



# **Future scenarios for New Zealand horticulture**

A tool to help the horticulture sector be fit for the future, whatever the future

> Kellogg Rural Leadership Programme Course 41 2020

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I wish to thank the Kellogg Programme Investing Partners for their continued support: Strategic partners



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# **Executive Summary**

The New Zealand horticulture sector is currently enjoying a period of growth and prosperity. However, the future operating environment for the horticulture sector 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 Psa<sup>1</sup> or the Covid19 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.

Development of plausible future scenarios is a tool that can be used at different scales to explore what the future may bring. Scenarios have been utilised by researchers and organisations around the globe for numerous purposes, for example for pre-policy research, to strive for commercial resilience, to influence military strategy and even to consider the future state of the planet.

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 - 20 years from the present day. 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 sectors 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

<sup>&</sup>lt;sup>1</sup> Psa is the bacterial pathogen *Pseudomonas syringae* pv. *actinidiae* which was discovered in New Zealand in November 2010 and rapidly caused widespread and severe impacts to New Zealand's kiwifruit industry.

that would be 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.

# **1** Introduction

### 1.1 Setting the scene: the New Zealand Horticulture Industry

New Zealand growers supply fresh, high quality fruit and vegetables to both feed our nation, and to supply discerning consumers overseas in over 120 countries - the horticulture industry serves a \$6.2b export market and \$2.2b domestic market (Fresh Facts 2019). The industry comprises over 5,000 commercial fruit and vegetable growers and their operations range in size from large scale production through to small or medium sized enterprises. The latter make up the majority of New Zealand's growing base and many growers run inter-generational family businesses. Horticulture is a significant employer, with over 60,000 people working in the industry.

Horticulture currently occupies 120,000 ha of production land spread throughout the country. Our temperate climate is well suited to growing many different crops including apples, kiwifruit, cherries, avocados, blueberries, potatoes, onions and a range of other fruits and vegetables. While our geographical isolation in the far south could be considered a drawback, for example in terms of transporting product to offshore markets, it also provides important benefits such as freedom from many of the pests and diseases that readily spread between countries with land borders, and the ability to supply the northern hemisphere off-season.

In the past decade the horticulture industry in New Zealand has seen unprecedented growth. Planted hectares have increased, yield has increased and export returns have increased (Mike Chapman, pers comm. 2020). The Ministry for Primary Industries produces an annual publication called the Situation and Outlook for Primary Industries (SOPI). The SOPI primarily takes a forecasting approach – looking at current activities and trends and extrapolating them out. Consideration is given to offshore supply and demand, price, seasonality, local weather events, varietal differences and planted area (Ministry for Primary Industries 2019). The December 2019 edition of the SOPI indicated further growth for the industry with the collective horticulture sector revenue forecast to rise by 4.7% for the year ending June 2020. Horticulture was the 4<sup>th</sup> largest primary sector industry by value in 2019 (after dairy, meat and wool, and forestry) with signals indicating that the industry will become the 3<sup>rd</sup> largest value by the end of 2020 (Ministry for Primary Industries, 2019).

But with growth and time comes challenges. Trends that the industry has been grappling with over recent years include conscious consumers seeking more assurances about how their food is produced, competition with other land uses for access to limited resources such as land and water, scarcity of labour required for seasonal work and harvest, and climate change altering the growing environment, among others. Some of these trends may continue on their current trajectory, but it is also possible that they may not. A major change in trend trajectory or the wider operating environment is entirely plausible.

Growers and the industry bodies who advocate for them must be ready to adapt to the future, whatever it may hold, if they are to be successful in the long term. And the horticulture industry <u>must</u> be successful in the long term – domestically produced fresh fruit and vegetables feed our 5 million citizens, and contribute significantly to the New Zealand economy.

# 2 Literature Review

### 2.1 Change, futures and foresight

The Greek philosopher Heraclitus is credited with the quote "*Change is the only constant in life*". Change and the uncertainty that comes with it can be a significant challenge for businesses. However, it can also provide a wealth of opportunity depending on how an individual, organisation or sector chooses to view, anticipate and respond to inevitable changes to their operating environment.

The future operating environment for the horticulture sector is unlikely to be a direct continuation of the current track, simply because the future is uncertain. This has recently been demonstrated by the COVID-19 global pandemic, an event which will inevitably change the future operating environment for horticulture and almost all other sectors well into the future. This is a dramatic example of how the operating environment can change, sometimes rapidly, but even much smaller scale or slower change can have significant impacts for organisations.

When considering what the future may be in order to inform organisational planning, the default approach tends to be use of quantitative forecasting. i.e. extrapolating current trends. Forecasting may be accompanied by identification of some discrete shocks or wildcards (defined as "low probability, high impact events that, were they to occur, would severely impact the human condition" Petersen 1999) that may result in a deviation from the prediction. Whilst forecasting is a useful for many end-users the approach has a number of shortcomings, one of the most significant being the tendency to narrow the thinking to a single permutation of the future. This does not address the inherent uncertainty when considering the future, and doesn't foster the practice of building flexibility into decision-making.

Voros (2001) suggests that there are three 'laws' of futures: a) the future is not predetermined b) the future is not predictable and c) future outcomes can be influenced by our choices in the present. Given the future is unpredictable and could play out in an infinite number of ways, how are we to consider what may come in a practical way in order to make decisions? The cone of plausibility, a concept first mentioned by Charles Taylor (Taylor 1990; Taylor 1993) and modified by subsequent futurists offers a useful way to think about the different aspects of the future (figure 1). The cone shows time from the present through to the future, and differentiates between the probable (more likely) and the possible (less likely but still able to occur). The cone shows the probable future as a straight-line trajectory from the present, but also encourages consideration of alternative futures thorough inclusion of plausible scenarios, wildcards and acknowledgement that the preferred future may not be the same as the probable future.



Figure 1: The 'cone of plausibility' (adapted from Voros 2001)

Futures and foresight tools can help organisations understand the range of possible futures, and how decisions made today could play out in the years to come. The tools available are numerous, varied and serve a range of different purposes. Examples include horizon scanning, 7 questions and Delphi which are used to gather intelligence about the future; driver mapping for exploring the dynamics of change; scenarios, visioning and SWOT analysis for describing what the future might look like; and policy stress-testing, backcasting and roadmapping for developing and testing strategy and policy (Government Office for Science, 2017).

### 2.2 Scenario planning

#### What are scenarios?

One tool that is commonly used by futurists, and the tool that is the focus of this report, is scenarios. Various definitions have been developed for the scenario, for example Johansen (2018) defined a scenario as 'a description of a possible future state or condition within a subject field'; in contrast Van Notten (2005) defines scenarios as 'consistent and coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present and future developments, which can serve as a basis for action'. Whilst there is no universally agreed definition of the scenario (Spaniol and Rowland 2018) a scenario can be simply described as a carefully constructed 'story' that paints a picture of a possible future. For scenarios to be useful, they must be plausible. Most suites of scenarios present divergent futures - these divergent futures come about by exploring the uncertainty in a number of key drivers of change.

It is very important to be clear about what scenarios are not - a scenario is **<u>not a prediction</u>**. This distinction is critical, and if not clearly understood, there is the potential for scenarios to be used inappropriately.

#### Why and how are scenarios used?

Bishop et al (2007) provide useful commentary about the utility of the discipline of scenario development:

"It is vitally important that we think deeply and creatively about the future, or else we run the risk of being surprised and unprepared. At the same time, the future is uncertain so we must prepare for multiple plausible futures, not just the one we expect to happen." The tool is used by organisations for many different reasons including a desire to (Davidson 2014; Amer *et al* 2013):

- Lift strategic capability and thinking (exploration)
- identify common trends, themes and responses that are relevant for an organisation (pre-policy research)
- Learn about how the organisation could be affected by their operating environment
- Shift from day-to-day thinking to longer-term thinking
- Identify threats and opportunities in the future
- Highlight uncertainty in longer-term trends
- Ensure decision-making considers how decisions today may play out in the future
- Instil flexibility and innovation in planning and decision-making
- Challenge taken-for-granted assumptions about the future

One or a number of the above could be the impetus for undertaking scenario development work. While there is never an intention to look for or provide answers, scenarios help "planning within uncertainty" (Ringland, 1998). Scenarios are typically used to inform and stimulate debate – to challenge people to consider the many different ways that the operating environment may change. Plausible future scenarios are interrogated to understand the challenges and opportunities that each scenario would present for a sector. While the tool is used to consider the future operating environment as a minimum, it can also be used to consider how the organisation could or should respond.

Leadership teams can use scenarios as one of their strategic tools to position the organisation for the future. As the direction of travel becomes clearer over time, decision-makers can refine their plans accordingly (World Economic Forum 2018). Once future plausible scenarios have been developed, signals can be identified that would indicate movement towards a certain scenario (i.e. a deviation from the business as usual scenario). Or, if desirable elements have been identified in one of the scenarios, back-casting can be used to identify the steps needed move towards the favourable plausible future (Davidson 2014). Divergent scenarios can be analysed individually, but also as a suite to identify whether there are common themes across multiple scenarios. Identification of commonalities allows consideration of common policy options or organisational responses that would be robust under all scenarios (Davidson 2014). It also helps to prompt discussion about the organisational resource needed to address any common responses (Davidson 2014).

Forecasting and scenario planning can be very beneficial when used in combination, though combining quantitative and qualitative approaches can be a challenge (Van Notten 2003; Kemp-Benedict 2004; Davidson 2014). Forecasting allows more detailed consideration of perhaps the most likely future, while scenario planning acknowledges that what is forecast is not the only possible future. Scenario development broadens the range of possibilities that are considered, to ensure that organisations can test for resilience in a changeable external operating environment (Davidson 2014).

The development of plausible future scenarios can provide many benefits, and ultimately help to ensure an organisation or a sector (e.g. horticulture) is better prepared for what the future may bring. However, scenario development is not always met with unanimous support. In contrast to forecasting, scenario planning makes use of a qualitative approach, which embraces uncertainty and encourages flexibility in organisational planning. This uncertainty and the use of intuition can make decision-makers uncomfortable (Davidson 2014). However, the scenario development process can create a 'safe space' for some, allowing existing assumptions to be challenged and difficult conversations to be had. Scenarios can be used to encourage decision-makers to engage with alternative points of view (Bentham 2014). The benefits and drawbacks of the tool are explored further in table 1. Table 1: Strengths and weaknesses of scenario planning

Strengths	Weaknesses
<ul> <li>Consideration of a long-time horizon (Amer <i>et al</i> 2013).</li> <li>Describe multiple plausible futures which are placed side by side (rather than just one) (Mietzner &amp; Reger 2005).</li> <li>Scenarios tend to provide a 'safe space' for challenging conversations and ideas that can be difficult to broach.</li> <li>Challenge long-held beliefs and open the mind to previously unimaginable possibilities (Mietzner &amp; Reger 2005).</li> <li>Allow identification of 'weak signals' and disruptive events which can then be included in long-range planning (Mietzner &amp; Reger 2005).</li> <li>Can open up strategic conversations in an organisation and improve communication about strategy (Van der Heijden 1996; Mietzner &amp; Reger 2005).</li> </ul>	<ul> <li>Significant uncertainty.</li> <li>The danger that scenarios are misused or wrongly considered predictions.</li> <li>Highly subjective (Davidson 2014).</li> <li>Scenario planning can cause stress to individuals who favour controllable factors (Davidson 2014).</li> <li>Scenario development can be time and resource intensive (Mietzner &amp; Reger 2005).</li> <li>The qualitative approach means the selection of suitable participants is important and it can be difficult to get the right people (Mietzner &amp; Reger 2005).</li> <li>It can be difficult not to focus on the most likely or most preferred scenario (Mietzner &amp; Reger 2005).</li> </ul>

#### Use of scenarios: a short history

Scenarios were first devised in the 1950's following World War II. Herman Khan, a futurist working for the RAND Corporation, created scenarios to help military leaders in the cold war understand what could plausibly happen if particular actions were taken (The Future Today Institute, 2019). At the same time two French futurists used scenarios to convey preferred outcomes given current circumstances. The approach proved a success, and The Royal Dutch Shell company brought scenario planning into the corporate world in the 1960s (van Notten, 2003). Scenario planning helped the company to anticipate oil shocks in the 1970s, and meant they were in a position to mitigate risk in a timely manner (The Future Today Institute, 2019; Shell International BV, 2013). The controversial 1972 report *The Limits to Growth* by the Club of Rome is one of the most famous examples of a scenario-based study (van Notten, 2003) – the report used scenario planning to explore the future of the environment, society and the economy.

Nowadays scenario planning is used by a variety of different organisations across a range of scales and disciplines. There are examples of use of scenario planning by Non-Governmental Organisations (NGOs), small to medium Enterprises (SME's), multinational corporates, government agencies and foresight bodies (van Notten, 2003). Some examples are presented below:

• The Mongolian Government and the World Economic Forum collaborated to produce 'scenarios for Mongolia' in 2014. The intention was to consider three key strategic decisions to help the country chart a course to long-term sustainable and diversified growth and reduce susceptibility to shocks. This work also allowed consideration of common policy options that would be robust under all scenarios (World Economic forum, 2014).

- In a defence setting, scenario analysis can be used to support the design of a future defence force, and is considered to be best practice for NATO nations (Johansen, 2018).
- Alternative future scenarios have been used to explore uncertainty, demand and implications for transport provision in Great Britain, Australia and New Zealand (Chatterjee and Gordon 2006; Queensland Department of Transport and Queensland Department of Main Roads 2000; Lyons *et al* 2014).
- The World Economic Forum (in collaboration with the Boston Consulting Group) developed three extreme but plausible future scenarios for the infrastructure and urban development industry. Analysis of the scenarios resulted in the identification of six common transformation imperatives that those in the industry should address to remain relevant (World Economic Forum 2018).
- The Royal Dutch Shell company continues to use the tool to this day (The Future Today Institute, 2019). One of Shells latest scenario planning products is 'the Digitalisation of society' in which three scenarios have been presented that consider the long-term impact of digitilisation (Shell International BV, 2020).
- ARUP have recently produced four scenarios out to 2050 that explore the intersection between societal conditions and the health of our plant (ARUP, 2019). The intention is to inform decisions about the built environment and to show how the United Nations' Sustainable Development Goals can drive change (ARUP, 2019).

#### Scenario building approaches

There is no single 'correct' approach to scenario planning (Bradfield *et al* 2005), a reality that could be considered a weakness of the methodology. However, this is also a strength – it means that the approach can be tailored to the specific organisation and their reason for undertaking the exercise (Davidson 2014). In a review conducted by Bishop *et al* (2007), the authors acknowledge that there are over two dozen different techniques for scenario development, each with its own benefits and drawbacks. Most futurists tend to use one of two approaches: the 'axes of uncertainty' or 'general morphological analysis'. These two approaches will be described, compared and contrasted below.

#### Axes of Uncertainty

One of the most common methodologies used to construct future scenarios is the Axes of uncertainty approach (Future Today Institute, 2019; Government Office for Science, 2017), also known as the dimensions of uncertainty approach (Davidson, 2014). This relatively simple method involves selecting two of the key drivers, and writing opposite statements for how each may play out. These are then placed at either end of a continuum on a matrix. The outcome of the interaction of these two statements is described in each matrix box to form the divergent scenario (see figure 2).



Figure 2: Axis of uncertainty framework (adapted from Future Today Institute, 2019)

#### General Morphological Analysis

Morphological Analysis is another popular methodology (Godet 2000). General Morphological Analysis, as described by Johansen (2018) and Ritchey (2002) takes a greater number of drivers and considers how each may play out. The combination is then checked for plausibility. The method aims to identify, structure and analyse the possible permutations for complex issues or problems (Johansen 2018).

Johansen (2018) describes general morphological analysis as having five key steps. The first step is to formulate the problem. The second is to break down the problem into a set of parameters that frame the problem. Then an exhaustive and mutually exclusive set of possible states (which will be referred to permutations in this document) must be decided for each of the parameters. Thirdly, the parameters and their permutations are configured into a grid or morphological box. The morphological box contains the entire morphological field/problem space i.e. all the various solutions to the problem. The fourth step requires identification and removal of any fundamentally inconsistent or impossible combinations of permutations. The fifth and final step is to connect up logical permutations to form the basis of scenarios (Johansen 2018) (see figure 3).

	Driver a	Driver b	Drive c	Driver d
Scenario a	Permutation 1	Permutation 1	Permutation 1	Permutation 1
Scenario b	Permutation 2	Permutation 2	Permutation 2	Permutation 2
Scenario c	Permutation 3	Permutation 3		Permutation 3
Scenario d		Permutation 4		Permutation 4

Figure 3: Morphological box framework

#### Comparison

With either approach solving the problem, or finding the 'right' answer is unlikely (Johansen 2018). However, the morphological approach is beneficial in that it provides a structured and transparent approach to finding something that 'makes sense' (Johansen 2018). The methodology allows identification of the most likely and mainstream situations as well as the more extreme or outlying ones. General morphological analysis can be resource intensive if the full methodology is followed (Johansen 2018). In contrast the axis of uncertainty approach is simpler, quicker and less resource intensive. However, one key drawback of the methodology is the heavy reliance on just two drivers, therefore driver selection is critical. Regardless of the approach chosen, scenario planning is always qualitative in nature and embraces a range of different views, therefore having a mix of people with varying opinions, perspectives and ideas involved in the process creates stronger and richer scenarios.

# 3 Methodology

The general morphological analysis methodology described by Johansen (2018) was adapted to create plausible future scenarios for New Zealand horticulture.

#### Formulation of the problem

In this instance the problem was defined by the overall project question: what could the future operating environment look like for horticulture in New Zealand and what challenges and opportunities might these different plausible futures present for the sector? The scenarios were developed to be set in the year 2040 – 20 years from the present day. Exploring a 20 to 30-year timeframe is common in scenario development, and was considered a suitable period given the objective of this exercise.

#### Identification of parameters

For this report 'drivers of change' (a pressure that shapes change for an organisation or industry) were used as the parameters, in order to align with the problem definition. An existing long list of drivers developed by the Horticulture New Zealand staff in 2019 was utilised for this step. Key drivers affecting the future of an industry can usually be grouped into broad categories (Future Today Institute, 2019). With this in mind, the long list of drivers was brainstormed using the PESTLE framework (Political, Environmental, Social, Technological, Legislative, Economic) (Oxford College of Marketing, 2016) to ensure good coverage and consideration of drivers of change from a variety of angles. Acknowledging overlap across the various PESTLE areas, the drivers were then gathered into a single list (see table 2).

#### Table 2: Long list of drivers of change for horticulture

Drivers of change identified by Horticulture New Zealand			
<ul> <li>Production intensification</li> <li>International agreements and obligations</li> <li>Social licence to grow</li> <li>Globalisation and trade</li> <li>Access to labour</li> <li>Use of technology</li> <li>Government priorities</li> <li>Food security</li> </ul>	<ul> <li>Population growth</li> <li>Compliance requirements</li> <li>Profitability/efficiency</li> <li>Crop protection</li> <li>Assurances- transparency, traceability and evidence</li> <li>Environmental sustainability</li> </ul>	<ul> <li>Market demand – conscious consumers</li> <li>Climate change</li> <li>Regulation</li> <li>Competitiveness</li> <li>Land scarcity</li> <li>Urbanization</li> <li>Health and wellbeing</li> <li>Cost of inputs</li> <li>Global instability</li> </ul>	

A group of workshop participants was established for the remainder of the scenario development process. The group consisted of 14 people from throughout the sector, including growers, government officials, industry body representatives, and those from the science community.

To ensure a manageable list of drivers for the next stage of scenario development, the workshop participants were provided with the long list of drivers and asked to select the five that they felt were most important for shaping the future of horticulture. This was done individually in order to avoid group think/group bias and to gather the diversity of views. The six drivers that had the most 'votes' were prioritised for taking through to the morphological box stage.

#### These were:

- Social license to grow
- Access to labour
- Use of technology
- Environmental sustainability
- Market demand
- Climate change

#### **Driver permutations**

A facilitated group workshop was held with all participants to develop the permutations of the six prioritised drivers. The group was asked to identify all of the mutually exclusive permutations of each driver in turn. These permutations were then configured into the morphological box.

#### Developing the basis of each scenario

The final step in the workshop was to connect up logical permutations as a group to form the basis of scenarios. The group worked from left to right to link up one permutation variation for each driver to form a scenario framework. Cross consistency assessment was completed by group consensus rather than by a more detailed pair-wise comparison. The group were asked about consistency as scenarios were identified in the morphological box, and any inconsistent or impossible permutation combinations were discounted. Roxburgh (2009) suggests that four is the optimal number of scenarios, and this recommendation was followed.

#### Scenario detail

The six drivers were mapped onto a continuum to show the underlying settings for each scenario. The continuums were based on the range of permutations developed at the workshop. The scenario basis was then fleshed out with a fuller description of what the sector looks like based on the permutation of each driver in the scenario, and how they would likely intersect. The four scenario descriptions were provided to a designer to bring each scenario to life with a visual representation.

#### Analysis

Each of the four plausible future scenarios was analysed for insights and common themes. This involved comparing and contrasting the scenarios and identifying the potential risks and opportunities that each might present for the horticulture sector.

# 4 Results (scenarios)

The four plausible divergent scenarios that emerged are described and visualised below. The scenarios comprise a short title for ease of reference, a snapshot that aims to capture the essence of the scenario, a narrative that provides more detail based on the drivers and brings the scenario to life, and a set of continuums that illustrate where each driver fell on the spectrum. The continuums have been included to help illustrate the driver settings that underpinned each scenario, and to allow easy comparisons about influential drivers to be made between scenarios. The driver settings range from the more extreme ends of the continuum for some scenarios to the middle ground for others. A designer has interpreted the narrative to create visual representations of each scenarios. This imagery was included to help to users quickly get a sense for the alternative future presented by each scenario.

It is very important that the scenarios are not reproduced in isolation of this report in order to avoid misinterpretation or misuse. They are not predictions or advice - they simply present a (non-exhaustive) range of ways that the future could plausibly play out.

#### Scenario snapshot

Proactive action and early adoption of better ways of doing things is the norm and is paying off - best practice has been embedded in almost every facet of production. Values play a strong role in decision-making for both producers and consumers.

#### Scenario narrative

New Zealand horticulture has focussed on doing things to a high standard and being ahead of the curve. Social licence to grow is strong – the public and the government are very supportive of horticulture and how the sector operates, especially as the popularity of alternative plant-based proteins grows. The sector has a widespread culture of 'doing the right thing'. This means self-monitoring and traceability provides enough assurance to meet market and regulator demands. Imposed regulation and compliance requirements are low. Horticultural operations have adopted technology as necessary. While not right at the cutting edge, they are keeping up and utilising the technology that matters. The sector is not only environmentally sustainable, but it is regenerative. Growers are actively improving environmental parameters. There is enough labour to satisfy the needs of the sector as horticulture is an attractive area to work in. Consumers are highly supportive of products with attributes and production practices that appeal to their values. Those products that don't align with consumers values are shunned. The standards of production that the sector has established align with this very high consumer expectation. New Zealand is world leading in our adaptation to climate change.



### Orange scenario: Proactive and striving to do better



#### Designers interpretation of the scenario

### Strongest external operating environment influences

- Societal expectations: high standards, product quality, production methods, traceability
- Competition (global) and the need to stay ahead
- Recognition of the need for a healthy environment
- Strong economy: good income levels & health awareness

### Pink scenario: Producing more of less

#### Scenario snapshot

New Zealand horticulture has been forced to specialise by the changing climate and now produces fewer crops on a larger scale and in a more standardised way. The focus is on minimising cost and maximising efficiency.

#### Scenario narrative

Some of New Zealand's crops and production systems have proven well suited to climate change, whilst others have not fared well. This is more through luck than conscious efforts to adapt. The crops and production systems that are well suited have flourished and scaled up, those that are not have all but disappeared. This has resulted in a much less diverse horticulture sector than seen in the past. There is surplus supply of some products, but an inability to meet demand for others. Operational decisions are driven by cost and efficiency, rather than values. Some aspects of environmental sustainability have been put in place, but not others. Those that have been adopted are based on cost and social pressure – only those aspects that consumers care about, and are therefore willing to pay for via slightly higher prices. Horticulture production systems are streamlined and sophisticated. Technology that enables optimised production is widely used. Support for horticulture is divided. Those who are informed about the sector and its challenges support expanding production, but those who are uninformed about it are sceptical and don't support growth in the sector - they don't want to see more of the same. While there is no shortage of labour for some roles, significant skills shortages exist for other roles which are essential for growth of the sector.



# Pink scenario: Producing more of less

### Designers interpretation of the scenario



### Strongest external operating environment influences

- Climate change pressure
- Cost pressures
- Domestic and global supply and demand

# Teal scenario: Falling behind the rate of change

Scenario snapshot

A failure to keep up with environmental, technological and societal change means that those outside the sector see it as an unattractive industry that is behind the times. Growth and innovation in the sector have almost stopped entirely. The focus is instead on being able to maintain the status quo.

#### Scenario narrative

New Zealand horticulture has not sufficiently acknowledged climate change and has therefore been unable to adapt enough to mitigate the impacts. Any adaptation that has happened has been far too slow to make a real difference. Improvements in environmental sustainability, though desired, are not feasible or possible as making changes to how things are done is considered too costly for most. There is insufficient labour for horticultural operations - as it's not seen as an appealing sector to work in horticulture loses out to other sectors who are also vying for labour resources. The New Zealand public support for horticulture has reduced significantly – social licence has been lost, though people reluctantly acknowledge the continued need to grow fruit and vegetables for domestic consumption. Technically there are enough fruit and vegetables available, yet product supply often cannot adequately meet demand and expectations. Yields and quality are slightly down. Some technology has been adopted as necessary, but adoption is late and not fast enough to keep up internationally.



# Teal scenario: Falling behind the rate of change

#### Designers interpretation of the scenario



#### Strongest external operating environment influences

- Climate change pressure
- Cost and resource (e.g labour) pressures
- Lack of access to/use of new tools, approaches or technologies
- Consumer demand inconsistent; lack of public support for growing

# **Green scenario: A segmented sector**

Scenario snapshot

The horticulture sector has started to fragment and divide based on differences in production practice. All factions of the sector have specialised their approach and refined what they offer as they strive to create a unique point of difference.

#### Scenario narrative

The sector has become increasingly divided. Producers aim to differentiate themselves by tapping into diverse and very niche markets. In some instances for example, producers have intentionally gone back to low technology holistic production systems and heirloom varieties. In other instances, they have utilised cutting edge technology and new genetics. The public are selectively supportive of horticulture – consumers have formed different groups that are loyal to some production systems and are dismissive of others. This is primarily based on alignment of product attributes with their personal values. Provenance, traceability and storytelling are important. The sector is very good at environmental sustainability and it is engrained in all aspects of horticultural operations, no matter the production system. The sector as a whole has also adapted relatively well to climate change but has taken vastly different approaches. Some have an integrated whole-of-system view where increasing seasonal variability is accepted, allowed for, and part of a flexible approach to adaptation. Others have used technology, innovation and controlled environments to adapt. There is enough labour as the needs of the sector have reduced slightly. Those who are high tech have increased automation, while those who have embraced more traditional permaculture type practices are smaller-scale boutique producers.



### Green scenario: A segmented sector

#### Designers interpretation of the scenario



# Discussion

The methodology resulted in four relatively diverse plausible future scenarios for New Zealand horticulture in 2040. Often a scenario set has a 'baseline' scenario, which presents a future based on a continuation of current trends or settings (e.g. Becca 2019). Development of a baseline scenario was never

intended, and though each scenario shows some aspects of current trends playing out, a baseline scenario has not fallen out of the scenario development process.

At a high level the scenarios help to illustrate that the future operating environment may turn out to be one that allows the sector to succeed by doing what it has always done, but also highlight that this may not be the case. Some of the scenarios hint at a relatively prosperous sector, while others indicate a sector that is limping along. Some scenarios feel much more intentional, while others are very reactive with things happening 'to' the sector. Some show a continuation of trends that are evident now, others demonstrate a change in trajectory. These and other differences between scenarios can be useful to think about when considering what might be necessary for the sector to succeed into the future.

### 5.1 Themes that were common to all scenarios

A number of strong themes came through that were common to all scenarios. Common themes 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 sectors 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 that would be more relevant to an industry body were primarily around sector cohesiveness, ability to advocate and key issues for growers that require support.

### 5.2 The 'so what' of the scenarios

Once generated, the core purpose of plausible future scenarios is to encourage thinking and analysis about what it would mean if each of them were to play out - the 'so what'. Each person or organisation who interrogates the scenarios may come up with a different set of implications that are worth considering. Table 3 presents one interpretation of the 'so what'. The table outlines some of the insights that could be drawn from this suite of plausible future scenarios. This interpretation is high level and generic, without focusing on insights relevant to any one type of organisation.

# Table 3: An example of some of the insights that could be drawn from this suite of plausible future scenarios.

<b>Orange scenario: Proactive and striving to do better</b> Snapshot: Proactive action and early adoption is the norm and is paying off - best practice has been adopted in almost every facet of production. Values play a strong role in decision-making for both producers and consumers.			
High level reflections	Implications: possible opportunities this scenario presents	Implications: Possible risks this scenario presents	
<ul> <li>Proactive rather than reactive – more intentional.</li> <li>High cost of operating but high opportunity for profit.</li> <li>Cohesive sector with strong conscience and culture.</li> <li>Strong communication and trust between regulators and growers.</li> <li>Storytelling and assurances are important for success.</li> <li>More players may enter the sector as it's seen as desirable and prosperous.</li> <li>The sector is likely to be producing less, but producing in a way that fetches greater value.</li> <li>Strong environmental focus.</li> <li>Values drive decision-making for both producers and consumers.</li> <li>High standards held by all.</li> <li>Requires a strong economy.</li> </ul>	<ul> <li>Consumers who can afford to may spend a greater portion of their household expenditure on fruit and vegetables because the quality is high and they see health benefits.</li> <li>Cohesive sector (and high standards) makes storytelling and advocacy easier.</li> <li>Makes for a good news story and increased public support.</li> <li>Likely to bring the whole sector up to a high standard - no room for laggards.</li> <li>Ability to be highly competitive in the global market.</li> <li>Likely to see environmental improvements.</li> <li>Climate change resilience.</li> <li>No resource shortages (e.g. labour) to constrain growth of the sector.</li> <li>Ability for entrepreneurial operators to enter and enhance practices/market.</li> </ul>	<ul> <li>Businesses must keep up with very high expectations or risk loss of social licence or business failure.</li> <li>Fruit and vegetables may be more expensive, which has implications for consumers who are price sensitive.</li> <li>High trust environment between growers, consumers and government means that one bad operator has the ability to do a lot of damage.</li> <li>Less profitable businesses are likely to exit.</li> <li>Lower investment in research and development/technology means industry may struggle to keep up incremental change which may be needed in future.</li> <li>If the national and global economy were to crash growers may be unable to sell at sustainable prices to operate.</li> </ul>	

<b>Pink scenario: Producing more of less</b> Snapshot: New Zealand horticulture has been forced to specialise by the changing climate and now produces fewer crops on a larger scale and in a more standardised way. The focus is on minimising cost and maximising efficiency.			
High level reflections	Implications: possible opportunities this scenario presents	Implications: Possible risks this scenario presents	
<ul> <li>More reactive than proactive.</li> <li>What we can and can't produce influences how we interact with the global market.</li> <li>Decrease in crop diversity within the sector.</li> <li>Focus on doing what we can well and at large scale - Emphasis is on large scale high volume growing operations.</li> <li>Cost and efficiency is the focus.</li> <li>Operators only adopt the practices or technology necessary to help with efficiency or cost savings.</li> <li>Technology and sophisticated systems are needed to remain competitive.</li> <li>Possibly a change in sector make up to comprise big players only.</li> <li>Financial returns/costs rule decision making, rather than values or good outcomes.</li> </ul>	<ul> <li>Presents an opportunity for comparative advantage - specialising and trading what we're good at with the world.</li> <li>Benefit of economies of scale and perfecting production.</li> <li>Focus is on resilient crops with specialised research and development investment which pays off.</li> <li>Streamlined and integrated processes may provide the ability to enter into new growing areas with a low-cost production model.</li> </ul>	<ul> <li>Likely a limited choice of affordable produce available and an inability to fulfil consumer demand for variety.</li> <li>Concerns about food security and vulnerability if the limited crops grown failed for any reason.</li> <li>Monocultures are vulnerable e.g. pest and disease risk.</li> <li>The reactive approach to climate change may make the sector vulnerable to further shifts in climatic conditions.</li> <li>Likely to be a cut throat and highly competitive environment due to oversupply. Growers may fight one other to sell product.</li> <li>Low returns possible due to oversupply.</li> <li>Skills shortages can hamper growth.</li> <li>Reliance on imports for many fruit and vegetable types.</li> <li>Large growers may be less nimble and struggle to change to respond to unforeseen events (e.g. weather, market, etc).</li> </ul>	

<b>Teal scenario: Falling behind the rate of change</b> Snapshot: A failure to keep up with environmental, technological and societal change means that those outside the sector see it as an unattractive industry that is behind the times. Growth and innovation in the sector have almost stopped entirely. The focus is instead on being able to maintain the status quo.			
High level reflections	Implications: possible opportunities this scenario presents	Implications: Possible risks this scenario presents	
<ul> <li>Haven't been able to adapt to changing world e.g. climate change.</li> <li>Under-resourced and under-funded so difficult to make improvements.</li> <li>Operators are likely to exit the sector (particularly small growers)</li> <li>Regulatory and compliance requirements may not have changed, but likely feel more burdensome to growers who face a combination of pressures.</li> <li>Competing on the global market is likely to have become difficult making the domestic market increasingly important.</li> </ul>	<ul> <li>Fruit and vegetables possibly more affordable for the public on the domestic market.</li> <li>Possibly a significant increase in product that is directed for processing.</li> <li>The few growers that have adapted and are fulfilling a niche market are likely to be highly sought after and profitable.</li> </ul>	<ul> <li>Struggle for profits and individual business survival.</li> <li>Highly competitive between operators.</li> <li>When setbacks such as extreme weather events are faced they would likely be difficult to recover from as no reserves.</li> <li>Resource challenges e.g. labour shortages, access to capital.</li> <li>Consumer expectations about how fruit and vegetables are produced (e.g. environmental sustainability) are likely not being met.</li> <li>The sector as a whole is likely to be losing public support due to underperformance in relation to public expectations.</li> <li>Lack of investment in research and development/technology means fruit and vegetables may be more susceptible to pest and disease pressure which sector is not adequately equipped to manage.</li> <li>Consumers may stop buying locally grown product and rely on imports.</li> </ul>	

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<b>Green scenario: A segmented sector</b> Snapshot: The horticulture sector has started to fragment and divide based on differences in production practice. All factions of the sector have specialised their approach and refined what they offer as they strive to create a unique point of difference.			
High level reflections	Implications: possible opportunities this scenario presents	Implications: Possible risks this scenario presents	
<ul> <li>Environmental preservation is important but how these environmental outcomes are delivered varies widely leading to a fragmented sector.</li> <li>People are very loyal to their values and base their decisions on these.</li> <li>Increase in diversity within the sector.</li> <li>A range of operations from small to large, but possibly more smaller operations.</li> <li>The sector may have downsized slightly in terms of land area.</li> <li>Focus on tapping into niche markets both domestically and internationally.</li> <li>Sector storytelling is strong however alignment of messaging is poor creating divergent consumer preferences.</li> </ul>	<ul> <li>Good environmental outcomes.</li> <li>Climate change resilience.</li> <li>Lots of product variety and consumer choice.</li> <li>Diversity of production systems and crops provides growth opportunities in some sectors.</li> <li>Ongoing investment in specialised research and development/technology.</li> </ul>	<ul> <li>The highly tailored approach and means the sector is very fragmented and lacks one unified, strong and coherent voice.</li> <li>Hard to advocate for sector as a whole, especially on controversial issues that may provide a point of difference for an operator.</li> <li>Fickle consumers can change loyalty easily.</li> <li>Targeting small markets may limit the potential for growth.</li> <li>Need to have enabling regulation in place for technology/innovation. If not, this may hinder progress.</li> <li>As investment in research and development/technology is tailored, costs are likely to be high and timeframes for development lengthy.</li> </ul>	

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### 5.3 Scenario use and interrogation

While a high-level analysis has been provided, 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. As a generic guide, below are a few key questions that can be used by people or organisations when they go to 'use' the set of plausible future scenarios.

- If this scenario played out how would your organisation fare? Would you be able to keep operating the way you do now? If not, how would you have to change things?
- What risks does this scenario present? Are there any steps that could be taken now to prevent these risks playing out?
- What desirable aspects does this scenario present? Are there any steps that would be taken now to increase the chance of those desirable aspects being realised?

For organisations that have a policy focus, it may also be useful to conduct a SWOT Analysis of the policy issues that each scenario presents (Government Office for Science, 2017). This would allow recommendations and/or issues for policy development to be identified.

The introduction of wildcards and shocks was out of scope for this piece of work. However, identification of wildcards may be a useful additional exercise for some organisations. Shocks could also be introduced into scenarios if they are specific i.e. they are highly relevant to the operating environment of an organisation and are a critical threat. Exploration of specific and plausible shocks can be useful to increase organisational resilience (Davidson, 2014).

### **5.4 Limitations**

Participant time is precious and therefore fewer touch points were built in than would be ideal. Though efforts were made to gather a group of people from diverse organisations and backgrounds (different perspectives add rigour to scenarios) the process would have benefitted from a larger number of participants with broader diversity. The workshop was held virtually rather than in person as planned due to covid restrictions in place at the time. The 'so what' presented in table 3 is one person's analysis (the author) and therefore may have bias. Ideally this type of analysis would be conducted in a group setting.

### **5.5 Recommendations and Conclusions**

Backcasting is recommended as a next step in this body of work. Backcasting is a different foresight method and is used to determine the steps that would need to be taken to get from the present to a preferred future. The Government Office for Science Futures Toolkit document (2017) outlines six key steps for backcasting:

- 1. Introduce or develop the preferred future
- 2. Identify the key differences between the present and the preferred future
- 3. Build a timeline that sets out the key changes needed to move from the present reality to the preferred future
- 4. Identify which changes are in your control and which aren't
- 5. Identify what you need to do to deliver the steps that are in your control
- 6. Identify how you can influence or facilitate the steps that are outside your control

Backcasting allows a roadmap to be built so intentional steps can be taken to help influence (for the better) how the future may play out.

The scenarios could be interrogated through the lens of the United Nations sustainable development goals (United Nations, 2016). Which aspects of these scenarios move us toward the 17 goals? Which would hinder achievement of the goals?

The discipline of futures and foresight, and particularly scenario development as a tool, can be considered non-traditional and make staff, leaders and decision-makers uncomfortable. Scenarios are therefore easily dismissed. Some form of post-publishing support or outreach might be useful to assist those who are interested in using the scenarios, but feel that they need guidance about how to use them or support to gain traction within their organisation.

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.

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