

RESEARCH REPORT

Medical Cannabis

State of the Industry and Socio-Economic Opportunities.

Prepared for ESR

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Executive Summary

The medical cannabis industry is in a transitional phase. Multiple companies have entered the industry over the past three years, and a few have begun to produce products ready for sale. The regulatory regime which allows for the cultivation, production, sale, and export of medical cannabis products is just over a year old at the time of this report. However, multiple companies in the industry are valued at over 30 million NZD. Global estimates for the size of the medical cannabis market range from 10 to over 100 billion USD annually, suggesting a significant financial opportunity. With a lack of domestic data, the international medical cannabis market is often pointed to as a clear indication of the potential of the New Zealand medical cannabis market. However, we know that New Zealand's primary industries can differ dramatically from their international equivalents and that international case studies are not always directly applicable. We also understand that every medical cannabis jurisdiction has unique regulatory settings which strongly influence the nature of the market and the ability of the industry to deliver socio-economic impacts.

The medical cannabis industry has attracted private enterprises, iwi, regional councils, and trusts as a potential mechanism for transformational change. It presents new opportunities for employment, regional economic development, sustainability, community wellbeing, and more. In this report, we sought to describe and quantify the potential socio-economic impact of the medical cannabis industry for New Zealand. The analysis was undertaken to provide potential funders, investors, policymakers, and researchers with insights into the current and potential future of the industry and its ability to create socio-economic impacts.

Through a review of the available literature, interviews with industry-leading figures, and modelling socio-economic impacts at a regional scale, we produced a broad overview of the industry's present state. A literature review indicates that there are three areas of social impact where information of reasonable quality is available, health (beyond direct treatment effects), crime, and employment. We wanted to hear from the industry how they are generating these impacts. However, our interviews revealed several considerable structural limitations that are currently reducing the sector's ability to create broad socio-economic impacts. There were a small number of key themes that were common across interviewees and were seen by all to be the most significant characteristics of the industry at present:

- There is currently no accessible domestic market.
- The testing requirements make exporting very expensive and challenging.
- Legislative change is required to make the medical cannabis industry viable – especially domestically.
- Nobody is making money yet (except by raising capital).

The overall view was that the current legislation is overly restrictive and not tuned to the reality of the industry. This limitation, in turn, was said to be limiting the industry's potential to create widespread impact. The industry leaders suggested that it will take up to five more years for the industry to establish and that not many companies will survive.

We modelled the potential financial and employment impacts at a regional level and found that the industry could create up to 2893 FTE positions nationally once established. This figure is comprised of those employed directly by the industry as well as jobs in supporting industries, and jobs that result from an increase in associated household spending.

Financial modelling suggests that an expected direct economic output of \$379 million from the industry would create a further \$128 million indirect impacts and a \$45 million induced impacts. In total, generating an economic impact of \$553 million or 1.5 times the direct output. These numbers show that the industry has significant potential. We are aware from our past experience that iwi have expressed substantial interest in the medical cannabis industry. We hoped that through this research, we would be able to provide clear guidance to iwi on the opportunities presented by the industry. However, there remain significant degrees of uncertainty around the potential of the industry to meet iwi needs. At this point, we suggest that the medical cannabis industry presents a relatively high-risk option for iwi compared to a comparable operation such as a native tree nursery with similar financial and employment potential with less uncertainty. However, some of this risk could be mitigated through partnerships or cooperative agreements.

The medical cannabis industry is in a transitionary state and presents significant levels of uncertainty. While global trends point towards further entrenchment and liberalisation of medical cannabis schemes, we are unsure about the time frame this will occur in New Zealand. This report provides an overview of the impacts, opportunities, limitations, and future potential of the medical cannabis industry.

Project Background and Overview

ESR is investigating the potential for the medical cannabis industry to contribute to regional socio-economic development. This investigation considers multiple aspects of the industry, including financial, health, employment, wellbeing, sustainability, legal, and cultural implications. The medical cannabis industry is newly established. There is a high degree of uncertainty around the industry's impact on regional economies and its potential to create sustainable value. There is a particular interest in the potential opportunities and risks the medical cannabis industry presents for iwi and whānau communities. As a first step towards clarifying ESR's role and interest in the medical cannabis industry, ESR is interested in understanding the current state of the industry and its future potential.

ESR approached Matatihi to provide an analysis of the current socio-economic impacts being generated by the medical cannabis industry and the opportunities and risks the industry presents. Jay Whitehead, director of Matatihi, has previously researched the medical cannabis industry and reported on the potential scale of medical cannabis markets in New Zealand, including an analysis of economic, employment, and social impacts the industry was expected to generate¹. To date, this report remains the only published socio-economic analysis of the medical cannabis market in New Zealand. In addition, Matatihi has extensive experience in socio-economic impact assessment across multiple sectors and at various scales, from hapū enterprises to nationwide impact assessment.

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1 Introduction

The introduction of a regulatory Medicinal Cannabis Scheme in April 2020 facilitated the founding of a new industry that spans multiple sectors and technical expertise. The medical cannabis industry is in a transitional phase in which several companies have established cultivation and processing operations which, in 2021, are beginning to produce products. No recent figures are available on the number of cultivation licences granted; however, by November 2020, 12 had been granted from 58 applications. Several companies have been successful in raising substantial investment from crowdfunding to develop their operations. Past polling² has shown significant public support for medical cannabis, which may partly explain the record-breaking³ crowdfunding campaigns by medical cannabis companies.

On the surface, the medical cannabis industry presents a significant investment opportunity. Global estimates for the size of the medical cannabis market range from 10 to over 100 billion USD annually. However, not all regulatory regimes are directly comparable in terms of market impact. The medical cannabis industry has attracted private enterprises, iwi, regional councils, and trusts as a potential mechanism for transformational change. It presents new opportunities for employment, regional economic development, sustainability, community wellbeing, and more. In this report, we sought to describe and quantify the potential socio-economic impact of the medical cannabis industry for New Zealand. The analysis was undertaken to provide potential funders, investors, policymakers, and researchers with insights into the current and potential future of the industry and its ability to create socio-economic impacts.

The Misuse of Drugs (Medicinal Cannabis) Regulations 2019 reclassified cannabidiol (CBD) products from a controlled drug to prescription medicine. This change was intended to provide a more accessible pathway for licensing CBD products. THC, the other primary compound involved in medical cannabis products, remains a controlled drug but with new pathways for medical use. In practice, the medical cannabis scheme has created two separate medicinal cannabis regimes, and they can sometimes run out of sync with each other. Informal discussions with cultivation companies suggest that getting a licence to grow is not particularly difficult. However, the licensing and product testing requirements around selling raw flower or developing medical cannabis products has proved to be much more difficult for companies to navigate. In this report, we investigate the key constraints and limitations of the industry with the intention that this information could clarify the reality of generating socio-economic impacts from medical cannabis production in 2021.

The analysis relies on three primary approaches. First, we review the literature on medical cannabis to identify the key socio-economic impacts the industry could create. We also review documentation from several domestic medical cannabis companies to determine the role these socio-economic impacts play in their operations. Second, we interview three domestic medical cannabis industry leaders that represent cultivation, processing, research, and lobbying activities. There is a shortage of information and analysis on the New Zealand medical cannabis industry. These interviews provide an inside view of the industry, the challenges it faces, and its potential future. Third, we quantify potential national and regional employment and financial impacts of the industry. To do this, we use two primary approaches. The first uses international case studies to provide a proxy for what may occur in New Zealand. The second uses regional Input-Output (IO) tables and economic multipliers to model socio-economic impacts at a regional scale.

The medical cannabis industry presents a wide range of potential benefits; however, we conclude that the industry is also facing several significant constraints that make this potential difficult to realise.

We conclude the report by discussing the current limitations of quantifying the impact of the medical cannabis industry and the limitations of the industry itself in its ability to create significant socio-economic impacts.

2 Meta-Analysis and Review

The development of a functional medical cannabis industry in New Zealand shows promise in providing a range of social and economic benefits. Medical cannabis has been tightly regulated in New Zealand. The first step towards liberalising medical cannabis in 2016 allowed doctors with specialist oversight to prescribe Sativex (a medical cannabis product) for its consented use (as an add-on treatment in Multiple Sclerosis) without approval from the Ministry of Health. Recent developments in the legislation have further liberalised medical cannabis restrictions and brought about a new medical cannabis industry. The Misuse of Drugs (Medicinal Cannabis) Amendment Act 2018 was introduced to facilitate access to cannabidiol (CBD) products with up to two percent other cannabinoids (including Δ^9 -tetrahydrocannabinol (THC)). In addition, the new legislation provided a legal basis for the development of a medical cannabis scheme. The medical cannabis industry is in the foundational stages, and there remains some uncertainty around how the medical cannabis scheme functions in practice.

Medical cannabis has multiple meanings. For doctors, medicinal cannabis might refer to an approved pharmaceutical product, such as Sativex. For the wider public, medical cannabis might refer to raw plant material grown by themselves. The gap between these two extremes is vast. The debate on medical cannabis regulation often seeks to provide a compromise between the strengths and weaknesses from each end of the medical cannabis spectrum. In this report, medical cannabis is understood as a legal product produced from the cannabis plant and distributed and consumed within a regulatory framework. This definition contrasts with illicit cannabis, which has been grown, processed, and supplied illegally. This report does not consider recreational markets, animal health markets, or other alternative markets such as health supplements.

The New Zealand public has demonstrated strong support for expanded access to medical cannabis products. For example, in a 2017 Curia poll⁴, seventy-eight percent of New Zealanders agreed there should be no criminal penalty for growing or using cannabis for any medical reasons, such as pain relief. The Government's positive policy signals and public support have been a decisive factor in multiple large commercial investments being made in the New Zealand medical cannabis industry.

2.1 New Zealand's medical cannabis regulation

New Zealand's legislation on cannabis is still in a somewhat transitional state. The New Zealand government has passed a Bill increasing access to "medicinal cannabis"⁵. The Misuse of Drugs (Medicinal Cannabis) Amendment Act received Royal Assent 18 December 2018 and is now law. The Act provides an exception and statutory defence for terminally ill patients who obtain or use botanical cannabis. This exception is a temporary defence to provide patients security until domestic production of cannabis-based medicines is established.

The New Zealand Drug Foundation criticised the Act for not going far enough for many patients and their advocates⁶. For example, the Government did not agree to extend the criminal defence to those with a severe and debilitating illness, patients' families, or compassionate growers.

The Act states:

"... a person who has a certificate from a medical practitioner or nurse practitioner certifying that the person requires palliation may procure, possess, consume, smoke, or otherwise use any plant or plant material of the genus *Cannabis* or any cannabis preparation." Section 8 (6A).

The scheme enables domestic commercial cultivation and manufacture of medicinal cannabis and implemented three elements:

1. A licensing regime.
2. Introduction of standards for the quality of medicinal cannabis products and all stages of production.
3. Establishment of a medicinal cannabis agency.

The scheme allows local strains of cannabis to be used in developing a domestic medicinal cannabis market. Enabling domestic cultivation and manufacture is expected to make quality medicinal cannabis products more readily available. Domestic cultivation will remove a barrier for patients accessing medicinal cannabis, as health practitioners will be able to prescribe these products with confidence. Health Minister Dr David Clark has said⁷ the scheme would "speed up access to a greater range of quality medicinal cannabis products" and give those companies looking to develop those products "certainty and a clear timeframe". There are currently significant barriers to accessing legal products, including difficulty importing, a lack of quality products, high costs, an extensive bureaucratic procedure, and a lack of knowledge from medical professionals. The scheme is expected to reduce these barriers.

The passing of the Misuse of Drugs (Medicinal Cannabis) Amendment Act means some products containing cannabidiol (CBD) are now prescription medicines only⁸. The intent of declassifying CBD as an illegal substance is to make it easier to access CBD products. However, there is currently a limited range of CBD products available in New Zealand. Additionally, there are strict import restrictions on products sourced from some other countries, which will continue to impact the supply of CBD products in New Zealand. The range of products available in New Zealand was expected to increase once domestic cultivation and manufacture of medicinal cannabis products are enabled and established under the medical cannabis scheme. However, since the Medicinal Cannabis Scheme came into effect on 1 April 2020, this development of new products has not materialised.

2.2 Social Impacts

There are multiple social and induced economic impacts associated with both the use of cannabis products and the development of a legal cannabis industry. The State of Victoria in Australia produced the following infographic to outline the extended positive impacts of the Victorian medical cannabis industry (Figure 1).

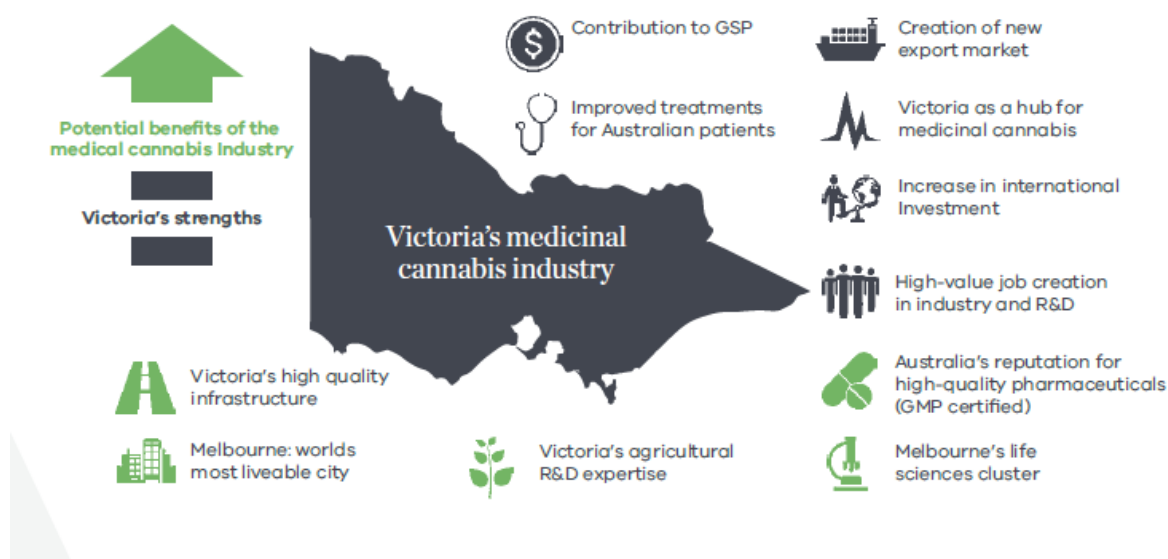


Figure 1: Benefits of a strong medicinal cannabis industry⁹

A review of the literature indicates that there are three areas of social impact where information of reasonable quality is available, health (beyond direct treatment effects), crime, and employment. We address employment extensively in Part 4 and therefore focus on health and crime and impact on Māori alone in this section.

2.2.1 Health

In addition to the direct treatment effects of medical cannabis, other beneficial indirect and induced health effects have been documented. Research has demonstrated that there is a small decrease in alcohol and tobacco consumption after the legalisation of medical cannabis¹⁰. While the decrease may be minor, the long-term health impacts of tobacco and alcohol abuse are significant. It has been shown that the introduction of medical marijuana laws resulted in a lower probability of binge drinking and fewer drinks consumed in each drinking session¹¹. Another study found a decrease in alcohol poisoning deaths after the introduction of medical marijuana laws¹².

Medical cannabis legalisation has also been found to reduce rates of prescription opioid overdose deaths¹³. In addition, cannabis products are increasingly being considered a substitute for opioids as

they are less addictive and possess no risk of overdose. The substitute potential of medical cannabis is significant; in one study, 75.5 percent (n=305) of respondents cited that they substitute cannabis for at least one other substance¹⁴.

2.2.2 Crime

The introduction of medical cannabis laws has been shown to reduce crime rates. The introduction of medical marijuana laws led to a decrease in violent crime in states that border Mexico¹⁵. These results support a theory that decriminalisation of the production and distribution of marijuana leads to a reduction in violent crime in markets that criminal organisations traditionally control. Since California passed medical marijuana legislation more than two decades ago, violent and property crime rates have dropped by 20 percent¹⁶. In explaining the reason why this decrease occurred, the authors of this study suggest that:

“California’s medical marijuana law may have shrunk the marijuana black market and its associated violence. It may have helped to reallocate police resources towards deterring crime instead of enforcing drug laws. The presence of dispensaries may also deter crime, as they are required to deal in cash and thus invest heavily in security¹⁷.”

There is also an important cultural element to cannabis-related crime in New Zealand. Māori are more likely to face a conviction for drug use than other ethnicities. Māori make up 42 percent of low-level drug convictions but only 11 percent of the population¹⁸. The effect of establishing a functional medical cannabis scheme in New Zealand may, therefore, have a more significant impact on Māori communities.

2.2.3 Potential Impact on Māori

Māori are much more likely to be apprehended, charged, and given a prison sentence for cannabis use or cultivation. A 2007 report from the Department of Corrections¹⁹ notes that, based on equivalent usage of cannabis, Māori experienced arrests at three times the rate of non-Māori users. Racial inequality has been a strong influence behind drug reform internationally; however, minorities have been largely excluded from participating in the booming medical cannabis industry²⁰ in the USA. Prior convictions for low-level cannabis offending have suppressed the ability of many Māori in the regions to find employment. It is yet to be seen what role Māori will play in the New Zealand medical cannabis industry; however, there is hope that it will bring new economic opportunities. Some iwi have expressed a strong interest in medical cannabis cultivation due to the potential opportunities the emerging industry offers. Some have seen cannabis cultivation as a safer option for young Māori than forestry, which can be a dangerous occupation²¹. Additionally, the cultivation of cannabis can be seen as being better aligned with Māori values, particularly those of kaitiakitanga, compared to forestry. The cultivation of cannabis can have a low environmental impact and, through regenerative techniques, restore nitrogen in the soil lost through intensive commercial forestry.

There is the potential that medical cannabis cultivation will draw whānau back to their home regions, partially offsetting decades of urban drift. Medical cannabis cultivation can create employment opportunities in a safe environment that respects Māori values. The medical cannabis industry represents an opportunity for Māori economic development and leadership in a high-value industry.

2.3 Information Memorandum's

Several medical cannabis companies have been highly successful at raising capital through crowdfunding on Pledge Me²². A requirement of raising capital in this way is that companies must produce an 'Information Memorandum' (IM) to educate potential investors. These IM provide insights into how medical cannabis companies view the industry and its potential future. We have reviewed four IM, each of which was associated with sizeable successful capital raising campaigns.

- Phytotecnia Limited - \$1.4 million raised
- Waiapu Investments | Hikurangi Cannabis - \$2 million raised
- Medical Kiwi - \$2 million raised
- Puro New Zealand - \$2 million (addition \$4 million raised in 2019)

The primary author of this report declares a conflict in that he conducted research that contributed indirectly to the Puro IM. The analysis determined the potential economic output for the New Zealand medical cannabis as a whole and features in a single paragraph in the IM. The author had no other input beyond contributing to this national market analysis. The author's research is also cited, without the author's knowledge, in Phytotecnia's IM.

We had six key questions we sought to clarify through the IM:

1. What is the ratio between export and domestic sales?
2. What is the ratio between CBD and THC production?
3. How many jobs will be created?
4. What are the values that underpin the business operations?
5. What is the role of Māori?
6. What is the expected revenue?

Most of our questions could not be answered within many of the IM; however, we provide some insights from our content analysis under each of the six questions.

What is the ratio between export and domestic sales?

Except for Puro, the other three IM provided little to no detail on whether they are focused on domestic or international sales. All IM discussed the size of the international medical cannabis market; however, sales channels were not elaborated upon beyond mentions of 'letters of intent' signed with international enterprises. Puro clearly states that they have a significant focus on international sales while leaving open the potential for domestic sales. Puro indirectly mentions that changes to New Zealand's cannabis laws and regulations are needed to increase domestic opportunities.

What is the ratio between CBD and THC production?

All four IM place equal emphasis on CBD and THC production. The focus appears to be to produce 'whole flower' or 'whole extract' products, noting that demand is for medical cannabis products that do not compromise the 'entourage' effect of the cannabis plant. Phytotecnia is particularly detailed in its analysis of the difficulties of developing full-spectrum medical cannabis products under the current regulatory regime. This limitation is due to the Good Management Practice (GMP) testing

requirements which have a major influence over the industry and will be discussed in more detail in the next Part 3. Related to the relationship between growing a plant and producing a medical cannabis product, three of the four IM state that the companies intend to develop the capability to grow and produce products in-house. Only Puro states that it will focus on a single aspect of the value chain (cultivation).

How many jobs will be created?

Only Waiapu Investments quantifies their job creation potential stating that they will generate 100 jobs with higher-than-average wages, increasing household incomes in Ruatorea. On the other hand, Puro emphasises their commitment to work with iwi and develop training and employment opportunities, while the remaining two companies do not mention job creation. Interestingly, while all IM describe the social-good opportunities of the industry, employment opportunities are not emphasised.

What are the values that underpin the business operations?

Two of the IM have a strong values foundation. Waiapu Investments discusses the social-good potential of their operation extensively. They draw on a framework of Māori values, which they point to as being the foundational drivers of the business. Interestingly, they have now rebranded to Rua Bioscience²³ and no longer emphasise these same values, focusing more on pharmaceutical science. Puro has a strong environmental values base that comes through in a commitment to organic farming and sustainability commitments. Puro also emphasises a strong commitment to local communities and working with local iwi. The remaining two companies emphasise only a technical and scientific foundation.

What is the role for Māori?

Waiapu Investments have strong Māori foundations, with the majority of their board of directors and founders being Māori. They also express a strong commitment to Māori values and Te Tiriti o Waitangi. However, this emphasis seems to have decreased over time. Puro has stated a commitment to work with iwi and recent communications between us and Te Rūnanga o Kaikōura suggest that they have followed up strongly on this commitment. The remaining two IM do not refer to Māori.

What is the expected revenue?

Three of the four IM provide revenue projects; we use March 2022 to provide a comparison:

- Phytotecnia Limited - \$4.7 million
- Waiapu Investments | Hikurangi Cannabis - \$5.7 million
- Medical Kiwi - \$36 million
- Puro New Zealand - \$0

Medical Kiwi is a significant outlier in its revenue projections. This projection is based on fulfilling a \$60m contract that appears not to have been formalised. Puro has stated that:

Following careful consideration, the Puro Board has determined that providing any such forecasts or projections for the coming financial year(s) could mislead potential investors with regard to details that are material to the Offer²⁴.

Puro is one of the most developed medical cannabis companies in New Zealand, having already harvested a commercial crop and begun indoor research activities. It is significant that a company in its position highlights the uncertainty in projecting future revenue streams while other less developed companies are projecting significant profits. Therefore, it is not unexpected that most of the IM are light on quantitative details as they tend to be selling a vision of the future more than a quantifiable reality.

There are very few reliable resources available that describe the current state of the New Zealand medical cannabis industry. Therefore, to investigate deeper into the state of the industry, we instead interviewed a small number of industry leaders to answer questions we were unable to through analysis of the available resources. These interviews are described in the next part.

3 Community and Industry Perspective

To develop an understanding of the current state of the medical cannabis industry, we conducted phone interviews with three leading figures in the New Zealand medical cannabis industry. These three experts collectively represented large-scale cultivation activities, processing and manufacturing operations, and the New Zealand Medical Cannabis Council, which acts as an industry body and advocacy platform. The knowledge, experience, and professional responsibilities of these experts covered all critical aspects of the industry we were interested in, including growing, exporting, manufacturing, testing, working with regional and central Government, and liaising with communities.

The expert participants were contacted directly and asked to provide answers within their professional capacity. Matatihi has an ongoing relationship with one participant, while the remaining two were introduced to us in anticipation of this research.

Each participant was interviewed by phone for 40 to 50 minutes. The interviews intended to build a foundational understanding of the industry's current and potential future state. We did not directly compare responses or seek any analytical significance in the analysis of the interviews. Experts were asked to discuss the same topic areas but were not asked identical questions. We preferred instead to let the participant steer the discussion to elicit new insights. This organic discovery approach provided interesting insights that could be followed up through more structured methods to better understand the industry.

After discussing the New Zealand medical cannabis industry with the three experts, we quickly found that the story being told by each was remarkably similar, and by the third interview, we appeared to have largely reached saturation in the responses. For the purpose of this research, we found three industry interviews to be sufficient in providing an adequate understanding of the current state of the industry.

In addition to our industry discussions, we also spoke in person to representatives and leaders of three Ngāi Tahu Ngai Tahu rūnanga who have expressed an interest in the medical cannabis industry. These were informal discussions based on the primary researcher's existing friendships and whakapapa connections. The views of rūnanga we spoke to will not be discussed in detail here as we wish to focus on the industry itself. However, we confirmed a considerable interest in the potential of the medical cannabis industry to drive socio-economic growth for the rūnanga we spoke to. This interest is expressed equally by rangatahi and kaumātua and centres primarily around job creation. We found that medical cannabis was seen to align closely with the values and aspirations of the rūnanga. These aspirations included supporting the land, creating inter-generational wealth, moving into an emerging value-added industry, putting land held in trusts to more productive use, drawing on skills already held by whānau, and promoting the ora of the community.

3.1 Insights from the interviews: the industry has ‘huge potential’.

There were a small number of key themes that were common across all the interviewees and were seen to be the most significant characteristics of the industry at present:

- There is currently no accessible domestic market.
- The testing requirements make exporting very expensive and challenging.
- Legislative change is required to make the medical cannabis industry viable – especially domestically.
- Nobody is making money yet (except by raising capital).

3.2 Revenue

The starting point for this discussion is that the industry is still developing. The experts all expressed a view that the market is currently under regulatory constraints that impact the viability of the industry and reduce the potential to sell medical cannabis products.

“There is no need to be competitive because nobody is making any money.” [B]

We confirmed these claims by cross-checking profit and loss statements provided by two large and listed medical cannabis entities, Cannasouth and Rua Bioscience. In the period from December 2019 to December 2020, Cannasouth brought in \$131,140 in revenue; their financial statements do not distinguish what proportion of this income is from sales and what is from grants. However, the financial statement implies that this revenue is almost entirely from grants. Cannasouth had a \$51.8m market cap as of 06/05/2021²⁵.

Rua Bioscience in the year ended June 2020 brought in \$727,222 in revenue; however, this revenue was comprised almost entirely from grants with no sales income listed. Rua Bioscience had a market cap of \$56.1m as of 06/05/2021²⁶.

It is not uncommon for listed companies to have large market caps and low revenue; however, it is a clear indication that these businesses are selling a vision rather than a proven track record. At present, based on our interviews and review of public financial statements, we assume that there are few sales of medical cannabis products in the New Zealand industry.

3.3 Regulation

“We are waiting on regulatory review” [A]

Explanations for what is holding the market back were consistent across all experts.

“We are heavily restricted on what industry can do – regulations need to change” [C]

All medical cannabis products need to meet ‘minimum quality standards’ before being sold either domestically or internationally²⁷. The testing requirements and maximum limits are based on the European Pharmacopoeia (10th edition), which provides quality standards for medicines and their components. Testing must be certified as compliant with the New Zealand Code of Good

Manufacturing Practice for Manufacture and Distribution of Therapeutic Goods (the Code of GMP). The minimum quality standard sets testing requirements and maximum limits (e.g., limits for microbial contamination) that medicinal cannabis products and ingredients must comply with before importing, exporting, or supplying in New Zealand.

“The GMP standard is well-intended, but we don’t have a pharmaceutical industry, so no one here can test” [A]

All interviewees expressed a view that the current testing requirements are too stringent and significantly limit the industry’s potential.

“We have to export to the Netherlands to test before product can be sent to Australia which does not require the New Zealand Standard” [A]

“Having to export to the importing country standard rather than the NZ standard – this would be a big change” [B]

Testing is currently a costly process for growers. We were told that it costs up to \$250,000 to have product shipped to the Netherlands for testing. The markets into which the product is being sold do not have the same minimum standards as New Zealand. This was seen to be unnecessary, and two interviewees suggested that testing standards should be set to the requirements of the country into which product is being sold.

“There is no cannabis standard – has to pass a herbal tea microbiology minimum standard” [A]

“There is no legislation that sits between medicine and food – need to downgrade the product to find the correct place for medical cannabis” [C]

Additionally, as there are currently no specific cannabis testing standards, cannabis products are treated as herbal teas in the testing regime, which one participant saw inadequate.

“There is no domestic market, a few hundred [patients] max ... We have a solely export focus.” [A]

“A lot of growers can’t sell their product due to other licence and regulatory requirements – high chance it could end up in the black market.” [A]

One participant suggested that it is relatively easy to get a licence to grow cannabis but very difficult to meet the requirements to sell cannabis. This presents a risk that cannabis will be grown without a legal pathway to market creating the potential for legally grown cannabis to enter an illicit market. The experts were all appreciative of the government staff they have been working with; however, they identified several structural issues they feel present barriers to the industry. At present, export markets present the best opportunity for the industry.

“ MoH has no mandate for exports – so feel like it is not their problem” [C]

“MoH people are great, but they are operating within very tight requirements” [A]

“We need a cross-government approach to make this work”. “MoH won’t change unless other departments put pressure on them” [A]

The industry is dealing with multiple government departments. The Ministry of Health (MoH), the Ministry for Primary Industries (MPI), New Zealand Trade and Enterprise (NZTE), and the Ministry of Business, Innovation and Employment (MBIE) all have important roles in the industry. However, the

impression from the industry is that they are not collaborating in a way that would increase the viability of the medical cannabis industry.

3.4 Employment

We were interested in the employment potential of the industry; however, at present, employment is low and not representative of what a well-functioning industry could achieve. We, therefore, did not go into detail about the number of staff and positions held with the experts. Instead, we present a more detailed analysis of employment in the Part 4.

“We want to engage with youth. We want to give young Māori a very good training and mentoring undertaking for two years.” [A]

One participant did express a strong intention to employ young Māori in their operation. They were more focused on providing intensive training for a small number of people to improve their career prospects than mass employment. This participant suggested that they would not be able to provide a vast number of jobs for local Māori, instead preferring to focus on quality over quantity.

3.5 Focus

The two medical cannabis compounds that receive the most attention are CBD and THC. In many medical cannabis jurisdictions, CBD has been designated an over-the-counter product. However, in New Zealand, it is prescription only which is affecting the focus of the industry.

“For those who are making finished products – CBD and THC combos are the most common. Most growers are indoor, and most are growing THC.” [B]

“There is an even amount of both THC and CBD growers” [C]

In medical markets, THC often commands a higher price. As the testing regime in New Zealand is the same for both CBD and THC products, there is a financial incentive to focus on THC. However, a common point of discussion is that international market demand is directed towards multi-compound products.

“It’s a full-plant extract game – we are not going to compete globally on price” [A]

For New Zealand medical cannabis products to be distinguished in market, they need to focus on ‘value add’ or ‘credence attributes’²⁸. This need for value add is because a molecule like THC used in a medicinal application does not have any uniquely New Zealand attributes.

“If the focus is just on cannabis, it will be very difficult because there will be a big oversupply until the market kicks off.” [B]

If the New Zealand regulations were to move CBD to over-the-counter medication, the focus of growers would likely change. At present, only one grower is pursuing large scale outdoor CBD heavy cultivation. These types of operations have the largest mass employment potential; however, they also face limitations.

“Outdoor growers hit quality issues.” [C]

The industry is still finding its focus and determining how best to position products internationally. The regulations do leave some room for uniquely New Zealand product creation; however, there is still a large degree of uncertainty around the legality of different approaches.

3.6 Future

“Not many companies will survive” [A]

The consensus view was that regulatory changes are required before New Zealand can have a strong medical cannabis market. However, the experts speculated on some developments they thought likely over the next few years.

“It will take two to five years for NZ market to be operational” [A]

The experts stated that the regulations are set up to allow for only a small number of entities to operate. This opinion is partly due to the high cost and technical requirements of growing and selling a cannabis product.

“Consolidation will happen much more through collaboration than anything else.” [B]

The industry was also described as being highly cooperative. As all companies are restricted equally, they have a strong incentive to work together to get the changes they need. In doing so, they are also developing collaborative agreements and positioning themselves at different points on the supply chain.

“I don’t expect that once company would capture the value chain – better to find a niche” [A]

At present, most medical cannabis companies are concentrating on either growing or manufacturing. However, if consolidation occurs towards a smaller number of large companies, this arrangement could change, and a single company has the potential to control an entire supply chain.

“More amalgamation and strategic alliances are expected” [C]

The industry’s future direction was the only topic area that revealed some differences in opinion between the experts and even some contradictory speculations. This divergence indicates a high degree of uncertainty in the industry’s future from current medical cannabis industry leaders.

“Industry can’t plan for change, so they need to just plan for what they can achieve.” [B]

There could be a significant degree of consolidation between companies, or companies could target specific niches in the supply chain and seek cooperation over consolidation. At present, this future remains essentially unknowable.

4 Financial and Employment Impact Modelling

In this part, we estimate the financial and employment impact potential of the New Zealand medical cannabis industry. These estimates are underpinned by assumptions on the size of the New Zealand medical cannabis market provided by Whitehead (2019)²⁹. Two scenarios are used as baselines to calculate impact. The high scenario is based on the average proportion of the population using medical cannabis across all medical cannabis jurisdictions in the USA. The low scenario is based on the average proportion of the population using medical cannabis across all medical cannabis jurisdictions internationally, averaged at a national scale (Table 1). Both scenarios assume an annual patient spend of 600 NZD. Further information on the methods and references used to develop these two scenarios are provided by Whitehead (2019)^{ibid.}.

Table 1 High and Low Domestic Market Scenarios

High scenario (1.10% of the population)	Low scenario (0.35% of the population)
52,734 NZ Patients	16,779 NZ Patients
\$ 379,684,800	\$ 120,808,800

The high range estimate of the total serviceable market aligns with a previous forecast³⁰ for the New Zealand medical cannabis market of \$360 million NZD by 2028. If the USA or Canadian markets were to be considered a proxy for the future New Zealand market, we would expect the New Zealand market to align more closely to the high-end forecasts, given the market is allowed approximately five years to reach a sufficient level of maturity.

4.1 Employment

The establishment of a well-functioning medical cannabis market can result in the creation of multiple employment opportunities. The Victoria State Government³¹ produced a report detailing the job requirements for the medical cannabis industry. The report states:

“... 80 per cent of the workforce will comprise of entry-level horticulture workers, as much of the commercial facilities will commence operations with limited automation. The remainder 20 per cent of the workforce are expected to be made up of mid-level and high-level professionals... An anecdotal report from a Victorian horticultural expert, suggests that 200 to 400 workers are required for a 100,000 square metre cultivation facility. The workforce capacity will depend on the cultivation method and other seasonal factors. According to this horticultural expert, a recent approved Australian facility is planning to employ 175 staff for its 10,000 square metres cultivation and production facility. Initial knowledge and skills required in Victoria’s medicinal cannabis industry will focus on scientific research, cultivation and business development.”

In the short term, there is the potential for many new companies to enter the market. In 2017 in Washington State, the cannabis industry had 6,049 full-time (FTE) positions and paid total wages of \$286.1 million USD³². A news report from March 2019³³, based on an industry report, claimed that the medical cannabis industry was the fastest-growing job market in the USA, adding 64,389 jobs in 2018 (a 44 percent gain), and bringing the total number of jobs directly related to the industry to 211,000.

Little research has been conducted within New Zealand on the potential employment impacts of the newly developing medical cannabis industry. There are a small number of articles in the media on the intentions of New Zealand medical cannabis businesses to hire staff; however, the majority are anecdotal. The New Zealand government may have conducted or commissioned research on the employment effects of the newly developed medical cannabis scheme; however, it has not been made publicly available.

In this section, we consider the job creation potential for New Zealand from the medical cannabis industry. We use two methods to estimate this potential. The first method detailed below considers international case studies and applies them to the New Zealand situation. However, several factors potentially limit the reliability of this approach. The medical cannabis schemes within each jurisdiction operate under different regulatory regimes that strongly influence the market structure. These differences make direct comparability difficult. To partially mitigate this challenge, we draw data from multiple jurisdictions, research reports, and scientific publications. The other challenge to looking offshore for guidance is that New Zealand's primary industries are highly efficient and employ a range of systems and technologies throughout the supply chain that are often unique to New Zealand. This influences the number of jobs required within the primary industries. We use a second method in Section 4.2 to accommodate this difference that uses New Zealand industry's economic data as proxies for the medical cannabis industry.

4.1.1 Using International Case Studies to estimate employment.

One method to determine employment potential for medical cannabis cultivation considers the number of employees per square meter of cultivation facilities. The Victorian Government suggests that between 200 to 400 workers are required for a 100,000 square meter cultivation facility³⁴. However, there are few other sources that consider employment using this metric. A more promising way to investigate employment potential is by comparing direct employment to direct revenue and expressing the result as a ratio of FTE Employment³⁵ / Revenue. The volume of employment is usually expressed as full-time equivalents (FTEs). FTEs provide a measure of total labour demand associated with expenditure - e.g., four full-time jobs running for three months or three part-time jobs running for a year would be shown as a single FTE.

We conducted a review of literature which provided details on both revenue and employment numbers for medical cannabis businesses. The primary data sources we used to conduct this analysis came from the USA due to the advanced state of its medical cannabis industry. The sources were primarily industry reports, as academic literature on economic aspects of the medical cannabis industry is limited. In addition to deriving an estimate of employment numbers, we also consider some of the additional benefits this new employment could generate.

Table 2 summarises information sources that provide data on employment in the medical cannabis industry. Where possible, we have focused on the cultivation aspects of medical cannabis production; however, some data sources combine cultivation and processing. An analysis of the available

literature suggests that cultivation and processing operations produce a similar number of FTE positions per unit of economic output.

Table 2. Summary of data on employment from medical cannabis cultivation.

Source	Direct Impact	Direct Employment	FTE Employment/ \$1million USD in revenue
Sustaining Technologies (2018) ³⁶	\$150M	1,814	12
Schultz, Laura (2019) ³⁷	\$4100M	30,700	7.5
Miles Light et al. (2016) ³⁸	\$996M	12,591	12.6
Washington Liquor Control Board (2016) ³⁹	\$502M	6,227	12.4
Oregon Liquor Control Commission (2019) ⁴⁰	\$520M	5,776	11.1
Center for Business and Policy Research (2016) ⁴¹ *	\$170M	672	3.9
		Average	10

* Based on forecasted data.

Based on the data in Table 2, on average, for every USD 1million direct revenue generated per annum, ten direct FTE positions are created.

These are the direct jobs created and do not account for indirect and induced employment effects. The closest industry to medical cannabis cultivation for which data is available in New Zealand is the horticultural industry. A report⁴² on the value of the horticultural sector to the Gisborne economy found that, for every NZD 1million in output from the horticultural sector, seven jobs are created. Thus, the medical cannabis industry appears to generate slightly more jobs per unit of output than the general horticultural sector does in New Zealand. Based on the evidence, we suggest that FTE employment in New Zealand from medical cannabis cultivation is likely to range from 7 to 10 FTE positions for every NZD 1million of direct economic output generated. In Table 3 we apply the market projections to estimate potential employment.

Table 3 Employment Estimates Based on 7-10 FTE per \$m Output.

High scenario (1.10% of the population)	Low scenario (0.35% of the population)
\$ 379,684,800	\$ 120,808,800
2658 – 3797 FTE	856 – 1208 FTE

There are few academic studies on the employment impacts of the medical cannabis industry. The data used in this study have come from reputable sources; however, we have no information on their peer-review process. Due to this limitation and the others described at the start of this section, we employ a second method to estimate employment.

4.2 Regional IO Modelling

As of May 2021, the only detailed economic analysis on the New Zealand medical cannabis market we were able to find was by this report's primary author. Economic analysis has been conducted in preparation for the recreational market referendum; however, this analysis relied on multiple assumptions that do not apply to a medical cannabis market.

In this section, we investigate the potential to develop input-output multipliers for the medical cannabis industry. We base the multipliers on the Statistics New Zealand National Accounts input-output tables 2013 (the most recent available), which we have updated to 2017. Input-output (IO) tables describe the structure of regional economies by identifying the linkages between industries. IO tables describe how goods and services produced by one industry are used by other industries. In doing so, they represent the flow of economic output through a regional economy. As cannabis is an illegal substance, StatsNZ National Accounts do not capture data for the cultivation, manufacture or retailing of cannabis. In this report, we follow an approach taken by BERL⁴³ in adopting existing industries as the closest proxies for the medical cannabis industry (Table 4).

Table 4 Proxy Industries for IO Modelling

Production	Processing
Horticulture and fruit growing	Pharmaceutical, cleaning, and other chemical manufacturing
Agriculture, forestry and fishing support services	

We exchange 'Beverage and tobacco product manufacturing' for 'Pharmaceutical, cleaning, and other chemical manufacturing' to better fit the manufacturing and testing requirements of the medical cannabis industry.

Estimates on the total volume of economic output produced by the medical cannabis industry come from Whitehead (2019)⁴⁴, which estimates the total value of retail sales output.

To estimate the economic output of new cannabis industries, we took the total volume of cannabis consumed and multiplied it by the price. In the absence of other information, we assumed this was

the total value of the outputs. We then assigned the total economic output as a proportion of manufacturing and cultivation activities as identified by RCG Economics for Nevada⁴⁵ (Table 5).

Table 5 Nevada Cannabis Industry Output Ratios

Sector	Value (US\$ million)	% retail sales	Output ratio
Manufacturing	219.5	48	0.61
Cultivation	140.1	31	0.39

We assume that the proportion of inputs for the medical cannabis industry would be relatively consistent with the existing industries that require similar inputs as cannabis (Table 4). As there is a minimal retail market for medical cannabis in New Zealand, we focus solely on manufacturing and cultivation and calculate output ratios for each. In Section 4.1.1 we used a different method to estimate employment numbers by using offshore data. The use of proxy industries from within New Zealand allows us to test the degree to which international experiences can be used to explain the New Zealand situation.

The horticultural sector relies on multiple inputs. As the medical cannabis market is not yet fully operational, we are unable to quantify these inputs. However, we know that primary industries require approximately 3 to 7 percent input from the ‘agriculture, forestry and fishing support services’ to generate one unit of output. Therefore, to illustrate the broader impact of the medical cannabis sector on supporting industries, we apportioned 5 percent of industry output to the agriculture, forestry and fishing support services industry. Multipliers were then calculated based on input-output tables using two market scenarios from Whitehead (2019)⁴⁶. The high scenario assumes an annual medical cannabis market worth \$ 379,684,800 p.a., and the low scenario \$ 120,808,800 p.a.

These two scenarios were then divided across 15 regions equally. While this is highly unlikely to occur in practice, it helps us to illustrate the relative differences in regional economic and employment impacts from the medical cannabis industry.

4.2.1 Employment Multipliers

Case studies suggest an average direct employment multiplier of 7-10 FTEs per million dollars of economic output. Our calculations based on New Zealand regional economic multipliers from proxy industries reveal an average direct employment multiplier of 5.6, generating 2132 FTE positions directly under the high scenario (Table 6).

Table 6 *Employment Multipliers*

Industry	Direct Employment High	Indirect Employment Low	Indirect Employment High	Indirect Employment Low	Induced High	Induced Low
Agriculture, forestry, and fishing support services	102	32	20	2	11	3
Horticulture and fruit growing	1466	467	398	62	126	40
Pharmaceutical, cleaning, and other chemical manufacturing	563	179	265	30	108	34
Total	2132	678	683	95	245	78

In addition to direct employment, we also considered indirect and induced employment multipliers. Employment multipliers measure the increase in FTE per million dollars of economic output at a regional scale. We use three multipliers, direct, indirect, and induced. Detailed explanations of each can be found in Richardson (1985)⁴⁷. Below we provide a simple example of each multiplier:

- Direct (7.62) - \$1m invested in horticulture raises employment in horticulture by 7.62 FTE.
- Indirect (2.79) - \$1m invested in horticulture raises employment in supporting industries by 2.79 FTE.
- Induced (1.45) - \$1m invested in horticulture raises employment, through household spending, in the Auckland region by 1.45.
- Total (11.86) - \$1m invested in horticulture raises employment in Auckland by 11.86 FTE. 7.62 FTEs from direct employment and 4.24 from indirect and induced employment.

Based on an aggregation of all regional employment multipliers, we estimate total job creation from the medical cannabis industry would create 2893 FTE positions. This total job creation figure sits within the high and low estimates from the case studies, suggesting that existing industries within New Zealand are potential proxies for the medical cannabis industry.

Job creation potential differs by region, as shown by Appendix A. For example, the same operation established in Marlborough would create more jobs than the same operation on the West Coast. Based on the results of both methods, we conclude that the medical cannabis industry in New Zealand, under the current conditions, has a job creation potential similar to New Zealand's horticultural supply chains.

In addition to employment potential, we also investigated the economic multiplier effects of an investment in the New Zealand medical cannabis industry.

4.2.2 Economic Output Multipliers

Output multipliers describe the total economic output generated for every unit of economic output produced by the target industry. Each industry relies on a group of supporting industries to create an output. Therefore, investing in an industry such as horticulture creates a ripple effect that leads to increased economic output from supporting industries and increases household spending in the local economy. Here we consider two multiplier effects, indirect, which determines the increase in economic output in supporting industries and induced, which determines the increase in economic output arising from an increase in household spending. A simple example is provided below:

- Indirect (0.56) - \$1 in horticultural economic output creates a \$0.56 increase in economic output from supporting industries in Auckland.
- Induced (0.31) - \$1 invested in horticulture raises household spending by \$0.31 in Auckland.
- Total (1.87) - \$1 invested in horticulture raises economic output in Auckland by \$1.87. One dollar from direct investment and \$0.87 from indirect and induced output.

Table 7 summaries the indirect and induced effects of the medical cannabis market by adopting data from proxy industries.

Table 7 Economic Output Multipliers

Industry	Indirect High	Indirect Low	Induced High	Induced Low
Agriculture, forestry, and fishing support services	\$3,369,008	\$1,071,957	\$1,951,528	\$620,941
Horticulture and fruit growing	\$69,939,391	\$22,253,443	\$23,539,944	\$7,489,982
Pharmaceutical, cleaning, and other chemical manufacturing	\$54,402,697	\$17,309,949	\$19,649,582	\$6,252,140
Total	\$127,711,097	\$40,635,349	\$45,141,055	\$14,363,063

Under the high scenario, a direct output of \$379,684,800 would create a further \$127,711,097 indirect impact and a \$45,141,055 induced impact. In total, creating an economic impact of \$552,536,952 or 1.5 times the direct output. These figures are averaged across the country as direct and induced multipliers differ by region (Appendix A). However, the results highlight the significant regional impacts that the creation of a new industry can have. Multiplier effects provide crucial information for potential investors interested in having a broader impact beyond direct financial benefits.

5 Limitations and Future Research

There is a significant lack of information and data on the New Zealand medical cannabis industry. At the time of this report, the only socio-economic analysis available was produced by the author in 2019, prior to the scheme coming into effect. No analysis has been made available by the Government, and economic output statistics are not yet available on the industry. As a result, many in the industry have looked offshore to foreign medical cannabis jurisdictions as guidance for the New Zealand industry. However, the vast differences in medical cannabis regulations between jurisdictions make comparative analysis difficult.

Based on company reports over the past three years which predicted significant sales revenue by 2021, we expect the industry to be in a more advanced state than it currently is. Our expert participants informed us that this is due to restrictive regulations, suggesting that company projections assumed a less restrictive regulatory framework that has not materialised. The lack of available data means that we were required to use proxies to determine socio-economic impact. While the use of case studies and proxy industry sectors to determine potential impacts is common practice in socio-economic research, it nevertheless requires several assumptions that may impact the accuracy of the findings.

It appears to be too early to gather the data from the industry that would lead to improved predictions. Many in the industry suggest that the current regulatory regime is too restrictive and needs to change. A more promising research direction would be to model socio-economic impacts under different policy conditions. There is a strong movement within the industry to push for CBD to be made an over-the-counter medication, as is common in multiple other jurisdictions, including Australia. Socio-economic modelling that compares current policy setting to a more liberal treatment of CBD would have value in informing future policy and fact-checking industry messaging.

The research presented here focused on socio-economic impacts and did not delve deep into the health aspects of medical cannabis. The Government developed the medical cannabis scheme with the intention to improve health outcomes. However, the current regulatory setting seems to be a barrier to achieving these outcomes. Research that aligns the intended outcomes of the medical cannabis scheme with the practicalities of accessing medical cannabis would be valuable for identifying whether the scheme, in its current form, is delivering its intentions.

Finally, we are aware from our own experience that iwi have expressed a significant interest in the medical cannabis industry. We hoped that through this research, we would be able to provide clear guidance to iwi on the opportunities presented by the industry. However, there remain significant degrees of uncertainty around the potential of the industry to meet iwi needs. At this point, we suggest that the industry presents a relatively high-risk option for iwi compared to a comparable operation such as a native tree nursery with similar financial and employment potential with less uncertainty. However, it would be valuable to research more deeply why iwi are interested in medical cannabis and how the industry could help meet their needs.

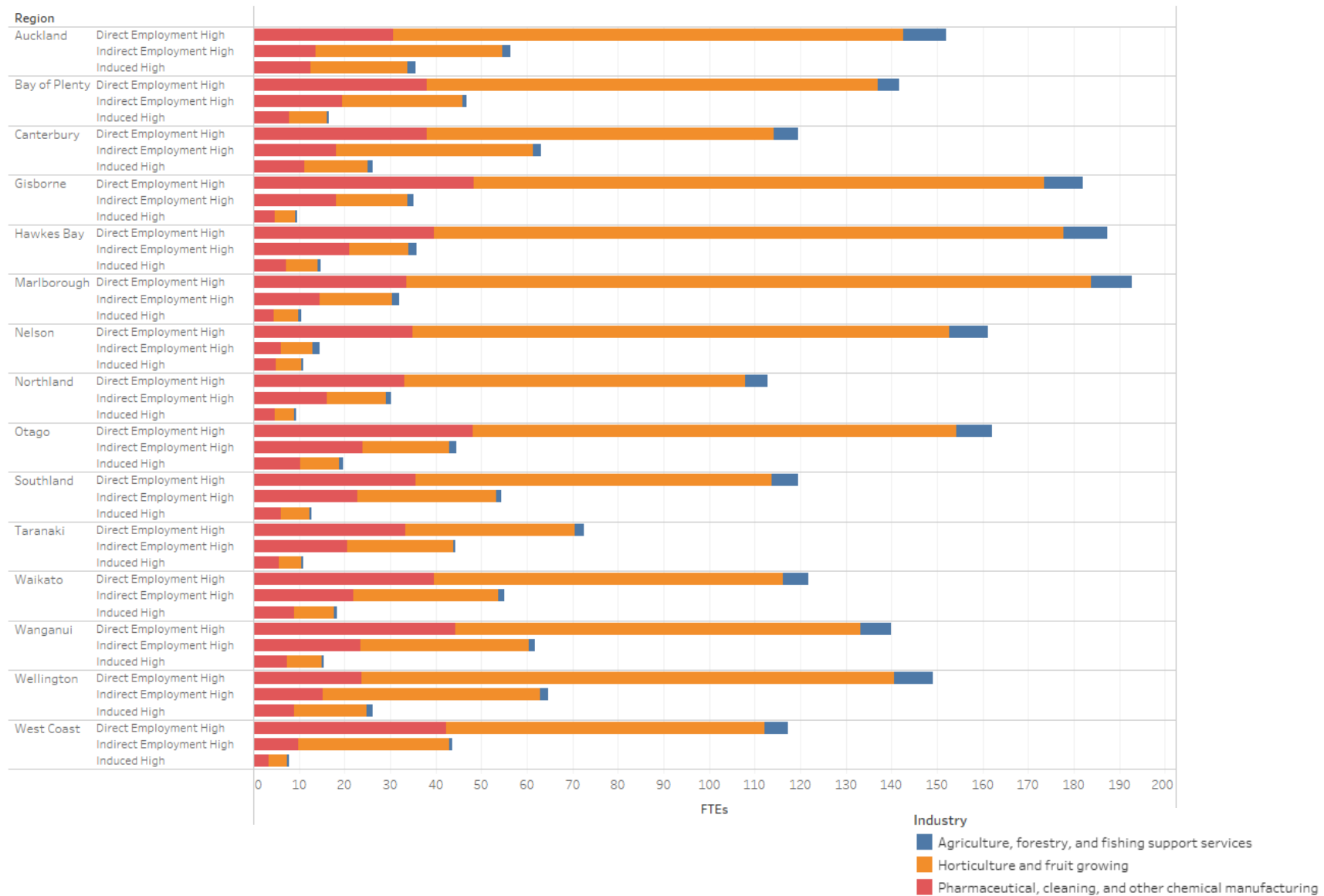
6 Conclusion

Several companies in the New Zealand medical cannabis industry have valuations over \$30 million, suggesting significant revenue potential. However, at present, these companies are trading primarily on potential and selling a future vision. We found no evidence that any company is making any significant revenue from sales at present. As a result, medical cannabis companies in New Zealand are currently reliant almost entirely on external funding for their operations.

International evidence suggests that the medical cannabis industry can create significant socio-economic impacts. However, care must be taken in drawing direct comparisons, as these jurisdictions have different regulatory regimes that significantly change how impacts can be created within the market. Additionally, each jurisdiction has a different social and historical context that influences the impacts it generates. The research demonstrates that the industry can generate new socio-economic impacts that would be similar in scale to establishing a new but smaller horticultural sector. There are several very significant constraints facing the industry which severely limit the industry's ability to generate large scale impacts. The industry leaders we interviewed all pointed to licencing and testing regimes as being the major barriers to success. They suggested that the current requirements are not aligned well with the practical realities of the industry and that change is required for the industry to achieve its potential.

The research demonstrated through case studies and regional input-output modelling that there is the potential to generate good socio-economic impacts at a regional level. However, this modelling assumes that companies can sell their product domestically or internationally while remaining competitive. The research reveals that the industry is in a transitional state, its fate being very closely tied to the regulatory settings imposed by the Ministry of Health. Under the present conditions, the industry could potentially have a small number of successful large companies that focus on the export market. However, the research did not find the same opportunities within the domestic market. It appears that for the medical cannabis scheme to deliver its intended benefits, there remains a need for further policy refinement to align the practical realities of growing and producing medical cannabis products with the Government's vision of the role of medical cannabis in healthcare.

Appendix A. Regional Multipliers - Employment

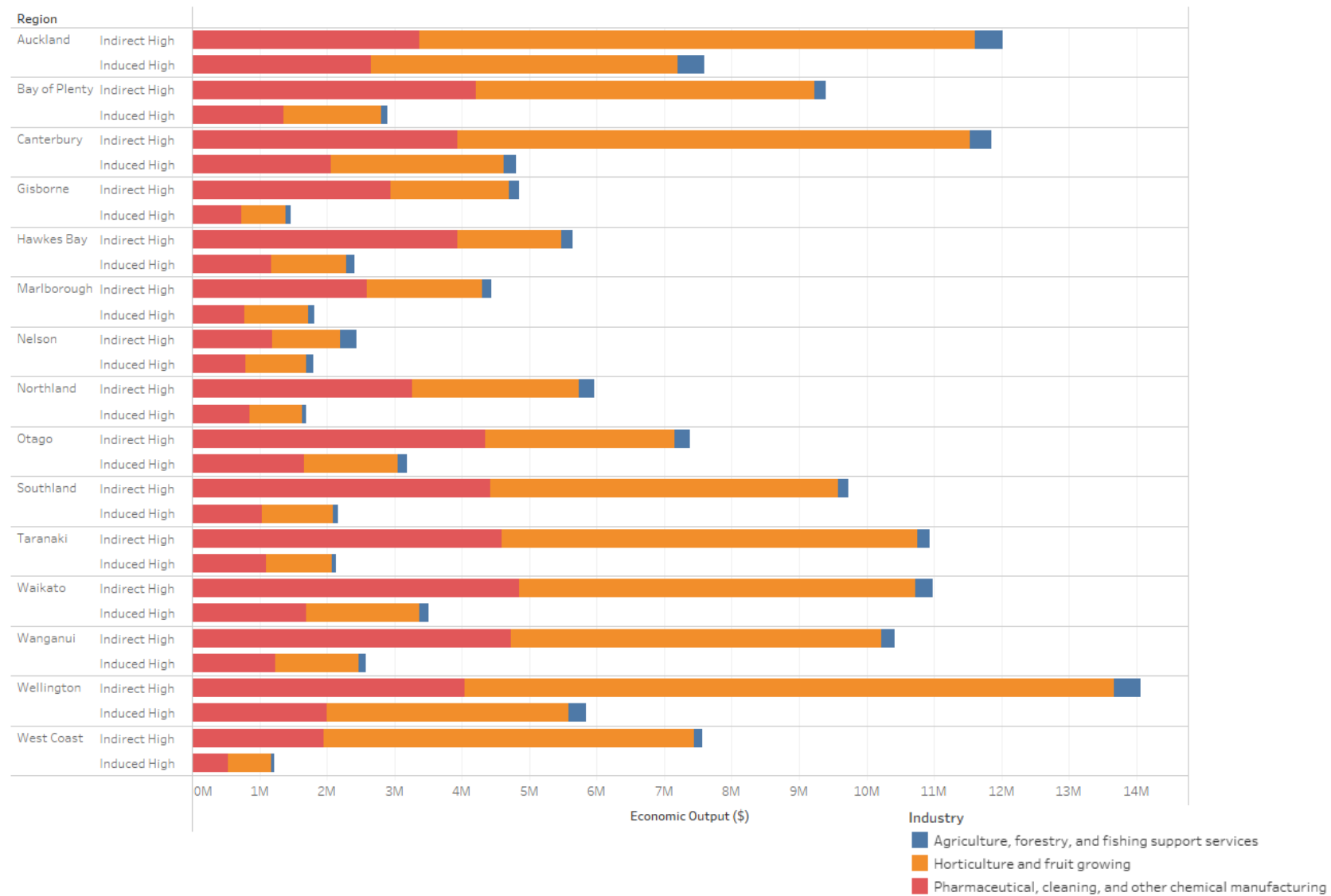


Regional Multipliers - Employment

Region	Industry	Direct Employment	Direct Employment Low	Indirect Employment	Indirect Employment Low	Induced	Induced Low
		High		High		High	
Auckland	Horticulture and fruit growing	111.8	35.6	40.9	13.0	21.3	6.8
Auckland	Agriculture, forestry, and fishing support services	9.6	3.0	1.9	0.1	1.8	0.6
Auckland	Pharmaceutical, cleaning, and other chemical manufacturing	30.7	9.8	13.7	2.3	12.5	4.0
Bay of Plenty	Horticulture and fruit growing	98.9	31.5	26.5	2.6	8.3	2.6
Bay of Plenty	Agriculture, forestry, and fishing support services	4.6	1.5	0.9	0.2	0.5	0.2
Bay of Plenty	Pharmaceutical, cleaning, and other chemical manufacturing	38.1	12.1	19.4	1.6	7.7	2.5
Canterbury	Horticulture and fruit growing	76.2	24.2	43.2	1.6	14.0	4.4
Canterbury	Agriculture, forestry, and fishing support services	5.3	1.7	1.9	0.1	1.0	0.3
Canterbury	Pharmaceutical, cleaning, and other chemical manufacturing	38.0	12.1	18.1	1.7	11.2	3.6
Gisborne	Horticulture and fruit growing	125.1	39.8	15.6	4.4	4.4	1.4
Gisborne	Agriculture, forestry, and fishing support services	8.7	2.8	1.3	0.1	0.4	0.1
Gisborne	Pharmaceutical, cleaning, and other chemical manufacturing	48.3	15.4	18.1	1.7	4.8	1.5
Hawkes Bay	Horticulture and fruit growing	138.0	43.9	13.2	5.2	6.9	2.2
Hawkes Bay	Agriculture, forestry, and fishing support services	9.7	3.1	1.8	0.1	0.7	0.2
Hawkes Bay	Pharmaceutical, cleaning, and other chemical manufacturing	39.7	12.6	21.0	1.5	7.2	2.3
Wanganui	Horticulture and fruit growing	88.9	28.3	36.7	1.9	7.5	2.4
Wanganui	Agriculture, forestry, and fishing support services	6.6	2.1	1.4	0.1	0.6	0.2
Wanganui	Pharmaceutical, cleaning, and other chemical manufacturing	44.3	14.1	23.6	1.3	7.4	2.4
Marlborough	Horticulture and fruit growing	150.2	47.8	16.0	4.3	5.5	1.8
Marlborough	Agriculture, forestry, and fishing support services	9.0	2.9	1.4	0.1	0.5	0.2
Marlborough	Pharmaceutical, cleaning, and other chemical manufacturing	33.5	10.7	14.6	2.1	4.5	1.4
Northland	Horticulture and fruit growing	74.9	23.8	13.0	5.3	4.2	1.3
Northland	Agriculture, forestry, and fishing support services	4.9	1.5	1.1	0.2	0.4	0.1
Northland	Pharmaceutical, cleaning, and other chemical manufacturing	33.1	10.5	16.1	1.9	4.7	1.5
Otago	Horticulture and fruit growing	106.3	33.8	19.1	3.6	8.6	2.7
Otago	Agriculture, forestry, and fishing support services	7.7	2.5	1.5	0.1	0.8	0.3
Otago	Pharmaceutical, cleaning, and other chemical manufacturing	48.1	15.3	24.0	1.3	10.2	3.3
Southland	Horticulture and fruit growing	78.1	24.9	30.5	2.2	6.2	2.0
Southland	Agriculture, forestry, and fishing support services	6.0	1.9	1.1	0.2	0.5	0.2
Southland	Pharmaceutical, cleaning, and other chemical manufacturing	35.5	11.3	22.8	1.4	6.1	2.0
Taranaki	Horticulture and fruit growing	37.2	11.8	23.3	2.9	5.0	1.6
Taranaki	Agriculture, forestry, and fishing support services	1.9	0.6	0.6	0.3	0.3	0.1
Taranaki	Pharmaceutical, cleaning, and other chemical manufacturing	33.4	10.6	20.5	1.5	5.6	1.8
Nelson	Horticulture and fruit growing	117.6	37.4	7.0	9.8	5.5	1.8
Nelson	Agriculture, forestry, and fishing support services	8.6	2.7	1.7	0.1	0.7	0.2
Nelson	Pharmaceutical, cleaning, and other chemical manufacturing	35.0	11.1	6.0	5.2	4.9	1.5
Waikato	Horticulture and fruit growing	76.4	24.3	31.7	2.2	8.8	2.8
Waikato	Agriculture, forestry, and fishing support services	5.6	1.8	1.5	0.1	0.7	0.2
Waikato	Pharmaceutical, cleaning, and other chemical manufacturing	39.7	12.6	21.9	1.4	8.9	2.8
Wellington	Horticulture and fruit growing	116.9	37.2	47.7	1.4	16.0	5.1
Wellington	Agriculture, forestry, and fishing support services	8.6	2.8	1.7	0.1	1.2	0.4
Wellington	Pharmaceutical, cleaning, and other chemical manufacturing	23.6	7.5	15.3	2.0	8.9	2.8

West Coast	Horticulture and fruit growing	70.0	22.3	33.2	2.1	4.1	1.3
West Coast	Agriculture, forestry, and fishing support services	5.1	1.6	0.7	0.3	0.3	0.1
West Coast	Pharmaceutical, cleaning, and other chemical manufacturing	42.3	13.4	9.8	3.2	3.4	1.1

Regional Multipliers – Economic Output



Regional Multipliers – Economic Output

Region	Industry	Indirect High	Indirect Low	Induced High	Induced Low
Auckland	Horticulture and fruit growing	\$ 8,238,757	\$ 2,621,423	\$ 4,541,098	\$ 1,444,895
Auckland	Agriculture, forestry, and fishing support services	\$ 404,652	\$ 128,753	\$ 390,649	\$ 124,298
Auckland	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 3,376,791	\$ 1,074,434	\$ 2,659,207	\$ 846,111
Bay of Plenty	Horticulture and fruit growing	\$ 5,026,990	\$ 1,599,497	\$ 1,451,448	\$ 461,824
Bay of Plenty	Agriculture, forestry, and fishing support services	\$ 157,105	\$ 49,988	\$ 94,177	\$ 29,965
Bay of Plenty	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,208,718	\$ 1,339,137	\$ 1,351,946	\$ 430,165
Canterbury	Horticulture and fruit growing	\$ 7,585,353	\$ 2,413,521	\$ 2,563,170	\$ 815,554
Canterbury	Agriculture, forestry, and fishing support services	\$ 332,882	\$ 105,917	\$ 187,347	\$ 59,610
Canterbury	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 3,940,795	\$ 1,253,889	\$ 2,059,126	\$ 655,177
Gisborne	Horticulture and fruit growing	\$ 1,754,578	\$ 558,275	\$ 666,308	\$ 212,007
Gisborne	Agriculture, forestry, and fishing support services	\$ 141,704	\$ 45,088	\$ 66,392	\$ 21,125
Gisborne	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 2,950,462	\$ 938,783	\$ 726,038	\$ 231,012
Hawkes Bay	Horticulture and fruit growing	\$ 1,545,526	\$ 491,758	\$ 1,119,756	\$ 356,286
Hawkes Bay	Agriculture, forestry, and fishing support services	\$ 172,375	\$ 54,847	\$ 120,719	\$ 38,411
Hawkes Bay	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 3,928,391	\$ 1,249,943	\$ 1,173,268	\$ 373,313
Wanganui	Horticulture and fruit growing	\$ 5,491,892	\$ 1,747,420	\$ 1,241,633	\$ 395,065
Wanganui	Agriculture, forestry, and fishing support services	\$ 201,638	\$ 64,158	\$ 96,771	\$ 30,791
Wanganui	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,732,457	\$ 1,505,782	\$ 1,235,735	\$ 393,188
Marlborough	Horticulture and fruit growing	\$ 1,699,082	\$ 540,617	\$ 954,527	\$ 303,713
Marlborough	Agriculture, forestry, and fishing support services	\$ 146,804	\$ 46,710	\$ 89,416	\$ 28,451
Marlborough	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 2,600,466	\$ 827,421	\$ 772,777	\$ 245,884
Northland	Horticulture and fruit growing	\$ 2,476,731	\$ 788,051	\$ 771,416	\$ 245,451
Northland	Agriculture, forestry, and fishing support services	\$ 228,096	\$ 72,576	\$ 73,335	\$ 23,334
Northland	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 3,261,663	\$ 1,037,802	\$ 854,343	\$ 271,836
Otago	Horticulture and fruit growing	\$ 2,812,570	\$ 894,908	\$ 1,393,012	\$ 443,231
Otago	Agriculture, forestry, and fishing support services	\$ 218,547	\$ 69,538	\$ 137,692	\$ 43,811
Otago	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,347,674	\$ 1,383,351	\$ 1,662,786	\$ 529,068
Southland	Horticulture and fruit growing	\$ 5,155,701	\$ 1,640,450	\$ 1,049,505	\$ 333,933
Southland	Agriculture, forestry, and fishing support services	\$ 155,372	\$ 49,437	\$ 81,309	\$ 25,871
Southland	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,422,800	\$ 1,407,255	\$ 1,039,962	\$ 330,897
Taranaki	Horticulture and fruit growing	\$ 6,166,672	\$ 1,962,123	\$ 976,820	\$ 310,806
Taranaki	Agriculture, forestry, and fishing support services	\$ 183,109	\$ 58,262	\$ 61,084	\$ 19,436
Taranaki	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,588,418	\$ 1,459,951	\$ 1,093,991	\$ 348,088
Nelson	Horticulture and fruit growing	\$ 996,791	\$ 317,161	\$ 900,663	\$ 286,574
Nelson	Agriculture, forestry, and fishing support services	\$ 251,561	\$ 80,042	\$ 108,118	\$ 34,401
Nelson	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 1,192,768	\$ 379,517	\$ 790,940	\$ 251,663
Waikato	Horticulture and fruit growing	\$ 5,877,492	\$ 1,870,111	\$ 1,686,457	\$ 536,600
Waikato	Agriculture, forestry, and fishing support services	\$ 259,832	\$ 82,674	\$ 134,523	\$ 42,803
Waikato	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,852,781	\$ 1,544,067	\$ 1,689,318	\$ 537,510

Wellington	Horticulture and fruit growing	\$ 9,631,024	\$ 3,064,417	\$ 3,582,814	\$ 1,139,986
Wellington	Agriculture, forestry, and fishing support services	\$ 390,224	\$ 124,162	\$ 265,767	\$ 84,562
Wellington	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 4,041,647	\$ 1,285,979	\$ 1,999,762	\$ 636,288
West Coast	Horticulture and fruit growing	\$ 5,480,233	\$ 1,743,711	\$ 641,318	\$ 204,056
West Coast	Agriculture, forestry, and fishing support services	\$ 125,106	\$ 39,807	\$ 44,228	\$ 14,073
West Coast	Pharmaceutical, cleaning, and other chemical manufacturing	\$ 1,956,866	\$ 622,639	\$ 540,383	\$ 171,940

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