Water NSW (2010). Environmental Benefits of Recycling; Grant, T. a. (2005). Life Cycle Impact Data for Resource Recovery from C&I and C&D Waste in Victoria. RMIT University Centre for Design.

¹⁵⁰ Non-plastic includes paperboard, aluminium, glass & steel. Source: Department of Environment and Heritage Protection (2017). Global Carbon Offset Markets Analysis.

¹⁵¹ AER (2018). Annual Volume Weighted Average Spot Prices, Wholesale Markets.

¹⁵² Team Poly (2017). Water Prices in Australia.

Sustainable packaging

Wholesale revenue from secondary materials = $A \times (1+B) \times C \times (D \text{ to } E) \times F$

Net environmental savings = $A \times (1+B) \times C \times (D \text{ or } E) \times (G \times H)$

PARAMETERS		VALUE
A	Total packaging waste – 2016 estimate ¹⁵³	0.85MT plastics, 4.2MT non-plastic
B	Annual growth in packaging consumption ¹⁵⁴	1.6% per annum
C	Packaging waste related to food and agribusiness ¹⁵⁵	68%
D	Packaging recycling rate ¹⁵⁶	31% for plastics 65% for non-plastic
E	Sustainable packaging uplift target ¹⁵⁷	100% recovery rate by 2025
F	Average price paid for plastic recyclables ¹⁵⁸ Average price paid for non-plastic recyclables ¹⁵⁹	\$448 AUD/T in 2018 \$174 AUD/T in 2018
G	Net savings from recycling waste: ¹⁶⁰ Greenhouse gas emissions - paper packaging, plastic packaging Cumulative energy demand - paper packaging, plastic packaging Water use - paper packaging, plastic packaging	0.6, 1.5 TCO ₂ e/T 10.8, 56.3 GJ LHV/T 28.3, 8.5 kL/T
H	Value of environmental savings Average carbon price ¹⁶¹ Average wholesale electricity spot prices ¹⁶² Average water price ¹⁶³	\$73.7/TCO ₂ e \$16.2/GJ LHV \$2.2/kL

153 National Packaging Covenant Industry Association (2017). National Recycling and Recovery Survey (NRRS) 2015–16 for Plastics Packaging.

154 Calculation from historical data available between 2011 and 2016.

155 Environmental Enterprises. Sustainable Food Packaging for Our Future. Accessed Nov 2018.

156 National Packaging Covenant Industry Association (2017). National Recycling and Recovery Survey (NRRS) 2015–16 for Plastics Packaging.

157 ACPO (2018). Australia's environment ministers commit to eliminating all packaging going to landfill by 2025.

158 KS Environmental Group (2018). Recycling Commodity Prices: The China Effect.

159 European Union Statistics (2018). Material Prices for Recyclates.

160 Department of Environment, Climate Change and Water NSW (2010). Environmental Benefits of Recycling; Grant, T. a. (2005). Life Cycle Impact Data for Resource Recovery from C&I and C&D Waste in Victoria. RMIT University Centre for Design.

161 Department of Environment and Heritage Protection (2017). Global Carbon Offset Markets Analysis.

162 AER (2018). Annual Volume Weighted Average Spot Prices, Wholesale Markets.

163 Team Poly (2017). Water Prices in Australia.

Luxury and novel products

Domestic consumption = $A \times B \times (1 + C) \times D \times (1 + E)$

PARAMETERS		VALUE
A	Average annual expenditure per capita on food, beverage and alcohol ¹⁶⁴	\$108 per week x 52
B	Average percentage of household expenditure on food, beverages and alcohol that are luxury-typed ¹⁶⁵	0.7%
C	Annual real growth in expenditure per capita on food, beverage and alcohol ¹⁶⁶	0%
D	Australian population level ¹⁶⁷	24M in 2016
E	Annual projected population growth ¹⁶⁸	1.5%

Export opportunity = $A \times (1 + B) \times C \times D \times E$

PARAMETERS		VALUE
A	Global market for luxury and novel foods ¹⁶⁹	\$84B GBP in 2016
B	Annual real growth in global market for luxury and novel foods ¹⁷⁰	~3.9% per annum
C	Export share of global market ¹⁷¹	31%
D	GBP to AUD ¹⁷²	1.8
E	Australia's market share of exports ¹⁷³	2.1%

164 ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16. Adjustments for inflation were made to calculate expenditure in 2018 prices.

165 Bain & Company (2018). Altgamma 2018 - Worldwide Luxury Market Monitor; Nielsen (2017). Premium Potential: Grocery Categories Pacific Consumers are Willing to Spend More On; Palermo, C., McCartan, J., Kleve, S., Sinha, K., and Shiell, A. (2016). A Longitudinal Study of the Cost of Food in Victoria Influenced by Geography and Nutritional Quality.

166 ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16.

167 ABS (2018). Australian Demographic Statistics, Jun 2018.

168 ABS (2018). 3222.0 - Population Projections, Australia, 2012 (base) to 2101.

169 Bain & Company (2018). Altgamma 2018 - Worldwide Luxury Market Monitor.

170 Between 2018 and 2023, annual growth is assumed to be between forecast global real GDP growth and forecasts from the worldwide luxury market monitor. Industry growth is estimated to converge towards forecast global real GDP growth rates from 2023-2030. Sources: Bain & Company (2018). Altgamma 2018 - Worldwide Luxury Market Monitor; IMF (2018). World Economic Outlook - Real GDP Growth.

171 Based on the 5-year average of global exports as a percentage of global gross domestic product. Source: World Bank (2019). World Bank National Accounts Data and OECD National Accounts Data.

172 XE Corporation (2019). Live Market Rates, GBP to AUD. Accessed on 2019-02-27.

173 Based on 2018 trade statistics. Sources: Department of Foreign Affairs and Trade (2018). Australia's Merchandise Exports and Imports; UNCTAD (2018). Merchandise Trade Matrix by Export Products and Groups; ABARES (2012). Food Demand to 2050: Opportunities for Australian Agriculture.

Convenience without compromise

Domestic consumption = $A \times B \times (1+C) \times (1+D)$

PARAMETERS		VALUE
A	Australian population level in 2016 ¹⁷⁴	24M
B	Average expenditure per capita on convenience meals in 2016 ¹⁷⁵	\$2.1 per week x 52
C	Annual projected population growth ¹⁷⁶	1.5%
D	Annual real expenditure per capita growth on convenience meals ¹⁷⁷	0.8%

Export opportunity = $A \times (1 + B) \times C \times D \times E$

PARAMETERS		VALUE
A	Global market for convenience meals ¹⁷⁸	\$110B USD in 2018
B	Annual real growth in global market for convenience meals ¹⁷⁹	4.0% per annum
C	Export share of global market ¹⁸⁰	31%
D	USD to AUD ¹⁸¹	1.4
E	Australia's market share of exports ¹⁸²	2.1%

174 ABS (2018). Australian Demographic Statistics, Jun 2018.

175 Convenience meals counts all of canned and bottled baby foods, frozen prepared meals and packaged prepared meals. Source: ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16.

176 ABS (2018). 3222.0 - Population Projections, Australia, 2012 (base) to 2101.

177 ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16.

ABS (2017). Household Expenditure Survey, Australia: Summary of Results, 2009–10.

178 Technavio (2017). Global Ready Meals Market 2016-2021.

179 Between 2018 and 2023, growth is assumed to be between forecast global real GDP growth and Technavio's forecast for growth in ready meal markets. Industry growth is estimated to converge towards forecast global real GDP growth rates from 2023-2030. Sources: Technavio (2017). Global Ready Meals Market 2016-2021; IMF (2018). World Economic Outlook - Real GDP Growth.

180 Based on the 5-year average of global exports as a percentage of global gross domestic product. Source: World Bank (2019). World Bank National Accounts Data and OECD National Accounts Data.

181 XE Corporation (2019). Live Market Rates, GBP to AUD. Accessed on 2019-02-27.

182 Based on 2018 trade statistics. Sources: Department of Foreign Affairs and Trade (2018). Australia's Merchandise Exports and Imports; UNCTAD (2018). Merchandise Trade Matrix by Export Products and Groups; ABARES (2012). Food Demand to 2050: Opportunities for Australian Agriculture.

Experiences and tourism

Domestic consumption and export revenue = A x (1+B)

PARAMETERS		VALUE
A	Annual retail sales in agritourism in 2016 from: ¹⁸³	
	Domestic day trip visitors	\$0.6B
	Domestic overnight visitors	\$4.1B
	International visitors	\$4.7B
B	Annual forecast growth in real expenditure for: ¹⁸⁴	
	Domestic day trip visitors	1.3%
	Domestic overnight visitors	2.1%
	International visitors	6.7%

¹⁸³ Retail sales or tourism expenditure counts day trip, overnight and international visitors that participated in at least one agritourism-type activity across expenditure categories such as airfares, food and accommodation, gifts and entertainment, tours and transportation. Sources: Tourism Research Australia (2018). National Visitor Survey & International Visitor Survey; Deloitte (2018). Perspectives – Agritourism, Agribusiness Bulletin.

¹⁸⁴ Tourism Research Australia & AusTrade (2017). Tourism Forecasts.



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