EPA reassessment of hydrogen cyanamide

A social impact assessment

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Executive summary

The EPA is reassessing the use of hydrogen cyanamide

New Zealand's Environmental Protection Authority (EPA) is in the process of re-assessing the use of hydrogen cyanamide (HC). HC is a 'budbreak enhancer' used widely by kiwifruit orchardists in New Zealand – it increases the quality and yield of fruit, while lowering production and labour costs. A reassessment of HC was triggered when the EPA found that levels of risk to operators, bystanders, and the environment were above levels of concern. Typically, an EPA reassessment involves consideration of human health, environmental impacts, and economic impacts. However, strong concern from the kiwifruit industry regarding the mental health and wellbeing effects stemming from a phase-out has promoted a social impact assessment (SIA).

The purpose of this report is, therefore, to provide the decision-making committee (DMC) with a social impact assessment. This involves trying to understand the impacts a decision to phase-out or retain HC will have on people and their communities. Towards this, our SIA aims to:

- evaluate the social impact of a five-year phase-out of hydrogen cyanamide
- investigate impacts on mental health, Māori, and employment opportunities
- assess community cohesion and resilience after a phase-out
- assess the viability of alternative land uses.

A people-centric qualitative approach

In achieving the aims of this report, a series of interviews were conducted with orchardists, members of the public, and representatives from various industry bodies based in the Bay of Plenty and Northland. These participants were asked several questions concerning the HC reassessment. Their answers have been analysed and reported here.

Responding to DMC questions

Although a SIA is principally an exercise in exploration, our mahi was guided by a series of questions raised by the DMC:

How are smaller orchards and Māori affected when compared to larger ones that can afford to minimise the effects of an HC phase-out?

Smaller orchards are comparatively less resourced and thereby less capable of minimising or mitigating the effects of an HC phase-out. However, the issue of proportionate impact is as much a question of varietal grown as it is of orchard size. The green (Hayward) varietal of kiwifruit relies heavily on the use of HC when compared with gold and red varietals. Green growers are, therefore, more exposed than growers of other varietals. Green kiwifruit is the varietal most grown by Māori orchardists, leaving them significantly exposed to the effects of an HC phase-out.

What land use alternatives are available?

Seven possible alternatives, including avocado orcharding, sheep and beef grazing, dairy farming, apple orcharding, berry growing, tropical fruits (Northland), and sub-divisions for residential housing and care homes, were identified. However, the technical capability to make alternative uses of the land does not necessarily render those uses a viable alternative to kiwifruit orcharding. Orchardists discussed issues exclusive to each land use alternative but, chiefly, no alternatives were considered capable of providing the same level of financial return as kiwifruit.

Who has alternative ways of making a living from the land?

Difficulties accessing capital prohibit the implementation of land use alternatives and enacting land conversion. Capital access issues are not exclusive to one group but are experienced acutely by orchardists of an advanced age, Māori orchardists, and orchardists servicing high levels of debt. Orchardists operating on small sections may also struggle to make an alternative living from the land, as not all land use options are sufficiently scalable. Moreover, the time taken to implement, and generate income from, a land use alternative, is unaffordable for many orchardists. It appears that the growers best equipped to wear the costs of land conversion, and by extension make a living from alternate land uses, are large and corporate kiwifruit growers.

How do the positive mental health implications of a phase-out compare with the mental distress induced by a phase-out?

At a high level, the mental health of two groups is potentially impacted by an HC phase-out: orchardists and concerned members of the public. On one hand, concerned members of the public will likely experience a sense of relief arising from a phase-out decision. However, the phase-out of HC alone appears unlikely to entirely satiate mental distress arising from orcharding activities. Members of the public pointed to a series of orchardist behaviours, including: the use of other sprays, noise pollution, water usage, and carbon emissions, that also caused them distress. Conversely, the financial implications of an HC phase-out appear likely to worsen the mental health of orchardist, particularly those servicing high levels of debt. Poor mental health of orchardists may also have a residual effect on families, leading to domestic violence, broken homes, and other forms of abuse.

What mitigation measures are possible and what timescales may be required for implementation?

Alternative spray products are available, however, their efficacy when compared to HC is considered inferior. Switching to organic production is another possibility for orchardists, but the market for organics may be unable to wear the additional supply that would occur if kiwifruit orchards transition to organics en masse. Implementing an extended phase-out period of 10 or 15 years may permit the development of high efficacy spray products or alternative kiwifruit varietals (that do not require HC), before HC use is prohibited. It may also ease the process for orchardists adjusting to a post-HC growing landscape.

Additional findings

Although Māori and Pākehā communities will both feel effects of an HC phase-out, the likely impact on Māori communities appears more visible, because of how Māori trusts disperse kiwifruit profits

back into their rohe. Māori growers provide funding for healthcare, kaumātua care, sports, cultural, education, and conservation programmes. Moreover, orchards have encouraged tangata whenua back to live in their rohe for employment, funded the development of new housing, provided rangatahi with gainful opportunities, instilled a sense of mauri in the community, and reportedly reduced poverty. Such programmes and community gains appear precarious, assuming an HC phase-out renders orchards economically unviable.

1. Purpose of this report

The EPA is presently conducting a reassessment of hydrogen cyanamide (HC), a budbreak enhancer used widely in kiwifruit orchards in New Zealand. Use of the chemical is found to increase the quality of fruit, while also lower costs of production and labour requirements. However, initial assessments of HC indicated that the risk to operators, bystanders, and the environment were above levels of concern, thereby triggering the reassessment process.

Typically, a reassessment includes comprehensive consideration of economic, human health, and environmental impacts. In this case, however, due to strong industry concern regarding mental health effects stemming from a ban or a phase-out, the EPA have also commissioned a Social Impact Assessment (SIA). This report, containing said SIA, will be considered by the Decision-Making Committee (DMC), and used to inform their decision as to the reassessment of HC. Specific questions and concerns (from the DMC) related to the SIA are contained within Appendix A.

1.1 What is a Social Impact Assessment?

Saliently, a Social Impact Assessment is concerned with 'people impacts' – what is being done to people, in the places where they live, in families and wider communities, as a consequence of decision-making. Its aim is to evaluate and predict impacts of certain decisions before they have been made. The SIA is not, therefore, an attempt to assess the effectiveness of existing policies and projects, but instead reflects anticipatory research.

Given its focus on people, families and communities, the SIA is, comparatively, less focused on quantifiable values and 'dollar amounts' than an economic impact assessment or a cost-benefit analysis. By extension, the SIA is more of a qualitative endeavour structured around individual insights. Importantly, the SIA is not intended to supplant or replace other forms of analysis. In this case, our SIA is intended to serve as a companion piece to the economic impact assessment, and other scientific research, being conducted in relation to the ongoing HC reassessment.

2. Our approach

Our approach involved conducting in-person interviews with kiwifruit orchardists, representatives from peripheral organisations, Māori trusts and growers, as well as concerned members of the public. Insights obtained during these interviews were analysed and reported. Occasionally, to provide context or credence to particular interview insights, we introduced existing literature or statistics.

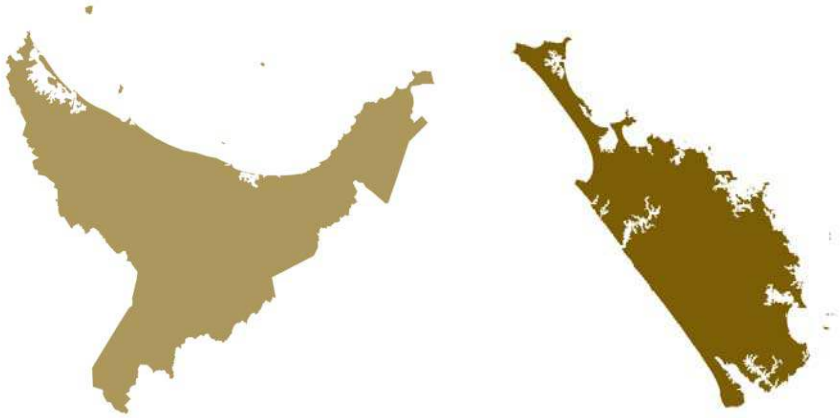
2.1 We extrapolate insights from exemplar regions

Kiwifruit is commercially grown across eight different regions of Aotearoa New Zealand:

- Bay of Plenty
- Northland
- Auckland Region
- Tasman-Nelson
- Waikato
- Gisborne
- Hawke's Bay
- Manawatu-Whanganui.

By a considerable margin, the Bay of Plenty represents the most significant kiwifruit growing region (approximately 80 per cent). Northland, Auckland, Tasman-Nelson, and Waikato represent 3.5 per cent to 5 per cent of kiwifruit production, while Gisborne, Hawke's Bay, and Manawatu-Whanganui represent around 1 per cent.

For this research, we extrapolate insights from the Bay of Plenty and Northland regions.



Our justification for focusing on the Bay of Plenty is based on the proportionately high volume of growing that occurs in the region, whereas our focus on Northland is based on the high levels of orchard expansion in the region.

2.2 Our interview participants are sampled from submitters to the EPA and existing networks

The EPA contacted individuals from the Bay of Plenty and Northland regions who had made submissions regarding the reassessment of HC, asking if they were willing to be interviewed by Sapere for the purposes of this SIA. Of those who agreed to be interviewed (n=36) eight were members of the public, while the remainder were either orchardists, or people with commercial connections to orchards. Interviews were conducted with these submitters, largely on an individual basis, but at times in groups. Additionally, two hui were held with Māori orchardists and representatives. The first hui consisted of a small engagement at Matapihi with seven participants. A larger hui was held at Mount Maunganui consisting of approximately 50 participants.

2.3 Limitations of a qualitative approach

Given the qualitative nature of our approach, and social impact assessments more broadly, we cannot obtain the resolution required to discern reasonable differences in social impact between 10, 15, or 20 per cent of orchards becoming economically unviable in the event of an HC phase-out. Interestingly, however, when posed with these figures, most orchardists considered them a gross underestimation. Only two orchardists expressed confidence in the viability of their orchards following an HC phase-out. Most of the responses given and presented in this report, therefore, reflect a presumption of economic unviability following a five-year phase-out period, assuming the DMC finds in favour of phasing out HC.

3. A note on the proportionate community effects of an HC phase-out

We do not seek to quantitively weight proportionate impacts of an HC phase-out as part of our SIA. We do, however, seek to understand, based on participant insights and the balance of probability, which communities will feel the most significantly impacted, should a phase-out proceed.

3.1 The Bay of Plenty will face a comparatively greater impact

Given the extent to which kiwifruit is grown in the Bay of Plenty (80 per cent of all New Zealand production), any impact stemming from an HC phase-out will be more severely experienced by Bay of Plenty communities, when compared to communities in other kiwifruit growing regions. Several orchardists and kiwifruit industry representatives stressed to us the importance of noting this disproportionate effect.

> "Whatever the community effects of a Hicane phase-out are, just know that communities in the Bay of Plenty will feel it far worse than anywhere else. Kiwifruit is so important to the Bay of Plenty."

In other words, due to the degree of kiwifruit production, Bay of Plenty communities are particularly vulnerable to changes, challenges, and shocks experienced by the kiwifruit industry. Regions with lower levels of kiwifruit production, such as Northland and the Waikato, would be comparatively less affected.

3.2 Green kiwifruit growers and Māori likely face disproportionate impacts

Although we are careful to avoid traversing into the scientific domain, we acknowledge industry consensus that the use of HC is required more for cultivating the green (Hayward) varietal of kiwifruit. HC continues to be used on gold and red kiwifruit varietals, but seemingly these have comparatively better odds of economic viability without the continued use of HC. As such, green kiwifruit orchardists are likely to be comparatively more affected by an HC phase-out.

> "I can't see how green growers can do without HC – just doesn't seem viable at all. Gold can almost manage without it, but green is nowhere close."

For context, according to Stats NZ, in 2020, green (Hayward) accounted for 7,500 hectares, while gold kiwifruit accounted for 7,800 hectares, whereas red accounted for 300 hectares. The production of Hayward green varietals occurs in all kiwifruit growing regions. However, it is the varietal most commonly grown by Māori. Some communities, such as Matapihi for example, exclusively grow the green varietal. Therefore, assuming HC phase-out renders green kiwifruit unviable, Māori growers will be significantly impacted.

4. Comprehending the anticipated loss of Pākehā growers

To fully understand the nature of anticipated losses that may occur due to an HC phase-out, it is necessary to tease out the distinctions between Pākehā and Māori growers. At high-level, Pākehā growers appear to identify a close relationship between economic and social impacts. In other words, Pākehā growers principally identify social losses as being an extension of economic losses, such as the implications of unemployment or reduced local business revenue. This perspective is likely driven by the kiwifruit boom in recent years, which may alter perceptions considerably in loss aversion. Conversely, Māori growers generally view the economic benefits of orcharding as a contributor to sustaining a way of life and community. In this section, we highlight the social contributions, and anticipated losses, of Pākehā orchardists.

4.1 Anticipated losses of Pākehā growers

To determine the perceived social losses of Pākehā growers in the event of an HC phase-out, we consider the present societal contributions identified by those growers. The social contribution of Pākehā orchardists can be organised into three broad categories:

Table 1: Overview of Pākehā growers' social contributions

Social contribution	Description
Social effects of employment	Employment opportunities have a net social benefit to local communities
Social effects of residual economic benefits	Residual economic benefits substantiate the local communities
Local sponsorships and philanthropy	Orchardists and kiwifruit organisations sponsor schools, sports teams, and scholarships

4.1.1 Social contributions stemming from employment opportunities

Although, strictly speaking, employment opportunities are an economic benefit stemming from the viability of kiwifruit orchards, several orchardists advised that there is also a visible associated social contribution. The social contributions described appear to emanate from notions of self-actualisation that come from being in employment and earning a salary. Such social contributions include:

- **Employees settling in rural communities to raise families**

> "A few of our guys, they were on the dole before. They didn't have much going on in their lives. Now they are buying their own cars, buying, or renting homes, and raising their families here. It's hard to understate the impact having a job has had on these guys' lives."

- **Reductions in recidivism**

"Plenty of our guys have come from Ngawha, they've been in there for a range of things, a lot of gang-related stuff. Once they have a job, and can take care of themselves, they are much less likely to go back. I'm certain that without their jobs these guys would be back inside Ngawha in no time."

- **Reduced gang-activity and crime in regional communities**

"If our guys weren't working here, or another orchard, they wouldn't be in work. There are no other jobs here, no other big industry. If they didn't have jobs here, they'd be involved in the gangs. Crime would be back up, and the Northland community would feel the effects of that."

- **Reductions in drug and alcohol abuse**

"As part of our health and safety rules, we do test for drugs and alcohol. It can create problems for us, sometimes. But what we find is that having a job, a decent income, means that our guys are keeping away from drugs and alcohol."

4.1.2 Residual economic benefits may substantiate local communities

To varying degrees, orchardists explained that they used local contractors for a range of services. One orchardist provided a comprehensive list of 48 local contractors she used in the last three-months. Contractors included, but were not limited to:

- spray contractors
- engineers
- builders
- accountants
- pickers and pruners
- landscapers
- arborists
- electricians
- plumbers
- planners.

Again, directly, this reflects an economic contribution, but as some orchardists argued, these are businesses based in regional communities, such as Katikati and Te Puke. If an HC phase-out were to render orchards economically unviable, these 'peripheral' contractors may also lose viability.

4.1.3 Orchardists and kiwifruit organisations deliver community programmes

A frequently espoused narrative from orchardists and stakeholders representing kiwifruit organisations was that the industry engages in sponsorships of local rugby clubs, schools, school sporting events, as well as providing some educational scholarships.

> "We do a lot of sponsoring in our local communities; the school sports programme is great. I think 20,000 kids get involved in that each year. They get to travel to other schools and compete. For some of those kids, that'll be the only opportunity they have to do something like that."

A kiwifruit industry representative provided a comprehensive breakdown of community programmes delivered by industry bodies, namely Zespri. It was advised that should an HC phase-out proceed, the finances of Zespri could be negatively impacted to the extent it may be required to withdraw funding from such programmes. It is important to note that Zespri is not the sole sponsor of these programmes but does appear to be a significant organiser and contributor.

Table 2: Community contribution programmes

Community programme	Contribution
Zespri AIMS Games	• Participation of 10,500 athletes • Estimated economic benefit of $5.5m from 18,000 attendees
Zespri Young and Healthy Virtual Adventure	• Annual participation of 20,000 children • 220 children gifted sports shoes in 2022
Surf Life Saving (since 2015)	• 182 new Patrol Captain qualifications • 1099 new IRB driver and crew qualifications • 512 IRB upskilling attendees • 33 fee scholarships for attending National Lifeguard School • 20,173 hours of training delivered

It was also advised that Zespri partners with a series of community initiatives that would be negatively impacted if an HC phase-out required Zespri to withdraw funding:

- Ōtanewainuku Kiwi Trust
- Youth Search and Rescue
- KidsCan
- Good Neighbour
- NZ Food Network (and other food bank providers)
- Zespri Horticultural Scholarship
- Kellogg Rural Leader Scholarship
- Industry Governance Development Programme.

Industry representatives were largely of the view that an implication of economic unviability arising from an HC phase-out is that such sponsorships and community programmes either cease to exist or are delivered in a reduced form.

5. Comprehending anticipated losses of Māori growers

The social contribution to Māori communities was articulated to the research team during two separate hui with Māori orchardists and representatives in the Bay of Plenty. The hui were important in raising issues of importance to the attendees, both those issues that are shared with non-Māori and those that are specific to the Māori trusts and entities who gave their views.

It should be noted that the contents of this section have been limited due to the timing of our hui and engagements. It is anticipated that this section will be revised and expanded upon prior to the DMC hearing in March 2023.

5.1 Māori growers are diverse, with unique histories and context, as well as some shared aspirations

Thinking in terms of impacts on Māori is misleading and not particularly insightful. Moreover, participants highlighted that they were speaking specifically for their people (trust, iwi, hapū, or whānau) and a 'generic' concept of Māori was both unhelpful and unappealing.

Given the scale of the Bay of Plenty, representatives from at least six separate rohe were asked to detail their experiences with HC and the effect that a phase-out would have on them and their communities. Differences exist both *within* and *across* different rohe and trusts, in terms of their:

- longevity in the kiwifruit industry (and consequently their practice around distributions with a social purpose)
- existing land holdings and other land uses
- histories in respect of land holdings and use (including the genesis of their kiwifruit interests)
- relative scale of operations
- shareholding and governance structures (including the number of members/stakeholders).

The bullet points above caution against imputing similar impacts across all Māori growers, as there would be disparate effects in terms of:

- mitigation possibilities:
    - smaller and/or newer growers would have less ability than larger growers to make change and therefore be hit harder (similar to non-Māori)
    - larger Māori growers could still face significant hurdles moving away from kiwifruit due to lending restrictions on multiply-owned land (unlike non-Māori)
- the extent to which other land-related ventures are able to continue or be undertaken in future (e.g. kiwifruit has provided an effective 'subsidy' to other land use ventures, which would be put at risk due to any phase-out)
- the ability to continue to provide existing support to beneficiaries and other members of the organisation.

Notwithstanding such heterogeneity, the hui showed us that there are some common aspirations and motivations across rohe and groups that kiwifruit growing is central to, such as the:

- achievement of dreams and goals that were formulated by tūpuna and supported by their hard work, that the current generation is continuing such that future generations are better off (i.e. intergenerational aspirations)
- goal to do good in ways outside of the financial realm (e.g. employment and training)
- acknowledgement that social objectives are hard to separate from economic and financial performance
- concern that actions (actually or potentially) taken in respect of HC and flow-on effects on kiwifruit growing have not given consideration to Te Tiriti and in particular Te Tiriti partnership.

Taken together, the factors above lead us to the conclusion that Māori interests (and rights) are material in this reassessment. We do not purport to cover all the possible issues and concerns of Māori generally here. Rather, we provide further detail from the hui to highlight the role and prominence Māori growers should hold, given the likelihood of disparate impacts, in terms of their nature and magnitude.

5.2 Māori growers support numerous community programmes

While our SIA is not necessarily the domain in which to fully explore this view, it is worth noting that Māori trusts and orchardists challenged the premise of the previously conducted Māori Impact Assessment (MIA), arguing that it failed to capture a sufficiently wide spectrum of Māori perspectives on the issue. According to these growers, had the MIA been sufficiently wide, it would have fully comprehended the extent of social contribution emanating from kiwifruit growing, given its embeddedness in local communities. Towards improving said comprehension, Māori growers explained they have several social programmes that are funded using the profits generated from their orchards:

Table 3: Overview of Māori growers' social contributions

Social programme	
Healthcare programmes	Profits from orcharding are used to fund healthcare facilities and treatment for Māori in local communities
Kaumātua care programmes	Profits from orcharding are used to fund care programmes for elderly Māori in local communities
Sports events	Funding is provided to local sports teams, allowing them to purchase equipment, attire, and travel to inter-regional events.
Cultural events	Funding is provided to cultural teams, such as kapa haka, allowing the purchase of equipment, attire, and travel to inter-regional events
Education	A provision of funding is made to local schools, enabling the purchase of teaching materials, school trips, and school meals

Conservation	Funding is made available for the replanting of native bush as well as the protection of native birds and other animals.

The highlighted programmes reflect those raised during our kōrero with orchardists but are unlikely to reflect the full extent of social contributions made. This is because Māori orchardists have oriented their businesses in a community-focused way, which reflects the navigation of cultural and commercial imperatives.

> "We run our businesses differently from Pākehā growers. Typically, they might grow to make a profit for themselves and their families; we want to make a profit so that we can support our people."

This navigation of cultural and commercial imperatives is reflected across the spectrum of Māori businesses and is not exclusive to the kiwifruit sector. Saliently, the Māori business model involves the integration of Māori values, to varying degrees (Manganda et al., 2022). Assuming an HC phase-out adversely impacts the economic viability of Māori kiwifruit orchards, the ability to deliver upon the specific contributions mentioned and to enliven Māori values in a commercial context may be impaired.

5.3 Māori trusts are using kiwifruit profits to develop communities

During our second hui, several Māori trusts advised us about the community projects they were developing, using profits derived from their orcharding operations. Although there was some diversity in these initiatives, they could be aptly characterised as community development. The most common component of community development espoused by Māori trusts was the building of new homes in their rohe.

According to the trusts in question, the loss of kiwifruit revenue would place these housebuilding programmes in jeopardy. Likewise, some trusts noted they had used kiwifruit profits to develop kura and other local infrastructure. In the same vein, the future of this infrastructure would be precarious without kiwifruit supporting its development.

5.4 Employment opportunities have enhanced the prospects of rangatahi

Our second hui with Māori trust representatives and orchardists afforded us the opportunity to meet and kōrero with three rangatahi who had graduated through kiwifruit cadetships. These cadetships were funded through some of the Māori trusts represented at the hui and provided employment opportunities for young Māori on the orchards while training and acquiring orchard management skills. Of the three rangatahi, two were now orchard managers, and the third was responsible for overseeing the managers of three separate orchards. Therefore, Kiwifruit-funded cadetships can provide gainful employment to young Māori located in regions with limited opportunities.

5.5 Māori are proud to make a living from the whenua

Māori orchardists expressed a firm view that there is an immense mauri in managing, and generating a living for their people, from the land. In some cases, prior to kiwifruit, Māori trusts leased their lands to Pākehā farmers and agriculturalists. Some orchardists noted that if kiwifruit were to become economically unviable, they may have to return to a lease model, which in turn would diminish their mauri. Concurrently, such models may also diminish the strength of Māori tino rangatiratanga.

5.6 Māori trusts forecast an escalation in poverty should an HC phase-out occur

Māori trusts strongly advised that should an HC phase-out render their orchards unviable; they would anticipate elevations of poverty in their rohe. In many rohe, kiwifruit orchards represent the only source of sustainable employment and, in some cases, the only source of employment entirely. The loss of employment in a rohe with limited opportunities would likely force former orchard employees onto forms of social assistance. Although this has an economic impact, in terms of individualised and community impoverishment, it also seems likely to diminish feelings of self-actualisation and aspiration associated with gainful employment opportunities.

5.7 Māori trusts anticipate a migration away from their rohe should an HC phase-out occur

A commonly expressed concern of Māori trusts and orchardists was that the economic unviability of kiwifruit brought about by an HC phaseout would diminish employment opportunities in their rohe. Consequently, their rohe would experience a migration of people towards urban areas, where employment opportunities can be found.

From an economic perspective, the migration of people away from the rohe has obvious ramifications. However, negative implications for culture and heritage also arise when tangata whenua migrate away from their ancestral lands. Saliently, people may feel a diminished mauri when detached from their lands, and the longevity of communities becomes precarious in the absence of its people. In some cases, such as the kiwifruit growing activity around Te Kaha, Waihau Bay and Opotiki, it has led to the return of people from other areas to their haukāinga. The continuation of this relocation pattern would be imperilled if HC was phased out, according to a majority of those at the hui.

6. Issues and sources of community tension

Towards understanding the impact an HC phase-out may have on senses of community cohesion, it is necessary to explore the sources of tension between concerned members of the public and kiwifruit orchardists. It is important to note that HC is one source of tension within a package of other issues, some of which are related to the use of HC, while others represent a significant departure. We also note that these tensions were found solely in the Northland region. Unfortunately, we were unable to meet with concerned members of the public located in the Bay of Plenty region.

6.1 Poor experiences and interactions with orchardists account for community tension

Several members of the public recounted poor experiences and interactions with orchardists. Generally, these interactions were engendered by a member of the public raising a concern with, or complaining to, an orchardist.

- **Unfounded accusations of reverse sensitivity**

When raising concerns and complaints with orchardists, members of the public reported having been accused of reverse sensitivity, followed by instructions to leave the community.

> "They accused us of 'reverse-sensitivity' when we complained, it's quite insulting, we were here first, these communities are long-standing and have been in place long before the establishment of these large economic, productive lots."

Reverse sensitivity applies to people who arrive in a community comparatively recently, then complain about specifics of that community that pre-date their residency. Therefore, the accusation of reverse sensitivity, in this case, is unfounded and 'insulting' – and accordingly, a source of tension between members of the public and orchardists.

- **Dismissive, contentious, and aggressive responses from orchardists**

When raising concerns with orchardists, members of the public reported being in receipt of dismissive, aggressive, and contentious responses. In one case, a member of the public reported receiving death threats from a neighbouring orchardist following his complaints.

> "He called me late at night, he said something to the effect of 'we have ways of dealing with people like you!'

Such interactions appear to have led to a perception of 'us and them', in which orchardists have been unwilling to acknowledge or seriously consider the concerns of fellow community members and, in this case, threaten community members for raising concerns.

- **Perceptions of entitlement**

Some members of the public expressed a view that orchardists are 'entitled' and place their priorities above those of the rest of the community. Pointing to a specific example, one member of the public explained how a local orchardist had issued flyers notifying neighbours of an upcoming 'spraying day',

which informed people to disconnect their tank water and suggested that the local school close for the day [we sighted this flyer when interviewing the participant].

> "How entitled are these people, that they tell us to disconnect our tank water, and tell a local school to close because it suits them!? It's outrageous! If their activities require someone to climb on to my roof to disconnect the tank water, then they can go to the expense of organising it."

'Entitlement' appears to be an issue of members of the public feeling as though they must make significant accommodations for the activities of orchardists, while receiving limited, to no, acknowledgement, or consideration.

6.2 Feelings of preferential treatment and marginalisation are a source of tension

Some members of the public described feelings of neglect and marginalisation when lodging complaints or concerns with local authorities. Broadly, members of the public felt that their regional councils were not supportive of their position.

- **A lack of sufficient oversight**

Members of the public felt that their regional councils did not provide sufficient oversight to ensure the proper use of HC and other chemicals. This perceived lack of oversight stemmed from a combination of under-resourcing and a feeling of indifference.

> "I requested that the regional council monitored the water quality for eels and other aquatic life. They said they didn't have the resources for it. The health board also said they couldn't help."

This lack of ability, or willingness, to provide sufficient oversight over the impact of spraying practices has led members of the public to feel that they have been 'stepped over' by local authorities in favour of kiwifruit orchardists. These feelings have been amplified by a lack of punishment for orchardists who had broken spraying rules and regulations.

- **Insufficient punishment for rules breaches**

For members of the public, feelings of preferential treatment have been validated by the lack of punishment for orchardists who have breached spraying rules and regulations.

> "We've gone to the council to complain about orchardists spraying in high winds, and when the schools are open. The regional council advised us that they don't have the resources to investigate or punish rule breaking."

Again, this informs a view that the imperatives of orchardists are being prioritised by local authorities, over the concerns of members of the public which, in turn, intensifies tensions between the two groups.

- **A perceived failure of kiwifruit orchard zoning**

Notions of preferential treatment were compounded by "perplexing" zoning decisions on the part of local authorities, but namely Northland Regional Council. Specifically, members of the public were concerned that the council had made decisions to permit zoning of new orchards close to residential areas and schools [we did observe three-to-five new-looking orchards close to schools in Northland].

> "Zoning is a problem. Why are these orchards being allowed to establish so close to homes and schools? It's a real failure of the district council."

This aspect of perceived regional council failure has informed a view on the part of members of the public that the regional council has "become dominated by farmers and horticulturalists".

6.3 Absentee orchardists create a perception of no community involvement

Several members of the public in Northland felt that orchardists were, broadly, not part of the community. As they perceived it, many Northland orchards were owned by absentee owners – either overseas corporations or Bay of Plenty-based orchardists expanding their production.

> "They don't feel like community members, they don't live here, they don't engage with us, they bring in teams from the Bay of Plenty to work on the orchards, they don't make any contribution here."

The physical absence of some Northland orchardists makes any potential community contribution less visible to members of the public, hence the view that no contributions are being made by these absentee owners. By extension, these members of the public perceive no losses to the community resulting from any economic unviability arising from an HC phase-out. Providing an alternate perspective, however, a kiwifruit industry representative noted that many new orchards in the Northland regions are syndicates, which involve collections of Northland-based investors – many of whom are retirees. If phasing-out HC resulted in the unviability if these orchards, a community impact would, therefore, be felt in the wealth of some Northlanders.

6.4 Orchardist practices are an issue for some members of the public

The use of HC, and spraying more generally, was the most frequently cited issue by members of the public. Here, members of the public advised that orchardists and, in many cases, their spray contractors were not spraying in appropriate conditions.

> "They just spray whenever they like, even if the winds are high. The contractors are especially bad, they have tight schedules, and they can't afford to not spray on some days, so they just do it. "

Members of the public were somewhat divided on this issue, however. For some, the use of HC was considered acceptable, so long as spraying was in accordance with rules and regulations. For others,

the use of HC, regardless of any safeguarding, was considered inappropriate. That said, issues with orchardists' practices were not contained solely to the use of HC.

- **Broader issues with horticulture practices**

Our conversations with concerned members of the public indicated that they had a broader series of concerns regarding modern horticulture practices, including:

- noise pollution early in the morning or late in the day
- the use of sprays, other than HC
- high levels of water usage
- negative impacts on other vegetation and native bush
- emissions and carbon impacts.

The use of HC appears to be an issue within a package of other issues that cause tension between orchardists and members of the public. It appears phasing out HC alone will not entirely address public concerns related to modern horticulture.

6.5 Concerns that communities are hollowed out

Interestingly, both orchardists and members of the public expressed disquiet at the notion that communities could be 'hollowed out' because of an HC decision. For members of the public, this concern was based on a view that people will vacate their residences due to kiwifruit orchard expansion, while orchardists suggested that a loss of jobs and income, resulting from an HC phase-out, would encourage people to migrate to more urban areas in pursuit of work.

- **Migration due to kiwifruit orchard expansion**

Members of the public living in a small Northland community advised that several residents had left in the last few years, as more orchards were established in the area. Residents had, apparently, elected to depart due to concerns for their health as well as fractious interactions and experiences with orchardists.

> "There have been three or four people who have sold up and left here since the new orchards started popping up. The woman down the road here, she sold her B&B and left, because she ended up surrounded by orchards."

The concern expressed by members of the public was that the ongoing expansion of kiwifruit orchards in the region would continue to encourage residents to leave. Eventually, the community would become 'hollowed out' and, consequently, unsustainable.

- **Migration due to economic unviability of orchards**

If an HC phase-out were to render orchards economically unviable, owners, employees, and 'peripheral' contractors may also lose viability. According to some orchardists, this would lead to a 'hollowing-out' of regional communities.

> "If the orchardists aren't here to pay all for all these different services, they'll probably close down too. People won't stay when they don't have jobs or their businesses can't make any money. I think people will leave communities like Katikati, and we'll see another urban wave."

In other words, the immediate and residual economic impact of an HC phase-out may lead to a migration of people away from small regional towns in pursuit of employment opportunities elsewhere. In turn, regional kiwifruit growing towns could experience significant reductions in population.

6.6 Impacts of urban sprawl on reverse sensitivity (Bay of Plenty only)

Changes to land use, and rezoning for new housing, coupled with high house prices in recent years have led to greater proximity between residences and horticultural growing cites. This phenomenon presented itself in the Bay of Plenty, but especially in communities adjacent to Tauranga, such as Te Puna. This seems to have given rise to reverse sensitivity issues that were not previously apparent.

> "We have people moving here from Tauranga, then complaining about the sprays and the other work that goes on here. It's simple enough, if you don't want to be near sprays, then don't move here."

As stated, this issue was prevalent in the communities surrounding Tauranga. It did not appear to be a source of community tension in Northland and, as such, may not be a straining factor in other locales. It is, ergo, hard to extrapolate and apply to other kiwifruit growing regions.

6.7 Impacts of an HC phase-out on community tension

Based primarily on discussions regarding the sources and issues of community tension, we do not recognise that an HC phase-out is independently sufficient for ameliorating kiwifruit growing communities. Although a phaseout would be well-received by concerned members of the public, it does not address wider issues with local authorities, modern horticulture practices, nor absentee owners. Moreover, instead of rectifying issues of negative experiences and interactions with orchardists, it is entirely possible that an HC phase-out would amplify ill feeling between concerned members of the public and orchardists, which in turn would be a detriment to community cohesion.

7. Balancing mental health and wellbeing implications of a phase-out decision

Here, we discuss the mental health and wellbeing implications of a hypothetical HC phase-out. We are acutely aware that an HC phase-out will impact both growers and concerned members of the public differently. Although it is not possible to quantify and subsequently weigh a potential mental health and wellbeing impact within the purview of an SIA, we do endeavour to qualitatively account for and compare the likely experiences of both groups.

7.1 Mental health and wellbeing impacts experienced by orchardists

It is well-understood that horticulturalists, and agricultural workers more broadly, frequently experience poor mental health outcomes. Financial problems and uncertainty are factors most commonly associated with the psychological distress of farmers (Gorgievski-Duijvesteijn et al., 2005). However, exposure to chemicals, climate change, and poor physical health are also associated with mental health and wellbeing issues (Yazd et al., 2019) and, more recently, the social isolation imposed by COVID-19 has also proved detrimental (Rose et al., 2022). Altogether, this points towards a package of factors negatively influencing the mental health of farmers, and broadly reflects the insights retrieved from our conversations with kiwifruit orchardists.

- **The mental health and wellbeing of orchardists is being impacted by a series of factors**

In addition to the prospect of an HC phase-out, orchardists explained that there are a litany of factors influencing their mental health and wellbeing.

Table 4: Factors influencing farmers' mental health and wellbeing

Climate change	**Orchardists are concerned about the challenges to growing posed by rising temperatures and extreme weather events**
Economic uncertainty	The increasing uncertainty of the macro-economic environment, both domestically and overseas, has orchardists concerned about their profitability
Financial difficulty	Somewhat associated with concerns regarding climate change, orchardists are concerned about their ability to maintain a sustainable cash flow from kiwifruit growing
Debt	Orchardists are concerned about the level of debt they hold with lending institutions, as well as their continued ability to service their debt in an increasing interest rate environment.
Legislative reform	Relates to a specific concern about the impacts of Three Waters reform on access to water for growing activities

As such, without the prospect of an HC phase-out, the mental health and wellbeing of orchardists is already being adversely impacted.

- **A prospective HC phase-out has affected the mental health and wellbeing of orchardists**

Across the board, orchardists noted that they have experienced elevated levels of stress, anxiety, and in some cases, depression resulting from the ongoing discourse related to the potential HC phase-out. They also advised that fellow orchardists were experiencing similar negative mental health and wellbeing impacts.

> "Ever since this Hicane issue was brought up again I've been stressed out about what might happen, and what we might be able to do about it. It's tough because we can't really do anything until the EPA make their decision. Feels like it's out of anyone's control. "

Altogether, this suggests stress and other negative health and wellbeing impacts experienced by orchardists have been exacerbated by the discussion and impending decision surrounding the continued use of HC.

- **Negative mental health and wellbeing has a residual effect on families**

A representative of a kiwifruit industry body expressed concern that additional mental health and wellbeing stresses would have a significant secondary impact on the families of orchardists. Specifically, he expressed concern that poor mental health and wellbeing outcomes would manifest in orchardists' homes as domestic violence and other forms of abuse.

> "In New Zealand we talk about the correlation between the All Blacks losing and domestic violence. I've been in this industry a long time, and a similar connection between orchardist stress and domestic violence, and broken homes, can be drawn. It has a really damaging effect on families."

- **Orchardists do not perceive adverse wellbeing impacts associated with the use of HC**

Contrasting with literature that suggests the use of chemicals is a source of mental ill-health and negative wellbeing (Yazd et al., 2019), kiwifruit orchardists indicated that they did not experience negative wellbeing impacts from the use of HC.

> "I've been using the stuff since the 80s, it has never affected me or anyone I know of, so I have no concerns about using it."

> "Nah, I don't worry about using the stuff, it doesn't keep me up at night, as far as I can tell it's perfectly safe if used right."

Perhaps unsurprisingly, therefore, the mental and wellbeing effects of an HC phase-out for orchardists appear comparatively higher than the continued use of HC.

7.2 Mental health and wellbeing impacts experienced by members of the public

Balancing the mental and wellbeing ill-effects of a potential HC phase-out, we discuss the mental health and wellbeing implications experienced by members of the public concerned about the continued use of HC. Consistent with submissions, physical health and the environment were the primary concerns of members of the public.

7.2.1 Health impacts are a source of mental distress

- **Concerns for personal physical health**

Citing various pieces of scientific research, mostly from the European Union, members of the public were concerned that the use of HC was negatively impacting their physical health and wellbeing. The stress associated with this was having a significant impact on their mental health and wellbeing.

> "The science behind this stuff indicates that it's pretty awful. I worry about what it is doing to our health. We're old people, this stuff might be doing real damage to our health.
>
> "Who knows what this stuff is doing to us? Makes me sick thinking about it."

- **Concerns for the health of others**

Members of the public also experienced mental distress vicariously, through concern for the health and wellbeing of others in their communities. Most commonly, this concern-by-proxy related to the health and wellbeing of children attending schools next to kiwifruit orchards.

> "There's a school just down the road there. I worry for the children when the spraying is going on. That's where they go to learn and play, not get sick because of an inconsiderate orchardist."

- **Concerns for the health of pets and animals**

Public health concerns also extended to pets and animals. Specific concern was raised in respect to dogs, based on a perception that they are acutely affected by HC. One member of the public delineated an account of having his dogs become gravely ill following the HC spraying activities of a nearby orchard.

> "The dogs were out the day after the orchard next door sprayed, and maybe they were rolling around in the grass, then licking themselves, and picked it up that way. I took them to the vet, and they pulled through because they were fit dogs. One still gets seizures from time to time since then."

7.2.2 Environmental impacts are a source of stress

Consistent with concerns raised in submissions to the EPA, members of the public expressed concern about the continued use of HC on the environment. With 'environment', members of the public are referring principally to nearby vegetation, bird life, and water quality.

> "All those sprays, Hicane or whatever else they are using, it's damaging to birds and plants. I've heard that it harms native eels as well if it gets into the streams. We have some tuna behind the house here that I feed."

Environmental concerns manifested as commercial ones, when members of the public argued that negative environmental impacts will have a consequential impact on tourism.

> "There are groups up here (Northland) certain that all these new orchards popping up, damaging the environment, will ruin tourism. We're just coming out of COVID, and slowly coming back, only to see a beautiful environment ruined by kiwifruit orchards."

Members of the public concerned about environmental conservation, for commercial reasons or otherwise, may, thereby experience improved mental health and wellbeing outcomes because of an HC phase-out. This may, however, be an erroneous assumption, given that some members expressed environmental concerns surrounding modern horticulture practices more broadly, beyond the use of HC. The use of fertilisers, pesticides, insecticides, and fungicides was a cause for concern for members of the public. The mental health and wellbeing improvements experienced due to an HC phase-out may therefore be marginal while other concerns remain present.

8. Mitigation of HC phase-out

Here, we discuss mechanisms through which the economic and subsequent social impacts of an HC phase-out may be mitigated. The mitigation factors discussed were either offered up by our orchardist participants or presented to them for discussion by the interviewing team.

8.1 Mitigation factors

Kiwifruit orchardists identified four primary mechanisms for mitigating the phase-out of HC:

Table 5: Mitigation factors

Use of alternate spray products	**Switching to other bud-break spray products that do not contain HC**
Switching to organics	Removing HC and other inorganic sprays to grow certified organic kiwifruit
Alternate land uses	Switching to other forms of land uses to mitigate the economic impact that may come with the phasing-out of HC
Extended phase-out period	Implementing a phase-out period longer than five-years may permit the development of alternative sprays (of higher efficacy), alternative varietals, or ease the adjustment to a post-HC growing landscape.

In this section, we discuss the use of alternate spray products and potential for switching to organic production. The potential for land use alternatives and an extended phase-out period requires a more extensive discussion and is, therefore, presented in dedicated sections.

8.1.1 Alternate spray products lack sufficient efficacy to replace HC

Prevailing sentiment from orchardists when discussing alternate bud-break sprays was that they lacked sufficient efficacy to be a meaningful replacement for HC. Several orchardists spoke of first-hand experiences of trialling alternate sprays.

> "We've run trials of different sprays before. What we've done is spray one row with Hicane, one row with the alternate, and one row with no spray at all. The row with the alternate spray does marginally better than the row with no spray, but we have had cases where the rows with no spray do better than the alternative."

The capacity of alternate sprays to meaningfully mitigate the economic effects of an HC phase-out are, therefore, considered to be particularly low. In other words, kiwifruit orchardists largely do not believe alternate sprays can mitigate the effects of an HC phase-out.

8.1.2 The market may not justify a transition to organics

Orchardists broadly accepted that a transition to organic kiwifruit growing was possible and a potential mechanism for the mitigation of an HC phase-out. It is important to note, however, that phasing out HC alone would not render an orchard *organic* – other changes to growing would be required. Nonetheless, the primary concern surrounding a switch was based on the market for

organics. Orchardists were generally of the view that the market for organics is predicated on a niche that enables premium pricing. If there was to be a significant shift to organics, the premium pricing would be lost, due to oversupply.

> "If we all move over to organics, we'll flood that market with products, and there aren't many people looking to buy organic kiwifruit. We'll completely destroy the price premium that market has."

Altogether, orchardists do not consider the organics market sufficiently large to reflect the returns made via conventional kiwifruit growing, and by extension do not consider it capable of fully mitigating the impacts on an HC phase-out.

8.2 Mitigation via land use alternatives

We requested kiwifruit growers identify potential land use alternatives, should an HC phase-out lead to the economic unviability of their orchard. Although a series of options were identified, it is worth noting that several growers expressed disquiet at the notion they should effectively be "forced" to consider alternatives given, in many cases, families had grown kiwifruit for generations of their land.

> "That question makes me quite angry; my father turned this place into an orchard near on 50 years ago, and now all of a sudden, a decision out of my control means I have to start undoing all his work!"

Assuming an HC phase-out economically obliges growers to adopt land use alternatives, inter-generational growers appear likely to wear an emotional burden stemming from the loss of their family business.

8.2.1 Growers identified seven possible land use alternatives

Despite initial protestations as to the premise of our question, both Northland and Bay of Plenty growers identified similar land use alternatives, with a few exceptions emerging from Northland. In conjunction with the identification of land use alternatives, several orchardists explained why those alternatives may not be workable. Here, we present those alternatives as well as growers' assessments as to their viability.

- **Avocado orchards**

Avocado orcharding is a well-established component of the horticulture sector in both Northland and the Bay of Plenty. This means, from an environmental and climatic perspective, avocados are a potential land use alternative for kiwifruit growers. However, growers advised that avocado orcharding is not a viable land use alternative, primarily for economic reasons. Specifically, a glut of supply, arguably oversupply, has led to avocados experiencing significant price drops in both global and domestic markets (Pomranz, 2022). Moreover, growers expressed a view that growing requirements for avocados, which include a catalogue of other sprays as well as high volumes of water, would do little to satisfy the concerns of those opposed to the use of HC.

- **Sheep and beef grazing**

In many cases, the land presently used for kiwifruit orcharding was priorly used for sheep and beef grazing. As such, there is little question as to the viability of the land and environmental conditions as to the suitability of sheep and beef as an alternative. In addition to the issues of capital requirements (discussed later in this section) for land conversion and the comparatively low economic returns of sheep and beef, orchard size is a significant factor in the viability of this alternative. Pointedly, kiwifruit growers with small sections are constrained by the number of sheep and cows they are permitted to keep.

> "I've looked into it before. On a section the size of mine I would only be able to keep four sheep and two cows…something like that. I can't make a living from that."

The viability of a sheep and beef conversion, therefore, is a land use alternative available mainly to those kiwifruit growers operating larger orchards.

- **Dairy farming**

Similar to beef and sheep grazing, many orchards in both Northland and the Bay of Plenty were formerly dairy farms. As such, dairying is a potential land use alternative to kiwifruit orchards. However, according to growers, dairying is subject to the same limitations as sheep and beef: (1) capital requirements for land conversion are high; (2) the economic returns are comparatively lower than kiwifruit, although higher than sheep and beef grazing; and (3) smaller orchards lack sufficient land to make dairying economically scalable. In addition to the commonalities with sheep and beef, growers expressed a view that dairy conversions are not conducive to the present environmental goals of New Zealand and, as such, consents for dairy farms would not easily be obtained.

- **Apple orcharding**

At present, apples are grown in both Northland and the Bay of Plenty. A conversion to apple orcharding is, therefore, feasible from an environmental and climatic perspective. Kiwifruit growers, however, expressed concern about the ability of the apple market to absorb the additional supply that conversions would represent.

> "Depending on the type, apples don't always fetch much of a price. If we start growing apples too, I imagine that price would fall further."

Kiwifruit growers also expressed concern that if HC is phased-out, spray used in apple orcharding would also be subject to an eventual phase out. This called into question the long-term sustainability of apple orcharding as a land-use alternative.

> "They spray a lot more on apples than we do on kiwifruit. If HC goes, surely the sprays on apples will be looked at too, so it wouldn't make much sense for me to convert to apples."

- **Berry growing**

A range of berries are grown in both Northland and the Bay of Plenty. Some kiwifruit growers interviewed for this impact assessment also had small berry growing operations. This suggests berry growing may be a viable land use alternative for kiwifruit orchardists. Trepidation surrounding a conversion to berry growing is reflected in the strength of the export market. Specifically, growers

pointed to a heightened biosecurity risk associated with some berries, which may render exports unviable.

> "There have been a couple of biosecurity strikes with blueberries going to Australia. If there's another one, that export market is likely gone."

Other growers advised, in the domestic market, their blueberry growing operations are economically much weaker than kiwifruit and, thereby, not a suitable replacement.

> "We can't so much as wipe our face with what blueberries bring in for us."

- **Pineapples, peanuts, passionfruit, and bananas (Northland only)**

Kiwifruit growers in Northland acknowledged horticulture products being piloted and trialled in Northland could eventually represent a viable land use alternative from kiwifruit. In the short to medium term, however, growers argued that these products are not suitable alternative to kiwifruit growing.

> "We might have pineapples or whatever else growing commercially up here in the future, but we're still quite far away from that reality, I think. I couldn't replace my kiwifruit with pineapples or bananas in the next five years."

More time may be required to assess the commercial suitability of the products being trialled in Northland before they can be seriously considered as viable land use alternatives to kiwifruit orcharding.

- **Sub-division for housing and residential care homes**

In a complete departure from productive horticulture, some orchardists suggested their land could be rezoned for new housing developments, as well as residential care homes. Although this option could represent a significant short-term economic return, it would not necessarily represent an enduring investment. Moreover, the economic returns from subdivisions are limited for orchardists operating smaller sections. Perhaps most pertinently, however, growers expressed concern that new housing would not be required in their communities, due to the job losses (immediate and residual) that would occur as a consequence of their orchards ceasing operation.

> "We might be able to rezone for housing, but I'm not sure how needed new homes will be if there are no jobs after the orchard is gone."

8.2.2 There are considerable barriers to land use conversion

In addition to the specific challenges associated with each of the eight identified land use alternatives, growers noted that there are general issues associated with any type of land conversion. In this section, we discuss barriers to land conversion and, by extension, generate inferences as to the groups who may, and may not, be able to generate a living from alternate land uses.

- **Difficulties accessing capital for land conversion**

Kiwifruit growers advised that converting their land to another horticultural or agricultural use would require significant capital expenditure. Capital would first be required to uproot and dispose of the

kiwifruit vines and peripheral growing equipment. Based on our conversations with orchardists, this process would cost approximately $50,000-$60,000 per hectare. A second tranche of capital would then be needed to install the chosen land use alternative. Mainstream growers who belonged to an upper age range expressed concern that their ability to access capital from conventional sources would be obstructed by their advanced age.

> "Look, I'm 71 – which isn't unheard of in this sector – and I go to the bank and ask for $400K, they'll laugh me out of there."

International research (OECD, 2020) corresponds with the view that the advanced age of an applicant can prohibit access to capital. Altogether, this suggests that older kiwifruit growers may be limited in their ability to extract income from alternate land uses. In a similarvein, Māori are also acutely impacted by access to capital issues.

Some Māori growers advised that they would likely convert their kiwifruit orchards into another productive land use. However, they lacked sufficient capital to fund the conversion, primarily because profits generated from Māori orchards are disseminated back into communities. Māori growers articulated concern about their ability to access capital required for a land conversion.

> "Māori, we can't access capital and lending as easily as the rest of the country, so what do we do if we need to convert the land?"

Providing credence to the stated position, the Reserve Bank of New Zealand (2022) has provided a catalogue of research indicating that Māori are disproportionately affected by capital access limitations. Simply put, Māori growers may face disproportionate challenges in generating a living from alternate land uses.

- **Size of available land may prohibit alternative uses**

Alternative land uses and conversion options are restricted by the size of land available to the kiwifruit grower. For example, growers with small sections are effectively excluded from dairying, and sheep and beef grazing. However, the viability, and scalability, of horticultural alternatives are also influenced by the size of the section.

> "For a small grower like me, there is nothing out there that offers anywhere near the scalability that gold, and even green, kiwifruit offers."

Put differently, smaller growers' ability to convert to a horticulture alternative will be affected by the scalability of alternatives. If an alternative is not scalable given the size of available land, it may not be possible for small kiwifruit orchardists to generate a living from alternate land uses. Moreover, it seems that even if an alternate land use is scalable, it will be considerably less profitable than kiwifruit growing. This has important implications for the ability of the grower to service existing debt.

- **Existing levels of debt may prohibit conversion to land use alternatives**

Several kiwifruit growers advised that they carried significant levels of debt with their banks. Largely, this debt was accumulated during the purchase of their land, and the conversion of their land into kiwifruit orchards. As discussed, debt is a focal point to the mental health and wellbeing challenges experienced by orchardists. In terms of alternative land use, however, the obligation to continue servicing this debt can limit options at the orchardist's disposal.

> "I've got a hefty mortgage from setting up the orchard, if I need to replace the kiwifruit with something else, it's got to have high enough returns that I can cover the repayments…and I'm not sure what that is."

Orchardists holding high levels of debt are, therefore, constrained in their ability to generate a living from land use alternatives. Qualitatively, based on our fieldwork, these are mainly orchardists operating smaller sections.

- **The time taken to make a return from an alternative land use is unaffordable**

Numerous orchardists also expressed concern at the notion they would essentially be required to forgo any income while their land was converted to an alternate horticulture usage.

> "If we pulled out all the kiwifruit and planted something else, like avocados, we would be waiting three to five years before we could generate an income from it. What am I supposed to do without an income for three to five years!?"

Again, this concern was expressed mainly by growers with small sections. It appears likely growers without the available capital to forgo an income for several years would be inclined to sell their land, as opposed to converting it to an alternative usage.

8.2.3 Who can wear the costs of land conversion?

Our kōrero with growers indicated that the following groups would either be unable or face significant barriers to making a living from land use alternatives:

- Māori growers
- growers of an advanced age
- growers with limited financial capital
- growers operating on small sections.

Deductively, therefore, it appears that the growers best equipped to wear the costs of land conversion, and by extension make a living from alternate land uses, are large and corporate kiwifruit growers. In the event of an HC phase-out, these growers may find themselves in the position of having the opportunity to purchase land from growers unable to wear the costs of land conversion.

8.3 Mitigation via an extended phase-out period

Extending the phase-out period beyond the proposed five years may permit sufficient time for the development of high-efficacy alternative 'bud-break' sprays or kiwifruit varietals that do not require 'bud-breaking' sprays. An extended period may also provide orchardists with sufficient time to adjust to a post-HC growing landscape.

8.3.1 Extended phase-out may favour the development of alternatives

Broadly, there are two schools of thought concerning time and the development of innovations. On one hand, it can be said that tight timeframes create pressure which, in turn, expedites the innovation

process. This suggests a short phase-out period will encourage the kiwifruit industry to quickly develop alternate sprays or varietals. On the other hand, it can be said that to properly develop innovations, rigorously test their efficacy, and ensure their safety, takes considerable time. Orchardists and industry representatives, generally, advised that a five-year phase-out period was too short to fully develop an HC alternative, or alternate varietals, and bring it into commercial use.

> "They [Zespri] have been looking at alternatives for a while. I think it'll take more than five-years to bring something that works just as well to market."

Extending the proposed phase-out to a period greater than five years may enable the industry to properly develop a viable alternative to HC or HC-reliant kiwifruit varietals. This report is not necessarily the place to discuss or propose alternate timeframes. However, some participants noted that a 10-to-15-year phase-out period would be, realistically, more favourable to the development of alternatives. It should be noted, however, that concerned members of the public are unlikely to support an extension to the phase-out period, with many indicating that they were in favour of an immediate HC ban, intimating five years was "too long". It is, therefore, important to note that members of the public were generally not in favour of extending the phase-out period beyond five years, due to concerns regarding prolonged exposure to residual HC spray.

8.3.2 Extending the phase-out period may ease the process of adjustment

Disregarding the development of potential varietal or spray alternatives, extending the phase-out period may also ease the adjustment process for orchardists and, consequently, limit any social impact arising from the phase-out. We assess that a phase-out extension could facilitate one or more of the following:

- **Optimisation of new growing conditions**

In lieu of a viable HC alternative, or kiwifruit varietal, orchardists would benefit from additional time to adjust to growing with a 'bud-break' enhancer. This is because optimisation of growing without a 'bud-break' enhancer will likely require various trialling and test-piloting stages.

- **Testing and trialling land-use alternative viability**

Orchardists advised that it may take three-to-five years to generate a viable income from an alternative land use. Extending the phase-out period beyond five years could provide growers the opportunity to trial alternative land uses and gradually convert their land, should such trials prove fruitful.

- **Time to organise finances and debt**

According to a kiwifruit industry representative, 30-40 per cent of orchardists carry "significant" levels of associated debt. An extended phase-out period would provide a window of opportunity for those orchardists to reorganise their finances and reposition themselves in a way in which they can better manage their debts, should an HC phase-out negatively impact their economic viability.

- **Extended consideration of land sale**

Few orchardists seemed keen on the notion of selling their land as a means of mitigating the potential impacts of an HC phase-out. However, extending the phase-out period may render selling land more palatable to the average orchardist. The average orchardist age at present, according to an industry representative, is 61. Extending the phase-out well into the retirement age of the average orchardist would likely create an opportunity for the land to be sold, potentially for alternative uses, thereby mitigating the extent of social impact brought on by an HC phase-out. It is important to note, for obvious reasons, the sale of land is not an option considered by Māori orchardists.

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Appendix A Questions and concerns

- How smaller orchards (i.e. small Māori trusts) could be more heavily affected compared to larger ones that can afford equipment/infrastructure to minimise effects of a loss of HC.
- Who has alternative ways of making a living from their land and who does not?
- Will the analysis have the level of resolution to be able to discern reasonable differences in social impact between 10, 15, and 20 per cent of orchards becoming unprofitable? Would comparing 10, 20, and 30 be more amenable in terms of modelling and start to test the minimum and maximum bounds of social impacts that might occur and thus help tease apart the patterns of these impacts? *We do note that it might be prudent to include 15 per cent as that is the number proposed by NZKGI.
- The positive impacts of a phase-out. A ban may lead to mental distress of an orchard owner, but to an increase in quality of life for their neighbour. How will the positive/negative social impacts be quantified/compared? i.e., comparing the negative mental health effects of financial distress resulting from an HC phase out versus the positive mental health effects of HC not being used anymore. Would this be based on the number of people affected in each category?
- What sorts of mitigation measures may be possible and what would likely time scales be for implementing them?
- Examining land use alternatives is important to the analysis and could serve as an assessment of other such mitigations.
- The DMC has suggested that the EPA assess the list of participants to review for bias and inclusivity.
- One of the assumptions in the proposal is that some proportion of orchards become immediately unprofitable. Does this mean assuming such orchards become unprofitable right at the start of the five-year phase out? Presumably, unprofitability would increase over the course of the phase-out period, reaching maximum impact at the end of the phase-out period in terms of the overall proportion of orchards becoming unprofitable and the overall scale of this financial loss. Would the end of the phase out period be a more realistic marker of the maximum financial impact of phasing out HC?

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