What goes in must come out:

Protecting our Social Licence to grow Cherries

Kellogg Rural Leadership Programme

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I wish to thank the Kellogg Programme Investing Partners
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Executive Summary

Social licence to operate (SLO), also known as just social licence, is an unwritten agreement between stakeholders and a business/industry on the impact that they can have on the environment and community. As the values of the community change our SLO is going to come under increasing pressure. Stakeholders are increasingly scrutinising water usage, agrichemical and fertiliser applications, worker welfare, noise pollution and visual impacts. They want to see justification of use of the products and tangible outputs (saleable product).

The aims and objectives of this project is to investigate whether growing cherries in an intensive, indoor growing system will protect our social licence to operate. Social licence will be defined, the aspects that are important to different stakeholders explored and how we can enhance our social licence with forward thinking growing systems explained.

A literature review was conducted to gather some insight to the origins of the social licence to operate concept, define social licence, identify stakeholders and examine what businesses can do to maintain social licence.

Three levels of stakeholders were identified as being significant to cherry production operations. These were seasonal workers, the general public and regulators. Semi-structured interviews were carried out with each stakeholder group to ascertain what aspects of cherry growing operations they perceived to be most important to the social licence to operate and what of these operations put the social licence to operate most at risk. These factors were then compared through a case study between a traditional open field cherry growing system and cherries grown intensive indoor growing system.

Conclusions

- The practices of a cherry growing operation are likely to come under the spotlight. When questioned about operational practices and use of natural resources it is important that growers can provide quantitative data on the inputs involved and demonstrate attempts to increase efficiency.
- Industry needs to be more open to sharing the positive aspects of their operations on the environment and community. We need to get better at promoting the good stories and letting people know all the good stuff we do. This way the industry has control over the information that is shared.
- Education and communication are key to maintaining social licence to operate. Stakeholders are more likely to accept practices if they know why they need to occur, when they will occur, justification for the practice and what measures have been put in place to minimise any risk.
- An intensive indoor growing system will protect the social licence of cherry growing operations. It will do this by decreasing the amount of water, fertiliser and agrichemical required to grow a kilogram of cherries while minimising the amount of waste product that is produced.

Recommendations

- An industry-led research program needs to be set up to actively identify the stakeholders of cherry production and engage with them to find out their perceptions of positive and negative aspects of production and identify the strengths and weaknesses of each part production cycle. It will also identify practices that are deemed to be acceptable and unacceptable.
- Embark on an information sharing and education program with stakeholders. Keep them up to date with orchard activities, invite them to the orchard and use social media as an information sharing platform.
- Investment is required by industry to implement growing systems that are more efficient, that is have higher yields, less waste and use the natural resources and synthetic inputs more efficiently.

Acknowledgements

The completion of this report would not have been possible without the input of some key individuals. I would like to take this opportunity to thank and acknowledge the following:

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1. Introduction

Social licence to operate (SLO), also known as just social licence, is an unwritten agreement between stakeholders and a business/industry on the impact that they can have on the environment and community (Kenton W, 2021). It is a concept that originated in the mining industry in the mid 1990s. Over the last 30 years the term has been adopted by a large number of industries and has now become pivotal to the success or failure of a wide range of productive industries within New Zealand's food and fibre sector. This is because stakeholders' perception of any given industry can greatly affect the ability of that industry to operate in a manner that is financially sustainable. These effects could be through stakeholders influencing new regulations or products being boycotted by consumers.

Whilst our dairy farming cousins have grappled with their ability to maintain their SLO, the Central Otago Summerfruit industry, with a certain amount of arrogance have sat back in their cherry trees with the opinion "that won't happen to us". It is true that the summerfruit industry can take a certain amount of comfort from growing a healthy, nutritious world-renowned produce and businesses making significant contributions to the local and national economy but that will not maintain SLO forever.

As the values of the community change the inputs of orchard operations are going to come under increasing pressure. Stakeholders are increasingly scrutinising water usage, agrichemical and fertiliser applications, worker welfare, noise pollution and visual impacts. They want to see justification of use of the products and tangible outputs (saleable product).

The purpose of this project is to investigate whether growing cherries in an intensive, indoor growing system will protect the SLO. In this process Social Licence will be defined, the aspects that are important to different stakeholders explored and how the cherry growing industry can enhance its social licence with forward thinking growing systems. This will ultimately culminate in answering the question "What can be done to maintain and enhance SLO in the New Zealand growing industry?"

2. Aims and Objectives

The aim of this project is to investigate whether growing cherries in an intensive, indoor growing system will protect our SLO.

It is hoped that at as a result of this investigation the importance of SLO will be recognised as a key driver in future business decisions of the cherry industry, that growers will recognise what aspects of their growing operations are jeopardising their social licence and look to implement strategies and practices to maintain and enhance their SLO by being responsible stewards of our land and communities

3. Methodology

A literature review defines SLO, identifies the stakeholders and explores techniques of maintaining SLO. Following this, the results of a post season survey of seasonal workers were

obtained and analysed. Semi structured interviews with members of two other stakeholder groups were conducted. Through thematic analysis the themes and values from these interviews were compared, contrasted and evaluated against case studies from two different cherry growing methods to see if one system would have greater SLO than the other.

Seasonal employees were surveyed at the end of the summerfruit season by Summerfruit New Zealand to gain an insight into the industry's seasonal workforce and gain an understanding of what the experiences are like from an employee point of view. This survey was sent online via email, social media posts and to growers to email to their workforce. It was estimated this was distributed to approximately 600 workers and we received 97 responses. A summary of the results from this survey was obtained from Summerfruit New Zealand. The results of this survey gave some valuable insights to the factors that could affect SLO in the minds of seasonal workers.

Four semi-structured interviews with representatives of the Central Otago District Council (two interviews), Otago Regional Council (one interview with a two-person panel) and Horticulture New Zealand (one interview) were conducted. These three organisations work between SLO and regulation so were able to provide valuable information on the practices that were putting the SLO of cherry production at risk and what in their view were factors that helped maintain the cherry industry's SLO.

From these interviews five operational activities were identified as practices that could affect SLO. These were orchard development, agrichemical use and application, fertiliser use and application, water use and application methods and food waste.

Interviews with five members of the local and wider community were conducted. The sample population of interviewees consisted of one "born and bred" local, two who had recently moved to Central Otago from Auckland and two who were in Central Otago on holiday from Wellington and Christchurch. This group gave a broad overview of opinions of orchard operations in relation to SLO.

Three photos of new block development, a photo of agrichemical and fertiliser application, a photo of trees being irrigated and a dry creek bed along with a photo of a bunch of split cherries were shown as cue cards during the interview process. These photos were chosen because it was felt that they gave good representation of each of the operational practices that were seen as being a factor that could affect SLO.

For each of the photos a series of standardised questions was asked: What is happening in this photo? How does it make you feel? Is it good or bad? Why? The photo of the bunch of split cherries was shown last. The last question to be asked was "Given the inputs that we have discussed in the previous photos, is it acceptable that there could be potentially no tangible output?" This question was asked to see if cumulating all the inputs would affect SLO.

Conducting the interviews in this way gave valuable insight to the feelings of the wider community towards orchard operations.

After conducting the interviews, a thematic analysis was undertaken to access the data for common themes pertaining to the photos. Reactions to the photos were judged to be in one of three criteria; acceptable, acceptable with justification or unacceptable. These have been presented in a traffic light system with comments within the picture.

4. Literature Review

A literature review was undertaken to explore what SLO is, who controls social licence and theories on how to maintain it.

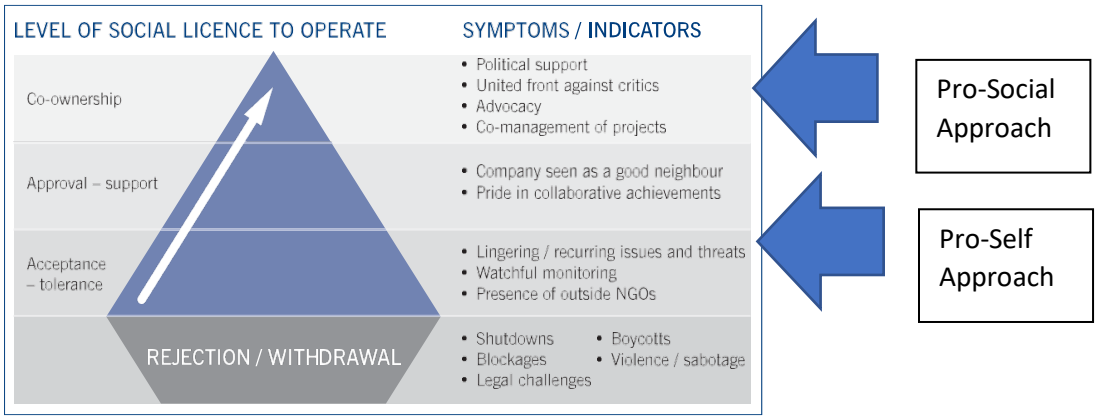
4.1 Social Licence Defined

SLO is a term that emerged out of the mining industry in the mid-1990s. It was initially coined to refer to the industry's need to recover its reputation after a series of highly publicised environmental disasters and the community conflict that followed (Edwards & Lacey, 2014). The concept was originally aimed at individual mines to change overall industry culture and community acceptance one operation at a time (Thomson & Boutilier, 2011). Since this time, SLO has been used by a wide range of other industries (Graafland, 2002; Wang, 2005; Williams & Martin, 2011).

Within the literature there are many varying definitions of SLO. Berkett (2014) describes SLO as a "broad acceptance of a company's activities by wider society or a local community", the Sustainable Business Council (2013) defines it as "the ability of an organization to carry on its business because society has confidence that it will behave in a legitimate, accountable and socially and environmentally acceptable way" while Parsons and Moffat (2014) refer to it as the set of demands and expectations held by local stakeholders and broader society about how a business should operate. Nathan Guy (Grant-Mackie, 2015) simplified SLO by defining it as "the ability to produce our products sustainably, bringing the community with us, and earning their respect and understanding. "

Hall (2018), Jenkins (2018) and SBC Paper (2012) all refer to a model adapted from Boutier and Thomson (Figure 1) illustrating the levels of Social Licence. Jenkins uses a driver's licence analogy to explain the model as learner–restricted–full structure, where the level of trustworthiness demonstrated by the licence applicant determines the level of trust the licence issuer accords to them, and potentially the scope of the permitted activities at each level.

Figure 1: *Levels of SLO and the Indicators that Influence Them*



Note. Adapted from Boutiller and Thomson (2011).

Hurst, Johnston and Lane (2020) simplify this model somewhat by identifying two types of social Licence—pro-self and pro-social approaches. Figure 2 sets out the two different approaches but simplistically pro-self is reactionary to the demands of the stakeholders. The Business maintains social licence by doing the minimal amount as dictated by the stakeholders. The pro-social approach goes as the business engaging with the stakeholders and having values which align. If we were to model these approaches against the pyramid, pro-self would sit at the bottom of the pyramid and pro-social at the top (see Figure 1).

Figure 2: *Pro-Self v Pro-Social Perspective on SLO*

Perspective	Pro-self Perspective	Pro-social Perspective
Purpose	Strategic approach to manage risk and reputation, whereby direct action is taken to meet specific stakeholder expectations in order to gain their consent or lessen opposition.	Collaborative, relationship-building process to achieve mutual benefit.
Public relations alignment	Functional, pragmatic: A managerial frame	Reflective paradigm: Fully functioning society
Engagement	Episodic	Relational
Stakeholders	Communities of place	Communities of place and communities of interest, including those viewed as marginalized or vulnerable
Power	Entity	Values-based or moral foundations (socially derived)
Initiated by	Entity only: Internally derived	Entity or stakeholders: Externally derived
Types of engagement	Information based: Advocacy with an emphasis on persuasion	Dialogue based: Communicative interaction and collective action
	Selective stakeholders	Authentic representative stakeholders
Outcomes	Transactional	Relational capital

Note. From Hurst et al. (2018).

4.2 Stakeholders

All the definitions discussed thus far have identified "stakeholders" or "community" as the group who issue the SLO, but who are they and how do we identify them?

Stakeholders can be customers, suppliers, and partners, as well as social, political, and government entities. In communities, stakeholders can be family units, interest groups, property owners, property users, businesses and/or farmers. Sometimes stakeholder groups that operate in a national or international arena, such as NGOs, religious groups, social justice groups, can claim an interest in a corporation's actions (Wilburn et al., 2011).

It is important to understand that licences may exist at different levels (Parsons & Moffat, 2014). A business must engage with a wide range of stakeholders locally, regionally, nationally and sometimes internationally to gain full understanding of the relevant values and or concerns. Research needs to be conducted at the different levels and amongst different stakeholders to determine the different factors that affect the SLO (Hurst et al., 2020).

4.3 Maintaining social licence

Identifying the relevant stakeholders has been shown as a key concept in having a SLO but once we have it, how is it maintained?

Securing and keeping a SLO takes dedicated effort and engagement with local communities, iwi and the wider public. This suggests a proactive rather than a reactive approach (Edwards & Trafford, 2015).

Edwards and Lacey (2014) describe how a SLO can be seen as being constantly re-evaluated and renewed in line with evolving practice and societal expectations, while Brown and Fraser (2006) suggest that "business must have regard for evolving social attitudes and expectations if it is to maintain its social licence." A pro-social approach would suggest that the values of the business would change along with the stakeholders.

The SLO is dynamic because expectations, interests, and social norms change over time and may vary amongst different stakeholders. Building and maintaining relationships through high-quality contact is vital in maintaining SLO (Johnston et al., 2018). "Farmers and their organisations carry an important responsibility in implementing the changes society desires. The challenge is to design an agricultural sector which lives up to the desires and expectations of consumers and society members" (Mureau, 2000).

Another strategy to maintain social licence is for the business to make sure that they tell their good news stories. Crofoot (2015), in an opinion piece for Federated Farmers of New Zealand, states that farmers need to be able to tell their story, and if they don't, someone else will tell it for them, relegating farmers to whatever role the "conflict industry" creates for them. Mureau (2000) agrees by stating "in agriculture new ways of communication are necessary to maintain the licence to produce in the future'.

5. Case Studies

Clyde Orchards is a summerfruit growing and packing operation situated in Central Otago, New Zealand. 40ha of the orchard is dedicated to cherry production, 6ha of which are contained within a state-of-the-art crop protection system, called "Cravo".

The purpose of the case study is to compare, contrast and evaluate the inputs and the production from the two different growing systems

1. A traditional open field growing system
2. An intensive indoor growing system (Cravo)

The factors that threaten the SLO that have been identified in the previous sections by the three stakeholder groups will be addressed.

5.1 Traditional Open Field System

Open field systems account for 85% of the cherry land in production at Clyde Orchards. The 34ha of land is spread over eight different production sites spread over different geographical locations between Earnscleugh and Bannockburn. There are seven varieties of cherries grown on the property. The combination of geographical spread and cultivar selection allow the company to spread the harvest window over a six-week season and the risk of isolated weather events ruining the crop. For the purpose of this case study all the inputs and outputs will be averaged. The orchard blocks are planted with a row spacing of 5m and an inter row tree spacing 3m (670 trees per hectare). The trees are fully grown and are 3m tall and are classed as being at full production.

Figure 3: *Picking in an Open Field System*

5.1.2 Agrichemical Application

The use of agrichemicals is a necessity on orchards. Insecticides and fungicides protect the trees and crops from pest infestation and infections from disease, foliar nutrients are rapidly absorbed through the leaves to keep the trees strong and healthy and produce premium fruit.

The agrichemicals are applied by a cropliner airblast sprayer at water rates of either 700 or 2000L/ha. Applications can be affected by wind and rain, and this can sometimes result in spray not being applied at the correct time.

The season's agrichemical application commences in August and concludes in May. During this time 15 different applications were made to the tree and the crop using a mix of 14 different products.

Figure 4: *Agrichemical Application in an Open Field System*

5.1.3 Fertiliser Application and Use

Soil tests are conducted annually in each of the different growing locations. Special blends of fertiliser and rates are developed by soil agronomists and applied in a solid state by means of a fertiliser spreader. Application of fertiliser is in September. At this time the trees are coming out of dormancy, soil is warming, and the tree roots are actively taking up nutrients. It is important to have the nutrients readily available in the soil at this time.

After application the solid fertiliser is either washed in via irrigation or rainfall. The risk is that if there is a high rainfall event that the fertiliser will be leached or run off.

50 units of Nitrogen were applied per hectare.

5.1.4 Water Use

Water is used for irrigation and a method of frost protection.

5.1.4.1 Frost Protection

Overhead sprinklers is the frost protection method preferred in the areas prone to the greatest risk of frost at Clyde Orchards. There are other methods of frost protection available, but they are not as effective in severe frost. See Figure 5.

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Figure 5: *Frost Fighting with an Overhead Sprinkler System*

The weakness associated with this method of frost protection is the use of large amounts of water. This can be for long periods of time, often on consecutive nights resulting in ground saturation, leaching and runoff.

Frost events vary from season to season. But last season there were 10 frost events and 60 hours of water application resulting in 3600000L of water being used/ha.

5.1.4.2 Irrigation

The requirements for water for irrigation use is dictated by rain events and evapotranspiration rates as shown in Table 1.

Average water use for irrigation/ha = 3400000L

Table 1: *Average Irrigation Requirements per Hectare for Cherries*

Crop: Cherries		Undertree Irrigation							
	September	October	November	December	January	Febuary	March	April	
Median Rainfall (mm)	25	25	35	35	35	35	30	30	
Evapotranspiartion (mm)	55	55	115	115	105	105	40	40	
Crop Coefficient	0.5	0.5	1.2	1.2	0.95	0.95	0.5	0.5	
Potential Evapotranspiration (mm)	27.5	27.5	138	138	99.75	99.75	20	20	
Moisture Deficit (mm)	-2.5	-2.5	-103	-103	-64.75	-64.75	10	10	
Crop Area (m)	10000	10000	10000	10000	10000	10000	10000	10000	
Volume required (L)	-25000	-25000	-1030000	-1030000	-647500	-647500	0	0	
irrigations /month	1	4	8	8	8	8	0	0	
volume/irrigation (L)	25000	6250	128750	128750	80937.5	80937.5	0	0	
output/hour (L)	108000	108000	108000	108000	108000	108000	108000	108000	
Irrigation run time (H)	0.2	0.1	1.2	1.2	0.7	0.7	0.0	0.0	
Median rainfall and evapotranspiration rates were obtained from the grow otago website									
Irrigation in September, October and sometimes November is dictated by frost events, water requirements for this have not been calculated									
irrigations should be planned for early morning and night time particuarly in the summer, this is the most efficient use of water and avoids creating disease infection periods									

Note. Source: Robb (2018).

Total water use 7000000L/ha

5.1.5 Work Conditions

5.1.5.1 Tree size

The trees in the open field blocks are relatively large (3m tall). This requires the pickers to be able to carry and climb a 10 step ladder.

5.1.5.2 Travelling time

The geographical spread of the orchard blocks means that sometimes there is up to one and a half hours of travelling time from the home base

5.1.5.3 Remuneration

Remuneration is dictated by the volume of fruit harvested by individual pickers. Tree size, actual fruit numbers and the quality of the fruit all affect the volume that the team member is able to harvest

5.1.5.4 Start dates and finish

Start dates are dictated by the maturity of the fruit. In the open field systems this is controlled by the weather and means that predicting start days is not an exact science. Staff can find this very frustrating.

5.1.5.6 Work availability

Weather events affect the amount of work that is available for employees. In the open field system last season there were 22 events that either delayed starts, shortened days or resulted in work being called off for the day.

5.1.5.7 Yields and Packout

Fruit volumes are dictated by actual numbers and fruit quality. There are 4 key factors that contribute to this

Fruit Set (pollination): Fruit blossom needs to be pollinated for fruit to form and grow. Temperature and humidity needs to be favourable (ideally 18 degrees and 80% humidity) so that the bees will forage and pollinate the flowers. In a traditional open field system temperature and humidity is governed by the season and unfortunately this can result in less-than-ideal pollination conditions over flowering. Poor pollination can result in poor yield.

- **Frost damage:** frost damage can occur even with protection strategies in place
- **Fruit size:** can be affected by weather conditions over cell division
- **Fruit quality:** the most common cherry defect is fruit splits caused by rain

On average 9000kg of fruit was harvested per hectare with 7000kg able to be packed and sold. There was 2000kg of unsaleable or waste product per hectare.

5.2 Cravo Growing system

In 2018, Clyde Orchards constructed the first Cravo shed in New Zealand and the second in the world to be built for growing Cherries in. The shed covers 2.8 hectares and combines the best growing conditions from both indoor and outdoor environments. The retractable roof and walls are controlled by a weather station that constantly monitors external and internal atmospheric conditions, maintaining optimum growing conditions and crop protection from adverse weather events 24 hours a day.

Tree spacing is condensed with 3.2m rows and 1.85m inter row spacing. This gives an overall plant density of 1670 trees per hectare.

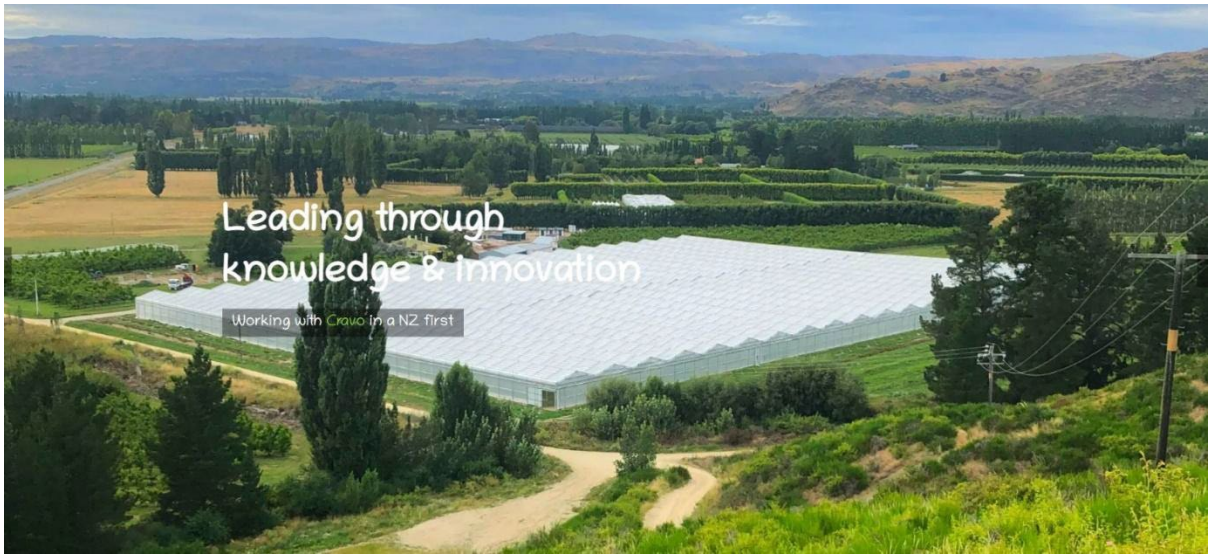


Figure 6: *Cravo Growing Shed at Clyde Orchards*

5.2.1 Agrichemical Application

11 applications were made in the last growing season.

Trails are being conducted to see if the number of agrichemical applications can be reduced further by creating unfavourable conditions for pest and disease infection periods.

Chemicals can be applied at optimum timing because conditions within the shed can be controlled to avoid being affected by rain and wind

Smaller canopy means that more targeted application methods can be implemented which gives better spray coverage and less agrichemical waste.

5.2.2 Fertiliser Application and Use

Fertiliser is applied through a fertigation system. This system injects specific amounts of nutrients as the trees are being watered. The benefit of this system is that the nutrients are in solution which is easily taken up by the plant. It also means that small amounts can be applied more often so there is less chance of runoff or leaching.

50 units of N are applied

5.2.3 Water use

Water is only used for irrigation and over watering from rain events is prevented using the roof. Water from rain events is recycled into the irrigation system to be stored and used at optimum application times.

Water use for irrigation = 3400000L/ha

5.2.4 Work Conditions

Trees are small and compact. Most of the fruit is picked from the ground

5.2.4.1 Travelling Time

The growing system is near the accommodation block and company base so travelling time is minimal

5.2.4.2 Remuneration

Trees are small and compact. Fruit numbers and size are good. Visual defects are minimal. This means that the picking is relatively easy, daily targets are met and exceeded and bonuses are received.

5.2.4.3 Start and Finish days

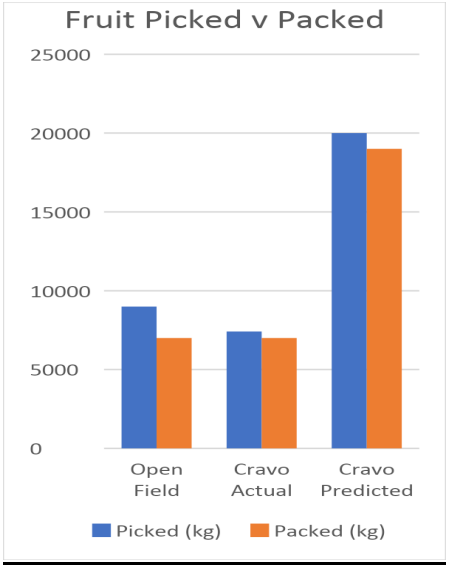
Through manipulation of growing conditions within the shed, start days can be guaranteed and work is not affected by the rain.

5.2.4.4 Yields and Packout

The projected volume of fruit picked and packed from a Cravo system is far greater than that of a traditional open field system. The average industry volume of fruit packed per hectare is just over 3000kg. Clyde Orchards average packed tons per hectare was seven in the 2021 season. This was 77% of the total fruit harvested. This compares to a 94% packout in the cravo system. Projected yields at full production from the Cravo system is projected to be up to twenty ton per hectare. Figure 7 compares open field production, versus cravo production in year three and anticipated full production of the Cravo system.

Figure 7

Fruit Picked versus Packed



- **Fruit Set:** conditions in the shed can be manipulated so that conditions are optimal for bees to forage and fruit set will occur

- **Frost damage:** frost conditions are minimal in the shed. There is little chance of loosing fruit to frost
- **Fruit Size:** maintaining optimum conditions throughout the growing cycle has resulted in the average fruit size from the Cravo being 32mm
- **Fruit Quality:** protecting the trees from the elements means that there are very few visual defects and no rain splits

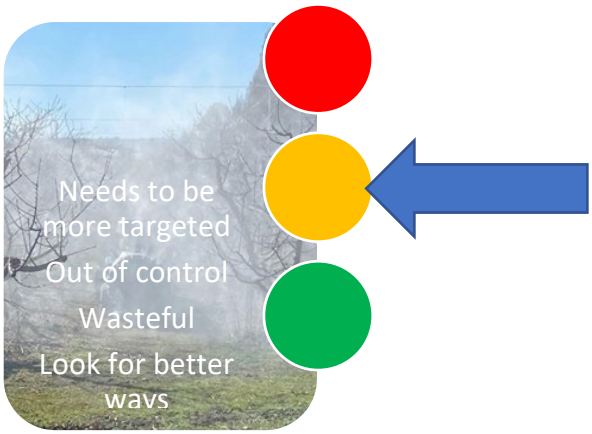
In year three, 7415kg was harvested from the Cravo with a 94.4% packout, resulting in 7000kg of packed fruit. As the trees reach full maturity over the next two years this volume is predicted to increase to 20000kg harvest with the packout maintained resulting in 19000kg/ha of packed fruit.

6. Findings and Discussion

6.1 Findings

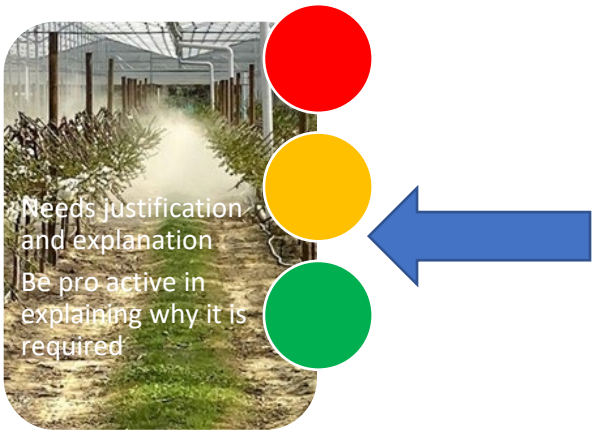
Findings from the five interviews carried out with members of the community are presented below.

Figure 8:*Interviewees reaction to Agrichemical application.*



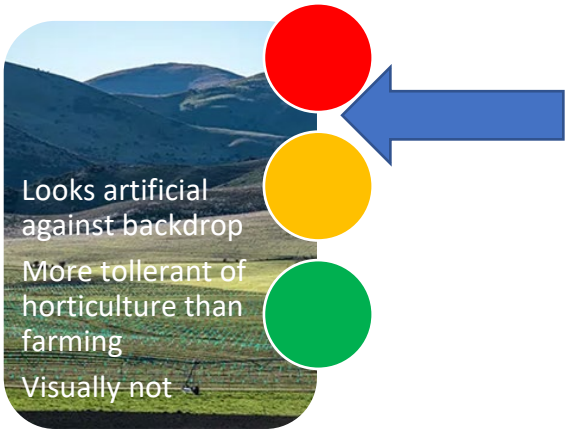
Agrichemical application was accepted with justification of use. A need for exploring more efficient ways of application and use of chemicals that were less harmful to the community were discussed. All respondents commented that it looks like a waste of spray and they wouldn't like it happening close to them

Figure 9: *Interviewees reaction to fertiliser use and application.*



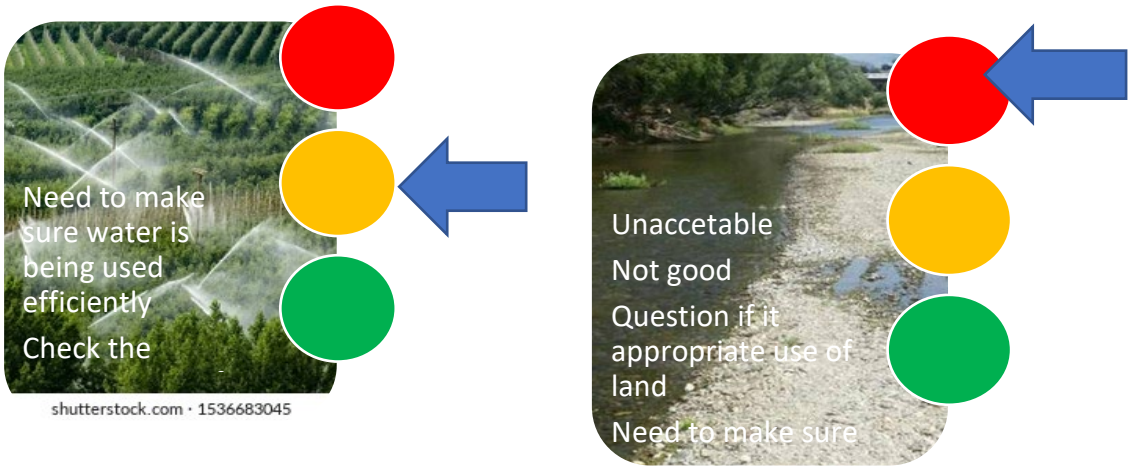
Fertiliser accepted with justification of use. A need for the use of the fertiliser needed to be proven for and assurances made that all possible steps were taken to prevent runoff or leaching. Looking for alternative ways to replenish the soil was encouraged

Figure 10: *Interviewees reaction to new block development.*



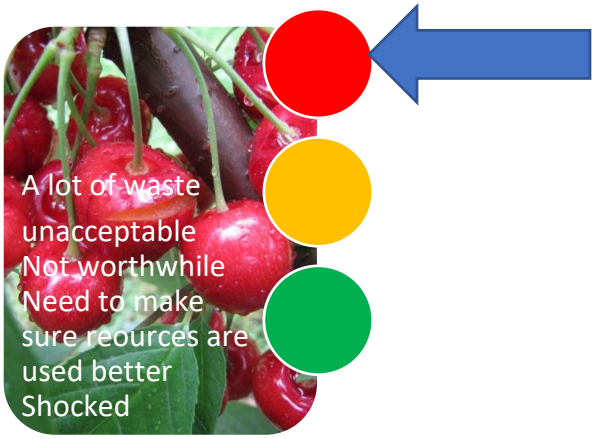
New land development was unacceptable in some locations. The location of new developments was a major factor in whether the respondents found this practice acceptable. If the development was in a prominent location or outstanding landscape with high visual impact all the interviewees deemed this unacceptable. Existing land use was acknowledged and horticulture was seen as part of Central Otago's regional story.

Figure 11: *Interviewees reaction to water use.*



Water use was accepted with justification unless the water source was unsustainable, here it was unacceptable. The unanimous response was the need to ensure that water was being used efficiently and all agreed that no business or Indi dual had the right to use water at the expense of others or the ecosystem.

Figure 12: *Interviewee's reaction to fruit waste*



Initial responses to the photo of split fruit were "sad", "waste", and "not good". There were some discussions about the need to investigate processing options for the waste fruit. When all the inputs were considered against waste fruit the unanimous response was very unfavourable. "Shocked", "not worthwhile", were among the responses.

6.2. Discussion

6.2.1 SLO and Seasonal Staff

Labour is the single largest input into any cherry growing operation. Even though employment law heavily regulates and protects employees minimum rights, the state of the current labour market in New Zealand gives potential employees the ability to scrutinise practises of specific operation against their individual values and choose an employer based on their values. This is a form of issuing SLO because if a horticultural operation is unable to recruit enough staff, it would be unable to operate.

Figure 13: *Clyde Orchards Seasonal Staff 2021*

Results from both surveys indicate that remuneration is a key driver in the ability to recruit and retain staff. In a cherry operation during harvest remuneration is performance based, ie the more an individual employee picks the more they are paid. Factors that can affect an employee's performance include canopy size (how tall the trees are), fruit numbers (tonnage per hectare), fruit size and fruit quality.

In an open field cherry growing system the tree canopy is relatively large with the trees being up to 4m high. Large step ladders are required to harvest the fruit on these trees. This combined with variable fruit set due to pollination and frost and cosmetic quality issues due to rain can greatly affect the volume of fruit harvested by individual staff members and therefore reduce the amounts of incentive payments received.

The Cravo system has a more compact tree structure, more reliable fruit set and the ability to protect the fruit from damage from wind and rain. The likelihood of staff being able to meet and exceed daily targets is far greater in this system, so they are far more likely to receive a higher pay.

Figure 14 : *Cravo Growing system in blossom*

Figure 15: *Cherries being harvested in Cravo*

Reliability of work and regular work hours was also received in feedback as being of key concern. Frustration is often evident when exact employment dates are not able to be given or work has been delayed due to rain events. Unfortunately, in an open field system there is little that can be done to manipulate start dates or prevent rain events. In the Cravo system environmental conditions can be manipulated to ensure that fruit is ready to be harvested when required and the crop is fully protected from rain events so a constant workflow is ensured.

It would appear that the Cravo system addresses two of the key components that seasonal staff deem important in their choice of an employer. Their ability to issue a SLO is issued by choosing an employer based on unregulated work conditions. In this case the Cravo system exceeds employee expectation so it could be argued that a company implementing this system would become a preferential employer or have greater SLO.

Whilst seasonal staff have power in their ability to issue SLO, by definition it is the community which within the business operates that has the power in issuing SLO, for they are ones who the operation impacts on the greatest.

6.2.2 SLO and the community

Agrichemical use and application methods is an operation within the horticulture sector that has negative connotations. Despite regulations that govern safety of people, the environment and the food chain it will always be a practice that is shrouded in controversy and one that will affect the cherry industry's SLO.

The reaction to this photo was unanimously negative. Apart from the negative impressions of the use and the need to reduce dependency on agrichemicals, comments were also made about the lack of targeted approach and the amount of waste that appeared to be happening.

The use of agrichemicals is less in the Cravo growing system than in an open field system. With further developments and trials this difference has the potential to increase as confidence increases in the ability to prevent pest and disease infection periods by manipulating the environment, thus reducing the reliance of agrichemicals. Agrichemical use was tolerated by all the interviewees after justification of the need and an explanation that it reduced food waste however steps to reduce their use was encouraged. In this respect an indoor growing system would protect the SLO.

Agrichemical application methods also differ between the two systems. Interviewees perceived the method shown in the photo to be "out of control" and "lack of target". The larger canopies of an open field growing system combined with air movement and/or wind require a large fan to give the spray enough push for sufficient penetration of the trees. This can result in large plumes of spray being applied. The Cravo growing system is more compact and provides shelter from wind and air movement. More targeted practices can be implemented in this system, and the product can be contained within the shed whilst application takes place. This approach was seen as far more acceptable by the interviewees.

Photos of fertiliser application were shown to the interviewees. Whilst most did not have any problems with the method of application, they all were concerned that nutrient leaching or run off did not occur. The justification of use was an important factor in the acceptance of this practice as was ensuring that the application rate was calculated, and product was not wasted.

Both growing systems fertiliser practices were acceptable to our respondents, although the Cravo system does have a greater level of control. In both systems annual soil tests are conducted and recommendations for application made by a soil agronomist. The differences lie in the application methods, where in the open field system a single bulk application of solid fertiliser is made and in the Cravo system it is applied in smaller more regular amounts through the irrigation system. Adverse weather such as a large rain event that would cause leaching or run off can also be prevented in the Cravo. This being the case the Cravo system would offer greater SLO.

Development and expansion into new land greatly impacts the community that we live in. Unfortunately, the most desired land for summerfruit development tends to be on elevated, sloping and visually prominent areas. Central Otago has a unique natural landscape, dominated by dry, barren hills and rocky outcrops and horticultural development can impede this.

All the participants were accepting but not enthused of current orchard blocks and developments impeding on landscape. “Sticks out against the environment,” “visually not appealing”, “at least its trees, better than farming”, “artificial” being the general theme. Future developments that had visual impact on prominent natural landscapes were seen as definitely unacceptable and a thought that there was a need to have to work with the land. On a side note the green plastic spray guards were of concern to 4 of 5 interviewees.

Given the responses in the interviews, it would appear that future horticultural development in prominent landscapes is unacceptable. The free draining, frost free, north facing slope required to produce world class cherries is not going to be available to carve up at the developers will. The Cravo system does have negative visual implications as well. The difference is that it can be constructed in areas that are not visually prominent and through the ability to manipulate environmental conditions have all the benefits of the hillsides.

During discussions with The Otago Regional Council, the overarching theme was water. In their view the sustainability of the water source, justification of water use, efficiency of application and the ability to be able to improve quality were all key components of our SLO. This could be partly due to the number of waterways in the country that are in a poor state of health. Water is a prime example of how the SLO can be taken away as we watched the dairy industry be the golden child of the New Zealand economy through the 1990’s to perceived ecological terrorists they are today.

The water take of any given property is a regulated activity with most properties having shares in a water scheme that issues a weekly allocation. The water scheme is issued a consent to take water from a source by the Otago Regional council. Despite meeting all conditions of consent, water is an emotive topic for the general populace and the need to protect our waterways and justify the use of water is a paramount factor in social licence.

The first photo was seen as an inefficient use of water due the method of application, the time of the day and the wind that appeared to be present. The initial reaction to this photo was negative. Everyone who was interviewed believed that it wasn’t responsible use, and more education was required in efficient use of this resource.

The dry creek bed with what appears to be poor quality water evoked even more negative emotions. Having this effect on a waterway was seen unanimously as inappropriate. No one believed that any individual, business, or industry had the right to abuse a natural resource in such a way. One of the interviewee’s commented “if this is the outcome, we need to question whether the land use is appropriate”. This was the only situation in the interview where no amount of justification for the use would be seen as acceptable practice.

Neither of the photos related directly to either of our case study operations. Responses did however highlight the need of being aware of the amount of water being used, keeping up with technology and implementing new efficiencies when available, ensuring the sustainability of the water source and giving back to not only maintain the quality of the water way but improve it.

If a comparison of water use between the two systems is made, the cravo system is far more efficient in the way its water is utilised. Because water is not used as a tool for frost protection, actual water use is half of the open field system. This combined with almost three times the amount of fruit packed per hectare results in water use per kilogram packed of 180L, 18% of an open field system.

Food waste and how to prevent it is becoming a major issue within the food sector and has potential to become a major factor affecting the cherry industries SLO. Whilst the amount of fruit wasted is relatively easy to account for post-harvest, accounting for wasted fruit left on the orchard floor is somewhat harder.

Packout statistics from the 21/22 growing season show that the open field blocks had an average pack out of 77.5%, while the Cravo system was 94.4%. That means that four times the amount of fruit goes to waste from an open field system than a cravo system.

Initial responses to the photo of split fruit were “sad”, “waste”, and “not good”. There were some discussions about the need to investigate processing options for the waste fruit. When all the inputs were considered against waste fruit the unanimous response was very unfavourable. “Shocked”, “not worthwhile”, were among the responses.

It is these responses that could put businesses at the most risk. Not only is fruit waste economically unsustainable, but environmentally unsustainable as well given the amount of agrichemical, fertiliser and water that is put into the product. If individuals within the community consider the inputs that go into producing cherries and the potential for only waste fruit it is likely that SLO has the potential to be lost.

Hidden beneath the canopy of the trees hide some questionable environmental inputs. Individually the industry can justify their use and need and SLO is granted. Luckily, very few have cumulated the inputs together and shown that perhaps the risk to the environment often outweighs the reward. The horticulture industry can ill afford a loss of SLO situations such as the dairy industry has been facing in recent times.

The future of food production in New Zealand and the SLO is going to rely on investment in innovative technologies that increase the efficiency of land use, resources and inputs, whilst reducing the amount of waste product through crop protection strategies. Intensive indoor growing system such as Cravo will help to keep our SLO. Table 2 shows how by reducing waste and increasing tonnage, efficiencies of inputs can be gained.

Table 2: *Operational Inputs of Open Field Growing System versus Cravo Growing System*

	Open Field (7000kg/ha)		**Cravo system (19000kg/ha)**	
	Number	**Rate/kg**	**Number**	**Rate/kg**
Sprays	15	.002	11	0.0005
Nitrogen Use	50 units	0.007 units/kg	50 units	.0002 units/kg
Water Use	7000000L	1000L/kg	3400000L	180L/kg

6.2.3 General Discussion

The discussion in this paper so far has concentrated on the practices on orchards that are putting our SLO at risk. What was discussed in all of the interviews, without prompt, was current perceptions of the summerfruit industry and what factors currently give us SLO.

On the surface, the industry is predominantly seen as not being detrimental to the environment. The current perception is that because we grow trees and fruit and are not heavily reliant on cultivation that we are a clean and green industry. “better than farming,” and “good guys” were comments through the interview process. We are extremely lucky that the images of cherries on a tree give a perception of being far more environmentally friendly than a cow waddling to the shed to be milked. Perceptions such as this give us SLO.

The predominant water source for the cherry industry in Central Otago is the Clutha (Mata-Au). It is one of the most sustainable and one of the healthiest water ways in the country (ORC Website). The Earnscleugh irrigation scheme has had a great deal of success in improving the health of the Fraser River by piping water to it from the Clyde dam. This has guaranteed the flow of the river, improved the fishery and combined with the riparian plantings greatly improved the health of the river, this helps protect our SLO.

The economic impact that the industry has locally and nationally also helps protect its SLO. Last year the New Zealand cherry industry generated approximately $65 million in export revenue with this figure projected to quadruple over the next five years (SNZ market data). Horticulture and viticulture employ 7.5% of the Central Otago population, the fourth largest employer in the region with over 1000 full time staff and in excess of 4500 seasonal workers required each year (CODC 2020). Being able to give school kids summer jobs, the economic kick that local businesses receive from an influx of seasonal workers, the families that are provided for through direct full time employment to those who are employed through associated trades, there is little doubt that the industry is a driver of the local economy and this in itself protects the SLO.

7. Conclusions

There are many factors that can affect a business's or industry's SLO. Through the process of this project the following conclusions have been made.

7.1 Seasonal Staff

The SLO that is held by seasonal staff is likely to be increased in an intensive indoor growing operation due to more reliable workflow, better work conditions and higher remuneration. The commencement of work is likely to be more reliable and days will not be interrupted by rain. The trees are smaller and more compact and picking fruit will be easier which should result in and individual picking more cherries and receiving greater bonuses,

7.2 Wider Community

A business is more likely to lose their SLO if their actions directly affect those around them. For example keeping neighbours awake with frost fans at night or running a creek bed dry.

Industry needs to be more open to sharing the positive aspects of their operations on the environment and community. We need to get better at promoting the good stories and letting people know all the good stuff we do.

Education and communication is key to maintaining SLO. Stakeholders are more likely to accept practices if they know why they need to occur, when they will occur, justification for the practice and what measures have been put in place to minimise any risk.

7.3 General Conclusions

Any business needs to understand the factors that affect their SLO.

SLO is dynamic, the rules and factors which control it evolve as the values of the community change.

Impact on the environment is likely to be the factor that will affect SLO. As the values of stakeholders change, they are going to want assurances that the places they work, the industry that supports them or that the product that they are consuming comes from a socially and environmentally responsible industry. This means that they (the stakeholders) are likely to put the practices of cherry growing operations under the spotlight. When this happens it is important that growers can provide quantitative data on the inputs involved and demonstrate attempts to increase efficiency and be more socially and environmentally sustainable..

The research suggests that an intensive indoor growing system could protect the SLO of a cherry growing operation. It will do this by decreasing the amount of water, fertiliser and agrichemical required to grow a kilogram of cherries while minimising the amount of waste product that is produced.

8. Recommendations

- An industry lead research program needs to be set up to actively identify the stakeholders of cherry production and engage with them to find out their perceptions of positive and negative aspects of production and identify the strengths and weaknesses of the production cycle. It will also identify practices that are deemed to be acceptable and unacceptable.
- Cherry businesses need to explore techniques to educate the community on the positive impact they have on the surroundings, the environment and the community.
- Growers must have a data source of all the environmental inputs into their operation and be able to justify their use and show what is being done to use resources more efficiently.
- The environmental impact of a given operation needs to be given as much weight as the economic returns when assessing its future sustainability.
- Investment is required by industry to implement growing systems that are more efficient, that is have higher yields, less waste and use the natural resources and synthetic inputs more efficiently.
- Embark on an information sharing/education program with stakeholders. Keep them up to date with on orchard activities, invite them on orchard use social media as an information sharing platform
- Investment is required by industry to implement growing systems that are more efficient, that is have higher yields, less waste and use the natural resources and synthetic inputs more efficiently

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Appendix 1: Employee Survey

Handpicked Crew March/April 2022

Seasonal employees were surveyed at the end of the Summerfruit season to gain an insight into the industry's seasonal workforce and gain an understanding of what the experiences are like from an employee point of view. This survey was sent online via email, social media posts and to growers to email to their workforce. I estimated this was distributed to approximately 600 workers and we received 97 responses. A great return rate for a survey.

One of the objectives of the survey was to understand demographics, age and visa status of the workforce. Along with employer attraction, recruitment and retention techniques, facilities, and conditions of work. It is important to note that all respondents were from the Central Otago region. While this wasn't intentional, most responses came through the Handpicked Crew contacts which is currently only available in the Central Otago region. Therefore, the following report covers only the Central Otago workforce.

Summary

Overall, most respondents reported an enjoyable season, were highly likely to refer their friends and pay rates and conditions met expectations. A healthy culture and a positive work environment were reported as very important factors at work. Improvements could be made in various areas of communication, pay rates, general comradery and small daily incentives.

Demographics

Many respondents (74%) were aged between 16 – 34 years. With 43% being in the younger aged bracket - 16 – 24years. NZ citizens made up 60% and majority of the remaining 40% were working holiday and student visa holders.

Those that were categorised as NZ citizens, 66% were NZ students, either university or high school age. Only a small number (10) were regular seasonal workers.

Almost all received Handpicked Crew cards – these were utilised by 50% of the workers.

Recruitment

Half the roles were filled with returning employees and the other half were new employees to the industry. Employees returning to previous employers did so because of the good work environment and culture. Pay rate being the next biggest driver to choosing to return to their employer.

The most successful recruiting technique reported was via a friend's referral. Highest percentage of new people to the industry were from friends. Emphasising the importance of creating a positive experience and environment that is then passed onto others.

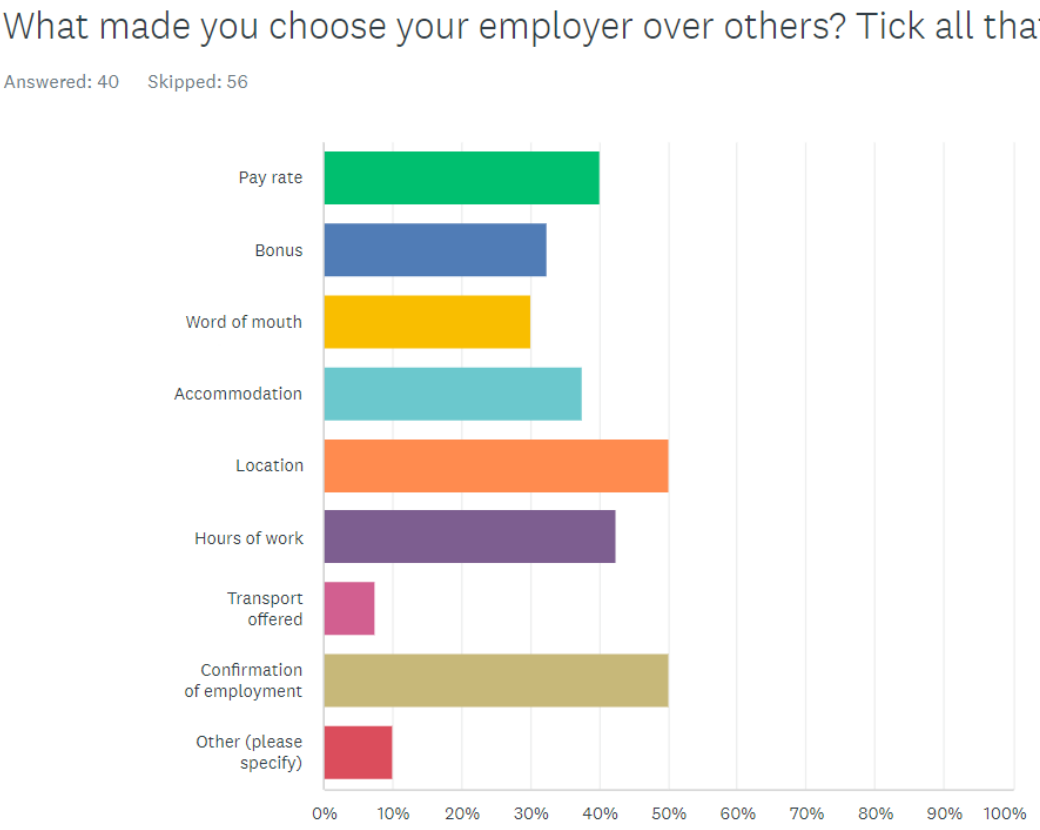
Despite large amounts of traffic going to Pick NZ, only 2 respondents found their job via the Pick NZ job board. There are many variables that might be affecting this which requires more research to fully understand the low number of successful applications via the website.

A growing concern last year was that growers were not following up with applications. This year, that did not seem to be the case with all applicants receiving responses when contacting orchards about employment.

Assumptions can be made that this highlighted the shortage and growers were able to keep up with the number of applicants. They also have a better understanding of the importance of communication with job seekers.

Those working for a new employer and deciding on which orchards to choose, various factors came into it, including pay, accommodation, bonus, hours of work, location, and confirmation of employment. Workers are not necessarily driven by pay or bonuses.

The graph below shows what made employees choose their employer over others. Please note this doesn't not include employees that were returning to their old employer.



Facilities

Accommodation was provided for a high proportion of the employees (over 75%). This ranged from cabins, backpackers, or a house, with only a few (11%) tenting onsite. This indicates growers are providing their workforce with suitable accommodation where possible.

The communal facilities provided by growers were up to a high standard with the majority of employees reporting facilities were satisfactory or above across all areas - toilets, communal areas, cabins and houses. There were some reports that the kitchen facilities, and toilets wash basins needed to be improved.

There are still some areas where growers need to improve their facilities, with some reports that kitchen facilities, fans/air con in rooms, toilets (wash basins) and offering transport would have helped employees enjoy their experience more.

Pay and Conditions

Payrates were reported as meeting expectations, with 25% reporting that were above expectation. Only a few reported it was below their expectations. However, when asked what could be done to improve, many reported increased pay would improve their experience.

Majority of respondents were paid an hourly rate, this ranged from $20 – 28 with 20% being paid a combination of bucket/bin rate and hourly rate.

Average daily income was just over $210, with a range of $140 and highest $360.

Most employees worked between 41 – 60 hours, for an average of 5-8 weeks. A smaller percentage (10%) reported working over 60hours a week.

Bonuses and Incentives

Many growers are paying end of season bonuses with over 77% of employees surveyed receiving this.

Others received bring-a-friend bonus, returning bonus and supervisor allowance. It was reported some were disappointed in bucket bonuses as they were set very high and hard to achieve.

Small incentives are still missing from some orchards with many reporting a cold drink, ice cream/ice water or meals/snacks on offer would be appreciated.

Overall experience

Over 90% reported they enjoyed their season and were highly likely to refer a friend.

The reasons for their enjoyment were due the people, the friendlessness of management, companionship, culture, fresh air, outdoor activities, variation of role, comradery

'I enjoyed our supervisors and all the support we received. Overall, i enjoyed the whole experience, especially because we did the job as a church group and thoroughly enjoyed our experience with each other and created deeper friendships with each other'

Employers could have made some changes to help improve their employee's experience. These ranged from improvement in facilities, to increased pay. A theme that was repeated when asked what improvements could be made was, communication and greater information sharing. Many reported they lacked honest information on what was coming next and would have appreciated more clarity on what is planned for the week/season ahead, and what were the expectations. It was highlighted that growers still need to work on employee encouragement, recognition, and appreciation.

To remove monotony, changing roles throughout the week would prevent boredom and lack of motivation.

Actions/Recommendations

- Pick NZ – high traffic volume to the website, however low success rate of recruitment? Why is this? Do we need to understand this in more depth? Have other industries experienced the same?
- 10% of workers report working over 60hours per week – is this acceptable?
- Recruitment - friend referral was the most successful recruitment strategy. It is important growers are aware of this, ensuring they are creating a positive experience for all employees to return and share with their friends.
- Communication – developing growers communication skills and getting a better understanding of how to relate to their workforce is required. Webinars plan to cover some of this but making growers away is also required.
- A healthy culture, core values match, and a positive work environment is a theme that was drawn out of the survey that employees are looking for when choosing and or returning to an employer.

Appendix 2: Hort NZ Questionnaire

Otago District Council, Otago Regional Council

1. What do you think are the greatest risks to losing our social licence to operate in the horticulture sector?
2. What do you think we could do to protect your social licence to operate?
3. What do you think are the key factors that contribute to our current social licence to operate?
4. How could these factors be enhanced?
5. What do you think the key issues to maintaining social licence in the future will be?

Appendix 3: Interview Questions

Cue Card photos and questions for community stakeholder group

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- What is happening in this photo?
- How does it make you feel?
- Is it good or bad?
- Why?
- Given the inputs that we have discussed in the previous photos, is it acceptable that there could be potentially no tangible output?”