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NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Making the economic case for vegetable production in New Zealand

NZIER report to Horticulture New Zealand

October 2024

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Key points

Objective

This report provides a preliminary examination of the options for freshwater management associated with commercial vegetable production (CVP).

As part of the assessment, we examine the importance of CVP, the regulatory framework and contaminant measurement approaches adopted by councils, and the unintended consequences of restricting CVP.

In an options analysis, we demonstrate why a National Direction for Vegetables is viable. This is underpinned by the importance of domestic vegetable production for New Zealanders.

A National Direction for Vegetables is required

For CVP to continue and grow to meet the needs of New Zealanders, it means providing priority for vegetable growing. This aligns with Horticulture New Zealand's stance that points to the need for National Direction for Vegetables. Specifically, this means:

- Giving CVP priority allocation of the nitrogen containment load *within* the freshwater limits, supplemented with Action Plans, to meet targeted freshwater outcomes. This will not be a significant issue in many catchments, but there are some catchments where CVP is a larger part of the catchment or Freshwater Management Unit (FMU) load. Importantly, these are critical vegetable growing areas and priority is essential to maintain New Zealand's fresh vegetable supply and acknowledging vegetable production can only occur in areas that have the specific combination of soil, climate and resources needed to grow
- The NPS-FM is largely retained, but greater specificity around priorities for human health, including vegetable production, is provided to ensure councils take a consistent approach to applying public good priorities
- Making rules that allow current and new vegetable production as a permitted activity within a freshwater farm plan is required. Vegetable farming should not need a consent
- Ensuring that vegetable production occurs within a Good Agricultural Practice Environment Management System Add-on (GAP EMS) framework. Following GAP EMS means assuring the safe and sustainable production, packing and distribution of fruit and vegetables. It is focused on maintaining production and reducing the impact of nitrogen leaching and sediment discharges
- Where bottom lines are unlikely to be met by freshwater limits alone, action plans are drawn up that work towards meeting those bottom lines. Local solutions in specific areas may need to be supported by resource from central government.

Priority regulatory provision for vegetables is required to safeguard the availability (volume and variety) of fresh vegetables for the New Zealand public at competitive prices.

The benefits of a National Direction for Vegetables

CVP production is mainly focused on meeting demand from domestic consumers. CVP has thin profit margins, and it is very unlikely that imports will replace the volume and variety. Providing a National Direction for Vegetables has potentially multiple benefits:

- Water quality improvements are promoted since each catchment will have outcomes to be achieved within specified timeframes. The impact of CVP having priority will only be a constraint in a few sensitive catchments
- Safeguards health concerns by meeting projected targeted outcomes for freshwater and meeting the vegetable needs of a growing population at competitive prices
- Recognises vegetable growing as a national priority. This is critical since this is the only way that the volume and variety of vegetables we now enjoy can continue
- Encourages administrative efficiency that describes how industries operate and develops rules and regulations that reflect the characteristics of industries being regulated.

Options analysis results

Table 1 summarises the options analysis undertaken as part of this assessment. Option 2 is preferred since it is the only option that meets all the established criteria.

Table 1 Systematic options analysis: Shaping the NPS FM debate

Criteria	Option 1: Status quo, NPSFM 2014/2020	Option 2: National Direction for Vegetables	Option 3: Reduced government involvement in targeted outcome setting
Improve quality water quality			
Human health			
Importance of food production			
Administrative efficiency			
Summary	**May achieve water quality targets, although this is unclear, but unlikely to be workable since the costs are too high**	**Achieves a wider range of government priorities. Recognises a need to balance the costs and benefits and the trade-offs that need to be made.**	**May partly achieve government objectives in the short term. In the long term, it pushes costs onto future generations.**

Notes (1) Pink the criterion is not met, (2) Yellow means the criterion is partly met, (3) Green means the criterion is fully met.

Source: NZIER

While the NPS FM (2014, 2017 and 2020 version) has a focus on water quality, it lacks clarity on how to achieve targeted water quality outcomes (Option 1). We don't know how contaminant allowance should be allocated across land uses or whether they will be

enforceable. There is also no focus, or direction on catchments that will struggle to meet bottom lines. A singular focus on reducing nitrogen at the farm level means that land use change is the only lever, when other levers, including catchment scale hydrological solutions, may also be needed.

The inability of CVP to comply with regional freshwater plans developed under the NPS FM (2020 and earlier iterations) (Option 1) means that production is likely to be severely impacted. The costs in these catchments are too high for a thriving vegetable industry to continue or expand.

Over time, this will have a detrimental impact on:

- Vegetable prices. Work commissioned by the Ministry for the Environment suggests that prices could potentially rise between 20 percent and 100 percent (The AgriChain Centre 2023). For the potential impact on the retail price of broccoli, see Table 4 and Figure 1
- Human health. As fresh vegetable prices rise, the ability of the population to access vegetables at competitive prices decreases. This will have an impact on the health of the population.

In Option 1, economic efficiency has also been partly ignored to facilitate administrative ease in some of these catchments, i.e. generic rules have been used that are geared towards measuring and managing leaching from bigger industries such as dairy.

Option 3, less government involvement in setting the freshwater national direction and regulatory framework, would be a step backwards. It would safeguard CVP (although growers would not be better off), and it would be administratively simple, but water quality and human health outcomes are likely to be poor.

Caveats

Most of the assumptions in this report are derived from studies commissioned by Horticulture New Zealand. Some of these studies have been done for different reasons other than water quality. In these cases, we have been careful to state this.

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1 A lack of priority for the supply of fresh vegetables in freshwater policy and regulations has far-reaching implications for vegetable growing

Horticulture New Zealand requested the NZIER to consider what rules and regulations are required for commercial vegetable production (CVP) to thrive in New Zealand, given that the government is rethinking the approach to managing fresh water.

Specifically, for CVP to thrive means:

- A clear, consistent and achievable regulatory pathway for CVP through rules that allow current and new vegetable production to be permitted as an activity within a freshwater farm plan. Vegetable farming should not need a resource consent
- Ensuring that vegetable production occurs within a Good Agricultural Practice (GAP) framework with the Environmental Management System (EMS) add-on. Following the GAP standard means assuring the safe and sustainable production, packing and distribution of fruit and vegetables. It is focused on maintaining production and reducing the impact of nitrogen leaching, sediment and other contaminants from entering freshwater
- Safeguarding the availability (volume and variety) of fresh vegetables for the New Zealand public.

To do this requires:

- The bottom-line contaminant loads formulated in the National Policy Statement Fresh Water Management (NPS FM) (2014) remain in place
- Vegetable growing contaminant loads are given priority within the targeted freshwater outcomes. This is to ensure that fresh vegetables are available to a growing New Zealand population at competitive prices.

A new approach is required because:

- The impact on vegetable production is not proportionate to vegetable production's national importance. The different rules that have been developed and applied in different catchments under the NPS FM 2014/2017 will significantly reduce vegetable production and it is not clear that under the implementation of the NPS FM (2020) there is sufficient direction around national priorities for this trend to change[1]
- The NPS FM (2020) allows regional councils to develop implementation rules. It is extremely unfair to expect unitary/regional councillors to balance local interests along with national interests, given that local interests are well organised, and consumers nationally are a diffuse group
- The rules have been created with an eye to administrative ease rather than understanding how economic activity is organised. One-size-fits-all approaches do

[1] This builds upon the NPS FM (2014) and subsequent updates.

have implications for efficiency and can add unnecessary costs in an industry that has tight profit margins.

The purpose of this report is to compare and contrast three options facing the government as it contemplates changes to freshwater national direction including the NPS FM. There may be more options, but the aim is to cover the breadth of stances (and the arguments) that the government could potentially consider.

We have drawn on domestic studies, case studies, information from government publications, perceptions of practitioners, past assessments, and other sources.

We have also drawn from Horticulture New Zealand and their publicly released policy position documents to describe the horticulture policy problem and to set out the technical details of vegetable growing and how it interacts with regional planning.

The analysis is intended to give policymakers an indication of the challenges (costs to vegetable growers and consumers) and benefits (improvements in water quality) and the trade-offs that might be considered.

This is a preliminary assessment. Time constraints also mean that no new work has been done in this paper to support this analysis.

2 The challenge confronting CVP

Theory or broad regulatory approaches to policy interventions do not by themselves lead to optimal policy outcomes. Regulation should recognise how markets work and the institutional arrangements in place. Policy interventions therefore need to be based on careful case-by case analysis to assess the trade-offs.

In the implementation phase of the NPS FM (2020) the focus is on the bigger industries such as red meat and dairy. This has left little room for consideration of vegetable production, despite the importance to the New Zealand consumer. To drive durable regulatory performance requires a more comprehensive approach that recognised the significance of CVP.

2.1 Blanket rules are a feature of regional council responses

Vegetable growing is constrained by regional rules which create costs and uncertainty and is making vegetable production increasingly unviable/marginal in some regions. Councils have focussed on addressing nitrogen leaching as a proxy contaminant for achieving freshwater outcomes.

Whilst vegetables have relatively high nitrogen leaching, they have a small physical footprint therefore their contribution towards the total catchment load is mostly small compared to other land uses in many catchments.

Councils have generally controlled nitrogen through blanket rules that limit nitrogen outputs per hectare without consideration of contribution to the catchment load and are agnostic about the contribution towards national priorities from different land uses.

2.2 Specific implications of proposed regional council rules

Under Waikato Plan Change 1 (PC1), CVP contributes only 3 percent of the nitrogen load, but it is the only farming activity that does not have a permitted activity pathway.

In the Horowhenua, 68 percent of the nitrogen load is contributed by grazing land. Unirrigated sheep and beef farming has a permitted activity pathway, and dairy farming has a consenting path[2].

CVP, which only contributes 23 percent of the nitrogen load has an unachievable consenting pathway[3]. Under the council's proposed approach, it will:

- Reduce existing CVP activity
- Make it extremely difficult for a consenting framework that allows for expansion of CVP.

This means that vegetable production is often required to significantly reduce nitrogen leaching. This would be an appropriate response if there was no need to allocate the nitrogen load based on consideration of national priorities.

[2] Agchain 2023 Sensitivity of Domestic Food Supply to Loss in Vegetable Growing Production in Specified Vegetable Growing Area. Report for MfE.

[3] Sands M, et al 2017, Healthy Rivers Plan Change Technical Support for Horticulture New Zealand's Submission. Jacobs (Appendix B)

CVP are unable to significantly reduce nitrogen leaching by reducing yield due to very thin margins. If vegetable production is not given national recognition, regional freshwater planning rules, such as the above proposed regional rules, are likely to reduce CVP. This is despite the importance of the national vegetable supply (a large human health cost) and the small contribution vegetable production makes to the nitrogen load for most catchments.

3 Vegetable growing is a small but significant part of the New Zealand economy, impacting all New Zealanders

3.1 Horticultural overview

Horticulture in New Zealand is big business estimated to reach $7.1 billion in exports in the March 2024 year and is projected to rise to $9.7 billion in 2028 (Ministry for Primary Industries 2024). These exports are driven by kiwifruit, apples, grapes (wine) and smaller crop groupings such as summerfruit.

New Zealand also imports a significant amount of fruit and some vegetables ($260 million per annum). Bananas make up 32 percent of imports. Garlic and beans are the highest volume and value imported vegetables (approximately $8 million each, July 2023 year) (United Fresh Facts 2023).

Vegetables are produced in much smaller volumes, and the main driver is the domestic market. Nearly all, over 80% of vegetables sold by New Zealand vegetable growers, are for domestic consumption. Importantly, New Zealand's geographic isolation means that fresh vegetables (volume and variety) have no real substitutes. If vegetables are not grown in New Zealand, then the ability to import them is limited. While imports add colour and variety for consumers, they are not substitutes for the main bulk of vegetables purchased in New Zealand because of cost.

The majority of vegetables grown in New Zealand are destined for the domestic market. These include cabbage, carrots, kumara, lettuce, broccoli and cauliflower (KPMG 2017).

Vegetable production has changed as the population has grown. In the mid-twentieth century, most vegetables were grown very close to large towns/cities. Many of these areas are now urban subdivisions. The majority of vegetables are grown in places such as Pukekohe, Horowhenua and Canterbury.

Vegetable production in all regions is important since weather conditions impact a large number of microclimates within New Zealand differently. Weather conditions or weather events have different impacts in specific regions, which means that to maintain competitive prices, supply chains need to be flexible as supply conditions change. Smaller production regions such as Nelson, Ohakune and Hawkes Bay, play an important role in creating resilience in vegetable supply.

3.2 Nitrogen discharge allocations are a key component of successful vegetable production

Access to part of the catchment's nitrogen discharge (and water) allocation constrains and enables the production of vegetables in New Zealand.

Under the Resource Management Act (RMA) 1991, contaminant discharge allowances are allocated without reference to national priorities. This has a number of implications:

- There are no priority users of the nitrogen discharge allowance, so domestic food production competes with all other land users who discharge nitrogen
- In the absence of priority allocations, broadly applied nitrogen reduction requirements mean that market forces will prescribe future land use patterns
- Specific allocations of contaminant loads, along with other measures, will be required to meet government priorities.

This is a critical issue given the outcomes sought by regional councils under the NPS FM. In effect, the land uses that may be permitted and consented will be determined by the regulations applied and the instruments that underpin those regulations. The use of this approach will likely have a major impact on land use change. In each catchment, different approaches are being used, which inevitably leads to the NPS FM being inconsistently applied in New Zealand, as some councils may give priority to vegetable production and other councils will not.

In some highly over-allocated catchments with highly modified hydrological systems, we are unsure whether using a mechanism such as the NPS FM on its own, is the most efficient way of determining social and economic outcomes. Future allocation of water across New Zealand may require more specific approaches (in the form of action plans) to ensure that desired outcomes are pursued long-term.

3.3 Vegetable production efficiency is high and labour-intensive

It is estimated that vegetable production is almost twice as efficient as dairy production (see Table 2). These comparisons have been undertaken on similar soil types. Vegetables are a very efficient convertor of nitrogen into food. That is, a high proportion of the nitrogen is used to grow the vegetable plant.

Vegetable growing leaches high amounts of nitrogen on a per hectare basis, but it is unclear that the methods developed by councils take into account the different characteristics of the industries being measured (as set out in Table 2).

Table 2 Reporting of nitrate leaching, surplus and conversion efficiency for two farm types on similar soils

Farm type	Nitrogen leaching kg/ha	Nitrogen surplus kg/ha	Nitrogen efficiency (percent)
Vegetable production	81	31	76 percent
Dairy	41	187	34 percent

Source: Dairy New Zealand in Ford (2019)

Using instruments to examine vegetable leaching that are specifically designed to measure leaching in the dairy industry may not give accurate comparisons. Further, two other issues are important:

- CVP contaminant load in most New Zealand catchments is relatively small despite relatively high leaching per hectare rates because we produce New Zealand's vegetable supply on a small physical footprint. As a result, removing vegetable production from a catchment is not likely to have much impact on water quality outcomes
- CVP production is labour-intensive. The following table sets out the importance of CVP on a per hectare basis (see Table 3).

Driving CVP production decreases through the NPS FM while using methods that are poor proxies for vegetable production leaching is likely to have a major impact on regional employment and have little positive impact on water quality nationally, given the small size of the industry. The likely (small) benefits of restricting CVP will come at a great cost to vegetable growing.

Table 3 Economic contribution of CVP

Farm type	Gross revenue per hectare ($ m)	Value added multiplier ($ m)	Employment multiplier (FTE)
Root crops	2.23	1.16	8.6
Leafy greens	2.99	1.55	11.4
Market garden	3.65	1.90	14.0
Dairy	0.80	0.42	2.4
Maise	0.65	n/a	n/a

Source: Ford (2019)

3.4 Consumers mainly buy from supermarkets

The focus on domestic production means that demand is driven by population growth, which has been between 1 percent and 2 percent per annum. Despite the strong demand for vegetables, growing vegetables is a competitive business. The main outlets are supermarkets that negotiate competitive prices for produce.

We know that many vegetable producers operate on thin margins. Auckland City Council, along with Horticulture New Zealand, contracted Perrin Ag Consultants (2023) to further understand grower returns. What Perrin Ag Consultants (2023) showed is that while demand is growing:

> *"The gross margin for weighted average Commercial Vegetable Production was $14,384 per hectare per year. The annual profit was $3,740 per hectare per year…*
>
> *… The annual earnings before interest and tax (EBIT) for kiwifruit was $44,390 per hectare per year."* Perrin Ag Consultants (2023, page 6)

Perrin Ag Consultants (2023) reported that the weighted average data indicate that the average annual profit from a vegetable rotation in Pukekohe was approximately 10 percent of the revenue. This data strongly suggests that the ability of vegetable growers to embark upon costly mitigations is limited.

Growers are caught between market requirements and losing contracts for short or non-supply. The main way to reduce fertiliser and the resulting nitrogen leaching is to match crop nitrogen uptake with fertiliser application. There are few other ways to reduce

nitrogen other than to reduce crop yields which erode already thin margins. Manageable mitigations can occur with GMP but once a grower has reached GMP there is little more that they can do other than land use change[4].

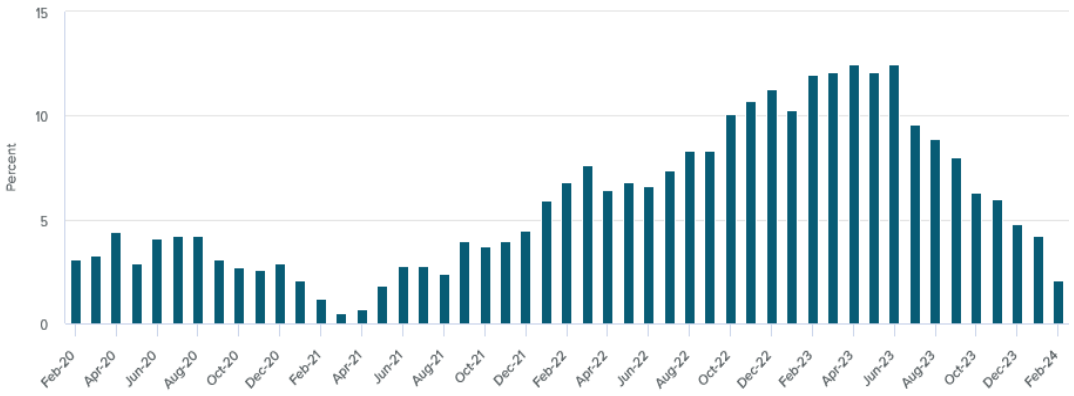
The one exception is when vegetable prices spike because of constrained supply. Vegetable prices are reliant on few disruptions in the marketing chain and stable weather conditions. Adverse weather conditions and COVID-19 disruption spiked prices quickly. This suggests there is a high variation in prices when disruptions cause a decrease in production, coupled with the inability to increase volumes from other sources (such as imports).

Significant price increases of food over the 2020–2024 period were driven by supply disruptions and weather events (see Figure 1). Statistics NZ commented that since August 2023, "*cheaper prices for fresh produce such as tomatoes, broccoli, and lettuce drove the decrease in fruit and vegetable prices*" (Statistics NZ 2024).

Importantly, significant price rises have not caused a flood of imports. This confirms Horticulture New Zealand's contention that we have few alternatives to growing fresh vegetables domestically.

Growers are price takers, so the market sets the price. They are extremely vulnerable to price fluctuations caused by surpluses and shortages. Price rises at the supermarket checkout do not necessarily mean that growers receive higher prices for their vegetables, indeed sometimes the prices they receive are lower than the cost to produce, Sands (2022) and Levenson (2023).

Figure 1 Food prices, annual percent change



Source: Statistics NZ 2024

3.5 The relationship between constrained production and vegetable price rises

For a number of years, Horticulture New Zealand has been concerned that population growth will put pressure on the ability of growers to supply vegetables. They are particularly concerned about land scarcity as land for growing was being competed away for housing developments.

Two recent studies examine the possible impact of production constraints and price rises.

[4] Horticulture NZ pers comms.

Using an economy-wide model, Deloitte (2018) ran a number of scenarios that examine the impact of constraining the growth in horticultural production in the Pukekohe area. While this is not strictly modelling NPS FM outcomes, it does indicate what to expect if horticultural production is constrained in the important vegetable-growing area of Pukekohe.

Deloitte 2018 assumptions expect:

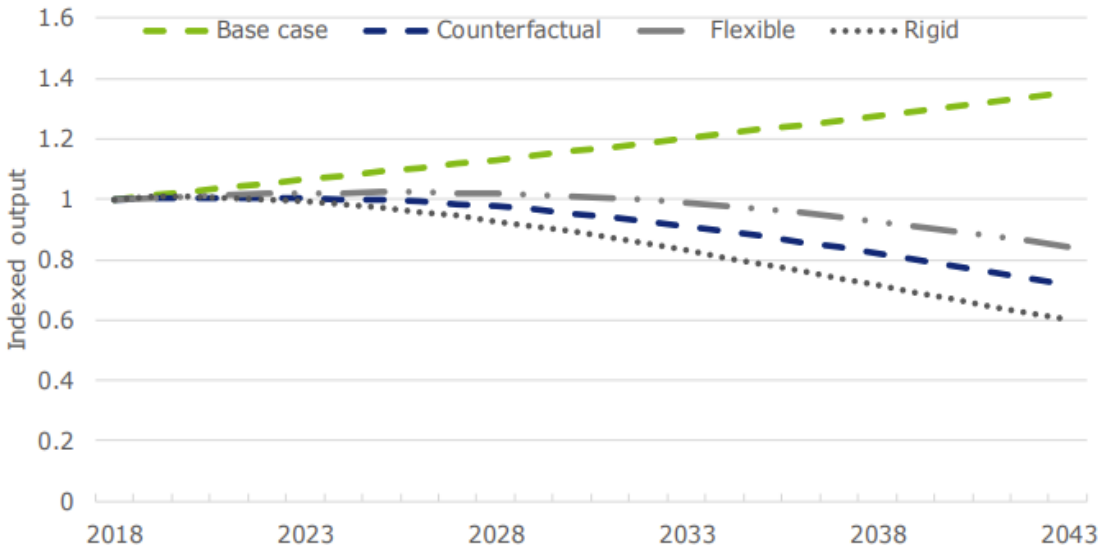
- The Auckland population grows by 37 percent between 2018 and 2043
- Demand for horticultural products to grows by 33 percent.

Deloitte ran two scenarios:

- Growers change farming practices in response to land constraints. Volume drops by 38 percent by 2043 (relative to the counterfactual used)
- Land use restrictions further constrain land scarcity. Volume drops by 55 percent by 2043 (relative to the counterfactual used).

The second scenario has implications for the likely impact of the NPS FM (2020). As a result of the land use restrictions, the economic losses were expected to be approximately $1.1 billion, a loss of 4,500 FTEs, and, most importantly, a decline in production (55 percent), leading to a 58 percent increase in prices. We are most interested in the impact of the decline in production since the NPS FM (2020) would restrict land use for vegetable growing (Figure 2).

Figure 2 Expected output decline



Source: Deloitte (2018)

3.5.1 How likely are these results?

Will the price rises be as dramatic as Deloitte expects? The AgriChain Centre (2023) study for the Ministry for the Environment, suggests that constraining vegetable production by between 5 percent and 10 percent is likely to push vegetable prices up by between 10 percent and 20 percent. Further, if vegetable production is constrained by 20 percent, then prices could rise between 20 percent and 100 percent.

This provides more evidence of the likely impact of constrained vegetable production on prices that consumers will face and suggests the Deloitte estimate is a low estimate of the potential price increase.

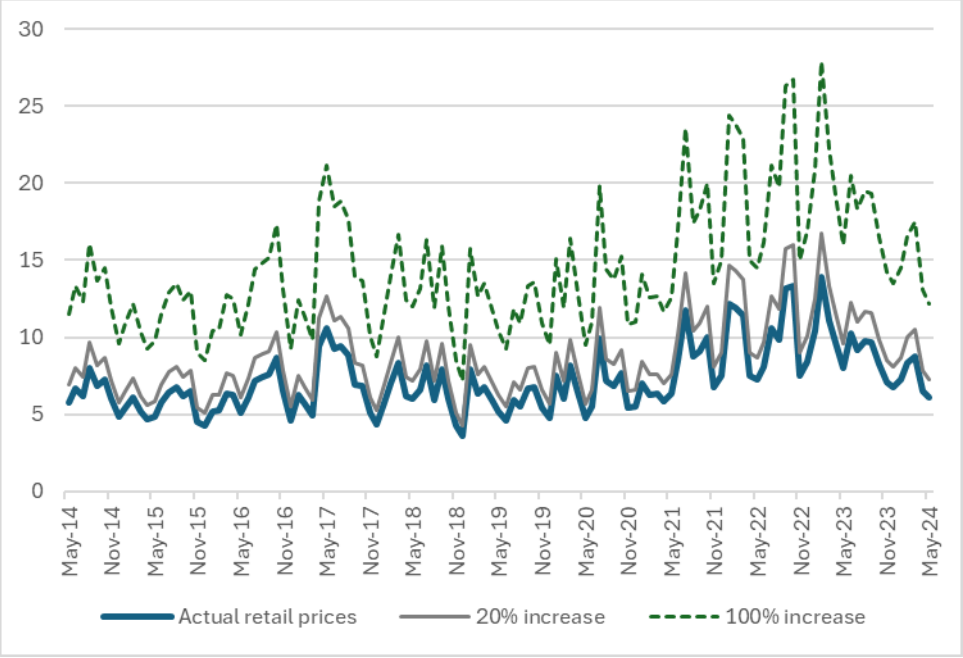
3.5.2 Price impacts: the case of broccoli

To illustrate the importance of CVP production, we have taken the retail price of broccoli since 2014 and increased it by 20 percent and 100 percent, in line with The AgriChain Centre's (2023) estimates.

This is a hypothetical thought experiment that focuses attention on the impact of a 20 percent (or more) reduction in CVP production as a result of how the NPS FM has been and could continue to be applied in various catchments, importantly noting that the effects of the regulatory barriers to vegetable production that are being put in place in regions such as Waikato and Horizons have not come into effect yet. For this scenario it assumes that the regulations are in place by 2014.

The volatility of the retail price of broccoli is evident. Actual prices range between approximately $4 per kilogram to $14 per kilogram. This is driven by weather conditions and supply disruption over the COVID-19 period. Table 4 Broccoli prices with and without a hypothetical NPS FM (Table 4).

Figure 3 Broccoli retail prices and the potential impact of the NPS FM (2020)



Note (1) Assumes that the NPS FM 2020 was in place in 2014.

Source: Statistics NZ and NZIER

Table 4 sets out the likely dollar-per-kilogram range for actual prices and the hypothetical prices as a result of how the NPS FM 2020 has been applied. Volume reductions are just one impact since some vegetables will not be grown. What those crops are is difficult to say since it would be up to growers to decide based on what consumers are prepared to pay. Some vegetables in some parts of the year will not be available at any price.

Table 4 Broccoli prices with and without a hypothetical NPS FM

	Actual prices	20% price increase (hypothetical)	100% price increase (hypothetical)
Low	$3.57 per kg	4.28 per kg	7.14 per kg
High	$13.95 per kg	16.74 per kg	27.90 per kg

Note (1) Assumes that the NPS FM 2020 was in place in 2014. This drives the hypothetical price increase.

Source: Statistics NZ and NZIER

The restrictions on supply are picked up in the actual series (see Figure 3 above). This gives a glimpse of the likely price rises with restricted vegetable production. The COVID disruptions, impacts of Cyclone Gabrielle and prolonged periods of bad weather can be seen in the data between 2021 and 2023. It has only been over the last year that we have returned to good growing conditions.

Another impact of the reduction in prices is likely to lead to higher price volatility, i.e. prices are likely to spike higher than represented in Figure 3. The sensitive nature of prices will be driven by lower overall volumes of vegetables in the market.

3.5.3 Why is vegetable production important in all regions?

There are many microclimates in New Zealand where vegetable production can thrive. This means that each grower contributes to the national vegetable supply. This also means that the supply chains for vegetable production require flexibility and can be complex as weather conditions and supply chain hold-ups constrain what vegetables are available for market – both locally and nationwide.

Constraining vegetable supply in all regions with unworkable rules will have major consequences for vegetable prices across the country. Decisions made in the Hawke's Bay to restrict vegetable supply will have upward price implications for consumers in the South Island.

There has been a tendency for local government decisionmakers to focus on the impact of vegetable growing on water quality in their catchment where vegetables are a major part of the rural economy. However, these areas play an important role in supplying the rest of New Zealand. Vegetable production and the regulations that govern it may be applied locally but the effects on vegetable production are important in all parts of New Zealand.

3.6 Impacts on human health are likely to be negative

To illustrate the impact on human health of CVP prices rising, Horticulture New Zealand commissioned work to examine the health impacts of a constrained vegetable sector.

Using the economic results developed by Deloitte (2018) (see section 2.3), Cleghorn (2020) develops two scenarios that demonstrate the impact of a rise in vegetable prices over the next twenty-three years. The scenarios model[5] includes:

[5] A discount rate of 3 percent was used in this analysis.

- A 2 percent cumulative price increase per annum. After 23 years, vegetable costs are 58 percent more relative to the baseline price
- A 2.5 percent cumulative price increase per annum. After 23 years, vegetable costs are 76 percent more, relative to the baseline.

Cleghorn finds that incremental increases in vegetable prices will have a detrimental impact on New Zealanders' health.

- Under a 2 percent per annum vegetable price increase, health costs are likely to be $500 million by 2043. Based on a reduction in health-adjusted life years (HALYs) (58,300 reduction in HALYs)
- Under a 2.5 percent per annum vegetable price increase, health costs are likely to be $610 million by 2043. Based on a reduction in HALYs of 72,800.

The impact of the NPS FM (2020), particularly how it is proposed to be implemented, will have a negative impact on human health. Price rises in vegetables will restrict consumption, particularly among low-income communities.

3.7 Horticulture can play a role in New Zealand's emissions reduction plan

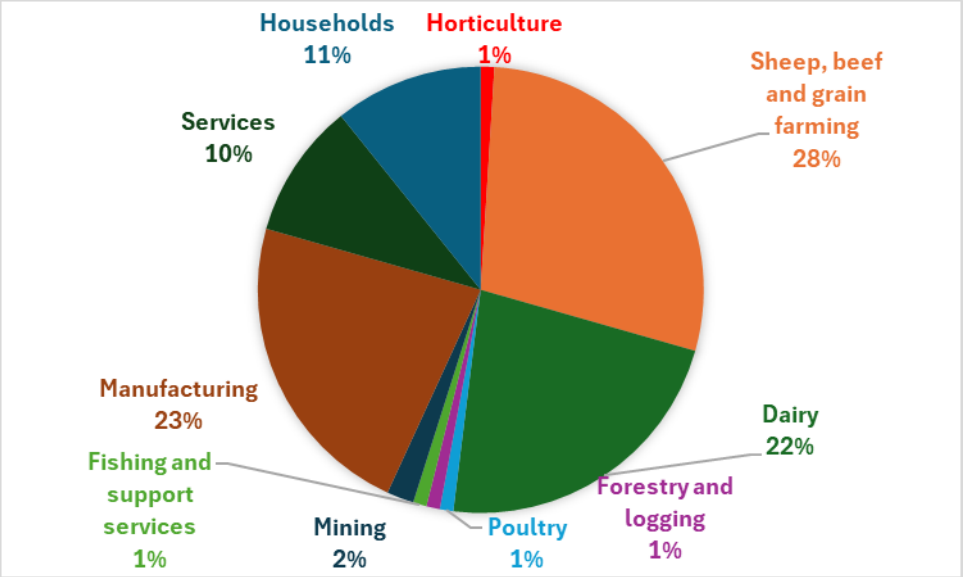
New Zealand has a unique emissions profile with a substantial proportion of emissions from agriculture. Meeting 2050 targets will require all industries to respond positively.

With agriculture contributing about 53 percent of New Zealand's greenhouse gas emissions, we have a significant problem. Part of the response is developing, acquiring and adapting best practice technology to reduce greenhouse gas emissions. Diversification of what we grow on the land will also be necessary.

Horticulture can play a positive role in this process as it is a low emissions land use. If higher emissions land uses diversify into horticulture our overall emissions profile will go down. Horticulture can potentially increase production and reduce emissions. According to MPI, there are potentially 1,000,000 hectares of land that could be developed as demand for plant-based foods increases (Dorner et al. 2018).

Moving this land into horticultural production would have significant positive impacts on New Zealand's emissions profile (Figure 4).

Figure 4 Emissions by Industry (Year ending 2022)



Notes (1) year ending 2022. (2) Percent of New Zealand's total carbon dioxide equivalent.

Source: Statistics New Zealand 2022

4 Water quantity and quality management are yet to be determined

4.1 The NPSFM (2020) does not prioritise vegetable production

The National Policy Statement Fresh Water Management (NPS FM) has gone through a number of iterations since it was first initiated in 2008 with a Board of Inquiry (Ministry for the Environment 2021).

The NPS FM was introduced in 2011. It was updated and replaced in 2014 and amended in 2017. Further direction was developed in 2020 (the NPS FM 2020), and there were subsequent amendments in 2022 and 2024.

The current plans were made under the 2014/17 NPS FM. The NPSFM (2020) has not been fully implemented. The main issue for vegetables is that the NPS FM, as implemented to date, constrains vegetable production.

For vegetable growers there are no consistent signals in regulatory responses to the NPSFM (2020) that place priority on CVP.

4.2 The NPS FM (2014) introduced national bottom lines

The NPS FM (2014) introduced a national objective framework as a way to assist regional councils in applying the requirements of the NPS FM in a consistent way across the country.

The national objectives framework specified the process regional councils must use to set freshwater objectives. Objectives were, as a minimum, to be set for two compulsory values:

ecosystem health and human health for recreation. Some national bottom lines were introduced for the compulsory values.

Objectives needed to be above the national bottom lines. The attributes that needed to be measured (e.g. total nitrogen, nitrate toxicity, periphyton) and their associated national bottom lines in the Freshwater NPS were selected on the advice of specialist science panels.

4.3 NPS FM (2017) provided further clarification and increased specificity

In 2017, the government amended the NPS FM so that it would:

- Introduce national targets for swimmable lakes and rivers
- Increase direction for Te Mana o te Wai (freshwater priorities) in freshwater management
- Provide direction for monitoring macroinvertebrates, managing nitrogen and phosphorus, and considering economic wellbeing
- Require regional councils to improve water quality so that it is safe for human contact and use which in turn improves human health.

4.4 The NPS FM (2020) introduced faster implementation

The NPS FM (2020) provided a new national direction to protect and improve rivers, streams, lakes and wetlands. The aims were to stop further degradation of freshwater using the 'national freshwater package' - the NES and NPS bundle with bottom lines specified in the NES FM.

The NPS-FM 2020 introduced a hierarchy of obligations through Te Mana o te Wai. This means:

- Looking after the health and wellbeing of water first
- The second priority is the health needs of people (such as drinking water)
- The third priority is improving cultural, social and economic wellbeing.

The NPS FM (2020) was a step up from other NPS FM updates since it provides a new direction that imposes strict guidelines to drive improved water quality and achieve the expected benefits.

Further amendments have been made as a result of a court case that quashed the exemptions for specified vegetable growing areas.

4.4.1 Further reform is occurring

The incoming Government is reforming the national direction for freshwater, including the NPS-FW 2020. The new government has repealed the Natural and Built Environment Act which included an important policy signalling the national importance of the supply of fresh fruit and vegetables in national direction.

5 What an optimal regulatory framework needs to consider

Below, we set out how the NZIER approaches regulation and the choices that the regulatory regime has developed. The aim is not to come up with an 'answer' but to illustrate what the government needs to consider when developing environmental regulation and specifically how it might impact industries and the economic implications for New Zealand.

5.1 What are we looking for in a policy framework?

The policy framework should aim to maximise welfare over time with respect to environmental risk and cost as well as production and consumption. In an ideal world, the market takes care of these outcomes. In real-world situations, however, market failure can occur, which necessitates regulatory intervention.

In general economic terms, less regulation is preferable to more. This reflects the general starting point of our laws, which is that people should be free to engage in activities unless they are prohibited for some good reason.

More specifically, good regulatory design should signal the importance of innovation for economic growth and the maintenance and enhancement of New Zealand's standard of living. This is why, for example, New Zealand has signed up to international agreements (under the TRIPs Agreement of the Uruguay Round) on intellectual property laws that give patent holders uniquely powerful property rights.

When it comes to environmental protection, it is widely accepted that the pursuit of economic growth by itself may increase the risks of environmental damage and that some restraints are needed on the types of activities that may be undertaken and the manner in which they are undertaken. This is 'sustainability', which is at the core of the RMA, along with managing externalities (such as nitrate leaching). The policy question then becomes how to design a balanced and appropriate regulatory regime in terms of the substantive rules, the associated processes and institutions, and the practical application of the regime (in this case, the NPS FM).

What should a regulatory framework look like? Below, we set out some of the fundamental questions that need to be addressed when designing any regulatory regime to be effective and appropriate. These questions are based on simple principles in relation to regulatory policy design, which are reflected in many publications (which are specific to New Zealand conditions) and from the NZIER's practical experience in developing and advising on policy in a range of fields.[6]

The important questions are:

- What are the policy objectives?
- Will the proposed regime advance those objectives? In principle? In practice?
- What are the associated costs?

[6] See for instance: Gruensprecht and Lave (1983), and Rose-Ackerman S (1996), which contain good background material. For New Zealand policy, see (Hawke 1993) for a sound overview.

- Do the benefits from the regime (measured in terms of advancing its aims) justify the full costs associated with the regime? Can the costs be reduced without appreciably compromising the benefits?

These questions are revisited when we summarise the options analysis developed in section 5.

5.2 We have looked at freshwater management through an options framework

Options analysis has been used to illustrate the most efficient and effective way to balance freshwater management objectives with food availability for the current population and future populations.

Options analysis allows the decision-makers to connect their own priorities with the criteria used and the options that best suit their purposes. It maximises the chances that regulatory development provides the best possible outcomes balancing:

- Desirability (does the option do what we need)
- Viability (does the option offer durable outcomes)
- Feasibility (do we have the resources to implement this option).

5.3 What are the government priorities?

This is the crucial first step. These must be decided first since they drive the process. For example, it is clear what the NPS FM was set up to do: improving water quality was the number one priority.

In effect, the policy was driving towards improvements in water quality. This is a high-risk approach in the absence of outlining other, clear national priorities since, while the benefits are clear, the impacts are likely to have far-reaching consequences since the ability of some catchments to meet bottom lines within the timeframes stipulated would not be possible, creating particular industries within those catchments, in particular for vegetables.

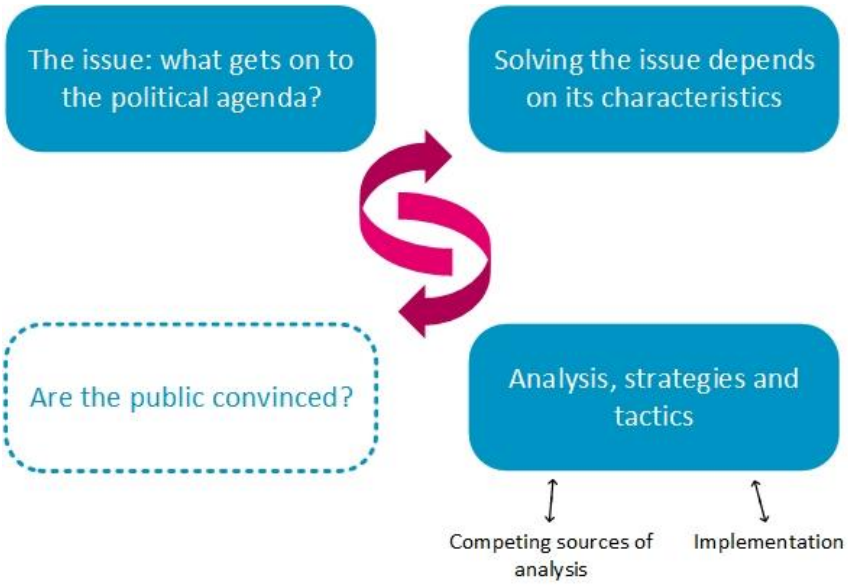
The government's priorities need to reflect a degree of public acceptance. While most New Zealanders would like to see improved water quality, there is a question about how much they would be prepared to pay for that privilege. Prospective policy needs to be put into the context of how to maximise policy durability. The key processes that impact on policy durability include:

- Agenda setting. What gets on to the political agenda is dependent on a raft of issues such as the stage of the political cycle, determination of interest groups, relationships between Ministers, events, openness to ideas, dealing with coalition partners and cross-party relationships. The NPS FM is on the agenda because of the disquiet about the compliance costs and wider economic costs within the rural sector
- The political strategies in play and how effectively politicians manage the political process
- Operational strategies, tactics, and analysis are developed to support the political strategies
- Determining how the above dot points impact public perceptions by those in government.

By far, the most important influencing factor is the public perception of how well the government is managing the stock of policies.

Any policy such as the NPS FM needs to consider the breadth of costs and benefits, as well as the trade-offs required. If the public is not satisfied with the outcomes, then the issue remains live (see Figure 5).

Figure 5 The policy wheel



Source: NZIER

5.4 What criteria would be used to judge policy options?

When developing criteria, the aim is to make any policy consistent with government priorities. The specific issue we are addressing is how to balance the needs of vegetable producers to provide for New Zealand's current volume and variety of domestic vegetable supply, and a small increase for projected population increases, at competitive prices while at the same time taking steps to improve water quality.

In this respect, the Te Mana o te Wai framework introduced in the NPS FM (2017) and (2020) points to criteria that could be used to explore the options that could be considered. In particular:

- Water quality. The health and wellbeing of water bodies and freshwater ecosystems
- Health of the people. Drinking water but also access to fresh vegetables
- Ability for populations to provide for their needs now and in the future. Vegetable growing fits into this category.

Other criteria may also need to be considered. These could include cost, strategic consistency, implementation ease, durability, impacts on production, and cultural factors such as implications for the Treaty of Waitangi. Some of these are covered in the Te Mana o te Wai framework; some are not.

Our preliminary assessment would be to use the following criteria but would be open to further discussion depending on the priorities of the government. We have decided on these criteria since they have been used before (why reinvent the wheel) and are drawn from NZIER's experience with regulatory processes.

- Water quality must be one of the criteria used since this regulatory approach is about freshwater management
- Health of New Zealanders. Water quality is one component of health. Fresh vegetables also need to be considered
- Recognition that vegetable production is required to support a growing population. This criterion explicitly states the need for vegetable production that allows a *growing* population to access fresh vegetables.
- Administrative efficiency. Implementation of regulations is a critical component of regulation durability. Regulations must have regard for the way industries operate since badly implemented regulation can have major impacts on the efficiency and effectiveness of industries.

We also have not commented on how we approach consultation with Māori. This is beyond our expertise.

6 What are the options to consider?

Central to policy evaluation is assessing a range of options. Options analysis is used as a vehicle to weigh up the benefits, risks, and trade-offs associated with each of the options.

The aim is to set out three options to compare and contrast different approaches to freshwater management as it relates to growing vegetables.

It should be stressed that this is a preliminary assessment by the NZIER, and the options have been chosen to illustrate how the comparisons can work. We fully realise that other options could be considered, or combinations of the options examined.

6.1 Option 1: The current water management regime (NPS FM 2014/2020)

The status quo (Option 1: NPS FM (2014/2020)[7]) is now under review and its subsequent updates. The NPS FM (2020) sets out the objectives and policies for freshwater management under the RMA. It replaced the NPS FM (2014) and its amendments in 2017. The NPS FM 2020 has yet to be implemented, and the current government has signalled that reform is required.

6.1.1 Water quality

Under the NPS FM (2014/2020), there is a strong focus on water quality. However, water quality is only one of the priorities considered. Water quantity, habitat, aquatic life, and ecological processes are the others.

The NPS FM (2014/2020) required regional councils, in consultation with their community, to develop a plan for maintaining or improving the state of freshwater in the region. There are a number of compulsory values and attributes (measures of the state of a river or lake) that must be met, and communities can choose to go above and beyond these measures.

Despite the focus on water quality, it is very unclear whether the NPS FM (2014/2020) will deliver the targeted water quality outcomes. The lack of clarity over how allocations are made means that we cannot be certain that the allocation decisions councils will make will change land and water use in a way that delivers the targeted water quality outcomes. Hard-targeted outcomes without sanctions will not be enforceable.

There is also no focus or policy direction on catchments that will struggle to meet bottom lines. This is where action plans, a focus on innovation, and land use change may be necessary to make real progress.

The NZIER assessment is that it is not clear that the NPS FM (2014/2020), despite its focus on water quality, will meet its targeted outcomes (marked in green and yellow in the following table).

[7] We have used the NPS FM 2014 and 2020 since both are partially in force currently.

Table 5 NPS FM (2014/2020): water quality

Criteria	NZIER view
Improve quality water quality	

Notes (1) Green means the criterion is fully met, (2) Yellow means the criterion is partly met.

Source: NZIER

6.1.2 Human health

Human health needs are also recognised as a priority under the NPS FM (2014/2020). The example given in most of the explanatory material supporting the NPS FM (2014/2020) is improved quality of drinking water (Ministry for the Environment 2023).

It is undoubtedly true that the NPS FM (2014/2020) will maximise the chances of meeting targeted outcomes for drinking water. However, it is unlikely that it will meet the needs of the population for fresh vegetables. This will have negative health consequences. These are set out in section 2.6.

In the most sensitive catchments, vegetable production is likely to be cut back sharply since water quality measurement approaches heavily restrict vegetable growing activity and also do not allow production to expand.

The NZIER assessment is that the unintended consequence means that it is unlikely that the NPS FM can fully meet the criteria for improving human health (marked yellow in the following table).

Table 6 NPS FM (2014/2020): human health

Criteria	NZIER view
Human health	

Notes (1) Yellow means the criterion is partly met.

Source: NZIER

6.1.3 Recognition of food production to support a growing population

From section 2.2, it has been established that vegetable growers operate on thin margins (Perrin Ag Consultants 2023). Furthermore, we also know that the most effective water quality mitigation approach is to control the total growing environment by moving crops indoors. This occurs for high-value crops (e.g. tomatoes).

For indoor systems to become more widespread, the costs of growing indoors must come down significantly, or the ability to pay for vegetable price increases. Also, not all vegetables are suitable for indoor growing.

These industry characteristics constrain the capacity of vegetable growers to meet both objectives for reduced impact on water quality while increasing production. The NPS FM (2020) needed to consider the ability of the vegetable industry to meet current and future demand for New Zealanders. In principle, it does so through the priorities set through Te Mana o te Wai (see section 3.1.3). However, in practice, Horticulture New Zealand has

found, as they deal with councils, that vegetable production is given inconsistent regional recognition.

One of the problems pointed to by Horticulture New Zealand has been that it is difficult for local politicians to consider the national interest (in this case, the need to grow vegetables) alongside local issues.

NZIER would go further than this. It is unfair that local politicians are put in this position since they are confronted with well-organised groups focused on improving water quality 'in their own backyard'. The national interest is lost in this debate since consumers are a diffuse group and don't all vote in areas where vegetable growing is important. Without any coherent voice setting out the costs associated with declining vegetable production, it is very unlikely that the NPS FM (2020) will address food production concerns or the need to increase the production of vegetables to meet a growing population.

In economics and other disciplines, this paradox is well known, and it does require central government action to correct the problem (Olson 1965). Although, it is important to recognise that some councils have considered the national interest and have made provision for vegetable production. This is inconsistent across New Zealand, and while some councils will meet the criterion, others will not. (marked in pink and yellow in the following table).

More importantly, the inconsistent application of regulations governing vegetable production across New Zealand leads to a mismatch in priorities regionally and nationally. The NZIER assessment points to the inability of council policies to be durable under the NPS FM (2014/2020).

Table 7 NPS FM (2020): Importance of food production

Criteria	NZIER view
Recognising the importance of food production	

Notes (1) Pink means the criterion is not met, (2) Yellow means the criterion is partly met.

Source: NZIER

6.1.4 Administrative efficiency

How regulatory regimes are administered can have a major impact on the efficiency of any policy action. For a policy to be effective, it must have some regard to how industries operate.

Understanding how industries operate allows for more efficient and effective policy development and can potentially mean better long-term outcomes. However, when administrative ease is substituted for administrative efficiency, it can create real and unnecessary disruption within industries.

Administrative ease occurs when the government and/or councils focus on minimising their administrative costs exclusively. What is forgotten are the compliance costs the industry faces and the wider costs to society of any regulatory action.

The NZIER assessment points to the likelihood of NPS FM (2020) having elements of administrative ease since it allows regional councils to dictate how they will apply the NPS

FM (2020). Councils indeed have custom-built tools to measure water quality; however, these tools tend to focus on larger, pastoral based industries such as dairy or the red meat sector.

Care is required when measuring contaminants and water quality assessments

Relationships between land use and water quality are complex, with interdependencies, feedback loops, and legacy effects. Land use intensity measured by kilograms of nitrogen per hectare losses (or kilograms per hectare inputs) is useful when managing localised risks of nitrogen leaching.

According to Horticulture New Zealand, councils have applied nitrogen per hectare leaching rates to control nitrogen without considering implications for national priorities such as the domestic supply of vegetables. Also, the approaches by councils appear not to consider whether the activity has a small load contribution despite high nitrogen applications per hectare.

NZIER believe that the focus has been on reducing administrative costs rather than compliance costs and wider economic complications. This means that it is more likely to undermine policy objectives. Councils needed more guidance on this from central government to ensure that workable policies are put in place.

Industries also need to have confidence that the models used provide reliable estimates of leaching activity at the farm level. The Overseer model used in the Horizons One Plan was referenced against grass growth rates rather than vegetable growing activities. This creates uncertainty around the results, particularly when very few vegetable growing operations meet specified limits set within Overseer.

Other catchments have faced similar issues with Overseer (e.g. Waikato Plan Change 1). This reduces confidence in the measurement of leaching loss rates used for vegetables at the farm level.

Inconsistent treatment between larger pastoral farms and CVP land owned and land leased

Typically, leaching rates are measured over a whole farm owned by the farmer and averaged. CVP often occurs on small, homogenous parcels of land so leaching rates are generally the same across the operation. Large, multi-use pastoral farms have varied leaching rates across the farm and can have average leaching rates leading to higher leaching areas being cancelled out by lower leaching areas.

Leasing land is common practice for growers. It makes sense as they need to be dynamic and move rotations to maintain soil health. Horticulture New Zealand believes that when a grower moves to a new leased, swapped or owned paddock, that it is just movement of existing CVP, not expansion. Because consents are often tied to specific land parcels in regional plans, rotation can erroneously trigger expansion rules.

From an NZIER perspective this type of regulatory approach hampers the ability of growers to organise their businesses in an efficient way. It blunts technical efficiency (the cost per hectare) as leasing costs increase, allocative efficiency (matching) by increasing the costs of using productive land best suited for vegetable production, and dynamic efficiency (innovation) since growers cannot easily take advantage of new leasing opportunities.

The application of regulations needs to be consistent across all ownership types and reflect the leaching activities that occur. This required more thinking about how leaching

measurements were to be applied under the NPS FM (2014/2020). While measurement of leaching techniques gives a generalised view of activity on a farm, it does not tend to be specific enough to capture the full impact in the catchment.

As a result, the NZIER believe that the NPS FM (2014/2020), as applied in regions, is only partly able to meet this criterion (marked in yellow in the following table).

Table 8 NPS FM (2014/2020) Administrative efficiency

Criteria	NZIER view
Administrative efficiency	

Note: (1) Yellow means the criterion is partly met.

Source: NZIER

6.2 Option 2: National Direction for Vegetables

Horticulture New Zealand are arguing for a National Policy Direction for Vegetables. The NZIER supports this approach since, while the industry is relatively small, it has a major impact on New Zealand society in the form of the provision of fresh vegetables at highly competitive prices. This is underpinned by New Zealand's distance from alternative potential vegetable suppliers, the need to ensure fresh food availability (food security), and the need to counter the long-term health implications of a reduction in the supply of fresh vegetables.

To enable an efficient and effective national direction approach requires:

- Vegetable production is allowed to occur, providing that it meets Good Agricultural Practice (GAP) scheme standards with the NZGAP Environmental Management System (EMS) add-on. GAP assures the safe and sustainable production, packing and distribution of fruit and vegetables (it is about maintaining production and reducing the impact of nitrogen leaching)
- Vegetable production not needing a consent and not needing reductions in contaminants/mitigations that reduce production to the point it is unviable
- Allows for vegetable production to occur as a priority. That is, the cumulative effects of commercial vegetable growing are managed using the NPS FM framework
- Action plans are drawn up to augment nitrogen limits in identified catchments with the purpose of achieving desired freshwater outcomes.

Vegetable growing is in a unique situation in New Zealand, and this needs to be recognised in a way that safeguards its production.

6.2.1 Water quality

Whilst this option allows CVP as a permitted activity, an important part of this proposal is that the cumulative effects of commercial vegetable growing are managed within the established NPS FM framework, i.e. are not an exception to limits but are managed with limits and action plans. In this way, the water quality objectives do not differ from those of current regulatory regimes.

In sensitive areas, action plans in addition to limits will be required, to ensure that limits are not designed in a way that would drive additional reductions from other land uses to accommodate the CVP priority. This will allow for a focus on the most appropriate mitigations given the multiple activities and processes, including the topographical features, vegetation characteristics, climate, and land use activity.

It will also mean a requirement for GAP standards (including the EMS add on) to be applied across all vegetable operations.

As a result of providing clear allocation priorities, NZIER expect that water quality targets can be reached, and this criterion can be met under the national direction for vegetables (marked in green in the table below).

Table 9 National Policy Direction for Vegetables: water quality

Criteria	NZIER view
Improve quality water quality	

Note: (1) Green means the criterion is fully met.

Source: NZIER

6.2.2 Human health

Under national direction for vegetable growing, we expect that human health objectives to be met for:

- Water quality and its impact on drinking water
- Reduced constraints on vegetable production.

The main reason for this is that vegetable production will continue (since it has priority), and the catchments where CVP occurs will meet their water quality objectives

In sensitive areas (where water quality is below National Bottom Lines), we expect that NPS FM objectives and limits, combined with action plans will, over time, have a positive impact on water quality.

Maintaining water quality by maximising chances of clean drinking water and allowing for food production targets to be met. NZIER believe that the human health criterion can be met under the national direction for vegetables (marked in green in the table below).

Table 10 National Policy Direction for Vegetables: human health

Criteria	NZIER view
Human health	

Note: (1) Green means the criterion is fully met.

Source: NZIER

6.2.3 Recognition of food production to support a growing population

Vegetable production supplies the New Zealand domestic market and being a demand-based industry with demand determined by population size, expansion of vegetable production areas will only grow at the rate of population growth. Giving vegetable

production priority within NPS FM limits means safeguarding vegetable production in New Zealand.

By developing this approach, a better appreciation may be developed of how regulators and the industry view vegetable production as part of a national system, with identified strengths and weaknesses.

Currently, there does not seem to be an awareness that decisions made in the Auckland or other regions can impact vegetable supply around the country. Through the national direction, the aim is to develop a coherent understanding of the production of vegetables and focus on continuous improvement in sensitive areas. This will be done through the use of action plans, innovation and in some cases, land use changes.

NZIER suggests that recognition of vegetable growing as a priority will mean that this criterion will be fully achieved under national direction. The recognition of the importance of the food production criterion can be met under the national direction for vegetables (marked in green in the table below).

Table 11 National Policy Direction for Vegetables: food production

Criteria	NZIER view
Importance of food production	

Note: (1) Green means the criterion is fully met

Source: NZIER

6.2.4 Administrative efficiency

By dealing with the administrative issues that have arisen with the NPS FM (2020), we expect a uniform approach to nutrient load settings.

Of importance are:

- The development of an approach that recognises vegetables as a priority will ameliorate the difficulties of matching local conditions with one-size-fits-all approaches to nitrogen regulation and measurement. Where vegetable production is sensitive, we expect that mitigation efforts will better match the local conditions
- Allowing vegetable growing to operate without a consent will solve the administrative tangle that some regions have applied; especially as it relates to rotations and lease hold lands that are both complex but critical parts of vegetable cultivation.

Most of the administrative issues will be solved with priority given to vegetable growing under national direction. NZIER suggest that administrative efficiency will be improved under this criterion (marked in green in the table below).

Table 12 National Policy Direction for Vegetables: administrative efficiency

Criteria	NZIER view
Administrative efficiency	

Note: (1) Green means the criterion is fully met.

Source: NZIER

6.3 Option 3: Reduced government involvement in water quality target-setting

Reducing government influence in many economic activities is typically the preferred option in many activities. Government intervention for no reason results in costly compliance that can hinder economic efficiency. By allowing people to engage in these activities, it signals the importance of innovation for economic growth and the maintenance and enhancement of New Zealand's standard of living.

There are times when regulation is appropriate. For example, it is widely accepted that the pursuit of economic growth by itself may/will increase the risks of environmental damage and that some restraints are needed on the types of activities that may be undertaken, as well as the manner in which they are undertaken.

Reducing environmental protection in New Zealand will create conditions that are contrary to the policy developed under the RMA. By ignoring these costs – mainly around water quality and human health – we are creating intergenerational transfers. In effect, we are asking future generations to deal with the costs of water quality and human health impacts.

6.3.1 Water quality

Water quality will inevitably drop with less regulation. This is because land users, including growers, will have less incentive to improve their mitigation efforts. Some land users will 'free ride' on the efforts of others, and without any limits, standards and clear priorities, the water quality will deteriorate.

It is also unlikely that growers will benefit from producing more vegetables since the structure of the industry remains. Volumes will increase, at least in the short run, but prices will fall for growers. Margins are likely to stay thin.

No water quality improvements are expected (marked in pink in the table below).

Table 13 Reduced government regulation: water quality

Criteria	NZIER view
Improve quality water quality	

Notes (1) Pink means the criterion is not met.

Source: NZIER

6.3.2 Human health

Unrestricted vegetable production will have a modest detrimental impact on human health because vegetable production in New Zealand is limited by the size of our domestic market so land use change to vegetable production would not be significant. Lack of regulations for vegetable production and other land uses would have a detrimental impact on water quality. It is likely that other, higher value exports with larger markets would grow. Water quality for streams, rivers and other water bodies will deteriorate, compromising any water quality ambitions and will inevitably lead to human health problems.

The human health criterion will not be met under the reduced government regulation option (marked in pink in the table below).

Table 14 Reduced government regulation: human health

Criteria	NZIER view
Human health	

Notes (1) Red means the criterion is not met.

Source: NZIER

6.3.3 Recognition of food production to support a growing population

The focus of this option is on the production of vegetables with reduced environmental constraints. However, it is unlikely that growers will benefit since volumes will increase and grower prices will fall. Growers will inevitably operate on thin margins since the current industry structure will remain, i.e. dominated by supermarkets.

Allowing vegetable growers and other land users to farm the land without restrictions means that industry standards such as GAP will be undermined, and it could result in reductions in other produce exports as New Zealand's reputation is tarnished. The recognition of the importance of food production criterion will be met at least in the short run (marked in green in the table below).

Table 15 National Policy Direction for Vegetables: food production

Criteria	NZIER view
Importance of food production	

Notes (1) Green means the criterion is fully met.

Source: NZIER

6.3.4 Administrative efficiency

Reducing government involvement in water quality outcomes reduces the administrative burden at least in the short term although we note that administrative burden may be delayed as water quality and health related issues become more complex and entrenched. While it will contribute to reducing government action, it may not meet any water quality objectives. The reduced administrative burden will improve efficiency (marked in green in the table below).

Table 16 Reduced government regulation: administrative efficiency

Criteria	NZIER view
Administrative efficiency	

Notes (1) Green means the criterion is fully met.

Source: NZIER

6.4 Summarising the options

The options are summarised in Table 17. The options are examined by asking a number of questions that relate to the policy objectives and its implementation.

- **What are the policy objectives?**

Policy objectives will determine which option you might take. All three options have clear policy objectives that could be potentially achieved. Options 1 and 2 clearly aim to reduce the contaminant load in waterways and may improve freshwater outcomes.

Option 3 reduces the administrative burden. However, by removing the administrative burden, it is unclear whether unintended consequences will be helpful to growers and the general public. Margins are likely to remain thin for vegetable growers, and water quality is likely to deteriorate further.

- **Will the proposed regime advance those objectives? In principle? In practice?**

While Option 1's objectives are laudable in principle, it does not appear that measures to achieve these objectives are applied consistently nationwide or that they are efficient. From the way freshwater rules have been applied, it is unclear whether the targeted outcomes will be consistently met for water quality.

In some cases, it isn't easy to see how nationally important industries such as CVP can continue without some priority allocation.

Further, most of the regulations have used tools that have been designed to measure the impacts of the dairy and red meat industries. While the measures considered are clear (kilograms per hectare of nitrate loss), they may not reflect leaching rates in vegetable growing. Nor do they consistently reflect the national importance of CVP despite the small size of the vegetable industry.

Also, the way that regulations are applied means leased land is treated differently from freehold land when it comes to measuring leaching. This has a negative impact on efficiency since it restricts grower land options because of the increased costs associated with leasing land.

Option 2 points to the national direction for vegetable production as the best way forward. Underpinning this thinking is that while vegetables are a small industry, the supply of fresh vegetables at competitive prices is critical for New Zealanders. It is also difficult to see how regional councils can balance regional interests against national interests in an unbiased manner. This option positively assists this by ensuring that vegetable production becomes a priority within contaminant limits.

Where bottom lines in specific regions cannot be achieved, action plans, alongside limits, are required. Action plans will consider what is necessary to meet the bottom lines. This means that a fit-for-purpose solution can be developed.

How these action plans work out will depend on the characteristics of the catchments involved and the costs and benefits that need to be considered.

Option 3 will reduce the administrative burden, but it is unlikely to be helpful to growers (profit margins are likely to remain thin), human health is likely to be impacted negatively, and water quality will drop further.

- **What are the associated costs?**

Under Option 1, maintaining the NPS FM (2014/2020), the practical impact will be a significant potential for a drop in vegetable production and price increases estimated between 20 percent and 100 percent (The AgriChain Centre).[8]

The reason for this is that vegetables cannot meet the generic rules applied under many regional council NPS FM regulatory approaches. There is also much less incentive for regional councils to properly recognise the national benefit.

Option 2 recognises the importance of vegetables by specifically making vegetable production a priority. In most catchments where vegetable production contributes a very minor load, allowing for CVP at GMP as a priority will make no difference to the design of limits for other landuses.

In catchments that are below bottom lines, and are important for vegetable growing and where bottom lines cannot be met with GMP, there are likely to be catchment scale mitigation costs and or land use change required. Some of the costs will be significant but are more likely to address the problems of water quality. This is why action plans are necessary since they provide the focus for mitigation.

Option 3 costs are likely to be very large since you are putting the onus on future generations to clean up rivers as a result of today's consumption. Water quality will deteriorate, and human health is likely to be negatively impacted. It is also unlikely that growers will benefit to any degree.

- **Do the benefits from the regime (measured in terms of advancing its aims) justify the full costs associated with the regime? Can the costs be reduced without appreciably compromising the benefits?**

Table 17 sets out the approach to assessing whether the benefits outweigh the costs.

Option 1 may or may not improve water quality over time, given the lack of clarity around allocation, but it partly meets the human health and administrative efficiency criteria. However, the way it has been implemented means that it is unlikely to underpin vegetable production and, as a result, may not be durable. That is, the government would have to make significant changes to the policy to ensure vegetable production area is not reduced and vegetable prices are not driven up substantially. As it stands, the costs outweigh the benefits.

Option 2 is durable since all criteria are likely to be achievable. The key to this option is the centrality of CVP. It is of central importance because New Zealanders rely on domestically produced vegetables. This is the favoured option since it explicitly gives vegetable production priority but also seeks to achieve national water quality outcomes. In the

[8] As yet we have not seen a drop in vegetable production because it was/is not clear how the previous government or the new government will respond to the situation CVP is faced with.

instances where bottom lines are unable to be met, action plans are required. These will mean significant costs in specific catchments. These costs are likely to be smaller over the long run when compared to Options 1 and 3.

Option 3 reduces the administrative burden but ignores other objectives that will push costs onto future generations. It is unlikely that the costs warrant the benefits of this option.

Table 17 Systematic options analysis: Shaping the NPS FM debate

Criteria	Option 1: NPS 2014/2020	Option 2: National Direction for Vegetables and Action Plans	Option 3: Reduced government involvement in targeted outcome setting
Improve quality water quality			
Human health			
Importance of food production			
Administrative efficiency			
Summary	**May achieve water quality targets, although this is unclear, but unlikely to be workable since the costs are too high**	**Achieves a wider range of government priorities. Recognises a need to balance the costs and benefits and the trade-offs that need to be made.**	**May partly achieve government objectives in the short term. In the long term, it pushes costs onto future generations.**

Notes (1) Pink, the criterion is not met, (2) Yellow means the criterion is partly met, (3) Green means the criterion is fully met.

Source: NZIER

6.5 National direction requires effective and efficient local action and the difficult allocation decisions around national priorities to be made at the national level

Earlier in the paper, we commented on the need for regulatory regimes to signal the importance of innovation for economic growth. This is one of the few sure ways of maintaining and enhancing New Zealanders' standard of living (section 4.1).

The RMA and the NPS FM as drafted currently may not be the best instruments to deliver on government priorities by themselves since they are silent on allocation. However, the Te Mana o te Wai i priorities under the NPS FM do hint at priority setting although greater detail is required on national priorities to assist councils. Addressing allocation through, in the first instance, national setting of priorities, must be tackled to achieve a workable and sustainable freshwater management.

The first-in-first-served approach taken by the RMA is not necessarily the most efficient way to achieve the priorities that you wish to attain. This is why the national direction for vegetables sees action plans as an integral part of any durable solution.

Action plans will need flexibility, and success will mean iterating towards solutions that may be unique to those catchments. There will be no silver bullets, central government resources may be needed, and improved water quality will happen over long periods of time.

If national priorities are not clearly provided for, regional councils are unlikely to:

- Produce quality and durable regulatory rules and guidance that reflect national priorities
- Provide for consistent regulatory approaches across the regions.

Instead, allocation priorities are likely to be made on the basis of ad hoc rules developed to suit the preference of councils (e.g. rules that are easy to enforce) and the economic activities that are favoured by those rules.

CVP with its low margins will be the first land use to be replaced by activities that regional council rules prefer (whether this is intended or otherwise). Since loss of access to affordable vegetables is likely to be unpalatable politically, this will curb the effectiveness of policy and regulatory freshwater actions, ultimately leading to water quality outcomes not being achieved.

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