SUBMISSION ON

Proposed regulatory regime for Carbon Capture, Utilisation, and Storage

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To: Ministry of Business, Innovation & Employment
Name of Submitter: Horticulture New Zealand
Supported by: Tomatoes NZ, Vegetables NZ Inc.

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Horticulture™ New Zealand
Ahumāra Kai Aotearoa

OVERVIEW

Submission structure

1. Part 1: HortNZ's Role
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   The importance of greenhouses, how they use CO_2, and how alternative CO_2 sources support decarbonisation.

Our submission

Horticulture New Zealand (HortNZ) thanks the Ministry of Business, Innovation & Employment for the opportunity to submit on the proposed regulatory regime for Carbon Capture, Utilisation and Storage (CCUS) and welcomes any opportunity to continue to work with the Ministry of Business, Innovation & Employment and to discuss our submission.

The details of HortNZ's submission and decisions we are seeking are set out in our submission below.

PART 1

HortNZ's Role

Background to HortNZ

HortNZ represents the interests of approximately 4,200 commercial fruit and vegetable growers in New Zealand who grow around 100 different fruits and vegetables. The horticultural sector provides over 40,000 jobs.

There are approximately 80,000 hectares of land in New Zealand producing fruit and vegetables for domestic consumers and supplying our global trading partners with high quality food.

It is not just the direct economic benefits associated with horticultural production that are important. Horticulture production provides a platform for long term prosperity for communities, supports the growth of knowledge-intensive agri-tech and suppliers along the supply chain; and plays a key role in helping to achieve New Zealand's climate change objectives.

The horticulture sector plays an important role in food security for New Zealanders. Over 80% of vegetables grown are for the domestic market and many varieties of fruits are grown to serve the domestic market.

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.

Export value

Fruit $3.94bn

Vegetables $0.74bn

Domestic spend

Fruit $1.10bn

Vegetables $1.71bn

Industry value $7.48bn

Total exports $4.67bn

Total domestic $2.81bn

Source: Stats NZ and MPI

PART 2

Executive Summary

Greenhouses are a Valuable Use of CO_2

Indoor growing supports:

- Nutritious food for domestic food supply;
- Climate adaptation; and
- Efficient resource use.

Greenhouse growers use CO_2 to improve plant productivity and ensure that their vegetables reach marketable size and yield.

Lack of CO_2 is a barrier to decarbonisation because growers will continue to heat with natural gas to capture CO_2 until alternatives are available.

Government support for alternative CO_2 sources through biomass and geothermal projects would be appreciated, but delaying ETS allocative baseline changes until ETS proceeds are reinvested in greenhouse decarbonisation efforts is a higher priority for the industry.

Policy Outcomes Sought

Enabling the **use of CO_2 for food production should be an objective** in any new regulatory system for carbon capture, utilisation and storage. There is a risk that if incentives are too high to bury CO_2 underground, it will not be accessible for purchase to use in greenhouses, as has been the case in the Netherlands.

HortNZ urgently seeks the **establishment of a Sustainable Food Systems Fund** to reinvest ETS proceeds in greenhouse decarbonisation to support this transition.

HortNZ seeks that the **allocative baseline change is delayed until funding is available**, no earlier than July 2025, to allow time for gas contracts to expire and for growers to make fuel or efficiency changes.

PART 3

Submission

1. Greenhouses in New Zealand

Greenhouse growers in New Zealand use carbon dioxide (CO_2) to increase their yield of tomatoes, capsicum, cucumbers and lettuce. These vegetables support domestic food supply, and New Zealanders' access to healthy, affordable food. Indoor growing, also known as covered cropping, is a climate adaptive growing system, described in more detail below.

Most greenhouse vegetables are grown to be sold in New Zealand, and they are staple foods in our diets. Some of these crops also have an export component. This supports the viability of businesses when excess seasonal summer supply exceeds local demand and wholesale prices fall below the cost of production.

2. Greenhouses are Needed to Adapt Our Food System

Growing indoors, also known as covered cropping, is what allows New Zealanders to buy tomatoes, cucumbers, capsicum, courgettes, eggplants, leafy greens and herbs year-round. Consumers expect access to these crops, which drives production. If these crops were not grown in New Zealand, consumer demand would drive greater imports from other countries without an ETS, driving carbon leakage and further emissions associated with international freight.

Covered crops provide a supply of fresh produce at times of the year when outdoor cropping is challenging, which evens out the supply of fresh produce and extends the availability of seasonal crops. Indoor growing systems work by using technology to provide a stable growing environment for their crops through environmental controls. Indoor growing systems also use less water, land and nutrients than growing outdoors, which means they have a low impact on freshwater quality while making efficient use of resources.

An increase in covered cropping will be essential to adapt the food production system to the variable weather that comes with a changing climate while still producing enough food for our population. New Zealand needs to recognise the risk climate change poses to food security and focus on sustaining a productive food system through a changing climate. Indoor growing reduces vulnerability to external environmental conditions and pressures such as significant weather events. During Cyclone Gabrielle, 80% of the tomatoes grown outdoors for processing were destroyed, whereas the supply of indoor grown greenhouse tomatoes was relatively unaffected.[1]

The crops grown in greenhouses are essential for New Zealanders' health and wellbeing. It is critical that we prioritise healthy, nutritious foods to improve health outcomes. New

[1] Tomatoes NZ, personal communication.

Zealanders diets aren't as healthy as they could be. Ministry of Health data indicates that only 32.8% of adults and 44.1% of children are meeting fruit and vegetable intake guidelines.[2,3] For families living in deprived areas, increases in fruit and vegetable prices compel them to substitute the purchase of healthier whole fruit and vegetables with cheap, energy-dense and nutrient-poor products.[4] The cost of production has a relationship with vegetable prices and the affordability of healthy food.

Given the importance of greenhouses for reducing the environmental footprint and providing healthy food for domestic consumption, they should be supported with enabling energy policy.

3. Greenhouses Use CO_2

Growers pump CO_2 into their greenhouses to support plant growth and help their crops reach a marketable size and yield. CO_2 supplements photosynthesis, boosting growth rates and yields and improving plant productivity by 20-25%.[5,6] Every 1 kg of CO_2 absorbed by a plant produces 10 kg of new plant material. In tomato plants, the tomatoes themselves get about 8 kg while the rest goes to leaves, stems and roots.[7] This allows growers to produce more food faster, thus feeding more people at a lower cost.

Limited sources of CO_2 for this purpose are one of the key barriers to greenhouse decarbonisation. Currently, the most common way to get CO_2 is by capturing the byproduct of heating greenhouses with natural gas. Greenhouses already need to be heated in the colder months to continue growing, and capturing CO_2 outputs from natural gas to boost production creates a dual benefit. 1-2% of the CO_2 inside the greenhouse is converted by plants to O_2, offsetting some of the emissions from burning natural gas.[8]

Natural gas is only available on the North Island, and it is becoming prohibitively expensive for growers. The closure of Marsden Point Refinery has put pressure on CO_2 availability. Growers will switch fuel sources if natural gas becomes too expensive, but their yields will decrease without alternative sources of CO_2. Some growers already buy tanks of supplementary CO_2, especially those using non-gas heating sources. There are not many alternative sources of CO_2, and the supply chain is fragile, as evidenced by an acute shortage in early 2023.

The consultation document notes that a potential extended shortage of CO_2 would have "an adverse impact on core primary sector activity, including dry ice enabled meat and seafood exports and packaging for dairy exports".[9] Such a shortage would also impact our domestic supply of fresh vegetables and associated exports if there was a shortage

[2] Adults' Dietary Habits – Findings from the 2018/19 and 2019/20 New Zealand Health Survey Accessed 06/08/24.
[3] Children's Dietary Habits – Findings from the 2018/19 and 2019/20 New Zealand Health Survey Accessed 06/08/24.
[4] Rush, E., Savila, F., Jalili-Moghaddam, S., & Amoah, I. (2018). Vegetables: New Zealand Children Are Not Eating Enough. Front. Nutr.
[5] Vegetables NZ, Inc., personal communication.
[6] Geothermal Food Systems (upflow.nz). Accessed 05/08/24.
[7] Nederhoff, Elly. "Covered Crops: Greenhouse energy efficiency". Produced for Tomatoes NZ, Vegetables NZ Inc. (available on request)
[8] Vegetables NZ, Inc., personal communication.
[9] MBIE. "Proposals for a Regulatory Regime for Carbon, Capture, Utilisation and Storage: Consultation document". June 2024.

of natural gas, or if growers transitioned away from natural gas, and supplementary CO_2 was in short supply. Growers would either have to buy CO_2 at high cost or go without, leading to higher cost of production and/or lower supply of tomatoes, capsicum and cucumbers in New Zealand. Reduced supply drives higher vegetable prices, which impact on the cost of living. Consumers would see higher prices at the supermarket checkout but also reflected in hospitality prices from restaurants that use these vegetables in their food preparation. New Zealand retailers would import more greenhouse vegetables from Australia, where these crops are not subject to the Emissions Trading Scheme (ETS). These crops are already imported when the cost of import is lower than the cost of growing in winter (due to heating requirements), effectively exporting New Zealand's emissions in a clear-cut example of carbon leakage.

3.1. Consultation Question: Objectives

Q. 2	Do you agree with our objectives for the enabling regime for CCUS? Please provide any further information to support your answer.

Enabling the **use of CO_2 for food production should be an objective** in any new regulatory system for carbon capture, utilisation and storage.

Without an objective directing enabling policy for this use, there is a risk that incentives will be too high for storing CO_2, making it unavailable for commercial purchase and use for food production. This unintended policy consequence occurred in the Netherlands, where a "system of subsidies and tariffs stimulates burying CO_2 deep underground rather than supplying CO_2 to glasshouses."[10]

4. Greenhouses in the ETS

The horticulture sector supports New Zealand's net-zero target and market mechanisms to achieve that goal. The greenhouse industry, in particular, is undergoing decarbonisation through efficiency improvements and a transition to renewable energy sources. Many greenhouses use heating sources powered by fossil fuels in colder months and rely on the CO_2 captured when burning natural gas to pump into the greenhouses to boost plant productivity. It should be noted that greenhouse-grown vegetables generate a tiny fraction of the emissions generated from dairy and meat production per kg, and yet heated indoor growers who have emitting energy sources have already paid into the ETS for years.

Growers of fresh tomatoes, cucumbers and capsicums are eligible for industrial allocation which recognises their "Emissions Intensive and Trade Exposed" status, whether they grow indoors or outdoors.[11] This policy was designed to prevent carbon leakage because these crops compete in the commercial market with imported vegetables not subject to the same emissions policies.

[10] Nederhoff, Elly. "Covered Crops: Greenhouse energy efficiency". Produced for Tomatoes NZ, Vegetables NZ Inc. (available on request)
[11] Environmental Protection Authority. "Horticulture". Accessed 11/07/24.

Recent proactively released changes to allocative baselines and the Government's policy change to no longer reinvest the proceeds of the ETS in decarbonisation signal that greenhouse growers will be facing an undirected "tax on food" without support for an alternative energy pathway. If ETS and natural gas costs push growers to transition without reliable alternative sources of CO_2, the Government will have put downward pressure on New Zealand's access to vegetables. Carbon capture and utilisation can support a just and least-cost transition, while protecting domestic food supply and this resource efficient, climate adaptive growing system.

Energy-switching is prohibitively expensive, particularly for small and medium-sized growers. HortNZ urgently seeks the **establishment of a Sustainable Food Systems Fund** to reinvest ETS proceeds in greenhouse decarbonisation to support this transition. HortNZ seeks that the **allocative baseline change is delayed until funding is available**, no earlier than July 2025, to allow time for gas contracts to expire and for growers to make fuel or efficiency changes.

5. Projects with Carbon Capture for Greenhouses

Alternative CO_2 sources are in development in New Zealand but not yet commercialised at scale or accessible to all growers. These projects and uptake of their technology can be enabled by Government. New Zealand could be a global leader in developing alternative CO_2 sources, because access to CO_2 for indoor growing is a problem in every country with glasshouses. Here are a few examples of promising projects:

Ecogas has opened the Reporoa Organics Processing Facility, a landmark project to process food waste and produce renewable energy, biofertilizer and renewable carbon dioxide. The facility is located next to T&G Fresh glasshouses, which will use the energy and CO_2 produced by the organics processing plant to grow tomatoes.[12]

Hot Lime Labs in Wellington is in the final stages of commercial development for technology to produce CO_2 from biomass and taking pre-orders.[13] In their system, CO_2 is produced from locally sourced wood waste and absorbed in lime pellets for release upon use.[14] They have successfully trailed their product at Gourmet Mokai, a site that grows tomatoes and capsicums in a joint venture with Māori trusts, where it has been used on a commercial basis since February 2024.[15, 16] The technology developed by Hot Lime Labs is still new and, as such, still has a high cost.

GNS has identified glasshouses as an application for geothermal heating and CO_2 capture, and pinpointed enabling policy, legal and regulatory frameworks as a priority action to scale up geothermal deployment in the agri-food sector.[17]

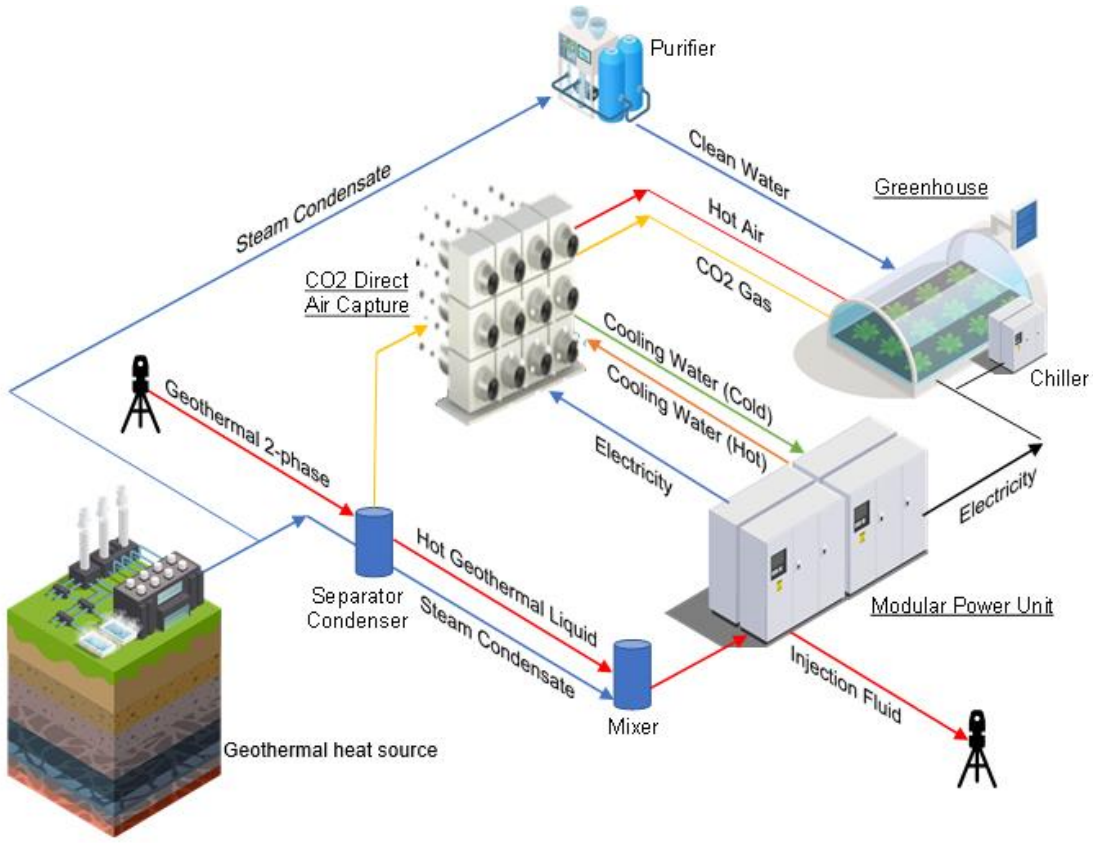
Upflow, a geothermal intelligence company, are designing a Geothermal Food Systems (GFS) project to use "geothermal resources to provide heat, electricity and carbon dioxide

[12] Ecogas opens its flagship Reporoa Organics Processing Facility – Ecogas Accessed 05/08/24.
[13] Hot Lime Labs. "Green CO2 for Horticulture". Accessed 05/08/23.
[14] Nederhoff, Elly. "Covered Crops: Greenhouse energy efficiency". Produced for Tomatoes NZ, Vegetables NZ Inc. (available on request)
[15] Gourmet Mokai - NZ Gourmet. Accessed 05/08/23.
[16] New Zealand Gourmet, personal communication
[17] Wells, Celia. "GeoHeat for Horticulture: Decarbonisation, Adaptation, and Resilience." GNS Science. Presentation for Geothermal Week: Taupō.

for glasshouses" to secure CO_2 availability for growers.[18] Figure 1 shows how Upflow plans to capture CO_2 gas from the air to replace fossil-fuel-derived CO_2. The GFS system will also provide heating, electricity and clean water from a geothermal heat source to power greenhouses.

BioEnergy Solutions NZ uses biomass to generate electricity and sequester carbon, and they are actively seeking development opportunities in New Zealand. Their system can utilise biomass from from forestry waste, green waste, food waste, animal and marine processing waste and bio-waste solids and manure.[19]

Figure 1: Geothermal Food Systems[20]



6. Links to Government Policy

Giving growers time and co-investment to adjust to the new allocative baseline fits within the following pillars of the Government's climate strategy –

- the second pillar, "Credible markets support the climate transition: Pricing emissions fairly and effectively to incentivise emissions reductions", and

[18] Geothermal Food Systems (upflow.nz). Accessed 05/08/23.
[19] Bioenergy Solutions NZ | Energy Junctions Homepage (bioenergy-solutions.eco). Accessed 05/08/24.
[20] Upflow. Decarbonisation Technologies presentation.

- the fourth pillar – "World-leading climate innovation boosts the economy", which contains the aim, "Agriculture industry uses technology to lower emissions while lifting productivity".[21]

Policies to support greenhouse production fit into the following key priorities of the Aotearoa Horticulture Action Plan (AHAP), a sector strategy jointly owned by Government, industry, science and Māori to double export value by 2035.[22]

- Key Priority 1.5: Transition to a low-emissions economy
    - Identify energy-intensive areas of the horticulture value chain and support conversion to systems that reduce greenhouse gas emissions, and
- Key Priority 1.6: Optimise land-use adaptation.

6.1. Further Consultation Questions

Q. 25	Are there regulatory or policy barriers to investment and adoption of CCU technologies?

Lack of regulatory certainty in the ETS due to constant reviews and changing settings is a barrier to investment. In addition, the disestablishment of the GIDI fund has created a vacuum for support to decarbonise. The Government should reinvest the proceeds of the ETS in decarbonisation efforts, including alternative CO_2 sources to support the covered cropping industry in this transition.

Q. 26	What potential markets for CO2 derived products do you see as most critical in New Zealand?

Vegetable production in greenhouses is a key market for CO_2 derived products in New Zealand. It will be essential for greenhouse decarbonisation and to continue providing New Zealanders and export markets with nutritious, New Zealand-grown vegetables and to adapt our food system to the effects of climate change.

Q. 27	Are there any specific barriers to transportation of CO2?

Compressing and transporting CO_2 is an expensive process. Because the CO_2 is transported under pressure, it requires specific systems and containment due to health and safety regulations. These difficulties indicate why producing CO_2 onsite or co-located with greenhouses is preferred, so that no pressurised transportation is required. The alterative CO_2 examples almost all include co-location in their design.

[21] Ministry for the Environment. "Responding to a changing climate: The Government's climate strategy". July 2024. Accessed 10/07/24.
[22] Aotearoa Horticulture Action Plan | Horticulture New Zealand – Ahumāra Kai Aotearoa (hortnz.co.nz). Accessed 05/08/24.