



Kellogg Rural Scholars Series

Vol. 1, April 2022

Horticultural Insights



ISSN 2815-8970 (Print)
ISSN 2815-8989 (Online)

Prepared for Horticulture New Zealand



**RURAL
LEADERS**

Introduction.

New Zealand's food and fibre sector is full of capable and purpose driven people. Supported by Horticulture New Zealand and an incredible group of Partners, the New Zealand Rural Leadership Trust is privileged to be entrusted with growing many of these people in their leadership journey.

A key aspect of the rural leadership approach is research-based scholarship. The clarity of thought and confidence this approach promotes is transformative.

Many Kellogg and Nuffield Scholars go on to live their research. They build businesses. They advance community and social enterprises. They influence policy and they advocate for animal and environmental outcomes, informed by an ability for critical analysis and their own research-fuelled passion.

The relevance of research by emerging strategic leaders – with their sleeves rolled up – is no more apparent than it is in New Zealand's Horticulture Sector.

In the following pages we are delighted to précis 14 horticultural research reports by Kellogg Scholars. The full reports can be found at <https://ruralleaders.co.nz/kellogg-our-insights/>

The reports traverse topics as wide and timely as horticultural futures, social impacts on Iwi, the potential for impact investing, technical production and profitability topics.

Ngā mihi,

Chris Parsons and the NZ Rural Leaders Team



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Minor edits have been made to some of the following pages by the NZ Rural Leaders Team.

Future scenarios for New Zealand horticulture.

Anna Rathe - May 2021

The New Zealand horticulture sector is currently enjoying a period of growth and prosperity. However, the future operating environment is uncertain and unlikely to be a continuation of the current track.

There are multiple possible futures with different levels of warning, timeframes and impacts: for example, sudden deep impact occurrences such as the kiwifruit pathogen Psa1 or the Covid-19 pandemic compared with a slower burning issue such as the labour shortage.

In order to be resilient and successful into the future, the sector needs to be ready to adapt to a changing domestic and global environment.

The aim of this project was to explore how plausible future scenarios can be used as a tool to better prepare the New Zealand horticulture sector for what the future may bring. The project objective was to develop scenarios to help to consider what the future operating environment could look like for horticulture in New Zealand, and what challenges and opportunities different plausible futures might present for the sector.

Four divergent and plausible future scenarios were developed and analysed to identify insights, risks and opportunities. They are not predictions or advice – they simply present a (non-exhaustive) range of ways that the future could plausibly play out. The scenarios were developed using group workshopping and the underpinning process was based on the general morphological analysis methodology.

The timeframe selected for the scenarios was 2040. Each of the scenarios is able to be interrogated by an individual organisation or business through their own lens to determine what opportunities or risks each could present.

However, at a high-level the common themes across scenarios included:

- The power of public sentiment and opinion and the resulting impact on a sector
- Consumer preference influencing not only the final product, but all aspects of production
- The culture and cohesiveness within a sector and how that can influence the perception of those outside the sector
- The importance of environmental sustainability as a foundation of a sector's prosperity
- The power of a sector that lifts performance across the board and works together to improve
- The influence that the diversity in operator scale and approach can have on the sector as a whole
- The ability of a sector to adapt is critical
- Storytelling is important.

The insights identified that would be more relevant to an individual business were primarily around competition, market expectations and the different domestic and export dynamics.

The insights identified more relevant to an industry body were primarily around sector cohesiveness, ability to advocate and key issues for growers that require support.

It is hoped that the scenarios and analysis will help those involved in the horticulture sector to acknowledge that the future is uncertain, and encourage them to incorporate flexibility and resilience into their planning and decision making. New Zealand needs a successful horticulture sector that is fit for the future, whatever the future.

 [Read - Future scenarios for New Zealand horticulture.](#)
Anna Rathe



New Zealand growers' priorities.

Angela Halliday - August 2016.



 [Read - New Zealand growers' priorities.](#)
Angela Halliday

The aim of this research project was to understand the main issues that growers perceive are (or will be) affecting their businesses and industry. A survey with 233 responses and four focus groups (two focused on vegetables and two on fruit) were conducted to get a snapshot of the industry and to help guide the strategic review for Horticulture New Zealand.

Survey respondents were predominantly small and medium sized enterprises with most (89%) indicating they had 20 or less FTE employees year round. 35% of survey respondents indicated that they employed more than 20 people in the peak season (some over 150). Annual turnover for 67% of the survey respondents was \$1 million or less with 36% of survey respondents indicating they had a turnover of less than \$250,000.

The survey found that these issues were thought to have had the most impact on growers businesses over the past five years (in order of perceived impact)

1. The price of inputs
2. The cost of compliance
3. Market access
4. Food safety
5. Health and safety

The survey found that the top five issues thought to be facing growers businesses in the next five years were (in order of perceived impact)

1. Health and safety
2. Biosecurity
3. Market Access
4. Cost of compliance
5. Access to Water

Growers thought that the issues Horticulture New Zealand should be focusing on for growers were (in order of priority)

1. Biosecurity
2. The cost of compliance
3. Health and safety
4. Access to water
5. Market access

However, the priorities changed with the availability of seasonal labour being elevated as a priority (along with employment and immigration law).

A similar pattern occurred when the results were filtered for businesses that are fully vertically integrated, possibly indicating that more vertically integrated export businesses, those with a single desk marketing structure and fruit growing businesses are more concerned with seasonal labour shortages than other survey respondents.

The survey indicated a growing concern about access to water moving from 48% to 71% (+23%) from the current situation to the future. Concern over the impacts of land fragmentation concern also rose from the current to the future scenario (+7%) as did the perceived impacts of land availability (+13%).

When asked about decision making priorities, the number one consideration growers had was financial sustainability with 144 (77%) rating this as their number one priority. Environmental sustainability was the most common second choice with 60 (or 31%), the third, fourth and fifth priorities varied between environmental sustainability, business reputation, worker welfare and lifestyle/family impacts; the most commonly ranked least important was 'wider community impacts' with 122 or 54%.

Business aspirations were assessed, and the most common response was a plan to double yield (40%) followed by staying the same size (40%) and (more concerning) getting out of the business (20%). Businesses planning to triple, more than triple or shrink were 14%, 7% and 4% respectively.

Overall this study highlights the diversity of horticultural businesses in New Zealand and the different priorities of growers. The difficulty of an industry body representing these diverse growers at a national level moving into the future is discussed, and recommendations made including regular grower surveys, ongoing quantification and calculation of its value add to growers, promoting succession planning and careers in the industry and communicating the value of the sector to New Zealand.

The social impact of land use change in Hawke's Bay.

Clare Easton - December 2021

2020 – a year most of us will never forget – a year of reflection on what truly matters. Our narrative for so long in New Zealand has been about protecting the environment and our beautiful natural assets.

But with the onset of COVID-19 we saw the narrative shift and our primary focus became people – people's health, well-being, and livelihoods.

We became a 'team of 5 million' and previous perceptions of urban and rural divides became non-existent as growers, farmers, and producers were the 'essential services' that got us through.

This Māori proverb perfectly encapsulates this people-centric view that resonates with me so strongly:

“HE AHA TE MEA NUI RAWA?
HE TĀNGATA, HE TĀNGATA, HE TĀNGATA.
WHAT IS THE GREATEST THING?
IT IS PEOPLE, PEOPLE, PEOPLE.”

The following research question was subsequently developed: what is the social impact of changing land use in the Hawke's Bay region?



The objective of the research is to provide another layer of insight and use this as a platform for collaboration and conversation – understanding the social impacts (real and perceived) of contrasting primary sector investment in rural Hawke's Bay – comparing sheep and beef, horticulture, dairy and forestry.

Hawke's Bay is a place of diverse geographies, climate, people, and culture. Qualitative research was undertaken to bring the voice of the people to this report. A wide cross-section of pan sector viewpoints were interviewed inclusive of iwi, corporate, regional/local government, industry bodies and farmers.

Three key themes emerged from the interviews and thematic analysis regarding the social impact of changing land use:

1. Employment and training opportunities.
2. Values and perceptions of changing land use.
3. Māori communities and post settlement land use.

It is projected that from 2020 to 2050 Hawke's Bay will have a 66.8 percent increase in forestry and 35.8 percent increase in horticulture. These are significant shifts and there is a responsibility on farmers, investors, industry leaders and government bodies to collaborate to ensure positive social outcomes.

The following report provides diverse insights coupled with recommendations to enable positive social outcomes in the region. The future is exciting and there is no one single answer. However, we must think holistically to deliver a positive triple bottom line – social, environmental and economic outcomes to sustain for generations to come.



[Read - The social impact of land use change in Hawke's Bay.](#)
Clare Easton

The social impact of converting traditional agricultural land into horticultural land within my Iwi.

Tom Keefe - January 2015.



[Read - The social impact of converting traditional agricultural land into horticultural land within my Iwi.](#) Tom Keefe

My Iwi – Ngati Pahauwera.

Ngati Pahauwera is a confederation of clans centred on the Mohaka River in northern Hawke's Bay. The tribe did not sign the Treaty of Waitangi, Chief Paora Rerepu sold large areas of tribal land to participate in the new economy, and supported the colonial government against anti-government Pai Marire (Hauhau) and Te Kooti fighters.

To be from Ngati Pahauwera is an honour that we all hold proudly. We are quick to advise strangers of our lineage to the region in order to take the front foot in Korero. Descendants of Pahauwera are global but we still have a common connection to our home through our whakapapa.

At the heart of Pahauwera are the Māori settlements of Raupunga and Mohaka. Mohaka being close to the mouth of the mighty Mohaka River and Raupunga situated 20 minutes upriver, close to the Mohaka viaduct, the tallest railway viaduct in Australasia.

In conversations with Pahauwera Leaders I have been told of the good old days when there were jobs for everyone. You were either a farmer, shearer, ganger on the Railways, driver for the Ministry of Works, forestry worker or you drove the short distance to Wairoa and worked at the freezing works. Most of the jobs were hard labour intensive ones, jobs where you knew that you had done a hard day's work, jobs in which young Māori thrived .

Today those jobs seemed to have been scaled back or restructured in preparation to sell off to the highest bidder and this has come at a cost to our people. Within the Raupunga and Mohaka area I remember growing up with a fish n' chip shop, movie theatre, two stores, a post office , a police station and a pub, today we have none of these.

The urbanisation of our people has left the area unrecognisable. Most of people moved to either Napier/Hastings or Wairoa in search of employment or following family. Today we have 180 households in the Pahauwera Catchment (Est. under 1000 people), the average household income is \$17,500 p.a. The average household income for those of Pahauwera living outside of Pahauwera is \$23,000 p.a

For me the root of some, if not most of these issues is education and employment. The Ngati Pahauwera Development Trust have a vision to increase the household income by 50%. On current figures this will take the range from \$35,000 for those residing in the Iwi and \$46,000 for those that are living outside the area.

“According to Statistics New Zealand, the average household income for New Zealand rose by 11.8% to \$84,462”. To do this we need to create jobs within the Iwi, jobs that have a career path and offer opportunity to upskill and personal development in an effort to breaking the cycle that I believe we are currently in.

Amidst all this doom gloom about how we are not succeeding as a people, we do have a strong heart, we are passionate about our Turangawaewae and we do have some highly motivated members of the community that have a vision for self-sufficiency for our people, and I am one of those!

The purpose of this report is to focus on what the social effect of having high density employment, like horticulture will bring to the region. This report will give you a back story to Ngati Pahauwera.

This report is not about how I plan to introduce a multi-million dollar horticultural industry into Ngati Pahauwera, giving full time employment for up to 100 people, 10 months part time employment for approximately 50 people and seasonal employment for up to 300 people at its peak, this report is more about 'why' do we need to do it and not the 'how'.

We need to 'decentralise' our people back to their homelands - but bring them back to what? What will the social impact be on a community who currently have an average household income that is insufficient for the needs of a modern family in New Zealand.

It is obvious that land planted with horticultural crops (in particular fruit trees) requires more full time employees than a traditional farm will and this is the basis for this report.

Sustainable impact investing into New Zealand's Horticultural Sector: Is there an opportunity and can we capitalise on it?

Oscar Beattie - August 2020.

 [Read - Sustainable impact investing into New Zealand's Horticultural Sector.](#) Oscar Beattie

In addition, the impact of organics was tested across the kiwifruit orchards with organic management producing less emissions overall than a conventional orchard.

Across the multiple interviews and literature reviewed, it was shown that there is significant variation in the positioning of investment funds and corporate farmers on the idea of impact investing.

In general, foreign, and younger investors appeared to be further advanced in the understanding of impact investment and its opportunities. However, for the New Zealand market to fully appreciate and take advantage of impact investment opportunities that will arise in the primary industry space, there needs to be changes to the consistency and transparency of sustainability reporting and fund raising.

Although this study provides a baseline understanding of the potential sustainability of the horticultural industry, there are recommendations to be considered in either further research or by leading organisations within the sector. These are:

- Where possible, the increase in establishment and use of other quantifiable sustainability metrics in addition to carbon
- Provide actual on-orchard data to test the strength and applicability of the carbon footprint modelling
- Further research into the environmental sustainability of orchards in an intensity-based approach such as kg CO₂-eq per tray produced or per \$.

In addition, there are also recommendations for the industry's investment sector to capture the possibilities of the impact investment movement:

- To increase the measurement and reporting of the sustainability of the industry and therefore utilise the existing foreign impact investment interest as well as being prepared for when the domestic New Zealand investor base ultimately increase their focus on impact investment
- For the industry to either create a universal accredited standard of reporting and measurement for sustainability of a business or to align itself to current global reporting standards and initiatives.

These recommendations will help to increase investor confidence in the industry and therefore increase the potential uptake of the opportunity for impact investment.

The global perspective on investment is changing from traditional financial metrics to the relatively recent idea of "impact investing". This is where investments are made with the objectives of creating a positive impact on environmental and social matters as well as receiving financial returns. The growth in this movement has raised questions on whether there is potential within New Zealand's horticultural industry to market its perceived sustainability and therefore access this pool of capital. With this theory in mind, this report looks to quantify the sustainability of the sector as well as analysing the ability of the investment sector in New Zealand to take advantage of impact investing theory.

To achieve this aim, this study uses an analytical framework to measure the carbon footprint of orchards and vineyards as a proxy for environmental sustainability. The model uses a case study of six different orchards and vineyards, owned by Craigmere Sustainable, to get an understanding of the variability within the sector. In addition to the carbon footprint modelling, four informal interviews of leading New Zealand primary industry investment managers and large corporate farmers and foresters were completed to get an understanding of the extent the primary industry and its investors are concerned and report on sustainability.

Using the purpose-built carbon model, the producing orchards and vineyards were shown to have a net positive impact on the environment through large sequestration by the plants and compost. The two developing apple and kiwifruit orchards were shown to have comparatively high net emissions in their early years. It was shown that there is significant variation in the sequestration potential of different crop types (apples have the greatest potential sequestration per ha).



Seasonal labour shortage in the kiwifruit sector.

Glenda Hutchison - December 2018



The kiwifruit sector has a serious labour shortage. What is the extent of the shortages, why has the industry got to this problem and how can we address the shortages?

The aims for me in doing this project was to get an understanding of the labour problems facing the kiwifruit industry. I wanted to see what was driving the labour shortages with an aim to consider how we could overcome the problems to create a desirable workplace and attract plentiful and reliable workforce.

New Zealand kiwifruit sector is currently producing 143 million trays, this is projected to reach 190m trays by 2027. The sector is set to contribute \$6 billion to New Zealand's GDP by 2030. The kiwifruit industry currently employs 15,000 FTE seasonal workers. An additional 7,000 workers will be required if projected growth is to be achieved so the extent of the labour shortages is critical to the industry.

Kiwifruit together with all sectors, are struggling to employ sufficient workers. In 2018 a labour shortage was declared in the Bay of Plenty with 1,200 vacancies and still 70% of the crop remaining to be picked. The reasons why these shortages have come about are multiple.

The current labour market is very tight with a nine-year unemployment low of 4.5%, projected growth for the industry of 67m trays by 2027, the diversion of working holiday visa workers to other sectors and poor uptake of the local seasonal labour pool, this being due to poor reputation around pay and conditions.

As an industry, labour constraints are a real challenge in meeting future growth. Many of these challenges are around the nature of seasonal work being inconsistent hours, physically demanding but other challenges are around compliance with employment law. How the industry participants respond to the situation will impact on future growth. The constrained labour market will require owners and employers reconnecting directly with employees.

Inconsistency of seasonal work is a significant deterrent to new employees; the industry could address this with centralised labour coordination to facilitate year-round employment and alternative employment arrangements and agreed hours. Employees are also looking for greater range of flexible working options with different shifts, staggered hours and job sharing.

How the industry engages with our employees, ensuring the pay is structured to provide certainty as well as incentives for efficient high performance. Allowances should be considered to address travel waiting times, and availability allowance to acknowledge employees being on hold and available to work and not redirecting to other sectors.

Investment into accommodation and transport options for the seasonal workforce will contribute to attractiveness as well as motivation and performance. Innovation is the way of the future and investment is needed now however it is not the immediate solution we are needing.

The attraction of all the seasonal workers available within New Zealand will not meet projected demands, the Recognised Seasonal Employer (RSE) scheme needs the full support of the industry and government, however employment standards, accommodation and transportation investments are required.

The growth of NZ Horticulture, including Kiwifruit, is a great economic success story for our country. People are or most important and scarce resource, coordinated, committed and compliant efforts are required by all.

 [Read - Seasonal labour shortage in the Kiwifruit Sector.](#)
Glenda Hutchison

The Labour Shortage – The role of technology led innovation in the kiwifruit industry.

Munazza Saeed - November 2021

 [Read - The role of technology led innovation in the kiwifruit industry.](#)
Munazza Saeed

Improving work culture, where everyone is treated fairly, will help to build industry reputation and would encourage everyone to work and stay. To empower and attract young locals, the kiwifruit sector needs to incorporate innovation, sponsor apprenticeships, change marketing strategies, provide accommodation, and travel facilities for seasonal workers. Universities and Polytechnic institutes need to encourage students to gain horticulture knowledge to produce a future workforce for the kiwifruit industry.

Even if all the unemployed in NZ would work, industry would still need more seasonal workers. What should industry be focusing on, to resolve long term labour issues? Industry needs to be creative and look for innovative solutions to ease the labour shortage issue.

Technology adoption could serve two major benefits to the industry: firstly easing the pressure on manual labour jobs, and secondly generating technical jobs for young kiwis. This new job market will call for skilled people to build, service and maintain technologies.

To successfully introduce and implement innovation in the industry, employers need to follow a change management process. Industry needs to make sure that contractors follow compliance requirements and keep investing in fit- for -purpose innovation to improve supply chain efficiency.

All stakeholders need to understand that continued small and large operational improvements and enhancements will move the industry toward efficient and reduced labour efforts. A dedicated investment in technology innovation and a collective effort for adoption needs to be supported by Zespri, post harvest facilities, Government, and the private sector to improve performance and brace for future challenges.

Kiwifruit represents 32% of New Zealand's total horticultural export revenue. Kiwifruit growers and the wider industry works hard to make sure consumers across the world can enjoy fresh, healthy kiwifruit; however a labour shortage could easily put high kiwifruit returns into jeopardy. If industry doesn't pick and pack kiwifruit on time it can result in substantial fruit loss in terms of quality and revenue.

The current and predicted labour shortage is already having a significant impact on the horticultural sector including the kiwifruit industry. Projected growth in kiwifruit sales is predicted to reach 190 million trays by 2027.

However, with the record-breaking volume increase every year, the tsunami of kiwifruit may arrive earlier than 2027. An additional 8,000 seasonal workers will be required if projected growth targets are to be achieved successfully, in addition to 23,000 seasonal workers in peak season (2021 data). Hence the extent of the labour shortages is critical for the kiwifruit industry.

The aim of this study was to investigate the extent of the labour shortage in the kiwifruit industry especially within postharvest, and how technology led innovation can help to ease the burden of the shortage in labour.

The physical, inconsistent/seasonal nature of the job plus lack of training and work culture, tighter immigration laws and COVID-19 are among the main factors hindering the industry from attracting and retaining people year on year. In most of the interviews, lack of change management, work culture, effective communication and leadership were raised as major barriers in technology-led solution of labour shortage.

Kiwifruit, along with the other horticultural industries needs certainty of labour supply. Key recommendations from this project are discussed here. One way the kiwifruit industry can attract labour is by supporting employment staggered year-round or fixed contract with flexibility to provide job security.



Establishing and operating a sweet cherry orchard in Central Otago.

Simon Witheford - May 2018

This business plan, to establish and operate a cherry orchard in Central Otago, intends to achieve the following objectives:

Understand the costs of establishing and operating a cherry orchard.

Gain an overview of the challenges and risks within the sector.

Understand the market dynamics for NZ produced cherries and what the future market trends might be.

To be fully informed, and in order to make reasonable judgements, the report was compiled using the following methods:

Personal interviews with current orchardists to understand current practices, risks that affect production and developments in growing systems.

Speaking with horticulture consultants to appreciate the current trends in orchard systems and the more successful approaches to growing.

Technical literature review of new planting systems and the development of automation and technology in orchards.

Direct discussion with product suppliers and manufacturers, agronomists, orchardists and accountants to compile accurate development and operational budgets.

Interviews of industry leaders who have a good overview of market dynamics and industry challenges.



The conclusions drawn from this report include:

A continual strong demand from export markets for premium NZ cherries that current supply cannot completely satisfy. A trend which is expected to continue.

Chile is a key competitor to NZ grown cherries producing high volumes and exporting at a similar time of year. This highlights the necessity for NZ to continue to focus on premium quality fruit and high value markets.

There is a greater need of collaboration and market co-ordination for NZ producers.

Capital cost of establishing a cherry orchard is high.

Growing risks are high though many can be reduced.

New planting systems offer increased yields and reduced operating costs, though have approximately 20% higher capital costs.

The report is intended to help any people thinking about entering this sector and establishing an orchard.



[Read - Establishing and operating a sweet cherry orchard in Central Otago.](#) Simon Witheford

Can vertical farming replace NZ's productive land to deliver high quality fruits and vegetables in the future?

Rachel McClung - November 2018



[Read - Can vertical farming replace New Zealand's productive land?](#)

Rachel McClung

While there are many recognised benefits of vertical farming, with the most prevalent being growing independent of weather conditions, the requirement to replace solar energy with electricity for artificial lighting and temperature control, combined with the high capital investment and operational cost, currently outweighs the benefits. This is a limitation in New Zealand where we enjoy high levels of sunshine hours and have enviable growing conditions (KPMG, 2017).

It was found that the type of crops that can be grown in a vertical farm are limited (e.g. leafy greens and herbs) and that vertical farms cannot grow the full range of fruits and vegetables currently grown in New Zealand. Nothing is currently known about how vertical farming aligns with the cultural values of Māori.

A survey was conducted to gain insight into the understanding of vertical farming in the New Zealand horticulture industry. Interestingly, three respondents had investigated establishing a vertical farm in New Zealand.

They did not proceed due to the economic feasibility. There may come a point in the long-term future where vertical farming is economic in New Zealand. Produce grown in a vertical farm may supplement a local market, but would not be suitable for export due to the crop types that can be grown.

The New Zealand Government and Horticulture New Zealand should take a balanced approach to the issue of New Zealand's diminishing productive land and food security.

This would include the proposed National Policy Statement to protect New Zealand's versatile land and high-class soils; a full review of the risks to vegetable growing in New Zealand; the development of a strategy for the sustainability of domestic fruit and vegetable supply; and earmarking investment into internationally leading technology and innovation for the field of growing, including vertical farming.

Urban expansion is reducing the availability of some of New Zealand's most versatile productive land for growing food. Between 2002 and 2016 there has been a 30% reduction in vegetable-growing land across New Zealand (Deloitte, 2018). Due to the abundance of land available, there is a misconception that food crops can simply be grown elsewhere, outside land in demand for housing (Curran-Cournane, 2018).

However, New Zealand soils vary widely in quality and versatility. Also, the climate varies across New Zealand. Fruit and vegetable crops generally need high class and versatile soils and climate requirements vary for crops.

It is estimated that by 2043, demand for fruits and vegetables will be 33% higher than it is in 2018 (Deloitte, 2018). A new way of thinking is required if the challenge of meeting New Zealand's growing demands for fresh fruit and vegetables is going to be met by the horticultural industry.

New Zealanders cannot rely on the way they have always done things to find the answers the country needs now (Deloitte, 2018). This study investigates the potential for vertical farming (that does not rely on productive land) to resolve this issue in New Zealand.

Vertical farming is described as an urban agricultural system of large-scale food production that utilises sophisticated greenhouse methods and technologies within a closed environment to maximise productivity (Kalantari, et al, 2017; Graamans, et al, 2017; and Januszkiewicz and Jarmusz, 2018).

High productivity is achieved by fully controlling aspects of cultivation, such as; lighting (exposure levels and time), temperature, humidity, levels of nutrient, growing medium composition and air composition (Graamans, et al, 2017; and Januszkiewicz and Jarmusz, 2018; Pascual, et al, 2018; and Wang, 2018). Crop trays are stacked vertically above one another to maximise the use of space (Banerjee and Adenaeuer, 2013; Molin and Martin, 2018).

Pipfruit Sector: Mechanisms for waste minimisation.

Grant McKay - August 2014.



Each of these areas, discussed either individually or collectively, has the potential to increase marketable yield and minimise waste through the supply chain directly or indirectly. The solution to reducing fruit waste and gaining efficiencies “lies in a combination of planning, investing, controlling, and partnering across the supply chain.” (Harz-Pitre 2013) The pipfruit industry needs to collaborate, create better transparency and technology transfer if it is to be successful in further minimising waste.

Growing pipfruit is complex; it is a dynamic biological system with many layers. Waste occurs throughout the growing cycle and the supply chain from the paddock to market. Waste fruit (apples) can account for 15 – 30% of the harvestable export crop and can be as high as 35%.

The key stages of waste are: in the field, grading, and packing, storage and at retail and beyond. It is important to understand that gaining efficiencies is necessary to minimise waste. There are many mechanisms for waste minimisation and all have varying degrees of complexity.

Waste is a component of all practices, processes, and procedures. One of the key drivers to reducing waste in the orchard system is the development and adoption of simple architecture. Simple architecture allows better crop load management, which is critical in reducing waste downstream in the production cycle. The impact of achieving the correct crop load can be as much as \$15,000 to \$29,000 per hectare.

“There are 3 management practices that have a large effect on crop load: 1) pruning, 2) chemical thinning and 3) hand thinning” (Robinson et al., 2013). Using quantitative rather than qualitative pruning strategies can reduce the inputs required for the remaining two management practices.

Chemical thinning, which relies on timing, rates and weather windows, is often variable and unpredictable. However, precision thinning which bundles new emerging technologies, such as carbohydrate modelling and new chemistries, is providing greater control. A good chemical thinning strategy can significantly reduce hand thinning to \$1000 – \$2000 per hectare, which could otherwise cost as much as \$8,000/ha.

The shift from more traditional canopies will be the catalyst for the move to greater mechanisation, because tree architecture that is Simple, Narrow, Accessible, and Productive, (SNAP) is more fruitful, less demanding, and allows for more mechanised forms of pruning, thinning and harvesting.

Growers that are on the path to full emergence in SNAP canopies currently are benefiting from the options of being able to implement partial mechanisation through harvest-assist machinery and platforms which increase productivity, are less physically demanding, attract staff, and broaden the labour pool.

Using platforms, compared to ladders, can reduce pruning and fruit thinning costs by \$1,400 per hectare. SNAP canopies allow for greater light interception and increase fruit quality, spray deposition, and colour.

The use of reflective cloth can increase the amount of fruit harvested by as much as 25%. However, the capital investment can cost up to \$16,000 per hectare. The plant growth regulator, Ethephon, could be a more cost-effective alternative to help improve fruit colouration.

Dry matter concentration (DMC), a new quality metric for apples, has greatly increased the ability to measure quantitatively a fruit’s quality attributes. Since the introduction of DMC, “many producers have seen a marked reduction in product rejection from overseas super markets related to quality” (Plant and Food, 2011)

Perhaps the largest area of waste yet to be fully realised, is the retailer and consumer. Waste in this area is less controlled by the actions of growers and more by the perceptions of the market place. The demand of consumers has placed high product specifications on growers, ultimately causing large amounts of waste.

The question remains : how we can influence consumers to minimise waste?



[Read - Pipfruit Sector: Mechanisms for waste minimisation.](#)
Grant McKay

Defining the cost within orchard production variability on the profitability of a New Zealand apple orchard.

Jonathan Brookes - August 2013.

 [Read - Defining the cost within orchard production variability on the profitability of a New Zealand apple orchard.](#) Jonathan Brookes

Growing conditions in New Zealand have historically been recognised as being some of the best in the world for producing exceptional volumes of excellent quality apples. To remain financially sustainable New Zealand apple growers need to specifically focus on their natural strengths, ensuring that the production they achieve maximises the advantage of their location.

NZ apple growers have spent significant time and focus on cost reduction in orchards this may have been detrimental to overall profitability. The NZ apple industry does not have the same access to cheap finance as many of its international competitors such as the USA. New production techniques generally come with significant costs, areas of new production have a relatively long lag time from initial investment to final repayment.

New growing systems also have financial risk, with the potential cost of mistakes made during the learning and development process. Increases in the overall production of market acceptable apples can be achieved by ensuring all trees are working individually at an optimum level with minimal variation between them. This has potential for gains in cost reduction, resource use efficiency, minimisation of fruit quality variability and improvement in overall profitability.

To ensure tree to tree variability is minimised systems need to be created to efficiently measure key differences between trees. Similar populations of trees are grouped and then analysed to quantify each groups impact on overall block performance, in an easily understood format.

Beyond the scope of this project, tree to tree variability information can be used to assist with investigations into potential solutions and financially justifying the cost of variation mitigation.

This study was undertaken in a commercial Royal Gala apple orchard with 6159 – 10 year old trees planted on M9 rootstock. The assessment focuses on 1887 trees within this block.

The use of trunk diameter measuring was decided as the basis for ranking variability. Fruit size and total fruit number per tree was assessed in a small trial. 5 different trunk size groups were eventually formed and the profitability of these assessed using a computer based profitability benchmarking model.

The missing new trees returned a negative profit of – \$19,755 per ha.

Weak/small trees returned a profit of \$ 8,516 per ha.

The average size trees returned a profit of \$14,435 per ha (approximately the same as the overall block profitability).

The largest of the average trees returned a profit of \$21,344 per ha.

The excessively large/scion rooted trees returned a profit of \$5,435 per ha.



What is the most profitable way to harvest asparagus in New Zealand?

Tim Van De Molen - August 2017.

As a relatively new asparagus grower, in the Waikato region of New Zealand, I am interested in exploring opportunities within this industry. The harvesting costs in an asparagus business are a significant portion of the total expenditure, so any efficiency gains would provide a direct contribution to profitability.

There are currently several different methods for harvesting asparagus, all of which involve manual picking of the spears. This project looked at which of the current methods was the most profitable for the New Zealand asparagus industry. Variations include paying staff a 'per hour' rate, a 'per kg' rate, or combinations of both.

Picking methods vary from individuals walking along a row in their own time, harvesting into a bin or container carried on their person; to a team of pickers walking behind a tractor with a 20 metre boom, loaded with crates that they place the spears into as they pick.

The highly manual nature of the harvesting raised the question of what automation options have been considered or attempted in the past, as well as what the potential for this may be in the future.

The interviews held with existing asparagus growers provided a wealth of information regarding the picking process, as well as the potential for automation. The lowest cost system currently in use amongst the interviewees involves paying the pickers \$0.87/kg through the entire season. The next lowest cost involved paying pickers a 'per kg' rate that varied from \$0.85/kg at the start of the season, through to \$1.20/kg at the end of the season when volumes were lower.



Read - [What is the most profitable way to harvest asparagus in New Zealand?](#) Tim Van De Molen

The most costly system paid the pickers \$18.00/hr, plus a \$0.20/kg bonus for all 'Class One' graded asparagus. These costs were adjusted to reflect the wastage through the grading process, and therefore provide a more accurate actual cost per kilogram of saleable product. The results then saw the lowest net cost at \$1.31/kg.

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Although this assessment clearly showed the lowest cost, the determination of their relative profitability from a long term perspective was much more subjective. This was because each business had a number of unique considerations to incorporate into their decision making process around harvesting costs, for example the age and productivity of a block, access to labour and the typical profile of the labourers.

The interviewee's perspective on the potential for automation was explored and their opinions varied widely, from highly unlikely to occur, to highly likely to occur. The potential for further study regarding innovative harvesting techniques, by incorporating automation, is significant. The challenge will be in balancing the needs of the growers for a cost effective and easy to use solution, with the research and development costs required to provide that as an appropriate solution.

The future of Gisborne Navel Oranges: sweet or sour?

Nick Pollock - May 2018.

This report looks into Gisborne navel orange production and investigates why a product (Gisborne navel oranges) with world class attributes fails to deliver reasonable returns to producers, and what can be done to improve, not only this industry, but also likely to be applicable to other products or industries that may find themselves in a similar position.

Using both Porters Five Forces and SWOT analysis this report looks at core issues facing the industry. The industry is made up of a large number of small producer's most of whom have no connection with the consumer.

With the exception of the shoulders of the season, typical grower returns are only sufficient to cover expenses. This is a long standing issue and previous attempts to improve grower returns have been short lived.

Recent attempts by the industry to lift consumer acceptance through the introduction of a voluntary maturity standard has improved fruit in the market, but falls short of making sufficient change to lift grower returns.

The biggest natural advantage of Gisborne Navel oranges is their ability to taste better than any other navels if left to reach their maturity potential; yet fruit entering the market is inconsistent and growers typically pick fruit very early in the maturity cycle, long before they are at their best.

There is little to no differentiation in the market and consumers typically don't know one navel orange from another.

There is a need for Growers to focus more on the consumer, and work together as an organised group to get sufficient control of the supply to make a significant impact on lifting quality and coordinating volume through the supply chain. Without significant change, returns to growers are likely to remain low.

 [Read - The future of Gisborne Navel Oranges: sweet or sour?](#)
Nick Pollock



Heat pump pollen drying.

Nicholas Woolsey - November 2021.

The project described in this report formed part of the Kellogg Rural Leadership Programme. It investigated the use of a heat pump in kiwifruit pollen drying in order to reduce energy use.

The author worked with a pollen producer to establish limitations in the existing conventional system, before researching and developing a concept that utilised heat pump technology.

Initial findings suggested such a system presents significant financial and environmental advantages that may be exploited by individual producers and industry bodies alike.

The recommendations were to:

1. Build a prototype pollen dryer using a Temperzone packaged water-cooled unit coupled with a reheat coil as per concept design.
2. Use the above prototype phase to gather more data, particularly around water volume requirements and heat transfer.
3. Investigate other potential sources of supplementary heat to provide further efficiencies.

Kia ora tātou



 [Read - Heat pump pollen drying.](#)
Nicholas Woolsey



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