Vegetable

STRATEGIC INVESTMENT PLAN

2017-2021

Hort Innovation
Strategic levy investment

VEGETABLE FUND

Content

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Introduction

This Strategic Investment Plan (SIP) is the roadmap that helps guide Hort Innovation's oversight and management of individual levy industry investment programs. The SIP lays the foundation for decision making in levy investments and represents the balanced interest of the particular industry from which the levy is collected. The very important function of the SIP is to make sure that levy investment decisions align with industry priorities.

Hort Innovation is the not-for-profit, grower-owned research, development (R&D) and marketing company for Australia's $9 billion horticulture industry.

As part of the role Hort Innovation plays as the industry services body for Australian horticulture, the organisation is tasked by the Australian Government with working alongside industry to produce a strategic plan for investment of levies in industry R&D and marketing activities.

Each individual levy industry investment strategy speaks to the future growth and sustainability of the Australian horticulture industry, as a whole. The SIPs are produced under the umbrella of the Hort Innovation Strategic Plan, which takes a whole-of-industry view in setting its direction, as it considers broader agriculture government priorities for the advancement of Australian horticulture.

The process in preparing each SIP was managed by Hort Innovation and facilitated in partnership with Industry Representative Bodies and Strategic Industry Advisory Panels (SIAPs). Independent consultants were engaged to run the consultation process, to gather the advice from stakeholders impartially and produce a plan against which each levy-paying industry can be confident of its strategic intent.

Hort Innovation has valued the support, advice, time and commitment of all stakeholders who contributed to producing the SIPs, especially vegetable industry growers.

The vegetable SIP

Producers in the vegetable industry pay levies to the Department of Agriculture and Water Resources (DAWR), who is responsible for the collection, administration and disbursement of levies and charges on behalf of Australian agricultural industries.

Agricultural levies and charges are imposed on primary producers by government at the request of industry to collectively fund R&D, marketing, biosecurity and residue-testing programs.

Levy is payable on vegetables that are produced in Australia and either sold by the producer or used by the producer in the production of other goods. The levy rate on the vegetable industry is 0.5 per cent of the gross sale value of the vegetables at the first point of sale.

Hort Innovation manages the vegetable industry levy funds that are directed to R&D (0.485 per cent of sale price); separately, Plant Health Australia (PHA) manages plant health programs (0.015 per cent of sale price).

Hort Innovation has developed this SIP for the vegetable industry to strategically invest the collected levy funds into the priority areas that will maximise the benefit to the industry as identified and agreed by the industry. In 2016/17, total vegetable levy receipts were approximately $9.2 million of R&D levies.

This plan represents the Australian vegetable industry's collective view of its R&D needs over the next five years (2017 to 2021). This plan has been developed in close consultation with the Australian vegetable industry levy payers, which included the facilitation of 20 levy payer meetings. Conducted in all major growing regions, the meetings were complemented by one-on-one interviews with selected growers. In aggregate terms, approximately 70 per cent of vegetable growers were within a two-hour radius of one of these consultations. In addition, all vegetable growers were asked to complete a survey that included their opinions on where levy funds should be directed. A detailed desk-based review was undertaken to understand relevant domestic and international trends. In addition to growers, key stakeholders considered insightful in relation to where levy funds should be directed were also interviewed, including various state government departments, industry groups, consumer groups, suppliers to the industry, and leading research organisations (***Appendix 2: Stakeholder consultation***). Recommendations were then modelled to understand, on a risk-adjusted basis, the likely economic benefit to growers and taxpayers of investing in priority areas, which in turn refined recommended areas of investment. These recommendations were presented at Hort Connections, an industry event presented by PMA Australia New Zealand and AUSVEG, where feedback was collected before the draft vegetable SIP was released.

The vegetable industry SIAPs have responsibility to provide strategic investment advice to Hort Innovation. The panels will be guided by the strategic investment priorities identified within this plan. For more information on the vegetable industry SIAPs constituency please visit Hort Innovation's website (www.horticulture.com.au).

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STRATEGIC INVESTMENT PLAN 2017-2021 AT A GLANCE

POTENTIAL IMPACT OF THIS PLAN

$471.87 Million

Based on an estimated investment of $90.68 million over the next five years

OUTCOMES	STRATEGIES
Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge	Increase knowledge to better understand consumer trends and segments
	Identify value-adding opportunities such as pre-cut and improved packaging to achieve price premiums
	Improve stakeholder education for vegetables such as the identification and extension of the health benefits associated with vegetables
	Increase the market share for vegetables in food service such as the identification of potential product offerings specific to the sector
	Support product differentiation that align with Australian consumer needs
	Improve food safety standards and traceability

OUTCOMES	STRATEGIES
Export markets grown through increased understanding of opportunities available, improved market access, improved export capabilities, improved reputation and competitive advantage	Facilitate a united representation of the vegetable industry to international markets
	Better understand the export opportunities available to the vegetable industry
	Improve market access in priority markets for vegetables
	Improve the export capability of Australian vegetable growers
	Improve and capitalise on the opportunities available for inbound and outbound trade linkages
	Improve and capitalise on the use of e-commerce to export produce to existing priority markets
	Capitalise on Australia's geographic advantage to Asia and realise the export potential available in regional areas

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OUTCOMES	STRATEGIES
Increased farm productivity and decreased production costs through better utilisation of resources, adaptation to climate, reduced impact of pests and diseases and better utilisation of advanced technologies on the farm	Reduce on-farm food waste including alternative uses such as value-added foods and beverages, biofuels and nutraceuticals amongst others
	Reduce major production costs through initiatives such as precision agriculture
	Adapt and improve current protected cropping and intensive production technologies to the Australian environment
	Protect the vegetable industry from both endemic and exotic pests and diseases that significantly impact the industry
	Introduce new cultivars that have favourable production related traits such as resistance to pests and diseases, severe weather conditions and varieties that allow for automation
	Enhance the sustainability of the industry and to help growers prepare and mitigate against the cost of climate change
	Improve the use and management of soil and water – critical inputs to commercial vegetable production
	Increase use of advanced technologies to improve farm productivity and/or reduce input costs for growers

OUTCOMES	STRATEGIES
Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships	Improve supply chain integration and efficiencies
	Improve the product quality along the supply chain with the aim to increase returns for growers
	Support collaboration between growers and stakeholders along the supply chain to improve its efficiency
Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems	Improve the communication and extension of research outputs to address a geographically and culturally diverse vegetable industry
	Support innovation that advance and grow the vegetable industry
	Improve grower skills in all areas associated with commercial vegetable production
	Improve farm management practices and systems to assist growers in efficient and effective decision making
	Build skills in the vegetable industry workforce and attract new people to the industry

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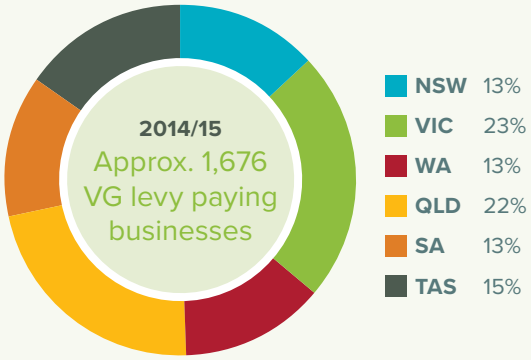
Major opportunities

- Seasonal opportunities for export markets (southern hemisphere location)
- Close proximity to large and growing Asian markets
- Reputation for quality processes and standards
- Export of premium quality fresh vegetables into new markets
- Production capacity across diverse regions
- Increasing consumer aspirations for healthy eating
- Increasing investment in new and innovative technologies
- Increasing supply chain and industry integration and collaboration
- Adoption of consumer insights and use in business decision making
- Better exploitation of the significant investment in R&D.

Major challenges

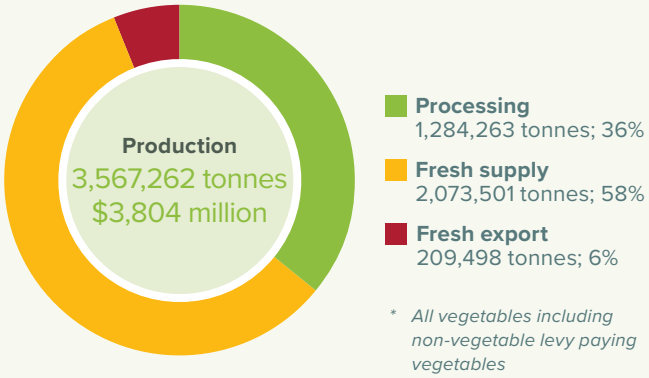
- Environmental, pest and disease factors
- Wide climatic variability and biosecurity risks
- Competition from imports, particularly from low-cost countries
- Economic factors and increased global competition
- High production costs
- Lower farmgate margins
- Insufficient and rising cost of labour
- Slowing of productivity growth
- Impediments to exports such as trade barriers
- Limited uptake of industry knowledge and transfer of innovation
- Adoption of best-practice management models.

Industry size and production distribution



(Calculated from data in Ashton D., and Weragoda A., 2017, Australian vegetable growing farms: an economic survey, 2014–15 and 2015–16, ABARES research report 17.1, Canberra, February. CC BY 3.0)

Vegetable* supply chain and value 2015/16



* *All vegetables including non-vegetable levy paying vegetables*

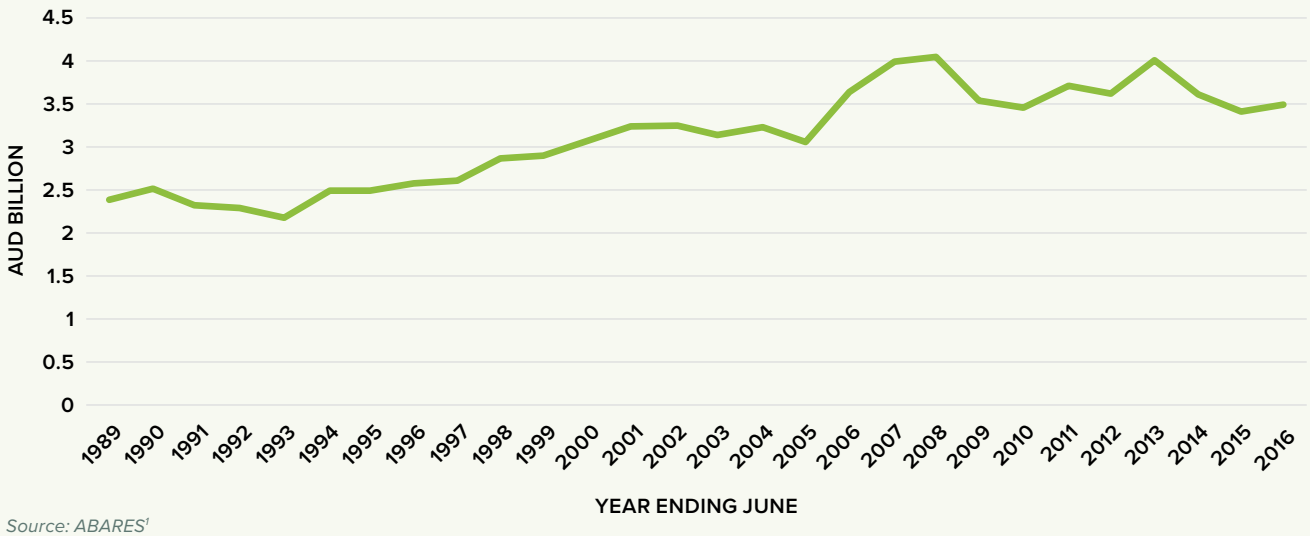
Source: Australian Horticulture Statistics Handbook 2015/16

SECTION ONE

Context

The Australian vegetable industry

Figure 1: Gross value of all vegetable production, 1989 to 2016



Source: ABARES[1]

** All vegetables including non-vegetable levy paying vegetables*

The vegetable industry is large and diverse. There were 1,676 vegetable-growing businesses paying the national vegetable levy in 2014/15, accounting for an estimated 68 per cent of all vegetable-growing farms.[1] These farms are located in all regions of the country and represent more than 130 different vegetable crops.

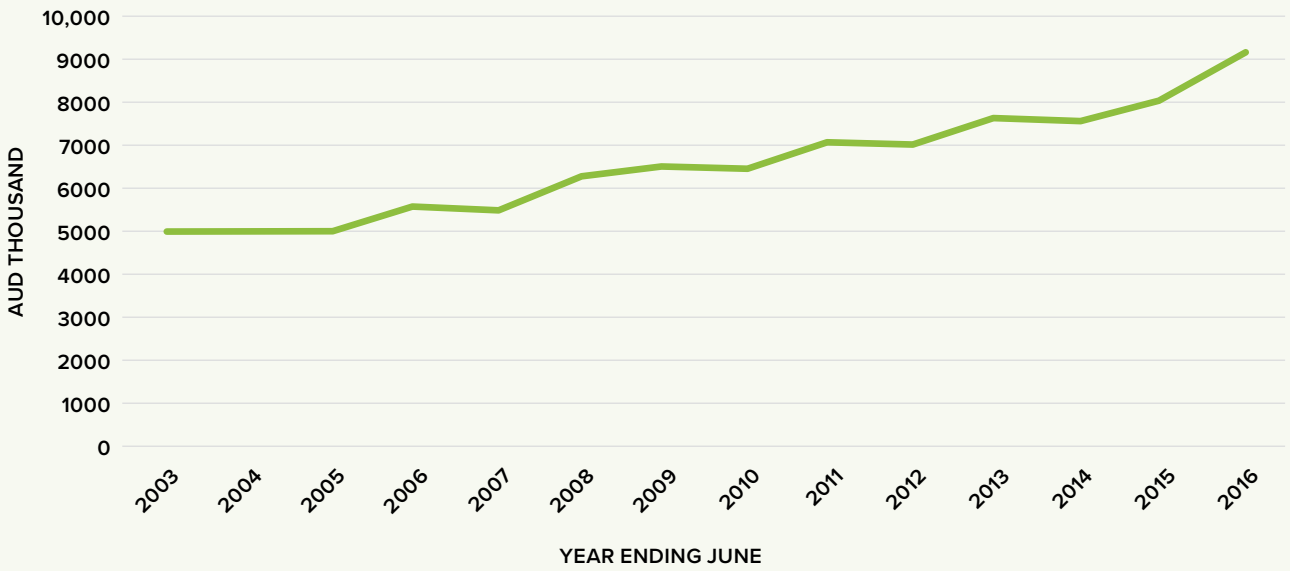
The gross value of vegetable production has grown by 45 per cent over the past 35 years.

The number of farms has been steadily declining in recent years as the industry consolidates, with small farms most likely to exit the industry. Under industry consolidation, which has driven economies of scale combined with innovation, the gross value of vegetable production has grown by 45 per cent over the past 35 years (***Figure 1)***. A key challenge for the vegetable SIP is to develop strategies that will not only improve grower productivity, but will also improve grower profitability.

In line with increases in vegetable production, levy receipts have steadily increased and are expected to continue over the forward SIP period (***Figure 2***).

1 Ashton D., and Weragoda A., 2017, Australian vegetable growing farms: an economic survey, 2014–15 and 2015–16, ABARES research report 17.1, Canberra, February. CC BY 3.0

Figure 2: Levy receipts, 2003 to 2016

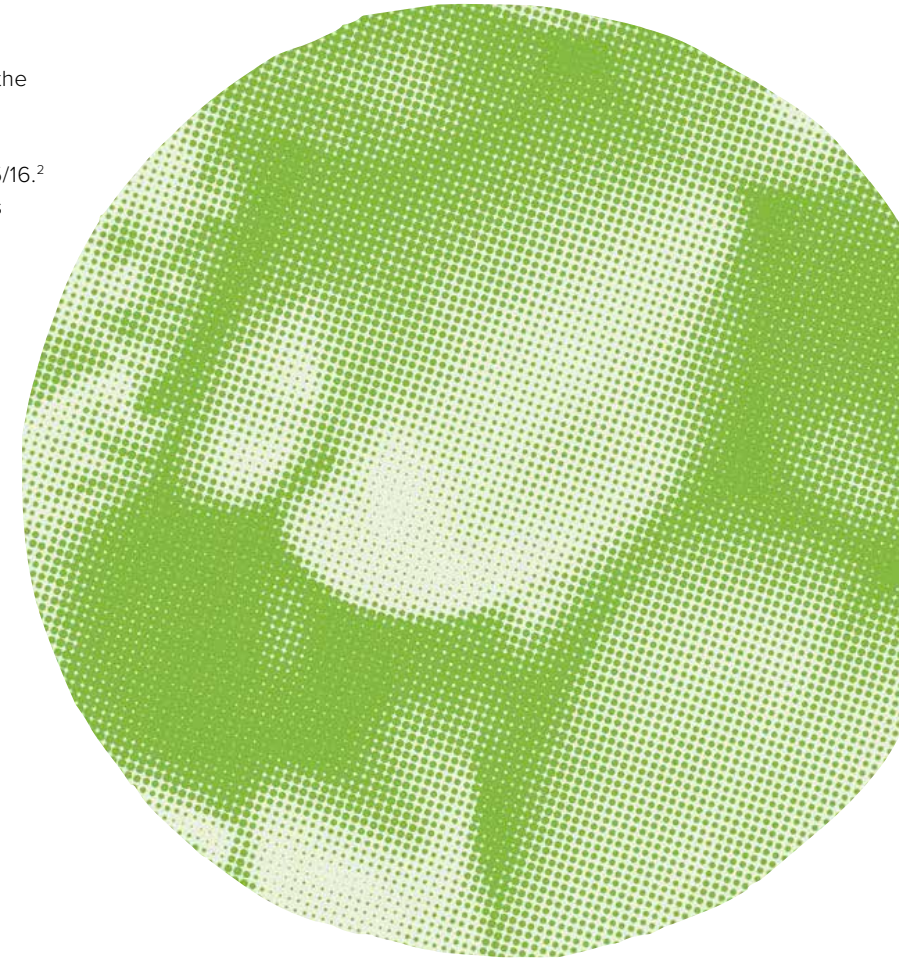


Source: Hort Innovation, 2017. Personal communication.

Australian vegetable production

The horticulture industry's gross value of production is the fourth-highest of Australian agricultural industries, after cattle, wheat and milk. It accounted for 7.9 per cent of Australia's gross value of agricultural production in 2015/16.[2] The gross value of vegetable production in 2015/16 was estimated at $3.5 billion.[3]

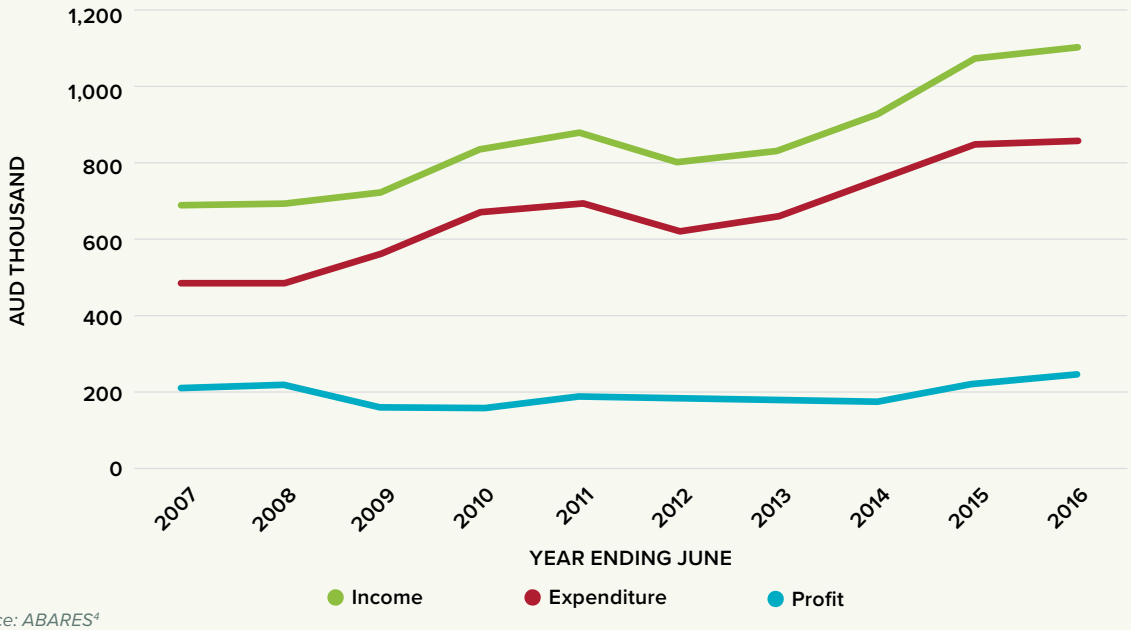
The gross value of vegetable production in 2015/16 was estimated at $3.5 billion.



2 Ashton D., and Weragoda A., 2017, Australian vegetable growing farms: an economic survey, 2014–15 and 2015–16, ABARES research report 17.1, Canberra, February. CC BY 3.0

3 Ashton D., and Weragoda A., 2017, Australian vegetable growing farms: an economic survey, 2014–15 and 2015–16, ABARES research report 17.1, Canberra, February. CC BY 3.0

Figure 3: Average vegetable farm cash income, 2007 to 2016



Source: ABARES[4]

** All vegetables including non-vegetable levy paying vegetables*

The greatest number of outdoor vegetable-growing businesses are in New South Wales (at 24 per cent of total), followed closely by Queensland (23 per cent) and Victoria (19 per cent), then South Australia (14 per cent), Western Australia (12 per cent), Tasmania (7 per cent) and the Northern Territory (1.5 per cent).[5] For undercover vegetable growing, this order remains the same.[6] Farms tend to be smaller in New South Wales. Queensland and Victoria were the two largest producers, together accounting for 47 per cent of area sown to vegetables in 2013/14.

Vegetable farmers report that input costs are increasing while at the same time prices for vegetables are broadly remaining stagnant. Farmers noted rising input costs, including electricity, fuel, chemicals and fertilisers, while some farmers are faced with reductions in water allocation allowances. The cost of most concern to growers is that of labour as this is often an unavoidable cost. These factors combined have limited improvements to farms' profits as shown in ***Figure 3***.

Pressure on profitability also comes from Australia's relatively concentrated retailers. This concentration has limited growers' market power due to very few buyers for a product, which has been compounded by growers increasingly supplying major retailers directly rather than through wholesale markets.

The future performance of the industry will, in large part, be attributed to its capability to embrace innovation in a commercially viable way. However, the vegetable industry is dominated by non-employing farms, with 63.3 per cent[7] of vegetable growers relying exclusively on family as their workforce, except when they might employ contract seasonal workers at harvest time. The average age of a grower is 57, with most not having any TAFE or university qualifications.[8]

The lack of profitability, particularly for small farms, further constrains their ability to invest in innovation and improve their operations. On the other hand, large farms tend to be more likely to innovate and transform their operations by adopting research outcomes, Information and Communication Technology (ICT) infrastructure, automation and management information systems – all of which improve productivity and/or quality. These factors, combined with economies of scale and the retirement of older growers, have driven the consolidation of the vegetable industry.

Consumers (domestic)

Over the last year, Australian households have slightly reduced the amount of fresh produce (includes fruit, vegetables, dried fruit and nuts) they buy, but are spending more than they did in the previous year. The vegetable category is the strongest contributor to both of these trends, with volume declines of -1.5 per cent and value increases of 9.1 per cent. In contrast, fruit has slightly lower rates of volume decline at -1.2 per cent and value growth of 5.3 per cent.[9]

4 Ashton D., and Weragoda A., 2017, Australian vegetable growing farms: an economic survey, 2014–15 and 2015–16, ABARES research report 17.1, Canberra, February. CC BY 3.0
5 IBISWorld, 2016, Outdoor Vegetable Growing in Australia, IBISWorld Industry Report A0123
6 IBISWorld, 2016, Outdoor Vegetable Growing in Australia, IBISWorld Industry Report A0123
7 IBISWorld, 2016, Outdoor Vegetable Growing in Australia, IBISWorld Industry Report A0123
8 Mifsud C., and Valle H., 2015, Australian vegetable growing farm businesses: an economic survey, 2013–14 and 2014–15, ABARES report to client prepared for Horticulture Innovation Australia Limited, Canberra, December, CC BY 3.0.
9 Based in part on Nielsen Homescan service for the 'Fresh Fruit, Vegetables and Dried Fruit & Nut' category (client defined) for the 52-week period ending 17/06/17 for the Total Australia market. Copyright ©2017. The Nielsen Company Australia Pty Ltd.

The vegetables with the highest rate of volume growth are fresh salad (12.4 per cent), Asian vegetables (9.6 per cent), pumpkin (4.6 per cent) and cauliflower (2.8 per cent). While consumer drivers of growth vary across vegetables, the common factor across the fastest growing vegetables by volume is increasing purchase occasions, as shoppers put these vegetables in their baskets more often.[10]

The vegetable types with the best opportunity to regain lost volume are beans (-11 per cent), cabbage (-8.5 per cent), sweet corn (-6.6 per cent) and zucchini (-5.4 per cent). The common consumer driver for these vegetables is the decline in volume purchased per shopping occasion, as shoppers put less in their basket each trip.[11]

Almost all vegetables grew their value sales in the last year, except for pumpkin, which gave consumers better value for their spend. Even though volumes declined for many vegetable categories, the strong price has more than offset this decline to provide value growth in almost every category.[12]

As price per volume increased for almost all vegetables, the largest value growth was in zucchini (20.3 per cent) and cucumbers (15.1 percent). The strong price per volume growth for vegetables may be a contributing factor to the lack of volume growth as shoppers buy less to balance the increasing household spend on vegetables.[13]

Average consumption of levied vegetables is currently 88.6 grams per day.[14] Only seven per cent of Australians typically meet the recommended daily intake of five serves of vegetables per day, with the lowest consumption of vegetables recorded in the 18-24 age group. There is also a growing movement away from meat consumption due to health, animal welfare and environmental concerns. Therefore, vegetable consumption has significant scope to increase further. The impact of increasing vegetable consumption is significant. Modelling by Deloitte Access Economics reveals that if Australians were to increase vegetable consumption by 10 per cent, the industry would generate $23 million in additional profit.

Consumers indicated a tendency to buy from supermarkets for convenience, typically buying quickly and without browsing. Because they don't actively look for inspiration or new ideas, their purchases are driven by habit and routine. They treat local grocers and markets as an 'experience' and are inclined to try new things.[15] A key observable trend among consumers is towards Asian cuisine. A significant number of domestic consumers also indicate a desire to cook Asian cuisine in the future.[16]

Domestic consumers often nominated being satisfied with their level of vegetable consumption as a barrier to increasing purchases.[17] In a similar vein, rising incomes are not expected to increase total vegetable consumption; rather, they are expected to encourage households to substitute away from cheaper vegetables towards more exotic, organic and local produce. The expansion of niche markets, such as organic vegetables, is likely to support revenue growth, as consumers have growing concerns about environmental impact, increasingly favour fresh produce, and indicate a preference for vegetable products grown without pesticides and herbicides.[18]

Consumers demonstrate strong preferences in the appearance, perceived freshness and other features when making purchasing decisions.[19] Preferences are for locally grown produce, mixed products with appealing packaging, vibrant colour and no discolouration, firmness, and uniform shape. Consumers also tend to buy vegetables that remain fresher for longer.

Nielsen Consumer and Media View (CMV) research reveals that compared to five years ago, there has been a 28 per cent increase in the number of respondents claiming that their diet is mainly vegetarian; and the number of consumers who say they purchase more fresh and chilled food than they used to has grown by 11 per cent. Among Australians who say they are trying to lose weight, 78 per cent say they are placing a priority on changing their diet.[20] In addition, a key determinant of demand for vegetables within Australia is population growth. The Australian population has grown relatively consistently over the past three decades, at an average rate of 1.4 per cent per annum.[21] Both domestic production and exports have increased to meet this higher demand. With a similar rate of growth expected to continue for the foreseeable future, demand for vegetables is expected to increase accordingly.

10 Based in part on Nielsen Homescan service for the 'Fresh Fruit, Vegetables and Dried Fruit & Nut' category (client defined) for the 52-week period ending 17/06/17 for the Total Australia market. Copyright ©2017. The Nielsen Company Australia Pty Ltd.

11 Based in part on Nielsen Homescan service for the 'Fresh Fruit, Vegetables and Dried Fruit & Nut' category (client defined) for the 52-week period ending 17/06/17 for the Total Australia market. Copyright ©2017. The Nielsen Company Australia Pty Ltd.

12 Based in part on Nielsen Homescan service for the 'Fresh Fruit, Vegetables and Dried Fruit & Nut' category (client defined) for the 52-week period ending 17/06/17 for the Total Australia market. Copyright ©2017. The Nielsen Company Australia Pty Ltd

13 Based in part on Nielsen Homescan service for the 'Fresh Fruit, Vegetables and Dried Fruit & Nut' category (client defined) for the 52-week period ending 17/06/17 for the Total Australia market. Copyright ©2017. The Nielsen Company Australia Pty Ltd.

14 Deloitte Access Economics, 2016, The impact of increasing vegetable consumption on health expenditure, prepared for Horticulture Innovation Australia Limited

15 Witham J., Ferguson M., and McKernan F., 2015, Full Vegetable Consumer Segmentation, Project VG12078, April 2015

16 Witham J., Ferguson M., and McKernan F., 2015, Full Vegetable Consumer Segmentation, Project VG12078, April 2015

17 Witham J., Ferguson M., and McKernan F., 2015, Full Vegetable Consumer Segmentation, Project VG12078, April 2015

18 IBISWorld 2016, Outdoor Growing in Australia, IBISWorld Industry Report A0123

19 Witham J., Ferguson M., and McKernan F., 2015, Full Vegetable Consumer Segmentation, Project VG12078, April 2015

20 Nielsen CMV April 2017 versus 5YA

21 Australian Bureau of Statistics (ABS), 2017, 3101.0 Australian Demographic Statistics, Population Growth

Figure 4: Australian vegetable exports, 2008 to 2016 (levy paying vegetables)

Source: IHS Global Trade Atlas (2017)[22]

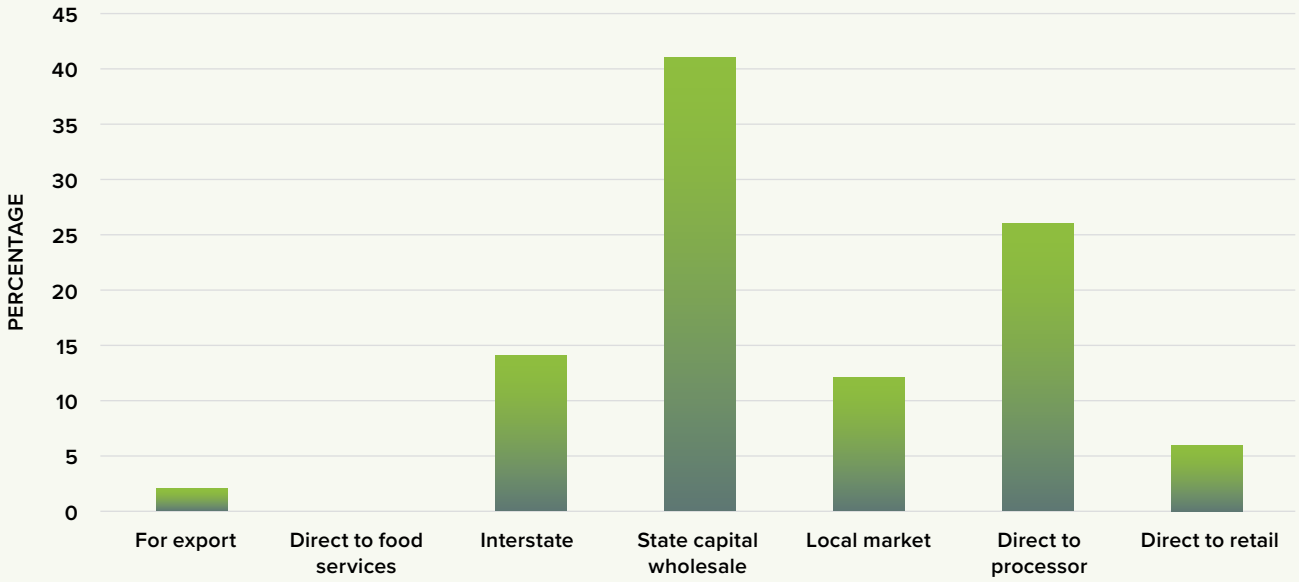
Consumers (exports)

Exports remain as a significant opportunity for the industry. Australia is located in the Asian region where more than 60 per cent of the world's population lives. This region also has the fastest population growth, growth in income, but with a decline in arable land. The combined effect will continue to drive demand for high-quality vegetables from Australia. Exports also divert produce from domestic markets, which reduces supply and as a result reduces pressure on prices.

Exports of Australian vegetables have increased since 2013, with the highest rate of growth in the year to 2016. An estimated six per cent of fresh produce is exported.[23] The category with the largest proportion of exports by value is carrots and turnips, the value of which has increased by $36 million to $82 million from 2008 to 2016.[24] The second largest category of vegetable exports in 2016 was cauliflower and broccoli, worth $16 million in 2016.[25] Consultation with exporters reveals that Australia tends to compete in overseas markets on the basis of quality and reputation for food safety. The largest competing supplier to most destinations for Australian produce is China,[26] which exporters believe has a less favourable reputation in those markets for quality.

22 IHS Global Trade Atlas (2017)
23 Horticulture Innovation Australia Limited, 2017, Horticulture Statistics Handbook 2015/16
24 IHS Global Trade Atlas (2017)
25 IHS Global Trade Atlas (2017)
26 Euromonitor Consulting, 2017, Horticulture trade intelligence: Vegetable: Q1 2017, Prepared for Horticulture Innovation Australia

Figure 5: Destination markets by percentage of farms, 2014/15



Source: ABARES[27]

Markets (domestic and exports)

Figure 5 shows the proportions of vegetable-growing farms selling to various destination markets in the year 2014/15. State capital wholesale markets are the most significant market for vegetable growers. Note that farms might sell to more than one type of customer.

For growers, the relationship with wholesalers is important because consistent supply to a wholesaler is likely to yield higher prices than sporadic supply. Importantly, however, this market is diminishing because Coles and Woolworths and specialist vegetable retailers bypass the wholesale markets to establish agreements directly with suppliers. These direct-to-retailer sales now account for nine per cent of the market for growers.

State capital wholesale markets are the most significant market for vegetable growers.

27 Mifsud C., and Valle H., 2015, Australian vegetable growing farm businesses: an economic survey, 2013–14 and 2014–15, ABARES report to client prepared for Horticulture Innovation Australia Limited, Canberra, December, CC BY 3.0.

Operating environment

The results of the industry summary, environmental scan and risk assessment (Section 6) is summarised in the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis below.

The vegetable industry	
Strengths	• Southern hemisphere location giving seasonal opportunities and geographic substitution for international markets • Strong and domestically focused demand for Australian horticultural produce and a reputation for quality processes and standards, also known as 'clean and green' • The close proximity to the large and growing Asian markets, with more than half of the world's population. Asia is the fastest growing region in the world in terms of population, food consumption and income growth, and is a market increasingly looking to import high-quality, 'clean and green' produce • Greater investment in research, development and extension than other countries, as many do not have a comparable RDC system or access to the same levels of investment capital • Regulatory systems that support environmental sustainability, quality assurance and biosecurity protection • High-quality producers • Relatively large amount of arable land available and production capacity across diverse regions.
Weaknesses	• Relatively high production costs, particularly labour • Small economy with diverse growers of diverse cultural background, scale, crops, geography and climate, which reduces the opportunity to achieve economies of scale • Slowing of productivity growth • Impediments to exports, such as biosecurity constraints/phytosanitary requirements, trade barriers and the cost and complexity of supplying distant markets • The significant influence of major retailers when dealing with suppliers and access to consumers, which affects margins at the farmgate • Limited uptake of industry knowledge and transfer of innovation due to time and investment constraints • Lack of adoption of best practice management models, particularly in less sophisticated operations.
Opportunities	• Targeting growth through exporting premium fresh food into new markets • Better market access to emerging economies • Growing world demand for horticultural products, specifically in the wider Asia region • Steadily increasing domestic demand for vegetables due to population growth • Increasing consumer aspirations for healthy eating and increasing demand for 'super foods', which include horticultural products as major components • Increasing investment in new and innovative technologies, including mechanisation, automation, robotics, uniform plant architecture, genomics, pest management, soil management, and protected cropping as ways of increasing productivity, production efficiency and maintaining international competitiveness • Increasing supply chain and industry integration and collaboration to better meet consumer needs and improve product quality • Opportunity to increase uptake of R&D outcomes • Adoption of consumer insights and use in business decision making.

The vegetable industry	
Threats	• Environmental, pest and disease factors, including higher instances and impacts of wide climatic variability and biosecurity risks • Competition from imports, particularly from low-cost countries • Economic factors, including uncertainty due to the volatility of the Australian dollar, and increased global competition due to changing trade barriers, and high input costs compared to global producers, as well as fluctuations in interest rates affecting indebted farms • Insufficient and rising cost of labour, such as changing employment rules, difficulty in attracting young people to the sector, difficulty in recruiting professionals to work in rural areas, specific skill shortages, visa regulations and competition with other sectors, such as mining • Strong competition in frozen and/or processed vegetables from overseas, due especially to high local cost of labour.

2

SECTION TWO

Vegetable industry outcomes

Industry outcomes

The achievement of the vegetable SIP will be to deliver on a number of realisable and focused outcomes. These outcomes, their key sub-components, the reasons these subcomponents were selected, and specific identified priority projects that will maximise benefits to the vegetable sector are described below.

OUTCOME 1: GROWTH IN THE DOMESTIC MARKET

Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge.

Because vegetables have a relatively fixed and highly competitive domestic market, increasing their productivity and associated volume has not and is unlikely to significantly enhance grower profitability. Grower prosperity will be more closely tied to the vegetable industry's ability to increase vegetable consumption as well as to the price consumers are willing to pay for vegetables. To achieve this outcome, the following six interconnected areas of focus have been identified.

1. **Consumer insights.** There are significant opportunities to increase vegetable consumption and the price consumers will pay for vegetables. To do this, deeper insights into trends in consumer preferences are needed. These insights will drive enhancements in quality, convenience, taste, and health attributes that are targeted towards customers' specific needs. Developing new and improved vegetable varieties could also help to raise vegetable consumption. Additionally, the sector must be able to influence consumer perceptions of vegetables. Partnering with industry and community groups who advocate and support healthy diets and lifestyles through the provision of better information that supports their claims and core messages is an important way to reach and grow key consumer segments.
2. **Value-adding.** Price premiums can be achieved through value-adding activities, such as pre-cutting and packaging produce, ready-to-eat meals or snacks, product substitution such as cauliflower rice, and packaging to increase shelf life. These are just some of the many examples where value-adding has improved growers' businesses. There is also significant scope to achieve a price premium for well-targeted produce that better meets consumer preferences. For instance, new functional health food products can gain a price premium of 30 to 500 per cent above comparable conventional foods.[28] Avocados in a tube, and cauliflower rice are other examples of the way value-adding has transformed the use and value of seconds. There is an opportunity to research new methodologies and processes for value-added products for the sector.

28 Horticulture Australia Limited, 2008, The Australian Horticulture Plan, Future Focus, Implementation, Stage 3 report, Dec, 2008 p. 10

OUTCOME 1: GROWTH IN THE DOMESTIC MARKET (CONTINUED)

Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge.

3. **Stakeholder education.** Large segments of the Australian population are increasingly consuming more vegetables as they become more informed about the health, animal welfare and environmental benefits associated with diets high in vegetables. In 2016, for example, 11.2 per cent of the Australian population were reported as being vegetarian (up from 9.7 per cent in 2012),[29] with the numbers of vegans and 'flexitarians' (a term to describe consumers whose preference is to be vegetarian, but who eat meat when this is not convenient or there are no appealing vegetarian options) growing strongly. There are still significant opportunities to extend the knowledge base and expand the proportion of vegetables in Australian diets. This should be supported by the development of a suite of vegetable options catered to different customer segments, such as vegans, so that consumers are confident that these tasty, cheap and convenient meals contain the ideal dietary requirements. Awareness of these meals, and partnerships with celebrity chefs and organisations in the public health sphere such as the CSIRO would strengthen their appeal to consumers and adoption to food service providers. Consumers are also disproportionately driving improvements in product appearance rather than taste and nutritional value. This results in significant food waste and inefficiency. A coordinated program involving retailers could have a significant impact on this counter-productive trend.
4. **Food service providers.** A large and increasing amount of food is consumed through food service providers, such as restaurants and takeaway meal providers, but also includes school and work canteens, hospitals, aged care facilities, disability service providers, prisons, caterers and hotel chains. These providers increasingly need to cater for people with food intolerances or preferences such as no MSG or gluten, and people who are vegetarian, ovo-vegetarian, lacto-vegetarian, fruitarian, pescatarian, flexitarian, kangatarian or vegan.

   Food service providers now account for 15 per cent of the value of all vegetables consumed. Significant opportunities exist in supporting these sectors through the development of nutritionally balanced and better tasting vegetarian meals or the vegetable components of meals.
5. **Product differentiation.** There are significant opportunities to differentiate products on taste, appearance, colour, safety, health and/or convenience attributes. Many significant successes have resulted from new product varieties such as sweetpotato; Harvest Moon seedless watermelon; cherry Truss tomatoes; Truss tomatoes; Sun King broccoli; On Deck sweet corn; Candy Apple pepper; and Good as Gold sweet pepper. These new varieties are differentiated to better meet Australian consumer needs.
6. **Food safety.** Further improvements to the food safety standards and traceability of contaminated food could be achieved through advanced mechanisms to trace produce within Australia and in export markets. These improvements could also be used to validate provenance and to limit counterfeiting of Australian vegetables in foreign markets. More advanced packaging and hybrid high-pressure processing would improve food safety outcomes.

The execution of these strategies will require innovators receptive to the translation of these developments, including engaged and receptive growers who have the capability and interest in guiding and testing these opportunities on-farm and in the marketplace. Communication, education and support in this execution phase will be vital for harnessing the opportunities to increase consumption and the value of targeted vegetables. The outcomes of these strategies could be further enhanced through an integrated marketing campaign for the industry.

29 Roy Morgan Research, 2016, Roy Morgan Single Source (Australia), April 2011-March 2012 (n=19,167); April 2015-March 2016 (n=14,380)

OUTCOME 2: GROWTH IN EXPORT MARKETS

Export markets grown through increased understanding of opportunities available, improved market access, improved export capabilities, improved reputation and competitive advantage.

The general trend for Australian exports of vegetables has been a decline for nearly two decades with a slight uptick in recent years. Australia exports six per cent[30] of its vegetable produce by value, with only two per cent[31] of growers directly involved in export activity. This is despite increasing global trade, and Australia's capacity and proximity to the burgeoning Asia market. Growth in export volumes would also take local produce off the domestic market, benefiting all growers who supply the domestic market.

Addressing what had been a long-term decline in vegetable exports was a priority of the past vegetable industry Strategic Investment Plan. This goal is now being realised, with exports initially stabilising and now beginning to increase in recent years. One focus of this SIP is to further the industry's export potential and realise substantial growth in exports.

1. **Global awareness.** The ability to provide overseas customers with confidence in the quality and safety of our vegetables provides an important point of differentiation. An awareness strategy that supports these quality and safety attributes and is customised for each export market will make it easier for exporters to penetrate international markets and drive price premiums.
2. **Market intelligence.** Export success will, in part, rely on market intelligence. Insights into how to customise for, present to, and interface with overseas buyers are key components of a successful export strategy. A significant opportunity also exists from a better understanding of seasonal fluctuations in vegetable prices in key markets. As Australia can grow many crops year-round (from different growing regions), there is significant potential for Australian producers to fill export market gaps created by seasonal supply shortages.
3. **Market access.** Free trade agreements and market access represent a significant opportunity for growers with export aspirations to access markets in key trading regions. While significant progress has already been made, the need to fully exploit these opportunities remains a key priority. However, more support in accelerating market access protocols by responding to information needed, and proactively engaging and educating priority markets, should remain priority areas of investment. More export markets also enable growers to take a portfolio approach to exports, which will reduce the risk of losing an export market. Market access limitations can be overcome through value-adding techniques, such as high-pressure processing, which should be more prominent in export expansion strategies.
4. **Capability building.** The key impediment cited by growers to realising export opportunities is that selling for export is 'too hard' or time consuming.[32] Building grower confidence and capability for export will be key ingredients to export success. Symposiums, study tours and mentoring by export developers are all currently available to growers and will remain important. This could also be extended to include the development of a network of experienced exporters to help mentor and partner with aspiring exporters.
5. **Inbound and outbound trade linkages.** The current programs have been highly effective for participating growers in beginning or expanding their export sales. More strategic selection of growers, markets and crops, and an expansion of this valuable service will further develop the industry. A program that seeks growers with export potential who are strategically aligned to priority markets and with crops to participate in inbound and outbound trade linkages should be expanded, and could include countries where market access is imminent.
6. **E-commerce.** Recent advances in e-commerce capabilities and the emergence of e-commerce platforms, such as Alibaba and Amazon, have the potential to transform export models, allowing borders to be more porous. These advances enable access to many more customers, and potentially eliminate key components of traditional supply chains, such as agents, marketers and wholesalers. Partnership models in which growers supply established e-commerce exporters also present major opportunities. Developing capabilities that integrate with existing platforms could have a profound effect on successful adopters of these emerging technologies.
7. **Regional investment.** Australia has significant potential to enhance its growing regions or support the development of new growing regions with strategic investment. For example, Northern Australia exports only a small amount of produce, despite its geographic proximity to Asia. Investment in understanding how to overcome infrastructure and supply chain arrangements could be used to help realise Australia's geographic export advantage.

30 Horticulture Innovation Australia Limited, 2017, Horticulture Statistics Handbook 2015/16

31 Australian Bureau of Agricultural and Resource Economics Sciences (ABARES), 2016, Australian vegetable growing farms; an economic survey 2015/2016

32 Mifsud C., and Valle H., 2015, Australian vegetable growing farm businesses: an economic survey, 2013–14 and 2014–15, ABARES report to client prepared for Horticulture Innovation Australia Limited, Canberra, December, CC BY 3.0.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY

Increased farm productivity and decreased production costs through better utilisation of resources, adaptation to climate, reduced impact of pests and diseases and better utilisation of advanced technologies on the farm.

The productivity of and cost structure for farmers varies considerably, and most closely correlates to the size and sophistication of farming operations. Larger farms are usually more profitable, however almost two-thirds (63.3 per cent) of the industry consists of small and non-employing family businesses.[33] The sector is also highly competitive, with about 1500 levy paying growers nationally in 2015/16. This has driven productivity gains and price competition. The dominance of the two major retailers has also concentrated buying power, further suppressing farmgate prices.[34]

1. **On-farm waste**. On-farm waste was reported as a major inefficiency, with some segments reporting as much as 25 per cent[35] of their produce being wasted. This does not include supply chain inefficiencies or retail and consumer waste. The major sources of waste are the result of vegetables not meeting consumer and/or retailer specifications, particularly produce appearance. Although the most significant opportunity to reduce food waste relates to driving retailers and consumers to be more accepting of vegetables with imperfections (see Outcome 1, Stakeholder education), other opportunities include finding other uses of food waste, such as value-added processed vegetables, biofuels, and ingredients for nutraceuticals, beverages and processed foods.
2. **Production costs.** Even though Australian vegetable growers have one of the highest cost structures in the world, input costs still typically outpace inflation. Growers also capture only 35 per cent[36] of the final sale value of vegetables. Intense local competition and the dominance of major retailers combine to limit grower margins. These issues will in part be addressed by other initiatives that enhance productivity and reduce input costs per unit of output. However, there are specific opportunities to reduce major input costs directly, for example, investment in solar energy as an alternative power supply. These solutions may also apply directly to other horticulture sectors.
3. **Protected cropping.** Many vegetable crops are particularly suited to protected cropping due to the intensive nature of crop production, the size and relative value of input costs. Benefits of protected cropping include productivity gains, which can be up to six times that of open field yields, adaptation to climate change, the potential to limit pest and disease incursions, improved quality, and to mitigate risk against severe weather events. Levy investment opportunities were found to relate most to the adaptation of existing protected cropping systems to the Australian environment, and the adoption of new approaches to protected cropping, such as aquaponics, cyclone resistance, and processes to limit pest and disease incursions.
4. **Pests and diseases.** Pest and disease management remains an important area requiring ongoing levy investment. Access to chemicals is becoming more limited; pests and diseases continue to evolve, in some cases making them resistant to chemical treatments. Incursions from overseas are an ever-present risk. Export markets are increasingly seeking chemical-free produce as consumer concerns about the health and environmental impacts of chemicals grow. Minor Use Permits will remain important for many growers, while ongoing investment is also necessary to further develop and extend Integrated Pest Management (IPM) strategies. There is also a significant opportunity to better understand the regulatory approval process, potential for streamlining systems, the better recognition of international data, and reducing both the cost and time required for chemical registration. Finally, there are opportunities to improve approaches to pest and disease management, such as lures, inundated releases of sterile pests, the use of semi-chemicals and 'softer' chemicals.
5. **Crop improvement.** Crop improvement programs that better meet consumer preferences are described in Outcome 1, Growth in the domestic market. Crop improvement programs for farm productivity are more focused on new and/or differentiated varieties that support efficient farming practices. Programs that rely on genetic engineering (transgenic or genetic modification), although offering enormous future potential, were found to be problematic due to consumer, grower and regulatory concerns. However, significant international investment overseas in breeding programs limits the need and opportunities for Australia to introduce new vegetable varieties. Improving crops by their traits and strains that address specific Australian environmental and climatic constraints, and allow for automation to reduce labour costs, were found to be the key priority.

33 IBISWorld, 2016, Outdoor Vegetable Growing in Australia, IBISWorld Industry Report A0123
34 ABARES, 2016, Australian vegetable growing farms; an economic survey 2015/2016
35 Gordon Rogers et al, AHR, 2013, VG12046: Identifying new products, uses and markets for Australian vegetables – a desktop study.
36 Horticulture Innovation Australia Limited, 2012, Vegetable Strategic Investment Plan 2012-2017.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY (CONTINUED)

Increased farm productivity and decreased production costs through better utilisation of resources, adaptation to climate, reduced impact of pests and diseases and better utilisation of advanced technologies on the farm.

6. **Environmental sustainability.** Because it depends on the availability of adequate land and resources, the vegetable industry should pursue initiatives to reduce harmful environmental impacts. Often, these initiatives fit neatly with reductions in input costs. In addition, there are increasing environmental requirements imposed on growers from consumers, retailers and by regulation. Potential future tax reforms for emissions should be considered.

   These factors, combined with climate change effects, present a use for levy funds to help growers better understand, mitigate against the cost of, and put in place practices that, firstly, ensure more sustainable farming practices and, secondly, adapt to the effects of climate change.

7. **Soil and water.** Soil and water are the fundamental inputs that must be managed efficiently. In broad terms, Australia has naturally infertile soils that are typically poor at retaining nutrients. Only 6.1 per cent[37] of Australia's land mass is available for productive agriculture. The productive regions are increasingly under threat of degradation, rising nutrient cost, declining water security and over-farming. Australia cannot realise a significant expansion in food (including vegetable) production without addressing soil and water productivity issues. Key levy-funded productivity projects should include new and improved solutions for soil and water management as well as the extension of past and current R&D.

8. **Advanced technologies.** A range of opportunities exist for improved farming practices through the use of new and emerging technologies, and adaptation of modern technologies. The most valuable advanced technologies are expected to be in robotics, reducing labour costs, and improving yields through more-precise farming practices.

OUTCOME 4: INCREASED LEVELS OF POST-FARMGATE INTEGRATION

Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships.

With over half of the value of fresh vegetables being captured post-farmgate,[38] and with historically little levy funding devoted to post-farmgate activities, more substantial benefits are expected to be realised from post-farmgate integration and innovations. This theory was also consistent and validated with growers during the extensive consultation phase of the development of the vegetable SIP. The major supply chain benefits are expected to come from the following:

1. **Supply chain integration.** There are many examples of growers successfully integrating their operations in the supply chain, such as marketing and awareness, packing and packaging, transport, logistics, direct sales to wholesalers and/or retailers, and direct export sales. Specific research projects that were found to be most sought after by growers were best practice examples and case studies of successful supply chain integration approaches and partnership models that would facilitate integration along the supply chain.

2. **E-commerce.** New internet-based technologies extend beyond improving on-farm productivity. E-commerce gives growers the opportunity to establish new supply chain arrangements. One rapidly emerging area is the development of e-commerce platforms with the potential to serve export markets through direct engagement with customers.

   Due to the lack of support and detailed information on e-commerce benefits and opportunities, vegetable growers have not embraced its platforms so far. This presents an opportunity for a strategic approach to partnerships between e-commerce providers and growers to create and coordinate new supply models, and to maximise value for growers – individually and for the whole industry.

3. **Product quality.** At least 15 per cent of the gross value of production is lost in the form of waste along the supply chain.[39] Levy-funded projects should be used to develop methods for cutting food waste and improving product quality along the supply chain. Intelligent sensors, packaging to monitor food quality, and innovative solutions to extend the shelf life of produce given supply chain arrangements are all areas worthy of investment.

4. **Collaborative models.** Supply chain integration is not only technically challenging for growers but is also often financially unviable for the majority of the industry – small family-owned businesses. Models that allow growers to collaborate and share the cost of transport, storage, packing, packaging, marketing, building expertise and using e-commerce platforms could deliver a net benefit. Evidence suggests that where these collaborative models have been successfully implemented, growers have benefited significantly. Such models should be developed and customised for each region, so that they can be adopted and tailored by growers for their full or partial use.

37 Food and Agriculture Organisation, 2014, Arable land, https://data.worldbank.org/indicator/AG.LND.ARBL.ZS?year_high_desc=true, accessed 11 September 2017.
38 Horticulture Innovation Australia Limited, 2012, Vegetable Strategic Investment Plan 2012-2017.
39 Estrada-Flores, S., 2010, Opportunities and challenges faced with emerging technologies in the Australian vegetable industry, Project VG08087 Final Report, p 4. Hort Innovation.

OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR ADOPTION AND INNOVATION

Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.

Given the significant investment in R&D and innovation in the sector, growers must have efficient mechanisms for identifying and harnessing innovations for their operations.

1. **Communication and extension.** The industry faces significant and ongoing challenges in developing effective extension strategies for projects. This is because it has more than one hundred crops, different regional needs, and variable literacy levels. Importantly, many growers speak English as a second language.

   Communication is a key element of extension activities. A plethora of communication channels have now been developed. Despite these efforts, growers often feel overwhelmed with the amount of information available, and unable to find information that meets their specific needs when they require it most. One of the key messages from the extensive consultation process was the need to improve the way outputs of levy-funded projects are made available to growers.

   Strategies tested with growers that, in part, address this issue include the following: a greater focus on growers participating in projects and showcasing project outcomes; closer connections to key stakeholders, for example, agronomists; the formation of grower networks for information sharing; and access to extension officers who speak languages aligned to those of growers speak in each region.

   Technology now allows for greater access to projects, so growers would benefit from having projects online. The development of a horticulture-specific app for mobile devices has significant appeal. This app could include training and development resources beyond levy-funded projects. Growers would also benefit from brief, plain English summaries of completed projects, with accompanying podcast and/or video, as well as more-detailed information and implementation guides.

   Extending and communicating research outputs across a geographically and characteristically diverse industry is inherently challenging. Despite this, growers express strong support for more effort, especially for extension support, perhaps through technology advances.

2. **Innovation support.** A key component of building greater extension capability and maximising the significant investment in research is building the capability to bridge the historically significant gap between research outputs and commercial application. This was also one of the strongest themes arising from the extensive consultation with levy payers. A greater commitment to identify innovation and best practice, showcasing these examples to interested growers, and building supporting mechanisms to extend this into farming practice remains a major opportunity for the industry. It will require better linkages with innovation networks as well as the development of an innovation model designed for the vegetable (which could be extended to the horticulture industry) that in time becomes self-sustaining through the commercialisation of valuable intellectual property (IP). This factor is crucial in fully realising benefits of levy funding for growers.

   An audit on dormant IP from past projects with commercial potential should be revived to join new IP from projects from this current plan included in the innovation support model.

3. **Professional development.** Profitable farm operations are becoming more sophisticated, with a greater use of advanced technology. However, with the average age of vegetable growers now at 57, and only one per cent of them holding TAFE and other education, there is a significant task to upskill interested growers to be able to take advantage of new and emerging technologies.[40] In addition, growers typically lack the information gathering, analysis and business planning skills required to strategically manage their farms and raise capital. Farmers consistently stated they sought easy access to information when it was needed, rather than when it became available.

   Rapid advances in internet-based portals providing high-quality and highly experiential learning make education and training more convenient, inexpensive and more accessible than ever before. Investigation into the adoption and extension of massive open online courses (MOOCs) could be an important solution to this perennial challenge. It should be noted that best practice study tours (domestic and international) were consistently cited as key sources of ideas and inspiration for on-farm innovations.

40 Mifsud C., and Valle H., 2015, Australian vegetable growing farm businesses: an economic survey, 2013–14 and 2014–15, ABARES report to client prepared for Horticulture Innovation Australia Limited, Canberra, December, CC BY 3.0.

OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR ADOPTION AND INNOVATION (CONTINUED)

Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.

4. **Farm management and information systems**. Most farms have poor information systems to support and guide management's decision making. Advances in data capture, and collection and interrogation of data are increasingly being deployed in limited cases to provide richer information to growers and stakeholders. Those growers who have invested in advanced management information systems cited the importance of these systems in decision making.

   Despite the plethora of crop management, farm management and financial management systems, a significant opportunity remains to extend and further develop management information systems that are appropriate for vegetable growers. This should include the provision of financial and benchmark usage information.

5. **Attraction of new talent.** The ageing workforce will increase the already significant need for new people to enter the vegetable industry. New talent should be attracted by developing a coordinated strategy with the following elements: improving links with major TAFEs and universities with large numbers of agricultural students; initiating innovation support (see above) to attract entrepreneurs to the sector; and promoting the broad base of available roles. The latter includes highly skilled jobs required by many larger and sophisticated farming operations.

SECTION THREE

3 Vegetable industry priorities

Industry investment priorities

The outcomes, strategies and deliverables for the vegetable industry set out below have been designed to help maximise the benefits of levy funding to the vegetable industry.

The strategies and possible deliverables under each outcome were identified and tested as part of the SIP industry consultation for the vegetable industry. The possible deliverables have been identified as the areas that would provide the highest benefit for the strategy listed. However, this is not an exhaustive list. Industry participants are encouraged to submit their innovation concepts and ideas to Hort Innovation to ensure that the projects of highest return on investment for the industry are commissioned.

Where possible, the vegetable SIP should leverage the work undertaken through the Hort Frontiers strategic partnership initiative developed by Hort Innovation to maximise return on investment of the industry. Hort Frontiers currently has seven areas of investment: Advanced Production Systems Fund; Asian Markets Fund; Fruit Fly Fund; Green Cities Fund; Health, Nutrition & Food Safety Fund; Leadership Fund; Pollination Fund. In addition to leveraging co-investment funding, a range of other funding sources could, if well considered, provide significant extra funding for the vegetable sector.

OUTCOME 1: GROWTH IN THE DOMESTIC MARKET
Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge.

STRATEGIES	POSSIBLE DELIVERABLES
CONSUMER INSIGHTS Increase knowledge to better understand consumer trends and segments.	• ***Consumer preferences:*** Information that quantifies changing consumer preferences and segments for vegetables. • ***Value-adding:*** Information on consumer willingness to pay premiums for value-added produce or produce with functional health attributes. • ***Product offerings:*** Identification of the most preferred offering of easy-to-prepare, nutritionally balanced meals for different segments of the population, such as vegans and the elderly. Engage with relevant stakeholders to disseminate this information effectively. • ***Extension:*** Consumer data and insights made available to growers and other key stakeholders, including advisors, suppliers, retailers and researchers, using a variety of communication and extension channels.

OUTCOME 1: GROWTH IN THE DOMESTIC MARKET (CONTINUED)
Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge.

STRATEGIES	POSSIBLE DELIVERABLES
PRODUCT VALUE-ADDING Identify value-adding opportunities such as pre-cut and improved packaging, to achieve price premiums.	• ***Value-adding opportunities:*** Development and extension of consumer insights on value-adding opportunities through a variety of communication and extension channels. • ***Value-adding processes:*** Development or improvement of value-adding processes involving pre-cutting, semi-prepared snacks and meals, packaging for extended shelf life, and other uses of vegetables, such as cauliflower turned into cauliflower rice. • ***Lower-grade value-adding:*** Solutions for other uses for lower-grade produce, including in feed stock, dietary supplements, food additives, bio-actives, biofuel, baby foods, vegetables in tubes, and inputs into beverages/processed foods.
STAKEHOLDER EDUCATION Improve stakeholder education about vegetables, such as the identification and extension of associated health benefits. ***Relevant Hort Frontiers Fund:*** *Health, Nutrition & Food Safety Fund*	• ***Partnerships:*** Development of closer relationships with industry bodies that can support vegetable consumption by providing existing information, networks and support for projects. • ***Information dissemination:*** Engagement with relevant stakeholders to disseminate outcomes of identified meal offerings for different consumer segments. See Outcome 1, Consumer insights: product offerings. • ***Lower-grade produce:*** Research to understand consumer willingness to trade off appearance for taste and price. This can then be used by relevant stakeholders to inform a strategy to encourage consumption of imperfect or lower-grade produce.
FOOD SERVICE Increase the market share for vegetables in food service, such as the identification of potential product offerings specific to the sector.	• ***Training:*** Partnership with training providers to change curriculum and lesson plans so that new chefs and food preparation personnel are able to replicate food menus developed in Outcome 1, Consumer insights: meals. • ***Product offerings:*** Development of potential product offerings for food service providers with the potential to fundamentally change the way people consume vegetables, for example. avocados as a breakfast item turned into a staple food. • ***Training programs:*** Training programs provided to commercial restaurants and culinary trainers to support the accurate replication of menus/meals.
PRODUCT DIFFERENTIATION Support product differentiation that aligns with Australian consumer needs.	• ***Overseas varieties:*** The market intelligence about development and adoption of overseas varieties with more favourable consumer traits that meet Australian conditions and/or consumer preferences. • ***Consumer preferences:*** Varietal trials that align with consumer preferences for appearance, flavour and nutrition. This aims to address the opportunities that are deemed too risky for the seed companies, for example, any step changes in product offerings. • ***Cultivar development:*** Develop projects to breed new cultivars with favourable consumer-related traits that are unique to Australia and are deemed to have high potential.
FOOD SAFETY Improve food safety standards and traceability. ***Relevant Hort Frontiers Fund:*** *Health, Nutrition & Food Safety Fund*	• ***Food safety standards:*** Methods and solutions to improve food safety standards across the vegetable industry. • ***Food safety harmonisation.*** Methods to encourage harmonisation of food safety standards across major retailers. • ***Traceability systems:*** The development of improved mechanisms to trace contaminated produce from both within Australia and in export markets, including strategies to improve adoption of these systems. • ***Food-borne diseases:*** Strategies to prevent and mitigate against food-borne diseases in vegetable production in high-risk areas.

OUTCOME 2: GROWTH IN EXPORT MARKETS
Export markets grown through increased understanding of opportunities available, improved market access, improved export capabilities, improved reputation and competitive advantage.

STRATEGIES	POSSIBLE DELIVERABLES
GLOBAL AWARENESS Facilitate a united representation of the vegetable industry to international markets.	• ***National awareness strategy:*** Development of an overall awareness strategy for Australian vegetables to support all horticulture initiatives, such as Taste Australia, and for industry groups and growers to use in their own marketing campaigns • ***Country-specific messages:*** Collaboration with industry to develop different messages for priority countries to support the national awareness strategy. This will be supported by export market research to understand consumer preferences in these regions. See Outcome 2, Market intelligence: consumer preferences • ***Trade shows and conferences:*** Development of a consistent awareness and messaging strategy for use in trade shows and conferences as well as outbound and inbound trade linkages.
MARKET INTELLIGENCE Better understand the export opportunities available to the vegetable industry.	• ***Taste Australia:*** Information on export opportunities, including prices and demand for vegetable commodities throughout the year in high-priority export markets • ***Consumer preferences:*** Information on the specific variations in customer tastes and expectations between export markets • ***Dedicated export staff:*** Funding of dedicated export staff to extend market intelligence and market access protocols to guide and improve growers' export efforts.
MARKET ACCESS Improve market access in priority markets for vegetables.	• ***Priority markets:*** Support for market access and market improvement strategies for the priority markets and commodities • ***Market access information:*** Collaboration with the Australian government to develop and provide information needed to accelerate market access in high-priority market • ***Markets for value-added produce:*** Identification of export markets for value-added produce that do not have market access protocols. See also Outcome 1, Product value-adding: Value-adding processes.
CAPABILITY BUILDING Improve the export capability of Australian vegetable growers.	• ***Export training:*** Development and delivery of export training material through a variety of communication and extension channels, such as online videos, webinars, and training sessions • ***Export mentoring group:*** Building of a network of experienced exporters to mentor and partner with aspiring exporters • ***Customised export plans:*** Support for the development of simple export strategies for targeted growers and use as case studies • ***Cooperative models:*** Development of cooperative models that provide a means for growers to overcome export barriers due to scale. Pilot these cooperative models with support export expertise.
TRADE LINKAGES Improve and capitalise on the opportunities available for inbound and outbound trade linkages.	• ***Targeted grower engagement:*** Identification of and encouragement for growers with export potential and strategic alignment to priority and commodity areas to participate in inbound and outbound trade linkages • ***Inbound and outbound trade linkages:*** Continuation of inbound and outbound trade linkages for export-ready growers with a focus on priority markets, including countries where market access is imminent.

OUTCOME 2: GROWTH IN EXPORT MARKETS (CONTINUED)
Export markets grown through increased understanding of opportunities available, improved market access, improved export capabilities, improved reputation and competitive advantage.

STRATEGIES	POSSIBLE DELIVERABLES
INTERNATIONAL PLATFORMS Improve and capitalise on the use of e-commerce to export produce to priority markets.	• ***International platforms:*** Information on the e-commerce platforms available for growers to access targeted export markets • ***E-commerce partnerships:*** Development of relationships with priority e-commerce platform providers and supporting networks to improve industry adoption • ***Grower capability building:*** Identification and provision of supporting capabilities needed by growers to fully realise the potential of using an e-commerce platform as a distribution channel • ***Case studies:*** Pilot and demonstration of the use of e-commerce platforms and transactions as case studies for other growers.
REGIONAL INVESTMENT Capitalise on Australia's geographic advantage to Asia, and realise the export potential available in regional areas.	• ***Opportunity analysis:*** An assessment of the feasibility of exporting vegetables from growing regional areas. • ***Stakeholder engagement:*** Collaborate with key stakeholders to provide the supporting infrastructure, processes, systems etc. to realise export potential in regional areas • ***Pilot programs:*** Pilot programs to export from key regional areas for priority markets. Use the pilots to build the export capability of other growers and involve them in the expansion of the program.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY
Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships.

STRATEGIES	POSSIBLE DELIVERABLES
FOOD WASTE Reduce on-farm food waste by finding other uses for food, such as value-added foods and beverages, biofuels and nutraceuticals.	• ***Revaluation of waste product:*** Conversion of vegetable waste into new products, such as biofuels and biochar. See Outcome 1, Product value-adding: Lower-grade value-adding • ***Precision agriculture:*** The development and extension of new precision agriculture technologies to improve marketable yield.
PRODUCTION COSTS Reduce major production costs through initiatives such as precision agriculture.	• ***Novel technologies:*** Solutions to reduce the major input costs for vegetable growers, such as an alternative power supply that is more cost effective and environmentally friendly • ***Precision agriculture:*** Research and extension of improved precision agriculture technologies to reduce the cost of production • ***Cooperative Models:*** Development of cooperative models to support lower production costs through economies of scale.
PROTECTED CROPPING Adapt and improve current protected cropping and intensive production technologies for the Australian environment.	• ***Adapting to the Australian environment:*** Research into customised protected cropping solutions to suit Australian conditions, such as cyclone-proof structures • ***Business case for adoption:*** Better market intelligence and tools to help growers assess the business case for protected cropping • ***Production efficiency:*** Adoption of new protected cropping approaches to improve production efficiencies.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY (CONTINUED) **Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships.**	
STRATEGIES	**POSSIBLE DELIVERABLES**
PESTS AND DISEASES Protect the vegetable industry from both endemic and exotic pests and diseases that significantly damage the industry. ***Relevant Hort Frontiers Fund:*** *Fruit Fly Fund*	• ***Minor Use Permit program:*** Continued investment in the Minor Use Permit program for vegetables to obtain greater access to chemicals • ***Biosecurity:*** Solutions to protect the Australian vegetable industry from emerging and exotic pests and diseases • ***Diagnostics and control:*** Solutions to manage and prevent pests and diseases from affecting vegetable production, such as the use of integrated pest and disease management (IPDM) • ***Reducing the red tape:*** Collaboration with government to develop possible solutions to reduce the regulatory burden for chemical registration.
CROP IMPROVEMENTS Introduce new cultivars that have favourable production-related traits, such as resistance to pests and diseases, and severe weather conditions, and also varieties that allow for automation.	• ***Climate change adaptation:*** Varietal trials to better meet the changing conditions in Australia to address the opportunities deemed too risky by the seed companies, such as drought tolerant cultivars • ***Farm productivity:*** Varietal trials that improve farm productivity to address the opportunities deemed too risky by the seed companies, including cultivars that have greater marketable yield and lower input requirements • ***Cultivar development:*** Development of projects to breed new cultivars with favourable production-related traits that are unique to Australia and are deemed to have high potential.
ENVIRONMENTAL SUSTAINABILITY Enhance the sustainability of the industry and help growers prepare for and mitigate against the cost of climate change.	• ***EnviroVeg Program:*** Education for retailers of the benefit to consumers of grower participation in the EnviroVeg program • ***Extension strategies:*** Best practice case studies and the replication of relevant environmental practices • ***Business case for adoption:*** Education for growers of the customer benefits and cost benefits of sustainable farming practices • ***Traceability systems:*** Development of whole-of-industry traceability systems to provide information, such as provenance and certifications • ***Climate change adaptation:*** Solutions to reduce the impacts of climate change and to maintain a healthy ecosystem for vegetable production.
SOIL AND WATER Improve the use and management of soil and water, which are critical inputs of commercial vegetable production.	• ***Soil health:*** Solutions to maintain the health of soils for commercial production of vegetables • ***Water security and efficiency:*** Solutions, such as precision irrigation, water recycling and trading systems, to improve water security and efficiency for vegetable growers • ***Decision support tools:*** Technologies and tools to support better management and use of soil and water.
ADVANCED TECHNOLOGIES Increase use of advanced technologies to improve farm productivity and/or reduce input costs for growers.	• ***Robotics and automation:*** Technologies to increase the efficiency of vegetable production processes, such harvesting and weeding • ***Monitoring, sensing and surveillance:*** Development and adoption of technologies that improve the efficiency of vegetable production, from the monitoring of pests and diseases to the nutrition in plants • ***Big data:*** Collection and use of big data to increase the efficiency of vegetable production • ***New technologies:*** Blue-sky research in new technologies that will provide vegetable growers with the tools and methods to compete on the international platform.

OUTCOME 4: INCREASED LEVELS POST-FARMGATE INTEGRATION
Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships.

STRATEGIES	POSSIBLE DELIVERABLES
SUPPLY CHAIN INTEGRATION Improve supply chain integration and efficiencies.	• ***Case studies and networks:*** Best practice case studies and supporting networks for growers interested in supply chain integration • ***Partnership models:*** Research and pilot of potential partnership models to reduce the risk and improve the economics of supply chain integration • ***E-commerce platforms:*** Support for the adoption of e-commerce platforms that allow growers to efficiently transact with stakeholders within the supply chain, and where feasible, to bypass intermediaries along the supply chain. See also Outcome 2, International platforms.
PRODUCT QUALITY Improve product quality along the supply chain with the aim to increase returns for growers.	• ***Supply chain intelligence:*** Better intelligence for farmers on where food losses typically occur within the supply chain, and strategies to mitigate against the losses • ***Quality maintenance:*** Solutions to improve the quality of the product along the supply chain, such as intelligent packaging, shelf life extension strategies, and sensors to monitor quality.
COLLABORATIVE MODELS Support collaboration between growers and stakeholders along the supply chain to improve its efficiency.	• ***Collaborative models:*** Research into potential business models and the provision of expert knowledge to help form cooperatives that allow growers to integrate into and capture more of the value along the supply chain. This will allow them to achieve a scale that justifies supply chain integration and the extension of their capabilities to realise supply chain opportunities.

OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR INNOVATION AND ADOPTION
Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.

STRATEGIES	POSSIBLE DELIVERABLES
COMMUNICATION AND EXTENSION Improve the communication and extension of research outputs to address a geographically and culturally diverse vegetable industry. Apply generic communication and extension activities to projects.	• ***Extension of previous R&D:*** A review of levy-funded projects that have commercial potential but need more extension, and the development of a plan to increase the adoption of the project outputs and improve outcome, for example, Soil Wealth and Integrated Crop Protection (ICP) program • ***Extension of current R&D:*** The integration of communication and extension activities into the projects commissioned. These activities may be within the specific project, where appropriate, or through linkages to industry communication and/or regional capacity building projects. The pathway to adoption should also be considered as part of this process • ***Improved access to R&D outcomes:*** A vegetable information portal to ensure growers can easily access relevant information generated from the R&D projects. Consideration given to allowing projects that are not commercially sensitive to be available online • ***Regional networks:*** Development of regional networks that encourage information sharing, the adoption of R&D outcomes, and the identification of innovation concepts and ideas that can be supported by the vegetable levy, for example, VegNet • ***Commercialisation support:*** Linking projects to initiatives that can support their commercialisation, such as incubators and accelerators, private investors and universities.

OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR INNOVATION AND ADOPTION (CONTINUED) **Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.**	
STRATEGIES	**POSSIBLE DELIVERABLES**
COMMUNICATION AND EXTENSION Improve the communication and extension of research outputs to address a geographically and culturally diverse vegetable industry. Apply generic communication and extension activities to projects.	Generic communication and extension activities that should be incorporated into future levy projects are: • ***Targeted dissemination:*** Improvements in the dissemination of research outputs and outcomes, such as through a more targeted dissemination approach to stakeholders of influence, including industry advisors, extension officers, agronomists, dieticians, food service providers and educational institutions • ***Culturally relevant information:*** Communication and extension activities that are culturally relevant to growers of non-English-speaking background to increase engagement and adoption of R&D • ***Customised information:*** Information that is customised to the needs of growers, including the introduction of plain English summaries for projects, with an easy-to adopt 'what this means for growers' section, short video or podcast summaries, and dissemination of information customised to a grower for the commodities they grow.
INNOVATION SUPPORT Support innovations that advance and grow the vegetable industry.	• ***Innovation connections:*** A database that links innovators with growers, providing innovators with information on vegetable growers, their produce and capabilities, and for growers, information about innovators and their capabilities • ***Technology transfer:*** Understanding of the technology transfer landscape, including incubators and accelerators, and how the sector can best link innovations to these technology support mechanisms • ***IP audit:*** An audit of IP from past projects with commercial potential to be supported by technology transfer mechanisms, such as incubators, accelerators and business plans • ***Alternatives to commercialisation:*** Where appropriate commercial pathways are inadequate, strategies to address these market gaps should be in place for projects with beneficial industry outcomes.
PROFESSIONAL DEVELOPMENT Improve grower skills in all areas associated with commercial vegetable production. ***Relevant Hort Frontiers Fund:*** *Leadership Fund*	• ***Business case development:*** A specific training program on how to develop a business case to obtain financing • ***Teaching platforms:*** Professional development and training programs delivered through a variety of platforms, such as e-learning. This should consider linking to current MOOC platforms or developing a new platform • ***Leadership and development programs:*** Links with the Leadership Fund in the SCIFP to provide ongoing support and improvements for established programs • ***Study tours:*** Domestic and international best practice study tours for growers to improve knowledge sharing and develop networks.
FARM MANAGEMENT AND INFORMATION SYSTEMS Improve farm management practices and systems to help growers with efficient and effective decision making.	• ***Current information systems***: Assessment and review of existing farm Management Information Systems (MIS), including proprietary systems already developed by growers • ***Information system for vegetables:*** Development of an MIS that can be used as a platform system across the vegetable industry and, preferably, the horticulture sector. This may include the extension of commercially available MIS programs or developed by major growers • ***Benchmarking system:*** A benchmarking system to provide growers with information on their performance, particularly information related to industry gross margins. This may be implemented as a standalone system or integrated into the MIS cited above.

OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR INNOVATION AND ADOPTION (CONTINUED) **Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.**	
STRATEGIES	**POSSIBLE DELIVERABLES**
BUILDING THE WORKFORCE Build skills in the vegetable industry workforce and attract new people to the industry.	• ***Coordinated approach:*** Development of a coordinated strategic approach/plan to attract new people into the industry • ***Collaboration with education providers:*** Partnerships with TAFE and universities to offer internships, projects and exposure to commercial farms and available employment opportunities • ***Education and extension:*** Education and extension of the range of employment opportunities available in the vegetable industry, including highly skilled roles required in many of the larger and more sophisticated farming operations.

Aligning to Hort Innovation investment priorities

In establishing investment priorities, Hort Innovation analysed both historical and current levy and co-investment portfolios and priorities. From this analysis we identified eleven cross-sectoral investment themes. We consolidated these themes further and considered their alignment with the Australian Government's Rural RD&E Priorities and National Science and Research Priorities, to arrive at five investment priorities outlined in ***Figure 6*** below. ***Figure 6*** also shows how each cross-sectoral investment theme relates to the five investment priorities.

Figure 6: Hort Innovation's investment priorities

The alignment of vegetable SIP outcomes to the Hort Innovation investment priorities and, consequently, the Australian Government's Rural RD&E Priorities and National Science and Research Priorities is shown in ***Table 1***.

Table 1: Alignment of vegetable SIP outcomes to Hort Innovation investment priorities

Hort Innovation Investment Priorities	Vegetable SIP Outcomes
Support industry efficiency and sustainability	Improvements in farm productivity
Improve productivity of the supply chain	Improvements in farm productivity
Grow the horticulture value chain capacity	Increased levels of post-farmgate integration Improvements in industry capability
Drive long-term domestic and export growth	Growth in the domestic market Growth in export markets
Lead strategically to enhance the development of the Australian horticulture industry through operational excellence	Enabler

4

SECTION FOUR

Vegetable monitoring and evaluation

Vegetable SIP monitoring, evaluation and reporting

A SIP program logic and monitoring and evaluation (M&E) plan has been developed for the vegetable SIP. These are informed by the Hort Innovation Organisational Evaluation Framework. The logic maps a series of expected consequences of SIP investment. The M&E plan shows the performance measures that will be measured to demonstrate progress against the SIP and what data will be collected. Progress against the SIP will be reported in Hort Innovation publications and at industry SIAP meetings.

The SIP outcomes and strategies will be used to inform investments in individual projects to deliver on the SIP. The results of the M&E will be used to reflect on the results of investments and in decision making. Hort Innovation will facilitate the regular review of SIPs to ensure they remain relevant to the industry.

Vegetable SIP logic

An indicative vegetable SIP program logic is shown in ***Figure 7***. The logic is based on the Hort Innovation SIP logic hierarchy (***Appendix 3***).

Figure 7: Vegetable SIP logic

Hort Innovation investment priorities	Support industry efficiency and sustainability	Improve productivity of the supply chain through innovative technologies	Grow the horticulture value chain capacity	Drive long-term domestic and export growth	Lead strategically to enhance the development of the Australian horticulture industry through operational excellence
End-of-SIP outcomes	1. Growth in Domestic markets	2. Growth in export markets	3. Improved farm productivity	4. Improved integration of supply chain	5. Improved industry capabilities for adoption and innovation
Intermediate outcomes	Increased domestic demand and value Increased market share in food service Improved food safety Increased product differentiation Increased consumer knowledge Improved grower knowledge of the market	Improved export market access Improved grower export capabilities Increased grower understanding of export market opportunities Improved reputation and competitive advantage	Decreased production costs Better utilisation of advanced technologies on farm Reduced impact of pests and diseases Growers plan/ adapt to climate change Better utilisation of resources on farm	Improved supply chain management Collaborative models and partnerships established Increased utilisation of E-commerce platforms	New talent attracted Growers supported to innovate Growers and value chain stakeholders access extension and training programs and Improved communication and extension programs
Strategies and indicative activities	Market development: • E-commerce platforms • Market access • Trade linkages Market research and intelligence: • Consumer insights • Identify domestic opportunities, export	Research and Development: • Value-adding processes • Alternative uses for lower-grade produce /waste • New cultivars and overseas varieties • Food safely and traceability • Reducing production costs • Cropping technologies • Biosecurity and pest/disease control • Farm productivity/efficiency • Supply chain quality management • Information systems and benchmarking		Extension, education, communication and engagement programs (for growers and value chain stakeholders): • R&D findings and innovation support • Consumer insights • Market opportunities • E-Commerce opportunities • Supply chain integration opportunities • Business and leadership development • Farm management and info systems	

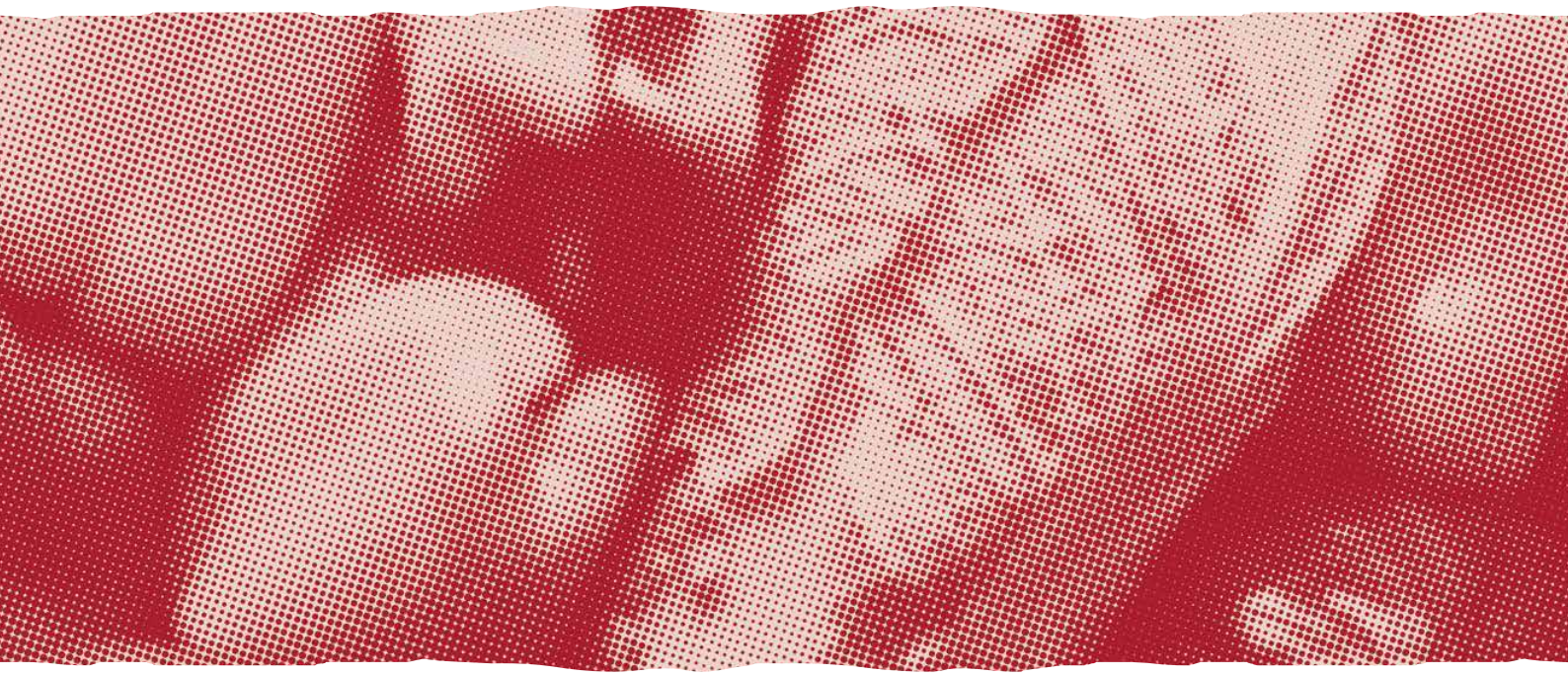
Vegetable SIP M&E plan

The vegetable SIP M&E plan is shown in ***Table 2.*** The table includes key performance indicators (KPIs), both at a macro/industry (trend) level and at more specific SIP level/s. Quantifiable measures will be developed at a project level within the strategic investment plan. The data collected will be used to measure against the KPIs.

Table 2: Monitoring and evaluation plan for the vegetable SIP

Outcome	Strategies	KPIs
OUTCOME 1: Growth in the domestic market	**CONSUMER INSIGHTS** Increase knowledge to better understand consumer trends and segments	• More stakeholders using consumer insights information from the projects commissioned • Higher economic benefit from use of the consumer insights information, for example, profits sustained
	PRODUCT VALUE-ADDING Identify value-adding opportunities, such as pre-cut and improved packaging, to achieve price premiums	• More growers implementing value-adding processes identified by the projects commissioned • Increased economic benefit to growers from value-adding processes, for example, profits from value-adding
	STAKEHOLDER EDUCATION Improve stakeholder education for vegetables, such as the identification and extension of the healtwh benefits associated with vegetables	• More stakeholder education programs developed and piloted through the projects commissioned • Higher consumption levels by consumers targeted in stakeholder education programs
	FOOD SERVICE Increase the market share for vegetables in food service, such as identification of potential product offerings specific to the sector	• More businesses engaged to improve supply to the food service sector • Higher production volumes for the food service sector • More training programs offered to food service providers for the benefit of the vegetable sector
	PRODUCT DIFFERENTIATION Support product differentiation that aligns with Australian consumer needs	• More new products introduced into the market due to the projects commissioned • More growers adopting the new products developed • Higher economic benefit from the new products developed, for example, profit
	FOOD SAFETY Improve food safety standards and traceability	• Fewer production recalls in the vegetable sector • Fewer production losses related to food safety issues

Outcome	Strategies	KPIs
OUTCOME 2: Growth in export markets	**GLOBAL AWARENESS** Facilitating a united representation of the vegetable industry to international markets	• Better recognition for Australian produce • Higher value of produce exported
	MARKET INTELLIGENCE Better understand the export opportunities available to the vegetable industry	• Increased access to export markets • Better grower understanding of the export market landscape • Higher value of produce exported
	MARKET ACCESS Improve market access in priority markets for vegetables	• Access to more export markets for the industry as a whole • Higher value of produce exported
	CAPABILITY BUILDING Improve the export capability of Australian vegetable growers	• More growers exporting produce • Higher value of produce exported
	TRADE LINKAGES Improve and capitalise on the opportunities available for inbound and outbound trade missions	• More growers exporting produce • Higher value of produce exported
	INTERNATIONAL PLATFORMS Improve and capitalise on the use of e-commerce to export produce to priority markets	• More growers exporting produce • Higher value of produce exported
	REGIONAL INVESTMENT Capitalise on Australia's geographic advantage to Asia and realise the export potential available in regional areas	• Higher value of produce exported from remote areas



Outcome	Strategies	KPIs
OUTCOME 3: Improved farm productivity	**FOOD WASTE** Reduce on-farm food waste, including other uses such as value-added foods and beverages, biofuels and nutraceuticals	• New uses of on-farm vegetable waste developed • More growers adopting new uses of on-farm vegetable waste • Higher economic benefit for growers adopting new uses of on-farm vegetable waste
	PRODUCTION COSTS Reduce major production costs through initiatives such as precision agriculture	• More growers adopting strategies to reduce production costs • Higher economic benefits for adopting growers, for example, lower inputs costs
	PROTECTED CROPPING Adapt and improve current protected cropping and intensive production technologies to the Australian environment	• Greater grower adoption of best management practices • Higher economic benefit for growers adopting best management practices
	PESTS AND DISEASES Protect the vegetable industry from endemic and exotic pests and diseases that significantly damage the industry	• More stakeholders attending information and training sessions • Fewer pest and disease outbreaks • Lower costs of pest and disease management for adopting growers
	CROP IMPROVEMENTS Introduce new cultivars that have favourable production-related traits, such as resistance to pests and diseases, severe weather conditions, and varieties that allow for automation	• New varieties developed • More growers adopting new varieties. • Higher economic benefits for growers adopting new varieties
	ENVIRONMENTAL SUSTAINABILITY Enhance the sustainability of the industry to help growers prepare for and mitigate against the cost of climate change	• More growers participating in training and information sessions • More hectares used for environmental sustainability initiatives • Higher economic benefits for participating growers
	SOIL AND WATER Improve the use and management of soil and water – critical inputs to commercial vegetable production	• More stakeholders, for example, growers and agronomists, in information and training sessions • Lower soil and water management costs
	ADVANCED TECHNOLOGIES Increase use of advanced technologies to improve farm productivity and/or cut input costs for growers	• New technologies developed • More growers adopting new technologies • Higher economic benefits for growers adopting new technologies

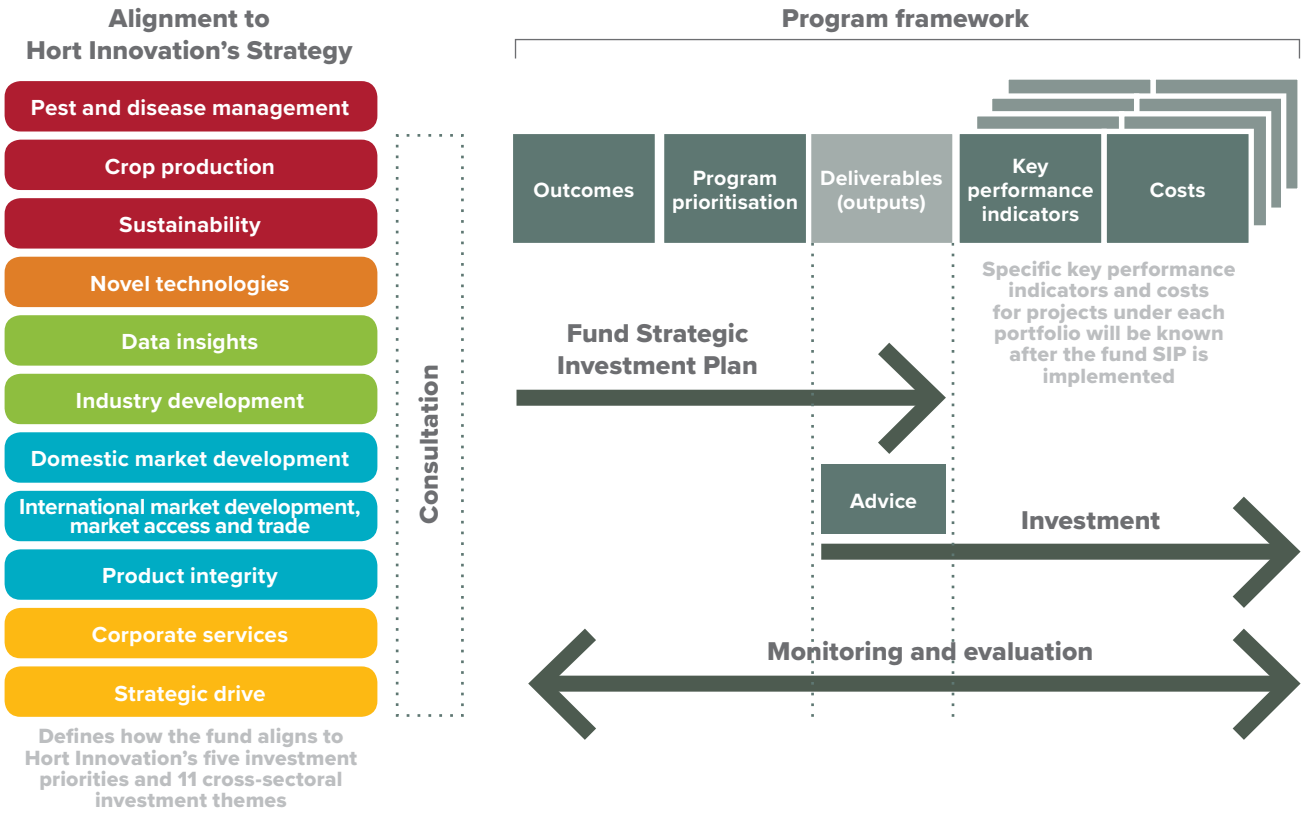
Outcome	Strategies	KPIs
OUTCOME 4: Increased levels of post-farmgate integration	**SUPPLY CHAIN INTEGRATION** Improve supply chain integration and efficiencies	• More growers integrating into the supply chain due to the work undertaken by the projects commissioned • Higher economic benefit for growers from supply chain integration, for example, profit • Lower costs for supply chain stakeholders involved in the projects commissioned
	PRODUCT QUALITY Improve the product quality along the supply chain with the aim to increase returns for growers	• Less waste along the supply chain from work undertaken in the projects commissioned • Higher economic benefits for supply chain stakeholders from less waste, for example, cost savings or higher revenues
	COLLABORATIVE MODELS Support collaboration between growers and stakeholders along the supply chain to improve its efficiency	• Higher economic benefits from the implementation of collaborative models, for example, cost savings or higher revenues through growth in customer base
OUTCOME 5: Improvements in industry capability	**COMMUNICATION AND EXTENSION** Improve communication and extension of research outputs to address a geographically and culturally diverse vegetable industry	• More stakeholders accessing levy-funded research findings and outcomes • More stakeholders engaged in communication and extension events • Communication and extension programs delivered, based on stakeholder engagement plans • More growers adopting practice change based on levy-funded research projects • Higher economic benefits from adopting practice change, for example, cost savings or higher revenues
	INNOVATION SUPPORT Support innovations that advance and grow the vegetable industry	• More businesses supported to provide innovation in the vegetable sector • Higher economic benefit from the innovations supported, for example, higher stakeholder revenue or cost savings
	PROFESSIONAL DEVELOPMENT Improve grower skills in all areas associated with commercial vegetable production	• More professional development programs offered to the vegetable industry • More growers participating in professional development to improve workplace productivity
	FARM MANAGEMENT AND INFORMATION SYSTEMS Improve farm management practices and systems to help growers in efficient and effective decision making	• More growers adopting better farm management and information systems • Higher economic benefit from the innovations supported, for example, higher grower revenue or cost savings
	BUILDING THE WORKFORCE Build skills in the vegetable industry workforce and attract new people to the industry	• More growers attending programs to improve their personal skills • More new people entering the workforce due to the work undertaken by the projects commissioned

Reporting

The program framework in ***Figure 8*** is the mechanism that links Hort Innovation's strategy and investment priorities to the investment process through the industry SIP. SIPs help Hort Innovation prioritise and implement the specific industry research, development and extension programs.

Hort Innovation will use dynamic reporting against our monitoring and evaluation framework to report on investment progress. The contribution of investments to each industry outcome will be reported regularly, including through industry Annual Reports, Hort Innovation's Annual Report and Hort Innovation's Annual Operating Plan.

Figure 8: Hort Innovation's program framework

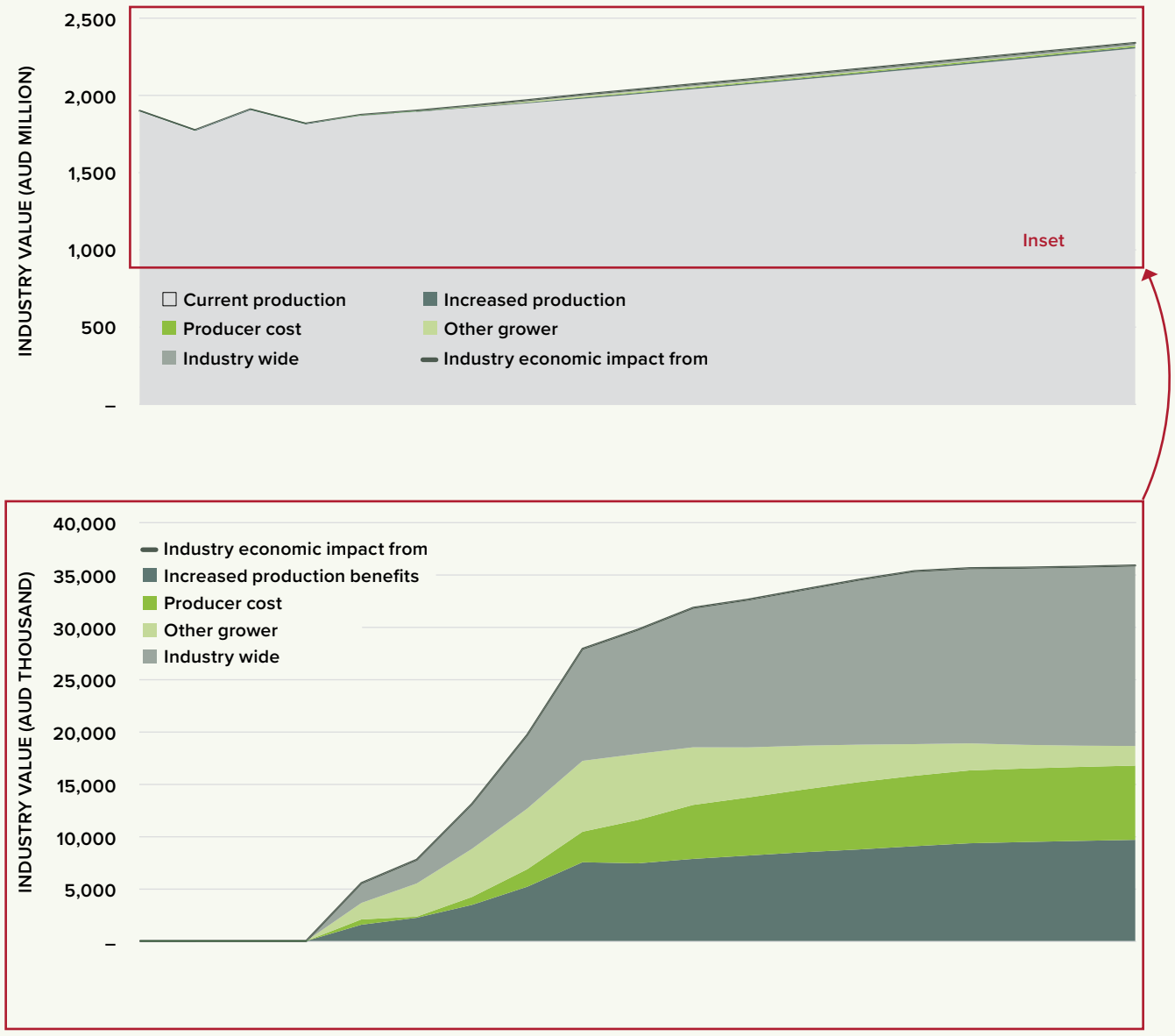


SECTION FIVE

5

Impact assessment

Figure 9: Economic benefit from investment in the SIP



Five key outcome areas have been identified that will be driven by a total of 29 strategies. It is important to note that many of these strategies may be able to attract extra funding from the Hort Frontiers strategic partnership initiative, other government funding sources, as well as direct funding from growers and related stakeholders. Modelling has not included assumed extra funding from these sources that would both reduce funding needed from the vegetable SIP, and expand the impact of these projects if third party funders added more resources.

An independent assessment of the potential economic impacts from investment into the vegetable SIP indicated a positive return on investment for the industry. The anticipated investment of $90.68 million over the next five years in research, development and extension activities is expected to generate $471.87 million in net benefits for the industry, representing a benefit-cost ratio of 5.20 times to growers and service providers along the value chain.

The assessment draws from a wide range of available data sources, and projects economic impacts over a 15-year period starting from 2016/17. A five per cent discount rate has been applied and all values are adjusted for inflation and presented in 2016/17 dollar terms. The assessment takes a highly conservative approach and the presented figures have been adjusted to account for risks associated with achieving research outputs, expected adoption and impacts.

Table 3 provides a summary of the assessed impacts for each outcome identified in the SIP, the anticipated deliverables, net economic benefits and benefit cost ratio.

Table 3: Overview of impacts assessed and alignment with SIP targets

Outcome	Expected deliverables	Anticipated SIP investment (over five years)	Net benefits (over 15 years)	Benefit cost ratio
OUTCOME 1: GROWTH IN THE DOMESTIC MARKET				**4.03**
Consumer insights	Methods and solutions to better understand consumer trends and segments	$3,126,848	$11,459,034	3.66
Value-adding	Methods and solutions for value-adding, such as pre-cutting and improved packaging	$3,126,848	$13,730,617	4.39
Stakeholder education	Methods and solutions to improve stakeholder education about vegetables, such as the identification and extension of associated health benefits	$3,126,848	$11,390,251	3.64
Food service	Methods and solutions to increase the market share for vegetables in food service, such as the identification of potential product offerings specific to the sector	$3,126,848	$13,604,832	4.35
Product differentiation	Methods and solutions to support product differentiation that aligns with consumer needs, such as better nutritional attributes	$3,126,848	$11,155,691	3.57
Food safety	Methods and solutions to improve food safety standards and traceability	$3,126,848	$14,308,985	4.58

Outcome	Expected deliverables	Anticipated SIP investment (over five years)	Net benefits (over 15 years)	Benefit cost ratio
OUTCOME 2: GROWTH IN EXPORT MARKETS				**5.22**
Extension	Methods and solutions to support a united representation of the vegetable industry to international markets	$3,126,848	$12,831,317	4.10
Market intelligence	Methods and solutions to better understand the export opportunities available to the vegetable industry	$3,126,848	$5,776,219	1.85
Market access	Methods and solutions to improve market access in priority markets for vegetables	$3,126,848	$24,936,714	7.98
Capability building	Methods and solutions to improve the export capability of Australian vegetable growers	$3,126,848	$16,768,465	5.36
Trade linkages	Methods and solutions to improve and capitalise on the opportunities available for inbound and outbound trade linkages	$3,126,848	$37,589,049	12.02
International platforms	Methods and solutions to improve and capitalise on the use of e-commerce to export produce to priority markets	$3,126,848	$8,138,915	2.60
Northern Australia	Methods and solutions to capitalise on Australia's geographic advantage to Asia, and to realise the export potential available in regional areas	$3,126,848	$8,141,256	2.70
OUTCOME 3: IMPROVED FARM PRODUCTIVITY				**3.67**
Food waste	Methods and solutions to reduce on-farm food waste, including other uses, such as value-added foods and beverages, biofuels and nutraceuticals	$3,126,848	$10,769,260	3.44
Production costs	Methods and solutions to reduce major production costs through initiatives such as precision agriculture	$3,126,848	$13,516,776	4.32
Protected cropping	Methods and solutions to adapt and improve current protected cropping and intensive production technologies for the Australian environment	$3,126,848	$9,234,603	2.95
Pest and disease	Methods and solutions to protect the vegetable industry from both endemic and exotic pests and diseases that significantly damage the industry	$3,126,848	$19,604,619	6.27
Crop improvements	Methods and solutions to produce new cultivars that have favourable production-related traits, such as resistance to pests and diseases, severe weather conditions, and varieties that allow for automation	$3,126,848	$6,187,459	1.98
Environmental sustainability	Methods and solutions to ensure the sustainability of the industry and to help growers prepare and mitigate against the cost of climate change	$3,126,848	$14,713,396	4.71
Soil and water	Methods and solutions to improve the use and management of soil and water	$3,126,848	$5,906,025	1.89
Advanced technologies	Methods and solutions that use advanced technologies to improve farm productivity and/or reduce input costs for growers	$3,126,848	$11,879,988	3.80

Outcome	Expected deliverables	Anticipated SIP investment (over five years)	Net benefits (over 15 years)	Benefit cost ratio
OUTCOME 4: POST-FARMGATE INTEGRATION				**4.46**
Supply chain integration	Methods and solutions to improve supply chain integration and efficiencies	$3,126,848	$14,246,175	4.56
Product quality	Methods and solutions to improve product quality along the supply chain with the aim to increase returns for growers	$3,126,848	$12,695,512	4.06
Collaborative models	Methods and solutions to support collaboration between growers and stakeholders along the supply chain to improve its efficiency	$3,126,848	$14,922,192	4.77
OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR INNOVATION AND ADOPTION				**9.49**
Communication and extension	Methods and solutions to improve the communication and extension of research outputs, and to address the geographically and culturally diverse vegetable industry	$3,126,848	$68,613,514	21.94
Innovation support	Methods and solutions to support innovations that advance and grow the vegetable industry	$3,126,848	$24,846,424	7.95
Professional development	Methods and solutions to improve grower skills in all areas associated with commercial vegetable production	$3,126,848	$16,531,316	5.29
Farm management and Information systems	Methods and solutions to improve farm management practices and systems to help growers with efficient and effective decision making	$3,126,848	$30,561,267	9.77
Building the workforce	Methods and solutions to build the vegetable industry workforce and attract new people to the industry	$3,126,848	$7,805,656	2.50

The quantified impacts associated with Outcome 1 include:

- The sustainability of current production levels and grower revenue through the use of consumer insight information, such as market trends and consumer preferences
- Increases in profits from the introduction of value-added vegetable products such as pre-cutting, semi-prepared snacks and meals, and packaging for extended shelf life
- Increases in consumption per capita from improved stakeholder education, including the development of closer relationships with advocates and advisory bodies, and training and food service providers
- Increases in production from market expansion in food service using strategies such as nutritional information and customised training programs for service providers
- Increases in production from the development of new vegetable varieties through a range of methods
- Reductions in the cost associated with food safety through the development of improved traceability systems, food safety standards and strategies to mitigate against food-borne diseases.

The quantified impacts from Outcome 2 include:

- Increases in the prices that overseas customers for Australian produce are willing to pay, through the delivery of better understanding of Australian vegetables
- Cost savings to exporting growers from the centralised generation of overseas market information for the industry. This represents a significant saving to the industry rather than having growers individually purchase or conduct market intelligence research
- Increases in exports from new markets and in value to growers from improved prices for produce as a result of higher overseas demand
- Additional profits from exporting produce by equipping growers with the tools an information required to access export markets
- Improved profitability for the industry from additional export trade by engaging with export-ready growers to facilitate networks and connections
- Increase in revenue from large, high-growth, premium overseas markets through the development of an e-commerce strategy to facilitate trade
- Increase in exports from the implementation of an export development strategy that takes advantage of our geographic advantage to Asia and growth in regional areas.

The quantified impacts from Outcome 3 include:

- Increase in production value attributed to new revenue streams, such as selling waste to markets producing bioactive compounds and fibre supplements; and, for some commodities, using waste to produce value-added products
- Reduction in production costs from the use of an on-farm solar energy system as an alternative power source, thereby reducing energy consumption costs for the growers
- Increase in yield from the adoption of new protected cropping approaches and solutions that are customised to Australian conditions
- Reduction in cost of crop and pasture chemicals from the implementation of integrated pest management strategies
- Increase in yield due to the adoption of new varieties identified in varietal trials
- Reduction in production costs and increase in yield from the adoption of enviro-sustainable strategies
- Reduction in irrigation, fertiliser, and chemical costs, and increase yield from the adoption of decision-support tools designed to improve soil and water management
- Grower benefits from the adoption of integrated robotic solutions. Benefits are derived from cost savings in fertiliser and chemical use, water use, harvesting; and increased marketable yield.

The quantified impacts from Outcome 4 include:

- Increase in grower revenue from supply chain integration using strategies such as e-commerce platforms and the implementation of new partnership models to capture more value along the supply chain
- Reduction in food waste through the development of new technologies to identify and monitor breaks in the supply chain, where food losses are highest. Other strategies include lower-grade value-adding and quality maintenance
- Increase in revenue and reductions in production costs from the adoption of new collaborative farm models to create economies of scale.

The quantified impacts from Outcome 5 include:

- Increase in revenue and reductions in production costs from greater adoption of research outcomes and practice change through the delivery of programs similar to the highly successful Soil Wealth and ICP program
- Increase in industry value through the provision of new innovations and commercial services to support growth in the vegetable sector
- Increase in industry value from improved grower skills through the delivery of programs such as Growing Leaders, the Nuffield scholarships, and new online teaching platforms
- Increase in revenue and reductions in production costs from the delivery of improved farm management systems customised to the needs of the vegetable sector
- Salary premiums from improvements in industry workforce skills and the attraction of new people to the industry. Strategies include collaborations with education providers, workforce education and a coordinated approach to attracting people to the industry.

SECTION SIX

Risk management

The purpose of this section is to highlight unique and/or specific risks that qualify the vegetable SIP. This is not intended to be an exhaustive review of the vegetable industry risks, which are, in part, considered in the SWOT. Rather, these risks have been considered in the development of the economic impact statement for the vegetable SIP. A major mitigation against these risks is that many of these initiatives may be, at least in part, supported by other funding initiatives, such as the Hort Frontiers strategic investment initiative, CRCs, CRC-Ps and ARC Linkage grants and direct funding from industry partners. These additional funding sources may enable a much larger investment into these areas, which would reduce the risk and increase the impact from these projects. This additional funding is not able to be considered in this risk assessment because it has not been targeted or secured.

It should also be noted that the impact risk rating is an assessment based on achieving the economic impact of each deliverable. This includes not just the research risk but also the adoption and extension risk. The major risks, their justification, and risk ratings are as follows:

OUTCOME 1: GROWTH IN THE DOMESTIC MARKET ***Increased demand and value of the domestic vegetable industry through improved grower knowledge of the market, product differentiation, increased food service revenue, improved food safety and increased consumer knowledge.***	
1.1	Consumer insights The ability of the sector to better meet customer needs through levy funds is largely untested. As the vegetable sector becomes more skilled at better meeting consumer needs and adding value to vegetables, other sectors might do the same, which will offset the benefits of this strategy.
1.2	Product value-adding Because this area of research is new, it will take time to establish relationships with key service providers and home in on the most productive projects. Benefits will be lower in the early years of this investment plan.
1.3	Stakeholder education Education of consumers is a difficult and resource-intensive area. Retailer receptivity to research findings cannot be assured. Vegetables is a traditional industry, so the messages may not resonate and change consumer behaviour. Without a marketing levy, the industry is significantly constrained in the way it promotes the outcomes of research and extension findings.
1.4	Food service An engaging and well-functioning relationship with the food service sector will take time to develop. Because its receptivity to advice is not well tested, adoption might be limited. Knowing which people to engage with and the effort required for effective engagement is not yet understood. A small level of impact can be achieved with the limited levy funds sought after for other levy projects.
1.5	Production differentiation Retailers are often inundated with new product offerings. While the successful examples generate large gains for growers, effective product differentiation is risky, and is largely done in other countries. If a product is successful there, it is adopted here. The need to differentiate for Australian circumstances is limited.
1.6	Food safety Food safety and its supporting system's link to consumption, price, and market access is at times tenuous. The direct impact will be difficult to measure.

OUTCOME 2: GROWTH IN EXPORT MARKETS ***Export markets grown through increased understanding of opportunities available, improved market access, improved export capabilities, improved reputation and competitive advantage.***	
2.1	Global awareness A focus on 'clean and green' attributes of our vegetable production may be only short term because other countries are also increasingly improving their environmental practices.
2.2	Market intelligence It is not certain that this intelligence will lead to significant opportunities or will be used by the industry.
2.3	Market access The ability to use levy funds to accelerate and provide information for market access purposes appeals in theory, but it has never been done and might not help to speed up market access.
2.4	Capability building Growers might not use the knowledge gained in the export training and mentoring programs effectively to support their specific organisational needs.
2.5	Trade linkages These programs are already in place and have been highly successful. Their expansion and the commensurate benefit is seen as low risk.
2.6	International platforms This is a new frontier for the vegetable industry. The ability to use these platforms, the demand for produce, and the potential to manage orders are all untested.
2.7	Regional investment Leveraging Australia's geographic advantage in exports is not a new concept. Logistical issues, such as ports or airport terminals with the appropriate infrastructure and/or the business case to establish this infrastructure, has not been tested. Investment in infrastructure, what to do with back loads, the overall economics and feasibility in the past have revealed that exports from regional areas have not been practical. There is a significant risk that this is still the case.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY ***Increased farm productivity and decreased production costs through better utilisation of resources, adaptation to climate, reduced impact of pests and diseases and better utilisation of advanced technologies on the farm.***	
3.1	Food waste While cutting food waste will lift productivity and cut costs, the subsequent increase in supply of vegetables will put pressure on prices. Retailer and consumer willingness to accept lesser looking produce (a likely consequence) is far from assured.
3.2	Production costs Australian vegetable growers have one of the highest cost structures in the world. Input costs are also growing faster than inflation. However, many of the solutions for directly reducing production costs fall outside the scope of the vegetable SIP. Issues such as labour, energy, water, and other input costs are typically not vegetable specific, and would in some cases benefit from partnering with other horticulture segments through Hort Frontiers Funds. Many of these cost problems are difficult to solve, and are already the subject of significant research, for example, reducing energy prices.
3.3	Protected cropping Although extensive research into protected cropping has been done, the customisation for Australian conditions might not provide significant advances.
3.4	Pests and diseases Although ongoing investment is needed, de-registration of key chemicals will create a greater reliance on IPM-based programs that may have limited effectiveness. Investigation into reducing the regulatory burden and making greater use of overseas data is a new frontier that might not end up being valuable.

OUTCOME 3: IMPROVED FARM PRODUCTIVITY (CONTINUED)
Increased farm productivity and decreased production costs through better utilisation of resources, adaptation to climate, reduced impact of pests and diseases and better utilisation of advanced technologies on the farm.

3.5 Crop improvements
Crop improvements are largely completed overseas. We believe there are limited opportunities for breeding programs here except customisation for Australian conditions. It has been assumed that GM vegetables will not be developed, but that gene editing and traditional breeding programs will be used. There is a risk of a consumer backlash through any developments of new or improved varieties from gene-editing.

3.6 Environmental sustainability
Although Australia has a reputation for 'clean and green' produce, our key markets will likely improve the environmental sustainability of their farming practices. There is a risk that they will do it faster than anticipated in the development of the vegetable SIP.

3.7 Soil and water
Soil productivity has been a significant area of investment. Although new technology and approaches provide great promise these solutions are emerging and have not been tested.
Water solutions are largely driven by water access rights and water pricing, which are beyond the scope of the SIP; hence, the benefits from water are limited.

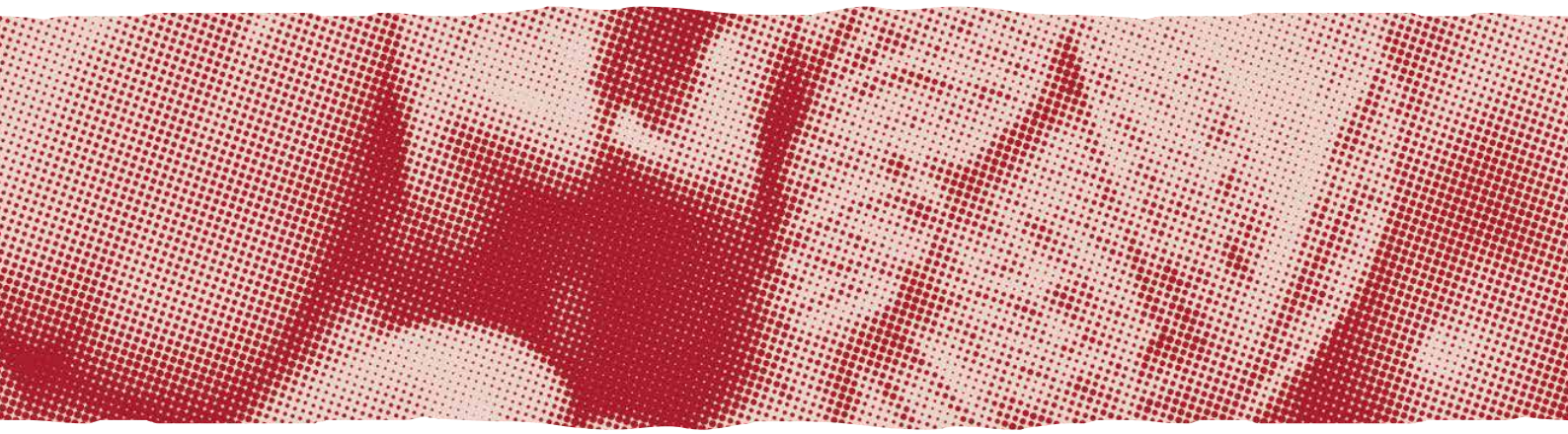
3.8 Advanced technologies
Significant advances are being made in vegetable operations, particularly related to ICT applications. The economics of these advances and the rates of adoption are still undetermined. This is a particular risk that most vegetable farmers lack technical skills, particularly for ICT solutions. Non-ICT solutions, especially those that will eliminate labour costs, have been considered and tried for many years. There is a significant chance that there is no market failure for the development of further automation in that the cost of development and the efficiency gains makes these types of technology unfeasible.

OUTCOME 4: IMPROVED FARM PRODUCTIVITY
Increased supply chain integration and development through improved supply chain management, development of collaborative models and partnerships.

4.1 Supply chain integration
Despite numerous examples of success, many farmers are not confident in taking initiatives to capture supply chain efficiencies. Smaller farms also lack the capital and scale to make these integrations feasible. If projects are not scoped properly, there is significant risk that any supply chain advances are captured by supply chain service providers rather than the grower.

4.2 Product quality
Increases in production quality and reductions in food waste from supply chain improvements might benefit service providers. However, these changes might put more produce on the market, which will be offset by lower prices.

4.3 Cooperative models
Grower willingness and ability to reach agreement on workable arrangements that will benefit a collaboration of growers is inherently difficult. A cooperation model would need to be customised to the circumstances of the growing region and the personalities of cooperative members. This is likely to be time consuming and, in many cases, workable arrangements might not be reached.



OUTCOME 5: IMPROVED INDUSTRY CAPABILITIES FOR INNOVATION AND ADOPTION ***Improved capability of levy payers to adopt improved practices and new innovation through improved communication and extension programs, grower innovation support, professional development and workforce building programs, and through improved farm management and information systems.***
5.1 Communication and extension This is an inherently difficult area. Most growers take little to no interest in levy-funded projects. They are often geographically removed from best practice, and despite initiatives in this plan to make access to information easier, many will not seek it. It is likely that the benefits of levy-funded projects will be confined to a relatively small but important share of the industry, with innovations being slowly taken up over the years.
5.2 Innovation support Despite these models working effectively elsewhere in the world, Australia has a poor track record of innovation adoption. It has little supporting infrastructure needed, such as capital markets to fund innovation, and entrepreneurs who can drive commercial success. As noted in 5.1, the ability of farms to take advantage of these innovations is also likely to be limited. Although this plan has tried to address these issues, they require broader support than is possible from this plan alone, and will remain constraints for the sector.
5.3 Professional development This has been recognised as an issue for the industry for many years. Advances in ICT have improved accessibility and the quality of providing professional development programs. The economics and adoption rates are still unknown and need to be tested.
5.4 Farm management and information systems As with 5.3, the economics of providing better MIS systems to growers is not yet understood, with adoption rates not known. The ability to develop systems that justify the data entry requirements and can give cost-effective information needs to be tested further. The benefits of these systems, although anecdotally positive, may not be as beneficial as expected, because it is possible that farmers have very good intuition when making decisions.
5.5 Building the workforce The trend toward people living in urban regions, the declining margins for vegetable growers (particularly for smaller growers), and the manual nature of the work make it unattractive for most young people to enter the industry if they are not already involved. However, larger operations offer a variety of increasingly skilled jobs, and the success of this program needs to be only marginal.

These risks have already been considered as part of the impact modelling of the benefits of the vegetable SIP. It is also noteworthy that most risks are seen to be high, with some moderate and a few low. Although this is of concern, it further validates the claim that these opportunities are appropriate for levy funding because their risk profile creates a market failure where commercial interests are not encouraged to invest.

Figure 10: The SIP strategic investment planning process

KEY ACTIVITIES	KEY ACTIVITIES	KEY ACTIVITIES	KEY ACTIVITIES
• Planning meeting with Hort Innovation and AUSVEG to tailor SIP development process to vegetables • Confirm roles, responsibilities and timeframes to develop the vegetable SIP • Develop the stakeholder engagement strategy including the regions to visit and stakeholders to interview • Obtain key data sources for environmental scan • Review past learnings from previous consultationprocess.	***Environmental scan*** • Completion of environmental scan • Case studies on international best practice • Review of the progress with the previous SIP • Investigation of key industry challenges and opportunities. ***Industry consultation*** • Facilitation of industry workshops • Interviews with industry stakeholders • Workshop with the vegetable SIAPs • Online industry survey.	***Economic modelling*** • Detailed impact modelling of the identified outcomes • Analysis of outcomes through the Hi-Link model developed by the Centre of International Economics. ***Business case*** • Prioritisation of the key outcomes and strategies identified based on the environmental scan, consultation and economic impact modelling • Develop first draft of SIP consistent with Hort Innovation requirements.	***Industry feedback*** • Release of the draft SIP on for feedback through Hort Innovation communications channels • Presentations to the Industry Representative Body for vegetables • Presentations at industry events such as Hort Connections. ***Strategic Investment Plan*** • Finalise the SIP based on feedback from industry • Final version of SIP released to industry.

APPENDIX 1: SIP development process

The SIP was developed in consultation with the Australian vegetable industry through a four-stage process formulated by Hort Innovation (***Figure 10***). This process is aligned to Hort Innovation's broader SIP process used for the development of the SIPs for the other horticulture sectors.

Preplanning activities included the meetings with Hort Innovation and AUSVEG to tailor the SIP development process specifically to the vegetable sector. This included confirmation of roles, responsibilities and timeframes; development of a stakeholder engagement strategy, including the regions to visit and the stakeholders to interview; obtaining data for the environmental scan, and reviewing learnings from the previous consultation process.

The preplanning activities provided an implementation framework and foundation for the work to be undertaken in stages 2 to 4 of the strategic investment planning process.

Preparation activities were undertaken in two distinct components: the environmental scan and the industry consultation.

- **The objective of the environmental scan** is to provide Hort Innovation with a detailed assessment of the current status of the vegetable industry and to identify an initial set of priority areas based on desktop research to support the industry consultation process.

  This was complemented with a review of the previous vegetable SIP, and the progress made to date with that plan, as well as identifying case studies of international best practice. The outcomes of the environmental scan were prepared in a separate report, with a summary of the findings included in Section one of the SIP.

- **The objective of the industry consultation** is to ensure the SIP is developed in collaboration with industry, and reflects the collective view of the Australian vegetable industry. The consultation focused on collecting feedback from a range of industry stakeholders on the key industry challenges, the research areas that would provide the biggest impact, the innovations that have taken place over the last five years, and the sources of innovation.

  Significant effort was placed on industry engagement to ensure all vegetable levy payers had the opportunity to contribute to the SIP. This was achieved through:

  - The facilitation of industry workshops in 20 major vegetable-growing regions across Australia, with more than 190 stakeholders attending, including growers, researchers, service providers, processors, government, and industry body representatives. Our aim was to have approximately 70 per cent of vegetable growers within a two-hour radius of one of the regions in which workshops were held (***Figure 11***)
  - More than 70 individual interviews with stakeholders at each of the workshop locations to ensure we provide an opportunity for those who could not attend the workshop to still be able to provide input into the SIP
  - The release of an industry survey during the three-month consultation period to ensure a greater geographical coverage was obtained. The industry survey received over 40 responses that provided valuable insights into the needs of the industry and where the levy funds should be directed in the SIP
  - A workshop with the three vegetable industry SIAPs to present the preliminary findings from consultation and prioritise the preliminary outcomes and strategies based on the level of importance and benefit to industry
  - Attendance at the Hort Innovation's Trade Stand at Hort Connections to obtain feedback and answer any questions on the progress of the SIP and the preliminary outcomes and strategies developed.

Figure 11: Major growing regions visited as part of the vegetable industry consultation

Growing regions visited as part of the industry consultation			
Adelaide	Carnarvon	Hobart	Sale
Ayr	Cowra	Ipswich	Swan Hill
Bathurst	Cranbourne	Katherine	Sydney
Bowen	Darwin	Manjimup	Wanneroo
Bundaberg	Devonport	Nambeelup	Werribee

Execution activities were also undertaken in two components: economic impact modelling; and development of the business case/draft SIP.

- **The objective of the impact modelling** is to provide industry with an independent assessment of the potential economic impacts from investment into the areas identified under the vegetable SIP. The economic impacts are assessed over a 15-year period starting from 2016/17 and risk adjusted for likelihood of achieving the research outputs, adoption and economic benefits. The net economic impact takes into account usage and research costs and is discounted at a five per cent rate.

  More value is added to the economic impact assessment through the use of the Hi-Link model. Hi-Link is a partial equilibrium model developed by the Centre of International Economics (CIE) specifically for the horticulture industry. It takes into account market factors that might influence the total benefits for the industry, such as supply and demand, as well as the distribution of benefits across the supply chain.

- ***The objective of business case/draft SIP*** is to collate and document the findings of the environmental scan, industry consultation and economic impact modelling into an SIP for the vegetable industry. As part of this process, the outcomes and strategies identified will be described and prioritised to provide the vegetable SIAPs with a framework to direct future levy-funded R&D investment. A monitoring and evaluation plan will also be put in place to track progress and achievement of the outcomes.

Validation activities included the release of the draft SIP on Hort Innovation's communication channels for industry feedback and presentations to industry, the industry representative bodies, and vegetable SIAP at the Hort Connections event. The SIP was further refined from the feedback obtained.

APPENDIX 2:
Stakeholder consultation

The following individuals were consulted during the development of this SIP (and their assistance is gratefully acknowledged).

Name	Position/company	Stakeholder group	Region	State
Claire McClelland	Schreurs & Sons	Grower	Cranbourne	VIC
Chris Schreurs	Schreurs & Sons	Grower	Cranbourne	VIC
Tony Croft	Arahura Farms	Grower	Swan Hill	VIC
Sean Croft	Arahura Farms	Grower	Swan Hill	VIC
Andrew Granger	Plant & Food Research	Service Provider	Adelaide	SA
Tom Rundle	ANZ	Service Provider	Adelaide	SA
Peter Carr	ANZ	Service Provider	Adelaide	SA
Kingsley Songer	4 Ways Fresh	Grower	Adelaide	SA
Richard Cobbledick	Cobbledick Produce	Grower	Adelaide	SA
Graeme Pitchford	Pitchford Produce	Grower	Adelaide	SA
Monika Fiebig	Monika's Organics	Grower	Adelaide	SA
Barbara Hall	SARDI	Service Provider	Adelaide	SA
Mike Rettke	SARDI	Service Provider	Adelaide	SA
Kathy Ophel-Keller	SARDI	Service Provider	Adelaide	SA
Steve Lapidge	SARDI	Service Provider	Adelaide	SA
Kevin	Grower	Grower	Adelaide	SA
Daniel Hoffman	Grower	Grower	Adelaide	SA
Hung	Grower	Grower	Adelaide	SA
Chris McKenna	McWacros Pty Ltd	Grower	Devonport	TAS
Nathan Richardson	TFGA Veg Council	Grower	Devonport	TAS
Peter Hardman	Simplot	Processor	Devonport	TAS
Andrew Craigie	Grower	Grower	Devonport	TAS
Ian Young	Grower	Grower	Devonport	TAS
Jason McNeill	Premium Fresh Tasmania	Grower	Devonport	TAS
Mike Badcock	Grower	Grower	Devonport	TAS
Neil Austey	Harvest Moon	Grower	Devonport	TAS
Josh Wing	Harvest Moon	Grower	Devonport	TAS
Mark Boersma	Tasmanian Institute of Agriculture	Service Provider	Hobart	TAS
Alistair Gracie	Tasmanian Institute of Agriculture	Service Provider	Hobart	TAS
Anthony Brandsema	Brandsema Farms	Grower	Mornington	TAS
Colin Sorell	Grower	Grower	Mornington	TAS
Donna Lucas	RMCG	Service Provider	Mornington	TAS
Justin Nichols	JG & JE Nichols	Grower	Mornington	TAS
Sophie Nichols	JG & JE Nichols	Grower	Mornington	TAS

Name	Position/company	Stakeholder group	Region	State
Peter Ward	Grower	Grower	Bathurst	NSW
Rebekah Pierce	NSW DPI	Government	Bathurst	NSW
Peter Conasch	Greater Sydney Local Land Services	Service Provider	Bathurst	NSW
Matt Plunkett	Greater Sydney Local Land Services	Service Provider	Bathurst	NSW
Frank Camilleri	F & F Camilleri	Grower	Bathurst	NSW
Michael Willott	Ravenswood Whiterock	Grower	Bathurst	NSW
Jeff McSpedden	Springfield	Grower	Bathurst	NSW
Michael Cook	H & M Cook	Grower	Bathurst	NSW
Joe D'Anastasi	Grower	Grower	Sydney Basin	NSW
Nathan Clackson	Wavertree Farms	Grower	Peats Ridge	NSW
John Drummond	Wavertree Farms	Grower	Peats Ridge	NSW
Casey Proctor	Greater Sydney Local Land Services	Service Provider	Cowra	NSW
Joe Elonstani	Grower	Grower	Sydney Basin	NSW
Mark Hinderager	Applied Horticulture Research	Service Provider	Cowra	NSW
Len Tesoriero	NSW DPI	Service Provider	Sydney Basin	NSW
Michael Nixon	AUSVEG	SIAP	Carnarvon	WA
Emma Germano	Grower	SIAP	Gippsland	VIC
Kees Versteeg	Grower	SIAP	Gatton	QLD
Maureen Dobra	Grower	SIAP	Gin Gin	WA
Jim Trandos	Grower	SIAP	Wanneroo	WA
Kelvin Free	Grower	SIAP	Swan Hill	VIC
Michael Coote	AUSVEG	SIAP	Melbourne	VIC
Nick Macleod	QLD Department of Agriculture and Forestry	Service Provider	Brisbane	QLD
Greg Owens	NT Farmers	Service Provider	Katherine	NT
Aisla Connolly	NT Farmers	Service Provider	Katherine	NT
Di Renfree	Red Dirt Melons	Grower	Katherine	NT
Jon Shaw	Surelines Produce	Grower	Katherine	NT
Chris Cranin	Kalano Farms	Grower	Katherine	NT
Scott M McDonald	Charles Darwin University	Service Provider	Katherine	NT
Lina Challita	Food Ladder	Service Provider	Katherine	NT
Angelina Siputro	Food Ladder	Service Provider	Katherine	NT
Luciano Raco	Grower Core	Grower	Katherine	NT
Mitchell Cortis	Kings Farms	Grower	Katherine	NT
Chirs Pham	Not provided	Grower	Darwin	NT
Phuoc Tran	Not provided	Grower	Darwin	NT

Name	Position/company	Stakeholder group	Region	State
Cameron McConchie	NT Department of Primary Industry and Resources	Government	Darwin	NT
Mila Bristow	NT Department of Primary Industry and Resources	Government	Darwin	NT
Fergol O'Gower	EE Muir & Sons	Service Provider	Darwin	NT
Bill Bremner	EE Muir & Sons	Service Provider	Darwin	NT
Sang	Not provided	Grower	Darwin	NT
Quang	Not provided	Grower	Darwin	NT
Tri Vu	Not provided	Grower	Darwin	NT
Saroun Phou	S & H Best Fresh	Grower	Darwin	NT
David Cormack	Cormack Farm	Grower	Darwin	NT
Ruth Cormack	Cormack Farm	Grower	Darwin	NT
Penny Goldsmith	ORDCO	Service Provider	Kununurra	WA
Christian Bloecker	Bothkamp Australia Farm	Grower	Kununurra	WA
Chris Jowett	Acadia Farms	Grower	Kununurra	WA
Katrina Jowett	Acadia Farms	Grower	Kununurra	WA
Peter Pegg	Western Desert Product Pty Ltd	Grower	Kununurra	WA
Rob Kuzmicich	Gascoyne Greenhouse Fresh	Grower	Carnarvon	WA
Michael Nixon	River Lodge Assets	Grower	Carnarvon	WA
Dan Kuzmicich	VegWA	IRB	Carnarvon	WA
Luke Skender	Carnarvon Growers Association	Service Provider	Carnarvon	WA
Paul Kelly	Gascoyne Development Commission	Service Provider	Carnarvon	WA
Deane Wiggins	Not provided	Grower	Carnarvon	WA
Chris Collins	Mundillya Farms	Grower	Carnarvon	WA
Bruer Munro	Carnarvon Growers Association	Service Provider	Carnarvon	WA
Valerie Shrubb	DAFWA	Government	Carnarvon	WA
Eddie Smith	Gascoyne Water Cooperative	Service Provider	Carnarvon	WA
Vince Catania	Member of Parliament	Government	Carnarvon	WA
Vange Panagiotidis	P & A Pan	Grower	Wanneroo	WA
Rachael Lancaster	Environmental and Agricultural Testing Services	Service Provider	Bunbury	WA
Liam Southam-Rogers	Applied Horticulture Research	Service Provider	Nambeelup	WA
Doris Blaesing	RMCG	Service Provider	Nambeelup	WA
Lauren Thompson	VegWA	IRB	Nambeelup	WA
Tom Mitchell	Worrolong Producer	Grower	Nambeelup	WA
Justin Wolfgang	C-Wise	Service Provider	Nambeelup	WA
John Shannon	VegWA	IRB	Perth	WA
Michelle De'Lisle	AUSVEG	PIB	Werribee	VIC

Name	Position/company	Stakeholder group	Region	State
Dimi Kyriakou	AUSVEG	PIB	Werribee	VIC
Sophie Lapsley	VegPro	Service Provider	Werribee	VIC
Kurt Hermann	AUSVEG	PIB	Werribee	VIC
Jade Killoran	AGF Seeds	Service Provider	Werribee	VIC
Marcus Dunnett	Elders	Service Provider	Werribee	VIC
Andrew Cohen	Australian College of Agriculture & Horticulture (ACAH)	Service Provider	Werribee	VIC
Esfuneliar Ghoreisky	Australian College of Agriculture & Horticulture (ACAH) Student	Service Provider	Werribee	VIC
Sara Salehi	Australian College of Agriculture & Horticulture (ACAH) Student	Service Provider	Werribee	VIC
Chris Fyfe	University of New England	Service Provider	Werribee	VIC
Ken Orr	RMCG	Service Provider	Werribee	VIC
Brad Johnson	AgNova	Service Provider	Werribee	VIC
Den	Stuart Grigg Consulting	Service Provider	Werribee	VIC
John Said	Fresh Select	Grower	Werribee	VIC
Frank Nobile	Select Produce	Grower	Korumburra	VIC
Ryan McLeod	Dicky Bill / Australian Fresh Salads	Grower	Brisbane	VIC
David De Paoli	AustChilli	Grower	Bundaberg	QLD
Troy Prichard	Australian Sweetpotato Growers Inc / Prichard Family Farms	IRB	Bundaberg	QLD
Eric Coleman	Australian Sweetpotato Growers Inc / Aus Sweetpotato Seed	IRB	Bundaberg	QLD
Martin Cole	CSIRO	Service Provider	Melbourne	VIC
Tom Mullins	DAFQ	Service Provider	Bowen	QLD
Jamie Jurgens	Veejay's Tomatoes	Grower	Bowen	QLD
Geoff Henning	E. E. Muir & Sons	Service Provider	Ayr	QLD
Jenny Van de Meeberg	Austrade	Government	Canberra	ACT
Dave Banham	NSW Farmers	IRB	Richmond	NSW
Hoang Au	GP Flowers	Grower	Richmond	NSW
Sue Greentree	Greentree Farms	Grower	Richmond	NSW
JC Capuyan	T&W Greenhouse	Service Provider	Richmond	NSW
Bradjesh Singh	Western Sydney University	Service Provider	Richmond	NSW
Andy Ryland	IPMC	Service Provider	Richmond	NSW
Thi Han Doan	WSU	Service Provider	Richmond	NSW
Sam Micallef	Alandale Produce	Grower	Richmond	NSW
Val Micallef	Alandale Produce	Grower	Richmond	NSW
Michael Chan	United Eastwood Pty Ltd	Grower	Richmond	NSW
Ken Wu	mgo Trangley Seeds	Grower	Richmond	NSW

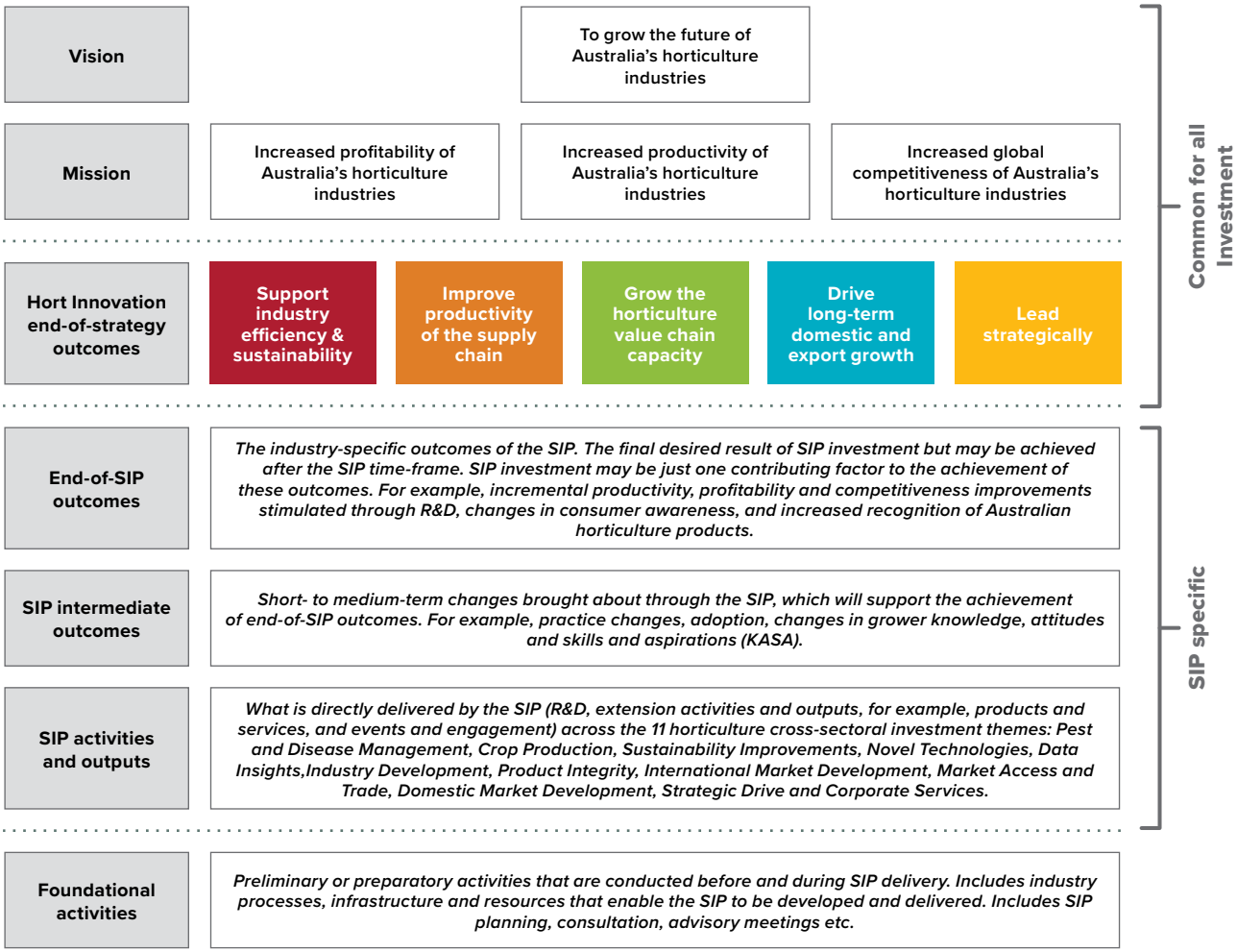
Name	Position/company	Stakeholder group	Region	State
Zhonghua Chen	WSU	Service Provider	Richmond	NSW
Ho Dang	Ex-DPI		Richmond	NSW
Renee Pearson	Greater Sydney Local Land Services	Service Provider	Richmond	NSW
Bill Dixon	Greater Sydney Local Land Services	Service Provider	Richmond	NSW
Nelson Cox	Riviera Farms	Grower	Lindenow	VIC
Ross Ingram	Bonaccord	Grower	Lindenow	VIC
Merv More	Rapisarda Enterprises	Grower	Ayr	QLD
Janelle Dobe	Pring Rural Produce	Grower	Bowen	QLD
Chris Monsour	Prospect Agriculture	Service Provider	Bowen	QLD
Carl Walker	Phantom Produce	Grower	Bowen	QLD
Siva Suluamania	DAFQ	Service Provider	Bowen	QLD
Sarah Limpus	DAFQ	Service Provider	Bowen	QLD
Laurie Land	Land Family Farms	Grower	Bowen	QLD
Nadine Land	Land Family Farms	Grower	Bowen	QLD
Sharyn Bailey	Limes & More	Grower	Bowen	QLD
Elaine Bradley	Mary Valley Country Harvest	Grower	Sunshine Coast	QLD
Stephen Burgess	Mary Valley Country Harvest	Grower	Sunshine Coast	QLD
James Larsen	Mary Valley Country Harvest	Grower	Sunshine Coast	QLD
Yana Mashynka	Mary Valley Country Harvest	Grower	Sunshine Coast	QLD
Sarah Meibusch	University of Queensland	Service Provider	Brisbane	QLD
Duncan Ferguson	University of Queensland	Service Provider	Brisbane	QLD
Andre Drenth	University of Queensland	Service Provider	Brisbane	QLD
Neena Mitter	University of Queensland	Service Provider	Brisbane	QLD
Ralf Dietzgen	University of Queensland	Service Provider	Brisbane	QLD
Mark Turner	University of Queensland	Service Provider	Brisbane	QLD
Victor Galea	University of Queensland	Service Provider	Brisbane	QLD
Robyn Cave	University of Queensland	Service Provider	Brisbane	QLD
Evan Stephens	University of Queensland	Service Provider	Brisbane	QLD
Ben Hankamer	University of Queensland	Service Provider	Brisbane	QLD
Cameron Turner	University of Queensland	Service Provider	Brisbane	QLD
Kasra Sabermanesh	University of Queensland	Service Provider	Brisbane	QLD
Martie-Louise Verreynne	University of Queensland	Service Provider	Brisbane	
Pat Hannan	Growcom	IRB	Brisbane	QLD
Peter Deuter	PLD Horticulture	Grower	Kalbar	QLD
David Simon	Simon Farms	Grower	Kalbar	QLD
Glenroy Logan	Glenette Produce	Grower	Kalbar	QLD
Pat Salter	Lockyer Valley Growers Inc	IRB	Kalbar	QLD

Name	Position/company	Stakeholder group	Region	State
Michael Sippel	Lockyer Valley Growers Inc	IRB	Kalbar	QLD
Bron Ford	DAFQ	Service Provider	Kalbar	QLD
Mark Deegenaars	Mulgowie Farming Company	Grower	Kalbar	QLD
Salah Sukkarieh	University of Sydney	Service Provider	Kalbar	QLD
Mike Keller	University of Adelaide	Service Provider	Kalbar	QLD
Cath Botta	PBC Consulting	Service Provider	Kalbar	QLD
Bill Bulmer	Bulmer Farms	Grower	Kalbar	QLD
Michael Radcliff	Rhebanvale	Grower	Kalbar	QLD
Calum Wilson	University of Tasmania	Service Provider	Kalbar	QLD
Jessica Lye	AUSVEG	PIB	Kalbar	QLD
Anthony Croft	Arahura Farms	Grower	Kalbar	QLD
Ed Fagan	Mulyan	Grower	Kalbar	NSW
Rob Hinrichsen	Kalfresh	Grower	Kalbar	QLD
Sharon Windolf	Windolf Farms	Grower	Kalbar	QLD
Richard Gorman	Kalfresh	Grower	Kalbar	QLD
Anthony Staatz	Koala Farms	IDO	Clarendon	QLD
Zara Hall	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
Julie O'Halloran	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
Fion Gibur	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
Sandra Dennien	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
Rachel Langenbaker	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
David Carey	QLD Department of Agriculture and Forestry	Service Provider	Gatton	QLD
Matt Hood	Rugby Farms	Grower	Gatton	QLD
Michael Kennedy	QLD Department of Agriculture and Forestry	Service Provider	Dutton Park	QLD
Andrew Bulmer	Bulmer Farms	Grower	Sale	VIC
Andrew Dimarco	Dicky Bill	Grower	Sale	VIC
Beth Cotterill	Dicky Bill	Grower	Sale	VIC
Richard Jarmusz	Mulgowie	Grower	Sale	VIC
Scott Botten	Mulgowie	Grower	Sale	VIC
Steve Covino	Covino Farms	Grower	Sale	VIC
Kane Busch	Busch Organics	Grower	Sale	VIC
Mal Forsyth	Forsyth Farms	Grower	Sale	VIC
Anthony Savage	Savage Gardens	Grower	Sale	VIC
Ben Centra	Vegco	Processor	Sale	VIC
Louw Lourens	Vegco	Processor	Sale	VIC
Tim Weight	RDA Gippsland	Service Provider	Sale	VIC
Nicola Watts	East Gippsland Food Cluster	IRB	Sale	VIC
Alison Buxton	East Gippsland Food Cluster	IRB	Sale	VIC

Name	Position/company	Stakeholder group	Region	State
Sophie Lapsley	VegPRO	IRB	Sale	VIC
Graham Scott	RDV, DEDJTR	Government	Sale	VIC
Mark Coleman	WSC	Government	Sale	VIC
Alexis Killoran	AgVic	Service Provider	Sale	VIC
Sarah Killury	AgVic	Service Provider	Sale	VIC
Mary Ann Augustin	CSIRO	Service Provider	Sale	VIC
Danyang Ying	CSIRO	Service Provider	Sale	VIC
Luz Sanguansri	CSIRO	Service Provider	Sale	VIC
Steven McInnes	HCI	Service provider	Sale	VIC
Shayne Hyman	East Gippsland Food Cluster	IRB	Sale	VIC
Bree Grima	BFVG	IRB	Bundaberg	QLD
Kylie Jackson	BFVG	IRB	Bundaberg	QLD
Leath Stewart	DAFQ	Service Provider	Bundaberg	QLD
Andy Mead	DAFQ	Service Provider	Bundaberg	QLD
Dave Da Pra		Grower	Bundaberg	QLD
Trent De Paoli	Austchilli	Grower	Bundaberg	QLD
David De Paoli	Austchilli	Grower	Bundaberg	QLD
Russell McCrystal	McCrystal Produce	Grower	Bundaberg	QLD
Penny Brad		Grower	Bundaberg	QLD
Mia Jenkins	APVMA	Government	Bundaberg	QLD
Ian Gaffel	AustChilli	Grower	Bundaberg	QLD
Nicola Mann	Roses2Go, Nuffield Scholar	Grower	Warnervale	NSW
Dan Hammond	Bulmer Farms	Grower	Lindenow	VIC
Rodney Wolfenden	ASPG	Grower	Rockhampton	QLD
Lachlan Brownhalls	Rugby Farms	Grower	Lockyer Valley	QLD
Belinda Adams	Coastal Hydroponics	Grower	Gold Coast	QLD
Rebecca Blackman	VegetablesWA	IDO	Perth	WA
Carl Larssen	RMCG	IDO/ Service provider	Melbourne	VIC
Roberto Marques	NSW DPI	Government	Central Coast	NSW
Jenny Ekman	AHR	Service Provider	Sydney	NSW
Georgina Woodley	BDRC	Service Provider	Sydney	NSW
John Cumming	Infotech	Service Provider	Melbourne	VIC
Belinda Hazell	Quality Assurance	Service Provider	Hobart	TAS
Jill Briggs	Rural Training Initiatives	Service Provider	Rutherglen	VIC
Gordon Rogers	AHR	Service Provider	Sydney	NSW
Anne-Marie Boland	RMCG	Service Provider	Werribee	VIC
Lara Senior	DAF Queensland	Service Provider	Dutton Park	QLD
Michael Vorrasi	DSA Produce	Grower	North Terrace	SA

Name	Position/company	Stakeholder group	Region	State
Leisa Carniel	Mulgowie Farming Company	Grower	North Terrace	SA
Steven Roberts	Rijk Zwaan	Service Provider	North Terrace	SA
Scott Samwell	Samwell and Sons	Grower	North Terrace	SA
Jarrod Strauch	AUSVEG	PIB	North Terrace	SA
Brock Sutton	Sutton Farms	Grower	North Terrace	SA
Matt Zagami	Avagrow Farms	Grower	North Terrace	SA

APPENDIX 3: Logic hierarchy



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