Horticulture Innovation Australia

Final Report

Vegetable snacking options market research – Stage 2

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Freshlogic Pty Ltd

Project Number: VG15060

VG15060

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Summary

Project VG15060 captures market research to identify vegetable snacking options in order to inform the Australian vegetable levy payers and industry stakeholders. The objectives of this project are to help Horticulture Innovation and the Australian vegetable industry to:

- Identify the distribution channels that have potential to deliver vegetable snacks to the point of purchase
- Assess the extent to which the providers of seed and plant material understand the demand for smaller snacking vegetables
- Assess and profile the detailed viability of locally produced vegetables being used in processed shelf stable vegetable snacks.

This project incorporated a range of **activities** including market and desk top research and industry engagement.

The key **output** of this project is a report which provides:

- Key analysis findings and implications for the Australian vegetable industry
- Examples and analysis of distribution channel options for fresh vegetable snacks
- Assessment criteria and opportunity ranking for fresh vegetable snacks
- An overview of processing technology relevant to vegetable snacks
- Examples and analysis of leading vegetable snacks that applaud the use of Australian ingredients including market success precedents
- Examples and analysis of leading processed vegetable snack foods globally including their attributes and success factors
- A summary of processed snack product options including vegetable type and technology
- A business strategy framework to incorporate and maintain the integrity of Australian ingredients.

The research undertaken as a result of the project, resulted in the following **outcomes:**

- In addition to mainstream food retail and food service, there are a number of distribution channels worthy of consideration for vegetable based snacks. These include; vending, education, health and fitness, accommodation, airlines and workplace. Distribution of shelf stable snacks may also include online specialty and health, recreation and department stores. There are real challenges in distributing fresh vegetable snacks which must be overcome in order to be viable.
- Fresh vegetable snacks should have the following attributes: small or bite sized; available in whole form to maximise portability and freshness; have positive taste, texture and digestion attributes; able and appealing to be eaten in raw and whole form in reasonable quantities; and able to be eaten on the go.
- The overriding consideration in determining the long-term integrity of incorporating local vegetables into a processed vegetable snack is the ability to overcome the challenges associated with operating in a competitive FMCG market. Other considerations include: scale of operation, and associated costs and knowledge requirements; the specifications for product ingredients; ability to capture acknowledgement for provenance attributes while also meeting demand for other attributes such as health and quality; and the presence of logistical barriers such as cost and handling requirements.

In concluding this research, the following **recommendations** have been made:

- There *is* demand for healthier snacks, and there *are* some opportunities in the fresh and processed vegetable snack market.
- However, any proposed investment must incorporate a sound business strategy to:
    - Overcome the challenges associated with operating in a competitive snack food market
    - Clearly identify and incorporate a range of desirable product attributes that meet market demand
    - Identify the most appropriate and effective distribution channel(s) to reach the target market
    - Identify suitable technology that generates economies of scale and allows for the inclusion of desired product attributes e.g. a healthier end product.
- The ongoing use of Australian sourced ingredients into a snack food product is enhanced where the product captures sufficient acknowledgement of provenance. This flows on to mean that replacing local ingredients with imported alternatives effectively violates the product's core positioning.

Keywords

Vegetable snacks; processed shelf stable vegetable snacks; fresh vegetable snacks; small snacking vegetables; healthy snacks; vegetable processing technology; distribution channels; Australian vegetables; locally grown

Introduction

This project seeks to better understand possible opportunities for the Australian vegetable industry to benefit from consumer demand for healthy snacks. The total snack food market is significant, valued at $9.3 billion per annum. Vegetable based snacks – either fresh or processed – currently only capture a small share of this total snack food market, significantly less than fruit based snacks. As such, it is valuable to understand factors that influence potential for success in this market including; key product attributes, market success factors of leading current vegetable snack products, global trends, distribution channel options, available processing technology, and other factors.

The Australian vegetable industry is one of Australia's largest horticultural industries with an estimated annual gross value of production of $3,350 million in 2014/15 and an estimated 4,527 vegetable growing business.

Project VG15060 captures market research to identify vegetable snacking options in order to inform the Australian vegetable levy payers and industry stakeholders. The objectives of this project are to help Horticulture Innovation and the Australian vegetable industry to:

- Identify the distribution channels that have potential to deliver vegetable snacks to the point of purchase
- Assess the extent to which the providers of seed and plant material understand the demand for smaller snacking vegetables
- Assess and profile the detailed viability of locally produced vegetables being used in processed shelf stable vegetable snacks.

This project aligns to the Consumer Alignment Objective in the Vegetable Strategic Investment Plan. It was framed by the Market and Value Chain Development design team. This project is centered on building on the findings of project VG14024, undertaken in 2015, which involved market research to define the snack food market, understand opportunities for vegetables and quantify the market size. Key findings of VG14024 include:

- The total snack food market is valued at $9.3 billion per annum, which is close to 10% of the retail food market and a clear indication that snacking is a mainstream consumption occasion for Australian consumers.
- At least 40% of all these snacks are viewed as 'healthy' by consumers – 53% of these 'healthy' snacks are fresh fruit, while vegetables represent only 6%.
- Fresh fruit works well as a snack because of the portable and durable product that allows purchase at mainstream retail and transport to the point of consumption. The current range of vegetables are not all as durable.
- There are gaps in distribution channel capacity to service consumers when they are seeking healthy snacks.
- The potential market value of the opportunities identified range in size from $2.98 million to $21.5 million.

Project VG15060 also builds on work previously undertaken with funding from Horticulture Innovation Australia and or HAL. These include:

- VG12078 - Consumer and market program for the vegetable industry - ongoing
- VG14024 - Market research around the opportunity to create more vegetable snacking options to quantify market size - completed 31/07/2015
- VG14026 - Market research for investigating opportunities for more vegetable meal occasions - completed 27/01/2016.

Methodology

This project with national reach is targeted to Australian vegetable levy payers and industry stakeholders including providers of seed and plant starter material, processers, manufacturers and marketers, consultants and other relevant stakeholders.

The research methodology centers around extensive market and desk research, stakeholder engagement, and application of consultant industry knowledge.

The market and desk research sought to identify key market and product success factors of leading products domestically and globally, technology options available to vegetable snack producers, and distribution channel options for the distribution of snacks to the end consumer. Information was collected in a consistent format to allow for direct comparison e.g. country, product attributes, product size and price, technology used, distribution channel etc. Information gathered was then assessed to identify key findings and ultimately key implications for industry.

An assessment criteria and methodology was developed to determine the factors that influence the viability of additional fresh vegetable snacks. The criteria were based on the key features of a successful fresh vegetable snack, including size, portability, taste, texture and digestion attributes, convenience etc. This helped determine the product opportunity ranking for these snacks.

Industry stakeholders were engaged to provide feedback on analysis direction and findings, as well as provide examples of practical and commercial realities. Freshlogic also utilised extensive in-house industry knowledge and experience to shape overall findings and implications for industry.

Project delivery activities

The key project delivery activities include:

- Communication to key industry stakeholders outlining key findings and implications.
- Engagement with the steering committee, discussing findings and gathering feedback.
- Publication of final report.

Other activities may follow, including the publication of findings and recommendations via relevant industry communication channels.

Outputs

The key output of this project is a report which provides:

- Key analysis findings and implications for the Australian vegetable industry
- Examples and analysis of distribution channel options for fresh vegetable snacks
- Assessment criteria and opportunity ranking for fresh vegetable snacks
- An overview of processing technology relevant to vegetable snacks
- Examples and analysis of leading vegetable snacks that applaud use of Australian ingredients including market success precedents
- Examples and analysis of leading processed vegetable snack foods globally including their attributes and success factors
- A summary of processed snack product options including vegetable type and technology
- A business strategy framework to incorporate and maintain the integrity of Australian ingredients.

The full report detailing all of the above research and associated findings can be found in the Appendix.

The key findings of the analysis and the implications for the vegetable industry are profiled below.

Key Findings and Implications for Vegetable Snacks

Key Findings	Page	Implications
Objective A: Distribution Channel		
Vending		
⇨ Food vending aligns with changes in food buying and consumption patterns. ⇨ The increased technical capacity of vending machines has expanded the scope for handling fresh food products. ⇨ The platform for commercial vending viability is similar to all fresh food distribution and based on sales volume levels and cost effective servicing. ⇨ Vending machines have evolved into solutions to extend trading hours. This type of location for existing businesses also provides cost effective access to an existing supply chain and a solution to restock. ⇨ Access to high pedestrian traffic locations is a must. However, even these prime locations in will have a limit on the machines that can be installed. ⇨ Vending distribution has more product range flexibility than conventional retail. ⇨ Fresh vegetables not a large part of vending offers ranges in other developed markets. This indicates that demand is low and or vegetables are difficult to manage through vending. ⇨ Product brands along with other features and attributes can be communicated as part of the food vending offer. ⇨ Australian consumers are increasingly accepting of the food quality that vending machines can offer. ⇨ There are real and absolute challenges in supplying fresh vegetables via the vending channel that must be overcome to in order to be viable.	Pg. 46-48	• Food vending machine capacities have improved to be more efficient and accommodate selling fresher food. • Buying food through vending machines meets many of the demand signals from today's food consumer. • Viability is dependent on volumes sales and cost effective distribution. • As a means of distribution vending is more flexible on range, an option to extend hours and provides a means of connecting with consumers. • Vegetables are not a major part of vending offers and this raises valid questions about demand and vegetable product viability in vending.

Key Findings	Page	Implications
Education		
⇨ Healthier food in UK & US education facilities has levered off the scale of more organised school lunch programs. ⇨ New products can readily gain access to education facilities as existing food service distributor are typically in place. ⇨ A vending solution could overcome challenges associated with insufficient scale, available labour or irregular demand. ⇨ Online meal providers may also offer opportunities to distribute new vegetable snacking product. ⇨ The vested interest in children's health, together with their natural inclination towards snacks, makes this channel attractive.	Pg. 50	• Snack into education facilities can lever off the food supply systems in place. • Children's healthy eating is a powerful motivator that supports healthy snacks. • Where supply systems are not in place vending is an option.
Health & Fitness		
⇨ Consumers are willing to spend on health and fitness. ⇨ Health and fitness centres are well placed to offer healthy food to members. ⇨ Some operators will require support with a food offer. ⇨ A quality vending offer may overcome some of the challenges faced by smaller providers in particular.	Pg. 51	• The prospect of healthy snacks has strong appeal to the stakeholders in the health & fitness channel. However, they will need a supply system and possible support at the consumer interface to be viable.
Accommodation		
⇨ Accommodation facilities have refrigeration and dispense snacks as well as existing food supply arrangements in place. ⇨ Demand for snacking can be driven by using accommodation services away from the normal domestic environment. ⇨ Boutique hotels are using their minibar range as part of their offer and therefore it is an extension of their brand image. ⇨ Concerns about the risk of fresh product may mean that processed vegetable snacks are more suited to the smaller operators in this channel.	Pg. 52-54	• Accommodation has holding facilities and supply systems in place. • Success therefore depends on an acceptable product form. Product perishability is the core challenge.

Key Findings	Page	Implications
Airlines		
⇨ Airlines are capable and well serviced providers of food. ⇨ Food on airlines reflects the airline standards, quality and contributes to justification of seat class levels.	Pg. 54	• Airlines understand snacks and deal with fresh food. • More healthy snacks in this channel are now dependent on commercial decisions.
Workplace		
⇨ The scale of people in workplaces is the fundamental driver of snack food demand in these facilities. ⇨ Employers can easily enhance their workplace by making healthy snacks available. ⇨ The pathways to reach workplaces with snacks are clear.	Pg. 56	• Workplace ranging of more healthy snacks is dependent on commercial decisions. • Vending is an option.
Objective B: Fresh Vegetable Snacks		
⇨ Fresh vegetable snacks should ideally be small, in whole form, have positive taste, texture and digestion attributes, appealing to eat in raw form, and able to be eaten on the go.	Pg. 59	• Vegetables that are in a small, whole form are more likely to meet consumer demand for convenience and support distribution requirements.
⇨ A limited number of vegetables suitable as a fresh solo snack, are already available in a product ready form. Others will require R&D to resolve consumption attributes, fresh cut processing or R&D to enhance form, or education and influence to raise awareness of raw form.	Pg. 62	• Additional R&D, fresh cut processing, and education and influence may support the availability of more fresh vegetable snacks.
Objective C: Processed Vegetable Snacks		
Production and Market Success Precedents for Processed Snacks including use of Australian Grown Vegetables		
⇨ There is growing demand for healthy, convenient snacks, with a variety of vegetable based snack products already capturing some of this demand.	Pg. 81-82	• Given their widely-acknowledged health benefits, vegetables are a welcome and complementary ingredient in healthier snack products. • Generating a price premium is clearly an enabler for product viability.
⇨ Leading processed vegetable snacks typically generate a price premium over comparable snack foods.		
⇨ Use of local ingredients is one of the attributes frequently applauded in leading vegetable snack products, however it is typically not the primary attribute.		• Local ingredients are a welcome 'support' attribute that can benefit from alignment with a complementary regional location.
⇨ Sourcing and applauding the use of local ingredients is commonly associated with premium		

priced products.		
⇨ Applauding local ingredients will be more effective when it can be associated with a food region that has an established positive regional reputation.		
⇨ The current range of minimally-processed, fresh chilled vegetable snacks in Australia is less available than in other developed markets.		• Based on the success in the US market, opportunities may exist for more minimally-processed fresh chilled snack products.
Key Findings	**Page**	**Implications**
Leading Processed Vegetable Snack Foods Globally		
⇨ Leading vegetable snack products reflect a wide range of processing technologies, with a trend towards processes that generate healthier products. ⇨ Some leading snacks applaud hand-cut or small-batch processing in what is typically presented as a reflection of high quality.	Pg. 92-94	• Technology choice should reflect consumer demand. • Technologies available have broadened the scope for producing vegetable snacks.
⇨ Leading vegetable snack products combine the best of vegetable nutrition with convenient snack product form.		• Vegetable based snacks will carry the appeal of real vegetable ingredients but will need to incorporate much more than that to compete with other snack foods.
⇨ Regardless of nutritional attributes, consumers also expect positive taste and texture attributes.		
⇨ Diet, lifestyle and ethical factors, such as allergy-friendly and certified organic, are often applauded as secondary attributes.		
⇨ The influence of new food opinion leaders enabled through the likes of Master Chef and fuelled by sociol media is broadening the awareness of, and interest in, different vegetables in different forms.		• Broadened awareness can only help stimulate vegetable demand.
⇨ Distribution channels for healthy snacks continue to evolve beyond mainstream retail, and include specialty and health stores, online channels, pharmacies, selected food service outlets, department stores and recreational stores.		• New distribution options are emerging and they are likely to embrace 'new' vegetable based snacks.
Application of Analysis Findings to the Australian Market		
⇨ The scale of the processing operation, set-up and operating costs, and knowledge requirements, represent significant factors that can influence the viability of any proposed processed vegetable snack.	Pg. 98	• Entering the snack food market warrants a platform of sound strategic planning.

Key Findings	Page	Implications
⇨ Leading vegetable snack products often require ingredients that have been grown specifically to meet certain product specifications.	Pg. 98	• Vegetables suitable for use in snacks may have to be grown specifically for that purpose.
⇨ The ongoing use of Australian sourced ingredients into a snack food product is enhanced where there is sufficient acknowledgement of provenance. This flows on to mean that replacing local ingredients with imported alternatives effectively violates the product's core positioning.	Pg. 99-100	• Locking provenance into the product market positioning is the strongest way to ensure local vegetables are a core part of the product.
⇨ Any successful processed vegetable snack must also reflect current consumer demand by applauding and capturing acknowledgement for other product attributes including health, quality and convenience.	Pg. 100	• The nature of snack food demand means vegetable snacks need to address and deliver a number of needs.
⇨ The presence of logistical barriers in the form of cost or handling requirements creates more favourable conditions for incorporating local ingredients.	Pg. 100	• Logistical barriers for imported product forms are solid indicators of local vegetable product opportunity.
⇨ The choice of distribution channel must accommodate product type, reach the target market, and ensure economies of scale and viable profit margins are achieved.	Pg. 100	• Snack foods is a mature and highly competitive market. • All new products, including vegetable based snacks, have to survive in this level of competition.
⇨ The ability to overcome the challenges associated with operating in a competitive market is the overriding consideration in determining the long-term integrity of incorporating local vegetables.	Pg. 100	

Outcomes

The research undertaken as a result of the project, resulted in the following **outcomes:**

- In addition to mainstream food retail and food service, there are a number of distribution channels worthy of consideration for vegetable based snacks. These include; vending, education, health and fitness, accommodation, airlines and workplace.
    - Distribution of shelf stable snacks may also include online specialty and health, recreation and department stores.
    - There are real challenges in distributing fresh vegetable snacks which must be overcome in order to be viable.
- Fresh vegetable snacks should have the following attributes: small or bite sized; available in whole form to maximise portability and freshness; have positive taste, texture and digestion attributes; able and appealing to be eaten in raw and whole form in reasonable quantities; and able to be eaten on the go.
- The overriding consideration in determining the long-term integrity of incorporating local vegetables into a processed vegetable snack is the ability to overcome the challenges associated with operating in a competitive FMCG market. Other considerations include:
        - Scale of processing operation, set up and operating costs and knowledge requirements
        - Specific ingredients and product requirements. i.e. vegetables suitable for use in snacks may have to be grown specifically for that purpose
        - The ability to capture acknowledgement for provenance attributes - locking provenance into the product market positioning is the strongest way to ensure local vegetables are a core part of the product.
        - The need to meet deliver a range of attributes such as health, quality and convenience.
        - The presence of logistical barriers for imported ingredients such as cost and handling requirements are solid indicators of local vegetable product opportunity.
- While vegetables have inherent health benefits, that alone may not be enough to support take up as a snack. The need to compete in a highly competitive market means a successful product will need to include other attributes such as appealing taste and texture, convenient form, quality, and diet, lifestyle and ethical attributes. Effective packaging and marketing are also essential.
- Growth in demand for high quality vegetable powder across a range of food sectors may reflect increasing acceptance of vegetables in this form, and may suggest opportunities for application in snack products also.

Longer term outcomes include improved decision making in relation to new product development and investment. Applying the project findings should allow stakeholders to be better placed to understand and manage the competitive market environment and therefore maintain ongoing viability.

Evaluation and Discussion

The methodology used in this project was appropriate and effective, and enabled the objectives and deliverables to be achieved.

Feedback from industry stakeholders, including the steering committee, confirmed support for the key findings and implications.

Findings from the fresh vegetable snack analysis (Objective B) were further disseminated when they were presented at the 2016 AusVeg Conference, by Freshlogic Managing Director Martin Kneebone, who spoke on the opportunities and challenges of marketing fresh fruit and vegetables to compete in the $9 billion snack food industry. This received positive feedback. There is availability to discuss findings at other industry conferences where relevant.

The findings from this analysis seek to reflect the competitive market conditions and commercial realities associated with operating in the snack food industry. The findings of this report have value for all industry stakeholders. However, the likely scope to benefit directly from any investment or new product development into vegetable based snacks will depend on the individual business circumstances faced by each vegetable levy payer and or stakeholder.

The effectiveness of the project will continue to be enhanced through the communication of key findings and implications, via relevant industry communication channels over time.

This project follows on from Stage 1 (project VG14024), undertaken in 2015, which involved market research to define the snack food market, understand opportunities for vegetables and quantify the market size. The findings from Stage 1 have been discussed with stakeholders from the wider fruit and vegetable industry and have proven to be useful guidelines for understanding what is happening the snack market and the implications for fresh fruit and vegetables.

Recommendations

In concluding this research, the following **recommendations** have been made:

- There *is* demand for healthier snacks, and there *are* some opportunities in the fresh and processed vegetable snack market. This is evidenced by the ongoing new product development in this area and the range of leading vegetable snack products found domestically and globally.
- **However**, any proposed investment must incorporate a sound business strategy to enable ongoing viability, which must:
    - Overcome the challenges associated with operating in a competitive snack food market. This will most likely require the input of technical, product and marketing expertise to ensure the snack product can withstand the challenges associated with a highly competitive market.
    - Clearly identify and incorporate a range of desirable product attributes that meet market demand. Where relevant this will include sourcing ingredients that meet specific product requirements e.g. nutrient levels, or physical features that enable a specific texture or form.
    - Identify the most appropriate and effective distribution channel(s) to reach the target market and resolve the challenges of distributing fresh snacks where applicable.
    - Identify suitable technology that supports operational economies of scale and generates products that incorporate desired features (e.g. health attributes).
- The ongoing use of Australian sourced ingredients into a snack food product is enhanced where the product captures sufficient acknowledgement of provenance. This flows on to mean that replacing local ingredients with imported alternatives effectively violates the product's core positioning.

Intellectual Property/Commercialisation

No commercial IP generated

Acknowledgements

We would like to acknowledge the input and feedback provided by the steering committee members Jane Miles (KalFresh) and Martina Fanning (Perfection Fresh).

We would also like to acknowledge the input from Hazel MacTavish, of MacTavish West, in providing feedback and input into the overview of processing technology section, and insight into the growth in the market for vegetable powders.

Our assessment of vegetables suitable as fresh snacks was assisted by reference to the Vegecation website, www.vegecation.com.au, which, among other things, provides information on suggested preparation and cooking methods.

Appendices

1. Reference of Vegetable Snacking Assessment Outcomes
2. Introductory Communication to Providers of Seed and Starter Material
3. Implications for Vegetable Growers
4. Detailed Analysis and Findings Report

Appendix 1: Reference of Vegetable Snacking Assessment Outcomes

The outcomes of the Vegetable Snacking Assessment are displayed below for reference. The model is fluid and can change to reflect recent developments.

Assessment Criteria	Decision	Outputs	Recommended Action
Suitable as a fresh solo snack	NO	Artichokes, Asian Greens, Asparagus, Beans (Broad Beans), Beetroot, Brussel Sprouts, Cabbage, Celeriac, Chicory & Endive, Chilies, Eggplant, Fennel, Garlic, Kale, Kohlrabi, Leek, Lettuce (Head), Lettuce (Specialty & Leaf), Okra, Onions, Parsnip, Potato, Pumpkin, Rhubarb, Rocket, Shallots, Silverbeet, Spinach, Spring Onions/Chives, Sprouts & Shoots, Sweet Potato, Turnip, Watercress.	• Rejected as a solo snack. • Consider as a processed snack ingredient.
	YES	Beans (Butter & Green Beans), Broccoli, Capsicum, Carrots, Cauliflower, Celery, Cucumber, Mushrooms (Button & Portobello), Mushrooms (Shiitake & Specialty), Peas (Green Peas), Peas (Snow, Sugar Snap), Radish, Squash, Swede, Sweet Corn, Tomato, Zucchini.	• Assess for next criteria.
Positive digestion, taste and texture	NO	Beans (Butter & Green Beans), Broccoli, Capsicum, Cauliflower, Mushrooms (Shiitake & Specialty), Peas (Green Peas), Squash, Swede, Sweet Corn.	• Consider R&D to resolve consumption attributes. • If not viable, consider as a processed snack ingredient.
	YES	Carrots, Celery, Cucumber, Mushrooms (Button, Portobello), Peas (Snow & Sugar Snap), Radish, Tomato, Zucchini.	• Assess for next criteria.
Can be eaten on the go (whole form)	NO	Broccoli, Cauliflower, Celery, Swede	• Consider fresh-cut processing to enhance form. • Then if necessary consider R&D to enhance form. • If not viable, consider as a processed snack ingredient.
	YES	Beans (Butter & Green Beans), Capsicum, Carrots, Cucumber, Mushrooms (Button & Portobello), Mushrooms (Shiitake, Specialty), Peas (Green Peas), Peas (Snow & Sugar Snap), Radish, Squash, Sweet Corn, Tomato, Zucchini.	• Assess for next criteria.

Assessment Criteria	Decision	Outputs	Recommended Action
Commonly eaten raw (> 10% consumption)	NO	Mushrooms (Button & Portobello), Mushrooms (Shiitake & Specialty), Squash, Swede, Zucchini	• Education and influence to raise acceptance of raw form.
	YES	Beans (Butter & Green Beans), Broccoli, Capsicum, Carrots, Cauliflower, Celery, Cucumber, Peas (Green Peas), Peas (Snow & Sugar Snap), Radish, Sweet Corn, Tomato.	• Assess for next criteria.
Suitable for distribution	YES	Carrots, Cucumber, Peas (Snow & Sugar Snap), Radish, Tomato	• Assess distribution channel options.

Appendix 2: Introductory Communication to Providers of Seed and Starter Material

This is an example of *introduction communication* used to inspire industry involvement in the development of an enhanced fresh vegetable snack offer.

Dear

Freshlogic is working with Horticulture Innovation Australia to research the opportunity to ***create more vegetable snacking options***. Providers of seed and starter material play an important role in this process.

Background

There is a **growing business case for the development of an enhanced fresh vegetable snack offer**. Consumers are increasingly interested in health and nutrition, which extends to healthier snacks. Once dominated by highly processed foods, the snack food market is evolving, and fresh and healthy snacks are becoming more popular.

In Australia, the **total snack food market is worth $9.3B per year**, almost 10% of the total retail food market. At least 40% or $3.7B of all those snacks is viewed as healthy by consumers. While fresh fruit makes up half of all healthy snacks, **fresh vegetables currently only contribute 6%.**

The success of fruit snacks goes to **highlight some of the ideal attributes of a healthy snack,** i.e. portability, able to be eaten on-the-go, bite sized, and appealing taste and texture.

While some vegetables have already established their place as a fresh and healthy snack, there are **opportunities for further development**, including consideration of other distribution channels for the sale of fresh snacks (e.g. fresh vending, workplaces and education).

The business case for snacking vegetables

The business case for the production of snacking vegetables centres around the **higher overall returns that are able to be achieved**. It acknowledges the lower yields that smaller vegetables generate and also the likely higher production costs per kilo. However, the anchor is centred on the premise that a vegetable in a snack ready form, when offered to the consumer in a snack sized portion and sold on an 'each' basis, will stimulate incremental consumption and generate a substantially higher price per kilo than conventional vegetables.

A complete, whole product that could replicate the success of the snacking tomato or cucumber is an attractive option.

We look forward to discussing this with you further.

Kind regards

Appendix 3: Implications for Vegetable Growers

This section is designed for vegetable growers. It highlights the key findings of the research into vegetable-based snacks, summarises identified opportunities and outlines potential actions for growers.

Key findings from the research that frame the opportunity for growers

- There is confirmed **demand for healthier, convenient snacks.**
    - Snacking is mainstream food consumption behaviour. It accounts for 11% of the national food and grocery retail market.
    - 40% of snack products consumed are considered "healthy" by consumers.
    - Vegetable-based snacks currently account for only a small portion of healthy snacks purchased, which are dominated by fresh fruit.
    - The higher prices achieved by leading fresh and processed vegetable snacks are an indication of consumer demand and the potential opportunity.
    - In addition to health, successful vegetable based snack products meet consumer demand by applauding and capturing acknowledgement for other product attributes such as quality, convenience and provenance.
- **Distribution options** for vegetable-based snacks are currently limited.
    - Despite the demand, there are limited vegetable snacks readily available to consumers at peak-snacking times. More distribution options are required to increase vegetable snacks.
    - There is supply chain handling challenges in distributing fresh vegetable snacks, particularly fresh-cut vegetables, which inhibit many distributors from handling fresh vegetables.
    - Feedback from distribution channel stakeholders indicates many channels would welcome more vegetable-based snacks.

Areas of Potential Opportunity for Vegetable-Based Snacks

There are three defined areas of potential opportunity for vegetable growers:

- Fresh small, whole vegetable as snacks, which are durable enough to withstand supply chain handling conditions and can lever off the success of small snack size tomatoes and cucumbers.
- Fresh cut vegetable snacks.
- Processed vegetable snacks.

Each of these is discussed in more detail below.

1. Fresh, small, whole vegetable snacks

Description: The production of vegetables in small, whole form, with no processing, offering a fresh vegetable snack that is far more supply chain robust than fresh cut product, and can be distributed to consumers in this whole form.

Potential advantages and disadvantages of undertaking the opportunity

- **Advantages:** Some plant starter material available; fewer distribution challenges; some vegetables already in a form suitable for distribution; existing market acceptance; and evidence of higher price per kg being achieved in leading products e.g. tomato and cucumber.
- **Disadvantages:** Range options are limited to available categories; leading existing products are mature and others require investment in R&D to overcome form and consumption challenges.

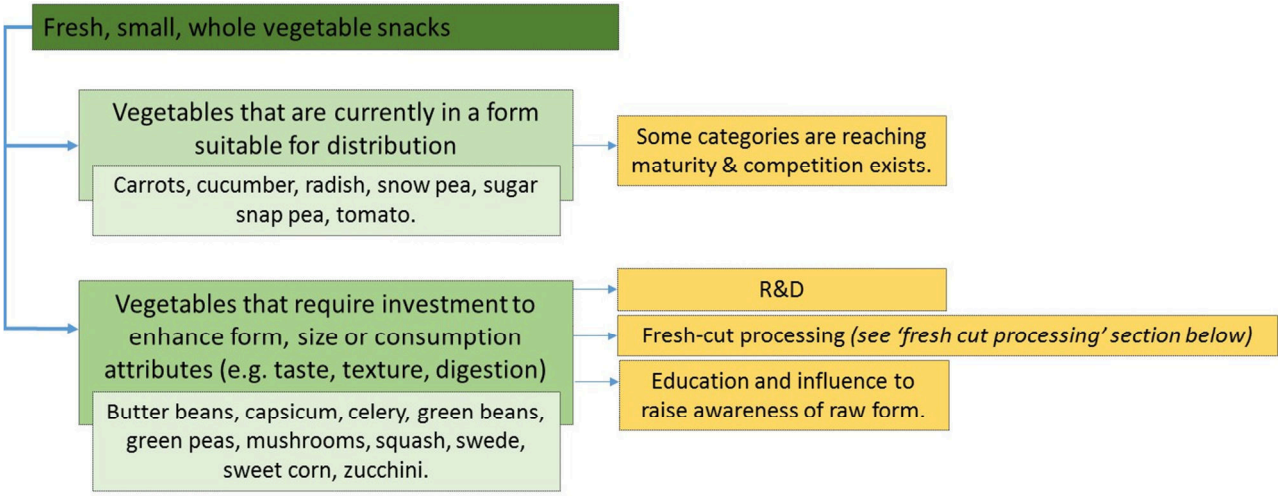
Overview of the opportunity:

The **development pathway** for small, whole fresh vegetable snacks may be easier for growers than other vegetable-based snacks given the availability of existing plant material. Small, whole vegetables also face fewer distribution challenges compared to fresh cut vegetables, as they are more able to handle the existing supply chain. Leading products on the market are achieving a higher price per kg at retail, with more established categories such as tomatoes and cucumbers achieving premiums up to four times that of conventional vegetables, confirming positive demand signals.

Retail remains the dominant **distribution channel** for fresh vegetable snacks, with further work needed to expand options beyond retail. The most attractive distribution channel options outside retail include airlines, accommodation and the workplace as supply systems are already in place. Success with fresh whole vegetable snacks will depend on whether the whole vegetable product form is acceptable and appealing to consumers, compared to other snack food on offer.

Category specific considerations

The chart below profiles vegetables that can be eaten as a fresh, solo snack. It highlights that some vegetables are currently in a form suitable for distribution, while others require investment to enhance form, size or consumption attributes before they should be produced for fresh snaking.



Business Case Framework

This section outlines the business case framework for **smaller snacking vegetables** and can assist with the assessment process. Smaller snacking vegetables have been chosen for the business case framework as this opportunity offers the lowest barriers to entry for growers, and does not require investment or existing capacity in processing or marketing operations which are often required for

part- or fully- processed vegetable products.

In order to compile this business case, a number of assumptions were made. Specifically, this business case assumes that:

- 1,000 square metres of production growing area in a low-tech protected cropping facility is currently available to produce these products. As such, this business case assessment assumes the presence of existing operations and does not include the cost associated with establishing a new facility.
- Similar types of vegetable are already being produced on site, allowing cost impacts to be assumed as increments of existing resources or operating costs. It assumes a level of existing knowledge and expertise regarding growing the vegetable in question (e.g. someone looking to grow mini-carrots would already be familiar with growing conventional carrots).
- That the grower has the capacity to grow the product and organise distribution into channels that acknowledge the value. (See pages 41-56 for more information on distribution channels options).

The table below outlines the comparison of operating costs and net margin for Lebanese and Baby cucumber. This has identified the variable costs and calculated their incremental impact in the return to the grower. The costs highlighted in bold and underlined are those that will vary between conventional Lebanese and Baby cucumber production. The other costs, such as rent, insurance, utilities and repairs, are expected to remain unchanged.

Comparison of Operating Costs and Net Margin				
	Lebanese Cucumber		**Baby Cucumber**	
Production m^2	1,000		1,000	
Kg produced per annum	40,000		32,000	
Wholesale price per kg	$1.60		$3.50	
Costs & Income		**% of Sales**		**% of Sales**
Labour*	**$15,667**	24.5%	**$43,868**	39.2%
Fertilizer & chemicals*	**$8,106**	12.7%	**$9,727**	8.7%
Seeds & plants*	**$3,971**	6.2%	**$4,368**	3.9%
Rent & lease	$1,197	1.9%	$1,197	1.1%
Interest & insurance	$3,155	4.9%	$3,155	2.8%
Utilities	$1,251	2.0%	$1,251	1.1%
Repairs	$4,733	7.4%	$4,733	4.2%
Fuel & oil	$3,699	5.8%	$3,699	3.3%
Other (e.g. packaging)*	**$12,621**	19.7%	**$13,883**	12.4%
Grower net margin	$9,600	15.0%	$26,119	23.3%
Total income	$64,000	100%	$112,000	100%

** See table below for more information on these variable costs and their drivers.*

The table below details the drivers of the variations between conventional Lebanese cucumber and Baby cucumber.

Drivers of the business case for small, whole snacking vegetables				
	Lebanese Cucumber	**Baby Cucumber**	**Variations**	**Reasons**
Labour	$15,667	$43,868	+180%	Daily harvesting for Baby cucumber, compared to twice weekly for Lebanese.
Fertiliser & Chemicals	$8,106	$9,727	+20%	Integrated pest management (IPM) in general and the use of beneficials to manage shorter withholding periods for Baby cucumber.
Seeds & Plants	$3,971	$4,368	+10%	The higher cost of seed for Baby cucumber.
Other - Packaging	$12,621	$13,883	+10%	The higher cost relates to the punnet and overwrap required for Baby cucumbers.
Yield (kg per m^2)	40kg	32kg	-20%	This is driven by assumptions of 4 plantings per year, density of 2 plants per m^2, and plant yields of Lebanese (5 kg) vs Baby (4 kg).
Wholesale price per kg	$1.60	$3.50	+120%	These are the prevailing market prices for the year ending 31 Dec 2016.

The key conclusions from the business case profile include:

- Small whole vegetables require considerably more labour, but this is compensated by generating higher income per kg. These are clearly the two key variables.
- The viability is essentially dependent on receiving a higher wholesale price.
- The additional cost increases associated with seed, pest and disease control, and packaging are also likely to be incurred with other small whole vegetables.
- Lebanese and baby cucumbers are two comparatively similar products as is the production in kilograms per metre. This may not be the case with other whole snacking vegetables.

Vegetable Grower Action

The action required by vegetable growers is similar to assessing a new product development, but involves a wider scope. The actions outlined below are designed as a checklist to guide the assessment of producing vegetables for snacks. This assessment is recommended and will require some resources and skills to complete.

A. **Assess the compatibility** of vegetable snacking products to your current crop and production systems, with consideration for your rotation, plant protection and nutrition systems, and packing operations. Clearly, some compatibility with current operations is preferred.

B. **Confirm the product commercial viability** by:

- Defining production systems, production costs, economies of scale, forecasted saleable yield per square metre and extending them out to break-even income per metre required.
- Determining whether growing trials are required, and if so defining the trial purpose and objectives.
- Determining how the product should be finished and distributed. This will include:
    - The target wholesale selling price, which can be directly influenced by the retail price. For instance, a retail price of $3.99 each for a product distributed through one intermediary (i.e. agent) is likely to translate into a wholesale price of $2.00 each. This assumes a retail gross margin of 40% and a wholesaler/agent gross margin of 15%.
    - An inner and outer packaging solution.
    - Portion per pack to suit snacking occasion, price point and packs per outer.
- Defining how the product can be distributed, which can include:
    - Sales to existing customers.
    - New arrangements with distributors who are already servicing target customers. This can include food service distributors like PFD, Bidvest and NAFDA who operate networks.

C. **Identifying the information gaps** in and around the planned new product.

- It is recommended to request support from your input suppliers that provide; plant material, nutrition and protection; and packaging and wholesaling.

Further information:

- *See pages 57 – 62 for further detail on fresh small, whole vegetable snacks.*

2. Fresh cut vegetable snacks

Description: The production of vegetable snacks, in fresh cut form. The end product may incorporate single or mixed vegetable product, as well as a complementary product such as flavouring, dip, cheese, or crackers etc. The product form will typically require packaging. While fresh cut vegetables can also meet demand for other uses e.g. stir fry and salad, these products are specifically designed to accommodate snacking.

Potential advantages and disadvantages of undertaking the opportunity

- **Advantages:** Examples of leading products globally suggest potential demand and higher prices per kg; this may be a more attractive option for those with existing access to processing operations.
- **Disadvantages:** The processing and packaging element creates additional complexity; fresh cut vegetables have a shorter shelf-life and greater distribution challenges than whole vegetables; and some vegetable categories will require education to encourage consumption in raw form.

Overview of the opportunity

Leading products globally, particularly in the US, suggest the potential demand and higher price per

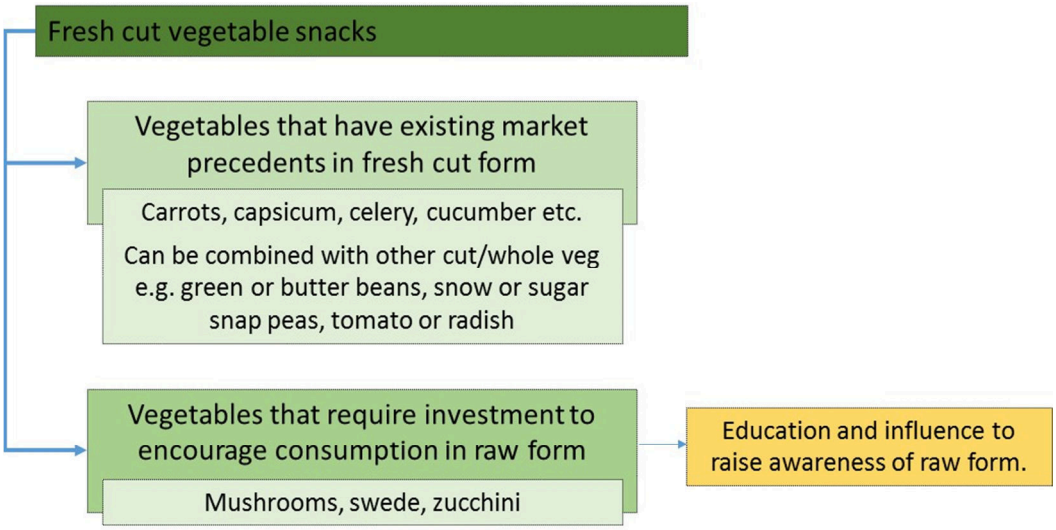
kg associated with fresh-cut vegetable snacks. These products offer convenience and taste, and often include complementary flavours and products such as dips, cheese or crackers.

Fresh cut processing can help overcome form and consumption attribute challenges that cause certain vegetables to be less suited as a snack in whole form. For example, it may improve their size or digestion. However, it typically requires access to, or investment in, fresh cut processing and packaging equipment. Some vegetables may require consumer education and influence to encourage consumption in a raw form e.g. mushrooms.

Fresh cut vegetables have a shorter shelf-life than whole vegetables and face greater distribution challenges, with the limited range currently available pointing to some of these challenges. Distribution of fresh cut vegetable snacks is currently dominated by mainstream retail. Outside of this, the most attractive distribution options include vending, the workplace, airlines and accommodation where refrigeration is available and existing supply systems are in place. Key to success in the distribution of fresh cut vegetable snacks is product perishability, the ability of the channel to handle fresh product form, and sufficient scale to ensure efficiency in restocking.

Category specific considerations

The chart below profiles vegetables that can be eaten as a fresh snack, and are suitable in fresh cut from. It indicates that some vegetables have existing market precedents in this form, while others require consumer education and influence to raise awareness and acceptance of raw form.



3. Processed vegetable snacks

Description: The production of vegetable snacks, in processed form. This includes crisps, chips, popcorn, preserved and pickled vegetables, puffed products, bars and other snacks e.g. roasted beans and vegetable powders. Processed snacks will require investment in, or access to, processing and packaging equipment and marketing expertise.

Potential advantages and disadvantages of undertaking the opportunity

- **Advantages:** Shelf-stable; fewer supply chain distribution challenges than fresh snacks; and numerous attractive distribution channel options.

- **Disadvantages:** Requires expertise in processing, packaging and marketing and access to processing and packaging equipment; investments or supply chain partnerships; is subject to competitive retail market; viability relies on ability to lock in Australian origin as an attribute.

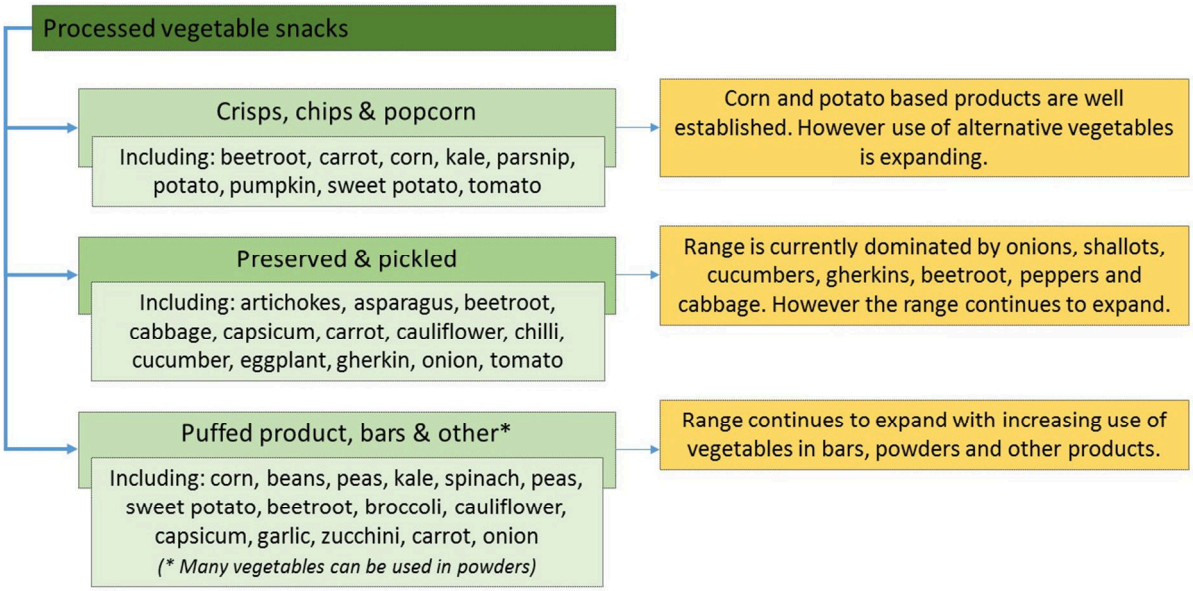
Overview of the opportunity

Being shelf-stable, processed vegetable snacks have fewer supply chain distribution challenges than fresh vegetable snacks. However, the processing element may present a tougher up-front process for growers to be involved. The necessary equipment, technology and marketing expertise, may require an expansion of current capacity or the formation of partnerships e.g. with a processor.

In addition to mainstream retail, the more attractive distribution channel options are those that enable snacks to be available to consumers at peak snacking times including; hotels and motels, health and fitness, airlines, and the workplace. Vending, as a distribution method, is also an option across many channels. The retail market for processed snacks is mature and very competitive, increasing the importance on branding and marketing. To be viable longer term, these products also require the successful locking in of Australian origin as an attribute. All of these factors contribute to greater pressure on margins.

Category specific considerations

The chart below outlines the types of processed vegetable snacks considered and the typical vegetables incorporated as ingredients.



Further information

- *See pages 63 – 100 for further detail on processed vegetable snacks.*

Appendix 4: Detailed Analysis and Findings Report

Appendix 4 includes the full and detailed analysis and findings including:

- Analysis of **distribution channels** including successful national and global examples
- The **demand for smaller snacking vegetables** including identification of products that have production viability
- **Processed snacking vegetables** including an overview of processing technology
- **Production and market success precedents for processed snacks** including use of Australian grown vegetables
- Examples of **leading processed vegetable snack foods globally**
- The **application of analysis findings** for the Australian vegetable industry.

Detailed Analysis and Findings Report

Contents

Key Findings and Implications for Vegetable Snacks

The table below summarises the key findings from the project analysis, and provides implications for vegetable snacks.

Key Findings	Page	Implications
Objective A: Distribution Channel		
Vending		
⇨ Food vending aligns with changes in food buying and consumption patterns. ⇨ The increased technical capacity of vending machines has expanded the scope for handling fresh food products. ⇨ The platform for commercial vending viability is similar to all fresh food distribution and based on sales volume levels and cost effective servicing. ⇨ Vending machines have evolved into solutions to extend trading hours. This type of location for existing businesses also provides cost effective access to an existing supply chain and a solution to restock. ⇨ Access to high pedestrian traffic locations is a must. However, even these prime locations in will have a limit on the machines that can be installed. ⇨ Vending distribution has more product range flexibility than conventional retail. ⇨ Fresh vegetables not a large part of vending offers ranges in other developed markets. This indicates that demand is low and or vegetables are difficult to manage through vending. ⇨ Product brands along with other features and attributes can be communicated as part of the food vending offer. ⇨ Australian consumers are increasingly accepting of the food quality that vending machines can offer. ⇨ There are real and absolute challenges in supplying fresh vegetables via the vending channel that must be overcome to in order to be viable.	Pg. 46-48	• Food vending machine capacities have improved to be more efficient and accommodate selling fresher food. • Buying food through vending machines meets many of the demand signals from today's food consumer. • Viability is dependent on volumes sales and cost effective distribution. • As a means of distribution vending is more flexible on range, an option to extend hours and provides a means of connecting with consumers. • Vegetables are not a major part of vending offers and this raises valid questions about demand and vegetable product viability in vending.

Key Findings	Page	Implications
Education		
⇨ Healthier food in UK & US education facilities has levered off the scale of more organised school lunch programs. ⇨ New products can readily gain access to education facilities as existing food service distributor are typically in place. ⇨ A vending solution could overcome challenges associated with insufficient scale, available labour or irregular demand. ⇨ Online meal providers may also offer opportunities to distribute new vegetable snacking product. ⇨ The vested interest in children's health, together with their natural inclination towards snacks, makes this channel attractive.	Pg. 50	• Snack into education facilities can lever off the food supply systems in place. • Children's healthy eating is a powerful motivator that supports healthy snacks. • Where supply systems are not in place vending is an option.
Health & Fitness		
⇨ Consumers are willing to spend on health and fitness. ⇨ Health and fitness centres are well placed to offer healthy food to members. ⇨ Some operators will require support with a food offer. ⇨ A quality vending offer may overcome some of the challenges faced by smaller providers in particular.	Pg. 51	• The prospect of healthy snacks has strong appeal to the stakeholders in the health & fitness channel. However, they will need a supply system and possible support at the consumer interface to be viable.
Accommodation		
⇨ Accommodation facilities have refrigeration and dispense snacks as well as existing food supply arrangements in place. ⇨ Demand for snacking can be driven by using accommodation services away from the normal domestic environment. ⇨ Boutique hotels are using their minibar range as part of their offer and therefore it is an extension of their brand image. ⇨ Concerns about the risk of fresh product may mean that processed vegetable snacks are more suited to the smaller operators in this channel.	Pg. 52-53	• Accommodation has holding facilities and supply systems in place. • Success therefore depends on an acceptable product form. Product perishability is the core challenge.

Key Findings	Page	Implications
Airlines		
⇨ Airlines are capable and well serviced providers of food. ⇨ Food on airlines reflects the airline standards, quality and contributes to justification of seat class levels.	Pg. 54	• Airlines understand snacks and deal with fresh food. • More healthy snacks in this channel are now dependent on commercial decisions.
Workplace		
⇨ The scale of people in workplaces is the fundamental driver of snack food demand in these facilities. ⇨ Employers can easily enhance their workplace by making healthy snacks available. ⇨ The pathways to reach workplaces with snacks are clear.	Pg. 56	• Workplace ranging of more healthy snacks is dependent on commercial decisions. • Vending is an option.
Objective B: Fresh Vegetable Snacks		
⇨ Fresh vegetable snacks should ideally be small, in whole form, have positive taste, texture and digestion attributes, appealing to eat in raw form, and able to be eaten on the go.	Pg. 59	• Vegetables that are in a small, whole form are more likely to meet consumer demand for convenience and support distribution requirements.
⇨ There is a limited number of vegetables currently available in a product-ready form, as a fresh solo snack. Others will require R&D to resolve consumption attributes, fresh cut processing or R&D to enhance form, or education and influence to raise awareness of raw form.	Pg. 62	• Additional R&D, fresh cut processing, and education and influence may support the availability of more fresh vegetable snacks.
Objective C: Processed Vegetable Snacks		
Production and Market Success Precedents for Processed Snacks including use of Australian Grown Vegetables		
⇨ There is growing demand for healthy, convenient snacks, with a variety of vegetable based snack products already capturing some of this demand.	Pg. 81-82	• Given their widely-acknowledged health benefits, vegetables are a welcome and complementary ingredient in healthier snack products. • Generating a price premium is clearly an enabler for product viability.
⇨ Leading processed vegetable snacks typically generate a price premium over comparable snack foods.		
⇨ Use of local ingredients is one of the attributes frequently applauded in leading vegetable snack products, however it is typically not the primary attribute.		• Local ingredients are a welcome 'support' attribute that can benefit from alignment with a complementary regional location.

⇨ Sourcing and applauding the use of local ingredients is commonly associated with premium priced products.		
⇨ Applauding local ingredients will be more effective when it can be associated with a food region that has an established positive regional reputation.		
⇨ The current range of minimally-processed, fresh chilled vegetable snacks in Australia is less available than in other developed markets.		• Based on the success in the US market, opportunities may exist for more minimally-processed fresh chilled snack products.
Leading Processed Vegetable Snack Foods Globally		
⇨ Leading vegetable snack products reflect a wide range of processing technologies, with a trend towards processes that generate healthier products. ⇨ Some leading snacks applaud hand-cut or small-batch processing in what is typically presented as a reflection of high quality.	Pg. 92-94	• Technology choice should reflect consumer demand. • Technologies available have broadened the scope for producing vegetable snacks.
⇨ Leading vegetable snack products combine the best of vegetable nutrition with convenient snack product form.		• Vegetable based snacks will carry the appeal of real vegetable ingredients but will need to incorporate much more than that to compete with other snack foods.
⇨ Regardless of nutritional attributes, consumers also expect positive taste and texture attributes.		
⇨ Diet, lifestyle and ethical factors, such as allergy-friendly and certified organic, are often applauded as secondary attributes.		
⇨ The influence of new food opinion leaders enabled through the likes of Master Chef and fuelled by sociol media is broadening the awareness of, and interest in, different vegetables in different forms.		• Broadened awareness can only help stimulate vegetable demand.
⇨ Distribution channels for healthy snacks continue to evolve beyond mainstream retail, and include specialty and health stores, online channels, pharmacies, selected food service outlets, department stores and recreational stores.		• New distribution options are emerging and they are likely to embrace 'new' vegetable based snacks.
Application of Analysis Findings to the Australian Market		
⇨ The scale of the processing operation, set-up and operating costs, and knowledge requirements, represent significant factors that can influence the viability of any proposed processed vegetable snack.	Pg. 98	• Entering the snack food market warrants a platform of sound strategic planning.
⇨ Leading vegetable snack products often require ingredients that have been grown specifically to meet certain product specifications.	Pg. 98	• Vegetables suitable for use in snacks may have to be grown specifically for that purpose.

⇨ The ongoing use of Australian sourced ingredients into a snack food product is enhanced where there is sufficient acknowledgement of provenance. This flows on to mean that replacing local ingredients with imported alternatives effectively violates the product's core positioning.	Pg. 99-100	• Locking provenance into the product market positioning is the strongest way to ensure local vegetables are a core part of the product.
⇨ Any successful processed vegetable snack must also reflect current consumer demand by applauding and capturing acknowledgement for other product attributes including health, quality and convenience.	Pg. 100	• The nature of snack food demand means vegetable snacks need to address and deliver a number of needs.
⇨ The presence of logistical barriers in the form of cost or handling requirements creates more favourable conditions for incorporating local ingredients.	Pg. 100	• Logistical barriers for imported product forms are solid indicators of local vegetable product opportunity.
⇨ The choice of distribution channel must accommodate product type, reach the target market, and ensure economies of scale and viable profit margins are achieved.	Pg. 100	• Snack foods is a mature and highly competitive market. • All new products, including vegetable based snacks, have to survive in this level of competition.
⇨ The ability to overcome the challenges associated with operating in a competitive market is the overriding consideration in determining the long-term integrity of incorporating local vegetables.	Pg. 100	

Project Background

This project seeks to better understand possible opportunities for the Australian vegetable industry to benefit from consumer demand for healthy snacks. The total snack food market is significant, valued at $9.3 billion per annum. Vegetable based snacks – either fresh or processed – currently only capture a small share of this total snack food market, significantly less than fruit based snacks. Therefore, it is valuable to understand factors that influence potential for success in this market including; key product attributes, market success factors of leading current vegetable snack products, global trends, distribution channel options, available processing technology, and other factors.

This project aligns to the Consumer Alignment Objective in the Vegetable Strategic Investment Plan. It was framed by the Market and Value Chain Development design team. This project is centred on building on the findings of project VG14024, undertaken in 2015, which involved market research to define the snack food market, understand opportunities for vegetables and quantify the market size.

The Australian vegetable industry is one of Australia's largest horticultural industries with an estimated annual gross value of production of $3,350 million in 2014/15 and an estimated 4,527 vegetable growing business.

Objectives and Deliverables

The full details of the objectives and deliverables are detailed below:

	Objectives	Deliverables	Due Date
A	Identify the distribution channels that have potential to deliver snacks to where they will be purchased by consumers. Assess and identify any constraints and or enabling factors and formulate courses of action that can be taken, to address these factors and therefore further support the distribution of more vegetable-based snacks.	• A1. **Identify distribution channels** that have succeeded globally in the distribution of fresh snacks and the key reasons for their success. • A2. **Assess local channel options and identify potential performance gaps** or inhibitors that need addressing. • A3. **Define channels that are deemed viable along** with any improvement solutions to address performance gaps.	Milestone One: Due 26 August 2016
B	Assess the extent to which the providers of seed and plant material understand the demand for smaller snacking vegetables, including the producer business cases for production of these products. Identify suitable products and confirm their production and distribution viability.	• B1. **Identify providers and influencers** of starter plant material for smaller sized vegetables that can be suitable for consumption as snacks. • B2. **Compile producer business cases** that profile the headline production output and income that these products can generate. • B3. **Identify products that have production viability** and scope for distribution as snacks. • B4. **Rank the identified product opportunities** by relative attractiveness	
C	Assess and profile the detailed viability of locally produced vegetables being used in processed shelf stable vegetable snacks. Identify the type of vegetable, the process, the nature of the end product and the targeted distribution channel. Also formulating a strategy to ensure the product is sustainable and can negate the threat of imported substitute ingredients.	• C1. **Assess the production and market success precedents** for processed snacks including the use of Australian grown vegetables. • C2. **Identify the leading snack foods globally** that are **based on processed vegetables** and the processing technology they use. • C3. Identify **the snack products and processing technology** that have viable commercial scope for the inclusion of locally produced vegetables. • C4. Define a **business strategy framework** to maintain the ongoing integrity of Australian vegetables as the primary ingredient.	Milestone Two: Due 4 November 2016 •

Objective A: Distribution Channels

The following section evaluates Objective A, and provides the deliverables described below.

- A1. **Identify distribution channels** that have succeeded globally in the distribution of fresh snacks and the key reasons for their success.
- A2. **Assess local channel options and identify potential performance gaps** or inhibitors that need addressing.
- A3. **Define channels that are deemed viable along** with any improvement solutions to address performance gaps.

The assessment of distribution channels outlined in the analysis will be used to complement the assessment of fresh vegetable products (Objective B) and also the assessment of processed vegetable products (Objective C). Together these three analysis will frame a detailed profile of the opportunities and development pathways for vegetable snacks.

Distribution Channels: Overall Conclusions

There are a number of factors that impact the merit of a food channel to distribute snack food to Australian consumers. A primary requirement is access to consumers who have a need to consume snacks and it is more attractive if these consumers can be reached at peak snacking times of mid-morning and mid- afternoon.

These core requirements are present when consumers are gathered together in their workplace, for their education, when they are traveling or when staying in hotels or motels. These opportunities are defined by the location of the facility or the means of the travel. The large majority of these options are currently serviced by existing food supply chains, which is a positive enabler.

Health and fitness facilities are also explored due to their rapid recent growth and an increasing role in their client's food diets.

Vending is a distribution system that has the scope to reach all locations and potentially service many of the venues where consumers gather and the snacking need arises. Vending machines have improved as new technologies have deliver new capacities including handling fresh food.

The analysis of fresh snacks on offer show very few vegetables on their own. Indicating either the difficulty involved in supplying and distributing such an offer, or the lack of current demand. It is also clear there are real and absolute challenges involved in supporting fresh chilled products which must be overcome.

Detailed analysis

This section provides a detailed analysis of individual distribution channels, including successful national and global examples.

Note that this assessment has been designed to focus on distribution channels other than mainstream food retail or food service. The rationale for this focus is based on discovering the potential of distribution channels that can enable additional distribution of fresh vegetable snacks. It is assumed that any successful new products developed for these new channels are highly likely to will work in existing channels.

Vending Distribution Channel

Overview

Distributing through vending is about placing product for sale in a self-serve piece of equipment that works without being manned. As the machine can be located at will it can provide effective access to targeted consumers in situations where the consumption need arises.

All indications are that the retail food buying patterns of consumers that are centred on smaller more frequent shopping trips are a behaviour that is complemented by food vending offers.

Food vending machines have developed rapidly in recent times as more effective distribution options. They have incorporated new technology in communications and refrigeration engineering plus enjoyed the impact of more advanced and appealing product forms.

A free-standing vending machine can be located in high pedestrian traffic locations and with typically assured access to power these machines have automated many retail functions. Operational challenges for food products are typically centred on the perishable nature of the product and the frequency of servicing required.

In general Australia lags behind other developed markets in the use of vending of machines for food and especially fresh food. The increased use of self-serve retail checkouts is viewed as a positive indicator of scope to increase sales through the similarly self-serve mode of vending machines.

The vending examples that follow show the range of food on offer globally and in Australia. They also profile the range of vending machine capacities.

Vending examples

Country	Comment	Product Examples
US	**Farmers Fridge:** • **Product on offer:** BPA-free jars of pre-prepared salads, breakfasts and snacks as well as individual proteins (that can be added). Vegetables include: cut, grated, leaves e.g. Capsicums, Carrot, Cauliflower, Cucumber, Radishes, Red Cabbage, Snow Peas, Spinach, Sweet Corn, Tomatoes. • **Refrigeration:** Fresh chilled. • **Locations:** 44 locations in Chicago including a university, a hospital, a 7-Eleven, and others. Limited options also available via various cafés and retail stores at counter (not in fridge). • **Servicing**: Refilled every morning (Monday to Friday). • **Shelf-life**: 3 days. • **Machine**: Credit cards, touch screen, bar code scanner for coupons, nutrition & ingredient info. • **Other attributes**: Healthy, organic, local ingredients.	 

Country	Comment	Product Examples
Japan	**Dole** • **Product on offer:** Bananas (bunch AU$4-5, single AU$1.50), dried banana and mango chips. • **Refrigeration**: Fresh chilled/ambient**.** • **Location:** Subway station. • **Servicing:** Regular stocking (2-3 days).	
Japan	**m.V.m** • **Product on offer:** Apples (peeled, cut and packaged). • **Refrigeration:** Fresh chilled. • **Location:** Major subway station. • **Other attributes:** Priced at premium, but fruit from region famous for apples and considered a luxury product by most city dwellers.	
US	**Fresh Del Monte Produce** • **Product on offer:** Bananas, light dips, and packages of fresh-cut fruit and vegetables. Fruit and vegetables include: Apple slices, baby Carrots, Bananas, Celery, Grapes, Pineapples, Tomatoes. • **Refrigeration:** Fresh chilled. • **Locations**: Various, including health clubs, schools, institutions and office facilities. • **Servicing**: At least weekly. • **Shelf-life:** The packaging and temperature control provides five days of shelf-life. • **Machine**: dual temperature zones in the machine (one for Bananas, one for fresh cut fruit & vegetables). • **Other attributes**: Protective wrapping to prevent bruising and temperature control.	

Country	Comment	Product Examples
Scotland	**Grewar Farm Vending** • **Product on offer:** Salads, seasonal selection of fresh produce including Carrots, Cauliflower, Broccoli, Eggs, Onions, Potatoes, and Raspberries, Strawberries, fruit & vegetable boxes. • **Refrigeration**: Fresh chilled/ambient. • **Locations**: On farm, a gym, hotel and shopping mall. • **Servicing**: Two part-time employees are mobile and keep the compartments stocked, receiving notifications when locker is half empty. Stock is supplied from a variety of farms.	
France	**Basque boucherie** • Paris' first raw meat vending machine. Paris also has vending machines for cheese & baguettes. • **Product on offer:** Steaks, sausages, beef carpaccio, Bayonne ham, chicken and eggs. • **Refrigeration**: Fresh chilled. • **Location:** Adjacent retail butcher. • **Servicing**: Delivered as required/daily. • **Machine:** Accepts cash or credit cards. • **Other attributes:** Goods are prepared and vacuum-packed by butcher.	
US	**Applestone Meat Company** • **Product on offer:** boutique quality grass-fed meats e.g. Brooklyn sausage meatballs, bratwurst meatballs, merguez sausages, burger patties and hot dogs. • **Refrigeration:** Fresh chilled. • **Location:** One vending machine outside a wholesale butcher (New York), with more vending locations planned. • **Servicing**: Daily via onsite wholesale butcher. • **Machine**: Coin operated. • **Attributes**: Locally sourced and sustainably raised meats.	

Country	Comment	Product Examples
Australia	**FruitBar** • FruitBar success follows on from BananaBar (which is located near train stations and hospitals). • **Product on offer**: A variety of fruit and salad vegetables, ranging from a single piece of fruit to snack packs with various mixes that also contain nuts and biscuits. • **Refrigeration:** Fresh chilled. • **Locations:** a high school, hospitals, with interest from one of Australia's major petrol suppliers. • **Servicing:** Daily, with some are filled multiple times a day.	
Australia	**Snack Savvy** • **Product on offer:** Shelf-stable Popcorn, 'Vege' chips (beetroot and sweet potato), muesli & protein bars, dried & pressed fruit bars. Refrigerated fruit & nut mixes, milk drinks, fruit juices & smoothies, protein drinks, water. • **Refrigeration**: Fresh chilled. • **Locations**: Healthy vending machines available to gyms, recreation centres, schools, hospitals, workplace/office. • **Servicing**: Remotely managed, refilled as needed.	
Australia	**The FuD Revolution** • **Product on offer**: Salads, proteins and snacks. Current vegetable offer includes Carrot/Celery sticks (with Nuts) and in salads. Able to choose a snack or a meal (extra protein, shake dressing/sauce options). • **Refrigeration**: Fresh chilled. • **Locations**: Various including workplaces, schools, gyms, hospitals, and shopping centres. • **Servicing**: All stock replaced daily, time-stamped. • **Other attributes**: Australian produce grown using sustainable practices. Rotate menu based on supply. Left overs donated to homeless shelter.	

Country	Comment	Product Examples
Australia	**Bianca Monley/ Eat Fit Food** • **Product on offer:** healthy meals. Each machine stocks 80 meals, e.g. lamb moussaka, chicken coq au vin, lean beef lasagne, butter chicken & rice, chilli con carne & rice, tofu bolognaise with pasta, tofu pad Thai, and pumpkin panang curry. • **Refrigeration:** Fresh Chilled. • **Locations:** CBD corporate offices/business hubs. • **Servicing:** Remote monitoring. • **Shelf life:** up to 3 days. • **Other attributes:** Meals are vacuum sealed. Nothing frozen. • Owner plans to spend $1 million on 50 German-made vending machines over the next year.	
Australia	**Ausbox Vending** • A typical hot food vending machine handles up to approximately 100 different meals at the same time. • **Product on offer:** Hot food vending. Up to 100 different meals at the same time. • **Refrigeration**: Chilled – with some semi/shelf-stable products. • **Locations:** Workplace locations. • **Servicing:** Topped up on a regular basis or every three days, depending on the frequency of sales. • **Other Attributes:** offered as an alternative to a staffed kitchen facility	

Vending Channel Conclusions

Reasons for vending success globally

- Headline changes in food buying and consumption behaviour are reflected in smaller more frequent shopping trips, health and wellness through diets, more eating on the run and a willingness to pay for aspects of convenience. These changes combine into demand patterns that can be met in part with higher quality fresh food vending offers.

  ⇨ **Food vending aligns with changes in food buying and consumption patterns.**

- Innovations in vending machine design and technology adoption has delivered increased capabilities including that they can; hold perishable stock; collect payment; dispense the product; provide product information and communicate the need for stock replenishment.

⇨ **The increased technical capacity of vending machines expanded the scope for handling fresh food products.**

- The commercial viability of a vending machine is determined by the margin generated in the sales less the servicing costs. Global precedents confirm a convenience price premium can be generated, so the key drivers of viability are centred on the sales level and the cost of servicing the vending machine.

  ⇨ **The platform for commercial vending viability is similar to all fresh food distribution and based on sales volume levels and cost effective servicing.**

- The new generation of vending machines are removing some of the negative connotations associated with earlier machines. This is reflected in some operators refer to them as 'self-service cafes' or an 'unmanned outlet'. Some vending machines being used to complement and or extend a retail or food service offer beyond normal trading hours. Such locations provide synergies in how a vending machine can be serviced.

  ⇨ **Vending machines have evolved into solutions to extend trading hours. This type of location for existing businesses also provides cost effective access to an existing supply chain and a solution to restock.**

- The flexibility of vending machines is only as good as the ease with which vending machines can be located in high pedestrian traffic locations remains a key driver of vending success. Many are located in workplaces, schools or tertiary facilities, hospitals, transport hubs and recreational facilities.

  ⇨ **Access to high pedestrian traffic locations is a must. However, even these prime locations in will have a limit on the machines that can be installed.**

- Vending product ranges have more inherent flexibility than conventional retailing where shelf space is under pressure and more controlled. Products still need to perform but some vending offers boast a range suitable for specific dietary requirements, like vegan, sugar free, paleo, and gluten free options.

  ⇨ **Vending distribution of food has more product range flexibility than conventional retail.**

- Fresh vegetables are being offered in selected vending offers but they are not the majority of food vending products on offer.

  ⇨ **Fresh vegetables not a large part of vending offers ranges in other developed markets. This indicates that demand is low and or vegetables are difficult to manage through vending.**

- Capacity to convey other product attributes are common and typically exploited with vending machine sales of food. This is enabled by machine capacity to provide information and the machine design, which uniformly provides a platform for shop front level signage.

  ⇨ **Product brands along with other features and attributes can be communicated as part of the food vending offer.**

Potential Performance gaps in local vending

- While Australia is not currently a 'vending' nation, vending is becoming more popular, with new generations vending machines establishing wider gaining are becoming increasingly common in Australia.

    ⇨ **Acceptance of the food quality that vending machines can offer.**

- Potential challenges for fresh vending include the need to source produce that looks appealing; limited shelf-life and the need to deliver daily or frequently; and the higher costs associated with this type of operation. In addition, while consumers may indicate that they want 'healthy snacks' actual purchasing behaviour may vary in practice.

    ⇨ **There are real and absolute challenges in supplying fresh vegetables via the vending channel that must be overcome to be viable.**

Education Distribution Channel

Overview

Education is a significant distribution channel with approximately 11,500 outlets in Australia. The channel includes day care and preschool, primary school, secondary school and tertiary education facilities. It typically incorporates the provision of lunch and snacks, for students and others who work there.

Similar to the workplace distribution channel, the education channel draws significant numbers of consumers together during the prime snacking occasions. In addition, children are often welcoming of smaller meals more often, making snacks an attractive option.

The Australian education distribution channel differs from global examples such as the US and UK where school lunch programs are commonplace. In Australia, the provision of food can vary significantly by education level and provider. Food may be supplied from home, be provided by the facility (e.g. some childcare centres), or a combination of both (e.g. students can bring food from home but can also purchase food via onsite canteens, vending machines, or cafes etc.).

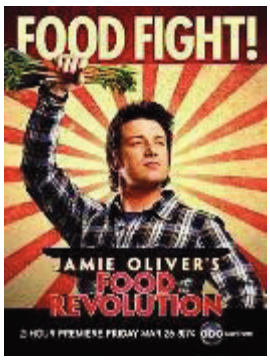
The provision of food through the education distribution channel can be influenced by government guidelines for school canteens, parents and caregivers (particularly for younger children) and other factors such as fundraising opportunities, food safety and allergy considerations.

Education Examples

Country	Comment	Examples
Australia	**NSW School Canteen Association** • This is an example of a canteen association guide that offers guidance on healthy food choices. • It makes mention of the need to make fresh fruit available, and advises that vegetables be included in salads or sandwich fillings. Selected snacking vegetables are referenced. • **Sample menu includes:** Carrot and Cucumber sticks or ribbons, Grape Tomatoes, sandwich fillers (grated Carrot, Beetroot, Lettuce, Red Capsicums, Tomato); salad box; Corn on the cob; "Vegie Sticks" and hummus. • Fruit appears more frequently than vegetables. • At secondary school level, vegetables as a stand-alone snack are less frequent than in the primary school sample menu.	
Australia	**Little Tummy Tucker** • **Product on offer:** Morning tea, lunch and afternoon tea, 52 weeks every year. Provides a 6-week rotational roster, meals will last up to 10 days from the day they are delivered. • **Available to:** Childcare providers or parents. • **Servicing:** Delivers daily using refrigerated vans. Products ordered in advance.	
Australia	**Kids Gourmet Food** • **Product on offer:** Meals and snacks for child care, and pantry items. • Menu examples refer to fresh/raw fruit and vegetables and mixed steamed vegetables for lunch. Vegetable products include: Lettuce, Tomato and Cucumber salad; Carrot and Cucumber sticks, Tomatoes. • **Refrigeration:** The fresh meals are snap chilled (never frozen) using blast chilling technology • **Servicing**: Delivered daily. Products ordered in advance, online.	 

Education Channel Conclusions

Reasons for education channel success globally



- Countries such as the US and UK where organised school lunch programs are common, provide access to significant scale and therefore potential opportunities.
- Healthy eating in schools is a sensitive community issue and this has been a key driver behind some success stories to date. This has included the likes of Jamie Oliver's Food Revolution in UK and then US.

    ⇨ **Healthier food in UK & US education facilities has levered off the scale of more organised school lunch programs.**

Potential performance gaps in local education

- Scale and short demand windows are considerations, especially primary schools. However secondary schools and tertiary institutions typically have sufficient scale to overcome this limitation.
- New products have the option enabling distribution through an established food service distributor. It is assured that if some level of food is provided at the facility, then an existing service arrangement will be in place. This is more likely to occur in high schools and tertiary institutions, where there is often sufficient scale to have outsourced catering systems in place.

    ⇨ **New products can readily gain access to education facilities as existing food service distributor are typically in place.**

- Vending is becoming more common in education settings, particularly secondary or tertiary education. There are several examples of new installations of healthy food vending machines in these education facilities.

    ⇨ **A vending solution could overcome challenges associated with insufficient scale, available labour or irregular demand.**

- While individual childcare centres tend to be smaller in scale, some are in networks like, Goodstart Early Learning and are increasing scale. There are an increasing numbers of online meal providers tailoring their offer to child care centres and parents and these businesses will have organised distribution systems.

    ⇨ **Online meal providers may also offer opportunities to distribute new vegetable snacking product.**

- Government guidelines and public interest in healthy eating in schools, together with children's natural inclination towards smaller meals and snacks, is an advantage for healthy snack products.

    ⇨ **The vested interest in children's health, together with their natural inclination towards snacks, makes this channel attractive.**

Health & Fitness Distribution Channel

Overview

The health and fitness industry has experienced significant growth in recent years, particularly among smaller, niche operators.

There are an estimated 3,170 gyms and fitness-related outlets nationwide.

Australians spend an estimated $8.5 billion each year on gym memberships, sports equipment and the latest fitness trends, with the average Australian spending close to $1,000 per year on fitness activities. 4.6 million Australian are members of a gym, with almost 1 million spending more than $100 per month on membership fees alone.

While consumers attend health and fitness centres at varying times, it is common for consumers to look for a snack pre or post exercise, either for convenience or from a social aspect.

Health and fitness operators are well positioned to extend their offer to include healthy food, as members are already interested in health and typically attend regularly.

Health & Fitness Channel Conclusions

General

- Health and wellbeing is a significant consumer trend at present. The growth in the health and fitness industry and the significant levels of spending on health and wellbeing activities are well documented.

    ⇨ **Consumers are willing to spend on health and fitness**

Reasons for health and fitness channel success globally

- Health and fitness centres offer an expanding range of products and services including coaching, personal training and health/nutrition advice. Consumers are already looking to the health and fitness industry for advice on health and nutrition, with some outlets even being drawn into food e.g. offering personalised supermarket and retail visits to give food and nutritional advice.

    ⇨ **Health and fitness centres are well placed to offer healthy food to members**

Potential performance gaps in local health and fitness

- Some operators already offer food and drinks through a range of models, including onsite cafes, over the counter sales, and vending. However, food is typically not their area of expertise. Smaller operators are also faced with the challenge of limited space and time to organise supply prepare and manage the delivery of food.

    ⇨ **Some operators will require support with a food offer.**

    ⇨ **A quality vending offer may overcome some of the challenges faced by smaller providers in particular.**

Accommodation Distribution Channel

Overview

There are over 13,000 accommodation outlets in Australia, making this channel a significant one. In the past year Australian's travelling domestically spent 327 million nights in accommodation, while international travellers spent 248 million nights in accommodation throughout Australia. This includes those travelling for leisure, work, and visiting friends and relatives.

The range of food and snacks offered by accommodation providers varies greatly and can include in-room and mini-bar supplies, vending, and onsite cafes and room service. In-room snacks also vary widely and can range from shelf-stable basics, to high quality fresh snacks. There are an increasing number of boutique hotels offering fresh snacks (e.g. via the mini-bar). Some are charging an additional expense, while others are incorporating it into the overall offer. Such boutique hotels view the offer of fresh mini bar food as an opportunity to reflect the quality of their overall service and as a point of differentiation.

Accommodation Examples

Country	Comment	Examples
US	**The Epiphany** • **Product on offer:** The Fresh Fridge includes Tomatoes, salad, pickled Cauliflower, green juices, nut milks, nine-grain tabouli, probiotic yoghurt with Blueberry crumble. • **Ordering:** Guests must request the Fresh Fridge package five days in advance. Costs US$95. • **Other attributes:** Fresh produce come from the local Palo Alto Farmers' Market.	
Australia	**The Adelphi Hotel CBD Melbourne** • Has been offering the contents of their mini bar as included in the room rate for 3 years. • Hotel staff confirmed this offer has been applauded by guests. • Range determined by Food and Beverage Manager and designed with the hotel image as a consideration.	Adelphi HOTEL

Accommodation Channel Conclusions

Reasons for accommodation channel success globally

- Accommodation outlets are almost always serviced by foodservice distributors. Accommodation outlets typically incorporate in-room refrigeration which could be used to accommodate fresh chilled snacks.

    ⇨ **Accommodation facilities have refrigeration and dispense snacks as well as existing food supply arrangements in place.**

- While guests may not always be in their accommodation during traditional snacking times, the disruption to normal schedules associated with travel may make them more open to snacking, as well as welcoming of fresh healthy food.

    ⇨ **Demand for snacking can be driven by using accommodation services away from the normal domestic environment.**

- There are an increasing number of accommodation providers (particularly boutique providers) offering high quality fresh products as part of their service, as a reflection of their brand and quality. This offering utilises the existing infrastructure of the in-room refrigeration. This trend has also been visible in Australia, and has received positive feedback from guests. This offering is in line with a general interest in health and wellbeing among consumers.

    ⇨ **Boutique hotels are using their minibar range as part of their offer and therefore it is an extension of their brand image.**

Potential performance gaps in local accommodation

- The confidence to handle perishable product and with that risk of product waster or shrinkage is a barrier to ranging fresh snacks. This concern is higher with the high number of smaller hotels and motels have to deal with varied levels of occupancy.

    ⇨ **Concerns about the risk of fresh product may mean that processed vegetable snacks are more suited to the smaller operators in this channel.**

Airline Distribution Channel

Overview

The airline distribution channel is significant in size. During 2015 there were 635,000 domestic flights (57.5 million passengers), and 90,000 international flights departing from Australia (17.3 million passengers).

Inflight food for airlines includes full meals and snacks. Research suggests that fresh vegetables are often incorporated into a salad. Various steamed or cooked vegetables are included into main meals. Meals and snack selection can differ significantly depending on class of travel (economy, business or first class).

During air travel, passengers are often positive to a snacking mode of consumption. Additionally, flight times may coincide with traditional snacking times of mid-morning and mid-afternoon, as well as after dinner.

In addition to inflight travel, meals and snacks are also provided in cafes and restaurants, as well as vending at arrivals and departures areas, and in airline member lounges.

Airline Examples

Country	Comment	Examples
Global	**All** • All airlines are serviced by owned or contracted centralised food preparation facilities, where all food is prepared and or ingredients received and meals are assembled.	

	• The quality of the food offered is increasingly associated with the airline quality standards and now a differentiator between the class of seats. • Fresh vegetables are typically incorporated into salads.	
Australia	**Qantas (and QantasLink)** • Fresh snack products that include some vegetables are known to be ranged by Qantas Link in Australia. • Qantas international menu: Primarily incorporates fruit platters or side salads. Vegetables are often included as part of a main meal (steamed or cooked).	

Airline Channel Conclusions

Reasons for airline channel success globally

- The airline distribution channel is significant in size, familiar with fresh food and supported by efficient food supply chain services.
    - ⇨ **Airlines are capable and well serviced providers of food.**
- Similar to accommodation, the range and quality of the meal and snack offer varies greatly and is a reflection of the brand and its associated quality.
    - ⇨ **Food on airlines reflects the airline standards, quality and contributes to justification of seat class levels.**
- Major airlines typically have large centralised food preparation facilities.

Potential performance gaps in local airline channel

- No apparent gaps in what is assessed as an attractive distribution channel.

Workplace Distribution Channel

Overview

The workplace distribution channel is both significant and varied. There are currently around 2.1 million businesses in operation, and while most of these (97%) have less than 20 employees, there are 51,000 businesses with between 20-199 employees, and a further 3,500 with more than 200 employees.

Workplaces, particularly larger ones, are strongly exposed to where snacking arises, e.g. morning and afternoon tea, and as such offer greater potential as viable distribution channels.

Larger workplaces generally have an existing food service distribution model in place, including existing labour to receive supplies.

There are various aspects to the workplace distribution channel, including onsite provision of food (e.g. canteens, cafes, coffee stands), as well as speciality catering and events, and workplace deliveries (e.g. fruit, vegetables and snack supplies).

Workplace Examples

Country	Comment	Examples
US	**Mindful Snacks** • **Product on offer:** 'Healthy' snacks and beverages. Includes individual pieces of fruit, small snack trays of fruit and vegetables, nuts, bars, yoghurt, chips, drinks/juices. • **Vegetable offer includes**: Snack trays of green Zucchini and Carrot sticks; baby Carrots and Celery sticks; and baby Carrots and Sugar Snap Peas. • **Servicing:** delivery 6 days a week.	  
US	**Fresh Direct** • **Product on offer:** Fruit, vegetables, meat, seafood, meals, bakery/deli goods, grocery items and alcohol delivery for home or office. • **'Office friendly' vegetable products**: 10 products e.g. bag of baby Carrots, snack packs, Carrot chips, Broccoli florets, Grape Tomatoes, Cucumbers (medium size), mixed vegetables & dip, Carrots & dip, and Carrots and Celery and dip.	 
Australia	**Fruit Passion** • **Product on offer:** Office fruit and corporate fruit boxes. • **Includes:** Large selection of fruit and vegetables (whole vegetables, not snacking or baby size), fruit salads, Greek and garden salads, Carrot and Celery packs (with Avocado and garlic dip), and fresh stir-fry vegetable packs.	
Australia	**Wicked Foods** • **Product on offer:** Wide range of corporate catering options including meals, snacks, functions and specialty menus. • **Includes:** Small vegetable snack boxes with fresh dip, vegetable sticks and crackers; Cucumber slices and Cherry Tomatoes. Vegetables are also included in various salads. • **Servicing:** Delivery as needed. Min $500 spend. Corporate events only.	

Workplace Channel Conclusions

Reasons for workplace channel success globally

- The scale of exposure to a large proportion of consumers in mornings and afternoons is the core reason for the workplace channel being an attractive snack food distribution option.
    - ⇨ **The scale of people in workplaces is the fundamental driver of snack food demand in these facilities.**
- Employers are more responsive to maintaining a positive work environment and the provision of healthy snacks aligns well with that goal.
    - ⇨ **Employers can easily enhance their workplace by making healthy snacks available.**

Potential performance gaps in local workplace

- The workplaces that have onsite cafes or canteens and supply systems in place will make normal commercial decisions about the merit of new snack food products.
- Workplaces that do not have food facilities are options for vending.
    - ⇨ **The pathways to reach workplaces with snacks are clear.**

Objective B: Demand for Smaller Snacking Vegetables

The following section evaluates Objective B, and provides the deliverables described below.

- B1. **Identify providers and influencers** of starter plant material for smaller sized vegetables that can be suitable for consumption as snacks.
- B2. **Compile producer business cases** that profile the headline production output and income that these products can generate.
- B3. **Identify products that have production viability** and scope for distribution as snacks.
- B4. **Rank the identified product opportunities** by relative attractiveness.

Identify providers and influencers

A list of key providers of seed and plant starter material, and industry influencers has been developed. This list will be used as a starting point for discussion with the industry as to the business case for the production of smaller snacking vegetables.

Bayer CropScience	Fairbanks Seeds	South Pacific Seeds
Bejo Seeds Pty. Ltd.	Monsato/Seminis/De Ruiter	Syngenta
Boomaroo Nurseries	Nunhems	Terranova Seeds
Charlcon Seeds	Rijk Zwaan	Yates Seeds Group
Enza Zaden		

Compile producer business cases for the production of smaller snacking vegetables

The business case for the production of smaller snacking vegetables centres around the higher overall returns that are able to be achieved. It acknowledges the lower yields smaller vegetables generate and the likely higher production costs per kilo.

The objective is to convey the merit of incurring the higher production costs, to produce a higher value product. The key message being that, in a snack ready form which will take the vegetable into a smaller portion, sold to consumers by the each, these snacking products will generate a higher price.

The table below outlines the principles of the business case framework for smaller snacking vegetables. It makes a comparison between conventional vegetables and smaller snacking vegetables.

A more detailed business case can be found on pages 25 – 27, including a comparison of operating costs and net margin for conventional Lebanese cucumber and Baby cucumber, as well as the drivers behind the different costs and margins.

Principles of the business case framework for smaller snacking vegetables			
	Conventional Vegetables	**Smaller Snacking Vegetables**	**Difference with smaller vegetables**
Primary Focus	Produced for **maximum yield**, measured by kg per m2.	Produced for **use as whole snacks,** aimed at higher $/m2 than conventional vegetables.	• Likely to involve growing different varieties, which can require confirming trial activity before production on scale.
Input Costs	Input costs known and benchmarked.	Input costs likely to be higher and require scaled production to confirm.	• Likely to involve varied set-up cost and or a difference in other input costs e.g. if establishing protected cropping or other new practices.
Yield	Conventional volume yield.	Typically lower than conventional vegetable volume.	• Smaller whole vegetables have a lower yield. • However, when part-processing is involved, the final yield can be higher.
Production Costs	Conventional production costs.	Typically higher than conventional vegetable production costs.	• Higher costs driven by more specific requirements and higher labour level in harvesting.
Income	Conventional income, measured in $ per m2.	Higher than conventional income, measured in $ per m2.	• Higher income per m2, generated from smaller snack food portions that sell at higher $ per kg.

Identify products that have production viability

The following section provides an assessment of vegetable products that have potential as fresh snacks. Any opportunities relating to processed vegetables will be discussed in the second milestone report, which covers Objective C (processed shelf stable vegetable snacks).

This section starts by outlining the desirable attributes of fresh vegetable snacks, and then profiles the assessment methodology, results and recommendations in relation to opportunities for fresh vegetable snacks.

Desirable attributes of fresh vegetable snacks

To succeed in the local market, a fresh vegetable snack needs to meet the following criteria:

- **Can be eaten** – suitable and appealing to be eaten as a fresh, solo snack;
- **Can be distributed** – there is a viable plan for ongoing supply and distribution, and the product itself is capable of withstanding the distribution process;
- **Can be sold** – consumers are aware of the product and are willing to buy it.

A fresh vegetable snack should ideally have the following attributes:

- Small if not bite-size, ideally naturally, or else with minimal fresh-cut processing;

- Available in whole form, or with minimal processing, to maximise portability and freshness;
- Pleasant taste and texture, along with no major digestion challenges;
- Able and appealing to be eaten in a raw and whole form, in reasonable quantities;
- Able to be eaten on the go, offering convenience and minimal mess.

  ⇨ Fresh vegetable snacks should ideally be small, in whole form, have positive taste, texture and digestion attributes, appealing to eat in raw form, and able to be eaten on the go.

The Vegetable Snacking Assessment Model

Freshlogic has developed a methodology and tool to assess the suitability of individual vegetables to be eaten as a fresh, solo snack. The framework of this tool is displayed below.

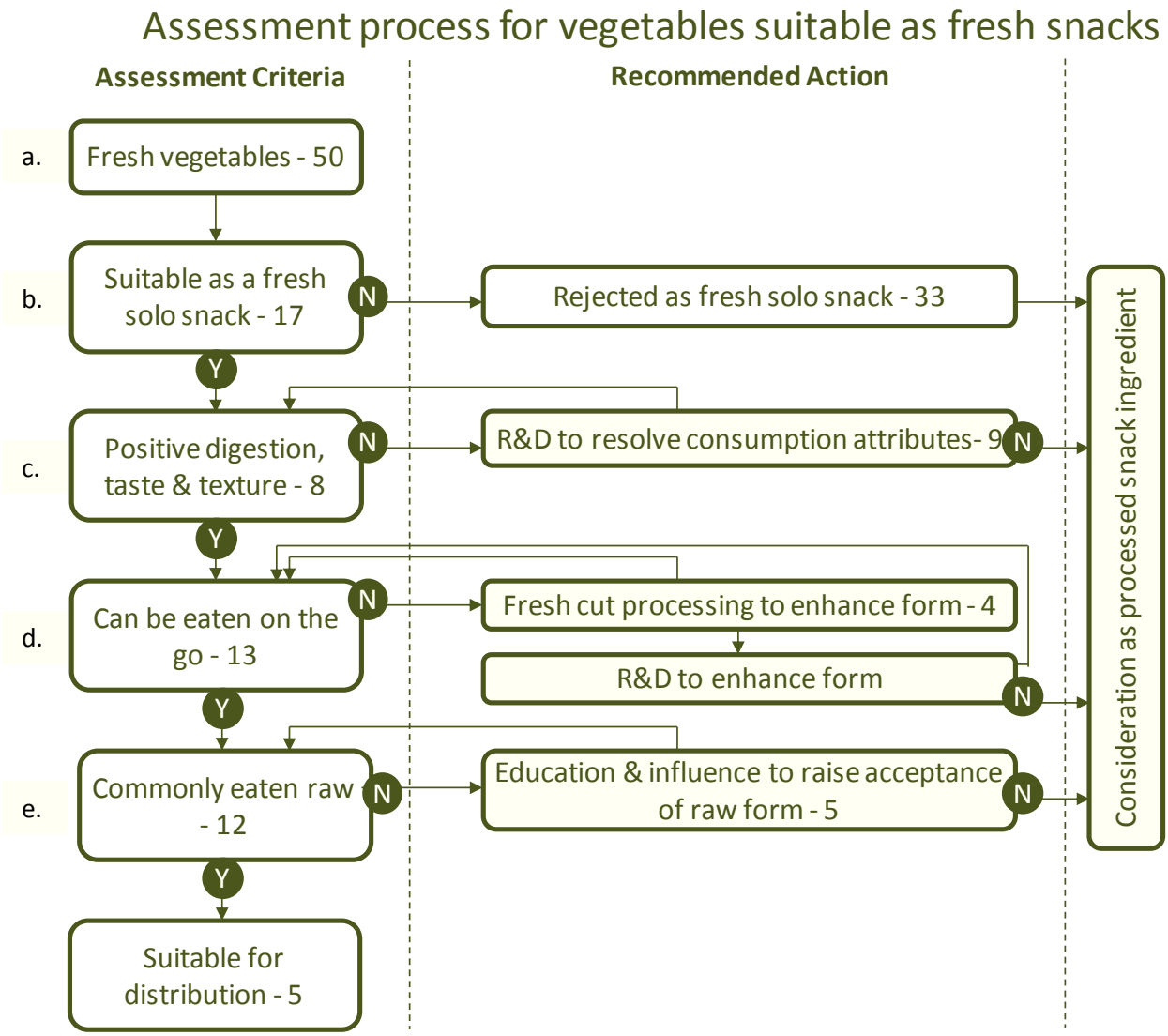
If a vegetable meets one criteria, it goes on to be assessed for the next criteria. Where is does not, a suggested action is recommended.

This assessment considers fresh vegetables, i.e. those in a raw or unprocessed form. Opportunities relating to processed vegetable snacks will be considered as part of Objective C (to be detailed in Milestone 2 report).

References to numbers in the diagram below, (e.g. 'Fresh vegetables – 50'), refer to the number of vegetables applicable at each stage of assessment. For example, 50 vegetables were initially considered, and 33 were rejected as being unsuitable to be eaten as a fresh solo snack, leaving 17 to be considered for the next stage of the assessment.

Where a vegetable is deemed unsuitable, a recommendation is made to resolve the issue. If it is able to be resolved, for example through R&D or fresh cut processing, it can then be reconsidered. If not, it will be considered as a processed snack ingredient (see Objective C, Processed Vegetable Snacks, pg. 33).

A full description of all assessment criteria is provided below. Further details on the model outputs, including a rank of the identified product opportunities, are discussed in the following sections.



Vegetable Snacking Assessment Criteria Descriptions

The vegetable snacking assessment criteria, outlined in the diagram above, are described in more detail below.

- **Fresh vegetables.** All major and relevant minor vegetable categories were considered. Where different varieties have a distinctly different use (e.g. Broad Beans vs Green Beans) the varieties were listed and assessed separately.
- **Suitable as a fresh solo snack.** This identifies vegetables that are suitable to be eaten on their own, and in fresh (raw) form. It excludes vegetables primarily used as herbs or seasoning, as base ingredients in a salad or main dish, or where raw consumption is not recommended (e.g. Leek, Eggplant, Broad Beans, Potatoes).
- **Positive digestion, taste and texture.** This recognises significant barriers to consumption as a raw snack, among the general population. We acknowledge these attributes may vary in degree and nature depending on the specific variety, and the perception may vary among individual consumer. A vegetable considered to have positive attributes, does not face significant challenges with the following:

  - **Digestion Challenges:** Including vegetables with high insoluble fibre content;
  - **Negative Taste Attributes:** Including a bitter or pungent flavour;
  - **Negative Texture Attributes:** Including specific textures that may discourage consumption.

- **Can be eaten on the go.** This identifies vegetables that make a suitable mobile snack that can be eaten on the go, in its whole form. It assumes reference to the baby or mini variety, and excludes vegetables that require preparation or cutting, or are too difficult to eat on the go.
- **Commonly eaten raw.** This recognises where there is a current level of familiarity among consumers with consumption of the vegetable in raw form, either by itself or in combination with other ingredients such as a salad or sandwich. A level of 10% of total consumption has been established as a guide of 'significant' mainstream consumption. A level of familiarity of raw consumption would greatly assist in the marketing of any new or improved fresh vegetable snacks.
  - Assessment was assisted by reference to www.vegecation.com.au, which, among other things, provides information on preparation and cooking.

Snacking Vegetables Identified

By applying this assessment process to 50 different fresh vegetables, 17 vegetables have been identified as suitable for consideration as a fresh snacking option. They are:

Beans (Butter & Green Beans)	Cucumber	Squash
Broccoli	Mushrooms (Button & Portobello)	Swede
Capsicum	Mushrooms (Shiitake & Specialty)	Sweet Corn
Carrots	Peas (Green Peas)	Tomato
Cauliflower	Peas (Snow & Sugar Snap)	Zucchini
Celery	Radish	

A detailed profile of all outputs from the Vegetable Snacking Assessment, including a comprehensive list of all vegetables considered for assessment, can be found in the Appendix.

Rank the identified product opportunities by relative attractiveness

The following profile considers the output of the assessment method, and ranks product opportunities by relative attractiveness. Tier 1 is the most attractive, while Tier 7 is the least attractive in that it requires the most significant investment.

This list includes **only those vegetables that are suitable as a fresh solo snack**.

Relative Attractiveness		Description	Recommended Action	Products
Most Attractive	**Tier 1**	• Already in a product ready form, and suitable for distribution	• Some could benefit from increased awareness (e.g. Radish).	Carrots, Cucumber, Peas (Snow & Sugar Snap), Radish, Tomato
	Tier 2	• Positive digestion, taste and texture attributes • Can be eaten on the go • Not commonly eaten raw	• Education and influence to raise acceptance of raw form	Mushrooms (Button & Portobello), Zucchini
	Tier 3	• Positive digestion, taste and texture attributes • Commonly eaten raw • Not easy to eat on go	• Fresh cut processing (or R&D) to enhance form	Celery
	Tier 4	• Can be eaten on the go • Commonly eaten raw • Have digestion, taste or texture challenges	• R&D to resolve consumption attributes	Beans (Butter & Green Beans), Capsicum, Peas (Green Peas), Sweet Corn
	Tier 5	• Commonly eaten raw • Have digestion, taste or texture challenges • Not easy to eat on the go.	• Requires R&D to resolve consumption attributes • Fresh cut processing (or R&D) to enhance form	Broccoli and Cauliflower
	Tier 6	• Can eat on the go • Have digestion, taste or texture challenges • Not commonly eaten raw	• Requires R&D to resolve consumption attributes • Education & influence to raise awareness of raw form	Mushrooms (Shiitake & Specialty), Squash
Least Attractive	**Tier 7**	• Have digestion, taste or texture challenges • Not easy to eat on the go • Not commonly eaten raw	• Requires R&D to resolve consumption attributes • Fresh cut processing (or R&D) to enhance form • Education & influence to raise awareness of raw form	Swede

⇨ There is a limited number of vegetables currently available in a product-ready form, as a fresh solo snack. Others will require R&D to resolve consumption attributes, fresh cut processing or R&D to enhance form, or education and influence to raise awareness of raw form.

Objective C: Processed Vegetable Snacks

The following section evaluates Objective C, and provides the deliverables described below.

- **C1.** Assess the production and market success precedents for processed snacks including the use of Australian grown vegetables.
- **C2**. Identify the leading snack foods globally that are based on processed vegetables and the processing technology they use.
- **C3**. Identify the snack products and processing technology that have viable commercial scope for the inclusion of locally produced vegetables.
- **C4**. Define a business strategy framework to maintain the ongoing integrity of Australian vegetables as the primary ingredient.

Analysis Scope and Methodology

This section outlines the analysis scope and methodology applied.

Our analysis seeks to provide maximum value to Australian vegetable levy payers and industry stakeholders by capturing the most relevant and innovative features of processed shelf stable vegetable snack products. As such, we have narrowed our scope to focus on the most significant areas.

Potato chips, corn chips, popcorn and other corn-based snacks, such as corn thins, cakes and puffs, capture a significant share of the total snack food market. We have highlighted them where there is a significant product or technology feature, however most of our focus has been on products derived from vegetables other than potatoes and corn, or where an additional vegetable has been incorporated into a potato or corn-based product, and this additional vegetable has been applauded.

Our primary focus has been on products that meet the following criteria:

- Is designed for snacking occasions and to be eaten on its own, i.e. is not a main meal, and does not rely on the inclusion of other ingredients.
- Can be eaten on the go, i.e. does not require preparation or the use of utensils.
- Includes and applauds a vegetable as a primary ingredient, i.e. not just a flavour.
- Is processed in some form and is either shelf stable or has an extended shelf life.

Our analysis has grouped products into the following four categories:

1. **Crisps, chips and popcorn**.

While acknowledging potato and corn based products, this category focuses on products that are based on a vegetable other than potato and corn, or where an additional vegetable has been added to a potato or corn based products and this additional vegetable has been applauded, like quinoa and kale popcorn for example.

2. Preserved and pickled.

This category focuses on preserved and pickled vegetables that can be eaten as a snack. While many products in this category are packaged in larger portions, many are still eaten as a snack. There are indications that snack sized portions are becoming more common.

3. Puffed product, bars and other

This includes vegetable based puffed products such as processed 'sticks' or 'puffs', as well as bars and other products not included elsewhere, such as pea tubes and roasted broad beans.

4. Minimally-processed, fresh chilled.

These products are minimally processed and are packaged in a way that provides some degree of extension to shelf life. They may include fresh cut product, with a dip, and additional ingredients or flavour. It may be displayed in the fresh chilled section.

A range of products have been ***excluded*** from our analysis, as they do not meet our outlined criteria. Below is a list of excluded products and the associated reason:

Snack Product Categories Excluded from Analysis	
Product Category	**Comment**
Baby purees and meals	Most are considered a meal or meal-replacement for small children. Finger foods or snacks that simply add a vegetable 'flavour' have also been excluded.
Dips	Typically, not eaten on their own and not shelf stable.
Fresh deli and antipasto product	Not shelf stable and may not be eaten as snack on its own.
Fresh vegetables	Out of scope if not processed and no extension to shelf life.
Juices	Not considered a snack and many are not shelf stable.
Legumes, grains, seeds	Either not a vegetable or are not eaten as snack on its own.
Vegetable-based burgers, pastries, quiches etc.	Not a snack, not shelf stable, and typically require preparation and utensils.
Vegetable-based pasta, noodles, wraps, breads etc.	Typically, a base product to be eaten with other ingredients, some preparation is required, and most likely eaten as a meal.
Salads	Not shelf stable, require utensils, and are most likely part of a meal or a meal-replacement.
Side or snack dishes	Require preparation, utensils, and many eaten as small meal

	e.g. pasta and vegetable microwave packs.
Smoothies	Generally, not shelf stable or may require preparation, e.g. ready-to-blend smoothie kits.
Soups	Even if shelf stable and snack sized, they require preparation and utensils.
Yoghurts	Even if snack sized and include a vegetable ingredient, they are not shelf stable.

Overview of Processing Technology

This section profiles the different types of mainstream processing technology applicable to vegetable-based snacks.

There is a variety of processing technology available that enables everything from primary processing such as peeling and cutting, to more complex processing such as extraction and drying. While much of the technology has been available for some time, technology features and application continue to evolve to generate improved product and process benefits.

The table below outlines; technology and process, primary benefits, product form generated, and barriers to entry for industry stakeholders. Barriers to entry seeks to incorporate factors such as; set up and operating costs, level of expertise required, and additional requirements placed on subsequent processes. The table is an overview and does not attempt to cover every aspect in detail.

Product shelf life has not been included in the table below as it may depend on the initial and subsequent processes, final form and packaging. Shelf life can vary greatly from days (e.g. cut product), to weeks (e.g. smoked or pasteurised product), to months and even years (e.g. some cooked, dried or preserved products).

Processing technology applicable to vegetable based snacks

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
Primary Processing				
Washing & Cleaning	Various machines and systems designed for washing and cleaning.	Low cost.	Clean whole product for final use or an input into other process.	Low
Peeling & Cutting	Various machines and systems for peeling and cutting.	Low cost. Can be used to change product size and form to specification.	Peeled whole, cut or sliced vegetables.	Low
Separation				
Pressing & Concentrating	**Pressing:** Veg ground into pulp, then hydraulic pressure applied to extract juice. **Concentrating:** Removes water to create concentrate for reconstitution and use in other forms. Often involves heat. **Other: Centrifugal**: Veg cut, then spun to separate juice from pulp.	Extends shelf life, and provides product for use in a variety of subsequent products. Can impact flavour, structure and nutrients.	Juices, purees, by-products.	Low-Med
Preserving				
Pickling & Fermentation	Preservations methods involving anaerobic fermentation in brine or immersion in vinegar.	Extends shelf life. Flavour is enhanced by technique and inclusion of spices and herbs.	Preserved vegetable, in brine or vinegar. May be whole or cut, and single or mixed products.	Low
Canning	Food is boiled (to sterilise) in the can before sealing. Includes	Extends shelf life.	Canned vegetables, single or mixed, whole or cut.	Med-High (capital, knowledge)

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
	product in can, jars, foil, plastic pouches or boxes (UHT).			
Refrigeration & Freezing	Preserves food by slowing or stopping bacterial action. Generally used in association with other techniques.	Extends shelf life with minimal impact on food's taste or texture.	Whole or cut product that is not shelf stable.	Low-Med (capital)
Smoking	Preserves food by slowing bacterial growth. Can also partially cook the food in the case of hot smoking. Generally used with other preservation techniques to extend shelf life, as smoking it primarily a surface treatment.	Extends shelf life. Impacts taste and texture. Reported health risks due to polycyclic aromatic hydrocarbon contamination.	Typically used to process spices or peppers.	Low
Pasteurisation	Flash (HTST) and conventional uses heat to kill microbes.	Extends shelf life. Flash reported to cause less nutritional and sensory damage to products.	Juices etc.	Low-Med
Non-Thermal Technologies	Range of technology including high pressure processing (HPP) which uses cold pasteurisation of foods at extremely high levels of pressure, and pulsed electric field.	Extends shelf life while retaining nutrients, flavour and colour, and quality. Avoids use of additives.	Juices, purees, sauces, smoothies, chunks, slices, ready-to-eat products, fresh-chilled product.	Med-High (capital, knowledge)
Cooking				
Roasting, Grilling & Baking	A range of dry-heat cooking techniques.	Microbial kill step. Impacts taste and texture.	Roasted, grilled or baked product e.g. roasted beans, or grilled veg for preserving.	Low-Med (Capital)

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
Boiling, Blanching, Steaming & Simmering	A range of moist-heat cooking techniques.	Microbial kill step. Impacts taste and texture.	Not commonly used for shelf-stable product. Blanching normally used prior to freezing.	Low-Med (Capital)
Quick cook, Puffing or Hot Popped	Various machines used to create puffed or popped products (typically rice or corn-based). Machines use heat, pressure or extrusion, and may include batch or stream puffing machines. **Corn thins**: While corn is popping, corn is pressed and made into required shape.	Changes texture. Value adding to simple ingredients. Often used as carrier for addition of flavours.	Puffed single product, e.g. popcorn, or puffed corn for inclusion in corn cakes or corn puffed products.	Low-Med
Frying	Machines accommodating a range of techniques including: • ***Deep-frying***: food cooked in hot oil. • ***Air-frying***: oil added to food, before hot air is circulated at high speed. *Both can be batch or continuous flow.*	Deep frying has crunchier texture and distinctive fried flavour. Air frying is considered healthier but still has crispy texture.	Vegetable chips and crisps.	Batch: Low- Med (Capital) Continuous: Med-High (Capital)
Vacuum-frying	Deep-frying machine housed inside vacuum chamber, producing low heat-low pressure. Includes batch or continuous fryer.	Helps maintain natural colours and flavours. Thought to retain more nutrients than traditional frying. Reduced acrylamide	Traditionally for potato chips, now expanding to other vegetables (e.g. green pod veg, root veg chips).	**Batch:** Med (Capital, knowledge) **Continuous:** High

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
		levels over conventional frying.		(Capital, knowledge) De-oiling post frying is usually required.
Drying				
Spray Drying	Produces a dry powder from a liquid or slurry by rapidly drying with a hot gas.	Produces a consistent particle size distribution, suitable for free-flowing dried product.	Powders, flavourings, spices, concentrates, starches, vitamins, colourings.	Med (Capital)
Air Drying	The conventional drying method, hot air drying oven using heat and air circulation.	Maintains as much of nutritional content, authentic taste and brightness of colour. Crisp texture.	Vegetable crisps, other dried whole or sliced vegetables.	Med (Capital)
Freeze Drying	A dehydration process where food is flash frozen, then put into a reduced-pressure system to remove water.	More expensive than traditional dehydration techniques. Absence of heat maintains structure, flavour texture, and nutritional value.	Dried vegetable chips, whole product e.g. green pod vegetables, or pieces e.g. kernel corn, broccoli heads etc.	**Batch**: Med-High (Capital, knowledge) **Continuous**: High (Capital, knowledge) Products require special packaging for moisture barrier.
Drum Drying	Pureed raw ingredients are dried at relatively low temperatures over rotating, high-capacity drums that produce sheets of drum-dried product. This product is then milled to a finished flake or powder form.	Retains much of original flavour, colour and nutritional value. Can dry viscous (sticky) foods which cannot be easily dried with other methods.	Powders.	Med (Capital)

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
Drying - Other	Other drying techniques including natural or sun drying, and microwaving.		Range of dried veg products e.g. sun-dried tomatoes.	
New Drying Technologies	E.g. patented Infidri technology that uses light waves to drive out water molecule.	Leaves flavour, colour and nutrition molecules intact. More energy efficient.	Powder and dried blends.	Med-High (Capital), High (Knowledge)
Extraction				
Extraction	A range of simple and complex technology processes that enable the extraction of flavours, aromas, colours, fibre and antioxidants.	Isolates and extracts desirable features for use in wide range of applications.	Liquid, powders, other.	Med-High
Blending, Coating and Marination				
Wet Blending	Blending together of liquid components for the purposes of mixing or dilution.	Combines liquids into a new form.	Wet blends, puree, bases.	Low-Med
Dry Powder Blending	Blending or mixing of dry powders for combining products, adding filler etc.	Combines solids into a new form.	Dry blends, powders, bases.	Low-Med
Infusion & Marination	**Marination:** Adding flavour by immersion in seasoned liquid prior to cooking. **Infusion:** Soaking a substance in hot liquid to extract the flavour. The liquid is infused with the flavour from the soaked item.	Enhances flavour, which is absorbed into desired product.	Various wet product.	Low-Med

Technology and Process		Primary Benefits	Product Form Generated	Barriers to Entry
Powder Tumbling	Applying a powder via tumbler process.	Can add flavour, texture, colour enhancing taste, appearance and appeal, and minimise caking.	Various dry product.	Med
Spray Coating	Applying a liquid or powder onto the surface of a product. Product may require subsequent process e.g. cooling, drying, freezing etc.	Can add flavour, texture, colour enhancing taste, appearance and appeal, and minimise caking.	Various dry product. More suitable for products that would not withstand powder tumbling.	Med
Packaging				
Packaging	A wide range of technology processes that assist with packaging form, function, design, material, and weight etc.	Supports transportation, storage and marketing.	Various. Some processes place specific requirements on packaging such as high levels of moisture barrier for dried (especially freeze dried) products to provide suitable shelf life.	Low-Med

Other important considerations in relation to technology choice and application

The choice and application of technology for use in the manufacture of processed vegetable snacks may be influenced by:

- **Scale and location of the operation** – This may impact efficiencies and cost.
- **Level of complexity or knowledge requirements** – Some may involve a simple extension of current operations, while others may involve a substantial investment.
- **The set-up and ongoing costs** - Some technology has a high set-up but low operating cost, and vice versa.

Other factors that should be taken into account include:

- **Growing and harvesting practices –** The presence or lack of particular practices can impact yield and quality, which may impact processing requirements. While outside the scope of this project, there are a variety of practices and technology used during the growing and harvesting phase that should be taken into account.
- **Building and facility design –** Application of best practice in building and facility design can support processing efficiencies and outcomes, and should be considered.
- **Packing, storage and transportation** – Processing can influence packaging, storage and transportation. For example, product shape or form can impact on packing, while some processing types can assist with shelf-life efficiencies. While outside of the scope of this project, there are a range of practices and technologies relating to packing, storage and transportation that should be taken into account.

Production and Market Success Precedents for Processed Snacks Including Use of Australian Grown Vegetables

This section assesses the production and market success precedents for processed snacks including the use of Australian grown vegetables. It provides deliverable C1.

Firstly, it profiles examples of successful domestic vegetable snack products that applaud the use of Australian grown vegetables and comments on key attributes and success factors. Secondly, it draws overall conclusions from this research.

Overview

The range of snack products available in Australia broadly reflects global trends. The trend towards healthier snacks is contributing to the expanding range of vegetable based products available.

While the range as a whole is dominated by crisps, chips and popcorn, interesting products that applaud the use of Australian vegetables can be seen across all product forms.

There is a range of technology used, however the majority is centred around frying, baking or roasting, and various methods of drying. Preserved products use a range of preserving techniques.

Quality and health are typically the key attributes highlighted across most products forms, except for preserved and pickled products where quality and taste tend to dominate.

Examples of leading vegetable snacks that applaud use of Australian vegetables

Below are examples of leading vegetable snack products that applaud the use of Australian vegetables. The assessment identifies the product type, technology used, product range, product attributes and distribution channels. Examples are in four groups according to the following categories:

1. Crisps, chips and popcorn.
2. Preserved and pickled.
3. Puffed product, bars and other.
4. Minimally-processed, fresh chilled.

1. Product Form: Crisps, Chips and Popcorn

Tyrrell's – Hand-Cooked Crisps and Poshcorn		
Technology & Process	• Crisps: Hand-cut, batch-fried, then tumble dried to remove excess oil. • Popcorn: Quick cooked.	
Country	• Yarra Valley, Victoria, Australia (parent company Tyrrell's is UK based). • On pack and website reference to 'Made in the splendid Yarra Valley, Australia'. • Website refers to use of Australian potatoes and popping corn.	
Range	• 5 flavours of premium potato crisps. • 3 flavours of premium popcorn.	
Attributes	• Quality: 'Hand-cut premium chips', 'gold standard corn', 'hand-cooked crisps'. • Health: Skin on, thick cut, lower sodium and fat, all natural ingredients. • Provenance: Product made from locally sourced ingredients. • Ethical & Diet: Gluten free, suitable for vegetarians.	
Size & Price	• Chips, 165g, $4.49. • Popcorn, 80g, $3.49.	
Distribution	• Leading retailers.	

Summary

- UK based Tyrrell's first sold its chips in Australia in 2014. In August 2015, Tyrrell's acquired local snack food manufacturer Yarra Valley Snack Foods who have two premium brands: Thomas Chipman and The Wholesome Food Company. The philosophy of the two companies align, with a focus on premium, healthy, provenance-based products.
- There is on-pack and website reference to 'Made in the splendid Yarra Valley, Australia', together with website references to the use of Australian potatoes and popping corn.
- The reasons for setting up an Australian base include; meeting the demand from the Australian market, using Australia as a base for Asian export from 2017, and logistical

efficiency as bulky items such as crisps and popcorn are expensive to ship relative to their value. Tyrrell's is also able to utilise the 'Made in Australia' label contributing marketing value.

Thomas Chipman – Organic Vegetable Chips		
Technology & Process	• Fried.	
Country	• Yarra Valley, Victoria, Australia. • Owned by Yarra Valley Snack Foods (UK parent company Tyrell's). • Website states chips are 'made with organic produce sourced from local farmers'.	
Range	• Vegetable chips: beetroot, sweet potato, mixed root chips. • Corn chips. • Potato chips.	
Attributes	• Quality: Australia's largest range of certified organic chips. • Health: Gluten free, nut free, no added MSG, made with non-hydrogenated expeller pressed oil. No preservatives, artificial colours, flavours or additives. • Provenance: 'Made with organic produce sourced from local farmers'. • Ethical & Diet: Non-GMO and pesticide free.	
Size & Price	• Vegetable chips, 75g, $6.05	
Distribution	• Major retailers, independent stores, fruit and vegetable stores, leading health food stores, plus selected speciality and health stores.	

Summary

- This is an example of an Australian product where local ingredients are applauded as an attribute. The products' provenance story leverages the reputation of the Yarra Valley as a quality food producing region.
- Marketing focuses on quality and lifestyle features, such as providing Australia's largest range of certified organic and gluten free chips.

The Wholesome Food Company – Popcorn		
Technology & Process	• Quick cooked. • Popped in small 'boutique' batches.	
Country	• Yarra Valley, Victoria, Australia.	
Range	Includes: • Popcorn: e.g. Sea Salted Kale and Quinoa. • Chips: Corn, falafel, hummus and lentil. • Split Pea Tubes (see page 78).	

Attributes	• Quality: 'Boutique batched', vegetable ingredients sourced from 'select group of Australia's leading growers'. • Health: Wholegrain corn, low calorie, low fat, 'guilt free', no MSG, no artificial colours, flavours, additives or preservatives. • Provenance: Reference to 'Proudly Australian Popped, in the Yarra Valley' on front of pack, website states that 'vegetable ingredients are sourced from select group of Australia's leading growers'. • Ethical & Diet: Gluten free, non-GMO ingredients, vegetarian and vegan friendly.	
Size & Price	• Popcorn, 50g, $3.08.	
Distribution	• All leading independent supermarkets, fruit and vegetable providers and quality health food and gourmet food stores.	

Summary

- This is an example of a popcorn product using highly popular kale and quinoa in a powdered form, adding to the promotable health benefits.
- The provenance story of this product is inextricably linked to its identity, as the Wholesome Food Company is a division of Yarra Valley Snack Foods. This product leverages the reputation of the Yarra Valley for fine foods with a creative front of pack logo stating 'Proudly Australian Popped, in the Yarra Valley'.

Coles Simply Gluten Free – Mixed Root Vegetable Chips		
Technology & Process	• Unclear, most likely fried.	
Country	• Australia.	
Range	• Mixed Root Vegetable Chips. • Variety of potato chips, corn chips, and wholegrain chips.	
Attributes	• Health: no artificial colours, flavours or preservatives, no added MSG. • Provenance: Made in Australia logo on pack. • Ethical & Diet: Gluten free and organic.	
Size & Price	• Mixed Root Vegetable Chips, 75g, $4.35.	
Distribution	• Coles.	

Summary

- This is an example of a retailer private label product also extending into vegetable chips, and making use of the Australian made label. Its main focus is health and lifestyle, specifically gluten free and organic.

Extraordinary Foods – Kale Chips		
Technology & Process	• Dehydrated (air dried) at 46°C for 14 hours.	
Country	• Byron Bay, NSW, Australia. • Front of pack reference to 'from Byron Bay', and organic Australian grown kale.	
Range	• Range of Kale chips with different flavours; garlic & spices, cashew & cheese, dill & onion. • Kale sprinkles (for inclusion in salad), plus other sprinkles (seed & nuts etc.).	
Attributes	• Quality: Hand-made. • Health: Raw, never baked, 'light'. • Provenance: Grown in Byron Bay, Australian certified organic. • Ethical & Diet: Vegan, gluten free, dairy free, nut free and oil free.	
Size & Price	• Kale Chips, 40g, $7.95. • Discounts for multiple packs.	
Distribution	• Online via retailer website, markets, specialty and health stores, other online channels.	
Summary • This premium product focuses heavily on health and provenance attributes. The package references raw, hand-made, organic Australian grown kale.		

2. Product Form: Preserved and Pickled

Sandhurst Fine Foods – Australian Char Grilled Pumpkin		
Technology & Process	• Preserved.	
Country	• Australian – Italian focus: 'Italian ingredients remain at the heart of our business'. • A number of products specifically highlight 'Australian' vegetables in the product name (char grilled pumpkin and olives, capsicum).	
Range	• A wide range of pickled vegetables, antipasto, condiments, fruit and olives. • Products are pickled, dried or otherwise preserved and then typically packaged in containers, jars or tins.	
Attributes	• Quality: Focus of marketing is on quality and taste, 'time honoured traditions, techniques and recipes'. • Provenance: Australian family business, 'Italian ingredients remain at the heart of our business', but local ingredients are also used with products reflecting Australian food market trends and tastes.	
Size & Price	• Australian char grilled capsicum, 270g, $4.99. • White asparagus, 330g, $2.98.	

Distribution	• Food service and retail.	

Summary

- Sandhurst Fine Foods emphasises the history of long held traditions, many of which originate from the Mediterranean and European diets (e.g. Italian, Greek, Polish). They predominately promote the sourcing of ingredients from these locations.
- The Australian Char Grilled Capsicum product featured above highlights an example where local Australian vegetables are included and recognised in the range.

Three Threes – various pickled vegetable products

Technology & Process	• Preserved.	
Country	• Australian family owned food manufacturing business. • Website claims 'proudly supporting Australian Farmers'. • Some products contain the Australian made logo, and all products contain a personal logo reading 'Family Recipe, Home Grown Flavour'.	
Range	• Large range of preserved products including beetroot, onions, gherkins, as well as sauces, relish and mustard.	
Attributes	• Quality: Premium product. • Health: The website and packaging details the numerous health benefits of the vegetables. For example, beetroot is applauded as a source of antioxidants and fibre, anti-cancerous properties, and improves blood flow and lower blood pressure. • Provenance: Australian family company, supports Australian farmers.	
Size & Price	• Beetroot, 250g, $3.22. • Onions, 500g, $3.65. • Gherkins, 260g, $1.54. • Gherkins, 540g, $2.92.	
Distribution	• Mainstream retail, with some at selected stores only.	

Summary

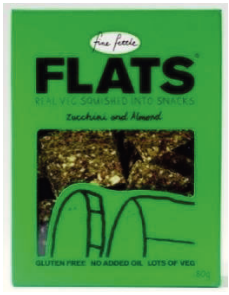
- This is an example of an Australian owned company that heavily promotes Australian vegetables. At times 'Australia' is included in the product name, such as 'Aussie Red Pickled Onions' and 'Australian Beetroot Super Strips'.
- This company also draws attention to the various health benefits of the vegetables, while most other examples in the preserved vegetable category emphasise quality and taste.

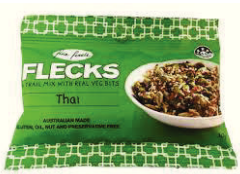
3. *Product Form: Puffed Product, Bars and Other*

The Happy Snack Company – FAV-VA Beans		
Technology & Process	• Roasted. • Broad beans are pre-soaked and then slow roasted.	
Country	• Queensland, Australia. • Packaging and website states, it's 'grown, made and packed in Australia'.	
Range	• 4 products are targeted to kids and 5 products to general audience. • KIDS Roasted FAV-VA Beans come in 4 flavours: pizza; lightly salted; BBQ; Salt & vinegar. • Other products ranged come in 4 additional flavours. • Chick pea based products also ranged.	
Attributes	• Quality: Packaging states it's '100% Wholesome: not blended or extruded'. • Health: 5-Star health rating, high in protein, contains 82% broad beans. • Provenance: 'Grown, made and packed in Australia'. • Ethical & Diet: Gluten free, nut free, allergy friendly, small convenient packaging that targets kids and lunchbox snacking occasions.	
Size & Price	• 10 pack, 150g, $6.60. • 6 pack, 25g, $5.49.	
Distribution	• Major retailers, as well as health food stores including online stores.	

Summary

- This is an interesting snack product, based on split broad beans. It focuses on health and lifestyle attributes, with a 5-star rating, allergy friendly ingredients and convenient packaging.
- The provenance story behind this product is highlighted, but as a second or third tier quality.

Fine Fettle – Flats		
Technology & Process	• Dried. • Real vegetables or fruit is pressed flat then dried (not fried) to help retain nutrition and flavour.	
Country	• Australian owned company. • Use Australian ingredients where ever possible.	
Range	• Flats available in flavours such as: Zucchini & almond; Sweet corn & paprika; Carrot & pepita; Spicy capsicum; Beetroot & hazelnut; Tomato & basil, Onion & sunflower. Some Flats packs also include additional salsa, hummus or yoghurt. • Eats: dried vegetables and lentils. Water must be added to this product.	

	• Flecks: trail mix half comprised of vegetables and half comprised of seeds.	
Attributes	• Quality: Real fruit and vegetables, 'wholesome ingredients'. • Health: Dried not fried, no added oil, high in fibre. • Provenance: 'Australian made, homegrown veggies'. • Ethical & Diet: Gluten free, non-GMO.	
Size & Price	• Flecks, 18g, $2.20. • Multi-serve pack, 80g (5 x 16g).	
Distribution	• Company website, Woolworths, IGA, La Manna Fresh, Target, Ray's Outdoors, Thomas Dux, Aunt Maggies, Leo's Fine Food & Wine, and other. • Also, a range of available on Qantas domestic.	

Summary

- In addition to major retailers and independent retailers, this is an example of a supplier who distributes product through specialty and health stores, both in-store and online, as well as through fruit and vegetable stores.
- They also have a range of on-the-go Flats snack packs available on Qantas (domestic economy).
- Pack size and price typically reflect a premium offering.

The Wholesome Food Company – Sublime Split Pea Tubes		
Technology & Process	• Unclear.	
Country	• Yarra Valley, Victoria, Australia. • Vegetable ingredients sourced from 'select group of Australia's leading growers'.	
Range	• Split Pea Tubes. • Popcorn. • Corn, falafel, hummus and lentil chips.	
Attributes	• Quality: 'Sublime'. • Health: 'Highly nutritious providing variety of macro and micro nutrients', low calories. • Provenance: Reference to 'Proudly Australian Prepared, in the Yarra Valley' on front of pack. • Ethical & Diet: non-GMO, no artificial colours, flavours, additives or preservatives, no added MSG, Vegetarian and Vegan friendly.	
Size & Price	• Split Pea Tubes, 120g, $5.50.	

Distribution	• All leading independent supermarkets, fruit and vegetable providers, select health food and gourmet food stores.	

Summary

- Split Pea Tubes are an example of innovative product form. It takes the best of vegetable nutrition and combines it with the best of fun, convenient product form, with a shape that looks similar to penne pasta.

4. Product Form: Minimally-Processed, Fresh Chilled

Just Veg. – Carrot Snack Pack		
Technology & Process	• Washed, peeled and cut.	
Country	• Australia.	
Range	• Carrot Snack Multipack. • Carrot Sticks. • Carrot Coins.	
Attributes	• Healthy: 5-star rating, 'healthy made easy'. • Provenance: "Grown and Owned by Aussie Farmers" logo on front of pack, referencing supporting farmers. • Ethical & Diet: Convenience, ready-to-eat, 'perfect for lunchboxes'.	
Size & Price	• Snack Multi pack, 5x60g, $4.49. • Sticks, 300g, $3.00. • Coins, 300g, $3.00.	
Distribution	• Woolworths in selected states.	

Summary

- There is a select range of similar products at Coles and other retailers, which primarily features carrot sticks (in varying sizes) and cut celery sticks, while capsicum, mushrooms and occasionally other vegetables are sometimes available. There is a limited range specifically targeted to snacking, others are marketed to suit a variety of uses such as a steamed side vegetable or as a stir fry ingredient.
- There is also a range of cut, preserved and package products from a variety of suppliers available in the deli section including capsicum, sun dried tomatoes, and mushrooms. Many are not specifically targeted to snacking, and many do not make sole use of Australian ingredients. They are often private label products.

Conclusions

Analysis of the production and market success precedents for processed snacks including the use of Australian grown vegetables has identified the following conclusions. Please note that these conclusions relate to analysis of processed vegetable snacks *available in Australia.* The next section of the report looks at global trends.

- Premium quality, healthier-for-you, snacks food products are in demand. This is helping to support an increasing range of vegetable based, processed snack products.
  - ⇨ There is growing demand for healthy, convenient snacks, with a variety of vegetable based snack products already capturing some of this demand.
- The pack size and price of leading processed vegetable snacks typically reflect a premium offering.
  - ⇨ Leading processed vegetable snacks typically generate a price premium over comparable snack foods.
- While there are many examples where local ingredients are applauded as a product attribute, it is typically not the primary feature. Provenance or use of local ingredients tend to be a secondary attribute, following other attributes such as premium quality and health.
  - ⇨ Use of local ingredients is one of the attributes frequently applauded in leading vegetable snack products, however it is typically not the *primary* attribute.
- Manufacturing snacks using locally grown vegetables is commonly associated with premium priced products, where this attribute will more likely be applauded and acknowledged.
  - ⇨ Sourcing and applauding the use of local ingredients is commonly associated with premium priced products.
- Incorporating local vegetables can provide cost and logistical benefits to the manufacturer. For instance, where the bulky and delicate nature of crisps or popcorn makes it inefficient to import finished product from overseas.
- Efforts to promote the use of Australian vegetables and ingredients can be strengthened by combining it with reference to a known quality food location such as Tasmania or the Barossa Valley.
  - ⇨ Applauding local ingredients will be more effective when it can be associated with a food region that has an established positive regional reputation.
- Among preserved products, there are fewer examples where local ingredients are applauded, reflecting the higher proportion of imported product in this category. In addition, these products are often associated with a Mediterranean or European diet. Where local product is highlighted, it is more likely to include products associated with an Australian diet such as beetroot, pumpkin or red onions.
- Following global trends, the distribution channel options for health snacks are becoming increasingly broad. In addition to major and independent retailers, many Australian suppliers are distributing product through specialty and health stores, both in-store and online. Some are also selling product through fruit and vegetable stores, as well as department and sports goods and outdoor stores.

- Domestically, the current range of minimally-processed, fresh chilled vegetables available at mainstream retail is less available than in other developed markets. At present the range is dominated by cut product or sticks, with little evidence in mainstream retail of the incorporation of complementary ingredients, e.g. a dip or cheese. A limited number of minimally processed products specifically target snacking, while the majority target multi-use options such as stir fries or steamed side dishes. Many of these products include a 'local' focus.

  ⇨ The current range of minimally-processed, fresh chilled vegetable snacks in Australia is less available than in other developed markets.

Leading Processed Vegetable Snack Foods Globally

This section identifies the leading snack foods globally that are based on processed vegetables, and the processing technology they use. It provides deliverable C2.

Firstly, it profiles global examples of leading vegetable snack products and comments on key attributes and success factors. Secondly, it draws overall conclusions from this research.

Our analysis has focused on the major developed markets of the US and UK, and also highlights examples from Asia where relevant.

Overview

The range of snack products globally reflects the trend towards products that are 'healthier for you'. Given that vegetables are typically acknowledged for their health and nutritional value, vegetable snacks that are also tasty and convenient are well placed to meet some of this demand. This is evidenced by the expanding range of vegetable based products available.

While the range as a whole continues to be dominated by crisps, chips and popcorn on a pure volume basis, there is some evidence that health-conscious consumers are moving away from chips and crisps altogether. There is a variety of interesting new products being ranged, and there appears to be increasing acceptance of vegetables in non-traditional forms, such the increasing application of powdered products.

There is a range of technology used, however the majority is centred around frying, baking or roasting, and various methods of drying. Globally, there is evidence of greater use of drying methods such as air-dried or freeze-dried as opposed to fried or baked products, due to the apparent health benefits. Many leading products also highlight hand-cut or small-batch processes to reflect quality.

Quality and health are typically the key attributes marketed across most products forms, except for preserved and pickled product, where quality and taste tend to dominate. Diet, lifestyle and ethical factors also feature regularly, e.g. gluten free, allergy-friendly, vegan, non-GMO, and organic.

Examples of leading processed vegetable snack foods globally

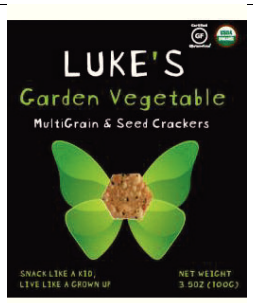
Below are examples of leading global processed vegetable snacks, highlighting technology used, product range, attributes and distribution channels. Examples are grouped into the following four categories:

1. Crisps, chips and popcorn.
2. Preserved and pickled.
3. Puffed product, bars and other.
4. Minimally-processed, fresh chilled.

1. *Product Form: Crisps, Chips and Popcorn*

Nim's - Vegetable Crisps		
Technology & Process	• Air-dried.	 
Country	• UK.	
Range	• Vegetable Crisps include Tomato & Cucumber, Pepper & Courgette and Beetroot & Parsnip. • Nim's is looking to develop broccoli chips. • Fruit crisps.	
Attributes	• Quality: UK's first air-dried range of vegetable crisps. • Health: 100% fresh vegetables, skin, core & pips retained, low calorie, these products have been licenced by the Department of Health – labelled as a 'one of your five a day' vegetable serving. • Ethical & Diet: Gluten free, Coeliac and Vegan friendly, health lunchbox, on-the-go and after-school snack.	
Size & Price	• Beetroot & Parsnip Vegetable Crisps, 18g, £1.25 (AU$2.00).	
Distribution	• Various retailers, plus direct online.	
Summary • Air-dried, or dehydrated, chips are becoming increasingly popular, as a way to maximise health while also being appealing to eat. They target on-the-go and lunchbox or kids snack market, and have the approval of the Department of Health as one of the 5 daily recommended serves of fruit and vegetables.		

Luke's Organic – Vegetable, Multigrain & Seed Chips and Crackers		
Technology & Process	• Unclear (either fried or baked).	 
Country	• US (plus many other countries).	
Range	• Vegetable, Multigrain and Seed Chips (including kale, corn and sweet potato). • Garden Vegetable, Multigrain and Seed Crackers (including capsicum and spinach). • Potato chips.	
Attributes	• Quality: Organic, • Health: Link to personal health story, ingredients such as multigrain, probiotic sprouts and seeds are highlighted.	

	• Ethical & Diet: Vegan, non-GMO, nut, soy, dairy and gluten free, kosher.	
Size & Price	• Kale Chips, 142g, £2.49 (AU$3.98).	
Distribution	• In US, sold via Amazon and an online health store. • In Australia, available from some specialty and health food stores.	
Summary • This example incorporates kale into multigrain corn and sweet potato chips, and promotes a vegetable cracker which includes spinach and capsicum. • It is sold largely online, including via Amazon.		

Hardbite – Vegetable Chips		
Technology & Process	• Fried, small batches.	 
Country	• Canada.	
Range	• Parsnip chips. • Carrot chips. • Beetroot chips. • Potato chips (various flavours).	
Attributes	• Quality: 'Handcrafted-style chips', small batches. • Health: No cholesterol or trans fats. • Provenance: Canadian flag depicted on front of pack, on the website more specific information can be found regarding the company's origin in the British Columbia Provence. • Ethical & Diet: Nothing artificial, gluten free, non-GMO.	
Size & Price	• Vegetable chips, 150g, CA$5.99 (AU$5.91).	
Distribution	• Leading retail locations in Canada and the US, as well as many export markets in Asia.	
Summary • This profiles the use of increasingly popular vegetables such as beetroot and parsnips in snacks.		

The Rawlicious Food Co. - Kale Chips		
Technology & Process	• Dehydration using low heat (under 40°C to retain nutrients and flavours).	
Country	• UK and EU.	
Range	• Kale chips with various flavours (cheese, pepper, Indian spice and Thai chilli). • Other snack products available, but no other vegetable snack products.	
Attributes	• Quality: Voted the "Best New Food Product" at the Natural & Organic Europe Awards. • Health: Promoting benefits of kale, and dehydration process. • Ethical & Diet: Certified organic, no artificial flavours, additives or preservatives, Vegetarian and Vegan friendly.	
Size & Price	• Kale Chips, 40g, £2.49 (AU$3.98).	
Distribution	• Major retail, online consumer and trade.	

Summary

- This award-winning product focuses on the globally popular vegetable kale in a snack form, and promotes the use of dehydrating.
- This is just one example of many kale chip products now available.

Crunchies - Freeze Dried Vegetables and Fruit		
Technology & Process	• Freeze dried, using combination of temperature and pressure.	
Country	• US.	
Range	• Freeze dried beetroots. • Freeze dried fruit (cinnamon apple, grapes, pineapple and berries).	
Attributes	• Health: 3.5 serves of beetroot, low calorie. • Provenance: Traceability (sourced from farm). • Ethical & Diet: On-the-go snack, no additives, non-GMO.	
Size & Price	• Freeze-dried Beets, 34g, US$4.83 (AU$6.36). • Multi packs available.	
Distribution	• Predominantly through CVS Pharmacy, Walmart and online via company website.	

Summary

- This is an example of freeze-dried product which focuses on health and taste.
- It is sold predominantly through one of leading retail pharmacy chains, CVS*, as well as directly online, and via Walmart.

** CVS Pharmacy, is the largest retail pharmacy chain in the US, and is a subsidiary of the American retail and health care company CVS Health. It sells prescription drugs, wide range of general merchandise, beauty, cosmetics, photo services, greeting cards and convenience foods. Sales are in-store and online.*

Terra - Real Vegetable Chips		
Technology & Process	• Unclear. Most likely fried, in small batches.	
Country	• US (available internationally).	
Range	• Mixed Vegetable Chips: available in a variety of flavours. • Vegetables include parsnip, taro, sweet potato, blue potato, yuca, and batata (Cuban sweet potato) dipped in beetroot juice.	
Attributes	• Quality: Supports heritage seeds. • Health: Wide range of vegetables, 'real vegetable chips'. • Ethical & Diet: Non-GMO, recyclable bags.	
Size & Price	• Mediterranean, 140g, US$9.13 (AU$12.01). • Smaller portioned multipacks also available.	
Distribution	• Focus started in food service, specifically premium quality catering, bars and restaurants. • Direct via Amazon, and in various stores including health and specialty retail, pharmacy, fruiterers and markets.	
Summary • Terra vegetable chips are a very high premium product, focusing on colour and appeal of the product. Product names including words such as 'Exotic', 'Heritage' and 'Mediterranean' reinforce this high-quality perception. • The range started in premium food service catering and has extended to retail from there. • Similar mixed vegetable products can also be found in the Asian market. One interesting example from Asia includes a mixed potato, pumpkin and onion chip combination (see to right).		

2. Product Form: Preserved and Pickled

The range of preserved and pickled products in mainstream remains dominated by varieties of onion and shallots, cucumbers and gherkins, as well as peppers, chillies, beetroot and cabbage. Others include cauliflower, sweet cocktail gherkins and mixed vegetable products. Products are whole or sliced, and include a range of private label and branded products.

Following the trend towards raw, whole foods, there is increasing interest in 'home made' pickling and preserving. Not only are people increasingly pickling their own products, but it has also broadened the range of 'home made' products available online, including via peer-to-peer e-commerce sites such as Etsy known for providing home-made and unique products (see examples below).

However, regardless of distribution channel the majority of product packs size remain quite large, between medium and bulk sized, with limited products specifically targeting the snack market. However, there are indications that snack sized portions are becoming more common. The product

below from the UK, sold in ASDA, produced by the Lincolnshire Beetroot company is a 70g, pickled diced beetroot product.

Lincolnshire Beetroot Company - Pickled Beetroot Punnet		
Technology & Process	• Pickled and diced.	 
Country	• UK.	
Range	• This product is available in a range of different packaging types and sizes. • Packaging technologies include punnet (see example to the right), potted and vacuum packed. • Sizes range from 70g to 1.5kg bulk pack. Most products weigh 150-300g.	
Attributes	• Quality: Cooked and ready to eat. • Provenance: Product of the UK, Lincolnshire Beetroot inextricably links the product with its provenance story. • Ethical & Diet: Vegetarian friendly, salad serving suggestion included.	
Size & Price	• Pickled Diced Beetroot, 70g, £0.50 (AU$0.80). • Sweet Chilli Diced Beetroot, 175g, £1.00 (AU$1.60).	
Distribution	• Retail, food service and airlines.	
Summary • This is one example of what appears to be a snack sized, pickled product. This product, however, requires refrigeration.		

Waitrose Private Label – Various Pickled Products		
Technology & Process	• Pickled and preserved.	 
Country	• UK.	
Range	• Waitrose and Essential Waitrose have a wide range of pickled and preserved products. These products range in size from smaller portions to larger bulk products. Small and baby products are also included.	
Attributes	• Quality: Small and baby product, clean labelling. • Health: Many Essential Waitrose products have low sugar, fat, saturated fat, salt and calorie information on front of pack.	
Size & Price	• Gherkins, 150g drained, £1.19 (AU$1.90).	

	• Baby beetroot, 200g drained, £0.75 (AU$1.20).	
Distribution	• Waitrose.	

Summary

- This example profiles two products in smaller portions.
- There is some evidence of smaller portioned products in the Asian market, including 170g of pickled lettuce. Pickled lettuce and cabbage, commonly comes in small tins, and may incorporate flavourings such as soy sauce (see right).

Examples of products available on Etsy

(Peer-to-peer e-commerce site, focusing on hand-made items)

Technology & Process	• Pickled and preserved.
Country	• US and world-wide.
Range	• Wide range of individual and vegetable combinations.
Attributes	• Quality: Focus on home-made, boutique. • Health: Typically based on the hand-made nature of the product. • Provenance: Growing and production region often intrinsically linked to product. • Ethical & Diet: Various ethical and lifestyle claims such as vegetarian, artificial colours and flavours free.
Size & Price	• Asparagus, 450g, $16 AUD. • Spicy pickled purple tomatillos, 425g, $10.70 AUD. • Pickled Pepperoncini, 425g, $10.70 AUD.
Distribution	• Online, worldwide distribution available.

Summary

- This profiles a range of home-made pickled vegetable products available online via Etsy. Many appear to be of larger portion size.

3. *Product Form: Puffed Product, Bars and Other*

"Hi I'm Skinny" - Vegetable Sticks		
Technology & Process	• Powdered vegetable product coated on outside of puffed corn and rice flour product.	
Country	• US.	
Range	• Superfood Sticks Mean and Green: contains kale, spinach and peas. • Sweet Potato Sticks. • Protein Mesquite BBQ Sticks. • Quinoa Sticks: available in various flavours.	
Attributes	• Quality: Made from 'REAL' vegetables. • Health: Low calories, source of vitamins, minerals and amino acids, reference to 'skinny' in product name. • Ethical & Diet: Non-GMO, gluten and dairy free, vegan, kosher.	
Size & Price	• Mean & Green Superfood Sticks, 184g, US$3.79 (AU$4.98).	
Distribution	• Selected retail, online health and speciality stores.	
Summary • This is one of many 'vegie' sticks products available across leading global markets. Essentially it is a puffed product coated with vegetable pieces or powder. • This type of product is also quite common among baby and children's snack products, and are commonly promoted as being healthy due to the inclusion of vegetable content. • A similarly interesting product from Asia includes a puffed blue or purple potato stick (see right).		

Calbee – Harvest Snaps Snapea Crisps		
Technology & Process	• Baked.	
Country	• US.	
Range	• Snapea range includes 4 flavours. • Lentil beans and black beans also available.	
Attributes	• Quality: 'Original green pea crisps', 'Harvest' included in product name implies freshness. • Health: 50% less fat than regular potato chips, source of fibre and protein, low sodium and calorie, made with 70% whole green pea.	

	• Ethical & Diet: Non-GMO and low GI.	
Size & Price	• Snapea Crisps, 50g, US$2.21 (AU$2.91).	
Distribution	• Wide range of grocery and produce retailers, markets, Target, health and specialty stores as well as online retailers.	

Summary

- This is one of many pea-based products. There is also a range of corn and bean based products that are similar (also see Australian based FAV-VA beans by The Happy Snack Company in section one of this report). Products are typically baked or roasted.
- A similarly interesting product from Asia includes coated green peas.

ReBAR – Organic Fruit and Veggie Bar		
Technology & Process	• Vegetables processed into powder blend (major ingredient) and added to fruits, fruit concentrate and raisin paste. • Unclear how bar is dried.	
Country	• Canada.	
Range	• Organic fruit and vegie bar available in 3 flavours (Original, Banana & Walnut, and Blueberry). • Ingredients include vegetable blend (Carrots, Beetroot, Spinach, Cabbage, Tomato, Broccoli, Kale, Parsley, Cauliflower, Cucumber, Capsicum, Collards, Watercress, Bok Choy, Tomato, Garlic), which are processed into a powder. Some natural fruit concentrates, raisin paste and apple are also included.	
Attributes	• Quality: 'Wholefood' (nothing depleted or extracted), non-pasteurised. • Health: 8 serves of fruit and vegetables per bar, 0% fat, 0% cholesterol. • Ethical & Diet: 'Earth-friendly', non-GMO, preservative free, pesticide free, gluten free.	
Size & Price	• Organic Fruit and Vegetable Bar, 50g, CA$2.25 (AU$2.22).	
Distribution	• Dedicated online store.	

Summary

- This is an interesting product in that it contains 8 serves of fruit and vegetables per bar.
- It takes the very best of vegetable nutrition and combines it with convenient form.
- It is targeted to a wide audience including sports, kids, families and convenience.

4. *Product Form: Minimally-Processed, Fresh Chilled*

In the UK, there is a range of cut vegetable product in mainstream retail like cucumber portions and cut celery and carrots. However, there is very limited product that incorporates an additional flavour such as dip, hummus or cheese. As with other markets, much of the cut vegetable product is not specifically targeted to snacking, but rather open to wider use such as stir fries, steamed side products and platters.

Example of products from the UK		
Technology & Process	• Wash, peeled, cut, or some cooked.	
Country	• UK.	
Range	• Essential Waitrose Cucumber portion. • ASDA Grower's Selection Celery Sticks. • Waitrose beetroot wedges with spices & seasonings. • Essential Waitrose Carrot Batons.	
Attributes	• Quality: Fresh, 'crunchy'. • Health: Many products are licenced by the Department of Health – labelled as a 'one of your five a day' daily vegetable servings. • Provenance: Some products reference to 'local' sourcing. • Ethical & Diet: Vegetarian and Vegan friendly, convenient.	
Size & Price	• Essential Waitrose Cucumber Portion, £0.35 (AU$0.56). • Waitrose Cumin and Pomegranate Beetroot, 180g, £1.49 (AU$2.38). • Essential Waitrose Carrot Batons, 400g, £0.75 (AU$1.20). • ASDA Grower's Selection Celery Sticks, 350g, £0.80 (AU$1.28).	
Distribution	• Mainstream retail.	

Summary:

- The range of fresh cut or minimally processed items with extended shelf life is broader in the UK than in Australia. Additional vegetables are included in the UK range, such as cucumber portions, and the deli range has a wider selection of pickled products.
- Many items are the retailers' private label products, and do not contain a lot of marketing on pack.
- As with the Australian market, a limited number are specifically targeting the snacking market, with the rest promoting more general use.

Examples of products from the US		
Technology & Process	• Washed and cut, with flavour or additional products incorporated.	  
Country	• US.	
Range	• Ready Snax: Spinach Parmesan Dip & veggies. • Ready Snax: Buffalo Ranch Dip & veggies. • Ready Snax: Hummus Dip, veggies & flatbread. • Wegmans Fresh Cut Snacks Cup: Hummus Dip, celery & carrot sticks.	
Attributes	• Quality: 'Crunch' and freshness. • Health: Low calorie, high protein, vitamins and fibre, low fat. • Other: Convenient, washed and ready to eat.	
Size & Price	• Ready Snax: Spinach Parmesan Dip & veggies, 113g, US$1.70 (AU$2.24) • Ready Snax: Hummus Dip, veggies & flatbread, 128g, US$1.70 (AU$2.24)	
Distribution	• Various, including mainstream retail, Costco, and selected specialty stores.	

Summary

- There is a variety of products available including cut vegetables and additional flavour, like dips, in snack ready portions and packaging.

Conclusions

Analysis of the leading snack foods globally that are based on processed vegetables has identified the following conclusions:

- A range of technology processes are being used. These include more traditional methods of frying and baking, as well as processes that have more recently been applied to vegetable snack products such as air-drying, dehydrating, and freeze-drying. It is also more common to see the generation and application of vegetable powder(s).
- The complexity of the technology varies greatly, and can include single or multiple steps.
- There is a move towards using processing technology that enables suppliers to highlight health benefits, with lower salt, fat and calories and higher nutrition, flavour and colour. Application of technology such as drying and roasting that enable healthier products while retaining much of

their natural attributes, are becoming more common. Some leading products also market hand-cut or small-batch processes to reflect quality.

⇨ Leading vegetable snack products reflect a wide range of processing technologies, with a trend towards processes that generate healthier products.

⇨ Some leading snacks applaud hand-cut or small-batch processing in what is typically presented as a reflection of high quality.

- While many attributes are applauded, the most successful vegetable snacks combine the best of vegetables i.e. nutrition, with the best of snack product form i.e. convenience.

⇨ Leading vegetable snack products combine the best of vegetable nutrition with convenient snack product form.

⇨ Regardless of nutritional attributes, consumers also expect positive taste and texture attributes.

- Specific examples of attributes applauded by leading vegetable snack products include:
  - **Premium quality**: This might extend to use of exotic varieties, small batch cooking, and hand-cut or hand-made product. This is reflected in the pack size and price, as well as general marketing appeal.
  - **Health**: For example, raw or natural, high nutritional value, x serves of vegetables, low calorie, no additives or preservatives etc.
  - **Taste and form**: For example, crunch or other texture, colour and appealing taste. Spices, herbs or flavourings are often added.
  - **Diet and lifestyle**: For example, gluten free, allergy friendly, nut free and vegan.
  - **Ethical factors**: For example, non-GMO and certified organic, with some also extending to include recycling, traceability and support of heritage vegetable varieties.
  - **Source of ingredients**: Some products make reference to local ingredients, although this is more common in the UK than in the US.
  - **Target market:** Leading products typically focus on convenience, offering on-the-go snacks, for school or lunchbox solutions, with some also specifically focusing on sport.

⇨ Diet, lifestyle and ethical factors, such as allergy-friendly and certified organic, are often applauded as secondary attributes

- There is an increasing range of vegetables being incorporated into snack food. This is reflective of consumer awareness of, and interest in, food and health, and increasing confidence to try new things. It incorporates a resurgence of interest in home cooking and home preserving. This trend is being supported by 'the Master Chef' effect and fuelled by social media. The interest in trying new foods is resulting in a greater variety of vegetables and accompanying flavours incorporated into products available in mainstream retail and other channels. For example, heritage or exotic varieties of potatoes and other root vegetables, parsnip and beetroot chips, and flavourings such as white truffle. There is also increasing interest in and application of powdered product.

⇨ The influence of new food opinion leaders enabled through the likes of Master Chef and fuelled by sociol media is broadening the awareness of, and interest in, different vegetables in different forms.

- The channels for the distribution of healthy snack products are continually broadening. While mainstream retail remains important for many suppliers, an increasing number also distribute through specialty and health stores – both online and in-store – as well as online sales direct from the retailer and via Amazon. Pharmacies, health stores and even premium sports and outdoor stores are increasingly ranging premium food and nutritional products, making them an ideal location to distribute healthy snacks. Some also include a range at specialty food service outlets, as well as department stores.

  ⇨ Distribution channels for healthy snacks continue to evolve beyond mainstream retail, and include specialty and health stores, online channels, pharmacies, selected food service outlets, department stores and recreational stores.

Application of Analysis Findings to the Australian Vegetable Industry

This section considers the findings of the analysis covered in the first two sections of this report – i.e. production and market precedents for processed snacks including the use of Australian grown vegetables, and the attributes of leading global processed vegetable snacks – and provides guidance for the application of these findings to the Australian vegetable industry. It provides deliverable C3 and C4.

Specifically, this section incorporates the following:

- Snack products and processing technology options.
- Factors that impact the scope for local ingredients in processed vegetable snacks.
- A business strategy framework to maintain integrity of Australian vegetables.

Snack products and processing technology options

The table below summarises the main snack product options and the associated processing technology. It also lists vegetables commonly used as an ingredient in each snack product form. This serves as a guide to options available. The technology and associated processes are covered in more detail in the *Overview of Processing Technology, on* pages 65–71.

Snack Product	Processing Technology	Common Vegetable Inputs
1. Crisps, chips and popcorn		
Crisps & Chips	Various including: • Fried, then tumbled dried • Dehydrated, air-dried or freeze-dried.	• **Base:** Includes, potato, carrot, sweet potato, beetroot, parsnip, other root vegetables, kale, corn, tomato, cucumber, zucchini, capsicum, pumpkin, broccoli. • **Flavour:** Includes, onion, garlic.
Popcorn	• **Base:** Quick-cooked, then tumble dried • **Flavour:** Powdered, then applied via spray or powder tumbler.	• **Base:** Corn. • **Flavour** include: Kale.

Snack Product	Processing Technology	Common Vegetable Inputs
2. Preserved and pickled		
Preserved and Pickled	• **Pre-prep:** Cut or sliced, grilled or roasted, infused or marinade. • **Preserving:** Pickling, fermentation, canning, high pressure processing or other. • **Packaging:** Bottled, canned, vacuum packed, other.	Potential for most veg including: • Onions, asparagus, capsicum, artichokes, beetroot, cabbage, tomato, gherkin, cucumber, chilli, cauliflower, carrot, eggplant. • Some veg typically only included in a mixed veg combo.
3. Puffed product, bars and other		
Puffed Product	• **Base:** Various machines using heat, pressure or extrusion to puff, then press or shape. • **Flavour:** dried or powder flavour added via spray or powder tumbler.	• **Base**: Corn (also rice) • **Flavour includes**: Kale, spinach, peas, sweet potato.
Bars	Various stages including: • Concentrated, blended or powdered • Pressed or shaped • Dried or baked.	Potential for many veg including; • Carrots, spinach, cabbage, tomato, broccoli, kale, cauliflower, cucumber, beetroot, capsicum, watercress, bok choy, tomato, garlic, zucchini, corn, carrot, onion.
Other: Snacking Beans, Peas, Corn	• Pre-soaked then slow roasted. • Dried or baked.	• Beans, peas, corn.
Powders	• Air-dried, freeze dried, drum dried, dried via other new drying technologies, or extraction. • Milled to form powder, and blended if necessary.	• Has potential for most vegetables. • Powder used in various forms.
4. Minimally-processed, fresh chilled		
Minimally-Processed, Fresh Chilled	• Wash, peeled and cut. • Some cooked (e.g. beetroot).	• **Fresh veg includes**: Carrots, cucumbers, celery, tomatoes, beetroot. • **Dip:** Spinach, other

Snack product options by vegetable category

The table below outlines product snack options according to vegetable category. This table reflects current mainstream use, however some categories (e.g. preserved, bars and powders) can technically include almost any vegetables.

		SNACK PRODUCTS BY TYPE							
		Crisps, Chips & Popcorn		Preserved	Puffed, Bars, Other			Powder	Minimally-Processed, Fresh Chilled
		Crisps & Chips	Popcorn		Puffed Product	Bars	Other: Snacking beans, peas, corn	Blend or flavour	
MAIN VEGETABLE CATEGORIES	Artichokes			■				■	
	Asian Greens					■		■	
	Asparagus			■				■	
	Beans						■	■	
	Beetroot	■		■		■		■	■
	Broccoli	■				■		■	■
	Brussel Sprouts							■	
	Cabbage			■		■		■	
	Capsicum			■		■		■	■
	Carrots	■		■		■		■	■
	Cauliflower			■		■		■	
	Celery					■		■	■
	Chillies			■				■	
	Cucumber			■		■		■	■
	Eggplant			■				■	
	Garlic			■		■		■	
	Kale	■				■		■	
	Leek							■	
	Lettuce								
	Mushrooms			■				■	
	Onions	■		■				■	
	Parsnip	■						■	
	Peas					■	■	■	■
	Potato	■			■			■	
	Pumpkin					■		■	
	Radish			■				■	
	Rhubarb					■		■	
	Rocket								
	Shallots			■				■	
	Silverbeet							■	
	Spinach					■		■	
	Spring Onions/Chives							■	
	Squash							■	
	Swede							■	
	Sweet & Popping Corn		■		■		■	■	
	Sweet Potato	■			■			■	
	Tomato			■		■		■	■
	Turnip							■	
	Watercress					■			
	Zucchini	■						■	

Vegetable powders

Vegetable powders have been identifed sepearately in the two tables above and here they encompass a variety of uses, e.g. ingredients in a bar or blended product, or as flavour or coating.

While powdered vegetable product has been around for some time, the demand for convenient health and wellness solutions has led to a resurgence of interest. Where products are able to support claims of health and quality, there is potential for high price premiums to be generated.

In addition to the incorporation of powdered vegetables in snack products, powdered vegetable product continues to achieve solid growth across a number of categories including supplements, pet food, baby food, sports nutrition, ready and convenience meals, smoothie and drink bases.

There is a wide range of vegetables already sold in powdered form including, beetroot, broccoli, carrot, cauliflower, kale, pumpkin, spinach, sweet potato, and tomato.

The strong focus on health benefits suggests the need for high quality vegetables with maximum nutritional value, which may necessitate the need for vegetable varieties grown specifically for this purpose, as well as incorporation of other ethical and diet attributes (e.g. certified organic).

Source of pictures: nutradry.com.au

Business strategy framework to incorporate and maintain the integrity of Australian ingredients

Essentially, any processed vegetable snack product and associated technology is an option for consideration by the Australian vegetable industry. There are examples of successful products, globally and domestically, across all of the snack product forms.

While some snack product categories are more mature - e.g. chips, crisps and popcorn - strong competition exists across the entire healthy processed snack market. As such, the viability of any new product development will be influenced by the following factors:

- **Scale, Cost and Other Barriers to Entry** – The level and nature of the barriers associated with the chosen processing technology.
- **Product Specification Requirements** - Whether the right product specifications can be produced to meet processing requirement.
- **Well-Designed Marketing** - The ability to successfully integrate Australian sourced ingredients into the overall product placement and marketing strategy.
- **Favourable Logistical Barriers** - Whether there are logistical barriers in the form of cost or handling requirements that favour the use of local ingredients.

- **Distribution Efficiencies** – Achieving efficient and effective distribution that maximises turnover and profit margins.
- **Withstanding Competitive Market Dynamics** – Having the ability to overcome the FMGC challenges associated with a competitive snack food market.

A business strategy to incorporate and maintain the integrity of Australian ingredients in a processed vegetable snack product must consider each of these factors, which are outlined in more detail below.

Scale, Cost and Other Barriers to Entry

Viable production will be impacted by the scale dependency of the processing technology, associated costs and other barriers to entry such as technical or knowledge requirements.

Some technologies will only be efficient at a larger scale. The degree of scale dependency will vary significantly based on the product and process. Larger scale is more important where there is a greater degree of product or process complexity. For example, if the changeover or clean-down time between products is long, it is more important to have scale to minimise production costs when lines are not active. Scale dependency is also greater when product margins are low, as minimum runs or specified volumes per minute are required to meet profit targets.

Cost and other barriers to entry include the set-up and ongoing operating and maintenance cost involved in utilising the specific technology, as well as the level of knowledge and technical expertise required. (Barriers to entry are covered in more detail in the *Overview of Processing Technology* on pages 65–71).

Ultimately, any processing operation will reflect commercial realities and will vary according to the commercial arrangement reached among the stakeholders involved. It may be possible for a smaller scale processing operation to be initiated by a vegetable producer, while a larger scale operation will more likely take place in partnership with a processer and or manufacturer – using existing or expanded technology and processing capacity.

⇨ The scale of the processing operation, set-up and operating costs, and knowledge requirements, represent significant factors that can influence the viability of any proposed processed vegetable snack.

Product Specification Requirements

In order to be viable, processing operations typically require ingredients that meet particular product specification requirements. This may include the need for ingredients to incorporate certain nutritional value or physical characteristics, such as texture, flavour or colour. Some product forms may have more stringent requirements e.g. high quality nutritionally-rich vegetable powders. There are examples globally where specific varieties are being grown for the primary purpose of inclusion in processed vegetable snack products.

⇨ Leading vegetable snack products often require ingredients that have been grown specifically to meet certain product specifications.

Well-Designed Marketing

The processed snack market exists within a mature, FMCG snack food sector where high levels of product competition exist. A well-designed marketing strategy is required to compete in this

environment.

Successful snacking products that include vegetable ingredients generally:

- Have captured acknowledgment for health and wellness features.
- Are positioned as premium products with quality ingredients.
- Reflect sophisticated marketing input in their branding, packaging and communication support.
- Have captured acknowledgement for product provenance.
- Have catered to prevailing taste, texture and visual preferences.
- Have acknowledged a range of diet, lifestyle and ethical attributes (e.g. allergy friendly, vegan, non-GMO, or certified organic).
- Are targeted to offer convenient, on-the-go snacks.

Consumer interest in health and wellness will impact on the choice of snack product form and processing technology used, with those that are seen to offer a healthier end product more favourable. There is a general trend towards food that is more 'wholesome' or less processed, with a common perception that 'heavily processed' food is less healthy. However, what constitutes 'healthier' food is ultimately subject to consumer discretion, with some product forms such as vegetable powders (which essentially involve considerable processing) receiving strong acknowledgement as a highly convenient health solution where there is evidence that vital nutritional and related attributes have been retained.

Many leading vegetable snack products applaud 'healthier' technologies such as drying and roasting, in favour of traditional methods such as frying and baking. Drying and roasting methods can produce products with lower fat, sodium and or calories, while also retain more nutrients and other natural characteristics of the ingredients. Manufacturers who use frying, may use a 'healthier' oil or incorporate an additional process to remove excess oil, and promote the associated health benefits of this. The interest in healthier methods of preparing food is reflective of consumer behaviour in the home, where cooking processes such as frying are becoming less common. To reflect quality, some leading snack manufacturers are utilising technology that incorporates 'small batch' or 'hand-cut' processing steps.

Successfully integrating Australian sourced ingredients into the overall product placement and marketing strategy is vital. Product provenance can have a number of layers, including local ingredients, local manufacture, and local company ownership. These factors may be strengthened through the association with 'family', e.g. a family farm or use of traditional family recipes, which can be used to convey a sense of association, loyalty and tradition.

SPC Ardmona, for example, undertook marketing activities that sought to establish brand presence based on a provenance story, and focused on local produce and family farms, with their campaign called #MyFamilyCan which featured six farming families.

⇨ The ongoing use of Australian sourced ingredients into a snack food product is enhanced where there is sufficient acknowledgement of provenance. This flows on to mean that

replacing local ingredients with imported alternatives effectively violates the product's core positioning.

- ⇨ Any successful processed vegetable snack must also reflect current consumer demand by applauding and capturing acknowledgement for other product attributes including health, quality and convenience.

Favourable Logistical Barriers

In some snack product categories, there are logistical barriers in the form of cost or handling requirements that favour the use of local ingredients. These include delicate or bulky products such as popcorn and some chips that means it is more cost effective to manufacture these domestically.

Similarly, minimally processed, fresh chilled product is reliant on fresh cut product which works in favour of domestic ingredients. Where ingredients have an extended shelf life e.g. through preserving or freezing, and where they still incorporate the necessary nutritional and natural characteristics, this may make local ingredient less favourable.

- ⇨ The presence of logistical barriers in the form of cost or handling requirements creates more favourable conditions for incorporating local ingredients.

Distribution Efficiency

Snack product viability relies on being able to efficiently and effectively distribute the final product.

The range of distribution channels continues to expand beyond mainstream retail, into online channels, health and specialty outlets, recreation, department stores, and food service.

Effective distribution channel selection is required to ensure economies of scale and viable profit margins. Typically, more distribution steps to the end consumer, means lower margins for the producer.

- ⇨ The choice of distribution channel must accommodate product type, reach the target market, and ensure economies of scale and viable profit margins are achieved.

Withstanding Competitive Market Dynamics

Once a new product has been successfully established, a business strategy framework to *maintain* the integrity of Australian vegetables will be centred on a logistical or cost advantage, or the ability to capture sufficient acknowledgement of provenance that losing this would violate the product's positioning (as discussed above).

However, the overriding consideration in determining the *long-term integrity* of incorporating local vegetables is the competitive market dynamics that prevail in the processed snack sector.

The competitive, mature FMGC environment means it's possible for copy-cat products to appear, or comparable private-label products to appear, and a successful product will need to be able to withstand these challenges. While potential opportunities exist, new product development risks exist regardless of snack type and success requires a strong business plan.

- ⇨ The ability to overcome the challenges associated with operating in a competitive market is the overriding consideration in determining the long-term integrity of incorporating local vegetables.