SUBMISSION ON

Emissions Reduction Plan Discussion Document

24 November 2021

To: Ministry for the Environment
Name of Submitter: Horticulture New Zealand
Supported by: Tomatoes New Zealand, Vegetables New Zealand, Citrus New Zealand, Summerfruit New Zealand, Persimmon Industry Council, NZ Feijoa Growers Association.

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Horticulture™ New Zealand
Ahumāra Kai Aotearoa

OVERVIEW

Submission structure

1 **Part 1:** Introduction and overall comments

2 **Part 2:** Specific commentary on the Emissions Reduction Plan discussion document

Appendix A: NZIER Report – Covered Crops Decarbonisation Problem Definition for Transition

Our submission

Horticulture New Zealand (HortNZ) thanks the Ministry for the Environment Council for the opportunity to submit on the Emissions Reduction Plan (ERP) discussion document consultation.

We welcome any opportunity to work more closely with the Ministry for the Environment and to discuss our submission.

The details of HortNZ's submission and the outcomes we are seeking are set out later sections of our submission.

Executive Summary

Horticulture has a role to play in New Zealand's transition to a low emissions economy and in meeting our 2050 targets. We welcome the opportunity to feed into the development of the Emissions Reduction Plan.

New Zealand's 2050 climate target needs to provide for a realistic and fair transition for food production, taking into consideration environmental, social and economic impacts, including global emissions and food security.

The Paris Agreement speaks to a 'fundamental priority of safeguarding food security' and action in a manner that does not threaten food production. It is important that New Zealand retains the ability to provide for our own fruit and vegetables – in terms of availability, but also affordability. Rising produce costs contribute to food insecurity in New Zealand; and as prices increase, consumption of fruit and vegetables decreases.

It is important to assess the impact on food security from policies in the emissions reduction plan and global emissions related to the timing of technology availability and the carbon price.

Transport sector

In the Emissions Reduction Plan:

- It is important that targets for decarbonisation are supported by investment into developing commercially viable options.
- We support the development of a National Freight and Supply Chain Strategy – this should take into consideration specific requirements and considerations of the horticulture sector.
- There could also be strategic planning opportunities which support mode shift, where the location is appropriate – e.g. A rail hub near Pukekohe connecting to Auckland and Tauranga Ports would significantly reduce road freight movements through Auckland.
- We seek clarity on the scope of proposed congestion pricing (and whether this includes freight, and if so, the approach).

Energy and industry sector

In regard to the approach to energy and industry in the ERP:

- HortNZ support the development of a New Zealand Energy Strategy. This needs to address concerns relating to security of supply for low emissions fuels (such as biomass and electricity, in particular), explore options for greater distributed generation ~~federation~~ and energy hubs that could deliver co-benefits (refer section 7.1).

- The phase-out of gas needs to be carefully managed to maintain security of supply in the interim period (refer section 7.2).
- We support investment and/or facilitation in developing robust markets for low-emissions fuels supply (refer section 7.4).

Specifically in respect to the greenhouse growing sector, there is a high risk that rapidly rising energy and carbon costs will result in greenhouse growers exiting the market. Investment and strategy to enable transition for greenhouses, so we can continue to grow these crops in New Zealand is needed. The sector is undertaking work with EECA on a decarbonisation plan to support and enable transition, however this takes time. It is the interim period we are concerned about – growers going out of business before they are able to transition.

- We seek to engage with Government on a solution that would assist the greenhouse growing sector to decarbonise, through the redesign of assistance currently provided as industrial allocation under the Climate Change Response Act (refer section 7.3).

Agriculture sector

HortNZ supports the He Waka Eke Noa partnership work in developing settings to drive lower emissions food production in New Zealand and seek that the Emissions Reduction Plan includes policies that support expansion of horticulture which produces healthy, low emissions food.

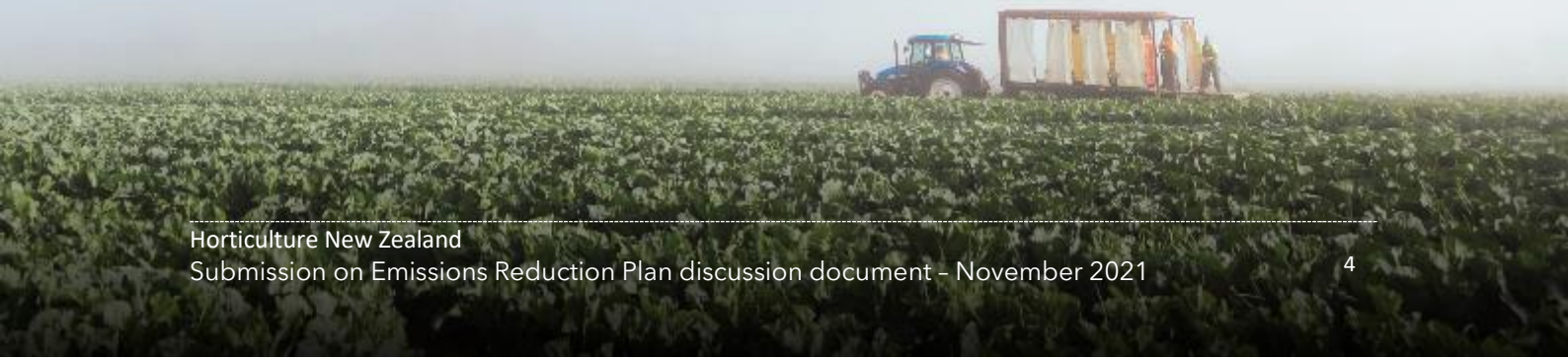
Waste sector

HortNZ seek that the Emissions Reduction Plan promote greater commercial composting to facilitate the bioeconomy.

Forestry sector

We seek that options are explored to ensure a supply of wood waste as biomass, as a means of helping to supply alternative fuels for transition.

It is also important to ensure there is a linkage with planning and resource management to ensure that forestry is appropriately located, in terms of preserving highly productive land for food production.



PART 1

HortNZ's Role

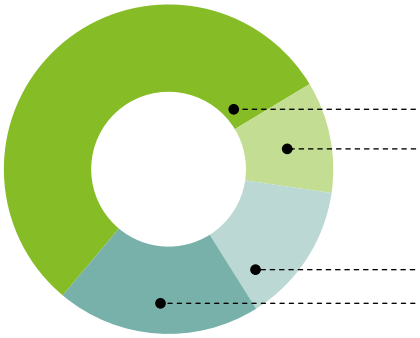
Background to HortNZ

HortNZ 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.

There is approximately 120,000 hectares of horticultural land in New Zealand - approximately 80,000 ha of this is fruit and vegetables. The remaining 40,000 ha is primarily made up of wine grapes and hops, which HortNZ does not represent.

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 values provide a platform for long term sustainability of communities, through the provision of food security.

HortNZ's purpose is to create an enduring environment where growers prosper. This is done through enabling, promoting and advocating for growers in New Zealand.



Industry value $6.39bn
Total exports $4.23bn
Total domestic $2.16bn

Submission

1. 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.

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.[1] 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.

Vegetables

The majority (80%) of fresh vegetables are grown for the domestic market.[2] 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.

Growing of vegetables for domestic supply is also integrated with vegetables grown for export in crop rotations, for practical (soil health) and economic resilience reasons.

New Zealand exported 569,800 tonnes of vegetables in 2020. The most predominant fresh vegetable export crops (by value) were onion, squash and potatoes. The most predominant process vegetable export crops (by value) are potatoes, peas, sweetcorn and beans.[3]

Greenhouse growing systems

Greenhouses are a highly efficient food production system, optimising the use of land, water, and nutrients. In New Zealand there is estimated to be 310 hectares of greenhouse vegetable growing[4], dispersed throughout New Zealand (although predominantly in the upper North Island).

Most vegetables grown in greenhouses in New Zealand are for domestic consumption; the main export crops are capsicums (~35% of the crop) and tomatoes (~10% of crop). This growing system is an integral part of New Zealand's food system, enabling New Zealanders to access freshly grown vegetables from a

[1] Freshfacts, 2019. https://www.freshfacts.co.nz/files/freshfacts-2019.pdf
[2] 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.
[3] Freshfacts, 2020. https://www.freshfacts.co.nz/files/freshfacts-2020.pdf
[4] Figure from greenhouse industry decarbonisation plan work.

local supplier throughout the year; provides resilience within the domestic food system; and is important for risk management at a national level.

2. High-level themes

2.1. Food security

Food security is a nationally important issue which needs to be addressed at a policy level; it is integral to human health. While New Zealand is a net food exporter, New Zealand does experience food insecurity - many New Zealanders live in food insecurity. A 2019 Ministry of Health study analysed household food insecurity among children in New Zealand estimated that 174,000 (19%) of all children in New Zealand live in food-insecure households.[5]

New Zealand's existing food production systems are coming under increased pressure from population growth (and competing land use demands reducing availability of highly productive land), climate change, water concerns, ETS costs and the cost of energy, and the need to improve environmental outcomes. There are societal and health costs to increases to the prices of vegetables in New Zealand and a decline in availability.

Health costs of increase in vegetable prices

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 percent, (Deloitte, 2018) would be a loss of 58,300 – 72,800 Quality Adjusted Life Years and health costs of $490 -$610 million across the population.[6]

HortNZ seeks that the ERP is cognisant of food security – specifically, we see a risk in respect of greenhouse growing systems and transport (both of which are exposed to ETS costs).

2.2. Highly productive land

For future generations, it is critical that Highly Productive Land (HPL) is protected and its value for current and future generations for food production and enable its use for food production recognised.

2.3. Climate change adaption and mitigation

Diversification to horticulture presents an opportunity to reduce emissions while increasing food production. In New Zealand there is 1,000,000 ha of land that could potentially be converted to horticulture. If this land was converted to horticulture it would be as effective at reducing New Zealand's agricultural emissions as a methane vaccine.[7]

The ERP needs to promote opportunities for land use change that supports New Zealand in moving towards a low-emissions economy, an opportunity identified in

[5] Ministry of Health. (2019). Household food insecurity among children, New Zealand Health Survey
[6] Cleghorn, C. 2020: The health and health system cost impacts of increasing vegetables prices over time, University of Otago
[7] BERG. (2018). The report of the biological emissions reference group. https://www.mpi.govt.nz/dmsdocument/32125/direct

the Climate Change Commission's advice (*Nāia tonu nei: a low emissions future for Aotearoa*).

New Zealand should also seek to retain the skills and infrastructure (highly skilled growers of crops, science capability, transport, cool storage, packhouse infrastructure) to feed itself vegetables, as well as the highly productive land. The New Zealand horticulture industry is diverse, highly skilled and innovative, and transitioning to a low carbon world will present many opportunities for the sector.

PART 2

Preliminary sections

3. Meeting the net-zero challenge

3.1. Guiding principles

We agree that the Emissions Reduction Plan should be guided by a set of principles.

HortNZ supported the principles that the Climate Change Commission established to underpin decisions on the transition to low emissions.

We consider that there are some gaps that exist in the proposed principles in the ERP discussion document (Table 5), particular in regard to:

- Providing high-level direction on the need to focus on reducing emissions as a priority (and then building a long-term carbon sink for residual emissions).
- The need to create options (different ways, tools, etc. to reduce emissions) – through the EPR – as a way of managing risk.
- Ensuring the transition makes New Zealand more resilient for the future (and for example, how we will produce food).
- Recognition that the ERP should where possible, avoid unnecessary costs through the transition.

We also consider that there is a need to protect New Zealand's food security and resilience of food production – as an important social and human health value.

These principles (investing in reducing New Zealand's emissions, while improving our resilience and protecting our food security) are particularly important for sectors such as the greenhouse growing sector, who rely on heat for production and need support to transition, so that we can continue to grow this food (with reduced emissions) in New Zealand and reduce the risk of carbon leakage that may result if this production were to be substituted with imports due to carbon pricing.

Outcome sought in the ERP:

Add new principles:

- Focus on decarbonising New Zealand's economy and prioritise gross emissions reductions
- Create options for transition that increase resilience to climate change
- Avoid contributing to global emissions through carbon leakage

Add to 'Environmental and social benefits beyond emissions reductions', a specific bullet point that addresses the need to consider and protect New Zealand's food security and resilience of food production.

Add to 'A clear, ambitious and affordable path', the following bullet point: "Avoid unnecessary costs".

3.2. Additional comments

3.2.1. LINE OF SIGHT TO FUTURE EMISSIONS BUDGETS

We consider it important to have a line of sight to future emissions budgets, and the investment that is needed now that will create longer-term benefits to enable us to meet future budgets.

3.2.2. ENABLING INVESTMENT

Mechanisms that support and enable investment (both public and private) for transition are important.

Some barriers we are aware of with current funding structures are:

- The level of support is often 'out-of-reach' for smaller growers, due to the scale thresholds of funding, administrative requirements, and the need to employ professionals to design bespoke solutions due to the wide variation in needs and circumstances.
- Funding to support capital investment for already proved technologies is limited, however even when the technology is established there are still barriers to widespread commercial uptake (e.g., regional supply issues) – particularly as there is no 'one-size-fits-all' energy solution for growers.

There are also additional measures that are needed to 'fill the gap' in the transition period – as discussed in more detail in section 7 with regard to the greenhouse growing sector.

Key barriers that could be removed to support decarbonisation include:

- improving long term access to, and supply of, renewable energy options including biomass and electricity;
- Make decentralised electricity generation a more attractive option for rural businesses that cannot easily access national grid electricity at the levels required;
- Encourage and support local renewable/low emission energy "hubs" that include food production, industry and possibly residential housing; investigate and eliminate regulatory barriers to renewable/low carbon energy update; fund energy assessments and decarbonisation plans for businesses at all scales.

We agree that avoiding stranded assets is a vital component of mitigating the risks. Stranded assets are likely to occur if costs rise faster than growers can transition. Assets that could be stranded include glasshouses, packhouses, and storage facilities.

4. Making an equitable transition

HortNZ supports the development of an Equitable Transitions Strategy – we consider domestic food security to be a critical consideration as part of this.

We support the need to help shape the workforce for a low-emissions future and supporting business to transition.

Outcome sought in the ERP:

Include as an objective/focus of the Equitable Transition Strategy, the need to be cognisant of impacts on food security (and the social impacts which are often unequally distributed).

5. Aligning systems and tools

5.1. Government accountability and coordination

HortNZ supports the need for coordinated work programmes across Government – not only will this be essential for aligning action but will also be more efficient. This is important to consider when consulting on proposals – linkages within and between work programmes should be clear.

5.2. Funding and financing

HortNZ agrees that access to funding is an important part of transition - HortNZ proposes an alternative approach is taken to funding/ supporting transition for the greenhouse sector - this is set out in Section 7 below.

5.3. Emissions Pricing

The ERP discussion document notes that a higher emissions price is needed. While it is inherently the intent of the ETS that the price of carbon will increase to drive transition – the glasshouse sector is at risk of becoming economically unviable due to ETS costs. If growers no longer produce these crops in NZ, this will result in less variety of vegetables available to NZ consumers, and substitution with imported products. This is discussed in more detail in section 7 below.

5.3.1. RECOGNITION OF FOOD SECURITY IN CLIMATE POLICY & PRICING

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.

The approach to allocation for eligible industrial activities (industrial allocation) and the corresponding level of assistance needs to reflect the risks to food security in the transition period.

Industrial allocation is not currently designed to protect these values. This was discussed in HortNZ, VegetablesNZ and TomatoesNZ's recent submission on the 'Reforming industrial allocation in the New Zealand Emissions Trading Scheme' discussion document.[8] Our primary subjection point was that the industrial allocation should be reviewed to include wider considerations that support New Zealand's progress towards meeting climate targets, while also safeguarding food security, and align with supporting the sector to transition to lower-emissions fuels.

Outcome sought in the ERP:

We seek food security as an explicit consideration in climate policy assistance, including investment and free allocation. Specific considerations could include:

- Prioritising food security in the redesign of industrial allocation
- Include a criteria relating to food production and domestic food security (i.e supporting these sectors to transition to maintain and/or enhance food security) in contestable funding to support transition projects.

[8] https://www.hortnz.co.nz/assets/Environment/National-Env-Policy/Climate-Change/HortNZ-submission-on-ETS-IA-review-17-Sept-2021.pdf

We seek policy support for the transition to a low carbon economy without increasing food costs so that New Zealanders can transition to eating healthy lower emissions food.

5.4. Planning

We agree that the reform of the RMA (resulting in the Natural and Built Environment Act, Strategic Planning Act, and Climate Adaptation Act) presents opportunities for alignment with climate mitigation and adaptation.

- HortNZ supports the NBA promoting, as an Environmental Outcome, reduction in greenhouse gas emissions;
    - It is important to enable land use change to horticulture,
    - There is also a need to ensure the resource management framework is appropriate in terms of enabling the supply of low emissions fuels.
- There must be a clear approach to the strategy of reducing emissions, in terms of areas which overlap with the NZ ETS.
- With respect to urban form, we support intensification from the perspective of also being a tool for protecting highly productive land from sprawling urban development.

There are also planning linkages with forestry and land use change that might be driven by mechanisms such as carbon pricing; it is important to retain highly productive land (a scare resource) for food production.

Outcome sought in the ERP:

We seek stronger links between greenhouse gas emissions and resource management legislation – that is aligned with a clear strategy.

5.5. Research, science and innovation

Research, science and innovation will play an important role in supporting transition.

Science can help growers transition to using different fuel types or more energy efficient systems which requires new skills and knowledge. Science can also help to develop new cropping systems and varieties that are more climate resilient.

Research can also support the transition to low emissions land uses (e.g., horticulture), including research into new products/varieties, robotic technology and new generation orchard design.

5.6. Behaviour change

We make the following comments, in terms of enabling behaviour change:

- Aligning climate change and greenhouse gas requirements (e.g reporting) with the multitude of other areas, such as environmental, labour etc. so that it is clear what growers need to do and the approach is efficient. Industry assurance programmes (such as GLOBALG.A. P and NZGAP in the horticulture sector) are an important vehicle in this respect.
- The need to support transition with expertise from behaviour change experts – particularly, the need to focus on empowering and enabling businesses (with a

focus on positive change), rather than focusing too heavily on regulation that tends to be more negatively framed.

- Work in the area of showing the 'how' – including information about options for transition (and how those look economically) and showcasing businesses who have made positive changes.
- Compliance costs needs to align with scale and impact, it is otherwise inefficient and could limit opportunities for positive change.
- Education and behaviour change need to also occur on the consumer side (e.g., buying 'imperfect' produce assists in reducing food waste – but is consumer, rather than grower driven).
- Long-term investment certification is important to enable transition.

5.7. Move to a circular and bioeconomy

HortNZ supports initiatives to support the development of the bioeconomy and move towards a more circular economy. We make more specific comments on this in section 9 (Waste).

We support in the ERP discussion document, initiatives to:

- Develop further science and innovation to support the move to a circular economy with a thriving bioeconomy.
- Accelerating the uptake of bioenergy.

We would add to that, the need to explore the opportunity for 'energy hubs' (this is touched on below in Section 7.1).

Transitioning by key sectors

6. TRANSPORT

For the horticulture sector, on-farm vehicles, including light commercial vehicles (e.g., utes) and machinery for cultivation and harvest are important. Alternatives are available in some areas, but not across the board.

Beyond the orchard gate, trucks are frequently used to transport fruit and vegetables to New Zealand consumers or ports. Some growers have their own truck fleets.

The sector is particularly reliant on trucks as a mode of transport between the farm and packhouse and/or processing facility.

Due to the distributed nature of horticulture and the perishability of fresh product – this creates limitations around the use of rail and coastal shipping (particularly for domestic distribution). However, there are opportunities for less perishable products, processed products (e.g., frozen, canned, juiced) and within or between main centres and/or areas where there are clusters of growing.

6.1. Decarbonising heavy transport and freight

The ERP discussion document proposed, for freight transport, a 25% reduction in emissions by 2035.

It is important that this is supported by investment into developing commercially viable options, including:

- Where the technology is available – there needs to be a focus on making it affordable/accessible.
- Investment in technology and subsidisation of options before they become fully economically viable to drive critical mass.

We support the development of a National Freight and Supply Chain Strategy – this should take into consideration specific requirements and considerations of the horticulture sector, and the different roles trucking, rail and coastal shipping play (and/or could play) in efficient transport of produce.

There could also be strategic planning opportunities which support mode shift, where the location is appropriate – e.g. A rail hub near Pukekohe connecting to Auckland and Tauranga Ports would significantly reduce road freight movements through Auckland.

6.2. Congestion pricing

We seek clarity on the scope of options relating to congestion pricing (and whether this includes freight vehicles). Freight is different to light vehicles e.g., freight transport has limited options for alternative modes, freight for fresh produce cannot choose when to travel to avoid peak rates.

There also needs to be clear objectives, not just revenue raising. Revenue should be limited to supporting alternative modes of transport.

7. ENERGY AND INDUSTRY

The production of fruit and vegetables requires reliable and economic energy supply. The demand for energy depends on growing systems (e.g., greater in heated greenhouse growing systems) and different stages in the supply chain.

Many growers have energy efficient goals and strategies for their businesses.

Example initiatives of growers reducing their energy use include the use of energy efficient machinery and equipment (including irrigation infrastructure), and efficient design of buildings (such as 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.[9]

In regard to the Energy and Industry chapter, HortNZ seek that the ERP include clear direction on investment and a strategy to enable transition - particularly there is a need to provide alternative support pathways for greenhouses, so we can continue to grow these crops in New Zealand.

7.1. A New Zealand Energy Strategy

HortNZ support the development of a New Zealand Energy Strategy. We touch in areas we see as priority areas below.

Security of supply (particularly availability of biomass and electricity)

A key challenge for the greenhouse sector (aside from the capital cost) is the lack of security of supply for alternative fuel sources to enable an investment to be made in transitioning. This needs to be a priority area in the energy strategy – particularly for biomass and electricity options, which has been the focus. There also needs to be resilience in supply – e.g. we are aware of a situation where biomass was unavailable due to flooding.

These areas require clear signalling and investment, in order to enable transition and certainty for growers.

Distributed generation

There is potential for 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.

Energy hub options to deliver co-benefits across industries

There could be an 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. The 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.

[9] https://www.choiceenergy.co.nz/customers/agriculture/jivan-produce

Outcome sought in the ERP:

Progress with the development of a New Zealand Energy Strategy, in consultation with stakeholders. We consider the Energy Strategy needs to include:

Biomass supply

- Include 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.
- Include a strategy for ensuring there is a supply of biomass that meets the needs of the transition.

Electricity

- Analysis of the rate/timing of the increase in renewable energy regionally and the ability for increased capacity and infrastructure to be delivered through the network and demand for electricity demands (e.g., alongside more EVs, etc.) will be met.
- Have a strategy for the generation and distribution infrastructure – so there is certainty over where electricity will be an option as an alternative energy source for users such as greenhouses.

Other opportunities

- Consider opportunities that might exist for greater energy generation as part of a distributed network within farms and energy hubs.
- Consider opportunities to develop cross-sector energy hubs in strategic location (for example, geothermal energy).
- Not preclude alternative fuels or technologies which might already exist, be in development, or provide options in the future, as transition will not be 'one-size-fits-all'.

7.2. Phasing out fossil gas while maintaining consumer wellbeing and security of supply

We agree that there needs to be careful management to maintain security of supply until transition is possible. Growers have faced disruption as a result of the gas supply market. This creates an additional pressure on growers at a time when alternatives are not necessarily available to fill this gap (particularly in the short-term).

7.3. Decarbonising the greenhouse growing sector

Heat and carbon dioxide enrichment are important for the viability of greenhouse growing.[10] ETS costs are having a big impact on growers. Growers have been experiencing

[10] Refer to submission on 'Review of Industrial Allocation in the NZ ETS' for further explanation: https://www.hortnz.co.nz/assets/Environment/National-Env-Policy/Climate-Change/HortNZ-submission-on-ETS-IA-review-17-Sept-2021.pdf

substantial cost increases, due to rapidly rising ETS costs - for example the NZU price has doubled, reaching $65 (on the secondary market) in the last year.

7.3.1. DECARBONISATION PLAN AND INVESTMENT REQUIRED

The sector is committed to transitioning to a lower emission economy – as demonstrated by partnering with EECA on developing an Industry Decarbonisation Plan for the sector. This will be available shortly.

Analysis as part of the decarbonisation plan estimates that the greenhouse vegetable growing sector (as of 2020) had 211,000 tCO2 emissions per year: 59% from the use of gas (used to heat 66% of glasshouse area), 31% from the use of coal (used to heat 15% of the glasshouse area), the remaining 10% from other hydrocarbon sources. The estimated proportional of emissions and capital cost of transition is summarised below.[11]

Size		Emissions %	Estimated cost of transition (CAPEX)
Large	≥5 ha	84% of sector emissions	Estimated cost of $200million to transition by 2040
Medium	1-4 ha	10% of sector emissions	Estimated cost of $27 million to transition by 2041
Small	<1ha	6% of sector emissions	Estimated cost of $6 million to transition by 2042
Total Sector		**211,000 tCO2**	**Estimated cost of approximately $233 million to transition by 2042.**

7.3.2. CHALLENGES TO TRANSITION AND THE RISKS OF THE CURRENT APPROACH

The Decarbonisation Plan is an important step towards a lower emission future – however challenges remain (particularly in the short-term) for growers.

The key barriers or challenges for transition include economic reasons (transition is very capital intensive, and operating costs are high relative to grower profitability), and energy security limitations (for biomass and electricity in particular). Some technology – e.g. electric heat pumps – have yet to be successfully trialled at scale. Carbon dioxide captured from natural gas combustion and injected into greenhouses to increase yield is also an important factor in terms of fuel choice and the economics of transition.

Over the period from now (2021) to 2040:

- The Level of Assistance (LA) for horticultural growers eligible for industrial allocation (as moderately emissions intensive trade exposed businesses[12]) will gradually be phased out – i.e. decreasing progressively from 0.6 now to 0.4 in 2040 (and virtually zero by 2050).
- Other growers (e.g., of lettuce, herbs, leafy greens, chillies, eggplants) continue to face the full ETS costs, with no industrial allocation.

[11] Covered Crops Decarbonisation Plan. Draft Report Version 1.0a
[12] Fresh tomatoes, fresh cucumbers, and fresh capsicums.

- The ETS cost will continue to rise. Growers have been experiencing substantial cost increases, due to rapidly rising ETS costs - for example the NZU price has doubled, reaching $65 (on the secondary market) in the last year.
- The cost and availability of low-emission alternative fuels is uncertain or limited in many areas.

These factors limit the ability of growers to transition. There is considerable risk that some will go out of business due to limited financial, technical and physical resources to rapidly invest in transition. The ability to switch to lower emissions fuels may still be a number of years away, depending on the alternative fuels available to growers in their location.

Attached as **Appendix A (Covered Crops Decarbonisation – Problem definition for transition)** is an economic analysis undertaken by NZIER, defining the challenge of transition for the covered crop sector, particularly the risk that the price of carbon poses to the covered crop industry and the ability to transition:

- Transition requires investment – the expected increase in carbon emission costs will quickly push the industry 'to or below' breakeven profit levels making it difficult for the industry to attract investment to replace existing assets let alone switch to lower emission technology.
- The report estimates that growers without free allocation will be exposed to carbon costs above the current estimated maximum profit of the industry by 2023, and for growers who can access free allocation by 2028.

The current ETS settings have driven energy efficiency, but growers do not have the capital to invest in decarbonisation.

There is a significant risk that the greenhouse sector will be significantly downsized due to the rising costs becoming uneconomic before transition to low emissions alternative fuels is possible.

If it is desirable to retain this food production in New Zealand (which we consider it is for reasons expressed below), a different approach is needed to support the transition that will reduce New Zealand's emissions while also enabling continued food production.

7.3.3. PROPOSED APPROACH TO ENABLE TRANSITION FOR A RESILIENT FOOD SUPPLY

NZIER's analysis (**Appendix A**) estimates that the value of free allocation units for the sector over the period 2023 to 2040 will be approximately $216 million – a net present value of approximately $110 million. The report concludes that options to capitalise allocation could support covered crop growers to transition.

We seek to redesign the assistance provided for within Section 83 of the Climate Change Response Act (CCRA), to provide the ability for growers to anticipate and capitalise future free allocation. Redesign of the assistance provided for under Section 83 and 84 of the CCRA in a way that has a comparable cost to growers and the Government over the next 20 years will result in faster decarbonisation of the sector while maintaining food security for New Zealanders.

There is urgency associated with the work because the economics of greenhouse growing in New Zealand is under considerable pressure due to the rising ETS price.

Outcome sought in the ERP:

We seek an agreement for the greenhouse sector and government to jointly undertake economic and policy analysis to redesign the assistance under CCRA, so the assistance supports capital investment for decarbonisation of the greenhouse sector.

7.3.4. WHY IT MATTERS (AND WHY A BESPOKE APPROACH IS REQUIRED)

A clear strategy and investment approach that supports transition of the greenhouse growing sector is important for a number of reasons, summarised below.

Risks to food security

Greenhouse growers are producing healthy, fresh (perishable) fruit and vegetables, enabling year-round food supply and security for New Zealanders.

The Paris Agreement speaks to a 'fundamental priority of safeguarding food security' and action in a manner that does not threaten food production. It is important that New Zealand retains the ability to provide for our own fruit and vegetables – in terms of availability, but also affordability.

Growers are price takers and need to produce year-round for economic viability. For the majority of crops grown in greenhouses, outdoor growing has been overtaken by greenhouse vegetable production due to higher yields, better quality, and improved efficiency of water, nutrients and other input use. Increased costs of production could impact ability to supply domestic market.[13]

Domestic consumption of vegetables is sensitive to price[14]. Some of the costs of reducing emissions that will be borne by the horticulture sector (via the ETS or otherwise) will either be passed on to consumers or result in significantly reduced domestic supply.

Resilience of New Zealand's food system and the future of food

Greenhouse growing is an efficient growing system that also provides resilience in domestic food supply and is resilient in a changing and more volatile climate.

In respect to our domestic food system, the greenhouse industry plays an important role in evening out market supply issues in shoulder and off seasons. This is particularly important when there are adverse weather events that impact on the few areas in the country where there is winter production of certain vegetables.

Greenhouse systems are more resilient to the challenges of climate change. Global trends suggest that covered cropping will have an increasingly important role to play in feeding people. An increase in covered cropping will be essential to adapt the food production system to the changing, more volatile world climate while still producing enough food in a way that also uses less water and nutrients and mitigates the risks associated with unpredictable climatic events. A 2019 Intergovernmental Panel on Climate Change report into land use stated, "*The stability of food supply is projected to decrease as the*

[13] Refer to submission on 'Review of Industrial Allocation in the NZ ETS' for further explanation: https://www.hortnz.co.nz/assets/Environment/National-Env-Policy/Climate-Change/HortNZ-submission-on-ETS-IA-review-17-Sept-2021.pdf

[14] Rush, E., Savila, F., Jalili-Moghaddam, S., & Amoah, I. (2018). Vegetables: New Zealand Children Are Not Eating Enough. Front. Nutr. https://www.frontiersin.org/articles/10.3389/fnut.2018.00134/full

magnitude and frequency of extreme weather events that disrupt food chains increases".[15] Covered cropping can reliably deliver high yields of quality produce using less land and water.

Risk of climate leakage

There is a risk of carbon leakage from the loss of greenhouse production. Countries that might fill that gap (notably Australia) through imports are very unlikely to face the same carbon charges that our growers face; they may pay a different price; or they may produce with much higher emissions than NZ growers.

For example, 302,186kgs of fresh tomatoes were imported from Australia during this winter (July – September) at an average CIF price of $5.63/kg. New Zealand grown produce for the same period averaged a retail price of $15.24/kg, so even with a retail mark-up and other costs the imported tomatoes are substantially lower in cost.

Imports are sensitive to market changes in New Zealand. For example, import data for tomatoes, capsicum, cucumber and lettuce indicates that imports predominately occur over the winter months when the prices are higher in New Zealand, this coincides with when prices are at their peak.[16]

Economic and social implications

The loss of greenhouse growing would mean reduced access to locally grown produce, which is fresher and more readily available from a range of suppliers than imports; biosecurity risks will increase from the imported products; jobs and export income will be lost; and New Zealand's own food security (ability to provide its own fresh vegetables) reduced.

7.4. Supporting development and use of low-emissions fuels

We think that there is a role for Government (and the ERP) in facilitating or supporting the d establishment of robust markets for low-emissions fuels supply– whether through policy, investment or some other mechanism. This will help to accelerate the options for transition.

[15] IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

[16] Statistics New Zealand Infoshare tool.

8. AGRICULTURE

In regard to the agriculture chapter, HortNZ seek that the ERP include direction on:

- He Waka Eke Noa partnership's work in developing settings to drive lower emissions food production in New Zealand.
- Policies that support expansion of horticulture which produces healthy, low emissions food.

8.1. He Waka Eke Noa

We support the He Waka Eke Noa partnership between government, the primary sector and iwi/Māori to make progress on climate change mitigation

The He Waka Eke Noa approach acknowledges that a price in isolation cannot drive the systems wide change required to reduce agricultural emissions, and what is needed to achieve change is an integrated approach including farm planning supporting behaviour change.

The farm level response through He Waka eke Noa, will need to be supported by a wider network of changes including investment in research, infrastructure and technology as well as strategic planning and regulation.

Outcome sought in the ERP:

Continued support for He Waka Eke Noa, supported by investment in research, infrastructure and technology as well as strategic planning and regulation.

8.2. Supporting lower emissions farming systems

The Climate Change Commission's report to Government, included recommendations to support alternative, lower emissions land uses (refer box below) – this does not appear to have been carried through into the agriculture section of the ERP discussion document.

We consider this should feature in the final ERP – as investment and action now will be required in order to make gains in future emissions budgets.

Ināia tonu nei: a low emissions future for Aotearoa

- The demonstration path assumes 2,000 ha of land is converted to horticulture per year from 2025. The Climate Change Commission expects that this could include in future "if barriers – such as water availability, labour, supply chains and path to market – are addressed."
- A path of less technological change and more behaviour change ('Alternative Pathway A') would require an additional 3,500 ha per year. By 2050 this would see horticulture increase by approximately 100,000 ha.
- "Opening up opportunities for more conversion to lower emissions production systems and land uses, including horticulture" is listed as a critical outcome.
- Policy direction for agriculture includes:

  "Support systems and infrastructure for alternative, lower emissions land uses so that there is more potential to convert land to low emissions uses in future. This includes, for example, infrastructure and supply chains for horticulture."

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 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.

It is also important to recognise that transition to horticulture may occur at different scales – from incremental changes in mixed farming systems (e.g., addition of, or greater proportion of vegetables in rotation as part of a mixed farming operation), to more wholesale changes of in land use/farming system, and both of these options need to be enabled.

Outcome sought in the ERP:

Policy direction and investment (and alignment of policy direction) to support alternative land uses such as horticulture, to realise the potential for our highly productive land, to be economically productive and generate lesser emissions, including in the areas of:

- R&D and Innovation: including research into new products/varieties, robotic technology and new generation orchard design
- Policy/regulatory settings, including:
    - Labour policy,
    - Environment policy (ability to access land and water, enable land-use change, resolving Māori rights and interests in water),
    - Food policy.
- Enabling investment: water storage that provides reliable water and community benefits, investment in growing international markets.

9. WASTE

9.1. Reducing organic waste disposal to landfill

We consider that there is an opportunity to support/promote greater commercial composting to facilitate the bioeconomy. This would provide an alternative pathway for organic waste, rather than going to landfill.

For the horticultural sector, we see two opportunities here:

- A supply chain for alternatives (e.g., compost-type products) to synthetic fertiliser. This could be further supported by research and investment in developing compost that is more of a known variable in respect of nutrients and GHG emissions.
- Supply of biogas and/or biofuels.

Outcome sought in the ERP:

- Promote greater commercial composiing to facilitate the bioeconomy – to provide low emission alternative fuels and fertiliser products.

9.2. Reducing food waste

HortNZ is also making a submission on the consultation on a new Aotearoa New Zealand Waste Strategy.

We support the objective of reducing food waste – but are mindful that initiatives in this area need to ensure they do not contribute to food insecurity, and that New Zealanders are not inadvertently discouraged from eating "5 plus" a day. From a supply perspective, there is a need for some redundancy in the food system to ensure a reliable and resilient supply of fresh, healthy and reasonably priced food.

10. FORESTRY

An opportunity that should be considered is leveraging regulatory controls to support the development of the biomass supply market, through greater recovery of wood waste from forestry. It is important that there is an efficient fuel market that supports the transition (which relies on the availability of alternative fuels).

Another consideration in respect to forestry in the transition to a low carbon economy is the need to retain highly productive land for food production, now and for future generations - -this is likely to be best managed through resource management legislation (including the Strategic Planning Act and Natural and Built Environment Act that will be replacing the RMA).

Outcome sought in the ERP:

The options (and benefits) of regulating the forestry sector, in respect of supply of wood waste as biomass be considered, as a means of helping to supply alternative fuels for transition.

Ensure there is a linkage with planning and resource management (e.g. SPA and NBA legislation) to ensure that new forestry is appropriately located, in terms of the highly productive land resource.

Appendix A: Covered Crops Decarbonisation: Problem definition for transition, NZIER (November 2021)

NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Covered crops decarbonisation

Problem definition for transition

NZIER report to Horticulture New Zealand

26 November 2021

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice.

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NZIER was established in 1958.

Authorship

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Key points

Situation faced by the covered crops industry

Recent and forecast increases in the price of carbon (NZU) pose a serious challenge to the ability of the covered crops industry to decarbonise and to its long-term financial viability. Energy costs are estimated to be about 15 to 20 percent of covered crop grower revenue.

Recent increases in carbon prices to above $60 per NZU will increase the gross cost of emissions as a share of the energy cost of covered crop growing from 20 to 40 percent. Projected increase in the price of NZU to $140 by 2030 will lift gross emission costs from 40 percent of current energy costs to approximately 100 percent of energy costs.

Export intensive trade exposed (EITE) covered crop growers – which include capsicum, cucumber and tomato growers are temporarily and partially insulated from the increase in gross emission cost by the allocation of free NZU up to 60 percent of the emissions by the sector. However, the allocation of emissions will be reduced annually by 1 percent per year from 2021 to 2030, 2 percent per year from 2031 to 2040 and 3 percent per year after 2040. Growers receiving free allocations are expected to see an almost four-fold increase in the cost of their emissions by 2030 if their energy use continues at current levels.

Some covered crops growers are fully exposed to gross emissions costs

Capsicum, cucumber and tomato growers earned total revenue of about $213 million in 2020 and account for about 85 percent of the covered vegetable growing industry. Growers of the two other main covered vegetable crops – lettuce and aubergine with combined sales of $37 million do not receive free allocations and are fully exposed to the projected increase in gross emission cost due to rising carbon prices.

To avoid these potential increases covered crop growers need to improve energy efficiency and switch to low emission fuels (biomass, biogas and to a lesser extent electricity). This switching requires capital investment in heating technology that uses low emission fuels while managing uncertainty about the availability of low emission fuels let alone their likely cost.

Decarbonisation requires significant capital investment

DETA Consulting has modelled a decarbonisation pathway for the covered vegetable growing industry that indicates a capital investment of $233.6 million would be required over the period 2023 to 2040 to reduce emissions from 211,000 t CO_2e in 2020 to 6,072 t CO_2e by 2042. Most of the investment and the reduction in emission occurs after 2035 leaving growers exposed to rising emissions cost in the short term.

The scale of capital investment required is large in comparison to the investment in existing assets and would be in addition to the replacement of these assets. Growers tend to be price takers. Recent industry analysis by NZIER suggested that industry profit was about 0 to 5 percent of revenue before the recent increase in carbon prices (implying a maximum industry-wide profit of about $12 million per year).

The current free allocation process does not allow growers to adjust

The estimated value of free allocation units over the period 2023 to 2040 is about $216 million. This free allocation is a cost to the Crown. It provides growers with a diminishing level of assistance to meet their current emissions costs but does not assist them to make a transition to low emissions methods of growing vegetables.

An option to capitalise part of the free allocation could contribute to EITE covered crop grower implementation of the lower[1] cost emission projects in the DETA consulting path (2023 and 2026) and develop a strategy for the next stage of the decarbonisation plan.

[1] 'Lower cost' is intended lower capital cost per tonne of CO_2 emission reduction.

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Tables

1 Projected Industry gross emission costs

1.1 Scope

Horticulture New Zealand has asked us to:

- Problem definition: short description of the financial aspects of transition challenges which would focus on the timing mismatch between:
  - The need for capital (and viable alternative fuel supplies) in the short to medium term to make the transition away from fossil fuels
  - The expected increase in the value of NZU allocated to the industry in the medium term.
- Two illustrative scenarios for the transition of the covered crops industry away from fossil fuels if the expected value of the NZU allocation could be exchanged for capital funding.

1.2 Emissions by EITE and domestic growers

Our starting points for the analysis of the likely change in gross emission costs are the following:

- Estimated total CO_2e emissions of 211,000 tonnes in 2020 by DETA Consulting[2]. This is roughly consistent with the estimate of total emissions from the indoor cropping based on EECA data in Table 4 as the EECA data covers flowers and nurseries as well as vegetables.
- Reported free allocation of 107 243 NZU in 2019[3]. We have assumed that this free allocation represented 60 percent of the emissions by growers that received a free allocation which implied total emissions by these growers of 178,378 t CO_2e[4]. This suggests growers with free allocations account for just under 85 percent of the emissions from the sector.
- Projected carbon prices in the Climate Change Commission Final Advice June 2021[5].

1.3 Implications for the problem definition

Table 1 shows the forecast emissions and cost for growers with (EITE) and without (non-EITE) free allocations over the period if their emissions remained unchanged from 2020 levels.

In the absence of better data, we use this 85 percent share of emissions with free NZU allocation as an estimate of the share of grower revenue receiving free NZU allocation. On this basis the $212 million of capsicum, cucumber and tomato grower revenue is supported

2 'Covered Cropping Sector Decarbonisation Pathway Update

3 SUBMISSION ON, Reforming industrial allocation in the New Zealand Emissions Trading Scheme, 17 September 2021, Horticulture New Zealand, page 16

4 The allocation comprised 29,466 NZU to 10 capsicum growers, 27,940 NZU to 9 cucumber growers and 49,837 NZU to 20 tomato growers.

5 Scenarios dataset for the Commission's 2021 Final Advice (output from ENZ model), Demonstration path

by free NZU allocation with the $37 million of lettuce and eggplant grower revenue exposed to the full effect of rising carbon prices.

The key points to note are:

- The current approach to free allocation creates a two-speed adjustment in the sector. Growers without free allocations will be exposed to carbon costs above 5 percent of their gross revenue by 2023 – above the current estimated maximum profit of the industry. Growers with free allocation will be exposed to carbon costs above 5 percent of their revenue by 2028.
- The expected increase in carbon emission costs will quickly push the industry 'to or below' breakeven profit levels making it difficult for the industry to attract investment to replace existing assets let alone switch to lower emission technology.

Table 1 Projected emission cost without decarbonisation

Value of free allocation and cost to growers in $ million

Year	NZU price ($/t CO_2e)	EITE			Non-EITE	EITE and non-EITE
		Free allocation[1]	Cost to growers	Total	Cost to growers	Cost to growers
2020	30.00	3.22	2.14	**5.36**	**0.97**	**3.11**
2021	40.84	4.31	2.99	**7.30**	**1.32**	**4.31**
2022	51.68	5.36	3.88	**9.24**	**1.67**	**5.55**
2023	62.53	6.37	4.81	**11.18**	**2.02**	**6.82**
2024	73.37	7.34	5.77	**13.11**	**2.37**	**8.14**
2025	84.21	8.28	6.77	**15.05**	**2.72**	**9.49**
2026	95.05	9.17	7.82	**16.99**	**3.07**	**10.88**
2027	105.89	10.03	8.90	**18.93**	**3.42**	**12.31**
2028	116.74	10.85	10.02	**20.87**	**3.77**	**13.78**
2029	127.58	11.63	11.17	**22.80**	**4.12**	**15.29**
2030	138.42	12.12	12.62	**24.74**	**4.47**	**17.08**
2031	142.57	11.98	13.51	**25.48**	**4.60**	**18.11**
2032	146.85	11.81	14.44	**26.25**	**4.74**	**19.17**
2033	151.25	11.63	15.41	**27.03**	**4.88**	**20.29**
2034	155.79	11.42	16.43	**27.85**	**5.03**	**21.46**
2035	160.47	11.19	17.50	**28.68**	**5.18**	**22.67**
2036	165.28	10.93	18.61	**29.54**	**5.33**	**23.94**
2037	170.24	10.65	19.78	**30.43**	**5.49**	**25.27**
2038	175.34	10.34	21.00	**31.34**	**5.66**	**26.66**
2039	180.61	10.01	22.27	**32.28**	**5.83**	**28.10**
2040	186.02	9.64	23.61	**33.25**	**6.00**	**29.61**
2041	191.60	9.25	25.00	**34.25**	**6.18**	**31.18**
2042	197.35	8.82	26.46	**35.27**	**6.37**	**32.82**

Note:

1 The free allocation in 2020 is reduced by 1 percentage point per year from 2021 to 2030, 2 percentage points per year from 2031 to 2040 and 3 percentage points per year after 2040.

Source: NZIER

2 Potential decarbonisation path

2.1 Decarbonisation path

DETA Consulting has modelled a decarbonisation pathway for the covered vegetable growing industry. The potential problems for the industry in following this pathway are:

- How to meet rising emissions costs over the period
- How to maintain profitability and attract sufficient new investment to fund the pathway.

Table 2 below summarises the capital expenditure and emissions reductions expected from the decarbonisation pathway proposed by DETA Consulting for the industry as a whole – an aggregation of decarbonisation plans for 'large', 'medium' and 'small' glasshouses.

Table 3 estimates the emission cost for growers using the simplifying assumptions that the DETA Consulting decarbonisation pathway is followed and the free allocation of units to EITE growers is reduced as provided for in the current legislation.[6]

2.2 Outlook for transition

Previous analysis by NZIER has highlighted the risk of rapid downsizing of the covered crops industry as the carbon prices increase.[7]

> *At a carbon price of $50 per tonne (given current technologies) the covered crops industry will be significantly downsized. Growers will not be able to provide the volume or range they currently do. Most product will be imported.*

In this report we estimate that growers without free allocations will be exposed to carbon costs above 5 percent of their gross revenue by 2023 and growers with free allocation will be exposed to carbon costs above 5 percent of their revenue by 2028.

The free allocations provide growers with a diminishing level of assistance to meet annual emissions cost but do not assist them to make a transition to low emissions methods of growing vegetables. While the DETA report identifies a transition pathway to decarbonisation by 2042 it is highly unlikely that growers will be able to fund the necessary investment over that time period.

The net present value of the free allocations over the period 2022 to 2042 is about $110 million at a discount rate of 6.0 percent. Options to capitalise part of the allocation could contribute to covered crop growers implementation of lower cost emission projects in the DETA consulting path (2023 and 2026) and develop a strategy for the next stage of the decarbonisation process.

[6] 'Climate Change Response Act 2002, Public Act 2002 No 40, Date of assent 18 November 2002', 'Version as at 3 November 2021', Section 81 (1a) page162 and Section 81 (2) page 163,

[7] 'The potential impact of the Emissions Trading Scheme on covered crops, NZIER report to the Covered Crops industry, March 2020' page iv

Table 2 Decarbonisation pathway

Value of free allocation and cost to growers in $ million

Year	Capex ($m)	Emissions (t CO_2e)	Description
2020		211,000	
2021	0.0	211,000	
2022	0.0	211,000	
2023	9.5	183,896	Known projects
2024	0.0	183,896	Efficiency gains[1] 'large'-
2025	0.0	183,896	
2026	11.0	175,258	Screens 'large' and efficiency gains[1] 'medium'
2027	0.0	175,258	
2028	3.6	173,561	Humidity control 'medium', screens 'medium' and efficiency gains[1] 'small'
2029	4.2	171,438	Buffer tank 'large'
2030	0.0	164,771	
2031	37.0	155,205	Humidity control 'large' and buffer tank 'medium'
2032	0.0	155,205	
2033	0.0	155,205	
2034	0.0	155,205	
2035	11.7	151,444	Fuel switch to heat pump 'medium' and 'small'
2036	9.6	141,386	Fuel switch to biomass 'medium' and 'small'
2037	0.0	141,386	
2038	68.0	136,654	Fuel switch to heat pump 'large'
2039	79.0	95,950	
2040	0.0	6,799	Fuel switch to biomethane 'large''
2041	0.0	6,799	Fuel switch to biomethane 'medium'
2042	0.0	6,072	Fuel switch to biomethane 'small'

Note:

1 No capex required to achieve the efficiency gains

Source: NZIER

Table 3 Projected emission cost with decarbonisation

Value of free allocation and cost to growers in $ million

Year	NZU price ($/t CO_2e)	EITE			Non-EITE	EITE and non-EITE
		Free allocation[1]	Cost to growers[2]	Total	Cost to growers	Cost to growers
2020	3.11	3.22	**2.14**	**5.36**	**0.97**	**6.33**
2021	4.31	4.31	**2.99**	**7.30**	**1.32**	**8.62**
2022	5.55	5.36	**3.88**	**9.24**	**1.67**	**10.91**
2023	6.82	6.37	**3.37**	**9.74**	**1.76**	**11.50**
2024	8.14	7.34	**4.09**	**11.43**	**2.06**	**13.49**
2025	9.49	8.28	**4.84**	**13.12**	**2.37**	**15.49**
2026	10.88	9.17	**4.94**	**14.11**	**2.55**	**16.66**
2027	12.31	10.03	**5.69**	**15.72**	**2.84**	**18.56**
2028	13.78	10.85	**6.31**	**17.16**	**3.10**	**20.26**
2029	15.29	11.63	**6.90**	**18.53**	**3.34**	**21.87**
2030	17.08	12.12	**7.20**	**19.32**	**3.49**	**22.81**
2031	18.11	11.98	**6.77**	**18.74**	**3.38**	**22.13**
2032	19.17	11.81	**7.50**	**19.31**	**3.48**	**22.79**
2033	20.29	11.63	**8.26**	**19.89**	**3.59**	**23.48**
2034	21.46	11.42	**9.07**	**20.48**	**3.70**	**24.18**
2035	22.67	11.19	**9.40**	**20.59**	**3.72**	**24.30**
2036	23.94	10.93	**8.86**	**19.80**	**3.57**	**23.37**
2037	25.27	10.65	**9.74**	**20.39**	**3.68**	**24.07**
2038	26.66	10.34	**9.96**	**20.30**	**3.66**	**23.96**
2039	28.10	10.01	**4.67**	**0.00**	**2.65**	**2.65**
2040	29.61	9.64	**-8.57**	**1.07**	**0.19**	**1.26**
2041	31.18	9.25	**-8.14**	**1.10**	**0.20**	**1.30**
2042	32.82	8.82	**-7.80**	**1.02**	**0.18**	**1.20**

Note:

1 The free allocation in 2020 is reduced by 1 percentage point per year from 2021 to 2030, 2 percentage points per year from 2031 to 2040 and 3 percentage points per year after 2040.

2 After 2040 the free allocation exceeds the emissions by growers which means the value of the free allocation is greater than the cost of the emissions not covered by the free allocation.

Source: NZIER

Appendix A Estimated energy use and emissions

A.1 Energy use and emissions

This report has used two sources of information on the energy use and emissions; industry survey data used extensively in the body of the report and the EECA end use energy database (EEUD) which is the focus of this section. The DETA Consulting report and industry surveys both indicate natural gas is the dominant heating fuel (59 percent from gas for 76 percent of the glasshouse area and 31 percent from coal for 15 percent of glasshouse area) for indoor crops while the EECA EEUD used in this report indicates coal is the dominant fuel. The different assumptions about fuel use do not materially affect the assessment of the cost of emissions reductions in the body of the report. However, growers that are using coal will face a much larger proportionate increase in their emissions costs per unit of energy used than users of gas as emissions for coal are approximately double for those for gas.

The EEUD category for indoor cropping includes three distinct covered growing activities: vegetables, flowers and nursery. Table 4 below summarises the energy use and emissions by fuel over the calendar years 2017 to 2020[8]. The key points are:

- Energy use has fallen by 17 percent and emissions by 21 percent due to reduction in energy from coal by 31 percent.
- Coal remains the dominant source of energy for the industry supplying 52 percent of energy used in 2020 followed by gas which supplied 38 percent of energy requirements.

[8] Energy use data is from the EEUD. Emissions are calculated for fossil fuels using emission factors published by the Ministry for Environment for 2020. These factors do not change materially from year to year. Emissions for electricity are calculated from MBIE data on energy delivered and emissions from electricity generation. This emission factor has increased since 2017 due mainly to increased use of coal-fired thermal generation. However, the increase in emissions for electricity generation did not have a material impact on the emissions for indoor cropping as the use of electricity is so low.

Table 4 Indoor cropping energy use and emissions

Annual energy use in terra joules (TJ) and emissions in tonnes of CO_2 equivalent (t CO_2 e)

Energy use by fuel (TJ)				
Fuel	**2017**	**2018**	**2019**	**2020**
Coal	2,706.4	2,156.2	2,205.4	1,869.0
Diesel	234.4	236.4	309.5	306.0
Electricity Motors	12.9	11.4	12.7	13.1
Electricity Lights	13.6	12.0	13.3	13.8
Natural Gas	1,314.1	1,222.6	1,241.1	1,351.6
Total	**4,281.4**	**3,638.7**	**3,782.1**	**3,553.6**
Emissions by fuel (t CO_2 e)				
Fuel	**2017**	**2018**	**2019**	**2020**
Coal	242,669	193,339	197,752	167,586
Diesel	16,308	16,442	21,532	21,289
Electricity Motors	357	301	387	454
Electricity Lights	375	316	406	476
Natural Gas	70,979	66,036	67,034	73,004
Total	**330,687**	**276,433**	**287,112**	**262,809**

Source: NZIER

The reliance on coal as the main source of energy contrasts with survey findings that gas is the main heating fuel for covered vegetable crops. The difference may be partially explained by higher proportionate use of coal in nursery and flower production than for covered crops.

A.2 Energy and emissions cost

We combine the data on energy use and emissions with recent fuel and NZU prices to provide an indication of the energy cost incurred by indoor cropping and then compare this to reported revenues for the sector as a starting point for assessing the impact of changes in energy and emission costs on the viability of indoor cropping.

Table 5 Indoor cropping energy and emissions prices

Annual energy prices for energy $ per giga joule ($/GJ) and $ per NZU ($/ t CO_2 e)

Prices of energy by fuel ($/GJ)[1]				
Fuel	**2017**	**2018**	**2019**	**2020**
Coal[2]	5.81	5.97	6.15	6.56
Diesel	20.33	27.19	26.25	20.08
Electricity Motors				
Electricity Lights				
Natural Gas (Industrial)[3]	6.99	7.37	6.80	7.14
Natural Gas (Commercial)	15.20	13.99	14.26	15.34
Price of emissions ($/t CO_2 e)				
	2017	**2018**	**2019**	**2020**
NZU	18.23	22.85	24.69	30.58

Note:

1 Except for coal the annual average prices from energy are calculated by MBIE.

2 Coal prices are the cost to Genesis of coal used for electricity generation at Huntly. This is likely to be at least 20 to 30 percent below the cost of coal to covered crops growers because of wholesale margins and additional transport costs.

3 The natural gas price paid by covered crop growers is likely to be closer to the 'Commercial' price than the industrial price. We have included both to allow a comparison of the likely range of the impact of increases in carbon prices on energy costs.

Source: NZIER

Table 6 Indoor cropping energy and emissions cost

Annual energy use and gross emissions costs in $ million by fuel

Energy cost by fuel ($m)				
Fuel	**2017**	**2018**	**2019**	**2020**
Coal	15.72	12.87	13.57	12.27
Diesel	4.77	6.43	8.13	6.15
Electricity Motors				
Electricity Lights				
Natural Gas (Industrial)	9.18	9.01	8.44	9.64
Natural Gas (Commercial)	19.97	17.10	17.70	20.74
Total[1]	**40.46**	**36.40**	**39.39**	**39.15**

Note:

1 Total energy cost based on 'Commercial' natural gas prices.

Emissions cost by fuel ($m)				
Fuel	**2017**	**2018**	**2019**	**2020**
Coal	4.42	4.42	4.88	5.13
Diesel	0.30	0.38	0.53	0.65
Electricity Motors				
Electricity Lights				
Natural Gas	1.29	1.51	1.66	2.23
Total	**6.01**	**6.30**	**7.07**	**8.01**

Source: NZIER

At an average carbon price of around $30 per NZU gross emission costs are less than 20 percent of energy costs (assuming the price of coal is adjusted upward to reflect the likely cost to covered crop growers. At current carbon prices in excess of $60 per NZU gross emissions cost will be approaching 40 percent of energy cost.