Markets for Australian Native Flowers and Foliage

A report compiled by University of Queensland AGRC3000 students: ***Imogen McGrath, Chloe Quinn, Charlie Wells*** *and* ***Sai Wai Yan*** *for* ***Queensland Farmers' Federation*** *and* ***Nursery and Gardens Industry Queensland.***

Table of Contents

ACKNOWLEDGEMENTS

We would like to acknowledge the CEO of QFF, Dr Georgina Davis, and the CEO of NGIQ, Mr Ian Atkinson, for their continued support and guidance during all stages of our research design, collection and analysis. We would like to thank all those who participated in interviews, and those contacts who provided us with further information in the form of contacts, reports and documents, and industry data. Finally, we would like to thank Dr Phil Currey for sharing his experience and advice during this process. The group enjoyed gaining experience throughout the research process and have attained skills that will no doubt benefit our future careers.

1.0 Executive Summary

The global cut flower and foliage industry is worth billions annually, and Australian produce accounts for less than 1% of the total products traded. While Australian exporters have the disadvantage of geographical distance from major market hubs like the Netherlands or the US, they are not as far from the rapidly-expanding Asian markets as some European countries are. Furthermore, Australian and South African native plants may be the ideal products to answer consumer trends and niches due to their drought tolerance and unique shapes. To date, however, very little market research regarding native floriculture production within Queensland has been made available.

This research project, entitled 'Markets for Australian native flowers and foliage', hoped to discover where possible development opportunities are appearing in international markets, and to substantiate those. The following report will detail the objectives, methodologies and data collection processes used, and provide a summary of the key research findings. Recommendations will also be made in regards to further research and current avenues through which the production of native flowers and foliage in Queensland may be enhanced with the ultimate goal of increasing the value and resilience of Queensland's native cut flower and foliage industry. Specifically, this report suggests that further research centre around consumer information in key overseas markets, and recommends that information on all areas spanning production through to freight and marketing of flowers and foliage is critical to increasing Australia's international market share.

2.0 Research Design, Data Collection and Analysis

2.1 Research Design

2.1.1 Problem Definition

Both SWOT and PESTLE analyses were conducted using the limited data available to us, which we were then able to turn into a pseudo-gap-analysis. From these processes, our project objectives were identified, whilst adhering to the project parameters defined by the assessment brief.

2.1.2 Project Objectives

This project's objectives were thus:

1. Provide evidence to explain the availability and attractiveness of market opportunities for Australian native flowers and foliage, either in pots or as cut stems; and
2. Analyse data and information to draw justified conclusions that will allow us to make recommendations that will help the industry optimise sales, gain market share and increase profits from both Australian and priority international markets for natives produced in Queensland.

2.2 Methodology

2.2.1 Secondary Research

Over the course of the project, the research team relied on secondary data as an additional resource. Secondary data, which has such advantages as low cost, short turnaround times and ease of access to information, was pivotal to our interpretation of primary data (Malhotra 2010; Ellram & Tate 2016). Moreover, due to the ambiguity of research questions and difficulties testing some hypotheses through primary data collection, supporting the research findings with secondary data was strongly advised.

Secondary data was collected using the UQ Library and Google Scholar databases, along with databases such as Rabobank, IBIS World, Agrifutures and various departments of the Australian Government. Keywords used to search included 'Australian natives', 'proteas', 'native flower production', 'floriculture', 'cut flower industry', 'export industry', 'global flower trade' and 'floriculture global market trends'. Data from all sources were corroborated with at least one other reference to reduce bias, and conclusions were drawn according to commonalities throughout all sources. Figures included in the following sections are mostly from three sources, which is testament to the lack of current data freely available. However, the information they display can be found within other sources.

Identification of possible primary sources resulted from secondary research - authors of relevant articles or publications; named contributors or board members for relevant organisations; and the naming, or suggestion of, particular markets or products.

Secondary research was also critical for triangulation of limited primary data. All ethical and moral considerations were treated with the utmost respect, and the group code of conduct adhered to at all times during secondary research, which was mainly ensuring that the data we

sourced was both appropriate and relevant for this report. Ethical sourcing of that data meant ensuring privacy and rights of information were upheld.

2.2.2 Primary Research

The research team undertook problem identification research, including market potential research, market characteristics research, forecasting, and business trends research. The purpose of market research was to determine the viability of the product/s in the target market/s; a focus on buyers' behaviours within a marketplace, and the factors determining industry growth and production trends (Gregg & Klymowsky 2013).

The research team approached with explorative/qualitative research, which is based on smaller sample sizes compared to quantitative research. Qualitative research, which is somewhat unstructured and unquantifiable, is designed to provide insight and understanding from opinions and attitudes (Diaz Ruiz & Holmlund 2017). According to Malhotra (2010), qualitative research is highly preferred to quantitative research when the objective of the study is to gain a qualitative understanding of the underlying factors determining the issues being examined. In order to identify the factors affecting the presence and viability of market opportunities for Australian native cut flowers and foliage, a qualitative approach was necessary.

Primary research was conducted using direct procedures because costs are low; expertise required to conduct research is low; and room for interviewer bias is greatly reduced, compared to indirect procedures (Gregg & Klymowsky 2013). These procedures predominantly consisted of in-depth interviews with industry professionals which were: one on one, to remove social pressure to conform (as there might be in focus group discussions); private, as some involved discussions of sensitive information (Malhotra 2010); and unstructured, which was effective for uncovering opinions and attitudes. While the questions had been tailored to each professional, the quality of the data gathered had a high risk of bias (from the interviewee) and depended solely on knowledge and credibility of said professional (Diaz Ruiz & Holmlund 2017). Following this procedure, we did not quantify the sample size of these interviews. This is because we were not conducting positive qualitative research, which requires a large representative sample. Boddy (2016) argued that a sample size of one can be justified to be highly informative and meaningful while conducting in-depth qualitative interviews.

The research was cross-sectional and relied heavily on respondent-driven or snowball sampling, given the time constraints of this project (Gyarmathy et. al. 2014). The research team was also limited in contacts due to the restrictions placed because of COVID-19.

2.2.3 Selection of Initial Contacts

When selecting potential contacts, the research team grouped the names identified through secondary sources into five categories: government representatives, industry body representatives, researchers, growers and exporters. The initial contact list consisted of 17 names, before snowballing took effect. The final contact list included more than forty people and organisations, though only 18 interviews were conducted (some of these involved multiple contacts within a single interview).

The contacts were then approached initially either with an email invitation, including a project summary, or a phone call, which included a short explanation of the research.
According to Gill et al. (2008), semi-structured interviews are highly recommended due to the flexibility they allow, which enables researchers to uncover information that may have initially been overlooked or undisclosed. Our questions were, understandably, tailored to individual persons during each interview, so a number of factors were addressed during preparatory stages to allow for these inconsistencies whilst ensuring data collected from all interviews were relevant: specifying the information required to address our research questions; designing open-ended questions so they were not difficult to understand or elaborate on; arranging questions in a particular order to ensure flow; defining the tailored problem through addressing the who, what, when, where, how and why; and avoiding leading or biased questions and generalisations allowed for greater consistency during data analysis (Adams 2015; Malhotra 2019). Drafting and editing of questions was carefully considered (Adams 2015). Each interview began with general information about the person or company being interviewed. This then flowed into their experience and knowledge in dealing with export of plant products and cut flowers and foliage internationally; directions for future market opportunities; and the viability of certain products for export (again, depending on the interviewee). Rather than attempt to pack a large number of questions into an interview agenda, we outlined and prioritised questions of most importance in accordance with our research questions (Adams 2015). By doing this cooperatively and proactively as a team, we avoided asking questions that may have been answered ourselves through the company profile or website.

2.2.4 Data Analysis

During data collection, those interviews that were recorded were transcribed, and then referred to as a source of data. Although professional, trained transcribers are preferred to ensure the accuracy and depth of reflection of transcripts, the research team was unable to utilise such support services given time and budget constraints (Moser & Korstjens 2016). However, as Muswazi and Nhamo (2013) have suggested, the team was able to minimise the casual note-taking mistakes and biased transcription by video recording and voice recording for the majority of the interviews, provided consent was given and no privacy concerns were voiced.
As discussed in the initial project plan, explorative or qualitative research formed the basis for our data collection. The data reduction process consisted of examining the raw data from the conducted semi-structured interviews and generating a narrative from the information relayed. Labov's (1972) model of research allows for meaningful data analysis as the framework understands personal narratives within a text, thus allowing researchers to form a story from the information (Labov 1972; Mishler 1991; Lieblich et al. 1998; Elliott 2005). Data collated in this manner was then able to be synthesised relatively easily. This question method (Labov 1972) applied five clauses that answer different questions:

1. *Abstract*: Briefly describe what the story was about.
2. *Orientation*: Information about interview setting, time, place, situation and interviewees.
3. *Complicating action*: What happened, and what happened next?
4. *Evaluative action*: Justify all that occurred.

5. *Resolution*: What was the result of the story?

By performing this type of analysis, we are better able to understand and recognise bias hailing from experience or opinion, and then make allowances for those discrepancies.
After following the narrative method for condensing information, a content analysis approach was adopted to further simplify key takings from primary data collection (Erlingsson & Brysiewicz 2017). To maintain core messages drawn from the interviews, data was placed within a category and theme (Erlingsson & Brysiewicz 2017). The category section answers the 'who, when, where and what?' from the information, whereas the themes represent underlying meaning found within the categories, specifically asking the questions 'why, how, in what way and by what means?' (Erlingsson & Brysiewicz 2017). This method allowed easy assembling of core messages in a table within the 'category' and 'theme' sections. Each 'category' message has a number label attached and this corresponds to the number in the 'theme' column.

2.2.5 Ethics

The group was careful to inform all interviewees that all information that had been exchanged, or that was yet be exchanged, was privatised and confidential and that any data obtained had been, and would only be, used professionally in alignment with the project objectives and code of conduct. To meet the ethical requirements of the research, the team also explained the purpose of the research, and only recorded the discussion with permission, under the assurance that such a recording would not be misused. Bias was a large consideration in every interview and method of primary data collection undertaken. To ensure group members adhered to the code of conduct outlined in our project plan, we followed specific steps when conducting initial enquiries, and considered all ethical implications of our actions before taking them.

2.2.6 Reliability

Reliability of qualitative research investigates the extent to which results, or themes, are repeated throughout the primary data collection (Malhotra 2019). As discussed in the methodology for data analysis, the narrative analysis framework helps condense a broad data set, though the way in which the themes were listed enabled easy comparison of results, and helped us visualise how often a certain theme was repeated (Lemon & Hayes 2020). Given the small number of interviews conducted, and our narrow range of secondary sources, the reliability of data was at the forefront of considerations when compiling our report findings.
As discussed in the ethics section, the semi-structured interview process can be subject to bias, so the group had to account for this with regards to how it influenced our findings (Noble & Smith 2015). Themes and ideas pulled from research continued to evolve throughout the data collection process, therefore triangulation techniques were used when extracting and analysing the data (Leung 2015). All findings were compared with our initial research questions to ensure the validity of results (Golafshani 2003; Lemon & Hayes 2020).

3.0 Results from Secondary Data

Floriculture is the name given to the production of plant material desired for the appearance of their flowers or foliage, and includes house plants, potted plants, those plant materials used for breeding, and the flowers and stems produced either for use as fresh ornaments or as dried specimens (Ahmed, Linda & Majid 2018). For close to 300 years, modern production floriculture has pushed the trade of flowers and plant products between countries around the world, and while the centre of the global industry has typically been Europe, the dynamics are shifting (Staelens, Desiere, Louche & D'Haese 2018; Ahmed, Linda & Majid 2018). Globalisation is driving an increase in cooperation and trading between nations, and decreasing costs associated with labour, inputs and movement of goods, enabling the growth of floriculture industries in developing countries that can capitalise on higher profit margins (Staelens, Desiere, Louche & D'Haese 2018; Ahmed, Linda & Majid 2018). South African and Australian native cut flowers and foliage are touted as being unique and quirky, which is something that provides the opportunity for competitive advantage in such an ancient and well-established international market (RIRDC 2013). For the purposes of this report, Australia is referred to as a whole, as there is very little data on specific states, especially when looking at the global markets. Where possible, specific states are referenced.

3.1 Global Trade

The global floriculture industry is extremely lucrative, generating worldwide annual profits of more than US$8 billion (Ahmed, Linda & Majid 2018). Accounting for a combined share of more than 80% of international trade by value are potted plants, and cut flowers and foliage (Usman, Ali, Hassan & Abid 2015). Production and profits are influenced by a number of determining factors, with household disposable income perhaps the most important in importing countries (Sutton 2002; Usman, Ali, Hassan & Abid 2015; Ahmed, Linda & Majid 2018), and while volatility in climate can manifest in extreme price fluctuations (as can financial events like the European recession in late 2008 that impacted world flower trade), the volume for export is still increasing (see figure 1) (Rabobank 2015).

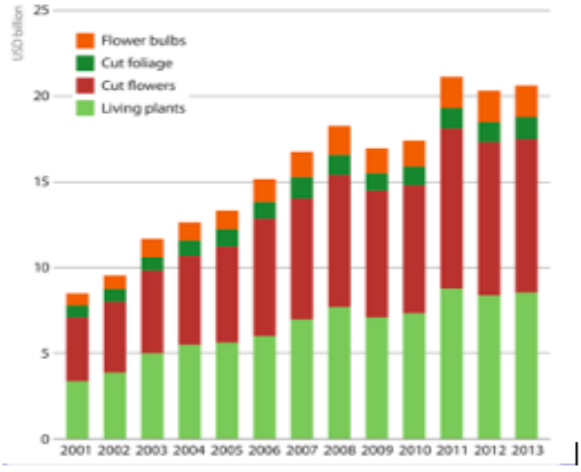


Figure 1: *The rising trend in floriculture exports from 2001 to 2013. Source: Rabobank 2015.*

Having been the dominant presence in the cut flower industry for many years, the Netherlands is slowly losing its market share as low-cost producers are becoming more competitive (see figure 2) (Ahmed, Linda & Majid 2018).

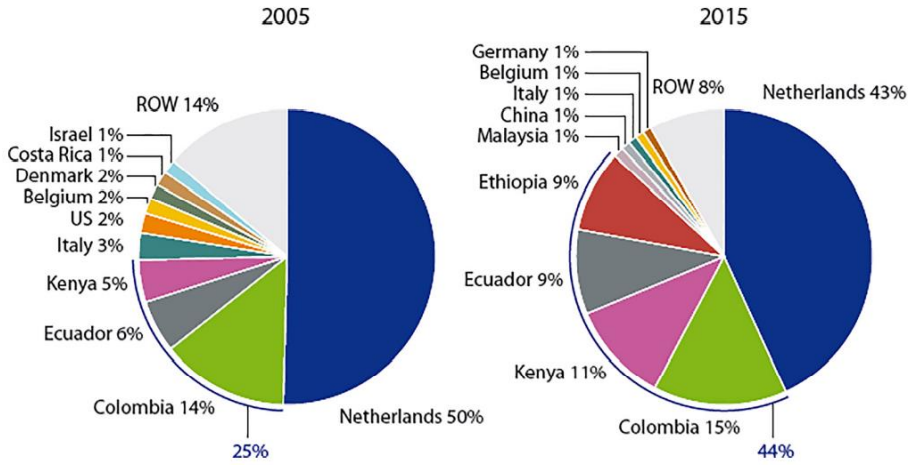


***Figure 2**: Contributions of countries to the cut flower and foliage global trade in 2005 and 2015, highlighting the diminishing share from the Netherlands. Source: Ahmed, Linda & Majid 2018, p.10.*

These low-cost cut flower exporters are predominantly developing countries benefiting from overseas investment, and include many countries close to the equator such as Kenya, Ethiopia, Ecuador, Colombia and Malaysia (Ahmed, Linda & Majid 2018; Uffelen & de Groot 2005; Wijnands et.al. 2006; Balwal and Chala 2008). All of these countries have increased their market share of the global floriculture trade, partly due to their consistency of year-round supply and proximity to markets (especially compared to Australia), but also because investment allows for technology and infrastructure components which enable more efficient production (Rabobank 2015; Ahmed, Linda & Majid 2018). It is these countries that also infiltrate the Australian market, and compete with domestically grown produce (see figure 3).

Cut Flower Imports and Exports by Country

Imports by country				Exports by country			
Year Ending June	2017	2018	2019	Year Ending June	2017	2018	2019
Kenya	$ 16.2	$ 17.4	$ 18.8	Japan	$ 2.7	$ 3.7	$ 3.8
Malaysia	$ 12.0	$ 15.3	$ 15.7	Netherlands	$ 2.8	$ 2.8	$ 2.6
Ecuador	$ 9.1	$ 9.7	$ 11.1	United States	$ 1.6	$ 1.3	$ 1.3
Colombia	$ 9.1	$ 9.2	$ 9.7	China	$ 0.5	$ 0.9	$ 1.1
China	$ 4.7	$ 4.1	$ 4.9	Korea, South	$ 0.4	$ 0.5	$ 0.4
Other	***$ 15.7***	***$ 14.6***	***$ 17.1***	***Other***	***$ 1.6***	***$ 1.3***	***$ 0.9***
TOTAL	**$ 66.8**	**$ 70.3**	**$ 77.3**	**TOTAL**	**$ 9.7**	**$ 10.4**	**$ 10.1**

***Figure 3**: Value of Australian cut flower and foliage imports and exports in AUD millions for the years spanning 2017 to 2019, including destinations and origins. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.470.*

Growth of more traditional, established markets such as Europe and North America is expected to plateau; countries experiencing rapid economic growth are expected to also increase expenditure on cut flowers and foliage (Rabobank 2015). Data suggests that Asian markets will soon be spending more on discretionary imports than European countries, so we can hypothesise that our target markets for Australian produce might also need to shift. While our exports are increasing year-on-year, figure 4 shows that this increase is much less significant than the rate at which our imports are rising. In the three years to 2019, when the value of our exports to our largest market increased by $1.1 million, the value of imports from our largest supplier increased by $2.6 million. This places us in the same category as the UK and Germany: net importers (Ahmed, Linda & Majid 2018). Australia has long heard of it's potential to be a net exporter, though there are a number of factors influencing this dynamic, many of which will be discussed shortly (Sutton 2002).

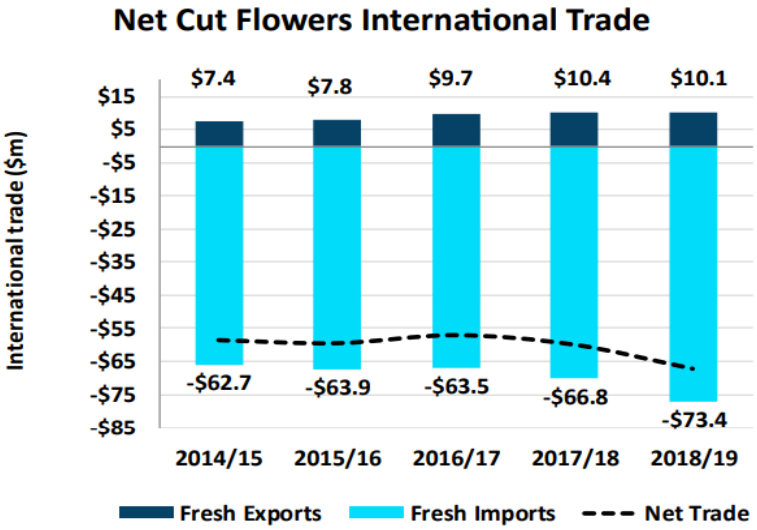


***Figure 4**: Australia's international cut flower trade between the years 2014 and 2019, including contributions in AUD millions from both imports and exports. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.469.*

3.1.1 Markets

The Netherlands, one of the major players, trades 45% of all flowers through their marketing and logistics auction centres, while African countries (such as Kenya) are steadily increasing production capabilities (Balwal & Chala 2008; Faragher et.al. 2010). Figure 5 illustrates the destinations for Australian cut flowers and foliage currently. According to Chapman (2020) and HortInnovation (2019), Japan currently leads the global export market at 51.8% share, while the US and Europe round out the top three (Ahmed, Linda & Majid 2018). More than 25% of the European and Japanese markets are satisfied by developing countries (Ahmed, Linda & Majid 2018). Products imported to Japan from the Netherlands between 2003 and 2008 decreased from 8% to 2%, while imports from Malaysia increased from 14% to 22% during the same time period (Rabobank 2015). Additionally, emerging markets such as China, Brazil, India, Mexico and Turkey are producing much of their cut flower and live plant products themselves, though domestic demand is steadily increasing (Rabobank 2015). Many of the developing countries are emerging as exporters of high volumes of flowers as a

result of government funding combined with a demand for cheaper products which is driving a rapid increase in output (Balwal & Chala 2008).

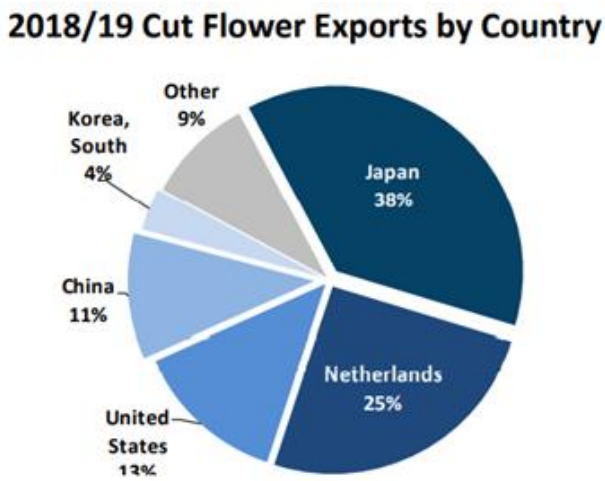


***Figure 5**: Exports of Australian cut flowers and foliage by country for the year 2018/19. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.469.*

3.1.2 Freight

Transport via sea freight has increased in the past 10 years as a result of innovations surrounding temperature control within containers, increased availability of seaports to reduce transport time, and high costs of air freight (Rabobank 2015). One 40ft container can fit 150,000 chrysanthemum stems, making them perfect for high volumes, especially when shipped along trade routes, such as between Vietnam and Japan (Rabobank 2015).

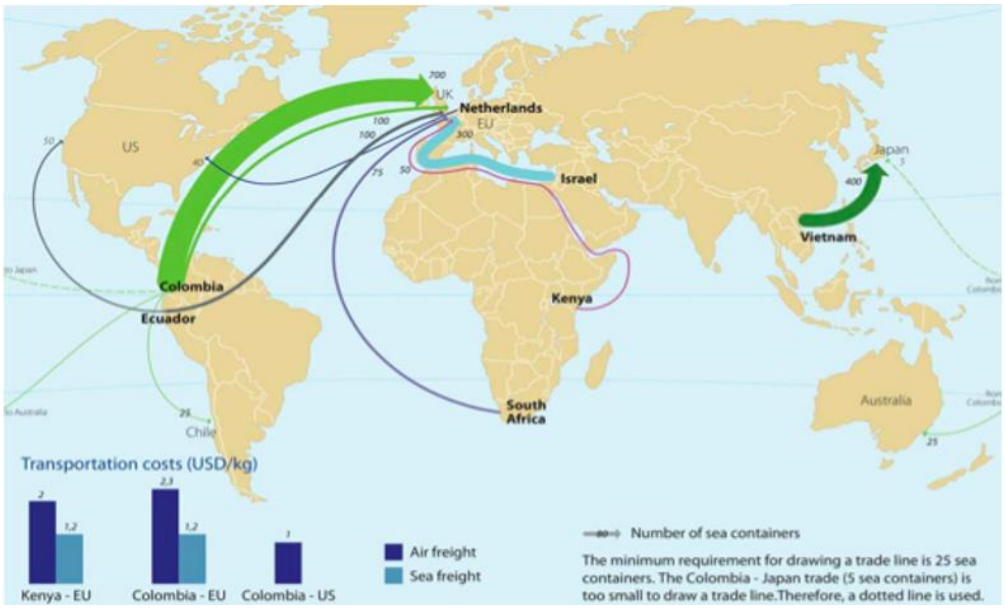


***Figure 6:** Global freight of cut flowers by sea, excluding cut foliage. Source: Rabobank 2015).*

Around 15% of Colombian products are exported via sea freight, and Colombia exports a vast number of flowers: 700 containers of cut flowers exported to the UK alone in 2013 (figure 6) (Rabobank 2015). Australia currently uses mainly air freight as this is faster than sea freight, and therefore more viable as Australia is a further distance away from most major countries than, for example, Israel is from the Netherlands, as shown above on the map. However, given the recent advances in sea freight, and the fact it is much more cost-effective, Australian growers may soon be able to use this as the better option.

3.1.3 Seasonal Trends

Demand for cut flowers fluctuates based on season, cultural and calendar events, and the consumer trends and demographics within importing countries. Holidays and events including Easter, Mothers' Day, Valentine's Day, Christmas and Chinese New Year, all create demand for specific products (Balwal & Chala 2008; Burgio-Ficca 2019; van Horen & van Rijswick 2020). Mothers' day sees more demand for carnations and chrysanthemums; Valentine's day is typically synonymous with roses; Chinese Lunar New Year sees demand increase for NSW Christmas bush; and bulbs like tulips and lilies are used more at Easter (Balwal & Chala 2008; van Horen & van Rijswick 2020). There is also steady demand year-round for flowers for birthdays, weddings and funerals, which Australia has the potential to supply (Chapman 2020; van Uffelen and de Groot 2005). Australia has an advantage in both growing capability and marketing in terms of supplying the northern hemisphere with flowers when they are otherwise out of season. Furthermore, Chapman (2020) noted that collaboration between growers within Australia could extend the harvesting period of flowers due to the large variation in natural climates.

3.2 Domestic Production

Floriculture production for cut flowers and foliage in Australia has a history spanning more than a century - but commercial export-oriented production of Australian and South African natives only manifested in the 1970s, and was followed by a surge in native plantings. The Society for Growing Australian Plants (SGAP) first met in 1957 and has continued for more than 60 years, eventually branching into Native Plants Queensland (as one of 8 affiliated societies nationally) (Native Plants Qld 2018). The Flower Association of Queensland (FAQI) formed in 1987, with other organisations later blossoming around the native industry, including the Australian Native Flower Growers and Promoters (late 1990's) and the Central Queensland Native Flower Association (formed in 1993) (Flowers Magazine 2020; Central Queensland Native Flower Association Inc. 2000). Figure 7 illustrates the increase in total Australian cut flower exports throughout the 1990's, when the industry domestically is said to have taken off (Sutton 2002).

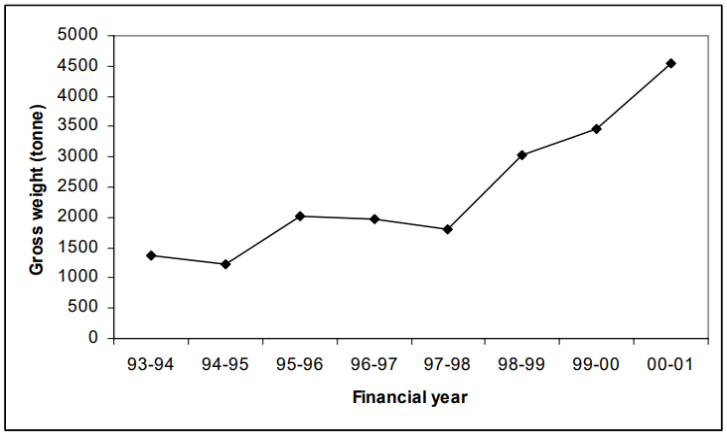


***Figure 7**: Total output of Australian cut flower and foliage exports for the years spanning 1993 to 2001. Source: Sutton 2002, p.15.*

More recently, our exports (figure 8) are failing to increase at the rate hypothesised in the 1990's, and are heavily outweighed by the products we're importing.

Year Ending June	2017	2018		2019	
	Value	Value	% YoY	Value	% YoY
Production (m units)	-	-	-	-	-
Production ($m)	$ 275.6	$ 280.6	+2%	$ 281.3	<1%
Production area (Ha)	-	-	-	-	-
Export Volume (m units)	-	-	-	-	-
Fresh Export Value ($m)	$ 9.7	$ 10.4	+7%	$ 10.1	-3%
Import Volume (m units)	-	-	-	-	-
Fresh Import Value ($m)	$ 66.8	$ 70.3	+5%	$ 77.3	+10%
Fresh Supply (m unit)	-	-	-	-	-
Fresh Supply Wholesale Value ($m)	$ 370.9	$ 376.0	+1%	$ 378.1	<1%
Supply per Capita (kg)	-	-	-	-	-

***Figure 8**: Value in AUD millions of imported and exported cut flowers for the years spanning 2017 to 2019, including year-on-year growth. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.467.*

The potential of Australian natives (and Proteas) as cut flowers and for foliage has inspired research into phenology, branches of agronomy and horticultural techniques for many decades (Weiss & Ohana 1996; Brennan, Crowhurst, Webb 1998; Brennan, Webb & Crowhurst 2000), including various reports published by government departments and industry bodies. RIRDC (now Agrifutures) published the first edition of 'Getting started in wildflower growing' in 2013, and the information provided, which covers plant science, commercial production, selling and markets, and the costs involved in wildflower production, remain highly relevant for producers today. While the number of growers of natives for cut flower and foliage production in Queensland is not known, the locations of wildflower growers have been summarised (see figure 9).

Figure 9: *Major cut flower production areas across Queensland. Source: Adapted from Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, pp.467.*

We can see in figure 10 that Queensland is well placed climatically to capitalise on sales of cut flowers and foliage on Valentine's Day, Mothers' Day, and Christmas, and yet we're still increasing national imports during those peak cultural windows. The proposal suggesting co-operatives may give domestic growers the benefit of a longer harvest window may also be slightly misleading - especially if the cut flowers in competing countries are grown in a protected-crop or paddock situation (i.e. climate control).

Cut Flower Seasonality by State

State	18/19 $m	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	$70.4												
Victoria	$161.9												
Queensland	$23.8												
Western Australia	$24.2												
Northern Territory	$1.0												
Imported	$77.3												
Availability legend			High			Medium			Low			None	

Figure 10: *Seasonality of supply of cut flowers domestically, including value of imported contributions in AUD millions. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.468.*

Cut Flower Imports and Exports by State

Imports by state destination			
Year Ending June	2017	2018	2019
New South Wales	$ 25.4	$ 26.1	$ 28.9
Victoria	$ 24.7	$ 25.8	$ 28.4
Western Australia	$ 8.9	$ 8.8	$ 8.6
Queensland	$ 5.5	$ 6.9	$ 7.8
South Australia	$ 2.3	$ 2.7	$ 3.6
Total	**$ 66.8**	**$ 70.3**	**$ 77.3**

Exports by state of production origin			
Year Ending June	2017	2018	2019
Western Australia	$ 3.1	$ 4.3	$ 3.9
Queensland	$ 4.4	$ 4.1	$ 3.9
Victoria	$ 1.0	$ 1.7	$ 2.0
New South Wales	$ 1.0	$ 0.3	$ 0.2
South Australia	$ -	$ -	$ 0.0
Other	***$ 0.2***	***$ 0.0***	***$ 0.0***
Total	**$ 9.7**	**$ 10.4**	**$ 10.1**

Figure 11*: Value in AUD millions of cut flower imports and exports by state for the years spanning 2017 to 2019. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.470.*

Compared to other states for the year ending 2019, Queensland was the fourth largest importer of cut flowers and foliage, and the second-largest exporter (see figure 11) (Hort Innovation 2020). Queensland produces 8% of total cut flower and foliage production nationally, suggesting potential for significant growth in the future (see figure 12) (Hort Innovation 2020).

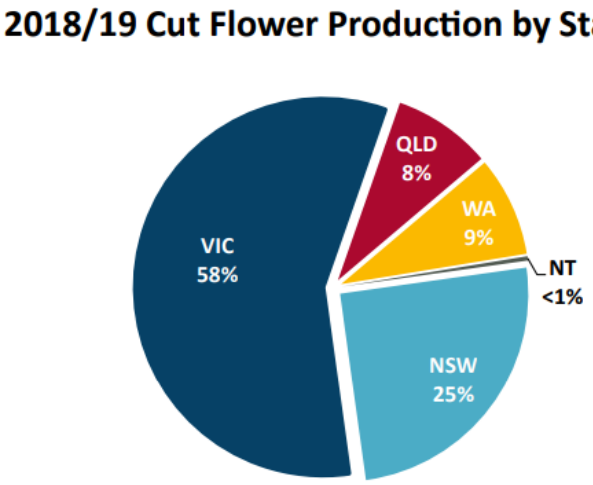


***Figure 12**: Domestic cut flower production by state for the 2018-19 year. Source: Hort Innovation's 2018/19 Australian Horticulture Statistics Handbook, p.486.*

3.2.1 Products

Some 10-20% of Australian cut stems are wildflowers, including Kangaroo Paw, Banksia, Waratah and Christmas bush, many of which are only grown commercially in Australia (Chapman 2020; Gollnow 2020). Typically, the 30 or 40 most popular flowers and foliage crops to grow have been those most talked about by the industry - and therefore most sought after by consumers: *Hakea francisiana*, *Grevillea* 'Crimson Yul-lo', *Acacia holosericea*, *Baeckea frutescens*, *Chamelaucium uncinatum* (Geraldton waxflower), *Acacia baileyana*, *Leptospermum polygalifolium* and *L. obovatum*, as examples (Janick 2010; Damunupola et. al. 2010; Gollnow 2020). One of the most important considerations when choosing which species to grow is your type of operation (Gollnow 2013; Sutton 2002) - that is, will the crop be undercover (in a greenhouse), sheltered (in a paddock) or plantation (paddock, without traditional shelter)? Soil type, climate, altitude, rainfall and cultivar selection all determine how well a cut flower or foliage species perform in any given location. RIRDC publication no. 12/090 lists extensive plant selections for the production of native cut flowers and foliage, and Agrifutures list almost 20 fact sheets for native species on their website (see appendix 7.2). While further information can be found for the other 200 or so species suited to native floriculture (Gollnow 2020), both of those sources include in-depth agronomic and climatic factors for consideration during cultivar selection.

3.2.2 Diversification

Agrifutures provides an online resource database entitled “Farm Diversification”, where fact sheets can be found for some 20 native species suitable to cut flower or foliage production, and a number of others for bush food or essential oils. Even those natives which have not historically been grown for their appeal as cut flowers are now able to satisfy other areas of the rapidly evolving cosmetic and beauty, health and wellbeing, and homewares sectors (Gollnow 2013). Natural oils, honey, carbon sequestration and soil rehabilitation, dried products for use in arts and crafts, and the emergence of multi-use crops such as edible Geraldton wax for boutique culinary purposes can each lend something unique to enticing growers towards native plants (Slater and Carlson 2003; Gollnow 2013; ACOLA 2020). Diversification, given the volatile nature of the global cut flower industry, should be considered as a risk-mitigation factor enabling greater resilience among flower producers.

3.2.3 Technology

Batt (2001) suggests that those who are slower to innovate, in a competitive sense, are left behind. There is a fear within the industry that this will become Australia. Innovation, knowledge-sharing and the invention and adoption of technology, have a large part to play in the future of Australia’s cut flower and foliage industry. Greenlife Industry Australia suggests as many as 63% of production horticulture growers are investing in infrastructure, technology and training, and it is assumed that a number of producers would like to expand or innovate but do not have the funds to do so (Hort Innovation 2018). The rise of developing countries in the global market trade is a result of foreign investment coupled with government support, both of which are typically greater in those countries than in Australia (Sutton 2002; ACOLA 2020). Under the government’s ‘National Agricultural Innovation Agenda’, the National Science and Technology Council funded ACOLA’s latest (Sep. 2020) addition to the Horizon Scanning Series, which analysed nine different technologies in order to determine how each could be applicable to agriculture within Australia. That report, along with other innovation-minded scholarly works, was instrumental in the formation of Agriculture Innovation Australia, which could be a positive force for innovation within agricultural industries into the future.

3.3 Factors Affecting the Australian Industry

3.3.1 Biosecurity in Australia

To manage and reduce the severity of risks associated with major pests and diseases, biosecurity and the related developed frameworks are essential to human health and safety (Agriculture 2020a). The Plant Health Committee (PHC) is the peak federal body that enforces and constructs policies that aim to regulate plant health with a holistic view of environmental, social and economic protection (Agriculture 2020c).
Substantial quantities of live plants move across internal borders throughout Australia, and there are specific state and territory biosecurity agencies that represent PHA to enforce regulations (Greenlife Industry Australia 2020). Various certifications and accreditation

schemes exist in order to uphold regulatory compliance of production, with many businesses integrating such schemes into their product branding and marketing strategies (HortInnovation 2019). To ensure exclusion, eradication and control of major pests, government and industry representatives must enforce effective biosecurity planning at all state levels (PHA 2013). Figure 13 displays the importance of how and where effective biosecurity frameworks are planned.

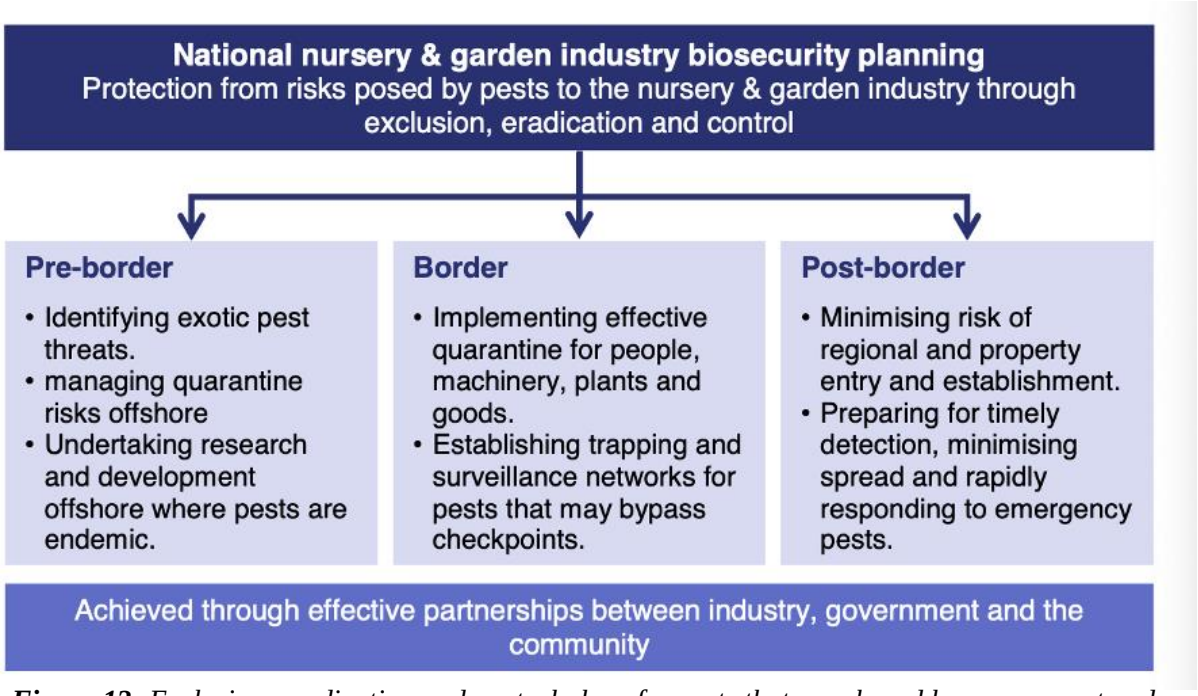


Figure 13: *Exclusion, eradication and control plans for pests that are shared by government and industry. Source: PHA 2013.*

For nursery industries in Australia, various certification schemes exist to offer industry benchmark recognition, as well as improve on-farm safety, hygiene and productivity (NGIA 2020). BioSecure HACCP is a biosecurity program that has been assisting growers to ensure best practice is maintained on-site, with quarantine processes being specific to each business (NGIA 2020). The risk management frameworks are designed to ensure compliance is optimised and future production of nursery products is safe and sustainable (NGIA 2020). One such framework, the Red fire ant (*Solenopsis invicta)* biosecurity zones, exists in South East Queensland (SEQ) which strictly limits the movement of plants, soils and potted plants. Permits are therefore required, further hindering interstate movement of plant products (Business Queensland 2020). Figure 14, below, shows the restrictions for interstate market access in SEQ. It can be seen that close to 400 suburbs are within this biosecurity zone.

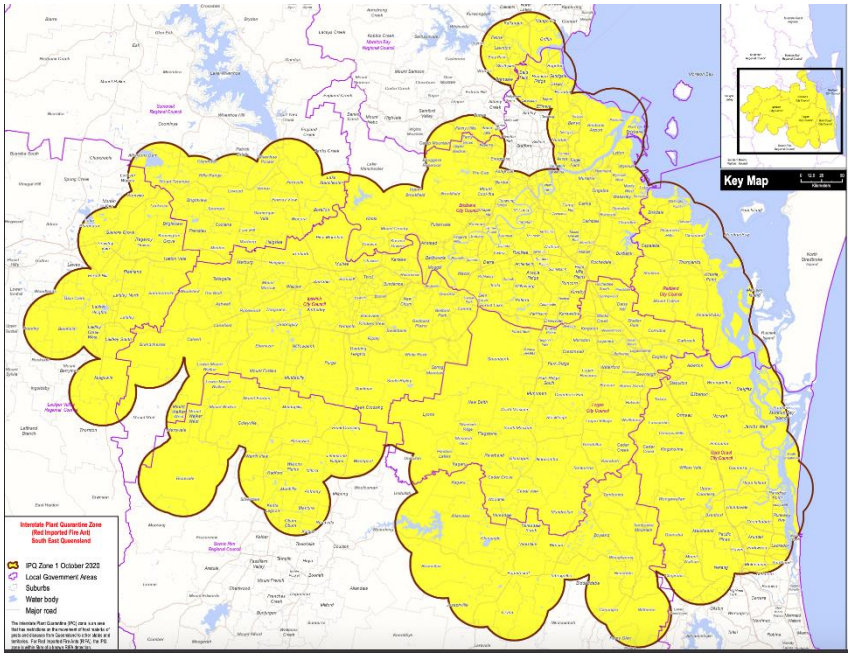


Figure 14: *Map of restricted biosecurity zones for Red Fire Ants. Source: Qld Government 2020.*

3.3.2 Biophysical Influences

Queensland, like most of Australia, is subject to a highly variable climate with drought, floods, fires and severe storms being commonplace across various geographical regions. The major biophysical factors influencing the native cut flower and foliage industry are water availability and infrastructure, climate, location and soil texture (Gollnow 2003). If an operation involves growing potted native flowers or foliage, biotic factors such as diseased and poor-quality growing media are thought to greatly impact production (A O'Brien 2020 pers. comm., 9 September). Large production nurseries, such as Pohlmans Nursery in SEQ, have had a number of issues over the years regarding diseased potting media that is brought in from local suppliers (C Johnson 2020 pers. comm., 9 September). Contamination of materials used on-farm present biological concerns and effectively impact yields for native flower and foliage producers. This also increases risk of potential pest incursions, as discussed previously in 3.3.1.

Native cut flower growers are encouraged to research long-term rainfall data heavily to determine the quality and level of water infrastructure needed to operate effectively. Gollnow (2013) suggests that irrigation is essential to obtain profitable yields and quality, though water requirements differ between plant species (Gollnow 2003). Knowledge gaps relating to the cultivation of some lesser-known or newer species exist, with very little published information being available to growers and technicians (Gollnow 2003).

3.3.3 Economic Influences

The domestic native flower and foliage industry is comprised of a number of small-scale growers, with many hobby growers using their native flower production as their second

income source (Gollnow 2003; S Holborn 2020 pers. comm., September 16). Much of the initial capital outlay includes the purchase of land, infrastructure (packing/machinery shed, refrigeration and irrigation), tools and machinery (Gollnow 2003). For someone wishing to commence native floriculture production, financial planning is recommended – undergoing a cash flow statement, for example, will outline the net present values, as well as operating expenses and revenues (Agrilink 2000).

Some native cultivars may take years to establish and begin producing flowers, so careful market-orientation and planning is considered vital (Agrilink 2000; Gollnow 2003). Many producers grow multiple species to help mitigate risks associated with volatile markets, though this business model needs to be carefully planned to ensure harvest periods are aligned with both labour availability and market demand (Gollnow 2003). As previously mentioned, Australian producers are exposed to climatic risks, so in order to remain economically viable, growers need to plan for natural disasters or periods where cash flow is reduced (Gollnow 2003).

Revenues are determined by both yields and wholesale price, the latter of which is greatly influenced by external factors of supply and demand (Gollnow 2003). Average production costs vary greatly depending on species grown, with plants such as Waratahs costing up to $3.80 per stem, while purple pride waxflower costs only 20c per stem to produce (Gollnow 2003). The main production costs include:

- Cost of establishment;
- Associated growing costs per stem;
- Harvest and packing;
- Freight;
- Fuel, oil, repairs and maintenance; and
- Other operating and capital expenses.

3.3.4 Political Influences

Queensland represents 17% of all Australian horticultural exports with the main policy barriers to countries such as Japan, China and South Korea being:

- Quarantine and Phytosanitary requirements;
- Label requirements; and
- Protocols for multiple cargo consignments.

Between 2014 and 2016, Australia concluded free trade agreements (FTA's) with the countries listed above, and holds strong trade relationships with a number of other countries, such as Malaysia, Thailand and Singapore (Department of Agriculture 2020b). While strong trade relationships exist between Australia and the aforementioned, exporting and trading flowering products does raise biosecurity concerns. Japan, for example, has strict quarantine requirements regarding imports, so appropriate protocols must be met in order to alleviate biological barriers to entry for products grown in Australia (Department of Agriculture 2020a).

In early 2019, an intergovernmental agreement on biosecurity (IGAB) came into effect with the aim to enhance Australia's internal biosecurity frameworks (Department of Agriculture 2020a). Increasing collaboration between Australia's state, territory and government bodies

was specified as the main pathway to minimising the risk of pest and disease impacts on the domestic economic, social and biophysical environments (Department of Agriculture 2020a). The IGAB framework encompasses principles of sharing biosecurity responsibilities as this will strengthen partnerships between all stakeholders. In the past, the interstate movement of plant material has been difficult due to lack of legislative transparency, however, the IGAB framework specifies that biosecurity measures will minimise trade-restrictive travel domestically, and harmonise the interstate processes (Department of Agriculture 2020a). Overall, the framework is aimed to facilitate partnerships between state governments and industry (Department of Agriculture 2020a).

3.4 Outlook

It has been suggested that the future of Australian exports should focus on the Japanese and Hong Kong markets as they are experiencing rapid growth in demand, are geographically closer to Australia than Europe or America, and represent a large potential market in terms of number of households (van Uffelen & de Groot 2005; International Trade Centre 2020). Prado (2013) recommends that Australia align its regulations and policies with those of potential export destinations. They also suggest the adoption of regulations would be more acceptable to producers if they were uniform codes spanning state and industry bodies that can regulate and apply to both native cut flowers and cut foliage. There is research currently being headed by Agrifutures (2019) that aims to improve technology in floriculture production to reduce costs for growers. This may also allow Australian exports to become more cost-competitive and allow for greater global reach (Burgio-Ficca 2019; van Uffelen & de Groot 2005).

4.0 Results from Primary Data

4.1 Market Opportunities

4.1.1 Domestic

Consumer demand for cut flowers and foliage depends on season and cultural events. It was noted during primary data collection that traditional bulb flowers were more popular in winter and native flowers were more popular in late spring and summer. Mothers' Day sees the largest quantity of flowers sold on any holiday, followed by Valentine's Day, Easter, Christmas and Chinese New Year. Flowers are also routinely bought for birthdays, weddings, funerals and other smaller occasions. In the last decade, consumer trends towards lower prices have pushed the sale of cheaper flowers and accessories, and steered demand away from the traditional, artisan arrangements and displays favoured by florists. Cut flowers in ready-made arrangements make more of an impact on the general consumer as a skilled florist is better able to utilise the different shapes, colours and textures to attract the eye towards a pretty image. Larger leaves such as monstera deliciosa, palms and cordyline, as well as smaller 'filler flowers' and leaves, work together with textural additions like gum nuts which add interesting shapes to the colourful arrangements. Consumer demand is encouraging growers to produce flowers with longer stems, brighter colours and longer shelf lives, and a number of new varieties of Australian natives have consequently been introduced in the last 20 years to match those market trends. Many fresh flowers sold domestically are imported from overseas, with sizeable contributions coming from Colombia, Japan and China. The fragmented Australian market is by no means at saturation in terms of domestic production, as is evidenced by the amount of product Australia imports versus what we export. Value-adding cut flowers, like drying natives, can capitalise on market niches. Customers are buying such products to decorate or enhance their homes, which also creates opportunities to satisfy a growing number of consumers.

4.1.2 International

The international consumer trends for cut flowers and foliage are closely correlated to colour trends in the fashion industry. Species of Grevillea, kangaroo paw and wax flowers are all touted internationally for their versatile colour options, and continued breeding of new, coloured cultivars is of great interest and importance for the domestic industry. European, Asian and American markets all value colour as a factor of quality for cut flowers and foliage.

4.2 Production

4.2.1 Australia has the advantage of expertise in genetics and cultural information for Australian natives and Proteas.

When considering the viability of products offered by Australian growers, we have the advantage of uniqueness. Even those countries growing and breeding Australian and South African species for an export look to Australia for cultural information, new finds (which is our monopoly because we can literally walk out into the bush and return with a new flower or

leaf) and genetics of existing cultivars. Australia currently produces less than 1% of the Australian natives and Proteas are grown globally (Gollnow, 2020). Even if international production of these natives increased tenfold, industry opinion states that the demand would still be there. Australia supplies a very small portion of the Japanese market, let alone the overall international trade, which allows for the inference to be made that our market share can expand to whatever size we can reliably supply. Australia needs to focus on building those supply chain relationships.

4.2.2 Production pitfalls result from insufficient access to information for growers.

Growers in QLD need to match the species they grow to their climate. While it's easy for new or emerging growers of Australian natives to be drawn in by an apparent niche or window within an existing market, product selection should not be entirely market-based. Information for growers is widely available - resources like Agrifutures' database are free and online and provide valuable information like the climatic suitability of a range of Australian and South African natives to specific areas in Queensland (see appendix 7.2), the differing crop demands between species, and the requirements for labour or water that are needed for each variety. There is, however, some information that is constantly evolving or updating, and this can make it difficult for growers to stay up to date. For example, a lack of sharing around labelling innovations has resulted in a modest uptake of the "Australian Grown Flowers" label, even though it is registered for use by growers of all cut flowers and foliage in all states and territories within Australia. A united industry body has often been suggested to remedy this lack of information cohesion.

4.2.3 Transparency is an integral component of maximising profits and controlling product quality along the supply chain.

A common theme across all interviews was the need for transparent change to regulations and processes associated with production. Not only are states and territories unwilling to openly share potentially competitive information, but each has their own regulations and industry structures, which makes fostering an innovative and collaborative domestic cut flower and foliage industry quite difficult. The growers we spoke to were perhaps most concerned about the quality of their products, and how this was impacted by conditions downstream from farmgate. Packaging, handling, transport and freight were all identified as off-farm processes where the growers typically had little-to-no control of their products. Frustrations resulting from this lack of transparency have even resulted in some growers leaving the cut flower and foliage industry.

4.2.4 Innovation is crucial to Australia's ability to compete internationally.

Australian producers, at least those who have established themselves in the native floriculture industry, know how to grow cut flowers and foliage to meet quality and export demands. However, this knowledge of native plants is not sufficient means for competitive advantage on an international platform such as the floriculture industry, where consumer trends and powerhouse producers can shift in a few short seasons. Costs of labour and production inputs are high in Queensland (compared to developing countries like Kenya), and the husbandry

practices employed by Queensland producers are those that were being used by growers some three decades ago. The nature of floriculture growers demands that they are protective of their production secrets - it's unfair to ask any farmer to cough up their methods or practices. And, yet, this culture of withholding information from other producers has resulted in a domestic market which is severely lacking innovation. Competition fosters invention, and healthy domestic competition between floriculture producers in different states should be encouraged because it will inevitably lead to technological breakthroughs. While agriculture in Australia is moving forward and embracing several new technologies, the jury remains out on whether any of the nine technologies listed in ACOLA's latest (Sep. 2020) report, for example, will be applied to horticulture. Growcom partnered with the government to develop the "Queensland Production Horticulture Workforce Development Plan", which aimed to focus on training and development to help the horticultural sector better adapt to changing industry trends and keep up with global movements - the organisers attributed the formation of the plan to the recognition that competitiveness is critical to Queensland's horticultural success both domestically and internationally. Their report (2015) also detailed issues around the adoption of innovative practices and emerging technologies.

4.3 Barriers to growth

4.3.1 The cost of both production and transport inhibit the growth of native floriculture in QLD.

The use of hydroponics in other countries, such as Israel, allows them to outcompete the Australian producers because hydroponics allows plants to grow faster, stronger and flower more prolifically due to the copious amounts of fertiliser used and the strictly controlled environment within the greenhouses. Hydroponics also requires less labour and pesticides than traditional field setups as they are in a closed, controlled environment. It has also been found that there is a problem with Australian expansion in that the growers won't grow unless there is a market for it and the buyers won't buy unless they know what it is and what to do with it, and since so many Australian flowers are relatively new to the cut flower industry this is a potential problem.

Australia also faces large difficulties competing in the global market due to the high costs of freight and transport required to get the product from the farm via truck, then overseas via plane. The use of sea freight, while cheaper is all but useless because of the time it takes for boats to get to their destination.

4.3.2 Consistency of supply, both in terms of volume and quality, is a major issue concerning growers.

A major issue for Australian native flower and foliage producers is the capacity to deliver large volumes to high demanding markets. Being able to maintain consistent volumes of supply at premium qualities is problematic for the industry, especially in Australia's variable climate. This information was considered an issue from a number of the interviewees, because many native flower and foliage producers are small organisations or family businesses.

If there was a way to uphold quality and ensure consistent volumes, markets such as Japan that have high willingness to pay premiums for Australian natives may be further exploited.

4.3.3 The attractions of exporting are overshadowed by difficulties arising from a lack of support mechanisms.

A common theme seen in the interviewees was the poor export culture in Australian horticulture. Many growers are convinced exporting is too difficult and the compliance and regulatory measures are tedious.

With the correct guidance and support through specialised assistance, growers will not have to be concerned with important elements such as supply chain inefficiencies. Though Austrade's website provides a step-by-step 'export-ready' checklist, smaller producers trying to access new markets may still be rather overwhelmed.

4.3.4 Inconsistencies across state/territory regulations of plant material discourage interstate movement of horticultural stock.

Further harmonisation of interstate movement of plant material and better transparency between states is specified in the IGAB framework. However, the IGAB framework has been described as inconsistent, and this has been attributed to a lack of expert resources and a lack of urgency to amend the issue.

Takings from data collection include reviewing legislation and regulation in the biosecurity framework as reductions in plant biosecurity investment has seen reduced skill sets and inconsistent policy developments.

4.3.5 Corporate social responsibility and sustainability are of growing importance globally.

Ecological concepts surrounding native flower and foliage production need to be documented to not only brand products but to ensure 'clean and green' status and accreditation compliance.

Native flower and foliage growers need to tailor their practices to ensure we compete within the 'health conscious' consumer markets, as these segments have been identified as prominent growth sectors for agribusiness moving forward. Agricultural producers have the opportunity to exploit potential ecological benefits of planting native flora on otherwise marginal land, which could result in a cut flower crop or another native floriculture-based product.

5.0 Recommendations

5.1 For Queensland Producers.

5.1.1 For SMEs

Educate yourselves. Treat the endeavour as a business. Start as you hope to continue (clean, green, and compliant). If you need funds, find a way - now is the opportune time to do that, given the current cost of lending and borrowing. Don't be afraid to traverse the global supply chain - if you want solid connections with retailers around the world, set about fostering them.

5.1.2 For companies, corporations and cooperatives

Push your production to align your ambitions with the market opportunities. But don't hoard your knowledge. You're already partnered with growers, breeders and innovators around the world: open that up to encourage a culture of market-grabbing, forward-thinking inventors and plant enthusiasts within the native/South African cut flower and foliage production space domestically.

5.2 For Australian Industry Bodies.

Educate and facilitate: target assistance towards growers themselves. Provide information about legal, political, environmental, social, technological, seasonal, agronomical and financial factors influencing primary production (of Australian native cut flowers or foliage). If requested, liaise with the government on growers' behalf and help establish connections between growers, industries, markets, countries or states. If requested, facilitate conferences, networking events or project funding, utilising either government or independent investment where applicable. If requested, help educate consumers (including the use of the Australian Grown Flowers™ label which has been successfully trialled and is registered until 2024). Stay abreast of new and emerging guidelines to which producers have to ensure they adhere. Where appropriate, encourage the development of specific best management practice (BMP) programs for growers of cut flowers and foliage.
Even in the absence of a designated Australian native or cut flower industry body, the flow of information is crucial to ensuring Australian producers can compete on the world stage. Organisations like NGIQ can still play a role in facilitating this flow of information. Similarly, encouraging innovation and attracting investment towards the floriculture sector will benefit horticulture in a broader sense; thus, horticultural industry bodies have a role to play.

6.0 Further Research

This research project was not only timed constrained, but the resources at the students' disposal were minimal. Reports published by organisations within the industry about market trends, for example, were out of reach financially. In addition, COVID-19 limitations on travel and contact resulted in research methodologies that were quite removed from traditional, in-the-flesh interviews. There are, subsequently, several areas to consider when continuing the limited research conducted in this report.

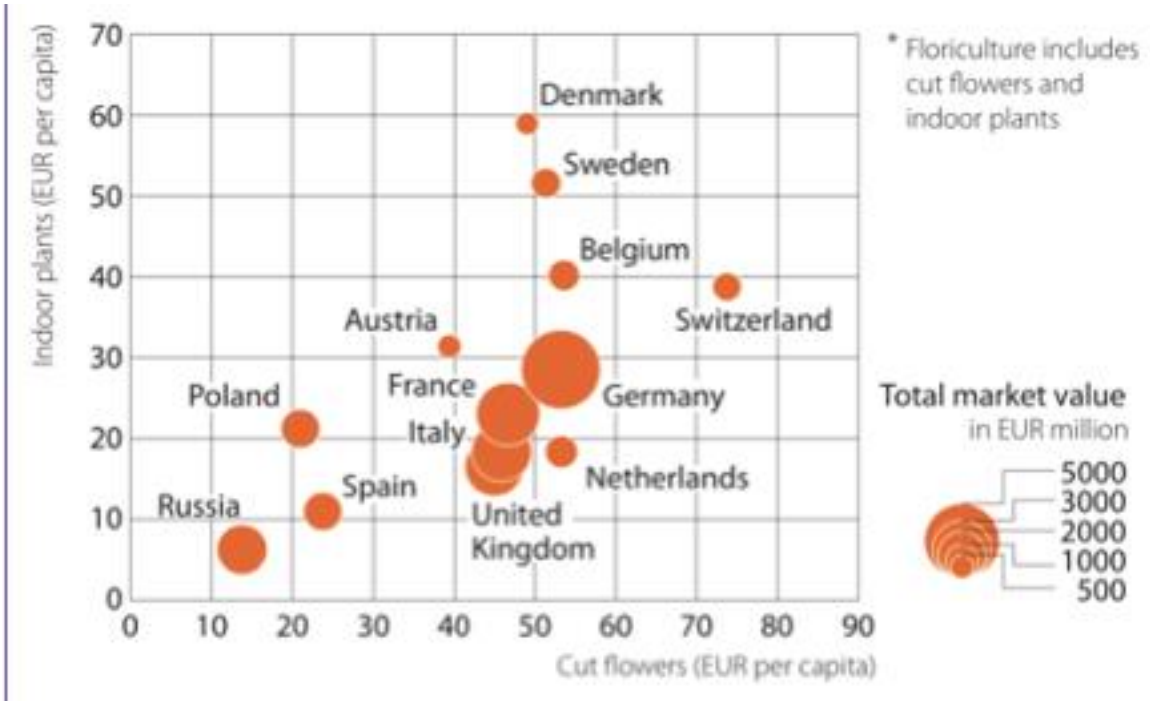
Firstly, an eye should be placed over industry and government-funded research organisations, such as AIA, Agrifutures research, and those organisations that could offer advancements of new technologies for possible applications in horticulture (see QAAFI's online seminar about sensing technologies in agri-food systems on October 27th at midday). This scanning should aim to encompass industry reports (see the International Statistics Flowers and Plants 2019 yearbook, by AIPH), resources offered by the government (like the Australian Trade and Investment Commission, Austrade's, market profiles for a number of overseas destinations), and those initiatives undertaken by individuals or companies nationally to improve export opportunities for Australian producers of cut flowers and foliage.

Secondly, further research should be conducted in order to gain an insight into operations within those countries successfully growing Australian native plant species for export. While some of our research has suggested these competitors cannot match Australian-grown products for quality, the large foreign investment funding a number of international producers will likely give rise to increasing innovation and quality assurance into the future. Understanding processes of production within developing countries or industries, like Israel and Ecuador, for example, could possibly help Australian producers identify those areas or practices that allow for competitive advantage in an international market.

Furthermore, data should be sought from plant breeders and those who assist in the development of new "Australian-native" cultivars for commercial production, in order to determine whether the cut flower and foliage market is the most lucrative for growers of native species, especially considering the recent trends towards diversifying uses of native flora.

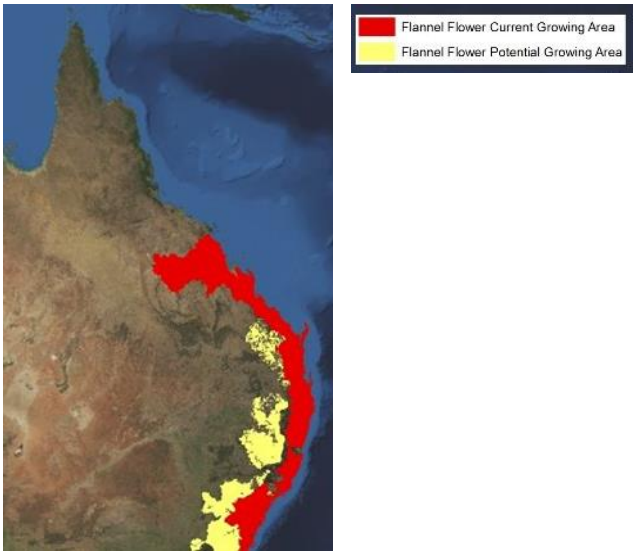
7.0 Appendix

7.1 Differences in expenditure (per capita) on floriculture products in Europe. Source: Rabobank 2015.

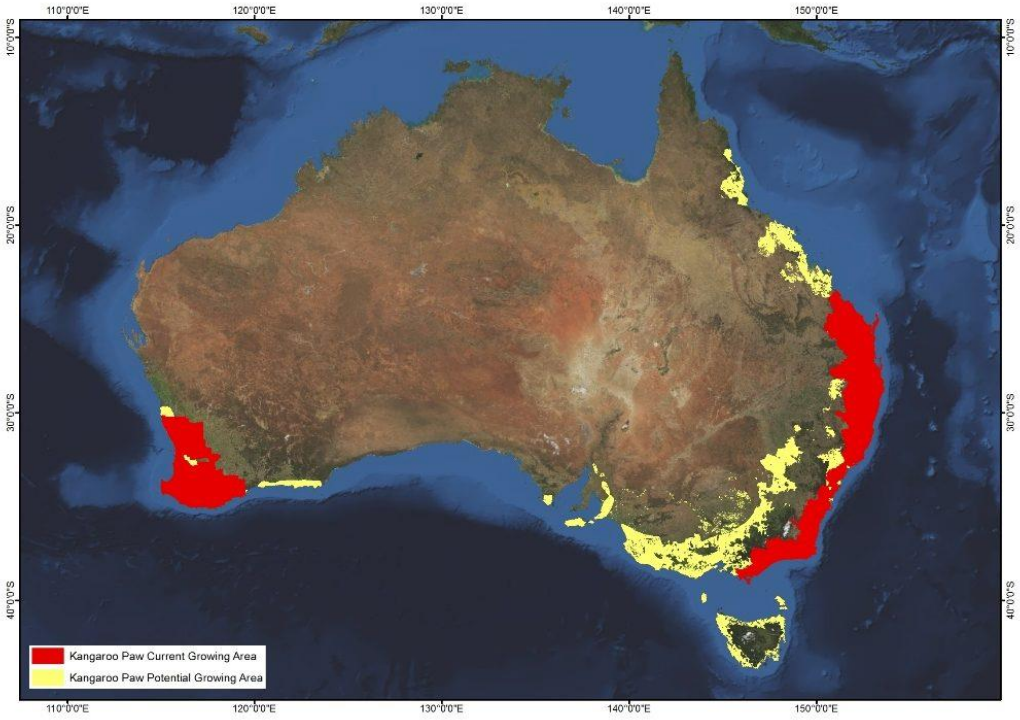


7.2 Geographical suitability for floriculture species.

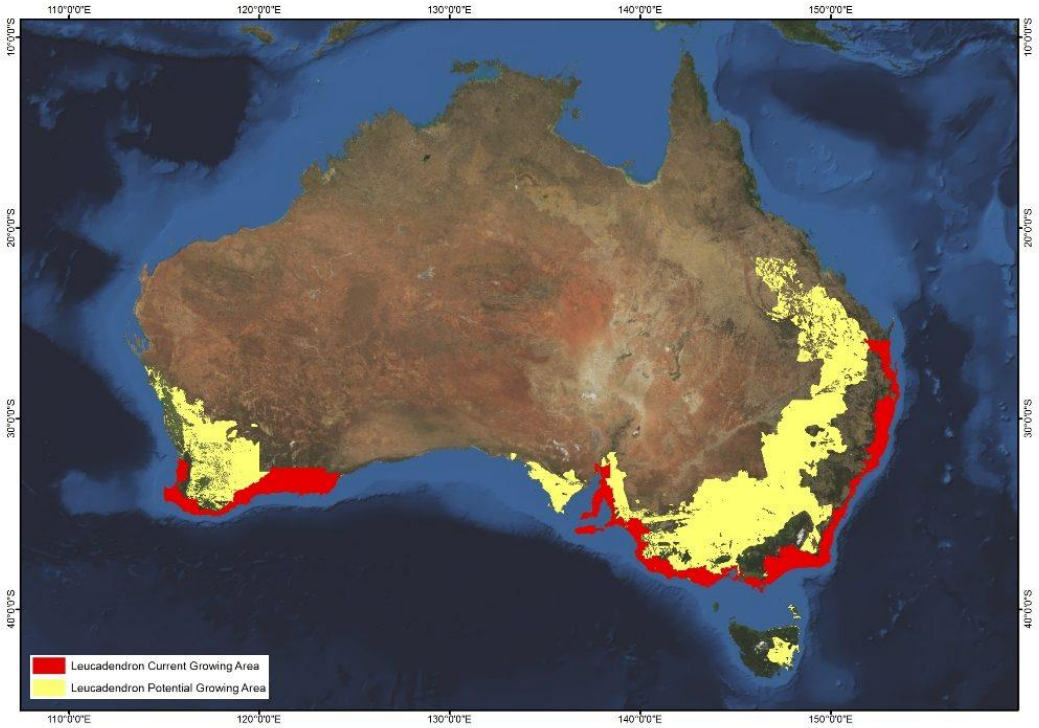
7.2.1 Suitability for growing flannel flower in Queensland. Adapted from Agrifutures: Flannel flower (2017); https://www.agrifutures.com.au/farm-diversity/flannel-flower/.



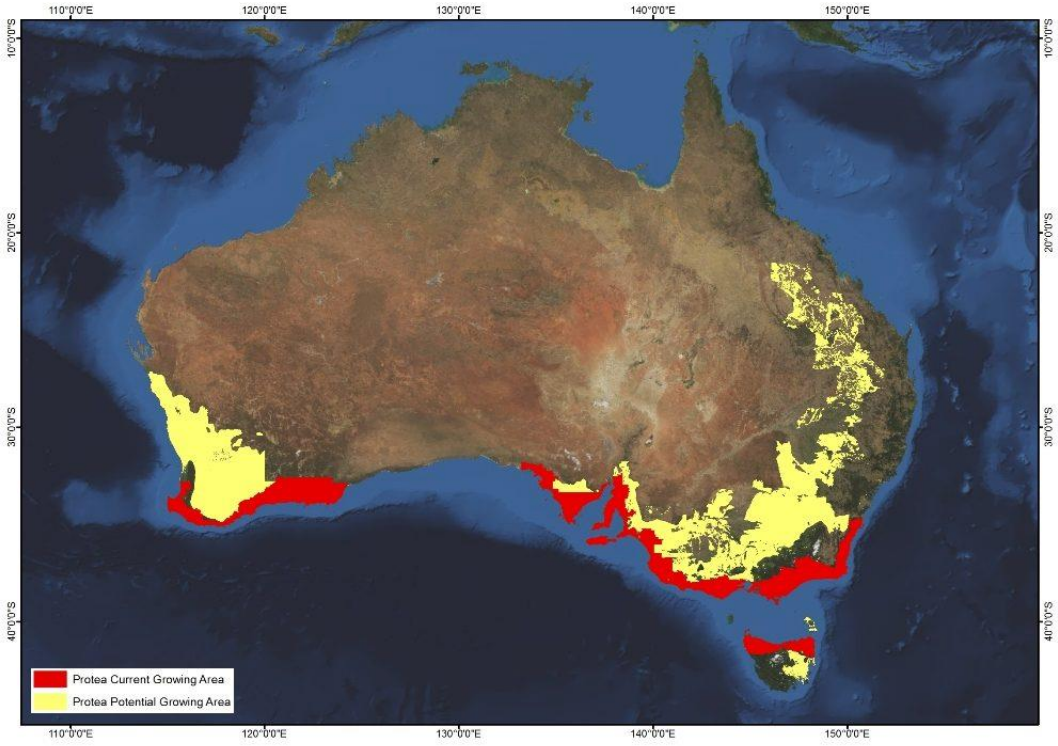
7.2.2 Suitability for growing kangaroo paw in Australia. Adapted from Agrifutures: Kangaroo Paw (2017); https://www.agrifutures.com.au/farm-diversity/kangaroo-paw/.



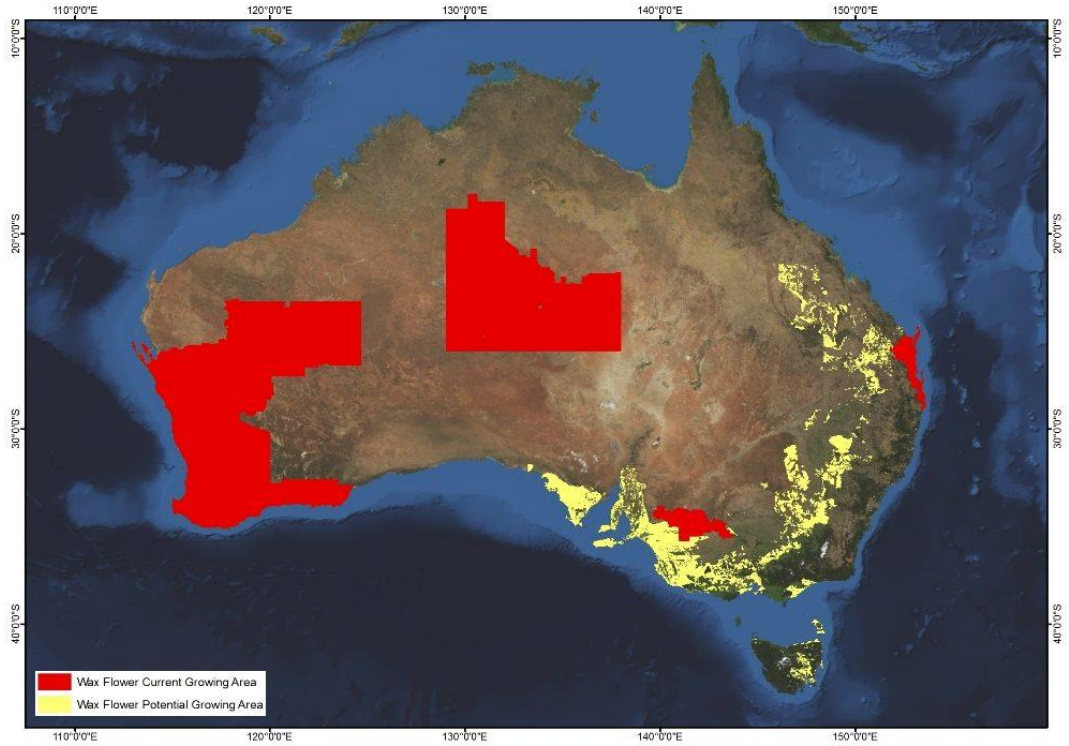
7.2.3 Suitability for growing Leucadendron species in Australia. Adapted from Agrifutures: Leucadendron (cut flowers) (2017); https://www.agrifutures.com.au/farm-diversity/leucadendron-cut-flowers/.



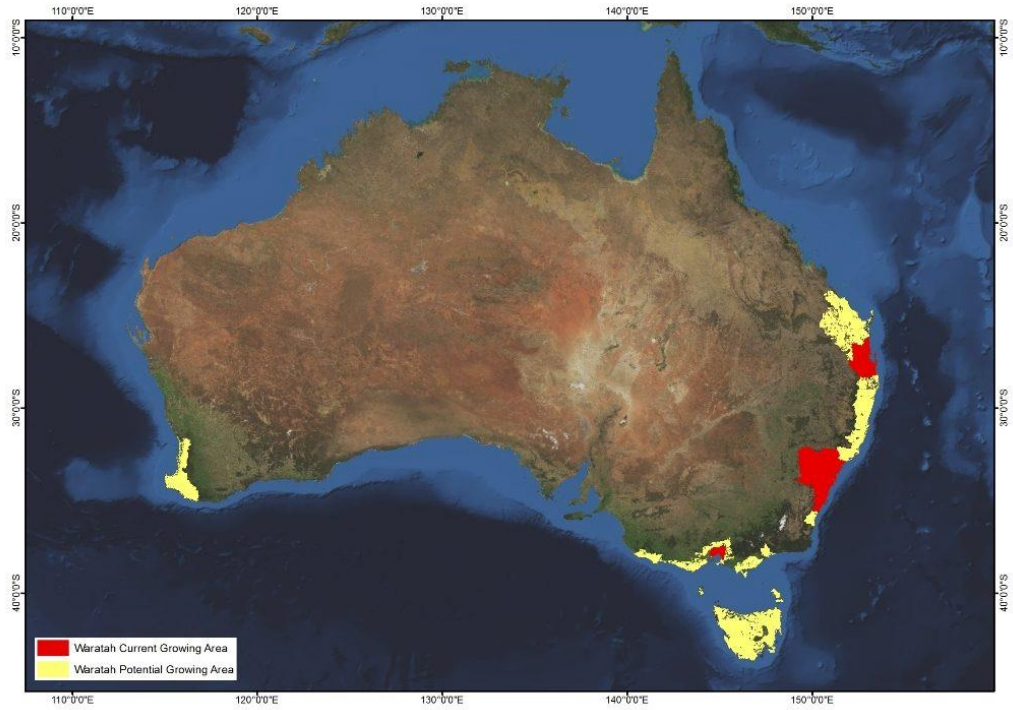
7.2.4 Suitability for growing Protea species in Australia. Adapted from Agrifutures: Protea (2017); https://www.agrifutures.com.au/farm-diversity/protea/.



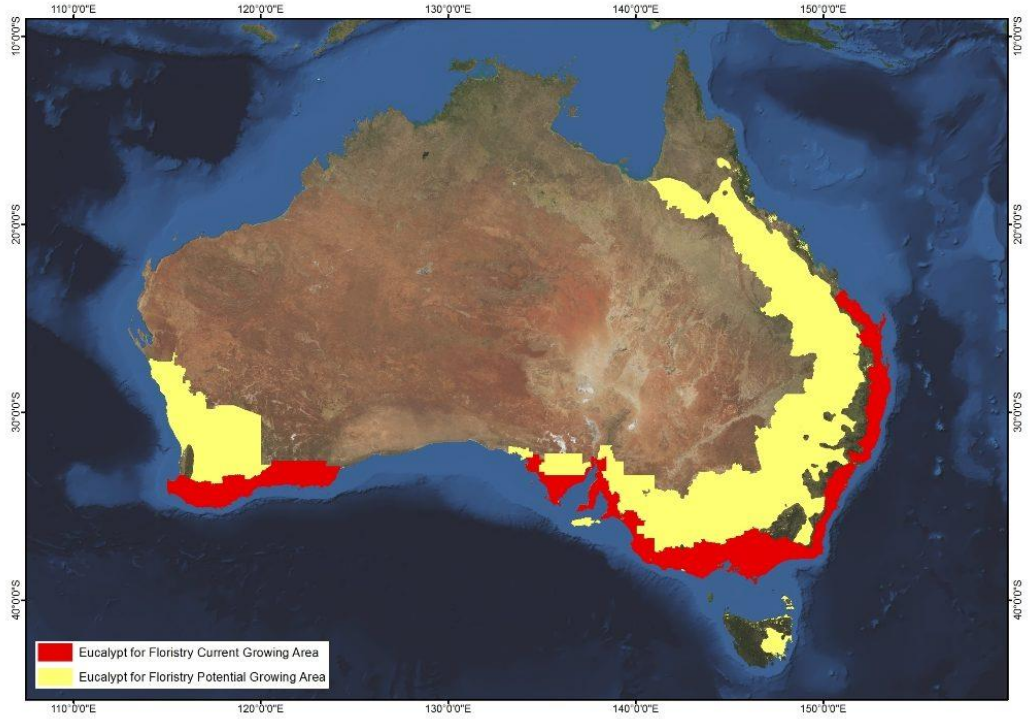
7.2.5 Suitability for growing wax flower species in Australia. Adapted from Agrifutures: Waxflower (2017); https://www.agrifutures.com.au/farm-diversity/waxflower/.



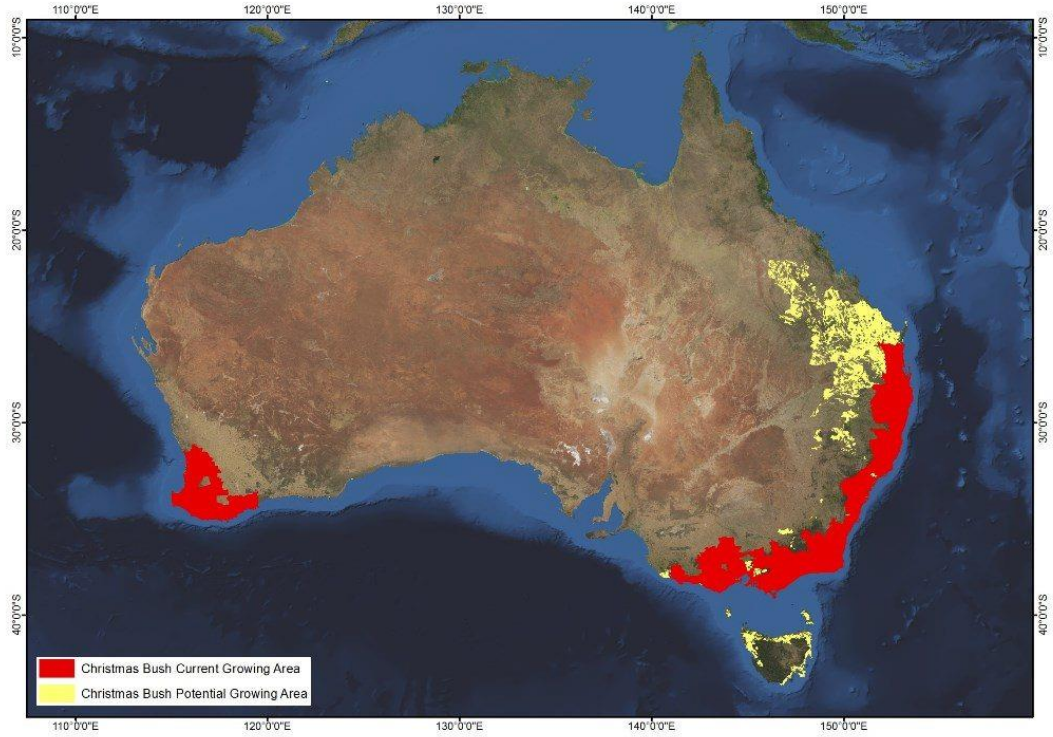
7.2.6 Suitability for growing waratah in Australia. Adapted from Agrifutures: Waratah (2017); https://www.agrifutures.com.au/farm-diversity/waratah/.



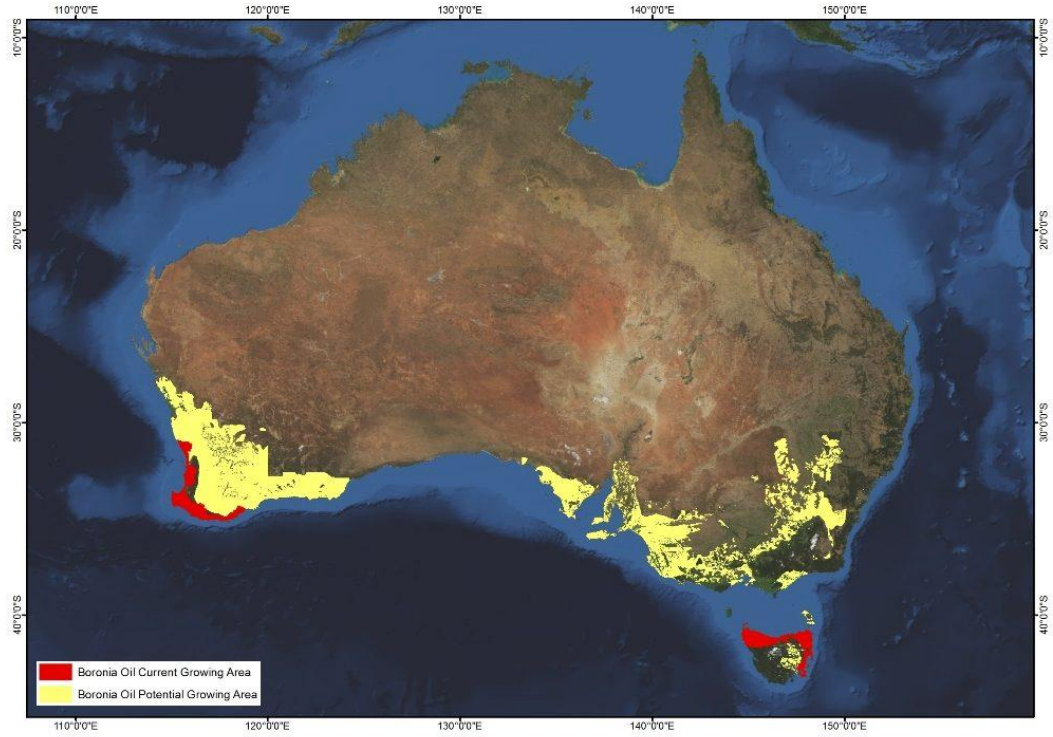
7.2.7 Suitability for growing Eucalypts in Australia. Adapted from Agrifutures: Eucalypts (floristry) (2017); https://www.agrifutures.com.au/farm-diversity/eucalypts-floristry/.



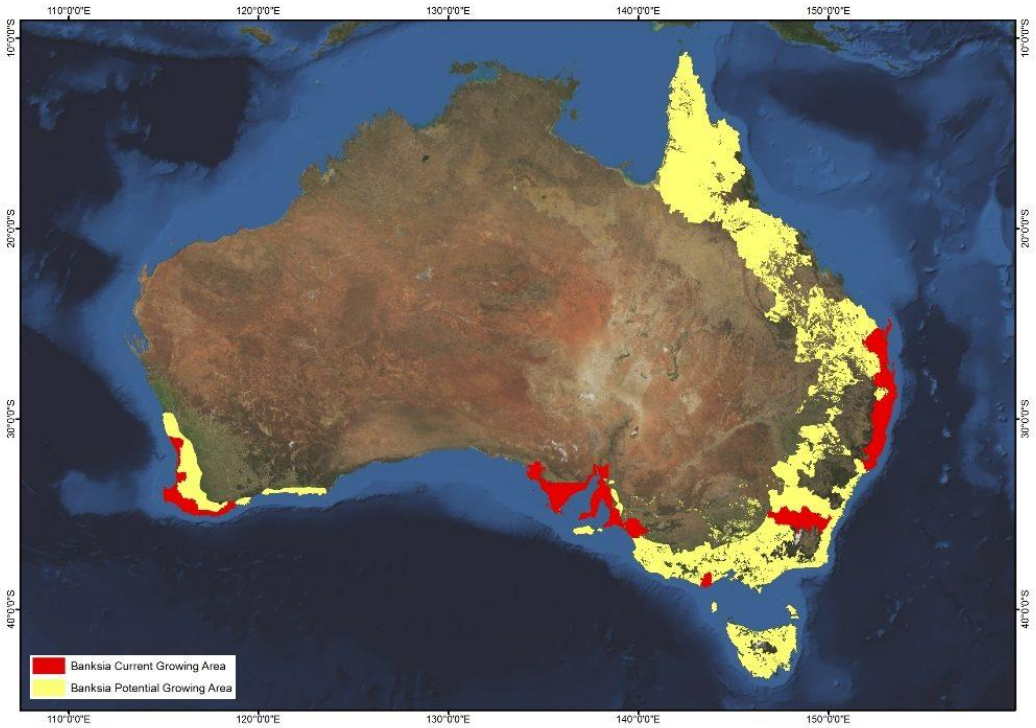
7.2.8 Suitability for growing Christmas bush in Australia. Adapted from Agrifutures: Christmas Bush (2017); https://www.agrifutures.com.au/farm-diversity/christmas-bush/.



7.2.9 Suitability for growing Boronia species in Australia. Adapted from Agrifutures: Boronia Oil (2017); https://www.agrifutures.com.au/farm-diversity/boronia-oil/.



7.2.10 Suitability for growing Banksia species in Australia. Adapted from Agrifutures: Banksia (2017); https://www.agrifutures.com.au/farm-diversity/banksia/.



8.0 References

ACOLA 2020, The future of agricultural technologies, https://acola.org/hs6-future-agricultural-technologies/.

Adams, WC 2015, *Handbook of Practical Program Evaluation: Fourth Edition*, Wiley Blackwell.

Agriculture, Do 2020, *Importing cut flowers and foliage*, Australian Government, https://www.agriculture.gov.au/import/goods/plant-products/cut-flowers-foliage

Agriculture, Do 2020, *Plant Health Committee (PHC)*, Commonwealth of Australia, https://www.agriculture.gov.au/biosecurity/australia

Agriculture, Do 2020, Biosecurity in Australia, *Commonwealth of Australia*,https://www.agriculture.gov.au/biosecurity/australia

Agriculture, Do 2020, Importing cut flowers and foliage, *Australian Government*, https://www.agriculture.gov.au/import/goods/plant-products/cut-flowers-foliage

AgriFutures 2017, Native flower suitability, *Rural Industries Research & Development Corporation (RIRDC*), https://www.agrifutures.com.au/farm-diversity/flannel-flower/>.

Ahmed, JU, Linda, IJ & Majid, MA 2018, Royal FloraHolland: Strategic Supply Chain of Cut Flowers Business, *SAGE Publications, SAGE Business Case Originals*, DOI: http://dx.doi.org/10.4135/9781526461919.

Alam, I 2005, Fieldwork and data collection in qualitative marketing research, *Qualitative Market Research*, vol. 8 (1), pp. 97-112.

APEC 1998, Apec Air Shipment Of Live And Fresh Fish & Seafood Guidelines, *First Coastal Corporation*, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi5leqN5a3sAhWhyDgGHTUADgsQFjAEegQIBBAC&url=https%3A%2F%2Fapec.org%2F-%2Fmedia%2FAPEC%2FPublications%2F1998%2F12%2FAPEC-Air-Shipment-of-Live-and-Fresh-Fish-and-Seafood-Guidelines%2F98_fwg_airshipment.pdf&usg=AOvVaw2qvRhGozIzM3q9eiGliKsH

Artuso, F & Guijt, I 2020, *GLOBAL MEGATRENDS*, Oxfam.

Ash, S. and Clayton, P. 2009, Generating, Deepening, and Documenting Learning: The Power of Critical Reflection in Applied Learning, *Journal of applied learning in higher education*, vol. 1, p. 25.

Austrade 2020, Consumer products to China, https://www.austrade.gov.au/australian/export/export-markets/countries/china/industries/Consumer-products.

Azuma, M, Onozaki, T & Ichimura, K 2019, Effects of bacterial proliferation and soluble carbohydrate levels on the vase life of cut dahlia (*Dahlia variabilis*) flowers, *The Horticulture Journal*, vol. 88, no. 1, pp. 106–115.

Batt, P. 2001, Strategic Lessons to Emerge from an Analysis of Selected Flower Export Nations, *Journal of International Food & Agribusiness Marketing*, vol. 11, no. 3, pp. 41-54.

Belwal, R. and Chala, M. 2008, Catalysts and barriers to cut flower export, *International Journal of Emerging Markets*, vol. 3, no. 2, pp. 216-35.

Boddy, C. 2016, 'Sample size for qualitative research', *Qualitative Market Research: An International Journal*,vol. 19, no. 4, pp. 1352-2752.

Brennan R., Crowhurst A., Webb M. & Agriculture Western Australia, Albany 1998, The growth of yellow bells (*Geleznowia verrucosa*) seedlings in response to additions of nitrogen, potassium and phosphorus fertiliser, *Australian Journal of Experimental Agriculture*, vol. 38, no. 4, pp. 385–390.

Brennan RF, Webb MG & Crowhurst AM 2000, Yield responses of mulla mulla (*Ptilotus exaltatus* Nees.) seedlings to additions of nitrogen, potassium and phosphorus fertiliser, *Australian Journal of Experimental Agriculture*, vol. 40, no. 6, pp. 867–871.
Burgio-Ficca, C. 2019, Flower Retailing in Australia, *IBIS World*, https://my-ibisworld-com.ezproxy.library.uq.edu.au/au/en/industry/g4274/about
Buxbaum, P 2018, Air cargo: Perishables technologies transforming logistics, *Global Trade*,https://www.globaltrademag.com/air-cargo-perishables-technologies-transforming-logistics/
CBI 2017, What competition do you face on the European cut flowers and foliage market?, *Ministry of Foreign Affairs*, https://www.cbi.eu/market-information/cut-flowers-foliage/competition#market-entry-what-are-the-opportunities-and-barriers-when-i-try-to-enter-the-market .
Central Queensland Native Flower Association Inc. 2000, http://www.members.tripod.com/cqnativeflowers/.
Chapman, T 2016, *Regulation of Australian Agriculture*, https://www.pc.gov.au/__data/assets/pdf_file/0008/195974/sub042-agriculture.pdf.
Chapman, W. 2020, *Floriculture Production in Australia*, IBIS World, https://my-ibisworld-com.ezproxy.library.uq.edu.au/au/en/industry/a0116/about
Cheikhrouhou, N, Pouly, M & Madinabeitia, G 2013, Trust categories and their impacts on information exchange processes in vertical collaborative networked organisations, *International Journal of Computer Integrated Manufacturing: Collaborative Networks as Modern Industrial Organisations: Real Case Studies*, vol. 26, no. 1-2, pp. 87-100.
Council, I 2019, *The Ugly Side of Flowers*, https://invasives.org.au/blog/ugly-side-of-flower-power/.
Damunupola, J, Qian, T, Muusers, R, Joyce, D, Irving, D and Van Meeteren, U 2010, Effect of S-carvone on vase life parameters of selected cut flower and foliage species, *Postharvest Biology and Technology*, vol. 55, no. 1, pp. 66–69.
Dawes, S & Schremmer, J 2020, Global flower industry suffers $1.5b loss, but Australian industry may bloom as a result, *ABC2020*, https://www.abc.net.au/news/rural/2020-05-28/coronavirus-pandemic-hits-global-flower-industry/12289132
Deewatthanawong, R, Chanapan, S & Suwanagul, A 2017, Evaluation of methyl bromide alternatives to control thrips in orchid cut-flowers, *Acta Horticulturae*, vol. 1167(1167), pp. 393-8.
Deloitte 2017, *Beyond the Noise*, https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/public-sector/deloitte-nl-ps-megatrends-2ndedition.pdf
Diaz Ruiz, C & Holmlund, M 2017, Actionable marketing knowledge: A close reading of representation, knowledge and action in market research, *Industrial Marketing Management*, vol. 66, pp. 172–180.
Ekman, J, Eyre, J & Joyce, D 2008, Flowers by Sea Improving Market Access for Australian Wildflowers, *Rural Industries Research and Development Corporation*.
Elliott, J 2005, Using Narrative in Social Research, *SAGE Publications Ltd, London*, https://methods.sagepub.com/book/using-narrative-in-social-research.
Erlingsson, C & Brysiewicz, P 2017, A hands-on guide to doing content analysis, *African Journal of Emergency Medicine*, vol. 7(3), pp. 93-9.
ESPAS 2020, *WELCOME TO* , https://ec.europa.eu/assets/epsc/pages/espas/chapter1.html
Faragher, J, Gollnow, B, Joyce, D 2010, Postharvest Handling of Australian Flowers from Australian Native Plants and Related Species, *Australian Government, RIRDC*, https://www.agrifutures.com.au/wp-content/uploads/publications/10-027.pdf

Fig&Bloom 2019, Australian native flowers are growing in popularity, https://www.figandbloom.com.au/flowers/australian-native-flowers/.
Food, DoAa 2009, Plan to Support Horticulture Industry Development, Perth WA.
ForeX 2020, Trading AUD/JPY Forex Pair, https://www.topratedforexbrokers.com/education-and-guides/aud-jpy/.
Galletta, A 2012, Mastering the semi-structured interview and beyond from research design to analysis and publication, *New York University Press, New York*.
Gebhardt, A 2015, Holland Flowering: How the Dutch Flower Industry Conquered the World, *Amsterdam: Amsterdam University Press*.
Gill, P, Stewart, K, Treasure, E & Chadwick, B 2008, 'Methods of data collection in qualitative research: Interview and focus groups', *British Dental Journal*, vol. 204 (6), pp. 291-295.
Golafshani, N 2003, Understanding reliability and validity in qualitative research, *Qualitative report*, vol. 8 (4), p. 597.
Gollnow, B 2003, Commercial flower growing in NSW - an industry snapshot, *NSW Government*,http://archive.dpi.nsw.gov.au/content/agriculture/horticulture/snapshot.
Green, L 2020, *Singapore's Gardens by the Bay*, http://gardentravelhub.com/singapores-gardens-by-the-bay/
Gregg, AP & Klymowsky, J 2013, The Implicit Association Test in Market Research: Potentials and Pitfalls, *Psychology & Marketing*, vol. 30 (7), pp. 588–601.
Gyarmathy, VA, Johnston, LG, Caplinskiene, I, Caplinskas, S and Latkin, CA 2014, A simulative comparison of respondent driven sampling with incentivized snowball sampling – The "strudel effect", *Drug and Alcohol Dependence*, vol. 135 (1), pp. 71–77.
Hajkowicz, S, Cook, H & Littleboy, A 2012, *Our future world*, CSIRO.
Hatt, S, Lopes, T, Boeraeve, F, Chen, J & Francis, F 2017, Pest regulation and support of natural enemies in agriculture: Experimental evidence of within field wildflower strips, *Ecological Engineering*, vol. 98, pp. 240-5.
Hort Innovation 2018, Nursery Industry Statistics and Research,https://www.greenlifeindustry.com.au/Attachment?Action=Download&Attachment_id=2170.
Horticulture Innovation Australia Limited 2020, The Australian Horticulture Statistics Handbook 2018/19, *Freshlogic*, https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/HA18002/.
International Trade Centre 2020, Floriculture, I*TC*, https://www.intracen.org/itc/sectors/floriculture/
Janick, J 2010, Leaf Blackening in Cut Protea Flowers, *In Horticultural Reviews*, pp. 173–201, John Wiley & Sons, Inc.
KadleČÍKovÁ, Mária, K, Zuzana, F & Michal 2012, The Impacts of the Global Financial Crisis on Agriculture in Central and Eastern Europe and in Central Asia, *Acta oeconomica et informatica*, vol. 15 (2), pp. 43-6.
Kim, J-H 2016, Understanding narrative inquiry : the crafting and analysis of stories as research, *SAGE Publications, Inc., Thousand Oaks, California Los Angeles, CA.*
Korovkin, T 2005, Creating a Social Wasteland? Non-traditional Agricultural Exports and Rural Poverty in Ecuador, *European Review of Latin American and Caribbean Studies*, vol. 47, pp. 55.
Kotler, A 2014, Foundations of Marketing, *P.Ed Custom Books*, Melbourne, ProQuest Ebook Central: https://ebookcentral-proquest-com.ezproxy.library.uq.edu.au
Kuiper, G 2019, Agro-industrial labour in Kenya: cut flower farms and migrant workers' settlements, *Cham, Switzerland: Springer International Publishing*.

Labov, W 1972, Language in the Inner City: Studies in the Black English Vernacular, *Oxford: Basil Blackwell*.
Lemon, LL & Hayes, J 2020, Enhancing Trustworthiness of Qualitative Findings: Using Leximancer for Qualitative Data Analysis Triangulation, *Qualitative report*, vol. 25 (3), p. 3.
Leung, L 2015, Validity, reliability, and generalizability in qualitative research, *Journal of family medicine and primary care*, vol. 4(3), pp. 324-7.
Lieblich, A, Tuval-Mashiach, R & Zilber, T 1998, Narrative Research, *SAGE Publications, Inc., Thousand Oaks, Califor*nia, https://methods.sagepub.com/book/narrative-research.
Lim-Camacho, L, Collins, R & Dunne, T 2008, Exporting Wildflowers to Japan, *RIRDC*,https://www.agrifutures.com.au/wp-content/uploads/publications/07-173.pdf.
Logan, T 2018, Australian native flower industry looking for growers to stock booming local, international markets, *ABC*, https://www.abc.net.au/news/2018-11-25/australian-native-flowers-in-demand-need-for-more-growers/10519518
Longhurst, R 2016, Key Methods in Geography, *SAGE*.
Lu, P, Huang, X, Li, H, Liu, J, He, S, Joyce, DC & Zhang, Z 2011, Continuous Automatic Measurement of Water Uptake and Water Loss of Cut Flower Stems, *HortScience*, vol. 46 (3), pp. 509–512.
Malhotra, NK 2019, Marketing Research: An Applied Orientation, Global Edition, *Pearson Education Limited, Harlow, United Kingdom*.
Mena 2019, Australia : Wildflower Friendliness Rating Scheme launched, *SyndiGate Media Inc*., 2219-0112.
Mishler, EG 1991, Research interviewing context and narrative, *lst Harvard University Press*, Cambridge, MA.
Mold, A 2020, Crisis? What crisis? COVID-19 and the unexpected recovery of regional trade in East Africa, *Brookings*.
Moser, A. and Korstjens, I. 2018, Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis, *European Journal of General Practice*, vol. 24 (1), pp. 9-18.
Muhammad, A., D'Souza, A. and Amponsah, W. 2011, Violence, Political Instability, and International Trade: Evidence from Kenya's Cut Flower Sector, *IDEAS Working Paper Series from RePEc*.
Narsimhalu, U, Potdar, V & Kaur, A 2015, A Case Study to Explore Influence of Traceability Factors on Australian Food Supply Chain Performance, *Procedia - Social and Behavioral Sciences*, vol. 189, pp. 17-32.
Native Plants Qld 2018, https://www.npq.org.au/aboutus/history
Noble, H & Smith, J 2015, Issues of validity and reliability in qualitative research, *Evidence Based Nursing*, vol. 18(2), pp. 34-5.
Oakley, B, Brent, R, Felder, R & Elhajj, I 2004, Turning student groups into effective teams, *Journal of Student Centered Learning*, vol. 2.
Patidar 2015, *Export Container Insulation*, http://www.patidarcorporation.com/product/export-container-insulation/
Patterson, W 2008, Doing Narrative Research, *SAGE Publications*, Ltd., London, https://methods.sagepub.com/book/doing-narrative-research
Pezeshki, Y, Baboli, A, Cheikhrouhou, N, Modarres, M & Akbari Jokar, MR 2013, A rewarding-punishing coordination mechanism based on Trust in a divergent supply chain, *European Journal of Operational Research*, vol. 230 (3), pp. 527-38.
Prado, AM 2013, Competition Among Self-Regulatory Institutions: Sustainability Certifications in the Cut-Flower Industry, *Business & Society*, vol. 52 (4), pp. 686–707.

Prendergast, J 2020, Native wildflower boom during COVID-19 pandemic, *ABC*,https://www.abc.net.au/news/2020-08-06/boom-in-native-flowers-grows-during-covid-pandemic/12519474

Queensland Farmers' Federation 2015, Planning Guideline for Intensive Horticulture and Production Nurseries, https://www.qff.org.au/wp-content/uploads/2016/11/QFF-Guide-to-Planning-Intensive-Hort-Prod.pdf.

Rabobank 2015, World Floriculture Map, *Rabobank Industry Note #475*, Netherlands, https://www.rabobank.com/en/images/World_Floriculture_Map_2015_vanRijswick_Jan2015.pdf

Reardon, T. 2011, The Supermarket Revolution In Food, *The Crawford Fund*.

Reardon, T, Timmer, CP & Minten, B. 2012, Supermarket revolution in Asia and emerging development strategies to include small farmers, *Proceedings of the National Academy of Sciences of the United States of America*, vol. 109 (31), pp. 12332-7.

RIRDC 2013, Getting Started in Wildflower Growing, https://www.agrifutures.com.au/wp-content/uploads/publications/12-090.pdf?fbclid=IwAR2d4srMTe6dG1UO9GWllUKxq19KpEHzzKooPFDJjKDZjT8lHTlSMGJQxUY.

Schneer, D 2016, Guidelines for a Holistic Evaluation of Marketing Research Studies. A Case Study, https://www.linkedin.com/pulse/guidelines-holistic-evaluation-marketing-research-iot-schneer-ph-d-

Staelens, L, Desiere, S, Louche, C & D'Haese, M 2018, Predicting job satisfaction and workers' intentions to leave at the bottom of the high value agricultural chain: evidence from the Ethiopian cut flower industry, *International Journal of Human Resource Management*, vol. 29 (9), pp. 1609–1635.

Tanaka, Y, Brugliera, F & Chandler, S 2009, Recent progress of flower colour modification by biotechnology, *International Journal of Molecular Sciences*, vol. 10 (12), pp. 5350–5369.

The Research Society 2020, Code of Professional Behaviour, *The Research Society*, https://researchsociety.com.au/documents/item/2796.

University of Queensland 2020, Responsible Conduct of Research, *University of Queensland*,https://ppl.app.uq.edu.au/content/4.20.02-responsible-conduct-research.

Usman, M, Ali, A, Hassan, S & Abid, M 2015, An efficiency analysis of tuberose cut-flower: a case study, *Journal of Animal and Plant Sciences*, vol. 25 (6), pp. 1699–1706.

Van Horen, L, van Rijswick, C 2020, Floriculture Demand Collapses Dramatically Under Coronavirus Pressure, *Rabobank: Rabo Research*, https://research.rabobank.com/far/en/sectors/fresh-produce/floriculture-demand-collapses-under-coronavirus.html.

Van Uffelen, R & de Groot, N 2005, Floriculture world wide; production, trade and consumption patterns show market opportunities and challenges, *Agricultural Economics Institute*, DOI: 10.22004/ag.econ.29148.

Warren, J 2015, Country of origin labelling and purchasing cut flowers in Australia: What are the social and moral considerations for consumers?, A*ustralian Journal of Environmental Law*, vol. 2 (1), pp. 77–102.

Water, SCoEa 2012, *Australia's native vegetation framework*

Weiss, D & Ohana, O 1996, Flowering control of *Ixodia achillaeoid*es, *Scientia Horticulturae*, vol. 65 (1), pp. 59–64.

Wijnands, J, van der Lans, K & Hobbs, J 2006, International Flower Networks: Transparency and Risks in Marketing Channel Choice, *EAAE Seminar in Germany*, DOI:10.22004/ag.econ.7759

Wildflowers-Australia 2017, Wildflowers Australia, *R&D information*, http://www.wildflowersaustralia.com.au/for-growers-and-value-chain-members/wildflower-r-d-information.html.
Wynne, E 2020, Researchers aim to map genome of WA's distinctive kangaroo paw, opening door to new colours, *ABC*, https://www.abc.net.au/news/2020-10-03/unlocking-the-secrets-of-the-kangaroo-paw/12721962.
Yang, Y, Wen, C, Ma, N & Zhao, L 2015, Heterosis and genetic analysis of branching in cut-flower chrysanthemums, *Euphytica*, vol. 205 (3), pp. 915–925.