

NSW cherry industry situational analysis 2021



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More information

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Cover image: Cherry orchard in blossom, NSW DPI.

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Abstract

The cherry industry is rapidly expanding in Australia to meet increased global consumer demand. To continue sustainable growth, the industry needs to produce high yields of good quality cherries and improve market access.

Through research, development and adoption, NSW Department of Primary Industries (NSW DPI), has the capacity to help the NSW cherry industry improve yield, cherry quality and market access.

For a current industry situation analysis, 52 NSW growers were interviewed and encouraged to discuss their production, challenges and opportunities for research.

From the interviews, the major growing regions for cherries in NSW were Young and Orange, with expanding areas in Mudgee and Gulgong. Most cherry orchards are between 1 and 10 ha, with the majority of respondents intending to increase plantings or intensify their orchards.

Climate and labour were identified as the two biggest constraints to production, with the COVID-19 pandemic exacerbating the labour issue. Improved market access was also high on the list of needs for sustainable expansion of the cherry industry.

Biosecurity, training systems, variety selection, rootstock and netting were the areas that respondents would like to see more research in to aid industry development. The following would also benefit the NSW cherry industry:

- implementing a NextGen Cherry Growers Network to encourage growth and support for cherry growers entering the industry
- weather mitigation strategies including netting and protective rain covers
- climate adaption strategies to improve orchard resilience to changing conditions
- reducing operating costs through new training systems, particularly focused on labour efficiency
- ensuring fruit quality and attributes match export market requirements
- new marketing opportunities, including international markets and value-added products to minimise oversupply on the domestic market.

Introduction

Cherries are loved for their delicious flavour and vibrant colours. With an abundance of phytonutrients to protect against heart disease, reduce inflammation and ease arthritis, cherries are enjoyed by people of all ages (Australian Cherries 2011). Australian cherries are harvested from November to late February, making them a popular fruit during summer. Demand for both domestic and export supply has increased an average of 6% per annum (Hort Innovation 2017), and supply coming out of drought conditions is expected to increase year on year.

Australian cherries are produced in six states, with New South Wales (NSW), Victoria (Vic) and Tasmania (Tas) being the main contributors. NSW growing regions are clustered around Orange and Young, with newer areas in Mudgee and Gulgong and smaller areas in Griffith and Batlow. These new areas have started growing cherries to extend the NSW cherry season.

Expanding planting areas in NSW is encouraging growers to consider other potential growing regions and intensifying their orchards. Land prices might make the former a less feasible option, and orchard intensification will require more research into production, rootstocks, varieties and tree spacing. Crop quality must also remain a priority to ensure market access and reputation. Deploying protective rain covers or nets will help preserve crop quality by reducing the effects of climatic events have on the fruit.

The 2017 Hort Innovation Strategic Investment Plan (SIP) for the Australian Cherry Fund identified some major challenges facing the industry, including more frequent damaging adverse conditions due to climate change, increasing competition from southern hemisphere producers, particularly Chile, increasing input costs and lack of workable market access into higher returning markets (Hort Innovation 2017).

This survey analysis was used to determine if these challenges are reflected in NSW and to identify priorities for research and development. The purpose of this analysis was to understand the current NSW cherry industry, with a focus on production and challenges growers are facing. Most cherry growing regions were included with growers being interviewed about these issues. External stakeholders including Cherry Growers Australia, Hort Innovation and regional agronomists (EE Muir and Sons Orange) were also asked for their input on the challenges they perceived for the NSW cherry industry.

Methods

Survey

A survey containing 37 questions (Appendix 1) was created by NSW DPI staff involved in the NSW cherry industry. Cherry growers were contacted through the NSW DPI mailing list and the NSW DPI Temperate Fruits Facebook page. Growers were asked to organise a time to meet for an interview at their orchard and were then individually contacted as a reminder. Growers not on the mailing list were found by word of mouth, business websites and a Facebook search using the search criteria terms 'cherry orchard' and location such as Bathurst, Orange, Young, Armidale and Hillston.

The surveys were conducted as interviews, where the questions were used to guide the discussion. This allowed growers to provide further comments and clarification of questions. Growers were able to show us their orchards and we were able to get a better understanding of their challenges.

A separate set of questions based around similar themes of production challenges, pest and disease pressures were given to Cherry Growers Australia, Hort Innovation and EE Muirs and Sons, Orange. Their comments were then used to inform the discussion section of this analysis.

Data analysis

The data were entered into an Excel spreadsheet for analysis. Response rate was calculated as the total number of completed surveys returned relative to the total number distributed. Percentages were calculated as a proportion of the total number of respondents for each response and did not include non-respondents.

Results

Response rate

There are currently 77 registered cherry growers in NSW (ABARES, 2020). Of these, 52 were interviewed as part of this analysis, giving a response rate of 68%.

Demographics

The majority (82%) of cherry orchards in NSW are operated and managed by males, however females are heavily involved in the packing and marketing of the product. Most (42%) NSW cherry growers are between 31–50 years of age, with 33% of the industry over 66 years (Figure 1). Almost one third (29%) of respondents have been cherry growers for more than 26 years (Figure 2).

Orchard characteristics

Cherry orchards are spread throughout NSW, with Orange and Young identified as major centres (Figure 3). NSW cherry orchards are between 1 and 10 hectares or 11 and 20 hectares (59% and 29% respectively; Figure 4) and most growers want to increase (62%) or maintain (38%) their cherry production area (Figure 5).

Colt is the primary rootstock used, followed by Gisela 6 and Mahaleb (Figure 6). There are many varieties grown throughout NSW, with Lapin (12%), Regina (9%) and Simone (7%; Figure 7) being the most planted.

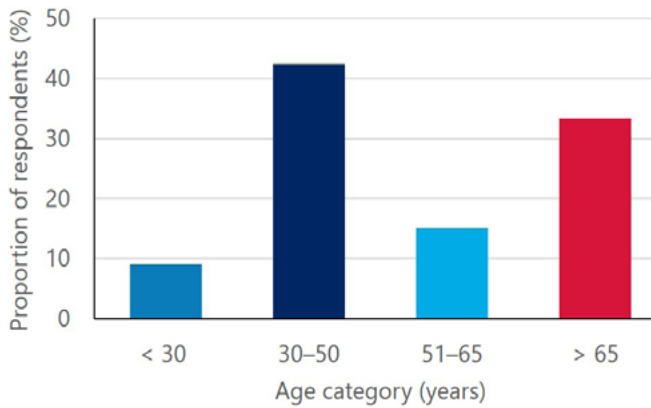


Figure 1. Age groups of respondents.

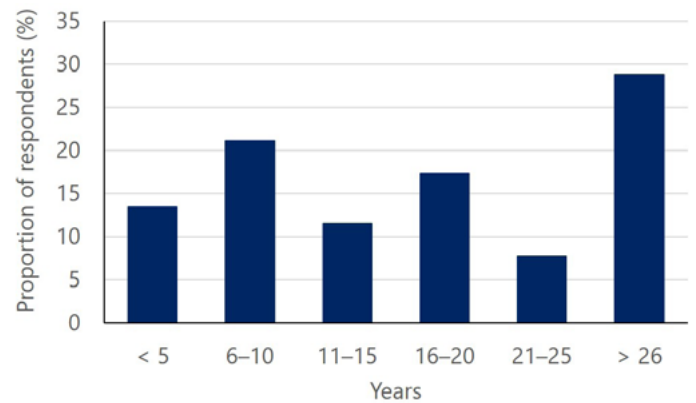


Figure 2. Number of years respondents have been cherry growers.

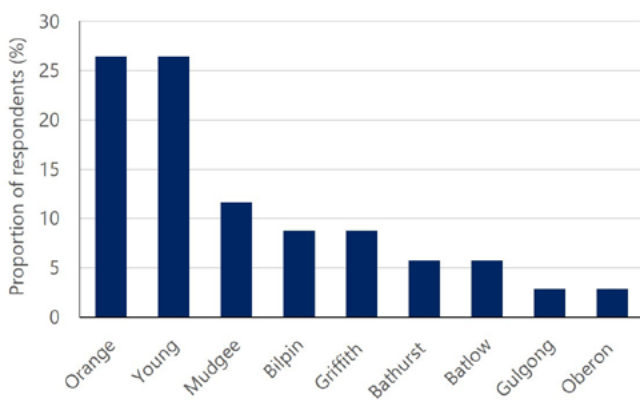


Figure 3. Location of cherry orchards in NSW.

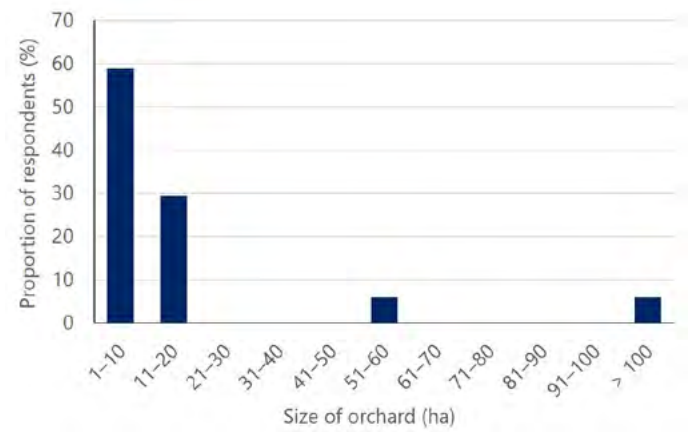


Figure 4. Size of cherry orchards in NSW.

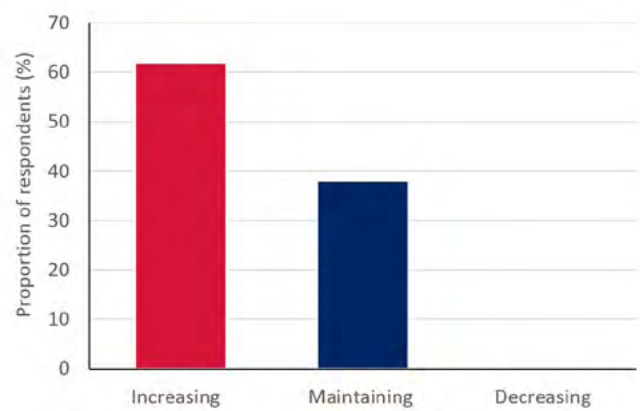


Figure 5. Cherry growers' intentions for plantings in NSW cherry orchards.

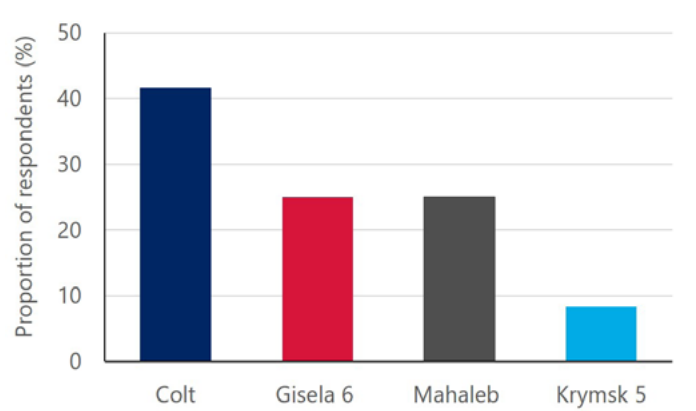


Figure 6. Most common rootstocks used by respondents in NSW cherry orchards.

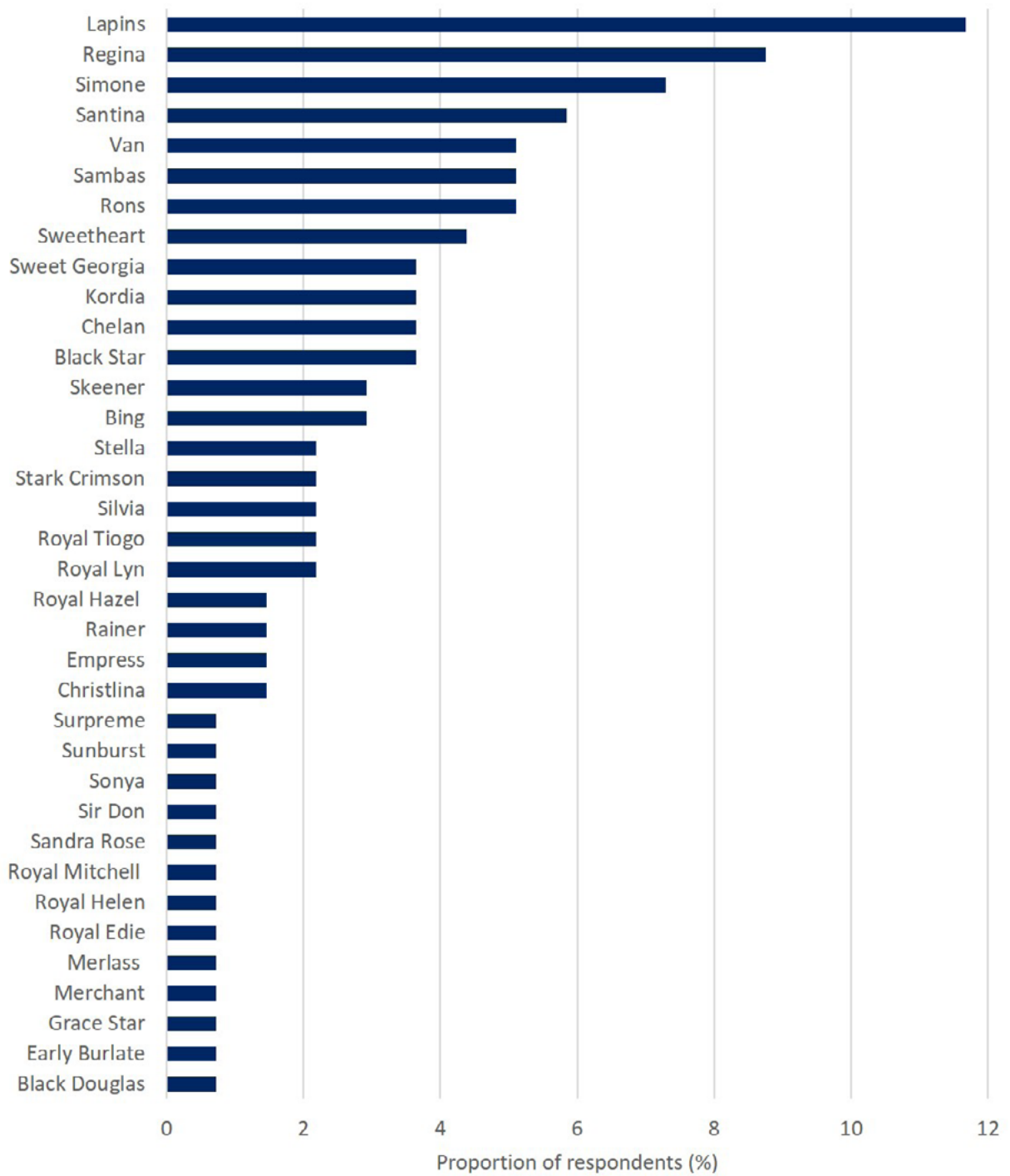


Figure 7. Varieties grown by respondents in their NSW cherry orchards.

Orchard management practices

The majority of respondents do not use protective rain covering or bird netting (96% and 63%, respectively) in NSW cherry orchards (Figure 8 and Figure 9).

European earwig (*Forficula auricularia*) was identified as the most common pest in cherry orchards (Figure 10) while brown rot (*Monilinia fructicola*) and bacterial canker (*Pseudomonas syringae*) were identified as the most common diseases (Figure 11).

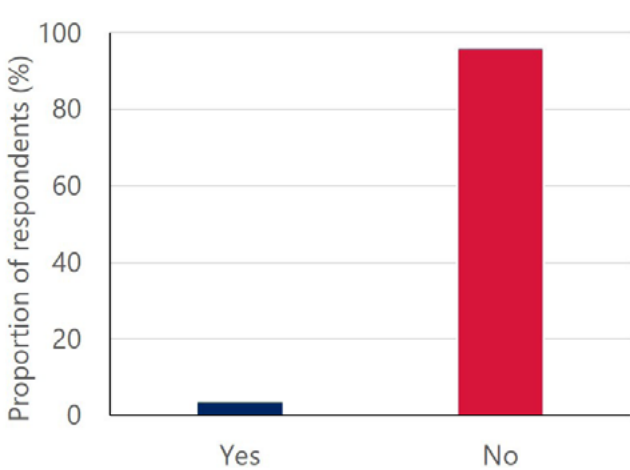


Figure 8. Proportion of growers using protective covering in their cherry orchards.

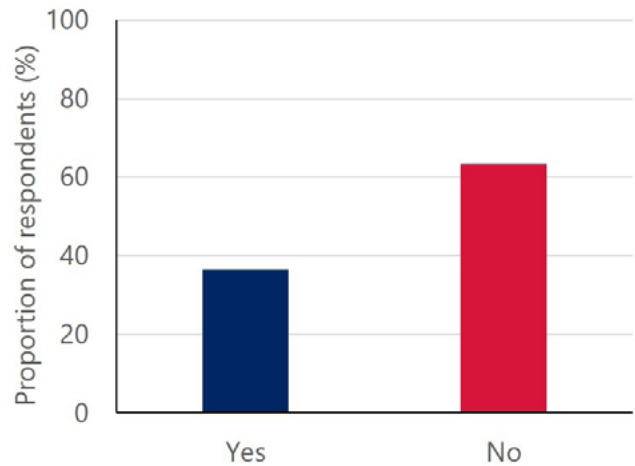


Figure 9. Proportion of growers using protective netting in their cherry orchards.

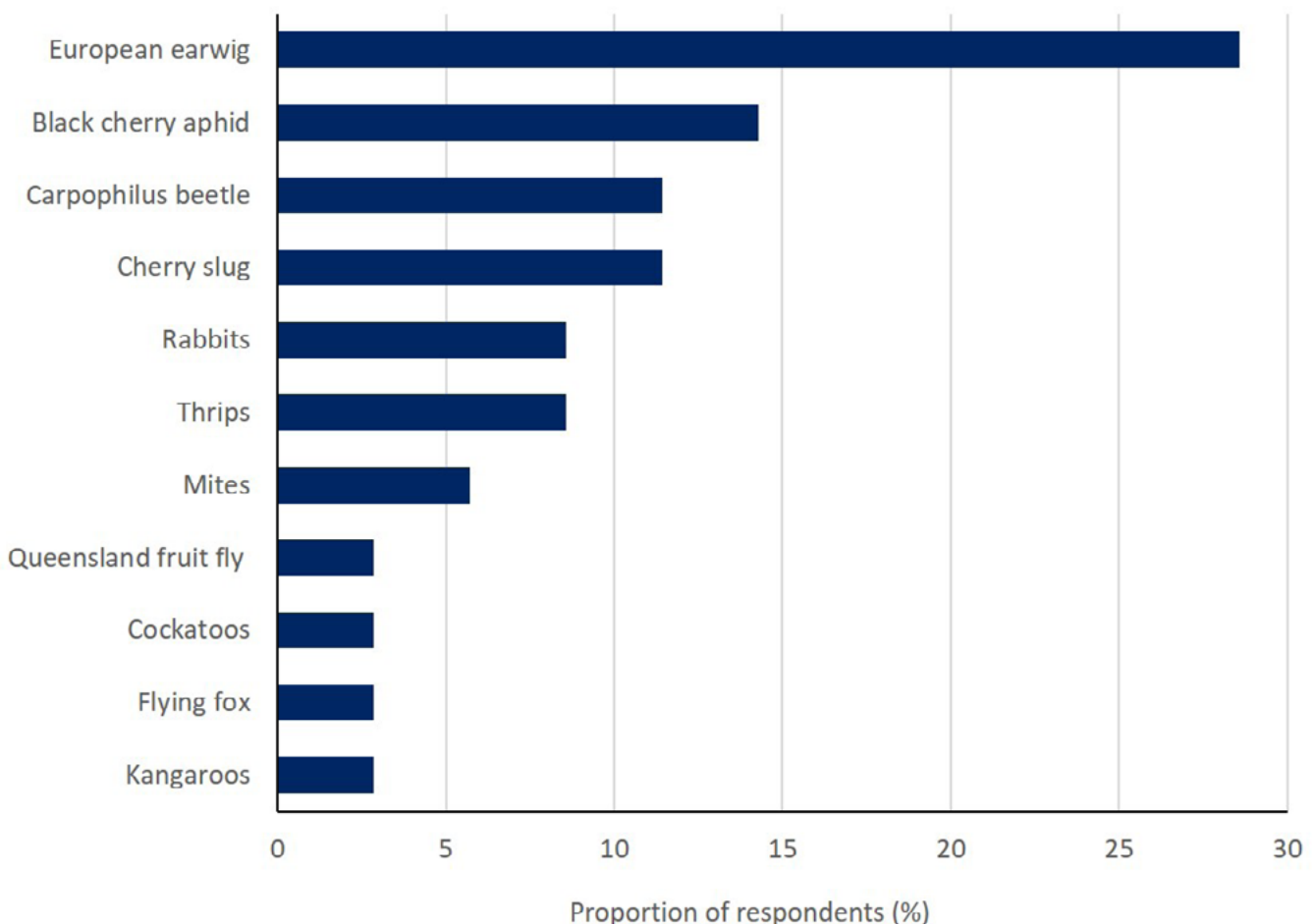


Figure 10. The main pests found in NSW cherry orchards.

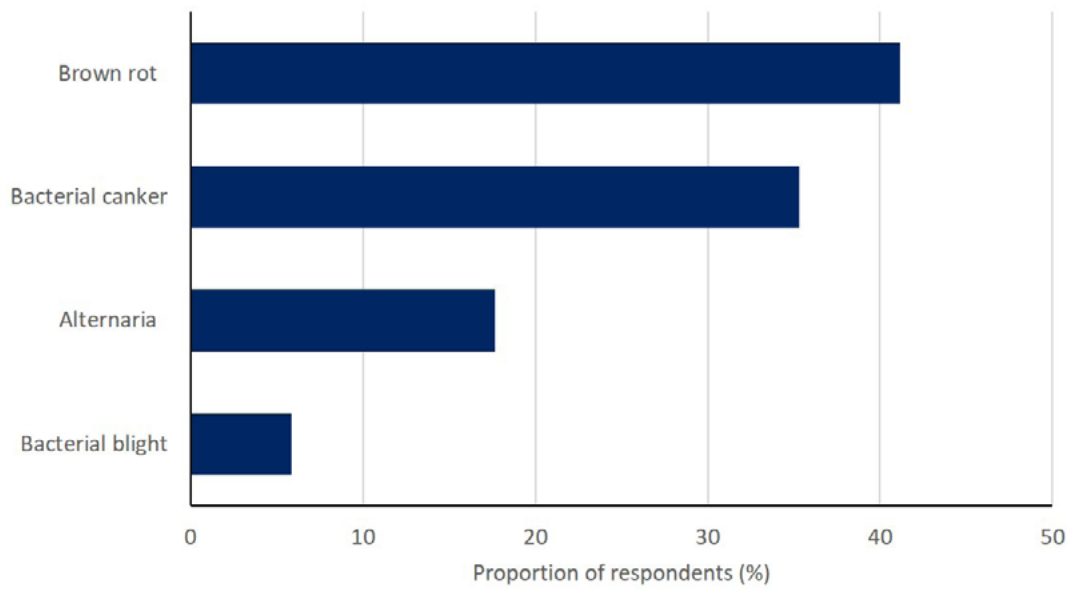


Figure 11. The main diseases found in NSW cherry orchards.

Of the growers surveyed, 96% use irrigation. Of these, 60% use drip irrigation while 37% use a micro-sprinkler system (Figure 12).

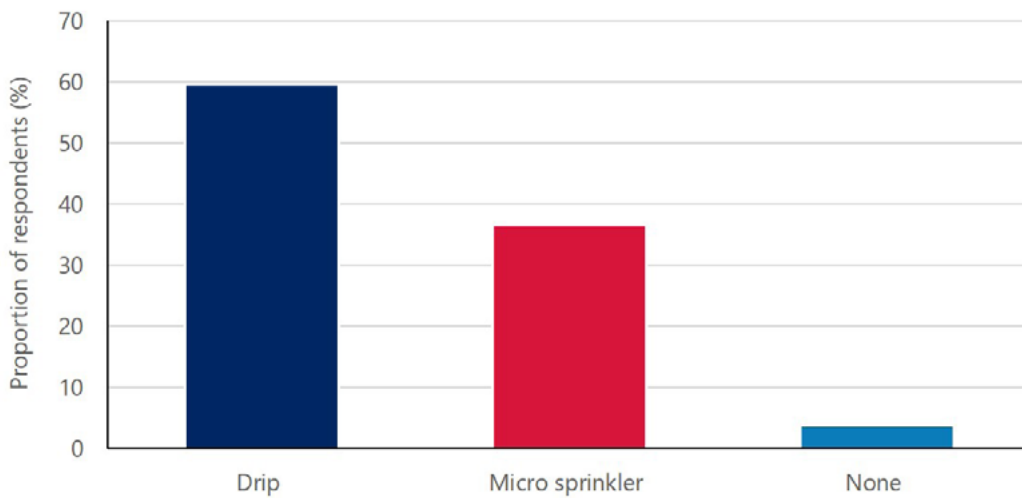


Figure 12. Types of irrigation used by respondents in NSW cherry orchards.

Labour

The number of staff required in cherry orchards including in the packhouse varies (Figure 13) and they are predominantly sourced from labour hire companies and local townspeople (27% and 25% respectively, Figure 14).

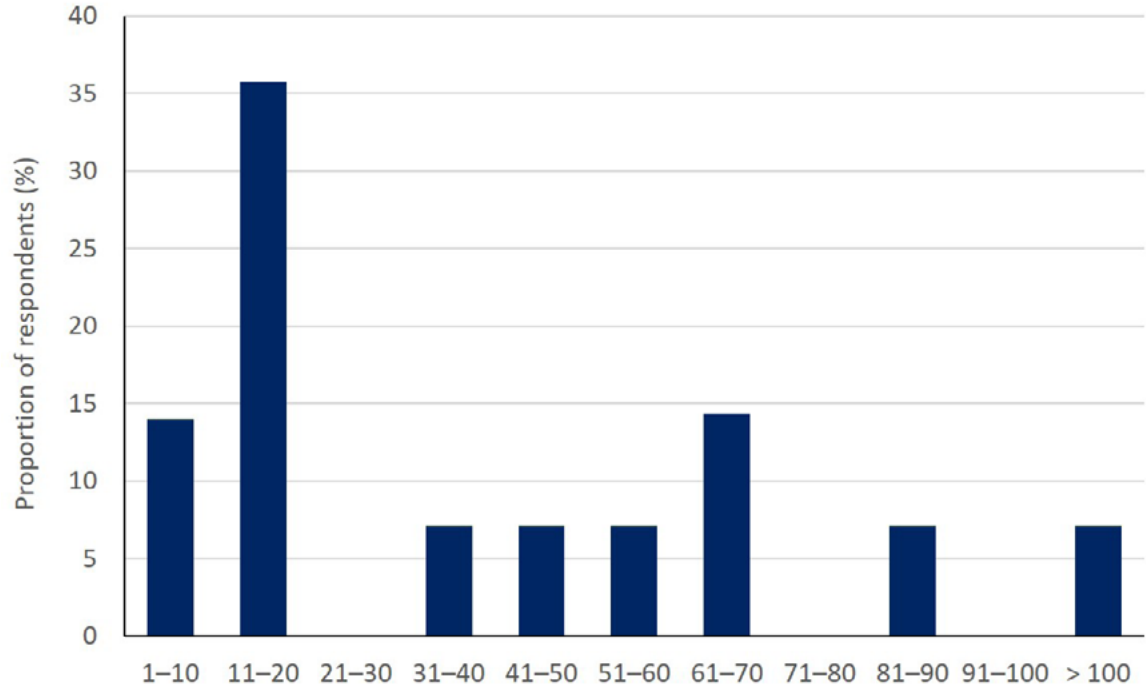


Figure 13. The number of casual staff required in the NSW cherry growing season.

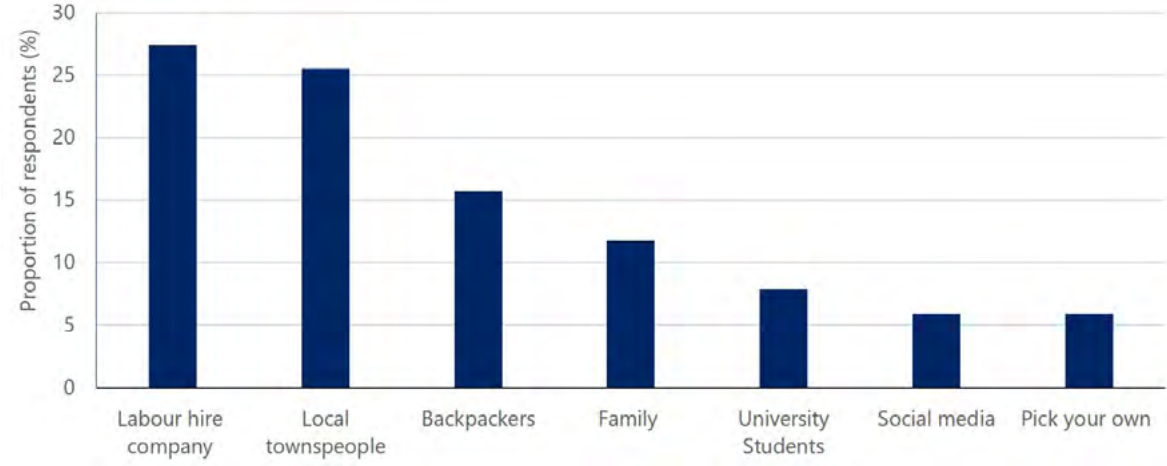


Figure 14. Sources respondents use to fill labour requirements for the NSW cherry season.

Markets

Cherries grown in NSW that are destined for the domestic market are predominantly sent to wholesale markets (34%) or sold at the farm gate (31%; Figure 15). Almost half of the respondents (53%) use export markets to sell cherries and 35% of exports go to China (Figure 16).

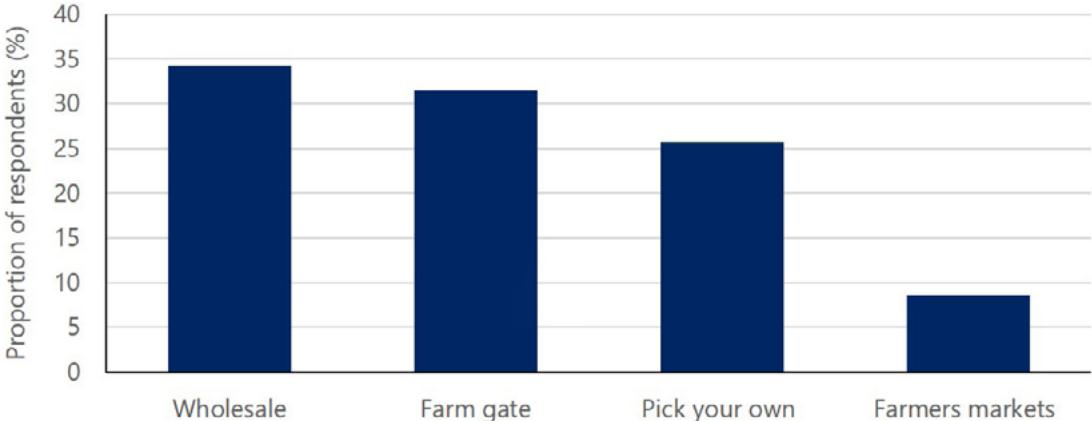


Figure 15. Types of markets used by NSW cherry growers.

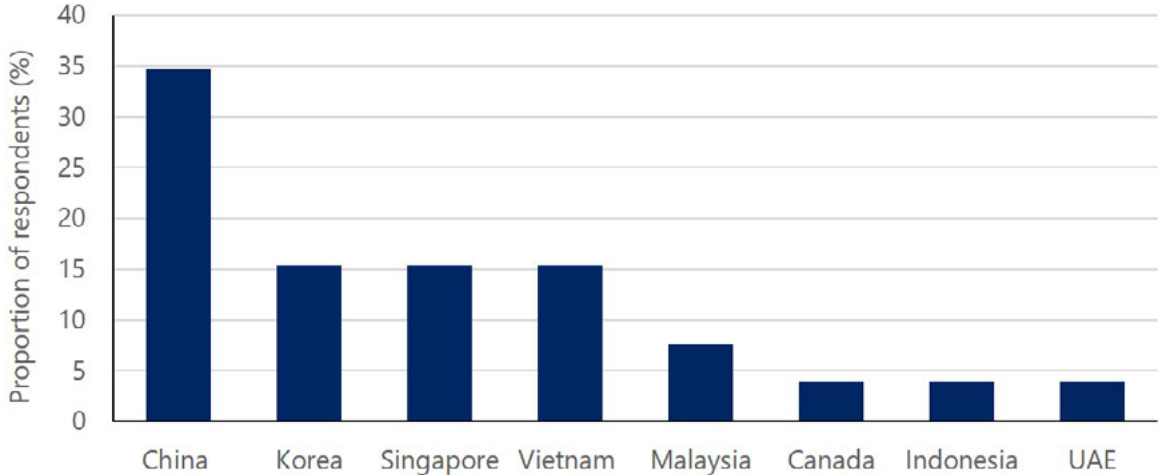


Figure 16. Countries to which cherries are exported.

Challenges

Survey respondents were asked to list the biggest challenges they see affecting the production and sustainability of the NSW cherry industry. Climate and labour were identified as the major challenges (30% and 27% respectively, Table 1).

Table 1. The main challenges faced by the NSW cherry industry according to respondents.

Challenge	Proportion of respondents identifying the challenge
Climate	30
Labour	27
Quality issues	8
Production cost	8
Market access	8
Expansion	5
Biosecurity	5
Water	3
Chilling requirements	3
Chemical availability	3

Targeted areas for research and development

Respondents were asked to suggest areas of research they think should be prioritised. This was an open response and answers were categorised into broad areas. Biosecurity, training systems, variety selection, netting and rootstock research were the most commonly given responses (Table 2).

The majority (70%) of respondents indicated they would be interested in joining a study tour focused on crop production and improving quality.

Table 2. Areas that NSW cherry growers would like to see more research.

Research areas	Proportion of respondents indicating this topic (%)
Biosecurity	16
Training systems	16
Variety selection	16
Netting research	12
Rootstock research	12
Mechanical harvesting	8
Nutrition	8
Building on previous research	4
Climate adaptation	4
Improving fruit quality	4
Market access	4
Stemless cherries	4
Value added products	4
Water efficiency	4

Discussion

Having baseline data reflecting the current position of the NSW cherry industry provides a clearly defined starting point for future work. It also provides a reference point from which to measure and compare the outcomes of future projects, ensuring industry needs are met. The results give an overview of the NSW cherry industry and will be used to tailor the direction of the work of NSW DPI to enhance sustainable and profitable production.

Industry statistics

Like many agricultural and horticultural industries, the cherry industry is characterised by an aging grower base. The small number of growers under 30 indicates that younger people need to be encouraged to enter the NSW cherry industry. Programs such as the APAL Young Members' Network (Apple and Pear Australia Limited 2019) and NextGen Banana Growers (Better Bananas 2011) help increase the number of young people entering the industry while also investing in leadership, networking and career growth opportunities. Providing support and mentoring for younger growers should help them to remain in the industry.

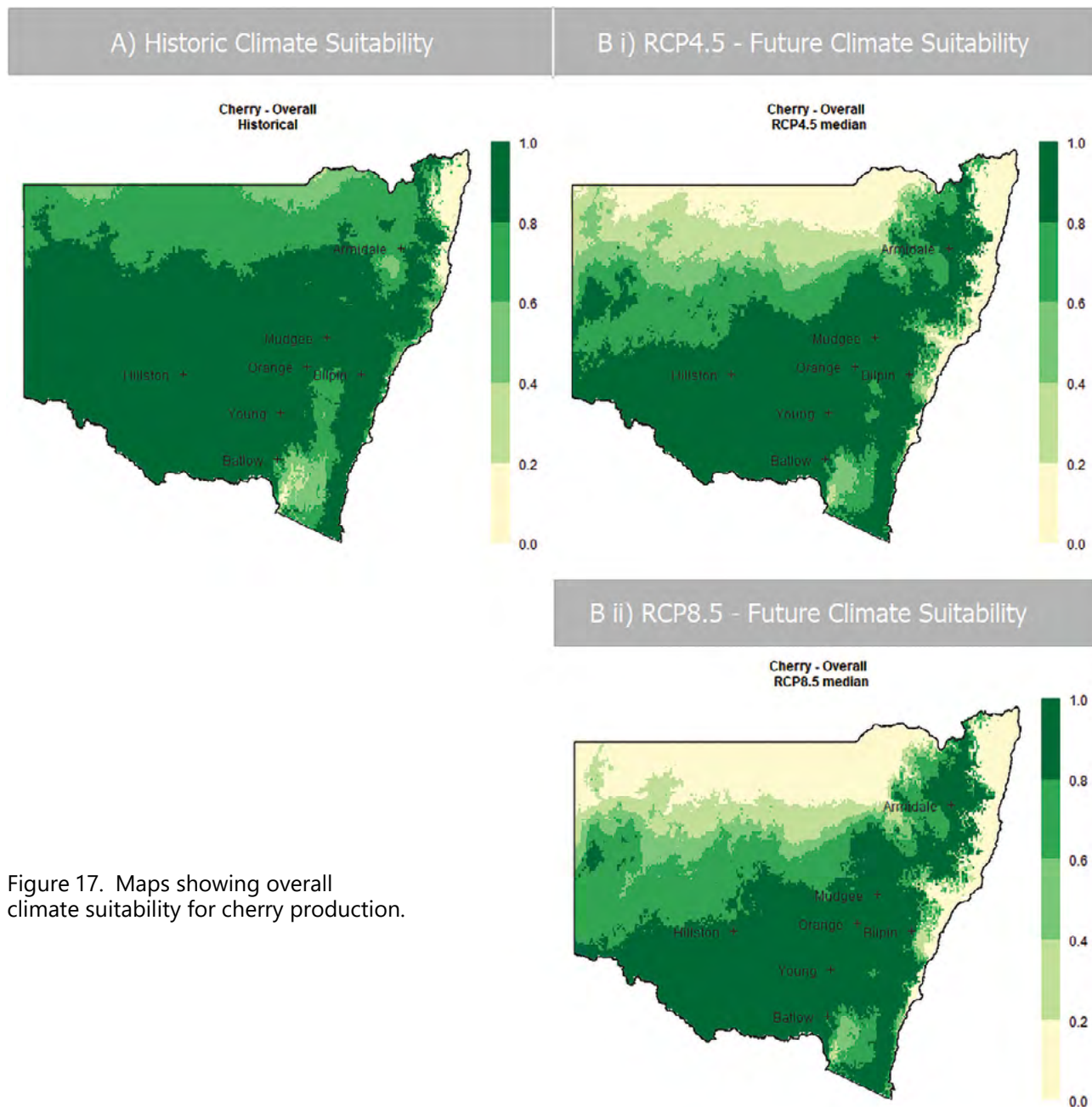


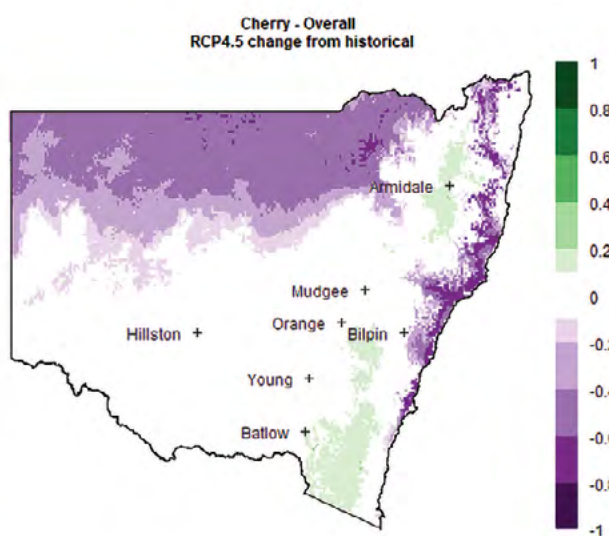
Figure 17. Maps showing overall climate suitability for cherry production.

It should be noted that the survey only asked for the age of the respondent, not all employees of the business. Many businesses may already have a succession plan in place, with younger growers working for the business owner, therefore the age distribution data might not be completely indicative of the entire NSW cherry industry.

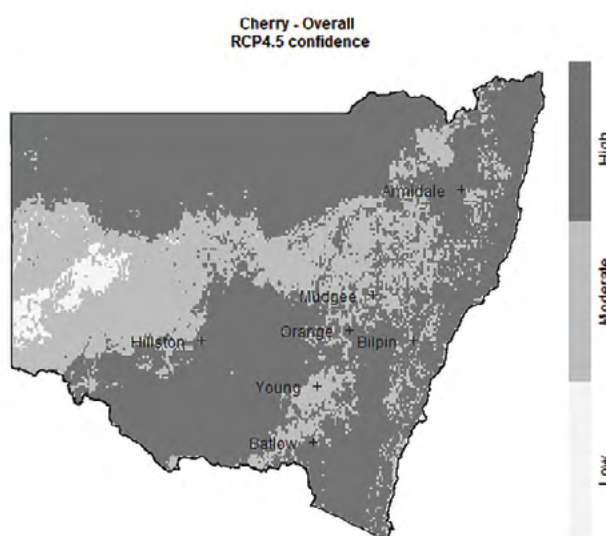
Production areas

Orange and Young are the largest cherry growing regions in NSW, which is not surprising as the cool winters and mild summers of these areas make them ideally suited. A recent vulnerability assessment as part of the NSW DPI Climate Change Research Strategy assessed the historic climate suitability of the known Lapin cherry growing regions in NSW and projected the suitability of these regions under both low and high emission scenarios (RCP 4.5 and 8.5) for 2050. These mathematical models can represent physical processes of the atmosphere and ocean to identify the response of global climate to increasing greenhouse gas emissions (ICCP 2013). Overall, the current NSW cherry growing regions of Orange, Young, Hillston, Armidale, Mudgee, Bilpin and Batlow should continue to have high to very high suitability in both future climate suitability models. There is high confidence across the growing regions that there will be little to no change in climate suitability in these areas (Fearnley et al. 2021; Figure 17).

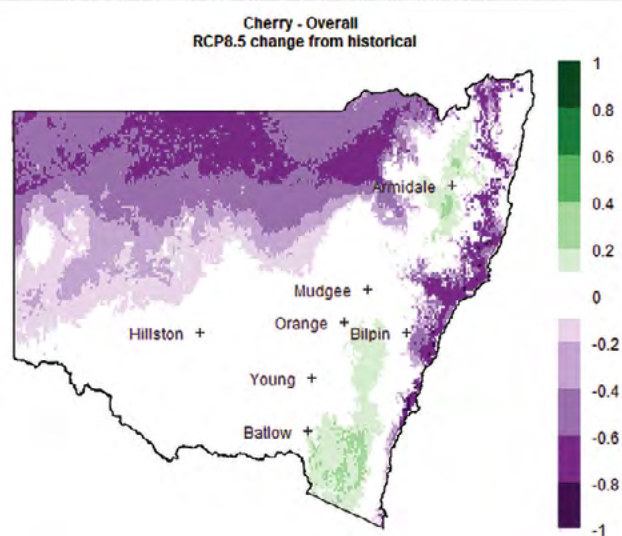
C i) RCP4.5 - Change in Climate Suitability



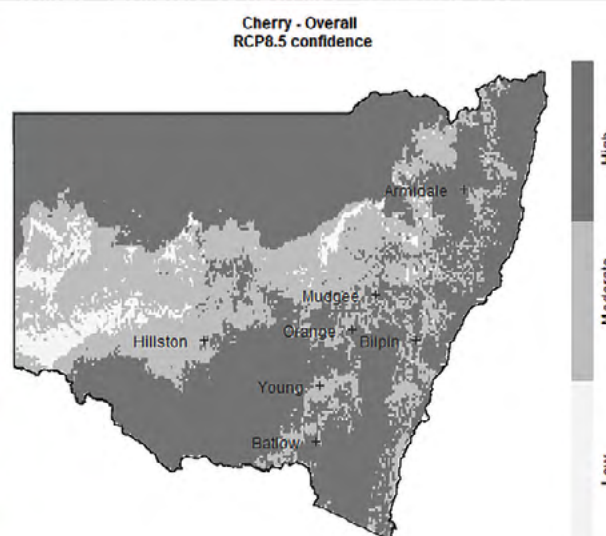
D i) RCP4.5 - Confidence in Change



C ii) RCP8.5 - Change in Climate Suitability



D ii) RCP8.5 - Confidence in Change



It should be noted these models were based on many climactic variables, factors such as wind, humidity, rainfall and hail contribute significantly to the overall suitability of growing cherries, but were not able to be included in the model.

However, while the current cherry growing regions will remain suitable for growing cherries overall, during dormancy there might be some changes to climate suitability. Traditionally, Armidale, Batlow, Bilpin, Mudgee, Orange and Young have had very high suitability and Hillston had high suitability during dormancy to accumulate chill portions. Some climate models predict the suitability rating for Bilpin and Young will drop from very high to high, while Hillston will drop from high to moderate (data not shown). Without sufficient chill portions accumulated, flowering can be delayed, uneven, or not occur at all.

Most cherry orchards are < 10 ha (Figure 4) and most growers (60%) would like to increase their orchard size; none indicated they wanted to decrease plantings. If growers are going to continue using traditional freestanding trees to increase plantings, then more land will be required. Land availability and price will be a large barrier for this type of expansion, unless other non-traditional locations in NSW are used. From the results of the NSW DPI cherry climate vulnerability assessment, there are suitable areas in the south east and southern parts of the central west that could provide growers with opportunities to purchase viable land for increasing their production (Figure 17, ci and cii, areas shaded green). Alternatively, dwarfing rootstocks and intensified training systems could be implemented, then existing land could be reworked to increase productivity of the existing land base.

Further investigation into dwarfing rootstocks, which was identified as a potential research area (Table 2), will give growers more information on how they can intensify their orchards. Dwarfing rootstocks are common in the USA, with those such as Gisela 5 and K6 providing many advantages over non-dwarfing rootstocks such as Colt (Long et al. 2020). The Australian apple industry moved away from traditional freestanding, widely spaced trees to more intensive planting on dwarfing rootstock over the past 3 decades. The aim of this intensification was to reach production earlier, promote higher yields and decrease labour inputs.

Smaller trees are easier to manage and pick, and can produce greater yields per hectare of planted area. They are also easier to cover with netting and rain covers, meaning less labour is required to deploy the coverings, which could assist in the transition to intensification.

Orchard protection

Hail and rain have always posed challenges to the NSW cherry industry. These conditions at certain times can cause skin cracking, wounds that open up the fruit for pest and disease damage, yield loss and quality downgrade.

One of the best ways for growers to minimise crop damage from hail and rain is to use protective covering (usually plastic covers that are deployed over the block) or netting, but according to the survey results, not many growers are choosing this option.

Growers have commented that, although they are aware of the benefits of having protective covering and nets, the cost of implementing these is extreme. Furthermore, the labour required to put the nets out and pull them off again in a short period is considered too expensive and time consuming.

Although implementing covers in orchards is expensive, many growers in other

states (e.g. Tasmania and Victoria) feel they have no choice but to invest in these options. Tasmania's rainfall causes significant damage each year to crop potential, while bird damage in Victoria can destroy a crop. Growers in NSW can learn from these experiences and find the most cost effective netting or protective covering for their orchard.

While not as effective as using protective covering or netting, there are other strategies growers can use to protect their crops from weather damage. Most cherry varieties have large leaves compared to other crops, however some varieties may have larger leaves than others. Further research into increasing leaf size through genetics or nutrition could potentially help prevent some hail damage in orchards. Growing a range of varieties can spread pollination over several weeks, which can reduce the effects a hail storm might have on the orchard. Having a range of varieties also prolongs harvest, providing market options and different selling windows that could attract a better profit margin. Whether intentional or not, many growers in NSW are already implementing this on the farm, by having more than four varieties at their orchard.

Varieties

Many different cherry varieties are available to growers with Lapins being the most commonly grown in NSW (Figure 7). Lapins are popular in NSW as they suit the cooler climate, have excellent firmness and are harvested mid to late in the season, perfect for the Christmas market. Different varieties are often planted to increase market opportunities, but with accumulating chill portions predicted to become more challenging in some regions, planting low chill varieties might be advisable in some marginal chill locations. This could also be useful for expanding the cherry industry into other regions. A research opportunity exists to investigate low chill varieties for quality and suitability for training systems.

Irrigation

As the climate becomes more variable, water management will become more important. Access to irrigation can offer growers the opportunity to increase yields and productivity, especially during periods of low rainfall. Even in locations where rainfall is abundant during the growing season, dry periods of a week or more during critical times for fruit growth can limit cherry fruit size and quality (Long et al. 2020).

Factors such as soil type, crop type, planting density, water quality, equipment required, capital and operating costs, will influence the type of irrigation system a grower will invest in for their orchard (Jerie and Adem 2010).

Irrigation can also enable better nutrient use efficiency through fertigation. Drip irrigation delivers water and nutrients directly to the plant root zone, with limited evapotranspiration (Netafim 2018), making it around 50% more efficient than micro-sprays (Niekerk 2017). While most NSW cherry growers are using drip irrigation, some are using micro-sprays, which have been reported to be easier to maintain, more obvious to see if the system is working or not, and could have a cooling effect on the trees (Niekerk 2017).

This could be of benefit to those regions that are experiencing quality issues due to heat damage and could be an adaptation to the increases in temperature predicted in the future. However, micro-sprinklers could also be encouraging pest populations such as European earwig (Figure 18), as they are attracted to moisture. Eliminating

high moisture areas, especially around the tree trunk, would help reduce earwig populations.



Figure 18. European earwigs.

A few respondents are not using irrigation, possibly due to having a small number of trees or adequate rainfall. There could be an increased risk for these growers as climate changes and rainfall patterns become less reliable.

Labour

Horticulture is Australia's third largest and fastest-growing sector in agriculture with high casual labour needs, which makes it specifically vulnerable to labour market interruptions resulting from unexpected events like the COVID-19 pandemic (Hort Innovation 2021). In general, labour use is greater in the vegetable, horticulture and cotton industries than in other agricultural industries. The NSW cherry industry is not exempt from these statistics, as the industry is heavily reliant on seasonal casual labour, usually sourced from labour hire companies, local townspeople and backpackers. Most farm employees are seasonal workers and many are working in Australia on Working Holiday Visas, Seasonal Worker Program or Temporary Work Visas (Hort Innovation 2021).

Labour was identified as the second biggest challenge for NSW Cherry growers. Sourcing staff to pick and pack fruit is becoming more difficult; a situation that has been exacerbated by the COVID-19 pandemic. Labour shortages will continue to affect the industry, with growers forced to make end-market decisions based on labour before the crop is seen. Implementing labour-saving technologies is one way orchardists can remain viable and competitive with other snack food producers. New plantings should be designed to take advantage of any advances in harvest mechanisation and associated labour savings.

Pests and diseases

Pests and diseases could destroy crops if not appropriately managed. The main pests identified by both growers and agronomists in NSW cherry orchards were the European earwig (*Forficula auricularia*; Figure 18), the black cherry aphid (*Myzus cerasi*; Figure 19), Carpophilus beetle (*Carpophilus* spp. Figure 20) and cherry slug (*Caliroa cerasi*; Figure 21). Each of these can cause significant damage to cherry crops and thus need to be managed. European earwig control can be tricky in NSW orchards, as many growers who have cherries also have apples. European earwigs are considered a beneficial insect in apples as they control woolly apple aphid.



Figure 19. Black cherry aphid. Photo: Whitney Cranshaw Colorado State University, Bugwood.org.



Figure 20. Carpophilus beetle.



Figure 21. Cherry slug.

Fortunately, orchard hygiene, cultural controls and integrated pest management (IPM) can all be used to help prevent these pests from entering and spreading throughout orchards. The prevalence of these pests in NSW cherry orchards suggests that educating growers on how to prevent their entry and spread is warranted.

IPM is relatively easy to adopt in cherry orchards as the season is shorter than other crops, therefore harsher chemicals with longer withholding periods are not used. This is an excellent opportunity for cherry orchards to be more sustainable and environmentally friendly. Growers can get information and IPM advice from the NSW DPI's [Orchard Plant Protection Guide](#).

Brown rot (*Monilinia* spp.) and bacterial canker (*Pseudomonas syringae*) were the most prevalent diseases in NSW cherry orchards. Both diseases are favoured by certain weather conditions, during which monitoring is required. Orchard cleanliness and appropriately timed cultural practices help prevent the spread of diseases. Perhaps training on these aspects is needed.

Markets

Cherries are a high value crop with significant potential for export opportunities. However, they are also a perishable product, therefore must be moved and consumed without delay. Increasing the national consumption of cherries is crucial, particularly after the Christmas season, to relieve the domestic market glut that can occur during the cherry season.

International markets can provide NSW growers with good returns that often cannot be matched by domestic prices, if they are supplied to the market at the right time. In 2020, \$13.4 million of Australian cherries were exported. Of this, \$5.3 million went to China (Global Trade Atlas 2020). The key export markets for NSW are China, Korea, Singapore and Vietnam.

Although China is a great market for NSW cherries, accessing it is not without challenges. In mainland Australia, Queensland fruit fly (QFF, *Bactrocera tryoni*; Figure 22) poses significant risks to trade due to its quarantine pest status, particularly in China (Haynes and Dominiack 2018). Lack of workable market access due to Queensland fruit fly for mainland fruit is a barrier for expansion in these areas (Hort Innovation 2017).

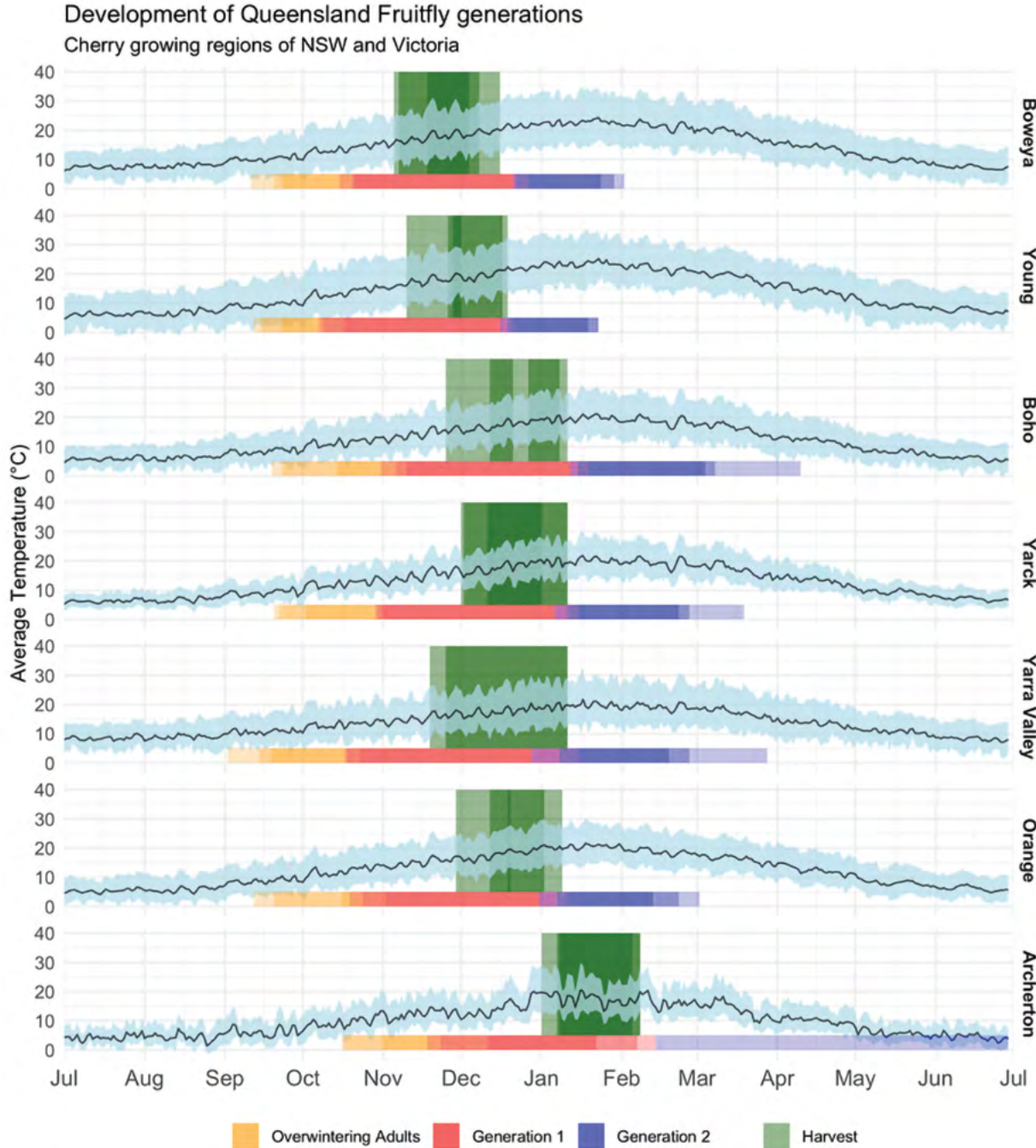


Figure 22. Queensland fruit fly.

A recent collaborative project with NSW DPI and CSIRO investigated how to manage the risk of cherries becoming infested by QFF. A key finding from this work was that QFF is typically absent or rare in commercial orchards in the cooler NSW production districts during the growing season (Figure 23). In these areas, the risk of QFF infestation in commercial consignments could be reduced to very low levels by applying a combination of measures in a systems approach.

A proposed protocol includes block-based pest monitoring, corrective action bait spraying if QFF are detected on a registered

block, and 'inspect and reject' measures based on crop scouting and fruit inspection in the packhouse. The protocol also includes a suspension threshold, triggered by trapping numbers or crop inspection results in a registered block. The system aligns well with growers' IPM practices, and early analysis indicates a reduction in already very low QFF pest pressure over multiple seasons in participating orchards. The proposed protocol is being considered for domestic market access but also raises the prospect for an international market pathway that may avoid the need for end point treatments.



Coloured bars for the fruit fly phenology indicate the time to develop for that generation: the generation is complete at the end of the bar. Models are run for each season of 2017/18 - 2019/20. Green bands represent the range of harvest dates for that region from 2017/18 - 2019/20, with darker being overlap between seasons. Temperature data represents 2010-2020 averages, the line indicating daily average, the blue band Tmin and Tmax

Figure 23. Development of Queensland Fruit Fly generations in NSW and Victoria and when they are present across the cherry growing season. Source: Matt Hill, CSIRO.

Although more than half of the survey respondents export some fruit, others choose not to for various reasons. Some of these included:

- orchard location being too far from packing and transport facilities
- volatile markets, too much risk for small business
- sufficient local market, so no need for export
- price of registering the shed and compliance
- small volumes of fruit.

NSW growers are mainly using wholesale and farm gate sales for accessing the domestic market. In NSW, the volume of cherries supplied to the domestic market increased by 11% (Hort Innovation 2021b). This could be attributed to the challenging pathway into the China market during the 2020–2021 season. A focus on increased market access to other countries is required to provide an outlet for a potential oversupply on the domestic market (Cherry Growers Australia 2018).

Understanding consumer preferences for purchasing cherries is important to tailor production to meet their needs. Those aged > 55 years purchased the largest volume of cherries compared to other age groups (Global Trade Atlas, 2020). Perhaps some market research is required to determine how to influence other age groups to purchase more cherries. Additionally, understanding what motivates the older age group to purchase cherries could then be used to encourage other age groups to do the same.

Some growers indicated the need for value adding options to prevent second grade fruit from being 'dumped' on the domestic market. This is something that needs to be considered carefully because reduced quality fruit in the domestic market could negatively influence consumers. Value added products can become very valuable additions to the farm business, with significant value generated from otherwise very low value or waste product.

If export and premium markets remain a focus for NSW growers, cherry quality will need to match the expectations of these markets. As indicated by respondents, quality issues are a major challenge faced by the NSW cherry industry (Table 1). Fruit colour, size, appearance (cracks or blemishes) and firmness can restrict access to certain markets and result in price downgrades.

Extreme heat and higher than average temperatures can reduce cherry quality, particularly firmness. Soft fruit is the main reason (60%) for fruit to be downgraded (Hampson et al. 2014). As temperatures are projected to increase, growers will need to adapt by using management tools to reduce heat around the fruit and tree. Overhead irrigation has been successfully used to cool buds during the hottest parts of the day in Israel (Luedeling 2012). Overhead cooling is also a common practice in warmer apple growing regions to alleviate sunburn on the fruit. It should be noted that overhead cooling can be very water demanding, therefore might not be an option for all growers. The effect of overhead sprinklers on the microclimate of the orchard under protective netting or covering will also need to be investigated.

In apples, many growers use hail netting to provide protection from sporadic hailstorms that can cause significant crop losses. Apple growers have also reported that since using hail netting, they have experienced a reduction in sunburn and heat under the netting (Wunsche et al. 2004). Further investigation into the economics and heat alleviating benefits of netting on cherries could strengthen the case for including netting or protective covering in cherry orchards.

Focus of NSW cherry industry research

Biosecurity

Biosecurity is one of the biggest risks and challenges in NSW cherry orchards. Managing biosecurity is vital on any orchard. The recent incursions of Fall armyworm (*Spodoptera frugiperda*) and Khapra beetle (*Trogoderma granarium*) highlighted the vulnerability of horticultural industries. This also emphasised the importance of continued research and support into biosecurity for the cherry industry.

Training systems

Expanding the orchard to gain larger volumes of fruit is one option for cherry growers, although land prices will determine the likelihood of this. Orchard renovation to higher densities using dwarfing rootstocks and new training systems that maximise both yield and fruit quality are also potential options. Encouragingly, many growers identified training systems as a key area needing more research.

The goal of training systems should be to establish a structural tree canopy framework that provides the potential to produce profitable quantities of marketable fruit (Long et al. 2020). Training systems are dynamic and continuously developing (Long et al. 2020). The top 7 commercial training systems for cherry growers are:

- Kym green bush
- Spanish bush
- Steep leader
- Super slender axe
- Tall spindle axe
- Upright fruiting leader
- Central leader

Most NSW cherry orchards are traditional, with many opting for the Kim green bush or central leader tree. Some growers are beginning to look at different training systems on newer plantings including the upright fruiting leader training system. Working towards a pedestrian orchard, or a fruiting wall, has been shown to decrease harvest labour requirements (Long et al. 2020) because there is less need for ladders, making the pickers more efficient and increasing the opportunity to hire unskilled or older labour.

Rootstocks

All commercial cherry trees require rootstock to grow (Long et al. 2020) and rootstock has a strong influence on tree size, resistance to disease and productivity. There are many rootstocks to choose from including the vigorous 'Colt' to dwarfing rootstocks such as Gisela 3. Colt was identified as the most common rootstock used in NSW cherry orchards, followed by Mahaleb and Gisela 6. Mahaleb and Colt are more traditional, full size rootstocks well suited to low density plantings. Gisela 6 is a more modern semi-vigorous rootstock suited to higher density orchards. For the industry to shift towards pedestrian, high density orchards, significant replanting will need to occur. Replanting involves several potentially difficult decisions, such as whether to invest in the old trees and organise nets or should the old varieties be replaced with new plantings and all the associated netting, spacing and training systems?

Building on previous work

NSW DPI has delivered many projects that have contributed to developing the NSW cherry industry. Market access has been significantly improved through projects such as 'Implementing domestic seasonal pest absence with phytosanitary irradiation as an endpoint treatment for cherries', 'Improving the quality and consistency of Australian cherries to ensure market access' and 'Improving cold treatment for disinfesting cherries for QFF'. Crop production and quality have been improved by projects such as 'Optimal management of pre-harvest rot in sweet cherry' and 'Thrips species in NSW Cherries and the timing of associated ring russet injury'. Outcomes from these projects can be used to guide future projects.

Conclusions and future steps

This analysis has provided an overview of the current NSW cherry industry in 2021 and has provided insight on where targeted research and development could help further develop the industry. To ensure the future prosperity of the NSW cherry industry, research and development should focus on:

- implementing a NextGen Cherry Growers Network to encourage growth and support for cherry growers entering the industry. This should be a collaboration between long time cherry growers and new cherry growers.
- weather mitigation strategies including netting and protective rain covers
- climate adaption strategies to improve orchard resilience to the changing climate
- reducing input costs through new training systems, particularly focused on labour efficiency
- improving quality, especially of fruit destined for export markets
- new marketing opportunities, including international markets and value-added products to minimise oversupply on the domestic market.

"If you can get cherries right, they are the best thing" (NSW cherry grower, 2021).

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Appendix

NSW Cherry Industry Production Survey

The following survey is part of a project being conducted by the NSW Department of Primary Industries to improve our understanding of the NSW Cherry Industry. The information gained from this survey will be used to:

- determine current management practices
- identify areas for research and development
- explore new markets and opportunities, both domestically and internationally
- further develop the NSW cherry industry.

You and your orchard

1. Please indicate your age group
 - a. <30
 - b. 31-50
 - c. 51-65
 - d. 66+
2. What is your gender?
 - a. Male
 - b. Female
 - c. Prefer not to say
3. Where is your orchard/s located (Please include postcodes)?
4. What is the size of your orchard (ha)?
5. Do you own or lease your orchard?
 - a. Own
 - b. Lease
 - c. Both
6. How long have you been a cherry grower?
 - a. <5 years
 - b. 6-10 years
 - c. 11-15 years
 - d. 16-20 years
 - e. 21-25 years
 - f. 26+ years
7. Are you a member of Cherry Growers Australia?
 - a. Yes
 - b. No – why?

8. What is your business structure?
 - a. Family partnership
 - b. Sole proprietors
 - c. Corporation
 - d. Cooperative
 - e. Other
9. Do you employ a farm manager?
 - a. Yes
 - b. No
10. How many full-time staff do you have?
11. How many part-time staff do you have?
12. How many casual staff do you have?
13. Where do you source your casual staff from?
 - a. Labour hire company
 - b. Pacific Islander Scheme
 - c. Local townspeople
 - d. Backpackers
 - e. University students
 - f. Other
14. How do your staff requirements change over the season?

Crop production

15. What cherry varieties are you currently growing?
16. For your top four varieties, please provide the following information
 - a. Area (ha)
 - b. Number of trees
 - c. Tree density
 - d. Rootstocks
 - e. Production per block
17. What are your plans for future plantings?
 - a. Increasing
 - i. Likely planting numbers for 5 years
 - ii. Likely planting numbers for 10 years
 - b. Maintaining
 - c. Decreasing
18. Do you use any protective covering for rain?
 - a. Yes
 - i. % area covered

- b. No
 - i. Why?
19. Do you use protective netting for hail protection?
- a. Yes
 - i. % area covered
 - b. No
 - i. Why?
20. Do you use netting for bird protection?
- a. Yes
 - b. No
 - i. Why?

Pest and disease management

21. What are the main pests in your cherry orchard?
22. How do you manage these pests?
23. What are the main diseases in your cherry orchard?
24. How do you manage these diseases?
25. Where do you get your information on how to manage pests and diseases in your orchard?
- a. Local agronomists
 - b. Local Land Services
 - c. Department of Primary Industries
 - d. Other (please describe)
26. What do you do if you find a pest or disease you cannot identify in the orchard?
27. Do you irrigate your cherries?
- a. Yes
 - i. Drip
 - ii. Micro sprinkler
 - iii. Overhead
 - iv. Other (please describe)
 - b. No – why?
28. How important is water availability to you?
- a. Very important
 - b. Important
 - c. Moderately important
 - d. Slightly important
 - e. Not important

Markets

29. What market do you use to sell your cherries?
- Pick your own
 - Farm gate/roadside stall
 - Growers market
 - Wholesale
 - Other
30. Do you export your cherries?
- Yes
 - China
 - Vietnam
 - Korea
 - Other
 - No
 - Is there anything that is holding you back from exporting (other than market access)?
31. Have you participated in any overseas trade/study tour missions?
- Yes
 - No
32. Would you be interested in taking part in overseas tradeshows and international trips to explore export opportunities?
- Yes
 - No
33. Do you need assistance in accessing more market options for your cherries?
- Yes
 - No
34. What is your main source of market/consumer feedback for your cherries?

Research and development

35. What do you see as the 3 most significant limiting factors for the success and growth of your orchard business?
36. What do you see as the 3 most significant opportunities for the cherry industry in NSW?
37. What research would like to see happen in the district over the next 2-3 years?
- Would you be interested in being involved in these?
38. What do you feel is the best way for the DPI to get in contact with growers?