SUBMISSION ON

Climate Change Commission
2021 Draft Advice for Consultation

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TO: Climate Change Commission

NAME OF SUBMITTER: Horticulture New Zealand

CONTACT FOR SERVICE:
Michelle Sands
Manager – Natural Resources and Environment
Horticulture New Zealand
PO Box 10-232 WELLINGTON
Ph: 04 470 5664
Email: Michelle.Sands@hortnz.co.nz

Submission structure

Background to HortNZ

Horticulture New Zealand (HortNZ) thanks the Climate Change Commission for the opportunity to submit on their draft recommendations and welcomes any opportunity to discuss this submission further.

HortNZ was established on 1 December 2005, combining the New Zealand Vegetable and Potato Growers' and New Zealand Fruitgrowers' and New Zealand Berryfruit Growers Federations.

HortNZ advocates for and represents the interests of 6000 commercial fruit and vegetable growers in New Zealand, who grow around 100 different crop types and employ over 60,000 workers.

It is not just the economic benefits associated with horticultural production that are important. The rural economy supports rural communities, and rural production defines much of the rural landscape. Food production provides for food security. Horticulture is an essential service; this has further highlighted through the Covid-19 response.

HortNZ's purpose is to create an enduring environment where growers thrive. HortNZ achieves its purpose through enabling, promoting and advocating for growers in New Zealand.

EXECUTIVE SUMMARY

HortNZ welcomes the report from He Pou a Rangi – the Climate Change Commission ("the CCC report"). Horticulture has a role in achieving the Climate Change Commission's vision for a 'thriving, climate-resilient and low emissions Aotearoa.'

Growers are proud to grow healthy food that feeds New Zealanders and the world's consumers. Many horticultural industry bodies have already committed to achieving carbon neutrality, and businesses in our sector are already making progress to reduce emissions. HortNZ is committed to responding to climate change challenges and doing what it can to support the horticultural sector's transition.

Growers need a progressive and planned transition with the right tools, incentives and policy settings. The transition should enable growers to remain competitive while reducing emissions and increasing sequestration.

The key themes of HortNZ's submission are:

1. Increased land-use change to horticulture will reduce emissions from the agriculture sector. Achieving increased horticulture will require an integrated plan. The plan should focus on reducing barriers across trade, labour and the environment.

2. Growers can reduce fertiliser emissions through improved practices. Growers can maintain and increase carbon stores through improved management of trees and soils. Education and market incentives will drive on-farm behaviour change for horticultural growers.

3. Horticultural farms can increase renewable energy generation using existing solar technology. Growers need incentives to maximise the benefits of on-site electricity generation.

4. We seek an energy transition strategy.

5. We seek targeted investment in accelerating research and technology uptake for process heat and alternative fuels.

6. The purpose of free allocation should shift towards driving global emissions reductions and maintaining food security. We seek an alignment of free allocation across industrial and power, transport and agricultural emissions. We seek recognition of fruit and vegetables' importance to maintain New Zealand's domestic food supply and food policy that links environmental and health outcomes.

7. Credible assurance and carbon-footprint standards enable consumers to make choices that reduce the risk of carbon leakage. We seek policy support for the use of Industry Assurance Programmes use in regulation and markets.

1.1 Emissions budgets, overall path and approach

HortNZ supports CCC's emission budget recommendations. We support the approach of decarbonising long-lived gas emissions where workable and building a long-term carbon sink to offset residual long-lived gas emissions.

The proposed Strategic Planning Act presents an opportunity for better alignment of resource use and climate change outcomes. We see an opportunity to identify land for long sequestration, including low-lying land that may become more marginal with climate change. We also consider the Act presents an opportunity to recognise and manage strategically important food hubs and highly productive land.

We discuss the approach in more detail in Section 3 of this submission. We also provide specific commentary on the sector actions required for Transport, Heat, Industry and Power, Agriculture and Waste.

Outcome sought:

- Support recommendations relating to emissions budgets and overall approach.
- Seek recognition of the importance of management of highly productive land policy.

1.2 Land Sector

Horticulture is a low emissions rural land use. The CCC report's assumptions about the effects on freshwater from horticulture conversion are incorrect. (refer to Section 3.5.4). Land-use change from irrigated pasture to irrigated fruit production would result in improved water quality, reduced water use and fewer emissions.

Perhaps because of the incorrect assumptions, little weight has been given in the report to the opportunity for horticultural expansion. Horticulture is a real option for highly productive land, and in our view, horticulture has a vital role in New Zealand's transition.

We agree with the predicted expansion of horticulture over the next ten years of 2000 ha a year. Importantly this predicted expansion is related to the current regulatory and market settings (refer to Section 2). We need to reset and align policy settings to ensure the status quo does not prevail. At present considerable barriers to the expansion of horticulture exist.

If New Zealand is serious about reducing emissions from the land-based sector, an integrated plan to remove horticulture expansion barriers is required. This plan requires policy support and investment in markets, labour, water storage and greater certainty in natural resource policy (refer to Section 4.3).

Outcome sought:

- Correct the CCC report to reflect an evidence-based assessment of the environmental effects/benefits of horticultural expansion.
- Make clear recommendations on the government's policy interventions to achieve meaningful reductions from the land sector in the second emissions budget. These reductions must not rely solely on technology that does not yet exist.
- Amend Necessary Action 11 to include a focus on investment in R&D and innovation and policy alignment.

1.3 Sequestration

We support a focus on emissions reductions rather than offset. We also recognise that carbon stores in perennial crop-land, soils, and other farm-level vegetation should be accounted for and managed.

Through He Wake eke Noa, we support the promotion of opportunities to maintain and improve sequestration. Improved sequestration can be achieved by mulching prunings, incorporating plant residue in soils, and planting perennial crop-land, shelter-belts, and riparian margins.

There may be opportunities for growers to offset emissions from sequestration that are not currently counted within the ETS. Not all sequestration may be sufficient to warrant offset. But, practices to maintain carbon stores should be encouraged.

Outcomes sought

- We support Budget Recommendation 5 regarding the broader accounting of carbon sequestration.
- We support the development of clear standards for sequestration for accounting, offset, maintenance and carbon-foot-printing purposes.
- We support robust voluntary mitigation parameters.

1.4 Transition away from Fossil Fuels

Horticulture requires targeted investment in accelerating research and technology and managing the costs of transition.

Renewable Energy Generation

There are opportunities within horticultural farms to generate solar electricity to support reducing on-farm diesel use. Horticultural farms often include large buildings that can generate solar energy, and some growers currently utilise solar power to reduce electricity and fuel costs. There is an opportunity to use on-farm solar generation to supplement the New Zealand grid, increase renewable energy, and charge batteries to fuel electric machinery and vehicles.

Energy Transition Strategy
We seek an Energy Transition Strategy. There is not a one-size-fits-all model for the energy transition in greenhouses or for on-farm and freight vehicles.

Instead, an energy transition strategy is needed taking into account the crop, region, size, infrastructure, age, etc. Investment in horticulture is strategically important for New Zealand.

The CCC must assess the impact on food security and global emissions related to the timing of technology availability and the carbon price.

A high ETS price will increase the cost of fresh fruit and vegetables and result in reduced food variety for New Zealanders. A high ETS price may also make New Zealand horticultural products less competitive internationally.

There are two critical areas of impact for horticulture that are relevant to the domestic food supply:

Farm vehicles and machinery, and trucks that use alternative fuels
Electric cars are becoming commonplace, and alternative lighter vehicles used in orchards and packhouses are emerging. Heavier vehicles used for vegetable and fruit production and freight are not likely to be commercially viable soon. A rising carbon price may impact domestic food prices and international competitiveness until there is a viable alternative for farm vehicles and trucks.

Alternative heating for the covered crop growers
The technology and fuel sources are not yet available for economic transition. Faced with an ETS price greater than $50, many greenhouse growers will go out of business. If greenhouse growers go out of business, New Zealanders will face higher prices leading to reduced vegetable consumption and increased imports. Imported vegetables may increase carbon leakage.

Greenhouse growing is a resilient, growing system with importance for domestic food supply. An increasing ETS price and free allocation are not assisting with the transition, and the sector is at imminent risk. The sector requires direct investment.

Outcomes sought

- Develop an Energy Transition Strategy.
- Provide clear policy criteria for the targeted support of sectors. The criteria should include free allocation and investment support. Criteria should include support where the loss of the activity would have an unacceptable societal impact. For example, an unacceptable impact on domestic food supply increases global emissions due to carbon leakage.
- Free allocation where alternatives are not available.
- Investment to enable growers to shift to emerging technology before it is economically viable but is available.
- Re-investment of funds collected in the ETS into a contestable fund.
- A shift in EECA funding's focus to funding the roll-out of transition, rather than only fund demonstration pilots.
- Incentivise on-farm electricity generation to support New Zealand’s transition to renewable electricity.
- There are no viable alternatives for some vehicles now, but there are some available alternatives, – e.g. battery-powered forklifts and light vehicles. Incentives would increase uptake.
- Clearer direction and support for off-road vehicles and heavy/medium trucks. The pathway to electrification (and other options such as hydrogen fuel cell technology) is unclear from Necessary action 4. We seek that options for hydrogen as a decarbonisation solution for heavy vehicles are supported and invested in.
- Recognise the importance of carbon for plant growth in greenhouses and the need for appropriate and efficient energy solutions. Biogas provides promise as an alternative heat and carbon source. Investment in this sector is needed so it can operate commercially.
- Amend Necessary actions 6,7, and 9 to provide a more straightforward transition path for the covered crop sector (process heat users).

1.5 Global Emissions

The European Green Deal requires NZ exporters to show they are subject to effective climate change policy. European supermarkets are starting to require products to prove their carbon footprint.

Growers are concerned about the risk of imported products, not subject to climate change policies as robust as New Zealand's, displacing NZ grown products in the domestic market.

While regulatory requirements on imports, like what is being required for New Zealand exporters in Europe, is an option to manage this risk. We think this risk can be reduced outside of trade agreements in two ways: market instruments supporting consumer choice and free allocation policy that recognised the importance of domestic food security.

For horticulture, the GAP schemes are vehicles for growers to prove they meet regulatory and market requirements. These schemes could be used to provide certified carbon footprints.

Country of Origin labelling is a crucial instrument in supporting consumers choices. We would like to see this extended to see more extensive use of certification of domestic and imported products within New Zealand retail.

Retailers could choose to stock local and imported products that align with their climate change goals. Supported by certified comparisons of carbon footprints, consumers could also make that choice.

The Governments focus on farm planning presents an opportunity to support the use of credible Industry Assurance Programmes aligned to JAS-ANZ, such as GAP, to deliver product certification.

Outcome sought

- Domestic regulation (around reporting/regulatory requirements for carbon emissions) should align with, rather than disrupt market requirements. Industry assurance programmes such as GAP can leverage off market requirements for lower-carbon products to deliver regulatory outcomes. We seek policy to support the use of industry assurance programmes.
- Recognition of the importance of domestic producers of food in providing for food security in New Zealand. Provision of free allocation to reduce the risk of imported products, with higher carbon-footprints, out-competing New Zealand grown produce.

1.6 Food Policy

Policy from many different domains, including water policy, land-use planning and climate change policy, impacts food security. Food policy links strongly to health outcomes, social outcomes, inequality, food insecurity, and climate change outcomes.

Outcome sought

- Food policy that supports and aligns with climate policy and freshwater policy, land use policy, and health policy are essential.

1 INTRODUCTION

1.1 Overview of Horticulture in New Zealand

Horticulture is a diverse industry - from fruit orchards to outdoor vegetable cropping rotations (including production for fresh and processed vegetables), through to covered crop greenhouses. There are approximately 120,000 hectares of horticulture in New Zealand.

The horticulture industry had a value of $6.39 billion; this is broken down as follows:

Total exports	**$4.2bn**	Fruit exports	$3.5bn
		Vegetable exports	$0.7bn
Total domestic	**$2.19bn**	Fruit domestic	$0.88bn
		Vegetable domestic	$1.28bn

New Zealand horticultural produce was exported to 130 countries in 2019. The top seven export crops (by value) were: Kiwifruit ($2.3bn), Apples ($828.8m), Potatoes ($129.4m), Onions ($170.3m), Avocados ($104.3m), Peas ($96.5m), and Cherries ($68.9m).[1]

1.1.1 Fruit

Collectively, fruit exports make up approximately 80% of the (fruit) industry value; the remainder is domestic. New Zealand exported 962,500 tonnes of fresh fruit in 2019. Fresh fruit exports from New Zealand have been experiencing growth; for example, exports grew in value by $54 million from 2018 to 2019.[2] The most predominant export crops (by value) are kiwifruit, apples, avocados and cherries.

Some fruit crops are predominately grown for the domestic market, e.g. citrus, feijoa, nectarines, peaches and plums.

1.1.2 Vegetables

The majority (80%) of fresh vegetables are grown for the domestic market.[3] New Zealand's vegetable-growing regions supply markets at different times of the year to provide a sustainable, year-round supply of produce for New Zealand.

New Zealand exported 518,650 tonnes of vegetables in 2019. The most predominant fresh vegetable export crops (by value) are onion, squash and potatoes. The most predominant process vegetable export crops (by value) are potatoes, peas, sweetcorn and beans.

Most fresh vegetables are highly perishable. New Zealand is too remote to import fresh green vegetables, except by air-freight, which can only provide for a fraction of demand and has a high carbon footprint. Most vegetables that New Zealand imports are processed. In 2019, the most imported vegetables were preserved tomatoes and frozen potatoes.[4]

[1] Freshfacts, 2019. https://www.freshfacts.co.nz/files/freshfacts-2019.pdf
[2] Ibid.
[3] For example, KPMG. (2017). *New Zealand domestic vegetable production: the growing story.* found that for the ten 'staple' vegetables, of the 1,133,800 tonnes produced in New Zealand in 2016, 242,400 tonnes (or 21%) was exported and in the same year 1,200 tonnes of vegetables were imported.
[4] Freshfacts, 2019. https://www.freshfacts.co.nz/files/freshfacts-2019.pdf

1.1.3 Covered crops

There are approximately 256 hectares of covered/indoor crops in New Zealand (based on 2017 Agricultural Production Statistics data) [5]. Covered/indoor crops are dispersed throughout New Zealand. In the North Island, growers are predominately located in the Auckland and Waikato regions, and in the South Island, predominately in Tasman, Marlborough and Canterbury.

In New Zealand, there are approximately 125 fresh tomato growers (almost all of whom grow in greenhouses) and approximately 120 greenhouse growers of crops, including capsicums, eggplants, cucumbers, lettuces, chillies and herbs.

Several berry varieties are also grown under cover – either in semi or fully enclosed structures such as tunnel houses or greenhouses (however, these crops are not currently heated).

Greenhouses are a highly efficient food production system, optimising the use of land, water, and nutrients. Compared to outdoor production, greenhouses use less water and grow higher volumes for the same production area. For example, tomatoes grown in a high-tech greenhouse can produce 100 kg per m2 per year, equal to 1,000 tons per hectare per year. This is 10 to 20 times more than the production of any field-grown crop.[6] In addition, the greenhouse crop will use four times less water than the outdoor crop.[7]

High tech greenhouses enable efficient use of chemicals and pesticides for pest and disease management. The product is of higher quality with a longer shelf life, and there is less waste. Greenhouse vegetables are grown year-round in a relatively stable, controlled environment with optimal growing conditions that offer the ability to produce a lot of vegetables in a sustainable way to feed our growing population.

Most vegetables grown in greenhouses in New Zealand are for domestic consumption; the main export crop is capsicums. A proportion of tomatoes are exported, for example:

- For the year ending 31 March 2020, 3,701T of fresh tomatoes (with an FOB value of $12.2 million were exported, representing 9% of the industry farm gate value. During the same period, 175T of fresh tomatoes were imported from Australia[8].

Covered cropping is an integral part of New Zealand's food system, enabling New Zealanders to access freshly grown vegetables from a local supplier throughout the year; provides resilience within the domestic food system; and is important for risk management at a national level. The covered crop industry plays an important role in levelling out market supply in the shoulder and off-seasons. This is particularly important when there are adverse weather events that impact the country's few areas where there is winter production of certain vegetables.

[5] Agricultural Production Statistics Additional Tables – June 2017 (Statistics New Zealand).
[6] Elly Nederhoff, Crophouse Ltd. March 2021
[7] The Futuristic Farms That Will Feed the World. August 2019
[8] Pers Comms, Tomatoes NZ (2021)

1.2 Broader context

1.2.1 He Waka Eke Noa

HortNZ participates in He Waka Eke Noa (HWEN), the joint climate change action plan with the food and fibre sector and iwi/Maori. HWEN is part of the primary sector's commitment to making progress on climate change mitigation in partnership with the Government.

The main impact on horticulture will be the need to improve the use of fertiliser. Our industry will achieve this objective through the audited Freshwater Farm Plans required by freshwater regulation.

1.2.2 Fit for a Better World

The Fit for a Better World roadmap, developed by the Primary Sector Council, sets a target of generating an additional $44 billion in export earnings over the next decade. This includes the growth of horticulture export revenue by $2.6 billion, including incentivising land-use change to high-value horticultural crops[9]. Carbon-neutrality is part of the core outcomes.

1.2.3 The Emissions Trading Scheme

New Zealand's Emissions Trading Scheme (ETS) applies to covered crop growers via energy costs.

Growers of tomatoes, capsicums, and cucumbers are eligible for an Industrial Allocation of NZUs, accounting for up to 60% of emissions because they are considered moderately "Emissions Intensive Trade Exposed" (EITE)[10]. Recent changes to the ETS by the Climate Change Response (Emissions Trading Reform) Amendment Act 2020 mean that industrial allocation is beginning to be phased out from this year.

Growers of other covered vegetable crops (such as herbs and lettuce) do not have free allocation access. Overall, these crops are not emissions-intensive because they are grown outdoors or without heat in some seasons and regions.

The ETS price has been on the rise – for example, increasing from $25 in December 2019 to almost $38 by the end of December 2020, per New Zealand Unit paid on gas, coal and other fossil fuels. Recent changes to the ETS provide a strong signal that the carbon price will continue to trend upwards.

An NZIER report commissioned by the Covered Crop industry to evaluate the impact of an increasing ETS carbon price on the covered crops industry found that the industry struggles to deal with increased fuel and labour costs due to current policy settings. The sector would be likely to significantly reduce in size at a carbon price of $50 per tonne (unless alternative fuels can be found and made to work practically).[11]

ETS costs are also present for transport, refrigeration, and He Waka Eke Noa, post-2025 for fertiliser, for all horticulture enterprises.

HortNZ, Tomatoes NZ and Vegetables NZ submitted on recent ETS changes and consultation by the Ministry of Business, Innovation and Employment (MBIE) in March 2020 on their 'Accelerating renewable energy and energy efficiency discussion document.

[9] https://www.mpi.govt.nz/dmsdocument/41319-Fit-for-a-better-world-Background-analysis-on-export-earnings-in-the-primary-sector

[10] https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/industries-in-the-emissions-trading-scheme/horticulture/

[11] NZIER, 2020. The potential impact of the Emissions Trading Scheme on covered crops.

Free Allocation

Free Allocation currently paid under the scheme has reduced the impact of the ETS price for eligible growers, but it has not driven transition. Crops are grown in different parts of NZ to meet market demand. Growing can not practically be shifted to locations with lower emissions heat. The sector needs investment to move past free allocation to ease the social transition and investment in a strategy to achieve the transition.

2 A VISION FOR HORTICULTURE

The purpose of this section is to preface our feedback on the CCC Report by providing a perspective of the growth prospects for our sector and a vision for the future.

New Zealand's horticulture industry has been growing strongly in recent years and has a reputation for producing safe, sustainable, healthy and ethically produced food.

Simultaneously, as horticulture has been expanding, the industry has been getting more efficient – producing more food from less land and fewer inputs.

For example, Freshfacts data indicates that fresh fruit exports have more than doubled over the last decade (from $1580.6 million in 2009 to $3,392.0 million in 2019). Across the same period, StatsNZ data indicates that the four crops that made up 97% of the fruit export value in 2019 (kiwifruit, apples, avocados and cherries) increased in collective land area by 10% (when compared to 2009) to just over 30,000 hectares.[12] Efficiencies are being gained through superior plant varieties, planting configuration (e.g. closer rows and plants), increasing and more sophisticated irrigation practices, and developments in knowledge and technology.

In 2019, HortNZ's submission on Action for Agriculture predicted the following industry change (based survey of product group that made up 100,000 ha of the estimated 120,000ha of horticulture in 2018) over a ten-year horizon:

- Fruit: predicted increase of 10,000 ha of other fruit growing by 2028 - most growth was expected in avocado, pipfruit and kiwifruit for export.
- Vegetable production: expected to increase in line with the domestic population (8,000 ha),[13] and a predicted 2000 ha expansion of potatoes and onions for export.

Of the crops surveyed at this time, there was an average predicted land area growth of 30% and an average predicted yield growth of 40%. The survey indicated that horticultural land area was predicted to expand (under the status quo settings) from 120,000 ha to 140,000 ha by 2028 (or slightly more to account for un-surveyed crops).

2.1 Expansion Prospects

New Zealand has strong markets to feed - we have seen a COVID-19 increase in demand for healthy products, and this trend looks set to continue. Ultimately conversion to horticulture needs to be market-driven

The following provides an overview of prospects for growth in the horticulture sector,

Fruit:	• Export crops are the most likely to be the drivers of expansion in the expansion of horticultural land use. • There is currently strong growth in kiwifruit, apples, avocados, cherries, and other high-value crops, e.g. berries.

[12] http://infoshare.stats.govt.nz/ViewTable.aspx?pxID=21542d9e-8906-40fc-86fe-2beeb07fdb95

[13] Assumed land area will grow proportional to the projected 20% population growth to 2030, which would be an additional 8,000ha

	• The Māori horticulture industry has been growing; a recent BERL report found that Māori horticultural growth is set to continue, especially the expansion of kiwifruit, avocados and berries.[14] • A changing climate will also influence growth opportunities – some areas that become more arid will be more suitable for horticulture than other land uses compared to previously. A plant and Food Study found there opportunities with climate change[15]. • Increased consumption of fruit internationally as consumers become more health-conscious.
Outdoor Vegetables:	• For domestic market-oriented crops, we expect that there will need to be an increase aligned with population growth. Existing growing areas are under pressure from urban development and freshwater regulations (e.g., Waikato, Horowhenua). • Most growth is projected in export-oriented crops (e.g., onions, potatoes, process vegetables). • There are opportunities for expansion into crops suitable for plant protein and other high-value nutrition food products such as nutraceuticals.
Covered crop vegetables:	• Not all future covered cropping will be heated. Many crop protection structures are currently used in the sector to protect crops from weather extremes. We anticipate an expansion in these growing systems as part of climate change adaptation. • Greenhouses provide an opportunity for growth to supplement outdoor vegetable growing. However, they cannot grow the full range of vegetables grown in New Zealand. While this type of growth won't be as significant (at a national land use scale) in terms of hectares of land, productivity is a far more efficient way to produce vegetables than outdoor growing. • Global trends indicate that greenhouse will become more popular because it mitigates the risks associated with unpredictable climatic events, requires less water per unit of output, and produces more consistent, high-quality products with a lower land requirement and lesser freshwater effects. For example, Rabobank's 2018 World Vegetable Map16 highlights that a key global trend included the growing importance of production in greenhouses and vertical farms to meet the growing need for vegetables that are available year-round.

[14] Green, S and Schulze, H (BERL) 2020. Māori in horticulture

[15] Clothier B, et al 2017. Futures for New Zealand's arable and horticultural industries in relation to their land area, productivity, profitability, greenhouse gas emissions and mitigations

[16] https://research.rabobank.com/far/en/sectors/regional-food-agri/world_vegetable_map_2018.html

Horticulture expansion as part of our path to 2035

The path to 2035 includes 'transforming a small amount of dairy land into horticulture, at a rate of 2,000 hectares per year from 2025'. We consider that this largely is on par with our industry's current growth. However, we believe horticulture has a more significant role in our transition to a low emissions economy.

However, to enable horticulture growth to continue and increase, we need investment in the right areas and a regulatory/policy environment that enables the market to respond. Investment and policy support required, including:

- R&D and Innovation: automation, robotic technology and new generation orchard design, new products/varieties
- Policy/regulatory settings: labour policy, environment policy (ability to access land and water, enable land-use change, resolving Maori rights and interests in water), food policy
- Enabling investment: water storage that provides reliable water and community benefits, investment in growing international markets

Investment and policy alignment in these areas is required to realise the potential for our highly productive land, to be economically productive and generate lesser emissions.

These are not quick wins - investment and policy support needs to occur now to enable outcomes to be achieved in the second and third emissions budgets—however, the alternative is to rely on technological solutions that do not yet exist.

This is important both from a perspective of climate change adaptation (adapting to changing climate may bring new opportunities for horticulture), climate change mitigation (through land-use change to a low emissions land use) and importantly, providing New Zealand with options for meeting our targets should other initiatives not proceed at the pace necessary.

Not all land in New Zealand is suitable for horticulture (due to constraints such as climate, soil, and topography), but there are growth opportunities[17]. While horticulture will continue to be a minority sector in terms of land area in animal-based agriculture, we can play a more significant role.

[17] Clothier et al. (2017) '*Futures for New Zealand's arable and horticultural industries in relation to their land area, productivity, profitability, greenhouse gas emissions and mitigations'* identified 2097 kha of land being land that horticulture could potentially expand onto.

3 PROPOSED EMISSIONS BUDGET ADVICE AND OVERALL PATH

3.1 Principles guiding the advice (Consultation Question 1)

HortNZ supports the set of principles developed by the Climate Change Commission to help guide their advice.

3.2 Emissions budget recommendations (Consultation Questions 2 and 3)

HortNZ supports the budget recommendations and agrees with the break-down of emissions between gross long-lived and biogenic methane and carbon removals from the forest.

3.3 Enabling recommendations (Consultation Questions 5 – 8)

HortNZ support enabling recommendations 1 – 5.

Enabling recommendation 1 - Cross-party support for emissions budgets:

- HortNZ agrees that it is crucially important to cement a long-term approach that endures political cycles; we support the Minister for Climate Change's recommendation to seek cross-party support on emissions budgets.

Enabling recommendation 2 - Coordinate efforts to address climate change across Government:

- HortNZ support (a) – which recommends policies and strategies for meeting both the next and future emissions budgets in each emissions reduction plan. This will, in our view, be critical to driving the necessary change to achieve these budgets as many of the changes that will need to be made will take time and require the right policy environment.
- Similarly, we support (b) to (c). It is critical that there are clear and co-ordinated government roles about implementing policies and strategies in line with emissions budgets and that Government funding aligns with this direction.

Enabling recommendation 3 - Genuine, active and enduring partnership with iwi/Māori:

- HortNZ agrees that it is critical to developing a genuine, active and ensuring partnership with iwi/Māori with central and local government, as recommended by Enabling recommendation 3.
- Partnership with iwi/Māori is also crucial at a sector level. Horticulture (and expansion of) is a real opportunity with many co-benefits that allow some iwi around the country to use their lands to align with environmental and social sustainability.

Enabling recommendation 4 - Central and local government working in partnership:

- HortNZ agrees that transitioning to a thriving, climate-resilient and low emissions future relies on central and local government working in partnership. It will also be necessary to partner with the private sector, including the primary sector.
- The alignment will be required across all areas, including, as noted in the draft advice report – the Local Government Act, Building Act and Code, a national direction under RMA (and RMA reform), implementation of the freshwater management framework and the 30-year infrastructure plan.

- Partnerships and funding mechanisms are essential; action needs to be supported by the local government. Adequate flow through to a local level will also rely on having the necessary national direction to ensure that decision-making at a local level which strategic and coherent at a national scale.
- This will be more than 'aligning legislation and policy and ensuring the necessary national direction in some areas. There is an important opportunity through RMA reform to ensure this. The proposed Strategic Planning Act presents an opportunity to align natural resource management to achieve climate change mitigation and adaptation. Opportunities for strategically planning for long-term sequestration, optimising climate change retreat to achieve mitigation outcomes through sequestration, protection of highly productive land and support for strategically important food hubs.

3.4 The overall path to meeting the budget (Consultation Question 10 & 11)

In general, HortNZ agrees with the overall approach proposed of decarbonising long-lived gas emissions where this is feasible and building a long-term carbon sink to offset residual long-lived gas emissions through native/indigenous forests.

We make the following specific comments:

- We support a greater emphasis on reducing emissions rather than offset with a greater emphasis on the use of native forest (on suitable land) for long-term sequestration.
- Other agricultural sectors must reduce their emissions, increase long-term sequestration, and seek opportunities to diversify into lower emissions alternatives such as horticulture.
- When planning for long-term sequestration (and retirement of land for this purpose), we consider it equally important to plan for the most highly productive land in New Zealand to protect this resource for future generations.
- More emphasis could be given to predicting low-land areas where a changing climate is likely to force retreat. The opportunity for sequestration is presented by retiring this land back into a wetland.
- We agree that plantation forestry has a significant role in the short-to-medium term sequestration, as we wait for technological solutions at a country-wide scale.
- We also note that there needs to be an effective stocktake of the future biomass resource is required. If native plantings supplant exotic plantings, it will be important to have a clear understanding of how this will affect biomass fuel availability.

3.5 Impacts of emissions budgets on New Zealanders

3.5.1 Food and fibre production (5.5.1, and Chapter 12 - 12.2.7)

There is no mention in the food and fibre production (5.5.1) section of horticulture – however, milk solids, meat and forestry output are graphed. We consider that this is a consideration which should also be included.

3.5.2 Food security – (Chapter 12 - 12.2.8)

The Chapter 12 evidence report addresses domestic food security and highlights that there are groups in New Zealand that find it challenging to access nutritious food. The report cites an increase in the overall cost of food prices of 4% in the last five years, but an increase in the cost of fruit and vegetables by 9%. It also states that:

"These domestic food security problems are driven primarily by low incomes rather than a lack of food supply. Given the export orientation of most food production in Aotearoa, it is likely that international markets would affect domestic food prices to a greater extent than changes in production due to climate change policies. The possible exception is if the production of items grown primarily for domestic consumption (such as some fresh vegetables) contracts, which could drive prices up and exacerbate existing food and nutrition access for some vulnerable groups. However, in both the Current Policy Reference case and scenarios modelled in Chapter 7: Where are we currently headed? and Chapter 8: What our future could look like, horticultural area, and therefore production, increases in the years to 2050."

"Given the high levels of food production in Aotearoa, and that horticulture production is unlikely to contract, reducing emissions to meet targets for biogenic methane and all other greenhouse gases is unlikely to exacerbate food insecurity domestically. Solutions to domestic food security problems likely lie in addressing poverty and other barriers to nutritional access rather than in climate policy."

We consider this commentary misunderstands the risks of climate change policy to domestic food security. We note the following:

- The Current Policy Reference case and scenarios modelled represent increases in horticulture. However, these scenarios are quite conservative (e.g. the Current Policy Reference is an increase of approx. 600 ha per year between 2021 and 2050). The assumptions also do not consider the type of crops – e.g. whether sufficient growth will occur in fresh vegetables or other crops (e.g. kiwifruit, apples).
- The analysis assumes that fresh vegetables won't contract under current policy settings (especially freshwater regulations and the carbon price under the ETS for covered crops that require heat). There is a risk that vegetable production in New Zealand will contract. Indeed, the vegetable growing area has been contracting year on year (for example, from 2002 to 2016, the area of vegetable growing in New Zealand decreased by 29 per cent)18. At the same time the consumption of vegetables by New Zealanders has also been dropping, only 53.1 percent of adults in New Zealand met the vegetable intake guidelines (3+ servings per day).19

We need to look closely at our domestic food supply and be sure that policy decisions are seen in the context of impacting the whole of New Zealand's food supply. The 2015 Paris Agreement (and its predecessor, the Kyoto Protocol), is vital in ensuring global food security and not reducing food production. Producing food while adapting to climate change is vital – New Zealand needs to continue producing food to feed itself (for our domestic food security) and export food.

A large percentage of greenhouse vegetables are consumed domestically. Greenhouse growing has been captured by the ETS since its inception – as explained in section 1.1.3, growers of certain crops receive free allocation (0.6), growers of other crops do not have any free allocation. Recent changes to the ETS (and recommendations in the CCC Report) mean that industrial allocation will be phased out, and the carbon price will steadily rise. Both of these thing's risk putting greenhouse growers out of business, as there are not currently commercially viable transition pathways to low carbon alternatives (as explained in section 4.2 below).

[18] https://www.mpi.govt.nz/dmsdocument/36624-Discussion-document-on-a-proposed-National-Policy-Statement-for-Highly-Productive-Land

[19] New Zealand Health Survey data. https://minhealthnz.shinyapps.io/nz-health-survey-2019-20-annual-data-explorer/_w_a508fff7/#!/

Conversely, agricultural emissions have not been captured by the ETS and will not become part of the ETS until 2025, at which time they will have 95% free allocation.

Greenhouse growers that use fossil fuels for heat are very exposed to an increase in ETS price. Suppose this occurs before the industry can transition. In that case, the food produced in these growing systems may be lost from our domestic food system, resulting in increased food prices and loss of a resilient food-producing system.

Outdoor vegetable growing contributes to a very small proportion of New Zealand's greenhouse gases. The costs associated with the carbon budgets will be primarily related to the costs associated with increased fuel costs and transition to alternative vehicles (as discussed in more detail below in the Transport section). If alternatives are more costly, this will be passed onto consumers.

Global food security

When considering global emissions and New Zealand's influence on global food security, the most helpful measure may not be how much food New Zealand can produce, but the technology and plant varieties that New Zealand can develop to assist the transformation of the global food system to one that feeds more people with lesser emissions.

Investment is required to enable New Zealand scientists to progress this work.

New Zealand particularly has a role to play in the Pacific's food security concerning export vegetables – for example, Fiji is a key vegetable export destination. In 2016, 76% of total exported potatoes went to Fiji.[20]

New Zealand's Food policy

We consider that there is overall a need for a more nuanced and holistic consideration of New Zealand's food security across all domains (i.e., not just climate change policy, but also resource management etc.). To enable integrated planning, HortNZ calls for a national food policy – that considers food security, climate change, the impacts of food production on ecosystem health and natural resources, and the importance of sustainability to New Zealand's international food brand.

There are links between the costs of fruit and vegetables and health outcomes, for example:

- The benefits of fruit and vegetable consumption are well established, particularly their role in preventing general micronutrient-deficiencies and chronic diseases [21]
- For families living in deprived areas, increases in fruit and vegetable prices, especially around their off-season, compel them to substitute the purchase of healthier whole fruit and vegetables with cheap energy-dense and nutrient-poor products[22]
- The Institute for Health Metrics and Evaluation Global Burden of Disease study estimated that almost 800 deaths were caused by low vegetable intake in New Zealand in 2017 and quality of life lost due to morbidity[23]

[20] KPMG. (2017). New Zealand domestic vegetable production: the growing story.

[21] Moore, D., Barton, B., & Young , M. (2019). The value of local vegetable production. Sapere.

[22] Rush, E., Savila, F., Jalili-Moghaddam, S., & Amoah, I. (2018). *Vegetables: New Zealand Children Are Not Eating Enough. Front. Nutr*

[23] IHME. (2017). *GBD Results Tool. Retrieved from Insitute for Health Metrics and Evaluation: http://ghdx.healthdata.org/gbd-results-tool.*

- Otago University has recently modelled the potential health impacts of increased vegetable prices. This study found that using the health costs of an increase in vegetable prices of 43 - 58% (Deloitte, 2018) would be a loss of 58,300 – 72,800 Quality-Adjusted Life Years (QALY), and health costs of $490 -$610 million across the population[24]

To maintain food security, we need a policy that prioritises direct investment in the technology that will enable these sectors to transition and domestic food supply to be explicit consideration of free allocation. This will support the transition to a low carbon economy without increasing food costs so that New Zealanders can transition to eating lower emissions food.

We are seeking a policy that ensures that the production of food in New Zealand remains economical for growers. We are not seeking regulation of the domestic food supply. Regulation of food supply could lead to lower prices being paid to growers, leaving the industry uneconomic and ultimately undermining food security.

We consider a policy to invest in strategically food hubs to be an important element of developing a reliant food system in New Zealand.

The government could also seek to support the sectors by mandating locally sourced produce for all Government contracts with external providers of services of the Healthy Lunches in Schools programmes, DHB's and other institutional service providers.

In addition to reducing costs for growers, the Government could also seek to reduce costs to consumers by removing GST on fresh fruit and vegetables.

[24] Cleghorn, Cristina. 2020. The health and health system costs of increasing vegetable prices over time. Wellington: University of Otago, 2020.

PUKEKOHE FOOD HUB

The Pukekohe food hub is of considerable importance to New Zealand's domestic supply of vegetables, year-round growing, and proximity to Auckland. The centre produces approximately 26% of New Zealand's domestic vegetables. In addition to the outdoor vegetables produced in the hub, the hub is also important for fruit production and greenhouse growing and agricultural support services

The growing hub is under pressure from urban encroachment. In 2019, the Government released the draft National Policy Statement for Highly Productive Land

The NPSFM Freshwater recognises the Pukekohe Hub as a 'specified vegetable growing area', enabling councils to account for the importance of domestic food supply of vegetables in freshwater decision making. However, this policy has a ten-year expiry.

The Strategic Planning Act presents an opportunity for a greater degree of spatial and strategic planning. The Pukekohe Food Hub is a strategically important national asset. Investment in the Hub could reduce emissions, improve food security and increase climate change adaptation resilience.

- Policy to protect highly productive soils from the encroachment of housing and lifestyle
- Urban planning to support housing development that does not conflict with food production
- Freshwater allocation policy recognising domestic food supply as a second priority activity in the Te Mana o te Wai hierarchy.
- Catchment scale water quality improvement infrastructure to support freshwater health and vegetable growing.
- Energy hub, to support energy generation to heat greenhouses and to support urban and residential uses.
- Rail Freight hub, there are currently 15,000 – 20,000 container movements out of Franklin. Truck movements could be reduced significantly with the rail hub that connected Pukekohe to the ports.

3.5.4 Emissions leakage (5.5.4)

The vast majority of New Zealand fruit and export vegetables are shipped to export markets, for example, kiwifruit, apples, avocadoes, onions. A very small proportion of high-value perishable fruit and vegetables, e.g., cherries and berries, are air-freighted to export markets.

Consumers and importers are starting to seek assurance on the carbon footprint of products they buy, including sources of emissions from farm to plate.

New Zealand produces low emissions foods for New Zealanders and export markets. Despite New Zealand's distance from its export markets, fruit and vegetables produced for export in New Zealand have a relatively low carbon footprint, for example:

- New Zealand's pipfruit is the highest per hectare producer, with relatively low inputs. A carbon footprint study identified a lower carbon footprint for New Zealand apples delivered to the UK, compared with domestic UK consumption;
- The same study found that, when comparing supplying onions in the same market window, New Zealand onions compared favourably to the UK equivalent with 30% lower emissions over the life cycle.[25]

The European Green Deal includes requirements for importers to demonstrate they are subject to effective climate change policy. A tier below the trade-agreements is the market access requirements, where European retailers are starting to seek carbon-foot-printing of products. For example, Zespri may calculate an industry footprint for kiwifruit, rather than an orchard-scale carbon footprint, which may produce multiple crops, doesn't include emissions past the orchard-gate.

In our view, the GAP schemes for horticulture provide the vehicle for integrating reporting required for regulators, such as He Waka Eke Noa and to local and international consumers.

Covered crop industry

The CCC Report (Chapter 12, 12.2.6) considers this risk of emissions leakage and competitiveness in industrial sectors. This analysis mentions the horticultural sector (noting that fresh cucumber, capsicum, and tomato growers receive free allocations); however, it does not include a sector-specific analysis of the carbon leakage risk.

Regarding the covered crop sector, we consider a substantial risk of emissions leakage associated with ETS pricing, which is intended to drive innovation in low emission technologies.

Australian grown greenhouse vegetables are not subject to any ETS or carbon costs, although they use gas, oil, diesel and coal for heating. Small volumes of Australian-grown vegetables are already imported into New Zealand when local supply falls short, usually for seasonal/climatic reasons. These imports will increase if New Zealand growers go out of business due to banning coal boilers or a high ETS price before commercially viable alternatives are available.

We consider a carbon leakage risk for covered crop vegetables associated with the timeframes for transition due to these businesses' current ability to adapt. These challenges are outlined in more detail in the Heat, industry and power section of this submission. As above, a review of free allocation policy should consider emissions/carbon leakage to support

[25] Saunders, Barber and Sorenson (2009). Food Miles, Carbon Foot printing and their potential impact on trade

the transition. There needs to be an emphasis on ensuring that New Zealand vegetables are not priced out of the market by emissions compliance costs when our international competitors do not face the same pressure or costs.

3.5.5 Environmental impacts (Section 5.8 and Chapter 14)

The draft advice states the following:

> *"Land use change from dairy to horticulture on flatter and more productive land could reduce biogenic emissions per hectare. However, it could also cause water quality to deteriorate due to the increased use of fertiliser and consequential nitrogen and phosphorus losses. Nutrient losses would vary depending on the crop, the site, weather conditions, the soils' physical and chemical properties, and how the land is managed. Increasing the area of horticulture could also increase water demand in Aotearoa. In light of the physical impacts of climate change, this increased need for water would need to be weighed up when considering converting to horticulture as climate action."*

Land-use change from dairy to horticulture would reduce biogenic emissions per hectare. We disagree with the assertion that this might cause water quality to deteriorate due to the increased use of fertiliser and consequential nitrogen and phosphorus losses. Horticulture is a diverse industry - we agree with the statement that nutrient losses would vary depending on the crop, the site, weather conditions, the soils' physical and chemical properties, and how the land is managed.

<u>Water quality</u>

The report does not substantiate this position with any evidence; in our view, these statements are misleading.

Contaminant discharges from fruit production are generally lower than other land uses on equivalent land. Land-use change from irrigated pasture to irrigated fruit would improve water quality, lesser water use and reduced emissions.

Vegetable growing includes a wide range of rotations. Still, the rotations most likely to produce vegetables for export (process vegetables, process potatoes and onions) can be grown in extensive rotations, with similar or lesser water quality impacts than dairy farming.

A 2014 study using SPASMO modelling in Poverty Bay[26] found that the average Nitrate-N leached (kg/ha/y) was 18.9 for pasture (low-intensity sheep and beef with no irrigation), compared to 6.6 for maize, 5.2 for grapes, 10.9 for squash (irrigated), 18.3 for citrus, 9.9 for kiwifruit (irrigated), and 15.5 for a broccoli/lettuce rotation (irrigated). In the same work, phosphorus runoff was more significant for broccoli/lettuce and squash but otherwise lesser for citrus and kiwifruit than pasture. There was a strong relationship between runoff of water and runoff of phosphorus, for which mitigation options are feasible.

Recent evidence presented in the Environment Canterbury Plan Change 7 hearing demonstrated 9000ha of irrigated dairy land. Nearly 10,000 ha of arable land could be used to grow potatoes, onions and root vegetables in rotation with pasture without resulting increases in nitrate leaching and with predicted decreases in *E. coli* discharges.[27]

The statement regarding water quality also does not provide any information regarding horticultural growth assumptions. Because horticulture is diverse, the type of land-use change

[26] Gentile, et al., 2014. Land Management Practices and Nutrient Losses from Farms on the Poverty Bay Flats. Refer to Table 3.

[27] Nation, T 2020. Statement of Evidence of Thomas Nation (Spatial Analysis) on behalf of horticulture NZ in the matter of Proposed Plan Change 7 to the Canterbury Land and Water Regional Plan

that might be anticipated is a relevant consideration. For example, as detailed in Section 2, based on a 2019 survey of product groups:

- We expected that vegetable production would increase to reflect population growth (assumed additional 8,000ha to 2030). Priority for domestic food supply in freshwater allocation policy is required to ensure New Zealand can continue to feed its people, with neutral water quality effects
- There was a predicted 2000 ha expansion of potatoes and onions for export; this expansion could occur with neutral water quality effects.
- There was a predicted increase of 10,000 ha of other fruit growing 2028 - most expected in avocado, pipfruit and kiwifruit for export. This expansion could occur with beneficial water quality effects.

Water uses by horticultural crops

The CCC report states that more horticulture could increase water demand and that this would need to be weighed up. We provide some additional analysis below on this topic.

The volume of irrigation water per ha is typically much less for horticultural crops than pastoral irrigation. Irrigation serving horticulture is typically more efficient than irrigation for pasture because of the delivery systems, predominantly drip or sprinkler systems. [28]

Many of the irrigation applications on horticultural crops are of a lower volume. They are generally applied more regularly than pastoral agriculture and therefore achieve higher technical efficiency than most pastoral farming irrigation practices. Additionally, horticulture is very efficient for the value generated from using the water resource; horticulture achieves measures three to eight times that of alternative uses of the water.[29]

Low impact horticulture crops use much less water compared with water of irrigated pasture overall. However, some crops require slightly more water for a period within their annual growing cycle than irrigated pasture. [30]

Of New Zealand's total land irrigated land area, 47% is dairy and 23% sheep and beef (collectively 70% of irrigated land)[31]. There is over 600,000 ha of irrigated pasture in New Zealand[32]. If some of this land were converted to fruit production, it would likely result in lesser volumes of abstraction and lesser contaminant discharges.

Conversion of dry land pasture to fruit production would not be expected to decrease water quality, as fruit and sheep and beef have similar losses of nutrients. Still, fruit production has much lower losses of pathogens and GHG emissions.

There are locations in New Zealand where unirrigated land can be converted to horticulture. This is mainly an opportunity in Northland, Eastern Bay of Plenty, Gisborne, Hawkes Bay, Nelson and Marlborough. In these locations, there are significant opportunities for Maori agri-business to expand more into horticulture and for water storage used to support new horticulture to support municipal water supplies' resilience, and an example of this is the newly approved Matawii scheme on Kaikohe.

[28] (Ford S. , Memorandum to HortNZ NESFW, 2019)
[29] The AgriBusiness Group (2021) Analysis of the impact of the proposed flow regime on Kiwifruit in Takaka (Draft Report)
[30] Allen RG, Pereira LS, Raes D, Smith M 1998. Crop Evapotranspiration. Guidelines for computing crop water requirements. FAO Irrigation and Drainage Paper No. 56. Food and Agriculture Organization of the United Nations, Rome, 301 pp.
[31] https://www.irrigationnz.co.nz/Category?Action=View&Category_id=210
[32] https://www.irrigationnz.co.nz/Attachment?Action=Download&Attachment_id=24

Water storage can be designed to have minimal adverse environmental impacts on freshwater, and in some cases, can improve degraded freshwater regimes by increasing low flows through augmentation. With a changing climate, the use of stored water to augment river flows may become increasingly important, supporting primary production and supporting ecosystem health in a changing climate.

3.5.6 Impact on government taxation and spending (5.9)

The advice mentions that the ETS will generate income for Government, estimated at *at least $3.1 billion over the next five years under current settings'*. The Government has options on how to spend these proceed, including recycling into climate change projects.

We consider it a priority that ETS generated income is re-invested into getting the tools and technology that these sectors need to enable and support the transition away from fossil fuels. This opportunity has not been realised to-date – further discussion is provided on this below in the discussion on the 'Heat, industry and power sector. This links to **Necessary Action 19** of the CCC Report.

Direct Investment Policy

The direct Investment policy should align with the Paris Agreement outcomes to reduce global emissions and maintain food security.

We see a need from an emphasis on free allocation to ease the social transition to lower emission future, to a role indirect investment in sectors, where alternatives are available, but not yet commercially viable, and where the industry provides long-term value to New Zealand – for example, produce food for domestic markets.

Free allocation policy

We support a review of free allocation (and seek to have involvement in this process) – how free allocation is managed will play a key role in the transition.

Free Allocation has, to date, mainly had a role in easing the social transition. We see the role of free allocation, being finite and support the phase-out of free allocation for social transition (e.g. in the next ten years).

Free allocation policy should align with the Paris Agreement outcomes to reduce global emissions and maintain food security. We seek a clearly articulated free allocation policy that includes explicit domestic food security and carbon leakage criteria. We seek alignment of free allocation policy across all emissions sources, e.g. industrial, transport and agricultural emissions.

- We see free allocation specifically for domestic food supply having an important ongoing role, where alternative technologies are not yet available. The activity is of value to New Zealand, such that we do not want to risk losing the activity in the period until alternative technologies are developed. This should be linked to a sector-specific strategy for climate change transition, which considers the availability and economic viability of low carbon fuel alternatives – this enables free allocation to assist in facilitating a transition to a low carbon future – as opposed to being an alternative to transitioning
- Free allocation for domestic food supply should be standardised across all sectors – transport, industrial and agriculture. Otherwise, there is a risk that the most disadvantaged members of our society will be most impacted.

- Free allocation for carbon leakage purposes should be re-directed into subsidies that make the transition occur.
- Over time, plantation forestry incentives should focus more on reducing emissions or planting native forestry.

If the shift between free allocation/plantation forestry offset/ technology uptake is left to the market, this will favour trees until technological options are low-risk and commercially viable. We need to ensure more uptake of "expensive" technology now and be less reliant on forestry off-setting. Because the risk cost of plantation is high, New Zealand needs to be competitive and cannot rely on forestry off-setting in carbon footprints for the long-term

4 SECTOR SPECIFIC POLICIES/RECOMMENDATION

4.1 Transport

Transport is an area that many sectors rely on; for horticulture, the critical interfaces in a domestic context are:

- Horticulture uses on-farm vehicles, including light commercial vehicles (e.g. utes), to machinery for cultivation and harvest. (We note that off-road vehicles and equipment are covered under the transport topic as options to reduce emissions are similar. However, their emissions are categorised as Heat, Industry and Power).
- Beyond the farm/orchard gate, trucks are frequently used to transport fruit and vegetables to New Zealand consumers or ports. Some growers have their truck fleets.

These vehicles and machinery use petrol and diesel, and the ETS captures the emissions produced from these vehicles. This climate change pathway could impact the horticultural sector if the increasing costs of transport consequently increase.

The research and technology required to replace the fuel source for farm machinery and heavy vehicles will be developed overseas.

<u>On-farm vehicles alternatives</u>

Relevant considerations which will dictate the ability for the horticultural sector to transition to low carbon on-farm vehicle options include:

- availability of viable electric or low carbon alternatives;
- where there are alternatives, their economic viability;
- the supporting infrastructure requirements (e.g. charging facilities and energy needs for electricity)

Alternatives are available in some areas, e.g., electric forklifts (for indoor settings), battery-operated light vehicles in orchards; however, this is not true across the board. However, alternatives will likely be the biggest challenge for large horsepower tractors –hydrogen fuel cells may be more viable for some of these vehicles.

<u>Road transport</u>

A transition to electrify medium and heavy trucks requires the technology to be available and economically viable. This climate change pathway would impact the horticultural sector if the increasing costs of transport consequently increase.

Hydrogen is the only viable technology to maintain current tonnage and distance capabilities within a heavy vehicle fleet. We understand that technology is available for hydrogen fuel cell electric trucks (but not necessarily viable for widespread adoption in New Zealand right now).

We understand that significant investment in this technology and further investment would reduce the barriers to this becoming a viable and efficient solution in New Zealand for this part of the (heavy) transport sector.

We understand from Hiranga that there is a case to be made for the progressive decarbonisation of the heavy vehicle fleet year on year, starting in 2022, for example:

- From 2022, Hiringa and partners importing hydrogen fuel cell heavy trucks and Hiringa and Waitomo refuelling network operational.
- Ballance Agri-Nutrients and Hiringa Energy collaboration in South Taranaki produces 'green' hydrogen using renewable energy as a catalyst for developing a sustainable green hydrogen market in New Zealand to fuel heavy transport.

Non-road transport

The pathway also includes switching some freight movements from road to rail and coastal shipping. Rail and coastal shipping are not viable options for just in time fresh product with limited shelf life. This is particularly true for the distribution of fresh fruit and vegetables within New Zealand. There are growing hubs distributed across the country, but there is a need to distribute food quickly across the country.

Road transport is necessary for the linkages between the grower and consumer – product needs to get from the farm/orchard to the packhouse to domestic consumers and export ships or can lose half of the shelf life of a product if using rail and costal shipping this would contribute to increased food waste

Rail and coastal shipping are likely good options for logs and frozen product etc., but not for fresh fruit and vegetables; in most cases, however, there is an opportunity if there were rail-hubs located to provide more efficient transport post-harvest and post-packhouse, to ports for export, and particularly if the rail network was upgraded to provide a faster and more reliable service. There is an opportunity for a rail hub to serve the Franklin food hub; this is discussed in Section 3.

Impacts of ETS pricing in transition

Areas of our production systems cannot rapidly adapt. Managing the carbon footprint of vegetables related to fuel use is more challenging than fruit due to the heavy vehicles used in vegetable cultivation and harvesting. Domestic vegetables that are hand-harvested year-round but freighted around the country serve all of New Zealand communities.

The costs of fuel used in transport are considerable for these businesses (e.g., approximately 4%). An increase in the carbon price from 6 cents to 40 cents would represent an increase of approximately 19% in the costs of production (from a baseline of fuel contributing 4.5% of costs) – assuming that no change to other costs and that this increased cost was able to be passed on to consumers, this could represent an increase in food prices by 19% by 2030 – in the situation that there a grower was unable to transition to a low emissions alternative. Because growers are price-takers they may not be able to pass the price on, meaning that they may choose to stop supply the domestic market, which would also likely lead to price increases.[33]

Related risks include crops with low margins becoming uneconomic to grow and production costs in the regions increasing, meaning that the food system's resilience is reduced.

For example:

ETS price	**ETS cost per 1 Litre of Fuel (at emissions factor of 2.45)**	**Percentage of production costs** (assuming no change to other costs)
At $25	6 cents	4.5%
At $150	40 cents	23.9%

[33] Ford S. , Memorandum to HortNZ NESFW, 2019

In this situation, growers would be paying millions into the ETS in fuel emissions with few transition options. The consequence of this is an increase in the price of vegetables for New Zealand (resulting in health effects) and cross-subsidy from vegetable growers to other parts of the economy when funds from the ETS are re-distributed.

Therefore, as discussed in section 6.5.2, domestic food supply must be included in the free allocation policy.

4.1.1 Response to Transport recommendations

The CCC report seeks to increase the use of low carbon fuels for trains, ships, heavy trucks and planes.

- Table 3.1 notes, as key transitions, electrification on medium and heavy trucks (road transport) in Budget 3 and (non-road transport) electrification of rail in Budget 1 and starting to electrify ferries and coastal shipping biofuel blending in Budgets 2/3.
- Necessary Action 4 speaks to supporting the use of low carbon fuels – referring to policies to support '140 million litres of low carbon liquid fuels are sold in Aotearoa by 31 December 2035', increasing demand for low carbon fuels and incentives to low emission fuel plants.

We support initiatives to make low carbon fuels more available. The report recognises that "*Electrification will generally be an applicable low emission alternative for this activity; however, there may be some particular use for which it is not suited, and low carbon fuels may be more appropriate."*

However, there could be a more precise direction and support for off-road vehicles and heavy/medium trucks. The pathway to electrification (and how that will be supported) is unclear. We also seek greater recognition of the opportunities and barriers to transitioning to hydrogen (particularly for heavy vehicles).

Fruit, and some vegetables (such as onions), are predominantly for export. For New Zealand to compete in international markets, our products need to address our carbon footprint across all life cycle elements because international consumers and trade agreements are starting to demand that. Options are coming into the market for battery forklifts and some of the lighter tractors and harvesters used in fruit production.

We seek:

- Where the technology is available –a focus on making it affordable/accessible (e.g., we understand that there is one electric tractor on the market, but it is costly)
- Investment in technology and subsidisation of options before they become fully economically viable to ensure that:
    - Export-oriented New Zealand producers reduce their emissions and keep ahead of international competitors.
    - Domestically, there is no increase in the price of vegetables; this would have knock-on effects on New Zealand health outcomes, and there is a risk that the most disadvantaged in our society will be the most impacted.
- Alternative fuel options – e.g. hydrogen – are also considered for transport/vehicle modes, which may not be suited to electrification (e.g. heavy trucks).

4.2 Heat, industry and power

Energy Generation

There are opportunities for greater energy generation as part of a distributed network within farms and energy hubs.

Solar generation on the farm

Horticultural businesses frequently have large buildings such as cool stores and packhouses. Some growers are taking the opportunity to generate solar energy off their roofs. This currently is an economically viable method of reducing electricity and diesel costs and reducing emissions[34]. There is potential for substantial expansion of solar generation within horticultural businesses and an opportunity for growers to feed the grid at times of high demand from their solar energy and draw-down energy from the grid to charge batteries at times of lower demand. This approach is being utilised by some[35] and has the potential to both reduce the dependence of growers on diesel and to support New Zealand's achievement of increased renewable energy

This opportunity has moved past the demonstration and experimental phase. It could be rolled out more significantly, but there needs to be an incentive to drive this behaviour for growers and make it an economically attractive investment that has a relatively short-term payback period, in the order of 10 years.

Energy hubs

The opportunity to co-locate production with urban centres and co-locate heat and power production (e.g., through small and medium scale geothermal power plants /biogas) to serve markets. These hubs' opportunity is limited in New Zealand, but there may be some strategic locations where investment in energy hubs is viable.

We seek that strategic planning is undertaken to understand and enable these opportunities further.

[34] https://www.choiceenergy.co.nz/customers/agriculture/jivan-produce
[35] https://www.forestlodge.nz/

Use of heat in the Covered Crop sector

Greenhouse growing is particular because it uses techniques not used in other cropping systems such as CO2 enrichment, soilless cultivation and heating. A recent industry survey of greenhouse vegetable growers indicates that, of the respondents, 72% of the greenhouses were heated (Note: this represented 95% of the area, indicating that almost all larger operations are heated).

To achieve efficiency and quality and ensure the viability of greenhouse vegetable production, greenhouses need to be heated. Heating has multiple functions. As well as determining the rate of photosynthesis, fruit set and fruit ripening, temperature regulates plant growth rate by driving transpiration rates and photosynthesis rates. Heating also allows the grower to manage relative humidity in the greenhouse, reducing the onset and spread of diseases, reducing the use of agrichemicals and increasing the fruit quality.

Without heating, a controlled environment is not achieved, fruit quality is poorer, losses are greater, and product cannot be grown in winter when the returns are at a level that sustains growers through the summer months when fruit prices frequently do not cover costs. Therefore, without heating, the benefits of the capital infrastructure of a greenhouse are not realised. Due to the fresh, highly perishable nature of greenhouse-grown vegetables, capturing the winter value of produce is essential to the greenhouse production model.

Without heating, the production season would be reduced to summer only (particularly in the South Island). Yields would drop significantly at all times of the year. Quality will fall (because the greenhouse's growing conditions will not be optimal, resulting in more disease). New Zealand growers would not meet the volumes demanded by the domestic market resulting in more imports.

Year-round production is crucial because a high seasonality level results in lost market share at the end of every peak season as volumes drop and prices increase. That market share, which has been lost during the low-season to alternative products or imports, has to be regained the following peak season, which often does not happen fast enough, resulting in prices that do not cover grower's costs. Year-round production helps to even out the prices throughout the year, which benefits both growers and consumers.

Energy demands for covered crop growing vary depending on the location, climate, greenhouse, crop and other variables. Each hectare of covered crops may require ~10,000 GJ of renewable energy for heating in winter and CO2 production in summer. At 95% of 256ha of covered crops, this equates to 2,432,000GJ energy demand without accounting for any sector growth.

The current energy cost for covered crops from either coal or natural gas ranges from $10-20/GJ – or $100,000 - $200,000 per Ha. The transition to renewable energy has a range of costs (including new capital demands) from $30/GJ to transition to wood fuels up to $50/GJ for direct electric heating, or 3x to 5x current energy costs. This will lift energy costs from $300,000 to $500,000 per Ha.

During winter, peak heating demands can be as high as 750kWth per hectare, so the boiler upgrade costs for the lowest cost of renewable wood fuels will around $1m per Ha. Many greenhouse sites are within constrained local networks, and one 5Ha example of these requires more than $5m contribution to the local network costs to get boilers and lighting

systems supplied. So, we expect alternative electrical heating systems to have capital demands of around $1m per Ha. Considering these costs per hectare, the total covered area of New Zealand crops would require around $243m of new capital investment to transition into renewables.[36]

Carbon dioxide (CO2) enrichment

CO2 enrichment in greenhouses enhances crops growth, as it is required for photosynthesis—too little CO2 results in slowed plant growth and reduced yields. CO2 enrichment is used to achieve sufficient yields, as the demand from all the plants in a greenhouse causes the CO2 levels to drop.

Methods of CO2 enrichment include combustion of carbon-based fuels (e.g. natural gas, also used as a heat source or directly from tanks of pure CO2.

Some alternative fuel sources for heating, such as geothermal heat, solar heat, electricity etc., do not provide CO2. Therefore, switching fuels also requires a solution to meet the CO2 deficit. The need for CO2 adds to the difficulty in establishing a viable business case for transition.

Contribution of the covered crop industry (process heat) to New Zealand's emissions

Covered crops are a relatively small user of process heat at a national level compared with other sectors. An MBIE factsheet from 2016[37] estimated that indoor cropping used 3.4 petajoules (PJ) of fuel for process heat (or 1.7% of New Zealand's total process heat demand); most of this was for low temperature (< 100º C) space heating.

In the same year, greenhouse gas emissions from indoor cropping were 220.8-kilo tonnes of carbon dioxide, equivalent to 2.8% of total heat-related greenhouse gas emissions. Process heat accounts for 27 per cent of all energy-related GHG emissions[38]; therefore, covered crops contribute less than 1% of New Zealand's total greenhouse gas emissions.

Crops are grown close to markets throughout New Zealand, including places where low carbon fuels are not readily available.

A recent industry survey indicated that the most common form of greenhouse heating is natural gas (62% of the heated area of survey respondents), followed by coal (15%). The survey also highlighted regional differences in fuel source:

- Natural gas was limited to the upper North Island (the advice report acknowledges no reticulated gas network in the South Island).
- There was one large grower in Central North Island using geothermal energy.
- Diesel/oil heating was found in all regions but is slightly more common in the South Island.
- Biomass was only being used in the South Island.
- Only one small grower was using electricity to heat their greenhouse.

[36] Pers comms, Ecogas (via T&G Global)
[37] MBIE (2016). Indoor Cropping – Process Heat and Greenhouse Gas Emissions (https://www.mbie.govt.nz/dmsdocument/5334-indoor-cropping-factsheet-process-heat-and-greehouse-gas-emissions)
[38] https://www.mbie.govt.nz/dmsdocument/4292-process-heat-in-new-zealand-opportunities-and-barriers-to-lowering-emissions

Boiler sizes ranged from 30 kW to 8MW (in the survey mentioned above) – there is a significant range in greenhouses' size.

Challenges and solutions for the Covered Crops Industry

We are of the view that the covered crop industry does need to transition to renewable energy sources and that, over time, this will be possible. However, sufficient time for the technology and alternative to becoming available and economically viable and support to reach this outcome will be required.

At present, we consider the key barriers to change in the industry is the risks and costs to the greenhouse sector are too significant for the new available technologies. The sector needs investment to move to new technologies ahead of these technologies becoming truly commercially viable. The alternative technologies, barriers and enablers are expanded on in **Appendix A.**

Energy security:

The lack of energy security limits the number of alternative fuels – particularly biomass and electrification. Energy security risk is compounded by the relatively small size of the covered crops sector.

- The impact of a large part of the economy needs to transition to low carbon fuels (and what this means for the supply to the covered crops sector, either negatively through greater demand/ competition for resources, or positively through economies of scale resulting in more affordable options).
- Specifically, for biomass – detailed modelling of biomass supply (and supply and demand across sectors) and assessing the ability of the regional biomass supply out to 2035 and 2050 that could better inform the industry of the prospects of products such as wood pellets. This needs to consider the biomass resource location and CCC Report recommendations around reduced reliance on plantation forestry (reducing supply over time) and the increased demand for biomass as an alternative fuel (increasing supply).
- Specifically, for electricity – a greater understanding of the rate/timing of the increase in renewable energy regionally and the ability for increased capacity to be delivered through the network and demand for electricity demands (e.g. alongside more EVs, etc.) will be met.
- We support recommendations for a National Energy Strategy and welcome involvement.

Variability in the industry:

The industry is located across New Zealand to need to be located within proximity to markets. The availability of alternative fuel sources, such as biomass and electricity generation/infrastructure, is also variable across New Zealand. There is also variance in the sector regarding the type, age, size, and greenhouses' energy demand. This variability makes it difficult to roll-out one solution en masse across New Zealand – solutions are unique to the specific situation. There is not a one-size-fits-all model for covered crop growers.

- Transition solutions (and what this looks like in terms of which alternative fuels will be viable options for growers) will vary across the country; this needs to be accounted for in climate change policy by a sufficient degree of flexibility.

Skills/expertise:

There is a gap in greenhouse specific knowledge and expertise in New Zealand – this is both regarding energy efficiency and supporting transition – whether this is the conversion of existing boilers or new systems.

Access to capital/ limitations due to the capital costs of transition:

There are alternative technologies that exist; however, it is very challenging for growers to make a business case for investment, some of the reasons for this include:

Transition is very capital intensive – for example, the costs of boiler replacements for larger sites could cost larger sites as much as $4m-$6m.[39]

The industry is at the same time also adjusting to increasing costs in other areas – for example, fuel, labour, environment. This is coupled with an inability to raise process in a competitive market.[40]

Rising ETS costs, for example, NZIER estimate that at a carbon price of $50 per tonne, profitability is at or below breakeven for growers.[41]

The age of existing infrastructure is also a factor - recent industry survey results indicate that growers are, in general, not currently actively looking to replace their boilers. The average replacement time for all boilers is 12.5 years from now.

Existing funding structures do not cater well to the needs of our sector yet, for example:

- We entered an Industry Collaboration Agreement with EECA in February 2021 to explore areas for the industry to decarbonise, noting growers situations vary. The goal is to implement projects to achieve estimated energy savings or renewable energy conversion potential for members in the order of 5% collectively.
- We have met with the New Zealand Green Investment Finance; however, they cannot support feasibility work (which is the stage of work required).

To support the transition, our industry seeks:

- Access to capital and debt relief to assist the industry with grants to change its capital configuration (e.g., converting coal to biomass boilers).
- Tax breaks for energy-efficient measures; Greater support for energy-efficient measures during the transition – the benefits of this will be sustained over the long-term (through reduced energy demand); Shift in the focus of funding so that it can fund the roll-out of transition, rather than only fund demonstration pilots.
- Reinvestment of ETS funds into enabling the transition
- Industrial allocation policy that assists with transition (refer to section 3.5.3)

[39] Lumen (2020). Grower Survey November 2020

[40] The potential impact of the Emissions Trading scheme on covered crops. NZIER report to the Covered Crops Industry. March 2020

[41] Ibid.

Operational costs/other:

Many alternative fuels do not provide CO2 used by greenhouse growers for plant enrichment and thereby increased yields – in which case, switching from one fuel source that meets both heat and CO2 needs two separate sources. The high cost of alternative energy/fuel is a limiting factor.

In general, we consider that the CCC Report places too much emphasis on biomass and electricity – which may be suitable in some situation but are not without their limitations.

The circular economy aspect should be further considered and supported by the government to maintain our efficient growing practices and transition to lower emissions for the supply of vegetables.

To support the transition, our industry seeks:

- A policy that brings the costs of alternative fuels down.
- Investment into alternative fuels, such as biogas.
- Support with a long-term collaborative, and sustainable transition strategy for growers.

Why it matters

The risk of transitioning away from coal and gas at a rate that exceeds the industry's ability to adapt would significantly reduce industry. This would be a negative outcome for several reasons, including those below:

Economic and social implications	A 2018 report by NZIER evaluating the contribution of the covered (greenhouse) vegetable crop industries to New Zealand[42]found that the sector contributes $120 million to New Zealand's GDP, 2,400 jobs. For every extra $1 in the covered crops industry's income, at least a further $1.50 is generated for other businesses. The same report concluded that New Zealand would have significantly reduced employment without the covered crops industry, less variety of fresh vegetables, and a greater reliance on overseas markets.
Risk to domestic food supply and reduced resilience	The loss of industry capability in the covered crop sector would be negative when the importance of greenhouse growing increases in the future in response to climatic variability. Further analysis could be undertaken on what the impact on our domestic food supply would be. However, inevitably loss of covered crop growers would lead to greater price fluctuations in response to weather events, normal seasonal influences – which negatively impacts both growers and consumers.
Risk of carbon leakage	We have addressed above in the discussion on Emissions leakage – we consider that the risk of carbon leakage is an important consideration that could feed more into the CCC's advice concerning the covered crop industry.

[42] Valuing covered crops. A national perspective. NZIER report to TomatoesNZ and Vegetables New Zealand, March 2018
[12] The potential impact of the Emissions Trading scheme on covered crops. NZIER report to the Covered Crops Industry. March 2020

Missed opportunities	It is important to ensure that lasting solutions are developed – e.g., pressure to move from coal, without sufficient support, infrastructure, biomass or electricity supply could result in less favourable outcomes. The missed opportunity to supply quality, fresh, healthy, local products are grown in a resilient and low-impact way (reduced land area, reduced water use). Missed opportunity for future export growth.

4.2.1 Response to Heat, industry and power recommendations

Electricity- based recommendations

As expressed in Evidence Report Chapter 4 – the rate of electrification in the industry would be limited by the time required to convert plants, upgrade transmission and distribution infrastructure and potentially build new renewable generation.

We support the recommendation (**Time Critical Recommendation 3**) for a long-term national energy strategy (that includes the infrastructure to support delivery) and a target for increasing renewable energy (60% by the end of 2035).

Similarly, we support (**Necessary action 5**), particularly regarding the need to ensuring the electricity distribution are equipped and incentivised to support the adoption of new technologies and monitoring to ensure that electricity remains affordable and accessible. We note that what this means, in reality, will likely differ for process heat using sectors than the average household.

It is also important that regulatory frameworks enable this response and transition to occur – this is critical in terms of RMA and how trade-offs are made in resource management decision-making.

We consider these initiatives necessary to make electricity a more viable option to support low carbon fuel/energy sources transition.

Bioeconomy-based reconditions

The CCC report recommendations (**Necessary action 6)** speak to scaling up new emissions fuels, specifically developing a plan for the bio-economy and assessing the place of hydrogen in the national energy strategy.

- We support the recommendation to develop a plan for the bioeconomy – we seek clarification that this is broader than just biomass and includes fuels such as biogas.
- We note that this needs to be built off robust analysis at a regional scale to provide a predictable pathway for change that is meaningful to the business, e.g. if there is enough biomass supply in New Zealand. Still, it is not located where the demand is; the nuances of this need to be explored.
- We support assessing the place of hydrogen – this may particularly option for tractors and heavy vehicles.
- We seek that an additional recommendation is added regarding investment in low emissions fuels (e.g., the development/commercialisation of biogas to provide options for the transition away from natural gas in greenhouses may be part of the solution in some parts of the country).

Process heat specific recommendations

We support the inclusion of increased support and access to capital – these need to be tailored to the needs of specific sectors in **Necessary action 7**.

We consider that a transition strategy is required with government and industry working together to develop a detailed understanding of how the industry can move away from fossil fuels and retain the benefits of local, healthy, sustainable vegetable production. We seek that this is included in Necessary action 7**.**

This would enable a strategy to be put in place which includes consideration of options for reducing (rather than eliminating, coal and gas); this would provide clear signals to the sector – while still meeting reduction targets – i.e. that process heat emissions from boilers are reduced by 1.4 Mt CO2e over 2018 levels by 2030 and by 2 Mt CO2e by 2035. The transition needs to be a managed process.

Over the next nine years (2022 – 2030), the advice (Table 3.1) anticipates that coal will be replaced by biomass and electricity for industrial process heat.

- Transition relies on having access to capital to make transition viable, having the necessary expertise and biomass or electricity being viable (meeting energy requirements) in the growing operation's specific location.
- While we agree that biomass and electricity are generally the most likely alternatives, alternative fuels may also play a part in the solution (e.g., geothermal, biogas).
- There needs to be consideration of reducing emissions in our sector through various means, rather than eliminating coal and gas. Options in transition may include, for example:
    - combining coal or gas use with biomass or electricity as a stepping stone to full removal of coal/gas or
    - retaining coal to supplement electric heating during the coldest weeks of the year. This would smooth the transition by spreading the costs and give more time for new technology.
- In the meantime, growers are very sensitive to increasing ETS prices (refer to the discussion on free allocation in section 3.5.2.)

Ten years from now (2031 – 2035), the advice (Table 3.1) anticipates that gas will be replaced with biomass and electricity for industrial process heat.

- We see biogas as a viable alternative option for greenhouse growers in the future – this fuel has the advantages of providing CO2 for the enrichment and using existing infrastructure. However, our industry/growers cannot be suppliers of biogas – they will rely on others. As expressed, we seek to support and invest in alternative fuels – to enable our industry to have the options and alternative it needs to transition.

Regarding **Necessary action 9**, we seek greater alternative low-carbon gas options as an alternative to natural gas.

4.3 Agriculture

Agricultural emissions are defined to include nitrous oxide and methane from animals and nitrous oxide and carbon from synthetic fertiliser.

Horticulture produces agricultural emissions from the use of fertiliser. Fertiliser contributes 4% of New Zealand's emissions. Horticulture uses 2% of New Zealand's nitrogen fertiliser.

Agricultural emissions are not currently priced within the ETS. Horticulture is a partner of He Waka Eke Noa, a programme to measure, manage and reduce on-farm agricultural greenhouse gas emissions and adapt to climate change.

As fertiliser is the only agricultural emission from the vast majority of horticultural operations, which do not have animals, fertiliser management to achieve water quality outcomes is aligned with fertiliser management to achieve GHG emission outcomes.

90% of growers already are part of a GAP scheme which requires them to demonstrate to auditors they are managing fertiliser use appropriately (e.g., fertiliser record, application rates aligned to crops demand). Growers are implementing additional and more detailed requirements as part of their Freshwater Farm Plans. (for example, quick N soils tests, nutrients budgets)

Create options for alternative farming systems and practices

The report states that "*Diversifying land uses and switching some land that is currently in livestock agriculture to uses like horticulture or arable cropping could reduce emissions*." (pg. 120). However, there is limited analysis in the recommendations of the benefits of horticultural expansion, other than concerns about water quality (which we have previously addressed in section 3.5.4).

Horticulture is an efficient land use. Diversification into more horticulture should be encouraged. HortNZ believes there is too little emphasis on the land-use change as a mitigation factor (e.g., this is not mentioned in Table 3.1. Key transitions along our path). The following section discusses horticulture's benefits and the investment needed to overcome barriers to continued strong growth.

Co-benefits of horticultural expansion

Emissions reductions – As explained elsewhere in this submission, horticulture has an important role in a low emissions future. The expansion of horticulture, in place of animal-based agriculture, will reduce emissions.[43]

Sequestration -The amount of carbon stored in, emitted by or removed from permanent cropland depends on crop type, management practices, soil properties and climate variables. Annual crops are harvested each year, with no long-term storage of carbon in biomass. However, the amount of carbon stored in woody vegetation in orchards can be significant, with the amount depending on the species, density, growth rates, and harvesting and pruning practices.

New Zealand's land-use change by perennial cropland land use and associated CO2 emissions from carbon stock change from 1990 to 2017 has reduced by 47% due to perennial crop expansion land during this period. [44]

[43] https://motu.nz/assets/Documents/our-work/environment-and-agriculture/agricultural-economics/agricultural-greenhouse-gas-emissions/Land-use-change-as-a-mitigation-option-BERG-report.pdf

[44] https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/nz-greenhouse-gas-inventory-2019.pdf

Economic – Horticulture adds to the diversity and resilience in New Zealand's rural production system and has positive economic impacts for regional areas and in a range of industries and communities. For example,

- Deloitte estimated that the 'Pukekohe Hub', a key vegetable growing area, generated $5.68 billion in value in 2017 (and that constrained horticulture production could result in lost economic value, higher prices for customers, and job losses).[45]
- NZIER reported in 2018 that the covered (greenhouse) vegetable crop industry contributed $120 million to GDP and provided a significant contribution towards diversifying the New Zealand economy.[46]
- New Zealand Apples and Pears' research indicates the industry's true broader economic benefit was 3 to 5 times its export value.[47]

Employment – Horticulture provides a range of permanent jobs in production, post-harvest, corporate services, and seasonal jobs.

As a primary sector, Horticulture has a high employment generation relative to land area and value, estimated at 46.8 FTE/1,000 ha or 6.91 FTE/ $ million respectively, in the BERG report.[48] This varies by crop – for example, it is estimated that green kiwifruit requires 0.46 FTE per hectare and gold kiwifruit require 0.64 FTEs per hectare.[49] Deloitte reported that the 'Pukekohe Hub' provides direct and indirect employment of 3,090 FTEs.[50]

Health – The benefits of fruit and vegetable consumption are well established, particularly their role in preventing general micronutrient-deficiencies and chronic diseases.[51] Recent research has exemplified the connection between eating patterns, climate change, and health outcomes. Eating more plant-based foods and minimising food waste were among the most important ways individuals could reduce their climate footprint while also having health gains generating health system savings[52]. This research reported annual diet-related emissions reductions of between 4 per cent (following New Zealand Dietary Guidelines) to 42 per cent (waste-free vegan diet), the latter being equivalent to one-fifth of the current emissions reduction needed to meet New Zealand's commitment under the Paris Climate Agreement.

Environmental – effects of horticultural expansion can be managed, and in many cases, the effects would be positive (refer to discussion in section 3.5.4).

Investment in overcoming barriers to horticultural expansion

The CCC report acknowledges barriers to changing land use, including market access, supply chains, lack of experience, skills, support, and infrastructure. That investment is a high risk where infrastructure does not already exist.

The majority of these barriers can be overcome with the right policy environment and investment in R&D, innovation and infrastructure.

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[45] Deloitte (2018). New Zealand's food story: The Pukekohe hub

[46] Valuing covered crops. A national perspective. NZIER report to TomatoesNZ and Vegetables New Zealand, March 2018

[47] https://www.hortnz.co.nz/assets/About-Us/Corporate-documents/2020-07-15-Horticulture-Post-COVID-Recovery-Strategy-July-2020.pdf

[48] https://www.motu.nz/assets/Documents/our-work/environment-and-agriculture/agricultural-economics/agricultural-greenhouse-gas-emissions/Land-use-change-as-a-mitigation-option-BERG-report.pdf

[49] Green, S and Schulze, H (BERL) 2020. Māori in horticulture

[50] Deloitte (2018). New Zealand's food story: The Pukekohe hub

[51] Moore, D., Barton, B., & Young , M. (2019). *The value of local vegetable production.* Sapere.

[52] Drew, J et al. (2020) 'Healthy and Climate-Friendly Eating Patterns in the New Zealand Context'. Environmental Health Perspectives https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5996

HortNZ seeks investment and specific policy direction to enable horticulture to expand to the degree required to achieve net-zero emissions for short-lived gasses.

Markets

We need to invest in growing international demand, including research into new products/varieties.

New Zealand's export success has been due to plant breeding innovations and a reputation for high-quality products produced using environmentally sustainable practices. Continued innovation in new varieties and production systems is necessary to ensure this success continues.

Labour

Horticulture requires labour. The sector requires investment in research and development to robotic technology and new generation orchard design—also, a genuine commitment from the New Zealand government to the flow of labour between the Pacific and New Zealand.

Natural Resource policy

The sector needs greater certainty around future access to appropriate land, water and low emissions energy.

In our view, the transition to a low emissions economy and adaptation decision-making requires strategic planning to achieve (social, economic, environmental, cultural and climate change) outcomes. We agree that implications for climate change adaptation and iwi/Maori are important. The RMA reform and the new Strategic Planning Act provide an opportunity to take a more holistic approach.

Issues that HortNZ has observed in the current system include:

- Lack of climate change consideration, e.g., inability to consider climate change mitigation and adaptation in planning provisions relating to rural land-use change. We note that amendments to the Resource Management Act have recently reintroduced (with a transition period) climate change as a consideration.
- No policy guidance for resource allocation – both for outcomes for iwi/Maori and broader national good outcomes like food security, climate change mitigation and adaptation in terms of land use – as a result, policy tends to favour the status quo.
- No national-level policy guidance for the protection of highly production land – a resource which is under threat from urban development.

Freshwater Allocation Policy

A water policy that supports the transfer of water currently used for irrigated pasture to irrigated horticulture is required. Current water policy creates barriers to this. The first-in-first allocation framework and water permits linked to water use and irrigated area constrain the use and expansion of the area to account for more efficient water use.

There is a need to resolve Maori rights and interests in freshwater to improve Maori involvement in freshwater management and support Maori agribusiness and improve certainty for all New Zealanders.

Infrastructure/ investment in water storage

Sustainable water storage (and irrigation) can be the biggest driver (or impediment if prevented) to future horticultural growth. When managed well, water storage and resulting irrigation can deliver additional horticulture benefits while protecting (and in some cases enhancing) freshwater outcomes and reducing our carbon footprint – while producing more food. It is also important for communities in terms of the resilience of our drinking water supplies.

Well-planned water storage provides more resilient food production and can strengthen economies by enabling a shift of higher-value land use.

In locations where there is limited irrigation now, such as Northland, investment in water storage, such as the recently approved Matawii Water Storage Reservoir, provides an opportunity for conversion of pastoral farming to horticulture with likely improvements in water quality and emissions, manageable impacts on flow regimes through storage design and the opportunity to improve the resilience of water supply for local communities, and presents an opportunity for Maori agri-business.

The Te Tai Tokerau Water Trust is progressing the Matawii Water Storage Reservoir to support the agriculture and horticulture sector and provide drinking water.[53]

- Prefeasibility reports, delivered in March 2020, identified that the schemes could provide economic benefits over and above existing land use of an estimated $150 million per annum lift in Gross Domestic Product (GDP) and an additional 877 jobs. The Mid-North scheme alone can increase the area's GDP by 22% and employment by 12%.
- The scheme is intended to stimulate conversion from existing land use to a higher value, primarily through horticulture. Significant potential to grow high-value horticulture in the region if more water was available.
- Land in command area identified as suitable for horticulture 3,220 ha in mid-north, 4,714 in Kaipara

Existing storage schemes in Northland have proven the benefits that can result – for example, the development of horticulture enabled by the Kerikeri Irrigation Scheme (which includes two large water reservoirs), which supply approximately 2,300 hectares of horticultural land, along with other agricultural land, lifestyle blocks, commercial users and provide water for town supply.[54] The scheme contributes $106.2m GDP per annum and approximately 1,300 FTE's (direct and indirect), which equates to 6.5% of the Far North District FTE's.

4.3.1 Response to Agriculture recommendations

HortNZ acknowledges that **Necessary Action 11** relates to alternative farming systems – we make comments and suggested amendments to this action in table in Section 6.

[53] https://www.epa.govt.nz/assets/Uploads/Documents/Fast-track-consenting/Matawii/LP16_Matawii_Appendix_J_Economics.pdf

[54] https://www.irrigationnz.co.nz/Attachment?Action=Download&Attachment_id=556

4.4 Waste

Food waste

Food waste is a source of GHG emissions; emissions from food waste occur along the supply chain and significantly after the point of purchase.

Waste fruit and vegetables before sale are diverted to animal feed and recycled as compost. This is common in vegetable production, where plant residue is incorporated in soils. ETS captures the methane emissions generated in New Zealand related to food waste of fruit and vegetables in New Zealand.

Increased efforts across the supply to re-use and recycle waste horticultural products like animal feed and compost will be required. Also, increased efforts to change consumer behaviour to eat more of what they purchase and to purchase crops that look less than perfect, such as Countdown's 'odd bunch' brand.

Storage and Packaging

Fruit and vegetables are frequently packaged in cardboard and wooden pallets for transportation. Packaging for processed fruit and vegetables and fruit and vegetables consumed in New Zealand includes plastic and aluminium.

The ETS captures the emissions generated in New Zealand related to the storage of fruit and vegetables and the packaging and disposal of New Zealand packaging.

Electricity is the dominant energy source for storage and packaging and therefore has a relatively low GHG footprint (depending on the electricity generation source). Fossil fuels are used in the production of plastic and aluminium. Investment in research and technology into the development of alternative packaging is required, and joint efforts between consumers and producers to minimise the use of packaging, where it is possible from a food safety perspective.

4.4.1 Response to Waste recommendations

Necessary action 13 relates to the Government taking steps to reduce waste at source, increase the circularity of resources in Aotearoa and reduce waste emissions.

Our industry is also working towards solutions to minimise waste across all areas of production, for example:

- Zespri are committed to all of their packaging 100 per cent reusable, recyclable or compostable by 2025[55]
- Apata trialled using biodegradable paper labels
- Seeka piloted an in-house worm farm in 2020 (diverting packhouse organic waste from landfill into a circular system)
- Reusable crates and pallets
- Using waste streams – e.g. AgResearch is researching dyeing wool textiles with extracts from waste horticultural materials, including potentially onion skins.

There are further opportunities to promote a circular economy by utilising organic and food process waste (that currently go to landfill) into producing biogas, which could support the decarbonisation of the covered crops sector.

[55] https://www.zespri.com/en-NZ/newsroomdetail/Sustainability-Our-Environment

5 Rules for measuring progress

Accounting for land emissions

The CCC Report states in Section 7.6.5:

> *"The most significant sources of land emissions and removals not yet part of NDC accounting are emissions from organic soils, mostly drained wetlands, and removals from biomass on grasslands, mostly small lots of trees. In line with our principle that accounting should aim to cover all material human-caused emissions sources and sinks, the Government should investigate the feasibility of including these land areas and uses in target accounting in future."*

We support improvements to NDC accounting. We think there is an opportunity for New Zealand to improve our accounting to demonstrate to the world a more accurate picture of the carbon sinks in New Zealand and the contribution of the reductions that are planned.

In our view, while it is important to account for all sources of emissions and sinks, the methods that are used for reducing emissions and maintaining and increasing carbon sinks will differ depending on their scale.

We support providing for voluntary offsetting for carbon-neutral claims to take place in Aotearoa through cancelling NZUs. We agree that adjustments corresponding to the amount of NZUs cancelled must be made to the relevant emissions budget or the inventory to avoid the emissions reductions claimed from being negated by increases to the NZ ETS cap.

6 Summary of HortNZ submission on CCC Report recommendations

Proposed Emissions Budget Advice (Chapter 2 – CCC Report)

HortNZ supports Budget Recommendations 1-4 and Enabling recommendations 1 – 5, as discussed in section 3.

Ensuring an equitable, inclusive and well-planned climate transition (Chapter 5 – CCC Report)

Specific edits to the recommendations are underlined, and further comments are summarised.

Recommendation	HortNZ's submission
Time-critical necessary action 1 – An equitable, inclusive and well-planned climate transition	**Support and seek additional actions:** HortNZ supports the development of an Equitable Transitions Strategy linked to the Government's Economic Plan. We consider domestic food security to be a critical consideration.
Necessary action 1 – An equitable, inclusive and well-planned climate transition	**Support** – HortNZ particularly supports: • policies for creating a workforce with the skills needed for accelerating the low emissions transition (as being relevant for a future where horticulture has a greater role to play) • the need to support small business • improving the evidence base and approach for factoring in co-benefits; we provide a discussion of the benefits of land-use change to horticulture in section 4.3.

What a path to 2035 looks like in each sector – TRANSPORT

Recommendation	HortNZ's submission
Necessary action 4 – Increase the use of low carbon fuels for trains, ships, heavy trucks and planes *We recommend that in the first budget period, the Government take the following steps to support the use of low carbon fuels for heavy vehicles such as trucks, planes, ships, and off-road vehicles to meet emissions budgets:*	**Support – but also seek additional actions.** We support initiatives to make low carbon fuels more available. However, there could be clearer direction and support for off-road vehicles and heavy/medium trucks. The pathway to electrification (and other options such as hydrogen fuel cell technology) is particularly unclear.

a. *Set a target and introduce policies to sell at least 140 million litres of low carbon liquid fuels in Aotearoa by 31 December 2035.* ***b.*** *Introduce low carbon fuel standards or mandates to increase demand for low carbon fuels, with specific aviation consideration.* ***c.*** *Introduce incentives to establish low emissions fuel plants, such as biofuel sustainable aviation fuel, and make those fuels more competitive with traditional fossil fuels.* **d.** *Place further emphasis on decarbonising the rail system, and establish an investment strategy and clear targets to increase rail and coastal shipping.*	We seek that: • Where the technology is available – there needs to be a focus on making it affordable/accessible (e.g. we understand that there is one electric tractor on the market, but it is very expensive, doesn't allow for long periods of continuous use, and is too heavy for many of our current uses) • Where the technology is not yet ready for widespread adoption and the impact on that activity in the interim (through increasing carbon price) would have an unacceptable societal impact – e.g., on domestic food supply, or environment impact – e.g., on global emissions, there is support to assist in 'bridging the gap' between the current situation and a lower emissions future. We recognise there will still be some fossil fuel use in the future. Still, with high ETS costs, the use of these fuels could make horticultural activities uneconomic if there are no viable alternatives. • We seek that hydrogen options as a decarbonisation solution for heavy vehicles are supported and invested. These modes of transport are not as suited to electrification (e.g. heavy trucks). We recognise the technology will occur overseas. We need support in facilitating rapid uptake in NZ.

What a path to 2035 looks like in each sector – HEAT, INDUSTRY AND POWER

Time-critical necessary action 3 – Target 60% renewable energy no later than 2035	**Support**
Necessary action 5 – Maximise the use of electricity as a low emissions fuel	**Support –** particularly (d) and (f) relating to electricity distribution and ensuring electricity is affordable and accessible. Also support incentivising the uptake of solar generation on large horticultural buildings
Necessary action 6 – Scale-up provision of low emissions energy sources *We recommend that in the first budget period, the Government make progress in scaling up the provision of new low emissions fuels by:*	**Support, with an amendment** We understand the reference to 'bio-economy to reference a range of potential fuels, rather than solely biomass. This action is focused on a

a. *Developing a plan for the bioeconomy alongside the new national energy strategy across transport, buildings, energy, waste, land use and industry.* b. *We are assessing the place that hydrogen has in the new national energy strategy.* c. *Investing in the development of low emissions fuels*	strategy for the supply of low emission fuels – we agree that a strategy for this is important. We seek that there is also investment in low emissions fuels to assist with making the supply of these options viable (e.g. geothermal, biogas, hydrogen etc.).
Necessary action 7 -Reduce emissions from process heat *We recommend that in the first budget period, the Government take steps to reduce carbon emissions from fossil-fuelled boilers by:* a. *Urgently introducing regulation to ensure no new coal boilers are installed.* b. *Alongside industry, develop sector-specific strategies for transition* c. *Introducing measures to help reduce process heat emissions from boilers by 1.4 Mt CO2e over 2018 levels by 2030 and by 2 Mt CO2e by 2035.* d. *Increasing support for identifying and reporting emissions reduction opportunities in the industry, including energy efficiency, process optimisation, and fuel switching.* e. *They help people access capital to reduce barriers to the uptake of technology or infrastructure upgrades such as boiler conversions, energy efficiency technologies, and electricity network upgrades.*	**Support – with an amendment** We see the need to develop sector-specific strategies for transition (that align with the broader goals for the sector) so that the measures, support and access to capital can be provided most effectively. This would assist with implementing (c) – by providing additional guidance as to what measures could be taken to reduce emissions, which may include, for example, using a mix of fuels such as combining coal or gas use with biomass or electricity as a stepping stone to full removal of coal/gas. We support (d) - increased support for transition is required. The advice provided for the covered crops sector needs to be specific to greenhouses, not general. There are skills gaps in New Zealand for this. We support (e) Support this recommendation – support to access capital would assist in the transition.
Necessary action 8 – Support innovation to reduce emissions from industrial processes	**Support** We support innovation to reduce emissions from industrial processes – we have commented elsewhere on the innovation and support that we consider necessary to support the covered crops sector's transition.
Necessary action 9 – Increase energy efficiency in buildings	**Seek amendment**

	It is unclear whether this also applies to greenhouse heating – this should be clarified. We seek an amendment to Necessary Action 9 (c) so that low-carbon gases (e.g. biogas, hydrogen) remains an option as part of the transition. Multiple fuels will likely be part of the solution – in addition to/alongside electricity and biomass.

What a path to 2035 looks like in each sector – AGRICULTURE

Necessary action 11 – Create options for alternative farming systems and practices *We recommend that, in the first budget period, the Government support land-use change to alternative farming systems (including horticulture) to reduce emissions by:* ***a.*** *Accelerating high-resolution investment, consistent, publicly available nationwide land and climate information, and decision-making tools and processes to better inform local and national land-use decisions.* ***b.*** *We are supporting deployment of the systems and infrastructure needed for alternative farming systems and products.* **c.** *Prioritising initiatives to reduce barriers and enable international market access for proven low emissions food and fibre products.* ***d.*** *Increasing support for R&D and innovation* **e.** *Supporting alignment across policy areas, including resource management (particularly freshwater) and labour.*	**Support – with an amendment** This action refers to 'alternative farming systems' – we consider this is highly relevant to horticulture. The recommendation could be more explicit in referencing horticulture as an alternative farming system. The wording of the first part of the action implies that alternative farming systems need to reduce their emissions. In contrast, we consider that the Necessary Action is oriented toward enabling land-use change to alternative farming systems – we suggest amendments of this nature. We support sub-clauses (a) to (c); however, make the following comments: • (b) is very non-specific • (c) refers to 'proven low emission food and fibre products' – it is not clear what this is measured against. The action should strengthen by including: • Support for R&D and Innovation • Integration of this across policy areas We note that policy/investment in the first budget period is important to enabling growth to occur in the second and third emissions budget periods.

What a path to 2035 looks like in each sector – WASTE

HortNZ supports waste recommendations, as discussed in section 4.4.

MULTISECTOR STRATEGY

Necessary action 15 - Integrate Government policy-making across climate change and other domains *We recommend that in the first budget period, the Government make progress on integrating policy-making across climate change and other domains by:* ***a.*** *Providing consistent signalling across investments, policy statements, direction to officials, internal policies, and directives ensures that all regulatory and policy frameworks are aligned with low emissions and climate resilience objectives.* ***b.*** *Investigating emissions reduction potentials and interdependencies amongst multi-sector activities, such as food production and distribution, tourism, construction and international education.* ***c.*** *Ensuring that central and local government considers climate change alongside other environmental, social, economic and cultural aspects by including requirements in new resource management legislation, such as the proposed Natural and Built Environments Act, the Strategic Planning Act and the Managed Retreat and Adaptation Act.* ***d.*** *Ensuring integrated systems, using industry assurance programmes, demonstrate compliance with domestic and international market requirements.* ***e.*** *Requiring government procurement policies to include climate change considerations to leverage purchasing power to support low*	**Support, with an amendment** Specific comments: (a) – consistent signalling across all regulatory and policy signals that are aligned with climate resilience objectives is supported. We note that there need to be clear low emissions and climate resilience objectives to occur effectively. (b) – we consider that it is particularly relevant to the covered crop sector – a sector that contributes a very small amount of overall emissions but has a role to play in food production. The impacts of timing must be assessed, both at a national scale and an industry-specific scale. Otherwise, we may increase the cost of food and less food variety for New Zealanders, with little benefit from an emissions perspective. (c) – RMA reform presents an important opportunity to seek alignment of strategic outcomes. We seek to include also support for integrated reporting requirements that are using industry assurance programmes.

emissions products and practices, particularly regarding third-party funding and financing transactions. **f.** *Facilitating opportunities for iwi/Māori to participate in the ownership of infrastructure or involvement in projects that align with iwi/Māori aspirations and positive climate outcomes.*	
Necessary action 16 - Support behaviour change	**Support** We agree that it is important to create an enabling environment for New Zealanders to make choices that support low emissions outcomes.
Time-critical necessary action 6 - Align investments for climate outcomes	**Support** We agree that policy decisions and investments should not act to lock us in a high emissions development pathway. The emissions and climate resilience must be embedded in decision-making; in the Infrastructure Commission context, this is important in considering the need for infrastructure such as water storage. We also support the need to investigate and develop plans to mobilise private sector finance for low emissions and climate-resilient investments
Time-critical necessary action 7 - Driving low emissions choices through the NZ ETS *The Emissions Trading Scheme (NZ ETS) needs to drive low emissions choices consistent with emissions reduction targets in Aotearoa, including a focus on gross emissions reductions. In the first budget period, the Government should:* ***a.*** *In the next annual update to NZ ETS settings:* *i. Align unit volumes with emissions budgets, taking into account the need to reduce the NZU stockpile.*	The CCC Report states that the auction reserve and cost containment reserve price triggers in the NZ ETS need to be higher, and ETS unit volumes need to be amended to align with budgets – this will inevitably increase the carbon price. Thus it is important that there are incentives and investment into making transition viable for businesses – so that they are not put out of business during the transition due to the rising carbon price and uncertainty. As we discuss in this submission – we see an important role for free allocation as part of the transition and seek to include this in the recommendations.

ii. *Increase the cost containment reserve trigger price to $70 as soon as practical and then every year by at least 10% plus inflation.* iii. *To maintain continuity with recent prices, immediately increase the auction reserve trigger price to $30 as soon as practical, followed by annual increases of 5% plus inflation per year.* *These changes are needed because maintaining current settings will lead to failure to meet emissions budgets.* **b.** *Amend the NZ ETS to contribute, as part of a package of policies (see time-critical necessary action 5), to delivering the amount of afforestation aligned with our advice on the proportion of emissions reductions and removals, consistent with budget recommendation 2.* **c.** *Establish a sound market governance regime for the NZ ETS as soon as possible to mitigate risks to market function, as some of these risks are potentially catastrophic for the scheme's effectiveness. This work should be advanced through an interagency team, including MBIE, for its financial markets expertise.*	
Necessary action 19 - Continued ETS improvements *We recommend that in the first budget period, the Government make progress on:* **a.** *Developing options and implementing a plan for recycling some or all of the proceeds from NZ ETS unit auctions into emissions reductions, adaptation, equitable transitions and meeting international climate change obligations.* **b.** *Undertaking a first principles review of industrial allocation policy.*	**Support (in part) and seek additional actions** <u>ETS funds</u> Growers have paid a large amount of money into the ETS – however. They have not experienced this being re-invested back into support for the transition. There is, in our view, strong justification for the re-investment of ETS funds into new technology and support for the transition. <u>Industrial allocation policy</u>

c. *Continuing to phase out industrial allocation.* ***d.*** *Exploring alternative policy instruments that could address the risk of emissions leakage.* ***e.*** *Providing more information to reduce uncertainty about adjustments to NZ ETS settings, particularly how it intends to manage unit volumes in light of the split-gas 2050 target.* **f.** *Clarifying the role and avenues for voluntary mitigation in Aotearoa.*	As discussed in section 5.3.2 – we support a review of industrial allocation policy and see a continued role for free allocation for domestic food supply and carbon leakage as part of enabling transition. We seek policy review of free allocation across all of the budgets, industrial, transport and agriculture. Carbon leakage We support the consideration of alternative policy; we, not New Zealand exporters, are subject to green tariffs in Europe. We consider supporting robust market claims as one method of supporting consumer choice to reduce carbon leakage. Voluntary mitigation – we support clarification of the rule and avenues for voluntary mitigation.

RULES FOR MEASURING PROGRESS

Budget recommendation 5 - The rules for measuring progress towards emissions budgets and the 2050 target	**Support** Support (v) regarding the Government developing methods for tracking emissions and removals by sources and sinks not yet included in the country's domestic or international target accounting.

Appendix 1: Barriers, challenges and enablers for the covered crop industry

	BARRIERS/CHALLENGES	ENABLERS
Electricity efficiency	A 2020 NZIER report notes many covered crop businesses have invested in energy audits, optimised boilers, and introduced new processes and practices to reduce their carbon footprint. They are about as efficient as they can be currently. [56] Product groups had an independent life cycle assessment in 2008 and updated in 2018 on greenhouse has grown standard tomatoes and capsicums. We found that the NZ weighted average standard tomatoes footprint decreased by 21%, and capsicums decreased by 7% due to efficiency improvements. [57] The investment costs of some new developments are high and can only be feasible if used over a lengthy period and on a very large scale. Barriers include expertise specific to greenhouses (there is a skills gap).	In general, growers are aware of the need to be as energy-efficient as possible, and many different efficiency initiatives have been undertaken. Examples from a recent industry survey indicate that a broad range of efficiency initiatives was identified. There could be an opportunity for knowledge sharing across growers and/or developing a best practice guide. Product groups are working with EECA and a greenhouse energy consultant to develop advice and guidance for growers on energy efficiency measures via publications, conferences and workshops. The sector has also commissioned a technology scan on sustainable greenhouse climate control, looking mainly at the Netherlands because the Dutch greenhouse industry is one of the largest, most diverse and most innovative in the world. Findings from this may help identify pathways for the industry in the future. In addition, the use of energy-saving screens (often two or three screens, of which one can be used for shade in summer) can assist with energy-saving. New approaches for cultivation are being applied (HNT, Plant Empowerment, semi-closed greenhouses). Support with access and investment into these energy-saving options should be considered. Greater sector-specific knowledge and expertise is needed in this area – as the sector is different from typical commercial building energy requirements. There may be an opportunity to investigate energy user “clusters” to combine efforts with other companies or residential users to assist with feasible investment.

[56] The potential impact of the Emissions Trading scheme on covered crops. NZIER report to the Covered Crops Industry. March 2020
[57] The Carbon Footprint of New Zealand Greenhouse Grown Tomatoes and Capsicums (Barber and Pellow, 2008; Barber and Stenning, 2018).

	BARRIERS/CHALLENGES	ENABLERS
Electrification	Concerns around the efficiency of electricity use. Infrastructure/network capacity: • Limitations with electricity network capacity and potential vulnerability in supply. • Infrastructure required to meet capacity – requires expensive lines upgrades. • Location is a limiting/determining factor in many cases. Security of supply: • Potential vulnerability in supply. Greenhouses' energy needs fluctuate according to climate – concerns around peak demand of greenhouses on cold winter days and nights, coinciding with household electricity demand. Cost: • The fuel unit cost is higher. • The upscaling of (renewable) electricity generation will take time – in the meantime. Carbon prices will keep increasing. The price of electricity won't drop before the new generation is brought on-line. • Capital costs of heating infrastructure upgrades. *For example, some growers have investigated electricity as an alternative, but being rurally located and needing significant energy, current infrastructure cannot supply enough electricity, particularly to meet peak loads.* *For example, many greenhouse sites are within constrained local networks. One 5 hectare example requires more than $5m to contribute to the local network costs to get boilers and lighting systems supplied. Based on this, it could be expected that:*	We consider that this energy source is likely to become a more economically viable option for growers over time. However, it will take time for renewable energy sources to be developed and infrastructure to be rolled out. This is a key dependency for the sector in terms of the ability to transition. An option for greenhouse climate control may be electricity combined with a low-grade heat source, often combined with a heat pump to extract the source's heat. Greenhouses may use a range of devices, including heat pumps, heat exchangers, condensers, and dehumidifiers. Further study is required in this area to assess the options available. It's noted in the Netherlands their energy transition aim is to get an economical coverage, which means that there is usually still a small amount of fossil energy used, e.g. especially for peaks in heat demand. This fossil fuel is combusted in a boiler, which can also be stand-by as a backup. It is important that when setting targets (and timeframes) for the transition away from coal and gas, the lead-in times for the electricity sector, increasing renewable sources and getting the necessary infrastructure in place are taken into account.

	BARRIERS/CHALLENGES	ENABLERS
	• *alternative electrical heating systems will have capital demands of around $1m per hectare – therefore, 250 ha of greenhouses would require $250 million in the capital.* • *Greenhouse CO2 can only be supplied from pressurized bottles, and these bottles are currently supplied from natural gas and oil refining. Green CO2 from alternatives will cost around twice the cost of CO2 sourced from the refineries. This will add a further $60,000/Ha per year to current operations using CO2.*[58]	
Biomass	A recent industry survey indicated that biomass is the most commonly considered renewable fuel depending on location and infrastructure. Security of supply: • This is a key barrier for biomass. The sudden conversion to wood pellets by covered crops and other industries would create supply constraints regionally. It would also drive the pellet price up to the point where covered crop products are likely to be unprofitable. • The experience of those who have converted to wood pellet boilers suggests it is very difficult to secure a clean, plentiful, and consistent supply of quality dry wood pellets. • Also, the storage requirements needed on-site to manage adequate boiler feed supply can be a limitation (i.e. wood also has a lower bulk density to coal, requiring significant changes to the fuel supply system into the boiler to manage the flow to handle wood waste, and its heat co-efficient is lower requiring more wood biomass. For example, a South Island greenhouse has advised they would need ten truck and trailer loads per day of wood biomass to heat their 10 hectares of greenhouses. They currently use one truckload of coal per week. Our industry is likely to be a low priority demand for biomass. • We understand a Scion report shows the falling supply of biomass residue over the coming fifteen or twenty years, after biomass residues peak next year.	Robust analysis at a regional scale would be most useful in providing a predictable pathway for change meaningful to the business, e.g. if there is enough biomass supply in New Zealand. Still, it is not located where the demand is; the nuances of this need to be explored. Ease of securing biomass supply as fuel for optimal plant operation is needed, along with the sustainability (durability) of different biomass types. Financial support for transition is a viable option (based on location, infrastructure, etc.). Support for the use of biomass in conjunction with another fuel source as a backup.

[58] Pers Comms. Grant Smith from Ecogas (via T&G)

	BARRIERS/CHALLENGES	ENABLERS
	• The Bioenergy Association state to meet biomass requirements, a ten-fold increase in available wood fuel is needed. *E.g. An experience of a South Island grower who has converted to biomass is that supply is not assured and often difficult to come by, despite being in an area with local forestry.* Highly depending on location: • e.g. 80-100 km radius to be viable etc. • Residues are heavily concentrated in regions like the Bay of Plenty. The boiler upgrade costs for the lowest cost of renewable wood fuels estimated to be around $1m per hectare.[59] Also, the storage requirements needed on-site to manage adequate boiler feed supply can be a limitation (i.e. wood has a lower bulk density to coal, requiring significant changes to the fuel supply system into the boiler to manage the flow to handle wood waste, and its heat co-efficient is lower requiring more wood biomass to produce the heat needed). For example, a South Island greenhouse has advised they would need ten truck and trailer loads per day of wood biomass to heat their 10 hectares of greenhouses. They currently use one truckload of coal per week.	
Biogas	The volume of biogas required to heat a greenhouse is very high. Biogas conversion is currently more expensive than other alternatives (at around $3m per Ha of covered crops). However, the plant can also produce a bio-fertiliser by-product and receive a gate fee for waste otherwise lost to landfills at the same or higher gate fees. • The biogas is rich in CO2 and is a direct substitute for natural gas and at prices that are more competitive than wood fuels or electricity.	Biogas holds a lot of potential as an alternative fuel for the covered crops sector – as it is the only alternative fuel that matches the benefits currently provided by natural gas. The first major biogas plant of this type is currently being built at a Reporoa greenhouse site. It will produce enough renewable energy and CO2 to supply more than 10Ha of covered crops from around 75,000 tpa of food waste. There are opportunities for

[59] Ibid.

	BARRIERS/CHALLENGES	ENABLERS
	• Some gas cleanup is still required, at around $60,000 per Ha of capital investment.[60]	smaller biogas plants to be built alongside greenhouses right across New Zealand (Source: Ecogas and T&G) Research and development for securing alternative fuel sources suitable for greenhouse use is needed, along with investment in biogas supply/industry A policy that enables biogas as an alternative fuel for natural gas (e.g.biogas) Industry/food hubs – e.g. in areas such as Pukekohe. Biogas' opportunities are likely to be particularly useful for sites located close to large urban centres/waste production.
Direct geothermal heat	Highly dependent on location Cost Regulatory constraints	It is unclear from the CCC Report whether this is an option that is promoted as an alternative fuel (e.g. Budget 2 seeks to reduce geothermal emissions). For some operations, geothermal heating is a more viable heating option for large areas of covered crops, depending on location. Consideration of regional clusters for geothermal heating is worth further research.
Hydrogen as a fuel	We are not aware of this being a viable technology that has been explored in detail for greenhouse heating at this time, and we note hydrogen production requires a lot of energy.	We understand that it could be a renewable energy source that could provide an option to covered crop growers in the future. In addition, hydrogen may be an option to be used as a substitute for diesel in heavier tractors and machinery. We are aware that field tests of hydrogen boilers are being conducted in the Netherlands (Source: Arend Verboom, Gakon).

[60] Pers Comms. Grant Smith from Ecogas (via T&G)

	BARRIERS/CHALLENGES	ENABLERS
		Where hydrogen can be made from surplus solar or wind energy, we welcome government investment in further research in this area.
Other		
Government policy		A certain policy environment is required to encourage the investment required to transition to a low emissions economy without businesses becoming uneconomic and closing. Government investment must support this transition towards alternative production systems and technology in a realistic manner and timeframe. A transition strategy is required with government and industry working together to develop a detailed understanding of how the industry can move away from fossil fuels and retain the benefits of local, healthy, sustainable vegetable production to: • examine how biomass production can assist the industry at the regional level; • assist businesses with grants to move from coal/gas boilers to biomass boilers or other low-carbon energy sources.
ETS	In theory, the current allocation system (in the ETS) based on yield instead of energy use should have given a price signal for incentivising fuel source changes. However, this has not occurred due to constraints, including the lack of suitable alternatives and conversion capital costs.	A reduced phase-out rate for industrial allocation for covered crops – as part of a transition strategy. Investing ETS funds the Government receives into supporting the industry transition to long-term sustainable solutions

Appendix 2: Vegetable covered crop grower statements

Energy use greenhouses - Grower statement from NZ Gourmet Protected Crops 25.03.21

Natural gas is the main energy source used for heating greenhouse heating as it is clean and the CO2 formed is used in the greenhouse to enhance crop growth.

Screens are commonly used in our (NZ Gourmet) greenhouses in NZ and can save up to 50% energy, further savings can be made when double screens are installed.

The heating systems are all set up to run boilers for CO2 production as this is essential to our business, therefore big, insulated (buffer)tanks (up to 1200 m3) are set up to store hot water for when it is needed.

Alternatives are geothermal but no CO2 available. Drilling for hot water is expensive, over a million $ investment but depending on depth of layer with hot water.

Woodchip, CO2 can be extracted (Hot Lime Labs) but supply is short in the Auckland area and source should not be further away than 80km from the greenhouse due to transport costs. Investment of over $300k per greenhouse.

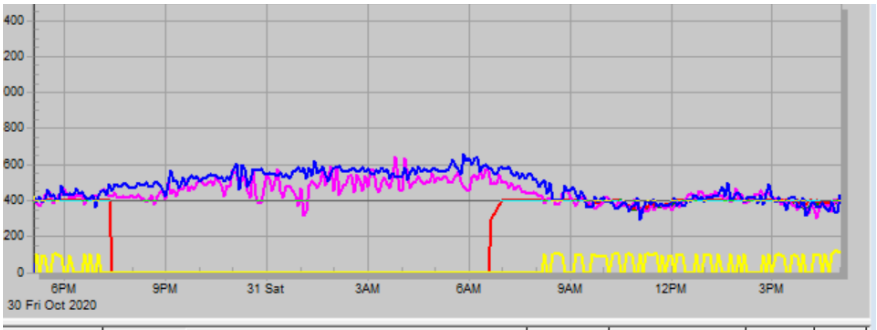
A greenhouse is a pretty much closed environment in which many crops are grown and over the years very efficient systems are developed to optimise production, and quality (internal and external).

As an example, 1 ha greenhouses produce as much as 8 ha outdoor grown crops and to produce a kg greenhouse product 6 litres of water is used against outdoors 60 litres to produce the same kilo.

Other key item is that these crops use a lot of CO2 to come to these productions. Common experience is that if ventilation openings are shut, the CO2 levels go from ambient 400ppm to 200 ppm within half an hour. Greenhouse capsicum crops use 60kg CO2 per hour per ha and tomatoes 90kg per hour per ha.

For this reason, growers use natural gas to produce heat and CO2. The boilers are running during daytime until there is enough heat made to heat the greenhouse during night-time. The heat is stored in a buffer tank until it is required. The CO2 in the meantime is used in the greenhouse to supplement the natural CO2 level and making sure levels do not go below ambient.

Below a graph with normal CO2 levels in a greenhouse, due to dissimilation CO2 levels go up at night and start to drop once the sun starts to shine and goes from 600 ppm to ambient within an hour. The yellow lines is when the boiler runs and replenishes the CO2, the red line is the set point for the CO2 level we like to see in the greenhouse.



Colour		Settings	Unit	Group	Factor	Axis
	☑	CO2 control: computed	ppm	S1-2	1	<-
	☑	CO2 control: computed	ppm	S3-4	1	<-
	☑	CO2 measurement	ppm	S5-6	1	<-
	☑	CO2 measurement	ppm	S7-8	1	<-
	☑	CO2 capacity: computed capacity	m^3/h	Gas Boiler	1	<-

Submission on climate change from Southern Fresh Group. 25.3.21

Southern Fresh is a primary food producer and processor for the New Zealand market located at 461 Bruntwood Road, just south of Hamilton.

We have 80 fulltime employed staff and we have an extra 50 part time workers in the busy season, tending to our crops of salads, vegetables and herbs. We consider ourselves a significant employer and contributor to our local economy.

Southern Fresh currently has an annual turnover of $21 million, with forecasted growth of 10% year on year. NZ demand for clean safe food is accelerating at a pace that can't be met by traditional farming practices. The demand for land to build residential houses on, and farming to making an impact on a cleaner environment, is all impacting on our primary food bowl. Southern Fresh crop on 200 hectares and can foresee significant challenges with the government's proposed healthy rivers mandate. This has made us at Southern Fresh look at more environmentally safer, and alternate ways of growing our salad and herb crops. Covered cropping is the way of the future for providing food for the world. This is a well-documented fact.

We have invested $6 million into a world class computerised growing environment. The glasshouse is a 2-hectare complex and we have obtained recourse consent to build another 4 hectares, so we are committed to further substantial capital investments in the next 2-3 years. The glasshouse has been installed with a modern, high efficiency natural gas boiler for heating the glasshouse and capturing the CO2 from the natural gas. The use of gas for heating and collection of the CO2 as a waste product from the burning of the natural gas is an essential ingredient required to keep the glasshouse operation sustainable. The issue around the government's proposed agenda on reducing carbon emissions is understandably a reasonable and expected request, however, what we do have an issue with is the road map as to what the alternative fuel source is and the huge uncertainty this government is creating for business here in NZ. Below are some specific points that we wish to point out in our submission.

- Natural gas is used as a heating source and the Co2 is captured from the flue duct and distributed around in our glasshouse. The reason for this is the Co2 in the natural air is between 375 and 390 ppm. When the plants want to photosynthesize, the plants use Co2 and when this happens and there is no supplementary Co2, the level of Co2 drops down below 250ppm very quickly, especially if the vents of the glasshouse need to stay shut because of the outside temperature being below what is required. Best growth and yield production for our type of crops comes about when the Co2 can be increased to 700 ppm while the plants are photosynthesizing.

- Our glasshouse complex and our industry is unique because we are using the Co2 up to produce the food. Our industry should be entitled to carbon credits as we aren't contributing very much to the problem of waste Co2 going into the atmosphere. The ETS we pay on the gas should be reimbursed to us somehow.
- There are alternative systems for producing Co2 in the event of natural gas use being ceased, however, the timeline for the government phasing out natural gas needs to reflect in the realities that this new technology needs to be developed and proven on a commercial scale, so NZ business aren't put at risk.
- There may be viability with using the existing infrastructure for natural gas and finding alternative gases to replace natural gas, such as bio gas or hydrogen. The government needs to have a clear plan forward on the options before committing to dates to stop using fossil fuels.
- We have started looking at alternative heating systems such as a wood chip boiler and a system for producing Co2 from limestone, however, the volume of woodchip we would need on a daily basis is 3 truck and trailer loads a day, let alone the storage of the woodchip to keep it dry. There are also issues with sourcing wood chip; there won't be enough trees around the countryside by the time everyone starts burning wood. Forestry takes 25 years to grow so the government's timeline would need to reflect the time to grow sufficient forests.
- We have also looked at bio reactors, using the vegetable waste from our factory and whey from the local dairy factory, but the efficiency and effectiveness of using this as a primary source of heat isn't an option it seems at this time.
- We are following very closely the developments in photovoltaic glass in Holland, where transparent glass can work like a solar panel to generate electricity. This could be a very feasible option in years to come but photovoltaic glass is still in development stages.
- The alternative fuel sources (i.e., hydrogen, biogas) needs to be at a competitive price, so NZ growers aren't at risk from overseas importation of vegetables.
- Any existing fuel system that uses coal or natural gas needs a system of government funding to facilitate the capital requirement to make the change to an alternative fuel source.

So, in conclusion in principle, we agree with the need to reduce emissions, but we don't agree with appointing end dates of gas supply until the government has a strong watertight plan to produce alternatives. We are very concerned that so much hinges on the government getting this process correct. The messages and communication needs to be clear and backed up with alternatives so that NZ businesses, and ultimately, its people are kept in employment, and just as important, that we have something to eat going forward.

Please feel free to reach out and discuss, until then, kind regards.

Pat Dunn	Jeremy Dunn	Greg Dunn
Southern Fresh	Southern Fresh	Southern Fresh

EXCEPTION LTD Passion Fresh Ltd

221 Buckville Road, Pukekohe 353 Harrisville Road, Pukekohe 2677

25 March 2021

Submission to Climate Change Commission by Exception Limited / Passion Fresh Limited

Together, Exception and Passion Fresh Limited are the largest cucumber growers in New Zealand. We are located south of Auckland, on the outskirts of Pukekohe, and have been in business since 1999.

We predominately grow telegraph cucumbers, with 7% of our site is dedicated to the production of smaller snack cucumbers. Our current produce is approximately 10 million cucumbers annually, with 99% being sent to the domestic market.

The two companies employ 50 permanent staff members and a varying number of contractors as seasons demand.

We grow cucumbers in glass houses as the New Zealand climate is too cold and variable for outdoor growth.

Natural gas is a key component in our production process, heating our glasshouses to allow year-round production, supporting New Zealand's food security.

We are mindful of reducing our energy footprint where possible, and so also use the Co2 from burning the natural gas, for Co2 enrichment. This has increased our yield by 25% (without Co2, indoor growers cannot produce economically). There are currently no economical alternatives to Co2 enrichment by burning bio-fuel or other sources.

In recent years we have introduced several measures to optimise energy usage. We conserve energy by lowering the gas exhaust temperature from approximately 100 degrees to 40 degrees. We achieved this result by installing an additional heat exchange unit behind our boiler. The surplus of heat from gas exhausts, is returned to the glass houses.

We also use horizontal energy curtains which we have found help us to save energy in the winter and spring by approximately 25% annually.

Further, we use sophisticated climate control software to continuously monitor glasshouse indicators, matching required energy inputs. This allows us to maximise energy efficiency.

Together, these measures ensure our use of natural gas is extremely efficient, with the energy conversion rate approximately 96%.

It may be that in the future there will be opportunities for natural gas (or LNG) co-generation. However, this can only be achieved with certainty of natural gas supply, and a fair per unit return on surplus energy returned to the grid.

Kind regards

A M Van Der Houwen
Managing Director

Submission to Climate Change Commission – Southern Paprika Ltd **24 March 2021**

Southern Paprika is a large greenhouse operator located north of Auckland. Currently our production is focused on capsicum production, however we are able to convert our greenhouse to production of many vegetable crops within a short time frame.

We currently produce 7000 tonnes of capsicums per annum for domestic and export markets Australia and Japan. We have been in business for over 20 years and employee 150 staff.

Over the years we have seen our export volume as a percentage of production drop from over 70 % to approx. 35 % export. This has been a planned move by SPL with a strong desire to be focused on domestic production for NZ communities (producing food for New Zealand). The domestic demand has also supported the move away from export with an increasing population and our scale being able to deliver capsicums year round at a more affordable price. This has also had the impact of a steady decline in the volume of capsicums imported to NZ from Australia and Holland which has a positive impact of global carbon emissions.

The Greenhouse industry is considered a large user of Energy and we have always been looking for alternative energy as a replacement for Natural Gas as part of a risk mitigation strategy. However, as we also use the Natural Gas for CO2 enrichment in the greenhouses (this increases yield by 15 %), there have been no alternatives. Until recently you have not been able to take the CO2 from Biofuel burners and use it in the greenhouses. This model is now being proved but is extremely expensive and viable only with Government subsidies.

Protecting the greenhouse industry is essential to food security. We at Southern Paprika are located within 50 minutes of Auckland meaning low emissions and cost-effective supply to NZ's largest population base.

As a company focused on only positive benefits for NZ and doing this in a sustainable manner, we ask you to consider the following:

1. A greenhouse production is approx 30 times more productive per square meter of a field crop.
2. We operate a closed loop water reticulation process with all nutrients collected and reused.
3. Limited chemicals used due to good climate control and biological insect control where possible.
4. Controlled environment protects reliability of supply compared with outdoor production.
5. Year-round production providing import substitution and export revenue in peak periods, along with stable employment.
6. CO2 enrichment critical to good production.
7. End of season growing material from plants used on our avocado operation as compost creating an environmentally sustainable benefit to additional food production for NZ.
8. Scale and efficiency allow us to produce affordable produce year around, benefiting lower socio-economic communities in terms of healthy food at a lower cost.
9. Our facilities use the latest in European production methods and we are refining this all the time.

We used to grow field capsicums 25 years ago but converted to greenhouse production due to this proven efficiency of the greenhouse and there is now very little field production in NZ of capsicums.

Worldwide more field production of all vegetables and salad lines are going under cover due to the aforementioned reasons.

Our use of Natural Gas is extremely efficient, and an optimal use of NZ's natural resource at over 95% conversion. Compare this with using gas to make electricity where all the heat generated is lost.

We are good stewards of the resource, delivering multiple benefits in terms of production, cost efficiency, sustainability of all resources used as well as using the CO2 produced.

Blair

Blair Morris
General Manager

Southern Paprika Limited
PRODUCERS OF QUALITY NEW ZEALAND CAPSICUMS

PO Box 614, Warkworth 0941
DDI +64 9 425 1165
blair@spl.nz www.spl.nz facebook

PO Box 184, Warkworth 0941
Mobile 027 525 2560