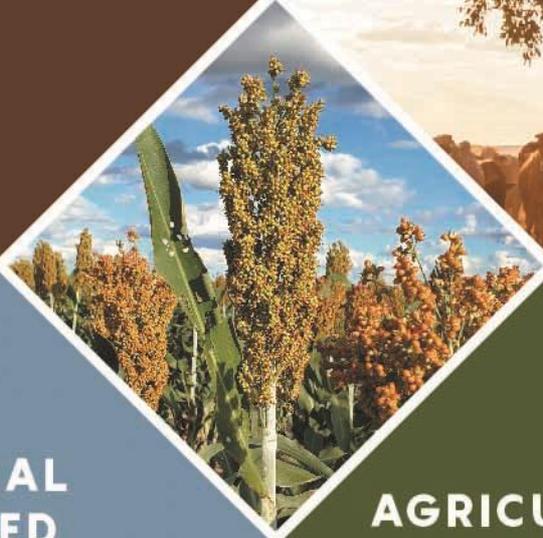


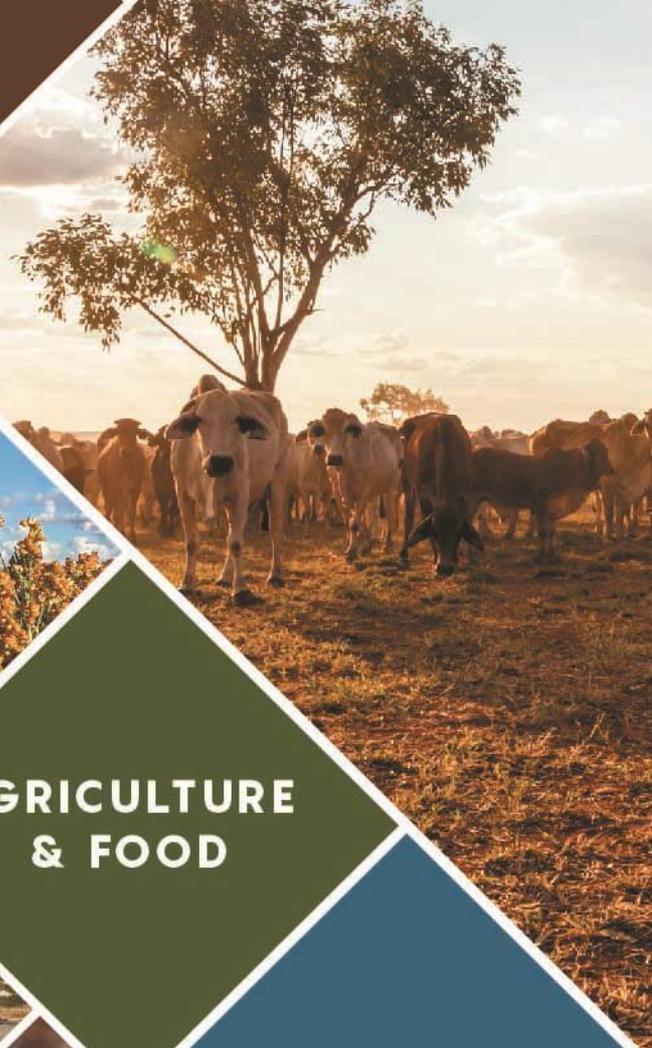
NORTHERN HEALTH SERVICE DELIVERY



TRADITIONAL OWNER-LED DEVELOPMENT



AGRICULTURE & FOOD



Exporting perishable commodities to Asia: Summary Report

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Acknowledgements

This research is funded by the CRC for Developing Northern Australia (CRCNA), which is supported by the Cooperative Research Centres Program, an Australian Government initiative. The CRCNA also acknowledges the support of its investment partners: The Western Australian, Northern Territory and Queensland Governments. We also acknowledge the financial and in-kind support of the project participants.

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The author(s) confirm(s) that this document has been reviewed and approved by the project's steering committee and by its program leader. These reviewers evaluated its:

- originality
- methodology
- rigour
- compliance with ethical guidelines
- conclusions against results
- conformity with the principles of the [Australian Code for the Responsible Conduct of Research](#) (NHMRC 2018),

and provided constructive feedback which was considered and addressed by the author(s).

This report should be cited as: Akbar, D., Rahman, A., Rolfe, J., Kinnear, S., Bhattarai, S., Nguyen, T. and Al Imam, M. H., 2021. Exporting perishable commodities to Asia: Summary Report. Project Report for CRCNA. CQUniversity Australia, Rockhampton, 24 pages.

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ISBN 978-1-922437-35-8



Australian Government
**Department of Industry, Science,
Energy and Resources**

AusIndustry
Cooperative Research
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1. Introduction

1.1 Background of the project

Northern Australia is an emerging economic region in Australia, which includes central and northern parts of Queensland (QLD), the Northern Territory (NT) and the northern part of Western Australia (WA). This region covers 40.5% of the Australian landmass and has significant agricultural potential (Australian Trade and Investment Commission, 2015). Within Northern Australia, Central Queensland (CQ) is home to major agricultural industries including beef, cotton, grain and horticultural production (Trade and Investment Queensland, 2020). Among the horticultural crops, CQ produces different varieties of vegetables, cucurbits, citrus, table grapes, avocados, mangoes, lychees, and other tropical fruits.

However, a majority of the horticultural crops are perishable in nature with a maximum shelf life of one week only (Department of Agriculture, Fisheries and Forestry, 2013). During the peak season, a large volume of fruits is discarded due to over-supply and domestic market saturation (McKillop, 2015). Additionally, the low domestic market demand for horticultural produces often results in low prices due to oversupply during the bumper production time (Akbar et al., 2019). Although some of the horticultural produces are being exported to Asian markets, mostly by large-scale producers, the export volume is still small (e.g. 12% of the total production of mangoes) compared to the production capacity of CQ (Department of Agriculture and Fisheries, 2018).

The demand for agricultural products is predicted to increase globally around 77% by 2050 due to the growth of population, urbanisation and economy and the changing pattern of consumption, particularly in Asia (Ash et al., 2014). The import of agricultural commodities has been increased in many Asian countries, including China and India, to meet the food demands of rapidly growing populations (Economist Intelligence Unit, 2014). Nearly 80% of the total agricultural commodities (mainly beef) of CQ are being exported to Asian countries (Department of Foreign Affairs and Trade, 2018). The global demand for agricultural products also creates an opportunity for CQ to export its high value perishable agricultural commodities (HVPACs) to Asian countries to improve the economic wealth of the region. To date, there is no or little systematic investigation about the export potential of HVPACs of CQ to Asian markets, particularly about the supply availability, domestic and international markets, land, labour and water availability, and collaboration platforms to grow HVPACs. Exporting HVPACs to Asian markets can bring significant development to the agricultural sector and the economy of Queensland.

The development of the horticulture sector, particularly HVPACs, of CQ primarily depends on the improvement of its export supply chains (Acil Allen Consulting, 2019). The supply chains for less-perishable agricultural commodities (e.g. grain) vary widely from those of the HVPACs (Yan et al., 2017), as the temperature and the time required for processing and transportation have direct impacts on the freshness of the HVPACs. Effective supply chain management is characterised as inter-enterprise cooperation and collaboration among all stakeholders who are either horizontally or vertically involved in the supply chain (Akbar et al., 2019). As the success of agricultural supply chain collaboration (ASCC) primarily depends on the production volume and the quality of agricultural commodities, farmers play a key role in the supply chain networks. The coordination and consolidation of the supply of produces by different farmers, ranging from small scale to large scale growers, is a major challenge in the ASCC for export markets. It has been suggested that in order to address such challenges, a contractual agreement between upstream and downstream entities of the supply chain needs to be established (Hobbs, 2000; Peterson et al., 2001). It is however still uncertain whether Queensland farmers would be interested in marketing contracts with wholesalers or specialised export facilitators to export HVPACs to Asia. Although there has been research on ASCC or HVPACs, the theoretical, conceptual and contextual domains of ASCC for HVPACs (e.g. avocado, lychee and mango) have not been adequately investigated to date.

On the other hand, the purchasing behaviour of consumers varies depending on many factors associated with food characteristics (e.g., colour, size, price, brand, country of origin, quality, credibility, health benefits, etc.) and socio-economic conditions of consumers (e.g., education, income, personal taste, etc.) (Lusk & McCluskey, 2018; Pechey & Monsivais, 2016; Fernqvist & Ekelund, 2014; Moser et al., 2011). There is recently an increasing demand for Australian horticultural produces in the Chinese market (Cao et al., 2020). As China is one of the key destinations for exported agriculture commodities due to its rapid economic growth, understanding Chinese consumers' behaviour towards specific food products is crucial for exporting countries like Australia.

The current research project focuses on assessing the nature of and processes involved with stakeholder's collaboration in planning and investment for exporting HVPACs of CQ to Asian markets. In addition, Chinese consumers' purchasing behaviour and willingness to pay for premium Australian HVPACs were investigated by referring to a theoretical framework for consumer study. Five reports have been produced to address the overall research aim, which are currently available on the Cooperative Research Centre for Developing Northern Australia (CRCNA) website (see Appendix 1). This report aims to summarise the key findings and result-based recommendations, and to develop guidelines for relevant stakeholders on what and how they can use the recommendations.

1.2 Aim and objectives

The project aims to examine the nature of, and processes for, stakeholder collaboration in planning and facilitation of investment for exporting HVPACs of Northern Australia to Asian markets through a case study region of CQ. This report aims to summarise key findings from the research project and provide some strategic recommendations based on the research findings. Overall, the objectives of the project are:

- To assess potential HVPACs that have high export value in the Asian markets. An extensive literature review has been conducted to collate and analyse secondary data about types and volumes of perishable horticultural produces produced in CQ that have high value in the Asian markets (*Milestone Report 5*).
- To present an analysis of potential ASCC models appropriate for avocado, lychee and mango industries in Queensland. A qualitative research approach was chosen, and a stakeholder collaboration workshop was conducted to identify existing and potential linkages amongst the entities in the supply chain, and their preferences for collaboration models in the sector (*Milestone Report 11-13*).
- To investigate Queensland horticulture farmers' willingness to participate in export-focused contract-based marketing agreements with downstream buyers as a form of closer vertical coordination. This study utilises a discrete choice experiment embedded within an online survey to understand farmers' perception about the export-focus contract-based supply chain coordination (*Milestone Report 18-20*).
- To explore Chinese consumers' purchasing behaviour towards, preference and perception of, and willingness to pay for imported Australian fruits and vegetables. This study adopts a semi-systematic literature review approach to investigate Chinese consumers' perceptions of and purchasing behaviour towards imported perishable horticultural commodities, followed by a survey for consumers living in the southern China region (*Milestone Reports 23a&b*).
- To examine the stakeholder panel's consensus on the translation pathway, particularly in relation to the mechanism and processes of building leadership and operation skills for collaborative agricultural supply chain development and management, particularly for avocado and mango industries. This study employs a qualitative approach, in which a review of past reports was conducted, and a stakeholder workshop to identify the translation components of two selected ASCC models was organised (*Milestones 25-26 Report*).
- To provide end-user guidelines based on the research findings and strategic recommendations (*Milestone Report 28* i.e., this report).

1.3 Organisation of the report

The first section forms the introduction of the report including background, aims and objectives, and organisation of the summary report. Section two describes the key findings of each of the studies that addressed each of the objectives, followed by strategic recommendations. Section three narrates proposed end-user guidelines, which are developed based on the strategic recommendations. Section four presents the conclusion and future research. The appendix provides web links to the full reports.

2. Key findings and strategic recommendations

This section presents the key findings of the five studies that address the first five objectives mentioned in the introduction section to achieve the overall aim of the project. In addition, result-based recommendations are provided towards the end of each key findings sub-section.

2.1 Objective 1: Assessing potential HVPACs that have high export value in the Asian markets.

The key findings- and results-based recommendations below are reviewed and collated referring to Akbar et. al.'s (2019a) study (Milestone 5 Report).

2.1.1. Key findings

- Chilled beef meat, mango, table grapes, avocado, lychee, blueberries, passion fruits, fig, citrus and culinary herbs are the dominant perishable commodities currently grown in the CQ region, that have high demand and high value in targeted Asian markets such as China, Middle East and South-East Asian countries. These countries are currently importing high-value agricultural commodities from South America, Africa, South Asia, as well as to a certain extent from Australia.
- Some HVPACs such as mango, lychee and avocado of the CQ region have counter-seasonal advantages to enter into the Asian markets. In contrast, some HVPACs such as figs and table grapes grow year-round at Emerald in CQ.
- The beef industry in CQ has a well-developed export supply chain with forwarding linkages to processing industries and CQ has the capability to handle higher demands from international markets.
- From 2000 to 2013, per capita consumption of vegetables increased by about 45%, while the same for fruits and beef are 115% and 34%, respectively, in China.
- A skilled labour force is available in CQ to increase the production of HVPACs.
- Current trade agreements among Australia, China, South Korea, Japan, Singapore and Thailand will facilitate access of HVPACs to these Asian markets with a better competitive price.

2.1.2. Strategic recommendations

- Natural resources of agriculture sectors, including access to water and advantages of the priority agricultural areas (PAA), need to be ensured to increase production volume for international markets.
- The production capacity of CQ should gradually be scaled up to meet the forecasted demand for HVPACs in the targeted markets.
- Horizontal and vertical collaborations in the HVPACs supply chain are essential to increase the efficiency of the supply chains.
- Access to the targeted Asian markets should give priority, if this has not been done, to establishing a sustainable export supply chain. This can be achieved by taking advantage of current trade agreements.

2.2 Objective 2: Assessing potential ASCC models appropriate for avocado, lychee, and mango industries in Queensland.

The key findings- and results-based recommendations below are reviewed and collated referring to Akbar et. al.'s (2019b) study (Milestone 11-13 Report).

2.2.1. Key findings

- Four categories of issues relevant to stakeholder collaboration models for HVPACs in Queensland have been found:
 - a) The first category is related to production, which includes land availability, water supply availability, capital investment, cost of production, quality produce, and genetics and green production system/regulation.
 - b) The second category is linked to logistics and processing, which encompasses transport and technology needs, advanced agricultural technologies, and value-added products.
 - c) The third category is associated with the marketing of the produces, which consists of market access to certain medium and high-income consumers in Asia, brand, traceability, and market discovery.
 - d) The fourth category is about modes of collaboration, including horizontal and vertical collaborations.
- Individual horticultural industries, representative bodies, and processors play an important role in facilitating horizontal collaboration among farmers. Furthermore, findings suggest that vertical collaboration within agricultural supply chains in Queensland could be best led by either a single entity or a combination of leaders, most likely being either processors, genetics companies and/or lead investors.
- The mango supply chains for international markets are already well-established in Queensland. However, a horizontal collaboration between small and medium scale farmers needs to be developed to ensure a consistent supply of mangoes into the international market. Value-added production facilities are also required to process any excess production during the peak mango harvesting season.
- The supply chains for the lychee industry are relatively new, which have access to only a few Asian markets such as Singapore, Hong Kong and Malaysia. Collaboration models led by producers, as well as technology and/or genetics firms, need to be developed to gain access to other markets and to produce different varieties for different markets.
- The existing supply chains for avocado are found to be complex, which warrants a simplified ASCC model for avocado. Although the demand for avocado has increased in the Asian markets, Queensland producers cannot meet this extra demand without a substantial upsurge in the production volume. For that reason, the stakeholders suggested that the involvement of resource providers (e.g. Government, industry groups) and the development of investor-led collaboration models would be useful to achieve an effective vertical integration between growers, processors and exporters in order to meet the demand for the high-volume Asian consumers.
- Horizontal collaboration amongst farmers, in addition to vertical collaboration, can play an important role to achieve an effective ASCC required to increase export volumes to Asian markets.
- The action plan to translate the findings into practice has seven essential steps including: developing leadership, quality control, contract management, forecasting and market analysis, policy and protocol development, brand development, and export.

2.2.2. Strategic recommendations

- An enthusiastic processor or a combination of supply chain actors (e.g. industry body and/or genetic company or investor) should come forward and lead the vertical collaboration in the agricultural supply chain for HVPACs in Queensland.
- For mango industries, a horizontal collaboration between small- and medium-scale farmers and value-added production facilities needs to be developed. Further strategic collaboration amongst the genetic industry, primary producers, processors and exporters is required to strengthen the existing export supply chains.
- For lychee industries, collaboration models led by technology and genetics companies and producers would expand the scope of access to international markets.
- For avocado industries, the involvement of resource providers and the development of investor-led collaboration models are required to vertically integrate the growers, processors and exporters.
- Cold storage and dedicated transportation facilities are required for operational export supply chains of perishable commodities. CQ needs to develop such facilities to access to international markets (Akbar et al., 2019).
- Coordination between industry bodies, and local and state governments should be developed to expedite the market access process.

2.3 Objective 3: Investigating Queensland horticulture farmers' willingness to participate in export-focused contract-based marketing agreements.

The key findings- and results-based recommendations below are reviewed and collated referring to Schrobback et. al.'s (2020) study (Milestones 18-20 Report)

2.3.1. Key findings

- Alliance with processors, retailers and consumers was found to be the most preferred form of vertical supply chain collaboration among the respondents who identified themselves as "collaborating". On the other hand, contract farming with major retailers currently seemed to be a less favoured form of supply chain collaboration.
- There was heterogeneity among the horticulture farmers regarding their preferences to participate in agreement-based vertical supply chains which focus on export. Some farmers tended to prefer the existing (status quo) supply chain systems over new export-orientated supply chains, while other farmers seemed to be more open to exploring export opportunities.
- Product price, potential higher production costs, and gross margin of profit were the key determinants for the farmer's decisions about changes in their supply chain.
- It is found that the farmers showed stronger interest in coordination within the domestic retail sector, potentially in the form of contract farming.
- The future willingness of the farmers to engage in supply chain collaborations was likely to be driven by their current level of collaboration within the supply chain of their produces.

2.3.2. Strategic recommendations

- Farmers who are not yet exporting their produces but have an interest in doing so, particularly through marketing contracts with export agents, need to be identified by the industry to facilitate the exporting process.
- The industry and the government should facilitate potential options to develop HVPACs supply chain collaborations within the domestic market and to increase opportunities for supply chain coordination (e.g., contract farming) in the retail sector.
- The industry and/or the government should offer awareness-raising programs or short courses for farmers to gain a better understanding of different types of vertical supply chain coordination.
- Industry networks are essential to facilitate business links to encourage the development of more coordinated vertical supply chain collaborations.
- Provision of information and training about the potential benefits and costs for agribusinesses from the improved coordination would support farmers' decision-making process.

2.4 Objective 4: Exploring Chinese consumers' purchasing behaviour towards, preference and, perception of, and willingness to pay for imported Australian fruits and vegetables

The key findings- and results-based recommendations below are reviewed and collated referring to Rahman et. al.'s (2020) study ([Milestones 23 a&b Report](#)).

2.4.1.a. Key findings on Chinese consumers' preference for and purchasing behaviour towards imported Australian fruits and vegetables

- The Chinese consumers were more concerned about environmental issues and therefore, they tended to focus more on the traceability of a product. Literature also suggests that Chinese consumers are willing to pay a premium price for green and environment-friendly products.
- There were seven factors that affected Chinese consumers' purchasing behaviour. The identified factors are as follows:
 - Consumer knowledge and product information
 - Demography
 - Economic factors and purchasing power
 - Health consciousness
 - Cultural factors
 - Behavioural factors and individual norm
 - Product quality and environmental standard
- The identified factors are supported by two associated theories: Theory of Planned Behaviour (TPB), and Alphabet Theory. The present study has developed a conceptual framework which links all associated factors shaping up Chinese consumers' purchasing behaviour.
- Literature also indicates that behavioural attitudes, health consciousness, product information and environmental standards are the key determinants of consumers' purchasing behaviour.
- There is a paucity of evidence on Chinese consumers' purchasing behaviour towards Australian fresh fruits and vegetables.

2.4.1.b. Strategic recommendations on Chinese consumers' preference for and purchasing behaviour towards imported Australian fruits and vegetables

- The industry and the government should consider country-specific factors (e.g. behavioural attitudes, health consciousness, product information and environmental standards) affecting consumer's preference and purchasing behaviour in planning exporting horticultural commodities to Asian (e.g., Chinese) markets.
- The conceptual framework developed in the present study can be used for segmenting Chinese consumers and conducting behavioural studies on Chinese consumers.

2.4.2.a. Key findings on Chinese consumer's perception and willingness to pay for imported Australian fruits and vegetables

- The Chinese consumers frequently purchased fruits and vegetables, and on average, they purchased about 2 kg of fruits and vegetables in a single shopping trip.
- The average income of the participants was about ¥ 233,000 per annum. The average expenditure on fruits and vegetables per week was ¥ 206, as revealed in this study.
- The respondents reported that they purchased fruits and vegetables from different locations and selling points, including online. This finding has implications for developing marketing strategies for Chinese consumers.
- The high percentage of respondents had past experience of purchasing imported fresh produces, and this implies that China is a very high demand market where imported fruits and vegetables are widely accepted.
- The Chinese consumers who had a higher personal preference for fresh fruits and vegetables tended to have better attitudes towards imported fresh fruits and vegetables.
- The Chinese consumers who had better attitudes towards imported fresh fruits and vegetables were more likely to purchase Australian produces.
- The image of Australian produces led to higher consumer satisfaction and motivated their willingness to buy.
- Taste was very important to the Chinese consumers, and who indicated taste as their motivation to buy fruits and vegetables were more likely to purchase imported products.
- The average appearance of fruits and vegetables were more preferred over the premium quality produces.

- Country of origin had some influence on the Chinese consumers' preference for fresh produce. Other Asian and African produces were preferred over the South American produces. However, the consumers' preference for produces from Australia and New Zealand was not identified in their survey responses.
- The analysis using latent class models employing total payment, revealed that class 1 representing 76 per cent of respondents who preferred excellent appearance, low levels of nutrition information, no food safety label, but both organic and environmental certification labels.
- The willingness to pay premiums for fresh produces was high among the Chinese consumers. The consumers indicated that they would pay a higher premium for organic produces, but unlikely to pay a higher price for produces with a food safety label.
- The Chinese consumer would pay about ¥ 2,170 annually for organic certified produces, which was a little bit high considering their estimated annual expenditure for fruits and vegetables, ¥ 11,125. However, the spending is highly correlated with income, and the consumers from the high-income group could easily accommodate the premium based on their budget.

2.4.2.b. Strategic recommendations on Chinese consumer's perception and willingness to pay for imported Australian fruits and vegetables

- Australian producers need to understand the quality required to export fresh produces to China. Failing to meet the quality requirements may have severe consequences as the quality expectation for Australian produces is very high.
- Environment concern has a moderate effect on consumer purchase decision, while food safety label has less appeal to consumers. Producers should adopt environment-friendly production strategies and procedure to reach more Chinese consumers.
- The results indicate the high demand for fruits and vegetables among Chinese consumers in the 13 provinces where the research participants of this study were from. Further research is needed to quantify the demand more accurately.
- Taste perception can be highly important among Chinese consumers, which leads to their purchase of imported fruits and vegetables. Producers should be aware of this and need to ensure that they deliver quality fresh produces with superior taste.
- Chinese consumers have a high willingness to pay premiums for fresh produces. It is indicated that Chinese consumers would pay a high premium for organic certified produces, but not for produces with a food safety label. Further research is needed to ascertain and quantify these findings.

2.5 Objective 5: Examining the mechanism and processes of building leadership and operation skills for collaborative agricultural supply chain development and management, particularly for avocado and mango industries.

The key findings- and results-based recommendations below have been reviewed and collated referring to Akbar et. al.'s (2021) study (Milestones 25-26 Report).

2.5.1. Key findings

- In the previous study, it was found that "developing leadership" in initiating and sustaining the collaboration is the most important translation component of an ASCC, followed by "developing business management skills" and "designing government and industry supports". This study investigates the translation pathway from these research findings, focusing on basic questions of why, who, how and what.
- The majority of the avocado-industry (59%) and mango-industry (45%) stakeholders reported that "to get more consistent prices" was the top reason for their decision of participating in an ASCC. Whereas around 41% of respondents believed that "to achieve better and reliable supply chain distribution network" was a significant ASCC motivation for both avocado-industry and mango-industry stakeholders.
- Most of the respondents recognised the leadership role of marketers/exporters and industry bodies but did not highly regard this role undertaken by resource/technology providers.
- The majority of the respondents considered "supply chain focused short courses" and "involvement in industry working groups" as the most critical leadership development strategies for both mango and avocado industries.
- Regarding strategies for development of general business management skills, "industry-specific business development training at the regional level" and "agricultural sector business development training and workshop" were the strategies chosen by the majority of participants for the avocado and mango industries, respectively.
- "Grants/scholarships/travel sponsorship for attending rural leadership course/event" and "support for industry to build collaboration and networks" were identified as the most critical types of support that the government could provide to develop ASCC in both the avocado and mango industries.

2.5.2. Strategic recommendations

- Development of the culture and environment of ASCC through information sharing and network building is essential for a sustainable ASCC.
- Building and maintaining trust as well as risk-sharing are key to retaining collaboration partners and ensuring a sustainable ASCC.
- Leadership in ASCC is important. However, all actors involved in the ASCC need to understand their contribution towards the collaboration and act accordingly to ensure the success of the collaboration.
- Leadership and business management skills could be enhanced through supply chain-focused short courses and the involvement of industry working groups.
- It is difficult for producers to attend a training program to enhance their business skills due to their work commitment at the farm. Cross-sector mentoring programs and on-farm face-to-face training could be beneficial for this cohort.
- The government and industry should work together in transforming and developing sustainable supply chains domestically first and then to reach export markets.

3. End-user guidelines

This section narrates how the recommendations derived from each of the studies can be best used by end-users (e.g. any stakeholders of the supply chain) to develop an export-oriented supply chain collaboration in CQ. These guidelines primarily focus on horticultural commodities with particular attention to mango, avocado and lychee industries. The method to develop the end-user guidelines is illustrated and described as follows:

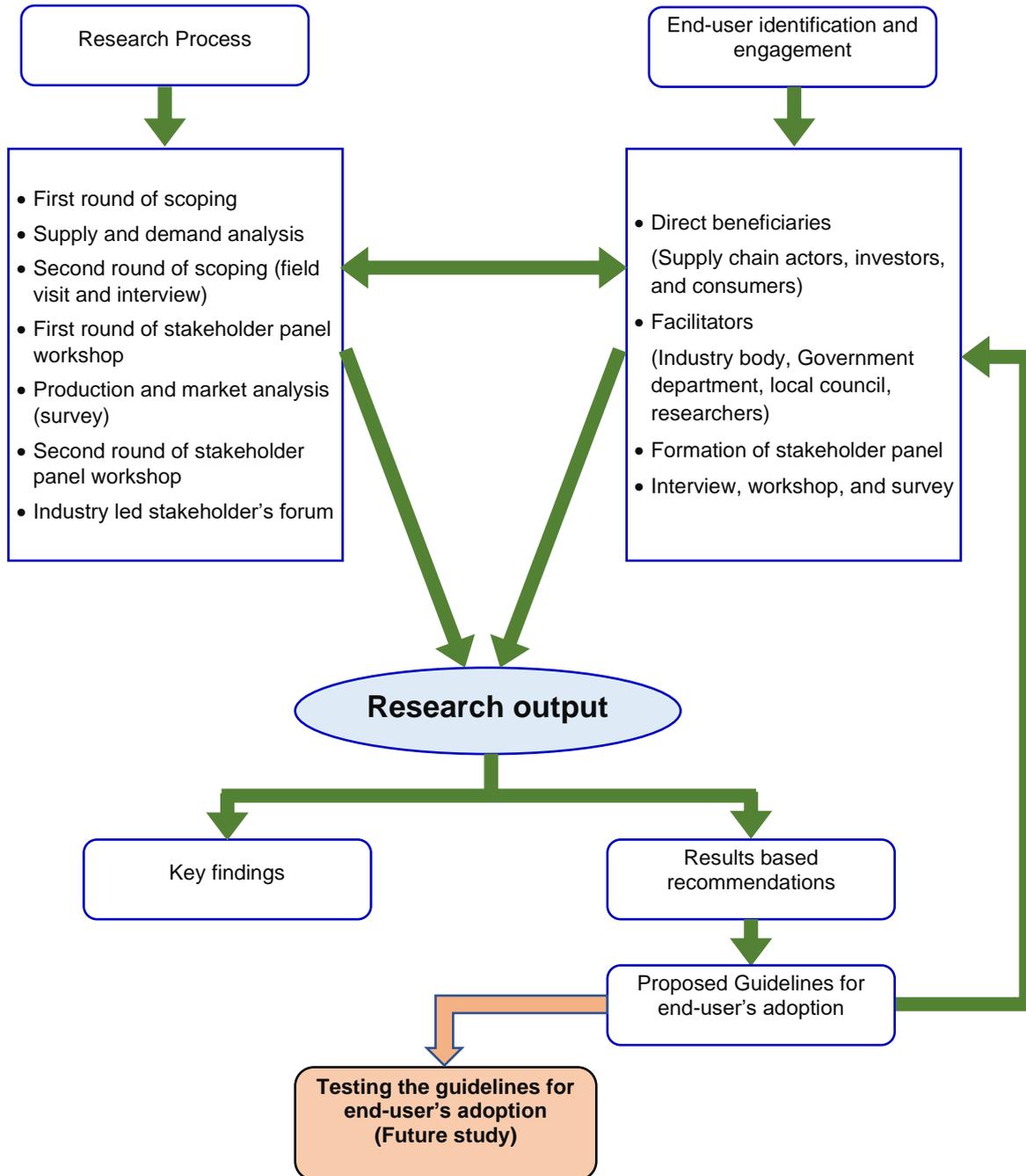


Figure 1: Method of end-user guideline development for ASCC model translation

The data collection methods adopted in this project, which were applied to engage the stakeholders with the study, include interviews, panel workshops and online surveys. Direct and indirect (facilitators and government) beneficiaries were identified, and a stakeholder panel was formed with the participants' consent. The data collection procedures include two stages of scoping, two rounds of stakeholder panel workshops, and two online surveys for production and market analysis. The first round of scoping includes a literature review and an analysis of secondary data. The second round of scoping consists of field visits and interviews. The first stakeholder panel workshop was held at Rockhampton, CQUniversity campus, while the second one was organised on an online platform. The producer and consumer surveys were delivered to Australian producers and Chinese consumers, respectively. The outcomes of the research were disseminated through a series of milestone reports, and each of which provides information about the key findings and strategic recommendations. Suggestions about guidelines for end-user's adoption were proposed from the result-based recommendations. It is expected that opportunities for testing the proposed guidelines for end-user's adoption would open up new directions for future research. Details about the proposed guidelines and targeted end-users are presented in the following tables.

3.1 End-user guidelines-1: Supply and demand of HVPACs

Table 1 End-user guidelines: Supply and demand of HVPACs

Strategic recommendations	Proposed guidelines for the end-users	End-users
<ul style="list-style-type: none"> Natural resources of agriculture sectors, including access to water and advantages of the the priority agricultural areas (PAA) need to be ensured to increase production volume for international markets. 	<ul style="list-style-type: none"> Industry bodies should maintain a strong liaison and coordination with the state and local governments to secure the natural resources required to improve production capacity. 	<ul style="list-style-type: none"> Industry body
	<ul style="list-style-type: none"> Local/state government should provide the resources and facilities required and manage to make sure that the provided resources are being used properly and the production capacity of primary producers is improved. 	<ul style="list-style-type: none"> Local/state government
<ul style="list-style-type: none"> Rigorous studies on identifying potential markets (both domestic and international) for HVPACs of CQ region are needed. 	<ul style="list-style-type: none"> Research and Development organisations (i.e. CRCNA) should undertake extensive research projects to determine the potentials of CQ horticultural commodities both in domestic and Asian markets and assess consumers' perception about and demands for HVPACs produced in CQ. 	<ul style="list-style-type: none"> Researchers
<ul style="list-style-type: none"> Access to the targeted Asian markets should provide priority (if this has not been done) to establish a sustainable export supply chain. 	<ul style="list-style-type: none"> Government should facilitate the application of trade agreements on accessing the international market. 	<ul style="list-style-type: none"> Federal/State government
<ul style="list-style-type: none"> The production capacity of CQ should gradually be scaled up to meet the forecasted demand for HVPACs in the targeted markets. 	<ul style="list-style-type: none"> Producers should work closely with all stakeholders of the horizontal and vertical supply chain collaborations along with the government and investors to ensure that appropriate resources, facilities and policies are put in place to increase the production volume. 	<ul style="list-style-type: none"> Producers
	<ul style="list-style-type: none"> Industry body should provide financial and input support for scaling up the production capacity. 	<ul style="list-style-type: none"> Industry body
	<ul style="list-style-type: none"> Producers should seek technical support and applied advanced technologies to increase their production capacity. 	<ul style="list-style-type: none"> Producer/Technology providers
<ul style="list-style-type: none"> Horizontal and vertical collaborations in the HVPACs supply chain are essential to increase efficiency of the supply chain. 	<ul style="list-style-type: none"> A single actor or a combination of actors should take the leadership role and coordinate with genetic companies, suppliers, farm input providers, growers, processors, distributors, retailers and consumers to develop a strong vertical supply chain collaboration. 	<ul style="list-style-type: none"> All actors in the supply chain collaboration

	<ul style="list-style-type: none"> • Industry body should coordinate with primary producers in order to maintain a horizontal collaboration among them. 	<ul style="list-style-type: none"> • Industry body
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3.2 End-user guidelines-2: Potential ASCC models appropriate for avocado, lychee and mango

Table 2 End-user guidelines-2: Potential ASCC models appropriate for avocado, lychee and mango

Strategic recommendations of the study	Proposed guidelines for the end-users	End-users
<ul style="list-style-type: none"> • An enthusiastic producer or a combination of several supply chain actors (e.g. processors and/or genetic company or lead investor) should lead the vertical collaboration in agricultural supply chains in Queensland. 	<ul style="list-style-type: none"> • A single entity or a combination of entities should step forward and lead the vertical collaboration amongst genetic companies, suppliers, farm input providers, growers, processors, distributors, retailers and consumers. 	<ul style="list-style-type: none"> • All actors in the supply chain collaboration
<ul style="list-style-type: none"> • For mango industries, a horizontal collaboration between small- and medium-scale farmers and value-added production facilities needs to be developed. 	<ul style="list-style-type: none"> • Industry body should coordinate small- and medium-scale mango farmers and value-added production facility providers to ensure consistent and export-standard supplies to Asian markets. 	<ul style="list-style-type: none"> • Industry body
<ul style="list-style-type: none"> • For mango industries, further strategic collaboration amongst the genetic industry, primary producers, processors and exporters is required to strengthen the existing export supply chains. 	<ul style="list-style-type: none"> • Industry body should work closely with primary producers, processing companies, genetic companies, and exporters to improve the existing supply chain collaborations to export mangoes to international markets. 	<ul style="list-style-type: none"> • Industry body
<ul style="list-style-type: none"> • For lychee industries, collaboration models led by technology, genetics companies and producers are crucial to broadening the scope of accessing international markets. 	<ul style="list-style-type: none"> • Industry body should work closely with technical support providers, genetic companies, and farmers to develop an effective ASCC for lychee industries to widen the scope of international market access. 	<ul style="list-style-type: none"> • Industry body
<ul style="list-style-type: none"> • For avocado industries, resource providers and investor-led collaboration models are required to vertically integrate growers, processors and exporters to increase production volume. 	<ul style="list-style-type: none"> • Industry body should work closely with resource providers and investors to develop a vertical collaboration among growers, processors and exporters with an aim to increase avocado production to meet its growing demands in international markets. 	<ul style="list-style-type: none"> • Industry body
<ul style="list-style-type: none"> • Establishment of cold storage and dedicated transportation facilities are crucial for an operational export supply chain of perishable commodities in CQ. 	<ul style="list-style-type: none"> • Government should provide support to establish cold storage and dedicated transportation facilities to strengthen the export supply chain of HVPACs in CQ. 	<ul style="list-style-type: none"> • Government
<ul style="list-style-type: none"> • Coordination between industry bodies, and local and state governments should be developed to expedite the market access process. 	<ul style="list-style-type: none"> • Industry body should work closely with the government to smooth out the market access process. 	<ul style="list-style-type: none"> • Government and industry body.

3.3 End-user guidelines-3: Farmers' willingness to participate in an export-focused contract-based supply chain

Table 3 End-user guidelines: Farmers' willingness to participate in an export-focused contract-based supply chain

Strategic recommendations of the study	Proposed guidelines for the end-users	End-users
<ul style="list-style-type: none"> Farmers who are not yet exporting their product but have an interest in doing so, particularly through marketing contracts with export agents, need to be identified. 	<ul style="list-style-type: none"> Horticulture industry associations (e.g. Growcom) should identify farmers who want to export their produces through contract farming. These farmers could be supported and linked up with export agents to explore market opportunities and a potential individual export agreement. 	<ul style="list-style-type: none"> Industry body
<ul style="list-style-type: none"> Industry and the government should facilitate potential options to develop HVPACs supply chain collaborations within the domestic market and increase supply chain coordination (e.g., contract farming) in the retail sector. 	<ul style="list-style-type: none"> Horticulture industry body should take initiative to identify methods to develop a high value supply chain that can generate higher revenues for farmers. Additionally, the industry body should work with retail sectors to assess possible ways to strengthen supply chain coordination in the retail sectors. 	<ul style="list-style-type: none"> Government and industry body
<ul style="list-style-type: none"> Industry and/or the government should offer awareness raising programs or short courses for farmers to gain a better understanding of different types of vertical supply chain coordination. 	<ul style="list-style-type: none"> Industry body should develop comprehensive awareness raising campaigns and/or training programs to help farmers know different types of vertical supply chain collaborations and the advantages and disadvantages of each type. 	<ul style="list-style-type: none"> Industry body, government and producers.
<ul style="list-style-type: none"> Industry networks are essential to facilitate business links to encourage the development of more coordinated vertical supply chain relationships. 	<ul style="list-style-type: none"> Government should provide industry support to facilitate business links to encourage the development of more coordinated vertical supply chain relationships. 	<ul style="list-style-type: none"> State/local government
<ul style="list-style-type: none"> The provision of information and training for agribusinesses about the potential benefits and costs from improved coordination would support farmers' decision-making process. 	<ul style="list-style-type: none"> Education providers should develop comprehensive training programs on the benefits and costs of supply chain collaborations in agribusinesses. 	<ul style="list-style-type: none"> Education providers
	<ul style="list-style-type: none"> Government should develop policies and training schemes on improved vertical supply chain collaborations. 	<ul style="list-style-type: none"> State/local government

3.4 End-user guidelines-4: Chinese consumer’s purchasing behaviours towards, preference and perception of, and willingness to pay for imported agricultural commodities

Table 4 End-user guidelines: Chinese consumer’s purchasing behaviours towards, preference and perception of, and willingness to pay for imported agricultural commodities

Strategic recommendations of the study	Proposed guidelines for the end-users	End-users
<ul style="list-style-type: none"> Factors (i.e. behavioural attitudes, health consciousness, product information and environmental standards) affecting Chinese consumers’ purchasing behaviour need to be considered. The industry and the government should consider country specific factors (e.g. behavioural attitudes, health consciousness, product information and environmental standards) affecting the consumer’s preference and purchasing behaviour in planning exporting horticultural commodities to Asian (e.g., Chinese) markets. 	<ul style="list-style-type: none"> Research and Development organisation (i.e. CRCNA) should arrange research findings dissemination sessions highlighting the impact of identified factors (i.e. behavioural attitudes, health consciousness, product information and environmental standards) on particular produces so that individual stakeholders of the supply chain can take informed decision while planning for exporting their produces to the Chinese markets. 	<ul style="list-style-type: none"> Researchers
<ul style="list-style-type: none"> The conceptual framework developed in the study should be used for segmenting Chinese consumers and for conducting behavioural studies on Chinese consumer 	<ul style="list-style-type: none"> Research and Development organisations should conduct rigorous research to segmenting Chinese consumers and to explore the strength and inter-relationship of different factors that influence the decision of consumers. 	<ul style="list-style-type: none"> Researchers
	<ul style="list-style-type: none"> State/local government should offer research grants to encourage research and development organisations to undertake research projects to generate evidence on purchasing behaviours of different levels or types of consumers towards Australian horticulture. 	<ul style="list-style-type: none"> State/local government
<ul style="list-style-type: none"> Australian producers need to understand the quality required to export fresh produces to China. Failing to meet the quality requirements may have severe consequences as the quality expectation for Australian produces is very high. 	<ul style="list-style-type: none"> Primary producers should be aware of the quality requirements of Chinese consumers and should ensure that they are producing and supplying high-quality produces that meet the expectations of Chinese consumers. 	<ul style="list-style-type: none"> Producers
	<ul style="list-style-type: none"> Industry body should work closely with farmers and processors to ensure that the horticultural produces meet the quality requirements of Chinese consumers. 	<ul style="list-style-type: none"> Industry body
	<ul style="list-style-type: none"> Government should establish a quality assurance system for horticultural produces to be exported. 	<ul style="list-style-type: none"> Local/state government
<ul style="list-style-type: none"> Environment concern has a moderate effect on consumer purchase decision, while food safety label has less appeal to consumers. Producers should adopt environment-friendly production strategies and procedure to reach more Chinese consumers. 	<ul style="list-style-type: none"> Producers may consider organic farming strategies or similar environment-friendly production procedures. 	<ul style="list-style-type: none"> Producers
	<ul style="list-style-type: none"> Industry body should work closely with farmers and technology providers to ensure that the production procedures are environment friendly. 	<ul style="list-style-type: none"> Industry body

<ul style="list-style-type: none"> • Taste perception can be highly important among Chinese consumers, which leads to their purchase of imported fruits and vegetables. Producers should be aware of this and need to ensure that they deliver quality fresh produces with superior taste. 	<ul style="list-style-type: none"> • Producers should ensure that produces are fresh enough to retain a superior taste. 	<ul style="list-style-type: none"> • Producers
	<ul style="list-style-type: none"> • Industry body should ensure that all producers are using similar farm inputs in order to maintain the similarity of taste. 	<ul style="list-style-type: none"> • Industry body
	<ul style="list-style-type: none"> • A sensory evaluation study should be conducted before introducing a new horticultural product in Chinese markets. 	<ul style="list-style-type: none"> • Researchers
<ul style="list-style-type: none"> • From the marketing perspective, Chinese female consumers need to be prioritised as they are more inclined to imported and Australian fresh produces. 	<ul style="list-style-type: none"> • All actors of a supply chain should consider the impact of gender in planning for exporting Australian produces. 	<ul style="list-style-type: none"> • All actors in the supply chain collaboration
	<ul style="list-style-type: none"> • Further research is needed to confirm the types of Australian fresh produces preferred by Chinese consumers. 	<ul style="list-style-type: none"> • Researchers

3.5 End-user guidelines-5: Translation of the ASCC Models for avocado and mango industries

Table 5 End-user guidelines: Translation of the ASCC Models for avocado and mango industries

Strategic recommendations of the study	Proposed guidelines for the end-users	End-users
<ul style="list-style-type: none"> Development of the culture and environment of ASCC through information sharing and network building is essential for a sustainable ASCC. 	<ul style="list-style-type: none"> Industry body should develop a strong network of small- and medium-scale producers. All actors in the ASCC should uphold trust among the collaborating partners through information sharing. 	<ul style="list-style-type: none"> Industry body All actors in the supply chain collaboration
<ul style="list-style-type: none"> Building and maintaining trust as well as risk-sharing are key to retaining collaboration partners and ensuring a sustainable ASCC 	<ul style="list-style-type: none"> Sustainability of the ASCC should be the priority; and active participation of all actors in the ASCC will build up the trust for maintaining the sustainability. A consensus needs to be developed among all parties to ensure the risk sharing. 	<ul style="list-style-type: none"> All actors in the supply chain collaboration
<ul style="list-style-type: none"> Leadership in ASCC is important. However, all actors involved in the ASCC need to understand their contribution towards the collaboration and act accordingly in order to ensure the success of the collaboration. 	<ul style="list-style-type: none"> It does not matter who is leading the collaboration, what important is each stakeholder should be proactive and aware of one's own role and contribution in the collaboration to ensure the success of the collaboration. 	<ul style="list-style-type: none"> All actors in the supply chain collaboration
<ul style="list-style-type: none"> Leadership and business management skills could be enhanced through supply chain-focused short courses and the involvement of industry working groups 	<ul style="list-style-type: none"> Producers should select appropriate training programs based on their education level and experience. Industry body should include primary producers in the industry working groups so that producers can share their pragmatic experiences and ideas while taking any decisions about them. 	<ul style="list-style-type: none"> Producers Industry body
<ul style="list-style-type: none"> It is difficult for producers to attend a training program to enhance their business skills due to their work commitment at the farm. Cross-sector mentoring programs and on-farm face-to-face training could be beneficial for this cohort 	<ul style="list-style-type: none"> Industry body should organise cross-sector mentoring programs and on-farm face-to-face training for farmers. 	<ul style="list-style-type: none"> Industry body
<ul style="list-style-type: none"> The government and industry should work together in transforming and developing a sustainable supply chains domestically first and then to reach export markets. 	<ul style="list-style-type: none"> Industry body should work closely with the government and all the other actors in the ASCC to ensure the sustainability of the collaboration. 	<ul style="list-style-type: none"> Government, industry body, and all actors in the supply chain collaboration

4. Conclusion and future research

The project aimed to examine the nature of, and processes for, stakeholder collaboration to develop a sustainable export supply chain of HVPACs of Northern Australia to Asian markets. Five key objectives were set for the project. Five studies with different focuses have been undertaken to address the objectives. Five final reports based on the studies, which contain research findings and recommendations for ways forward, have been conducted. The current report aims to summarise all the findings and strategic recommendations of the five studies, and to develop end-user guidelines based on the recommendations.

The agriculture sector of CQ has enormous potential thanks to the existing trade agreements and/or market access to some Asian countries, counter seasonal advantages in exporting HVPACs (e.g. mango, lychee and avocado), capability to handle the demand of international markets (e.g. beef), availability of the skilled labour force, and high demand of horticultural produces in Asian countries. Collaborative efforts among producers and other relevant stakeholders to develop export oriented HVPACs supply chains will ensure the future growth of the agricultural sector of CQ.

The study on mechanisms of horizontal and vertical supply chain collaboration in exporting HVPACs to Asian countries suggests that producers, processors and industry body have a crucial role in the development of horizontal collaboration. An enthusiastic producer or a combination of supply chain actors can take the leadership role in the vertical collaboration in the ASCC. For mango industries, horizontal collaboration between small- and medium-scale producers, value-added production facilities, and strategic collaboration between genetic companies, farmers, processors and exporters are found to be essential. The collaboration model for lychee industries should be led by technology providers, genetics companies and primary producers in order to expand its reach to international markets. On the other hand, resource providers- and investors-led collaboration models are found promising for vertical integration in avocado industries.

The study on farmer's willingness to participate in an export-focused contract-based supply chain coordination suggests that there exists a degree of heterogeneity in the preference of farmers for export marketing agreements which are not only linked to contract attributes, but also influenced by farmers' socio-economic characteristics and features of their agribusiness. The product price and the possibility of increased costs of production have been identified as important contract attributes. Farmers were interested in closer coordination with the domestic retail sector such as through contract-based farming.

A conceptual framework has been developed to investigate the strength of seven factors identified through literature review, which influence Chinese consumers' purchasing behaviour. Among the seven factors, behavioural attitudes, health consciousness, product information and environmental standards appeared to have a strong influence on the consumers' purchasing behaviours.

In another study, a survey was conducted to assess Chinese consumers' perception and willingness to pay for Australian fruits and vegetables. It is found that that Australian fresh fruits and vegetables have a high reputation among Chinese consumers. Chinese consumers who had more positive attitudes towards imported fresh fruits and vegetables are more likely to purchase Australian produces. Quality perception, environmental concern and taste of the produces are important factors to be considered in promoting and exporting fruits and vegetables to China.

In the study on translation pathway, it is reported that the role of marketers, exporters, and industry bodies in leading the ASCC were rated highly by the survey respondents. "Supply chain-focused short courses" and "involvement in industry working groups" were identified as critical leadership development strategies for both mango and avocado industries. The majority of the survey participants preferred two basic approaches for developing general business management skills, namely "industry specific business development training at regional level" and "agricultural sector business development training and workshop". State and Local governments both should support producers to involve in the ASCC through grants/scholarships. The government should also support the industry in building collaboration and networks.

The present summary report has proposed some guidelines for end-users, which are developed based on the recommendations of the five studies. Directions for future research, which are presented in the five studies of the project, are as follows:

- Rigorous studies on how to identify potential markets (both domestic and international) for HVPACs of the CQ region are needed.
- Future studies should assess the barriers, enablers and impacts of the proposed collaboration models on the mango, avocado and lychee industries.
- Future research could focus on quantifying the future demand for Australian fruits and vegetables among Chinese consumers.
- Our study on Chinese consumers' perception and willingness to pay for Australian fruits and vegetables does not identify the strong correlation between consumers' household income and their purchasing decision. Further investigation is needed to shed light on this issue.

- A comprehensive training program to improve the leadership and business management skills for ASCC actors needs to be developed and piloted with a small cohort of participants to confirm the findings of the current project.
- It was suggested by the participating stakeholders of the current project that more studies on the sustainability of ASCC should be conducted.
- The proposed end-user guidelines should be tested in a real-world scenario, that would be significant to investigate the impact of the end-user guidelines on the ASCC.

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Appendices

Appendix 1: Web links for full reports

Report No.	Report title	Web links
MILESTONE 5 REPORT	Current and potential High Value Perishable Agricultural Commodities (HVPACs) that have demand in Asian countries: A Case Study of Central Queensland	https://crcna.com.au/resources/publications/current-and-potential-high-value-perishable-agricultural-commodities-hvpacs-have-demand-asian-countries-case-study-central-queensland
MILESTONES 11-13 REPORT	Stakeholder Collaboration Models for Exporting Perishable Agricultural Commodities in Asia	https://crcna.com.au/sites/default/files/2019-11/Akbar%20et%20al%20_CRC_NA%20project%20milestones%20report%20%28FINAL%20NOV%202019%29%20web.pdf
MILESTONES 18-20 REPORT	Queensland Horticulture Farmers' Willingness to Participate in Export Focused Contract-Based Supply Chain Coordination	TBA
MILESTONES 23a REPORT	Literature Review on Chinese consumer's purchasing behaviour towards Australian and imported perishable agricultural commodities: Factors and barriers	TBA
MILESTONES 223b REPORT	Investigating the Chinese consumer's perception of and willingness to pay for imported Australian fruits and vegetables	TBA
MILESTONES 25-26 REPORT	Translation of the Agricultural Supply Chain Collaboration Models-Recommendations	TBA