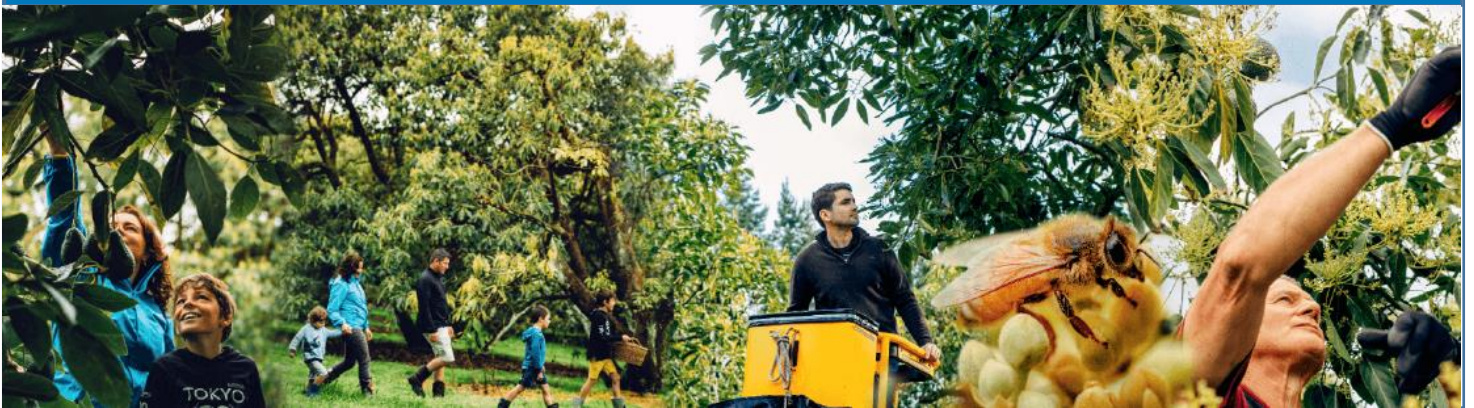


New Zealand Avocados Go Global

Primary Growth Partnership

Final Report



“An industry model of collaboration and innovation”



New Zealand
Avocado

NZ Avocado Growers' Association Inc.
NZ Avocado Industry Ltd

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1 Executive Summary

1.1.1 Partnership Overview

The New Zealand Avocados Go Global Primary Growth Partnership (PGP) was an eight-and-a-half-year programme which aimed to transform the New Zealand avocado industry. The aim was to reduce the industry's reliance on one market and move it towards being a globally competitive, high-value, sustainable export industry with a dynamic market in New Zealand.

The initial programme was for five years, and it included goals to quadruple sales and triple productivity by 2023. Go Global's vision was that by 2023 an integrated industry would be on track to deliver;

- NZ\$280 million annually in net sales.
- Productivity tripled to 12 tonnes per hectare.

1.1.2 Programme Performance

An independent progress review was conducted midway through the programme. It concluded that: *"The Go Global PGP programme has made a major contribution to the New Zealand avocado industry, achieving a step change in the way that the industry operates. It is now a much more trusting, collaborative, cohesive, communicative and co-ordinated industry, with a correspondingly greater public profile."* It also concluded that: *"The behaviour shift driven by the step change places the industry in a much stronger position to respond to increased international demand for avocados and increasing need for market diversification."*

Go Global has been an important catalyst of industry growth. This growth has enabled information-sharing across the industry, the opening and development of new markets in Asia, and improvements in productivity through a focus on tree health and orchard management. The programme was extended in 2019 to leverage industry growth and the work programme included the following projects:

- The development of a differentiated story for Asian markets.
- Sustainability credentials.
- Trusted supply chain projects including digitisation.
- A feasibility study on whether New Zealand should have an avocado breeding programme.

The programme has performed well. It supported the industry to achieve a return to New Zealand of \$230 million, through an estimated \$250m net sales. This achievement was up from \$70 million in 2012 and very close to the ambitious PGP objective to quadruple net sales from \$70m to \$280 million. The ambitious PGP goal to treble productivity was achieved with industry yields increasing from 3.4

tonnes per hectare in 2012-13 to 11.7 tonnes per hectare in 2021-22. Significant improvement in consistency of yields has supported sustainable increases in productivity.

Risks through a reliance on the Australian market have been mitigated through the development of Asian markets. Exporters have trebled the volume shipped and sold in Asia from 541k trays in the 2020-21 season to 1.5 million trays in the 2021-22 season. Exports to Asia reached 42 percent of export volume with the most significant growth in South Korea, Thailand, China, Taiwan, Singapore and Malaysia. Research was undertaken with 1,000 consumers in six Asian markets to understand the attributes influencing the purchase of avocados. This research led the development and implementation of the Triple Active New Zealand Avocados campaign, focusing on the three attributes most valuable to consumers, omega 3, folate and antioxidants.

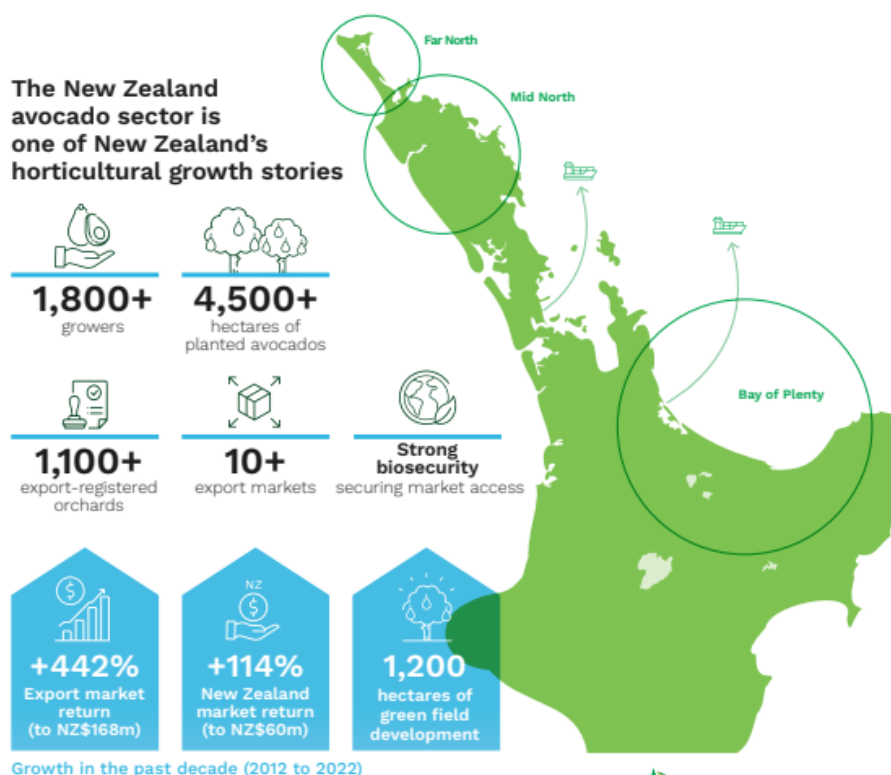
The Go Global vision was to significantly increase returns from the New Zealand market and over the programme these returns have increased from \$28m in 2012-13 to \$63m in 2021-22. This growth was the result of a focus on market development in New Zealand and promotional activity through an 'Avocado Story' developed under the programme.

Adoption of best practice increased through information sharing enabled by the programme. Systems were developed which digitised on orchard compliance & export data. These systems included the development of a grower facing portal and digitised spray diary, as well as a digitised system to collect, manage and report industry data. These systems ensure all parts of the supply chain can exchange data in real time as orchards are cleared for harvest. They include online market declarations, and digitised non-propagation agreements for nurseries. Productivity and consistency of yield data has been benchmarked and is tracked at both individual orchard and national levels. Go Global developed sustainability credentials for the New Zealand avocado sector. The first step was development of a Life Cycle Assessment (LCA) as part of the programme's sustainability work, with the orchard, packhouse and distribution models complete. Interim reporting shows an average water footprint for the New Zealand avocado industry at six times lower than recent South American studies on avocados. The presentation of New Zealand's orchard performance benchmarking was a highlight when learnings from the programme were transferred to a global and NZ audience of 1,160 avocado stakeholders at the 10th World Avocado Congress hosted by NZ Avocado in 2023.

The value of the avocado industry, and most importantly the returns to growers per hectare (OGR) have grown considerably in the last 10 years. There are now more than 1,400 avocado growers and 4,400 hectares producing avocados. 50% of these hectares are located in the Bay of Plenty, and 50% in Northland. Over 1,000 hectares of new planting has occurred in greenfield sites, or from dairy conversions as a result of the significant increase in returns per hectare for avocado.

The outcomes of Go Global will continue to support long term growth in new and existing markets with a differentiated and high value proposition from a trusted and sustainable industry. Although the global sector is currently impacted by significant increased supply from a number of countries, the potential remains very good for avocados, provided there is strong investment in increasing market demand, particularly in Asia.






The legacy of the Go Global programme will be that it will continue to add value to the sector with enduring systems and increased connectedness across the industry. A feasibility study for a breeding programme was undertaken in the programme and it confirmed that the sector would benefit well from a breeding programme in New Zealand. The programme has put the industry in a stronger position to respond to the growing demand for avocados, the increasing need for market diversification, heightened phytosanitary and compliance requirements and the implementation of some different ways of growing avocados that are more productive and more consistent in their yield.



The low cost and modest magnitude of the programme relative to industry production, increasing returns to New Zealand, multiplier effects and tax generated arising from a better performing industry substantially exceed the costs of the programme, implying a sound return on Crown investment.

The NZ avocado industry is building on its achievements by further expanding market access, investing in research and innovation, and fostering strong industry collaborations with the international community on the back of a hugely successful World Avocado Congress held in New Zealand in April 2023. Go Global has been instrumental in driving the growth and international success of the New Zealand avocado industry. By focusing on productivity, supply chain efficiency, market development and research the programme has positioned New Zealand as a niche but global supplier of premium avocados while supporting sustainable practices and benefiting the industry and the economy as a whole.

1.1.3 Key performance indicators

Go Global Key Performance Indicator	Measure	Baseline year 2012	Current situation (2022)
Increased productivity of New Zealand avocado orchards	National average tonnes / ha (4-year average)	4.0 tonnes/ha 3.4 tonnes/ha in 2012-13	9.95 tonnes/ha  11.7 tonnes/ha in 2021-22
An efficient and productive New Zealand avocado industry	Industry volumes tonnes (3-year average)	21,607 tonnes	45,073 tonnes 
New Zealand avocado industry supplying diversified export (non-Australian) markets	Percentage of exports to Australia versus Asia & other markets	Asian/other markets 12% Australian market 88%	Asian/other markets 42%  Australian market 58%
Higher returns to growers, packers, exporters in the New Zealand avocado industry	Total Industry value (3-year average) Industry Orchard Gate Return (OGR) (4-year average)	\$70 million \$39 million	\$170 million  \$116 million
A strong, high-value New Zealand market	New Zealand market value	\$28 million	\$63 million 

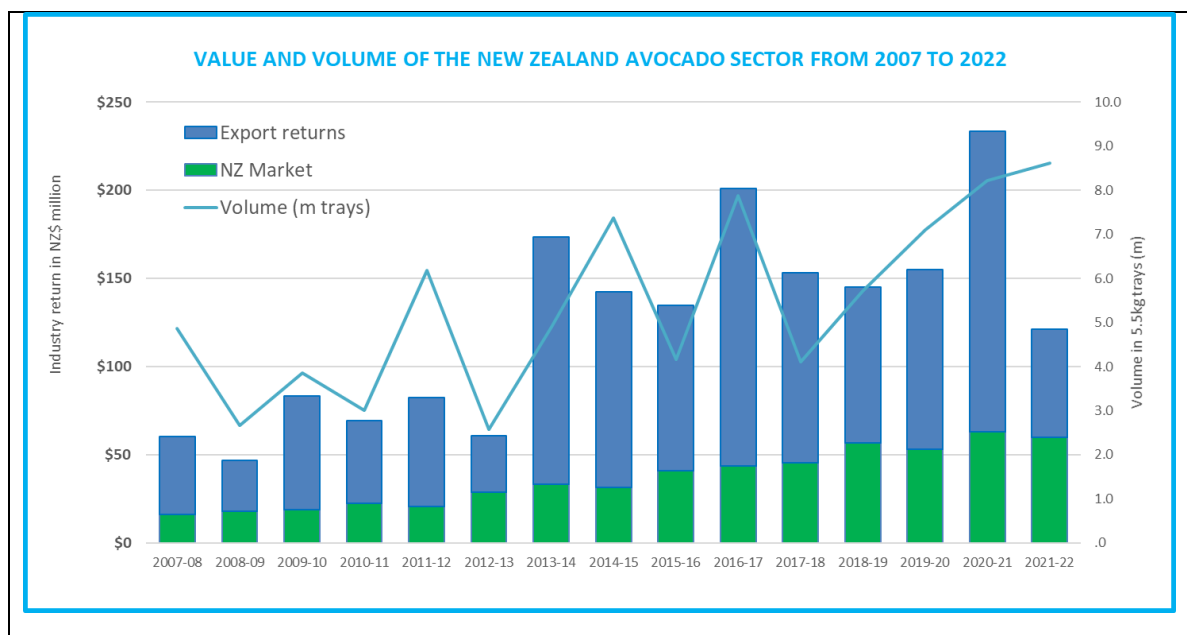
2 Industry Overview

Avocado seed was brought to New Zealand in the early 1900s and the industry has become New Zealand's third largest fresh fruit export. The New Zealand avocado industry consists of 1,800 orchards, 1,400 growers with yields ranging from under seven tonnes to over 30 tonnes per hectare. In 2022, there were 5,500 hectares of mainly Hass variety of avocados planted, with 4,400 in production. A number of packhouses, fruit marketing companies and exporters are involved in the industry to market and sell New Zealand avocados both in New Zealand and globally. Avocado growers in New Zealand register with NZ Avocado Industry Ltd and comply with strict rules around avocado quality, food safety and sustainability. These rules apply right through the supply chain.

NZ Avocado Growers' Association Inc (NZAGA) is the grower membership organisation that operates to support New Zealand avocado growers' interests. NZAGA promotes the sale and consumption of avocados, managing a research and development programme, and fosters a supportive structure that encourages development and growth within the industry.

New Zealand Avocado Industry Ltd (NZAIL – formerly Avocado Industry Council) is the recognised product group for avocados under the Horticulture Prescribed Product (Avocados) Order under section 31 (2) of the New Zealand Horticulture Export Authority Act. NZAIL is wholly owned by NZAGA, and its Board comprises NZAGA's executive representatives and two exporter directors. The sector operates under the Horticulture Export Authority Act and exporters must be licensed with the NZ Horticulture Export Authority in order to export avocados. The scope of NZ Avocado Industry Ltd includes all contractual arrangements necessary for HEA Act 1987, development and implementation of quality standards, export grade standards, rules and procedures that must be followed by growers, pack houses and exporters. These rules and procedures are documented in the Avocado Export Marketing Strategy (EMS) and the Avocado Quality Manual.

Significant growth in Industry value has occurred since the start of the Go Global programme with a corresponding trend in the consistency and productivity of orchards. The baseline for the Go Global programme was the 2012-13 year when industry value was \$60m, with an estimated net sales of \$70m. Eight years later in 2020-21, the value of export of avocados from New Zealand was NZ\$170m, with estimated net sales of \$183 million. The total value of the industry including the domestic market was NZ\$234m, with estimated net sales of \$250m.



In recent years New Zealand exporters have had to contend with major shipping issues and soaring freight costs resulting in nearly ten percent of export volume ending up in the New Zealand market as planned ships were either not available, delayed or rerouted. Additionally, border clearance issues brought on by Covid disruptions have impacted the quality of avocados available for customers. Avocados are not stored but harvested to meet market demand. The 2021-22 season was very challenging with the Australian market collapsing due to huge increases in Australian supply, very challenging shipping, with both delays and increased freight costs and Covid preventing exporters visiting their customers in market. Avocado export value fell 63 percent to \$62 million in the year to 30 April 2022. The sector is likely to go through a further couple of years of constrained growth, but opportunity remains for New Zealand as a supplier of this amazingly nutritious, safe food from New Zealand to target consumers.

Global visibility of avocados has significantly increased over the past two decades, with avocados recognized as the only fruit containing protein (as well as carbohydrates and good fats). Avocados are rich in nutrients, and free of sugar and salt, and have become a natural first food for babies. They can be consumed from breakfast through to dessert, and appeal to younger consumers as trendy, meeting both vegan and vegetarian requirements, and are a key part of the keto and Mediterranean diets.

New Zealand currently produces just 2% of the global supply but is the ninth largest international avocado exporter. Global demand continues to increase and according to the Organisation for Economic Co-operation and Development, 2.25 million tons of avocados were produced globally in 2020, compared to 1.69 million tons in 2017, an increase of 33%. Mexico is the largest producer, with nearly 55% of global supply and the USA the largest consumer, eating nearly 50% of world production.

Markets across Europe, the Americas and East Asia all have rising avocado consumption. Globally the Hass variety is the most commonly traded avocado.

New Zealand Hass avocados are harvested for export from July through to February. The Hass avocado is unique in that it is harvested mature, but unripe. In fact, the avocado will not ripen while it is attached to the tree. With New Zealand's cooler climate, the growing season is much longer than in other producing countries, and avocados will be 9-18 months old on the tree prior to harvest. New Zealand sets a minimum dry matter as a test for maturity, before which the avocado cannot be harvested. The avocado is then ripened before consumption. Ripening sees the avocado skin turn from dark green to a dark purple, and the flesh soften to a creamy texture making the avocado ideal for consumption.

The Go Global programme was initiated because the industry needed to invest in both productivity research and market development. Without support the industry was struggling to build capability of systems and knowledge while leveraging the amazing attributes of avocados. The Go Global programme took two years to initiate but its implementation has been instrumental in supporting very strong growth of value, knowledge and capability across the industry. The benchmarking developed in the programme enables enhanced export systems which support the future growth of volume and value, as well as the measurement of impact.

3 Main Report

3.1 Programme Overview

3.1.1 Introduction

The “New Zealand Avocados Go Global” programme was launched June 2014 in collaboration between the Ministry for Primary Industries’ Primary Growth Partnership fund and the New Zealand avocado industry partners. The programme was a strategic initiative aimed at increasing the value of the New Zealand avocado sector and maximizing its potential. The programme enabled the emergence of a globally competitive, high value, sustainable horticulture industry delivering real returns to New Zealand. It transformed the avocado industry from a reliance on one market to a globally competitive, high value, sustainable export industry with a dynamic market in New Zealand.

Go Global began as a five-year, \$8.6 million programme with a vision to deliver \$280 million annually in net sales and triple productivity to 12 tonnes per hectare by 2023. The aim was to enhance the industry's productivity, sustainability, and profitability, while positioning New Zealand as a leading global supplier of premium avocados. The programme focused on key areas such as orchard productivity, supply chain efficiency, market development and research and development. It began with five key objectives: market entry and growth; consistent and sustainable supply; efficient supply chain; products from waste; and information transfer and adoption. The baseline year for measurement was the 2012-13 season.

To build on current objectives, the programme was extended in 2019 with additional Crown funding to enhance outcomes in the areas of: market insights; trusted supply chain; evidence-based sustainability; and a feasibility study for an industry breeding programme. Under the agreement to extend the programme in 2019 the total investment in the programme was increased.

No additional investment was made in the programme after the May 2019 extension, however due to the inability to make progress under Covid-19 restrictions, two further time-only extensions were made to the programme. These time extensions took the completion date of Go Global out to December 2022.

Under the programme, investments were made to increase understanding on orchard of how to achieve productivity improvements, including the adoption of best practice and the development of a benchmarking model that tracks yield and consistency of yield, by orchard, from 2009 to present day. Extension of learnings resulted in increased avocado yields, improved fruit quality and more efficient orchard monitoring and management practices.

To ensure a streamlined and efficient supply chain, the NZ Avocados Go Global programme undertook meetings with growers to understand their challenges and opportunities and seek solutions through a digitised system. Digitising industry systems and optimising data used to benchmark orchard performance played a significant role in understanding and reporting on supply chain performance and orchard productivity.

Expanding market development was a key focus of the programme, with emphasis on diversifying export markets. Extensive research with 1,000 consumers from six Asian markets to understand why consumers ate avocados identified new opportunities and provided input to targeted marketing strategies. As a result, avocados from New Zealand gained a solid presence in established markets, such as Australia and expanded presence into emerging markets across Asia.

The programme included a feasibility study for an industry breeding programme to overcome environmental growing challenges along with a longer-term view of a differentiated cultivar for the industry. The feasibility study concluded that New Zealand would benefit significantly from a breeding programme. The research highlighted potential collaborations with breeding initiatives in other sectors and explored conventional as well as novel breeding solutions.

3.1.2 Partners

The New Zealand Avocados Go Global programme was a partnership between MPI and NZ Avocado Industry Limited Ltd (NZAIL), previously Avocado Industry Council. MPI invested under the Primary Growth Partnership fund, a joint venture between government and industry that invested in long-term innovation programmes to increase the market success of the primary industries.

Go Global co-investor NZ Avocado comprised:

- The New Zealand Avocado Growers' Association Inc (NZAGA) and
- The Avocado Industry Council Limited, which was renamed in 2018 New Zealand Avocado Industry Ltd

3.1.3 Programme governance and management

The Programme Steering Group (PSG) was composed of two Ministry for Primary Industries representatives, the NZAGA Chair, CEO and Programme Manager and a representative of exporters. The PSG met quarterly throughout the term of the Programme, for the first two years this group was chaired by a New Zealand Avocado member and subsequently by an Independent Chair.

Implementation of the programme was led by the CEO supported by the Programme Manager with project input from New Zealand Avocado managers. The programme finances were collated by the

New Zealand Avocado Business Manager and annually audited as part of NZAGA Group accounts by an external independent auditor.

3.1.4 Business Case

The Go Global vision outlined in the business case was to transform the New Zealand avocado industry to quadruple sales and triple productivity by 2023



The Go Global programme aimed to see the emergence of a globally competitive, high value, sustainable horticulture industry delivering real returns to New Zealand. The programme aimed to transform New Zealand’s avocado industry from a reliance on one market. The objective was to leverage research to deliver a consistent predictable supply of avocados and enable an integrated industry to work together through a unified marketing strategy, leveraging a category story that drives demand for New Zealand avocados in priority markets.

The Business Case proposed that the avocado value chain could be transformed through investment in building capability and knowledge. There was to be widespread adoption of best practice, underpinned by streamlined collection, analysis and dissemination of industry knowledge to drive performance. Lifting productivity was seen as critical to establishing the sector’s position in export markets and ensuring the value chain is competitive.



Key opportunities identified in the original Business Case included:

- Position avocados to meet the consumer demand for premium, safe, healthy, nutritious fresh produce. Develop priority markets and a compelling story of the differentiated nutritional benefits to provide a high value industry return for growing production volumes.
- Increase productivity by taking learnings from the highly profitable and productive orchards and spreading this industry wide. Analysis of these top orchards to understand what makes them successful.
- Build New Zealand’s reputation for having a good verification system, and for producing safe, healthy food.
- Enable isolated success to drive success through cross-industry performance benchmarking, significantly improved collection, analysis, and reporting of information and sharing of knowledge to build capability.
- Understand feasibility of processing avocado waste.

The following factors were identified at the start of the programme as being possible barriers to programme success:

- Exchange rate fluctuations
- Market access changes
- Significant land use changes
- Adverse weather events impacting on avocado production

- Significant events impacting on the performance of avocado orchards
- Global production and trade dynamics.

3.1.5 Investment

In June 2014, an Agreement was signed between the Avocado Industry Council Ltd and the Ministry for Primary Industries for a 5-year, \$8.6m, Primary Growth Partnership programme. In May 2019, a two year, \$2.8m programme extension was signed that was subsequently extended a further year until December 2022.

	MPI funding	Industry funding	Total contributions
Go Global programme	\$4,281,402	\$4,281,402	\$8,562,804
Go Global extension	\$1,120,000	\$1,680,000	\$2,800,000
Programme funding	\$5,401,402	\$5,961,402	\$11,362,804

In 2017, NZ Avocado indicated their intention to submit an extension to their PGP programme. At that time, industry value was more than double the \$60 million value of 2012, and a record average return per tray of \$41.50 was reached in 2018, 35 percent higher than the return in the previous year. New Zealand avocados were gaining popularity and preference in a number of export markets and achieving a premium. Korea, Japan and Singapore represented over 60% of the non-Australian exports. Promotional activity in these markets included New Zealand avocado websites, social media campaigns, competitions, influencer endorsements, and media and consumer events. Taiwan, India, and China were emerging market with strong avocado consumption growth. Gaining market access to China was important in the development of Asian markets for avocados from New Zealand.

Access to the China market was achieved with the first export shipments to China at the end of September 2018. The industry capitalised on a strong global demand, although its export volumes and values were still driven by swings in the irregular bearing pattern of avocados. This irregular fruit-bearing cycle of production was making it difficult to develop markets.

In October 2018 NZ Avocado's application for a two-year extension was submitted to MPI's Independent Advisory Panel. The objectives were:






- Sustainability projects: Life Cycle Assessment, industry case studies, strategy development and maintaining linkages to government environmental reforms.
- Further developments to allow digital industry data collection and online systems.

- Productivity projects relating to soil health and regenerative agriculture and its extension to growers.
- Extension of the differentiated story via website activity and collaboration with exporters.
- Development of case studies and marketing collateral to support the World Avocado Congress theme of resilience, sustainability and regenerative farming.
- Seeking options for funding channels if a breeding programme is feasible.
- Programme administration and supporting the development of industry investment plans aligned with Fit for a Better World and MPI and Horticulture science strategies.

MPI approved the extension in May 2019 and the New Zealand Avocados Go Global programme became a seven-year, \$11.4 million PGP programme. All PGP programmes were granted a 6-month time only extension in 2020, acknowledging the impact of Covid-19 restrictions. This took the end date of Go Global to December 2021, however, Covid-19 impacts continued to restrict ability to connect with researchers, market development agencies and supply chain partners. Many activities such as global market insights work, on-orchard trials, and industry workshops, were postponed. For that reason, a time only 12-month extension was granted, making December 2022 the final completion date.

3.2 The Approach 2014-2019

QUADRUPLE SALES & TRIPLE PRODUCTIVITY

OBJECTIVE 1	OBJECTIVE 2	OBJECTIVE 3	OBJECTIVE 4	OBJECTIVE 5
 <p>Market Entry & Growth - Asia & New Zealand</p>	 <p>Consistent & Sustainable Avocado Supply</p>	 <p>Efficient Supply Chain</p>	 <p>Products from Waste</p>	 <p>Information Portal, Knowledge Transfer & Adoption</p>
<p>Significantly increase volumes and value in prioritised Asian and the New Zealand market</p>	<p>Improve per hectare productivity & consistency of fruit production</p>	<p>Maximise efficiency throughout the supply chain, from orchard to packhouse to port to market to consumer</p>	<p>Develop added-value products from avocado stones, which are currently sent to landfill</p>	<p>Develop industry information portal for input, analysis and output of information and knowledge, specifically deliver knowledge developed</p>

3.2.1 Market entry and growth

3.2.1.1 Market diversification

This objective was to support the expansion of Asian and New Zealand market sales through the development of market entry and growth strategies, generic market collateral and market insights. The initial KPI was to achieve a reduction in the percentage of avocado exports shipped to Australia. The baseline was 87% of exports were being shipped to Australia at the start of the programme and the target was 50%. This KPI was adjusted to reflect the over-all growth in the export market, including Australia. The new KPI was the export volume into Asian markets. The baseline was 600,000 trays and the target one million trays. In 2021, 1.5m trays of avocados were shipped to Asia, well exceeding the KPI.

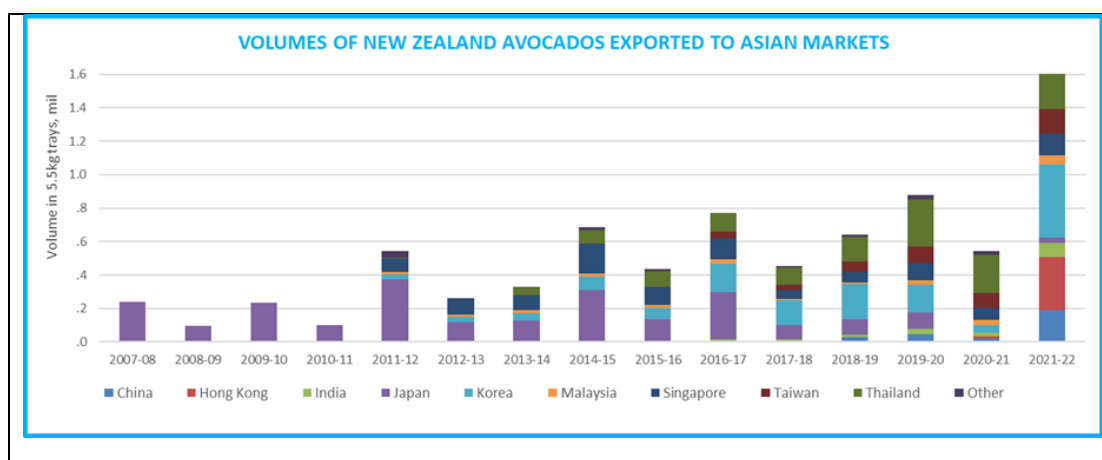


Chart showing the significant increase in volume of avocados from NZ to Asian markets

It was recognised that to effectively build the China market at good value returns to New Zealand growers, significant promotion activity and investment needed to take place to build awareness of New Zealand avocados in China. Avocados are not grown in China and are little known, so much investment into market development was needed.

3.2.1.2 Export market strategy

Industry was concerned that without strong differentiation, the 15% premium that New Zealand avocados were achieving in some Asian markets would be difficult to maintain. Without an enduring premium, exporters will struggle to compete and sustain an increased presence in these key Asian markets.

The programme produced a research-based marketing strategy to deliver maximum market penetration, consumer awareness and category value from industry and exporter marketing investment in new export markets. The strategy differentiated New Zealand avocados from competing products in the fresh produce category in Asian markets. Activities included:

- Exporter consumer insights working groups.
- Sensory research.
- Report produced on insights from NZ Avocado social media testing on differentiated story.
- Identification of research institutes or universities in Asian markets to publish differentiated nutrient analysis of New Zealand avocados.
- Premium Avocados from New Zealand story were tested and evolved based on substantiated points of difference that justify a price premium with target consumers and customers in Asia.
- Consumer, customer, and market research undertaken to inform differentiated positioning and drivers for purchase, including in-market focus groups and sampling.

The project contributed to a greater understanding of market and consumer dynamics in Asian markets and targeted promotions collateral and a public relations strategy based on research findings.

While the Australian market was outside the scope of the programme, more disciplined behaviour of exporters resulted from collaboration. Collateral and market research around the concept of a “New Zealand story” complemented (rather than potentially interfered with) the activities of licensed exporters supported market development and diversification.

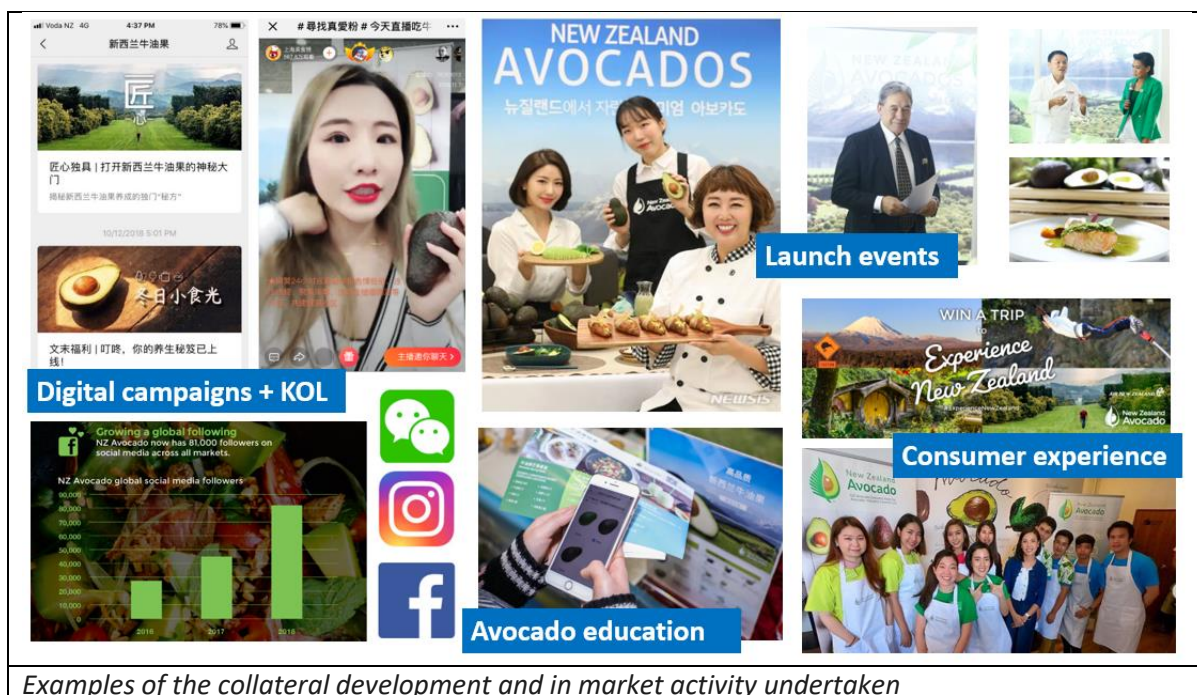
A steady increase in followers across Asian markets was achieved through the creation of innovative and on-trend collateral and campaigns. Ongoing consumer testing and themes from NZTE NZ Story research produced insights which continually updated the messaging, collateral, and delivery strategy. Digital programmes in Asia in local language websites and social media promotions resulted in activities including:

- Marketing the versatility and health attributes of our amazing avocados.
- Education programmes and PR campaigns developed by co-investor AVANZA.

Nutrient content knowledge is fundamental to the health science programme and health claim labelling. The NZ avocado industry was previously using nutritional information from overseas studies that did not specify Hass. Plant & Food Research were contracted to develop a reference nutritional composition profile for NZ Hass Avocado based on composite samples at two time points in the season and from the three major avocado production regions: Bay of Plenty, Far North and Mid-North. Results were published in the NZ Food Composition Database. Research indicated that avocados grown in New Zealand compared to Hass avocados grown in other parts of the world have 200% of the vitamin B6 and 120% of the folate. Knowing the nutritional composition of NZ Hass Avocado provided a basis for number of market and promotion initiatives.

Good uptake of messaging and imagery in export markets has been achieved through collaborative development of the category story for 'Premium Avocados from New Zealand.' Collateral is tailored to suit individual export markets and included in supermarket and retail displays in South Korea, Japan and Singapore and Thailand. In New Zealand, the 'Amazing Anytime' category story achieved endorsement from major retailers, with imagery used on retail displays in supermarkets nationwide

The focus on digital platforms and events throughout the course of the Go Global programme supported exporter activity and helped authenticate NZ brands with retailers. Digital platforms helped raise visibility of a differentiated story of avocados from New Zealand. Communities of followers were created who understand and share that story. The platforms include consumer led content creation including recipes and nutrition, reaching a huge audience across multiple markets. Digital platforms are used to assess consumer reactions and gain insights, as well as inform and educate consumers on how to choose, store and ripen avocados.

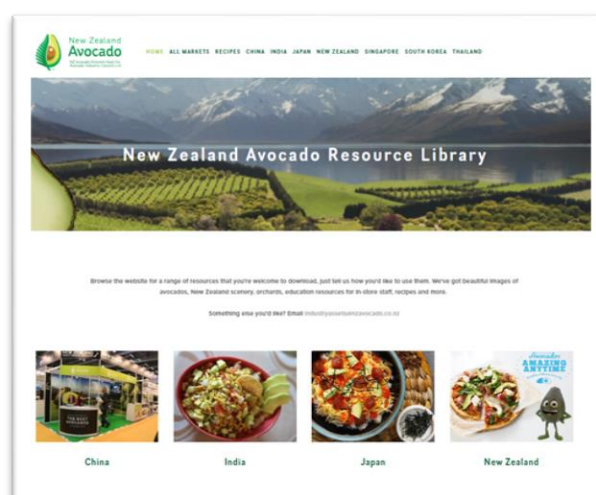


Examples of the collateral development and in market activity undertaken

An Avocado Supply Model was developed to measure the attractiveness of export markets using consistent parameters and methodology. The model evaluates export markets on macro environment indicators, demand and consumptions of avocados and the competitive landscape in each country. It helps prioritise future marketing activities. Tier 2 export markets were identified and prioritised. Programme partners also developed resources for supply chain education and implemented technical support programmes in key export markets.

A secure online library of promotion and education resources for exporters and New Zealand marketers was developed to facilitate the distribution of category story resources and drive increased uptake and usage from industry stakeholders.

Access for avocados from New Zealand into China was approved following the successful audit of the industry systems with the Avo Hub and Avo Diary taking centre stage in describing the level of formality and technology that supports the industry's compliance, food safety and market access systems. A trial airfreight consignment of New Zealand avocados successfully crossed the border into China in early 2018. An official event was facilitated by MFAT, MPI and NZTE in Shanghai to celebrate the successful market entry process and



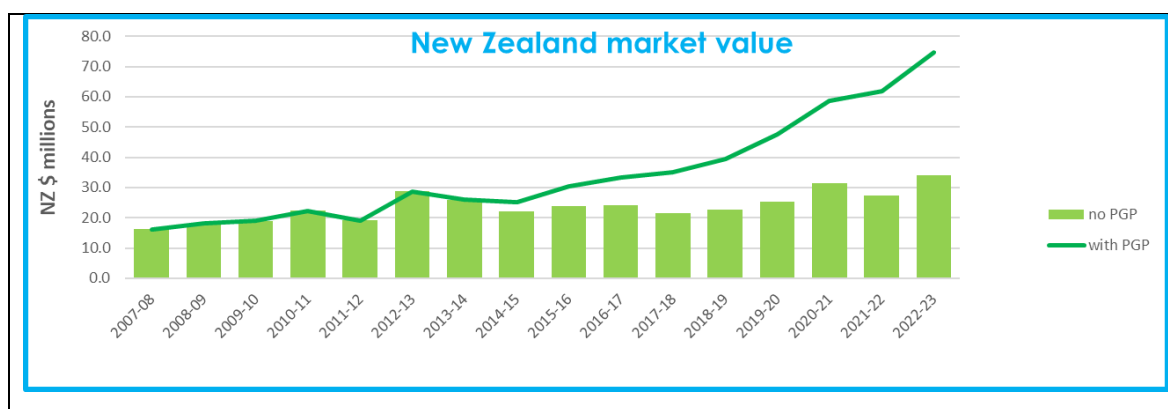
to thank the officials in China for their contribution to this process. New Zealand Chinese Digital Marketing Agency United Media Solution created a brand story for avocados from New Zealand in China and implemented digital marketing activities to promote the 2018-19 export season. NZ Avocado CEO and Marketing Manager attended the China International Import Expo in November 2018 in Shanghai. NZ Avocado facilitated a sampling event in Shanghai during the week of the expo and a collaborative promotion event with other New Zealand food and beverage products in November.



3.2.1.3 New Zealand market

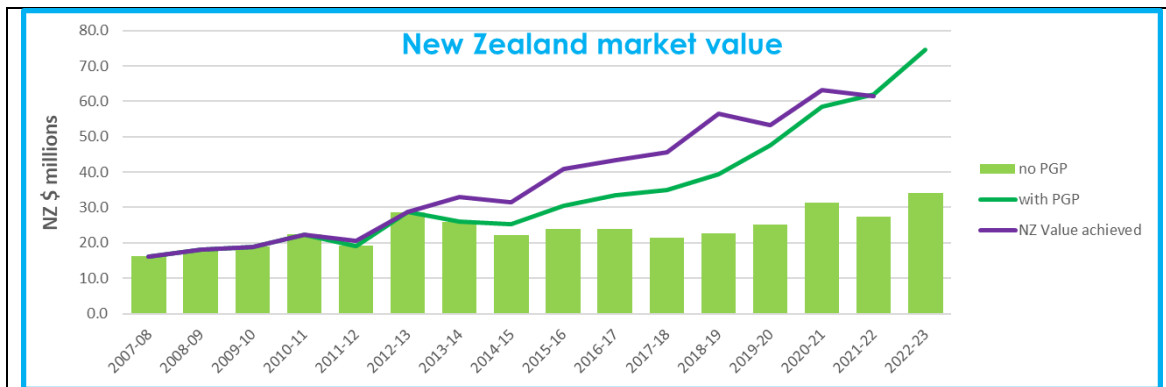
The New Zealand market had been a by-product of an export industry prior to the PGP programme. As the closest market and very visible to all growers, the New Zealand market offered an excellent opportunity to strengthen relationships and information flows as well as build collaboration to increase the value of that market.

The programme objective was to achieve a strong, high-value New Zealand market. The baseline was NZ \$28.7 million at the start of the programme and the target was \$75 million.



The business case set out the forecast growth with PGP and without PGP, and included a very ambitious target to grow from \$28m in 2012-13 to \$75m in 2023

Actual growth has been very close to this very ambitious target with value in the New Zealand market reaching \$63m in 2022.



The value achieved in the New Zealand market under the Go Global programme is shown as the purple line

NZ Avocado collaborated closely with independent marketers and developed strong relationship with retailers. Better data was collected, collated, and used by all parties. An umbrella branding, “New Zealand Avocados, Amazing Anytime” was developed and utilised strongly by NZ Avocado, marketers, and retailers in generic promotions.

The ‘AMAZING ANYTIME’ ‘Nutritious delicious every day’ logo was formally trademarked by NZ Avocado through the Intellectual Property Office of New Zealand.



Guidelines were produced to ensure appropriate usage with IP license agreements signed by exporters and retailers using the material in the New Zealand market and export markets. Retail toolkits, training videos and other resources were developed for produce managers to assist with receiving, storing, handling, and display of their avocados.

Online digital promotions, in-store tastings, season launches, and the effective use of influencers all supported the significant growth from \$28.7m in 2012-13 to \$61.5m in 2021-22. This growth in value of the New Zealand market was from both sales of fresh avocados and the value from processed avocado.

3.2.2 Consistent and sustainable avocado supply

3.2.2.1 Productivity

The objective was to increase the productivity and consistency of productivity of New Zealand avocado orchards. To manage this objective, we needed to measure productivity and the orchard performance benchmarking was developed under this Programme.

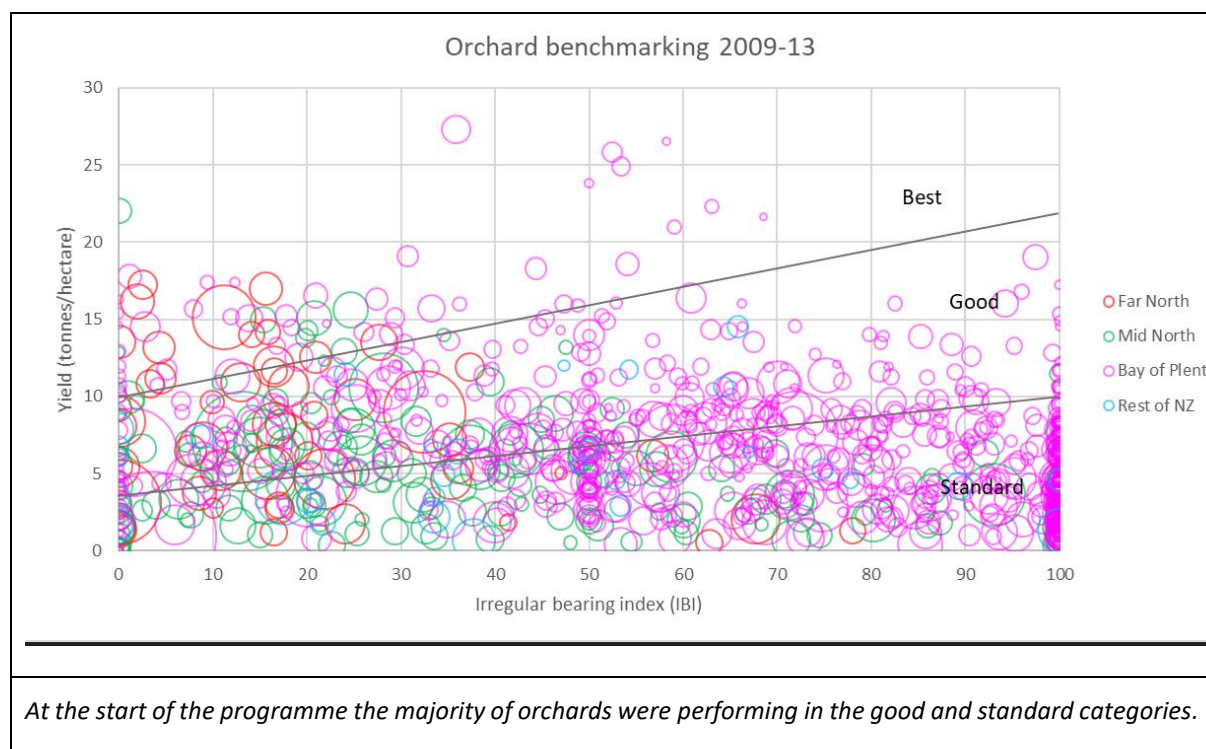
Orchard performance benchmarking

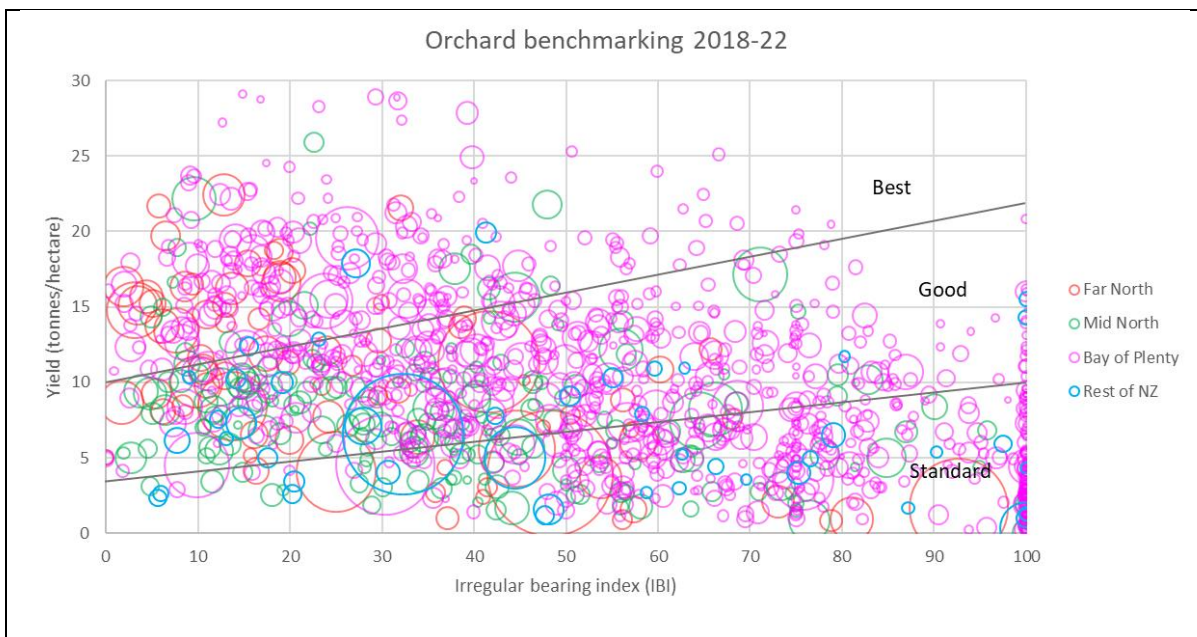
The development of the Orchard Performance benchmarking chart/system measuring the performance of every orchard over a four-year average was a significant milestone that enabled industry to track and report on individual and regional progress across key performance metrics.

Every year, NZ Avocado categorises orchard performance into three categories using a standardised calculation based on yield and irregular bearing index, IBI. The categories use the average across four years, to allow for the swings in yield, and are best, good, and standard. Every orchard is a dot on the chart below, with the size of the circle reflecting the size of the orchard. By benchmarking orchard performance, we can at any time measure the change across the industry of performance.

The first benchmarking chart shows the state of the industry when the Programme began, with orchard performance data from 2009-2013.

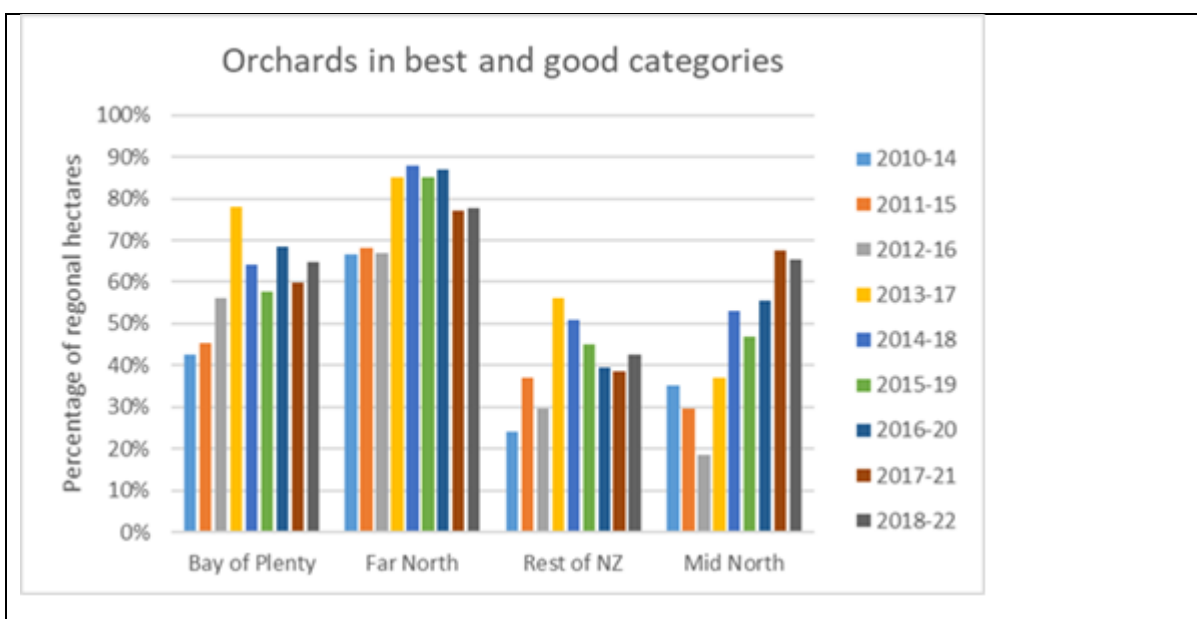
The second chart shows the state of the industry in 2022, using a four-year average from 2018 to 2022.





Orchard performance has improved markedly during the PGP programme, with a much greater percentage of orchards now in the best and good categories.

Case studies of the top performing orchards were developed, shared on the industry website, and reported at grower field days. Those case studies report that the top performing orchards manage their orchards in line with what is included as “best practice orchard management” on the industry website. The improvement in the percentage of orchards performing in good and best categories demonstrates that best practice is being used and used to achieve increased yields and increased consistency of yield.



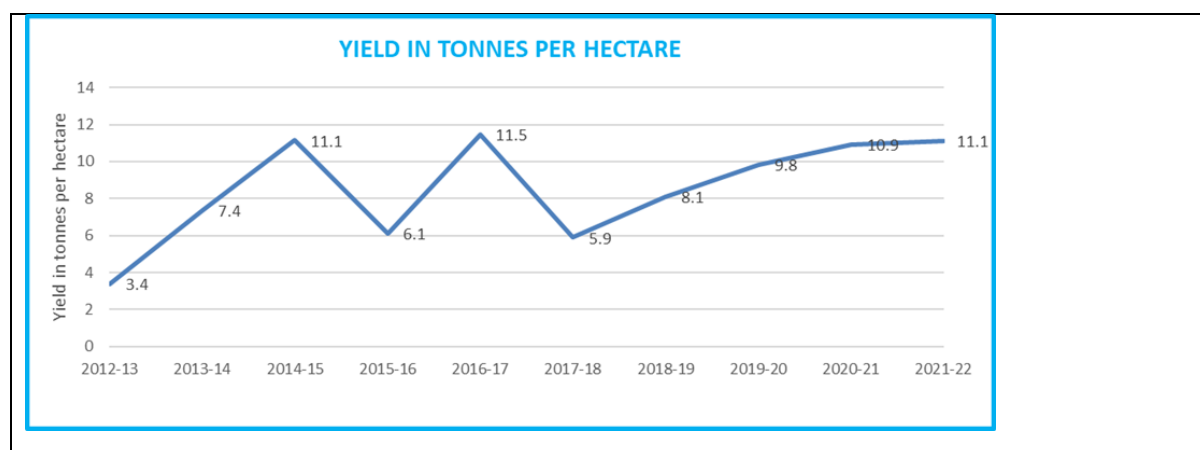
The chart shows the increasing percentage over time of orchard performing in the best and good categories, i.e., with higher yields and lower inconsistency.

At most grower field days, the orchard performance over time of the orchard being visited is shared with attending growers, and growers can request a copy of the benchmarking data for their orchard.

3.2.2.2 Consistent yields

Between 2014 to 2017, the industry was capitalising on a strong global demand, but its export volumes and values were affected by swings in the irregular bearing pattern of avocados. This irregular fruit-bearing cycle of production made it difficult to develop markets. The Go Global vision was to achieve a consistent industry average of 12 tonnes per hectare. Not only did this require an increase in tonnes per hectare, but also a decrease in the swings in productivity that had plagued the industry. There has been a distinct change since 2017, with much more consistency of annual volume at both an orchard and industry level.

The chart below shows the increasing yield in tonnes per hectare over time, and the decreasing swings in yield since 2017.



3.2.2.3 Orchard management

New Zealand's unique growing environment presents unique challenges. The Programme looked at different alternatives to improve productivity and value. The team leveraged overseas research on optimal extension programmes, had working groups in the regions where top growers shared their stories about how they had achieved well above average orchard performance.

Go Global included a canopy management project in which industry professionals developed their own strategies which were then reviewed within working groups in three different regions and used

to develop and extend best practice guidelines. This project enabled improvements from successful growers to be made available to the wider industry.

Tree decline issues limit productivity in New Zealand avocado orchards. Factors contributing to tree decline were identified, including excessive soil moisture, lack of adequate mulch, defective phosphorous acid injection methods, excessive crop loading, limb sunburn due to defoliation, mites, and increased virulence of pathogens. Working groups focused on these factors and provided growers with best practice advice to reduce the incidence tree health issues. Fruit staining, especially prominent in Northland, was also having some impact for growers, and on-orchard management demonstrated that application of best practice mitigated some of this challenge. On-orchard best practice guidelines and Postharvest systems literature review were completed with guidance produced for the main factors believed to be influencing fruit quality.

Monitoring equipment was installed in a number of trial orchards to track tree health and performance and define baseline information on environmental conditions. Standardised protocols were developed through the various regionally based working groups to provide a consistent approach to the diagnosis of tree decline factors. Outcomes from this work allowed for best practice content and videos for canopy management to be made available on the NZ Avocado website along with practical demonstrations of pruning methods delivered at industry field days.



A technical group of growers and consultants from across the industry proved to be a valuable medium to feedback ideas on research aims and help distribute research outcomes to growers. One specific area of focus was ensuring growers were getting consistent information about the optimal time they should prune to ensure they were setting up their trees for return flower and a consistent crop load.

In 2023 this technical group is still meeting and has ongoing objectives which are:

- Update industry representatives on recent research and improve awareness of work.

- Provide direct information to researchers and NZ Avocado about what issues growers are dealing with and where further research could be helpful.
- Build the network of contacts between industry representatives and researchers to support discussion and sharing of ideas and industry challenges.
- Look for opportunities for industry participants to work collaboratively, or share information, in areas of common ground to help tackle common industry challenges.

The learnings from orchard management working groups, experts and on-orchard field days also identified that orchard management had a big impact on fruit quality which was essential to optimise for delivery of premium avocados in the market. Fruit quality discussion groups were held with packers and exporters to identify and prioritise fruit quality issues and gaps in knowledge:

- Fruit rots on orchard.
- Fruit rots from harvest to retailer.
- Chilling damage.
- Inadequate data from the retail market (Australia).
- Shipping temperatures in relation to maturity and other environmental conditions.
- Offshore inspections and control of the supply chain once landed in Australia.
- Effects of methyl bromide fumigation.
- Grade standards.
- Changing consumer.
- Physical impact on fruit through the pack line – dropping, sanitisers and water blaster.

3.2.3 Efficient supply chain

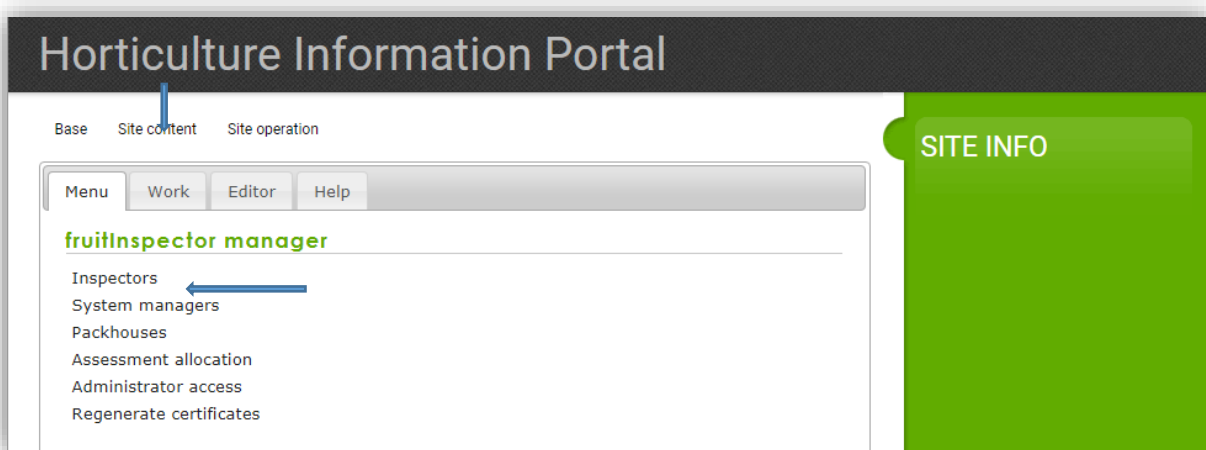
Evaluation of supply chain inefficiencies and their impact on productivity was undertaken. The information gained enabled industry to build an end-to-end picture of the supply chain and highlight areas needing further investigation. This work took longer than expected due to detailed observation and analysis of industry needs and existing third-party systems. There was significant consultation with growers, packhouses and other post-harvest operators to build an enduring system that was fit for purpose and scalable. These assessments led to the development of a grower portal, Avo Hub, and

the upgrading of the critically important industry spray and fertiliser diary, Avo Diary. These systems dramatically improved growers and postharvest operator’s ability to plan and comply with both the industry’s and Government export and market access standards.

A goal was to streamline the food safety system within the avocado industry by identifying what requirements the avocado sector and associated horticultural industry product groups have in common, taking into account the changes to the Food Act, and adopting programmes to achieve greater supply chain efficiency (specifically including but not limited to audit process). It included the quantification of how compliance with Agrichemical Minimum Residue Limits and withholding periods for all markets by all grower lines would improve packhouse supply chain efficiency. Changes required identification of all-market access status for all grower lines.

AvoGreen® data is necessary for EMS and quality standards compliance assessment. Data was previously collected both manually and electronically from a number of disconnected sources and brought together for compliance assessment. Streamlining data collection and management reduced manual errors and costs. Essential data linkages were identified to achieve greater supply chain efficiency (including, but not limited to, compliance process).

A post-harvest training programme relating to QC pest ID competency was developed to expedite the process around post-harvest operators meeting MPIs new export standards. Within the same online platform, the industry now delivers on-line training and competency assessment under the AvoGreen



programme, including post-harvest pest identification training modules.

A greater focus on processes improvement was achieved through the digitisation of many industry data systems from a grower level information portal to the more efficient handling of production data throughout the supply chain.

3.2.4 Products from waste

This project evaluated opportunities to produce by-products from processing grade avocados within NZ. Understanding the feasibility of developing value-added products utilising the high value components of avocado skin or stones for nutritional, health and cosmetic applications was initially centred on literature reviews to understand the potential value and properties of avocado stones/skins. This work then explored the feasibility of extracting and utilising the potential high value properties contained within the avocado waste stream.

There are four waste products from avocado oil processing - skin, stones, green water, fruit pulp. The skins and stones are removed from the fruit prior to processing – this is about 25- 30% of the fruit weight. One million kilograms of avocados produces 300,000KG of seed and skin. At present, seed and skin is used for composting. Dry fruit pulp left after oil and moisture have been extracted from the avocado pulp (50% by weight of the whole fruit) currently goes to cattle food. Green water is the liquid phase remaining after the oil has been separated off. It contains less than 5% oil.

Potential commercial applications and pathways to market for value added products relating to nutrition or health were explored. Co-investor Avocado Oil was unable to continue R&D work towards this project, however, Callaghan Innovation built up a large amount of knowledge, experience, data, and product concepts. Callaghan identified product opportunities from avocado skin and seed waste streams, including assessment of extracts and their composition. Their investigations determined:

- Avocado seed produces a notable lipid extract with promising properties for bioactive, nutraceutical or skin care applications and also yields a polyphenolic extract for similar end-uses. Avocado seed also contains unique peptides with interesting bioactive properties. The fibrous content of the seed was also of interest, and further work could be performed to develop these concepts. Also, the seed fibre is still usable after the valuable lipids and phenolics have been extracted.
- Avocado skin produces a useful phenolic extract and is available in relatively high yields compared to other common sources. After extraction of phenolics and lipids, the skin, like the seed, had a remaining bulk carbohydrate/fibre fraction of interest.

The expense and complexity of the extraction is a barrier to commercializing ingredients from avocado waste. In terms of ongoing research, intellectual property rights over past avocado seed research proved a barrier and there was no desire to repeat research already completed. It was acknowledged that the industry would not gain value without an economic extraction process and commercial entity to take the lead with end product development.

NZ Avocado has maintained limited communication with Callaghan Institute and Plant & Food Research, but stay informed of related projects to progress value from waste research. Although a defined project is not confirmed at this date NZ Avocado retains the ability to capitalise on any future projects if they arise in the value-add space of fruit processing.

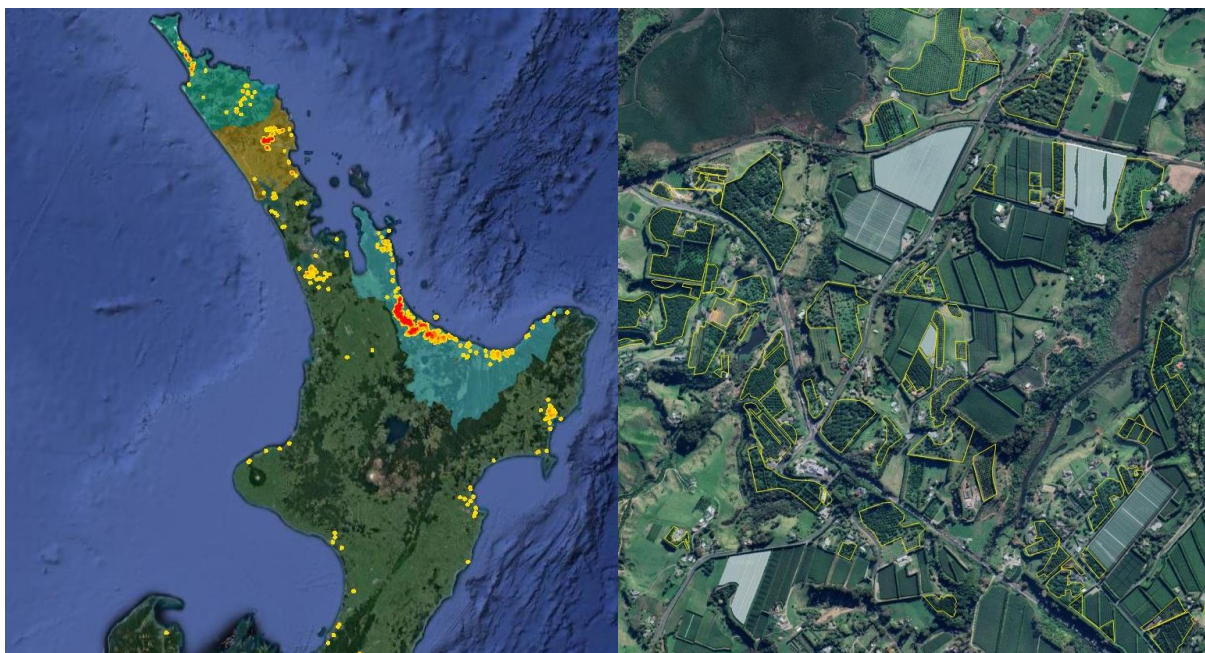
3.2.5 Information portal, knowledge transfer & adoption

This objective of this project was to generate and disseminate information, and included the development of online systems. The aim was having all growers well educated about the short- and long-term impact on quality, sustainability, and profitability of using fungicides in avocado production resulting in higher post-harvest quality measured in market and in library trays.

Online interactions and data handling are now essential tools for industry compliance programmes, substantiating industry food safety and traceability systems and productivity reporting back to growers to drive best practice.

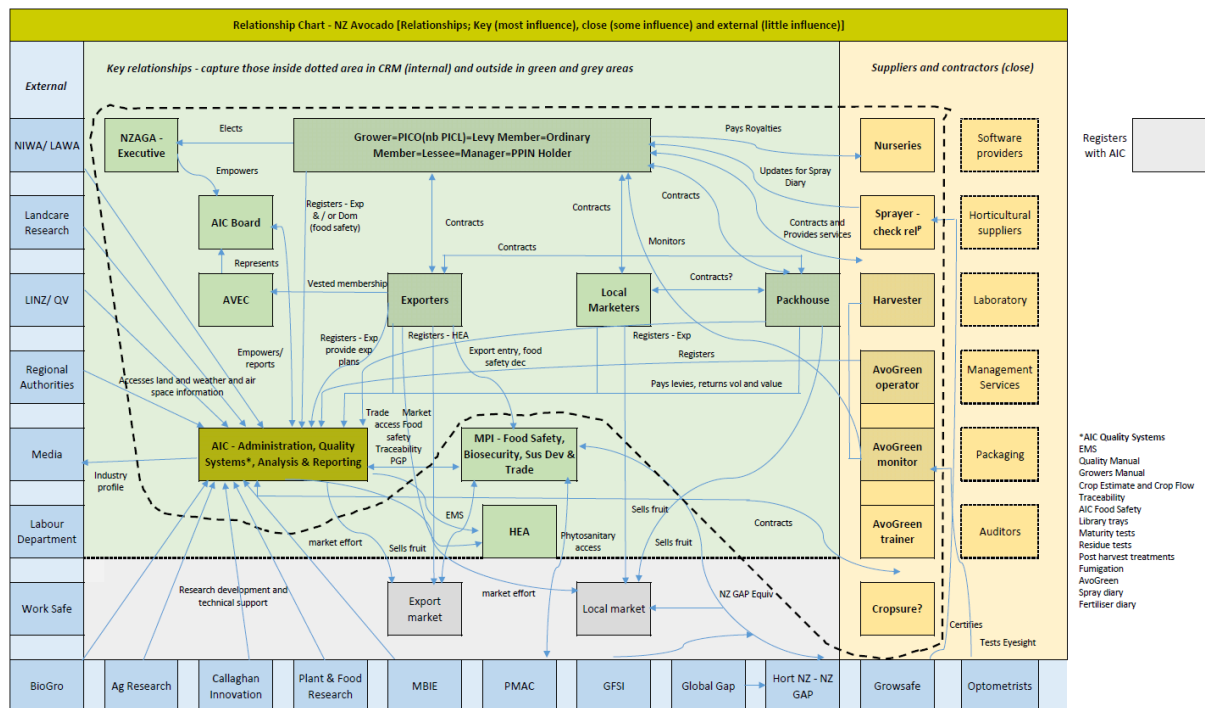
Progress on this programme of work would have been more rapid if New Zealand Avocado had had at least one IT proficient staff member at the commencement of the PGP programme, and if there had been an earlier analysis of user needs to guide strategic direction and establishment of priorities.

All export registered avocado orchards throughout NZ have now been GIS mapped, allowing for the first time an accurate picture of total industry hectares and regional distribution. The orchard and associated hectares of every grower registering for export with the industry annually is now displayed on a GIS map. This enables each orchard location and size to be verified and contributes to the industry



benchmarking and database, and is becoming an increasingly accurate and valuable resource.

The investigation of industry needs, relationships and data flow resulted in a review of software and existing systems across the primary sector, and the development of a comprehensive Relationship Chart, shown below. The chart identifies different industry stakeholders and supports understanding of the different applications they currently use to interact with data and each other.



The early completion of a 'single-sign-on' function provided access to a range of online services and created an IT platform for other online access and security functions for industry members. Creation of Avo Diary, Avo Hub, and the Agiloft CRM included the development of a web-linked information system to improve industry data collection. It provides the interface and interoperability for the industry systems and databases.

The industry website includes an intuitive design, vastly upgraded search function, updated content, event management and comprehensive industry directory making it a great resource for growers, suppliers, post-harvest operators, contractors and marketers.

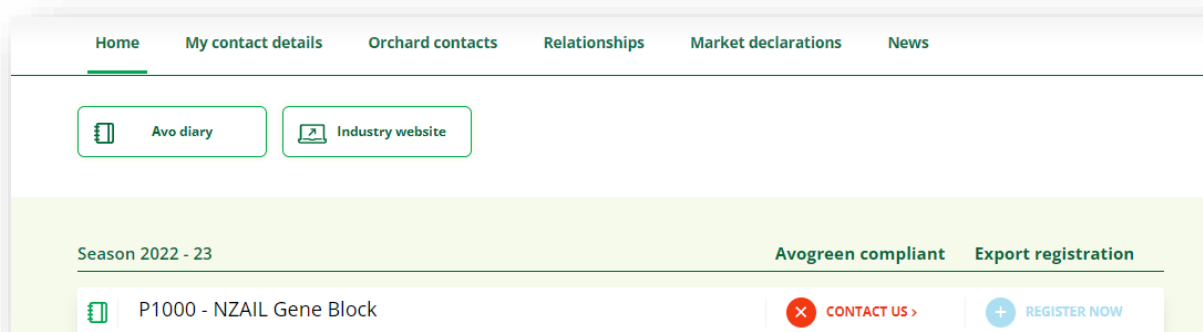
Through the development of more accurate and timely data capture and handling, grower production information is collated to benchmark orchard performance relating to yield and consistency of yield. This informs grower's management decisions and identifies regional trends. There is a continued focus on how to best capture and share this grower performance data.

Below is a summary of the information portal and aligned IT projects completed under the Go Global programme

3.2.5.1 Avo Hub

Avo Hub became the single source of truth for industry data, providing a centralised information platform utilised across the industry. Avo Hub was delivered in 2018 with the grower export registrations process. Avo Hub includes the following capabilities:

- A gate way to the new Avo Diary application.
- Online market declarations for both China and Thailand registration.
- Links to the new Industry website and grower contact and relationship management.



Avo Hub includes the development of a single sign-on process for growers to access all industry resources from restricted website content. This secure individualised log-in to the portal equips growers with the ability to:

- Digitally sign compliance documents
- Update their details edit relationships
- Access preferences with their service providers across all the orchards they are registered against.

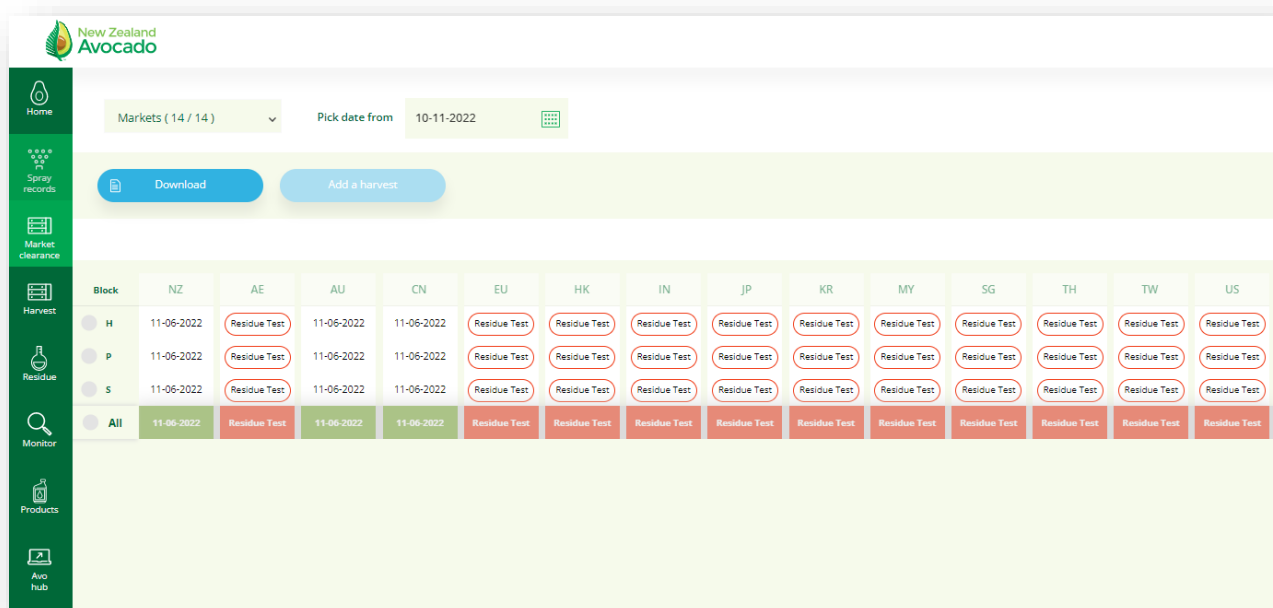
3.2.5.2 Avo diary

The previous industry spray diary was over 15 years old and no longer able to be supported. The industry spray diary system is a critical component of the food safety system and essential for export compliance. It has been completely redeveloped via an agile approach with intense consultation across the supply chain. The spray diary is recognised as a fundamental application used by all across the value chain for reporting and meeting market access requirements. The functionality and

accessibility of the electronic spray diary is now also being utilised to introduce a range of other reporting functions for the industry relating to:

- AvoGreen monitoring.
- Quality standards.
- Data upload/reporting functions.
- Central access for growers and postharvest operators to meet industry registration and contractual requirements.

Avo Diary goes beyond capturing just spray applications to providing a platform to collect spray, fertiliser and pest monitoring data. Packhouses have an administrative view across all the orchards they are connected to, allowing for harvest, food safety, export compliance and residue clearance functions. Described as a one-stop-shop for both growers and packers, the Avo Diary houses and digitises many of the industry compliance functions providing significant data for both research purposes and industry reporting.



The screenshot shows the Avo Diary web application interface. At the top, there is a navigation bar with the 'New Zealand Avocado' logo and a sidebar menu with icons for Home, Spray records, Market clearance, Harvest, Residue, Monitor, Products, and Avo hub. The main content area features a dropdown menu for 'Markets (14 / 14)', a date picker set to '10-11-2022', and two buttons: 'Download' and 'Add a harvest'. Below this is a table with columns for 'Block' and various market codes (NZ, AE, AU, CN, EU, HK, IN, JP, KR, MY, SG, TH, TW, US). The table contains rows for different harvest dates (11-06-2022) and 'All' entries, with each cell containing a 'Residue Test' label.

Block	NZ	AE	AU	CN	EU	HK	IN	JP	KR	MY	SG	TH	TW	US
H	11-06-2022	Residue Test	11-06-2022	11-06-2022	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test
P	11-06-2022	Residue Test	11-06-2022	11-06-2022	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test
S	11-06-2022	Residue Test	11-06-2022	11-06-2022	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test
All	11-06-2022	Residue Test	11-06-2022	11-06-2022	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test	Residue Test

Structured way of collecting fertiliser applications

Previous fertiliser applications were free-text fields with no functionality to enable comparisons between growers, regions, or years. Once a comprehensive database of all commercially available fertilisers was established, interrogation of data was possible to better understand who, what and where different products are used. Information could be overlaid with other productivity data. This

work enabled industry to quantify orchard inputs to align with regional and national resource management requirements.

Centralised, online repository for AvoGreen® reporting and linking these to spray applications

Previously AvoGreen® reporting was either paper-based reports in AvoGreen® Operator databases, or held by growers and packers on spreadsheets. By having the records on a centralised database, a 'one-stop-shop' for the grower and packhouse is available to manage compliance between monitoring and spray applications, retain history of pest monitoring.

Grower export registrations

Grower export registrations were completed online in 2018 in conjunction with a new single sign-on login method.

Market Declarations

Market Declarations were a paper-based application process where growers, packers, NZ Avocado, and the IVA managed signed forms and entered details onto their own internal registers. Market access registrations are now an online process (checkbox) for the grower. Registers are automatically created, and reports extracted from the Agiloft system.

E-signature functionality

All growers are now signing their non-propagation agreements using the e-sign/digital process when buying PVR cultivars. This has removed significant administration steps and paperwork from both the nursery sector and wider industry.

Traceability

The programme improved traceability for both PVR contractual and biosecurity outcomes. As data is now digital in the centralised Agiloft CRM, the industry can access it to understand how many and what date trees are entering into production, and which regions are expanding and/or replacing trees with new genetics.

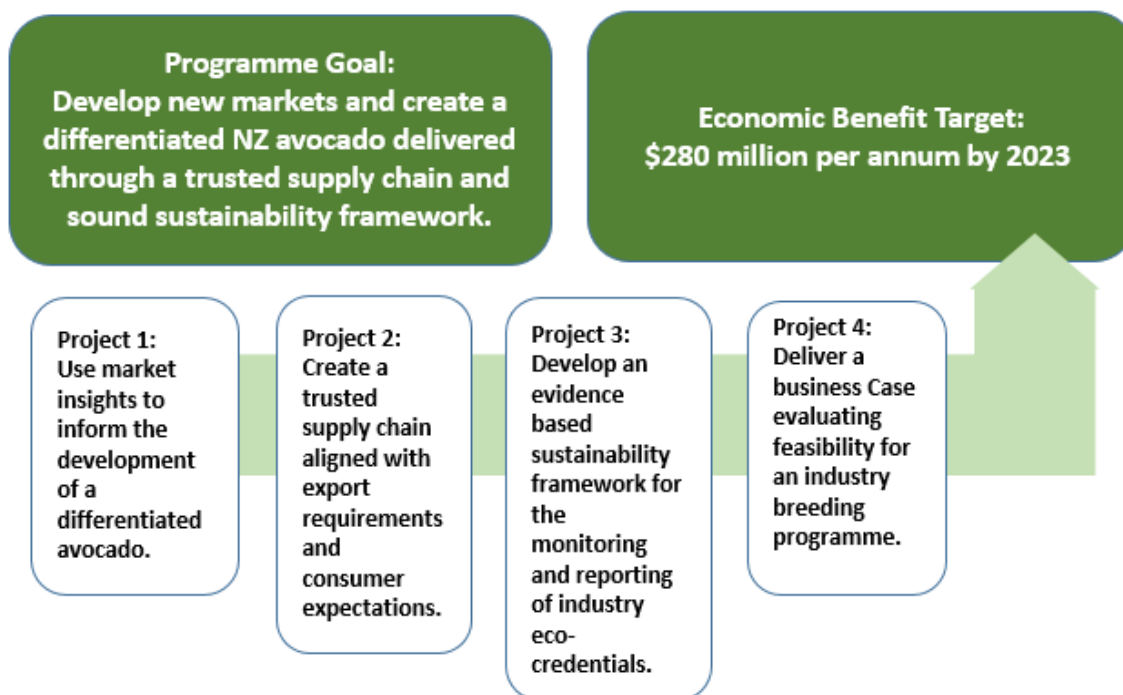
3.2.5.3 Industry capability

A programme goal was to increase the number of skilled and semi-skilled roles in the avocado industry in the main growing areas of Bay of Plenty and Northland. The programme supported capability in horticulture research in New Zealand by supporting service providers through the adoption of best practice. The KPI indicator used was the number of growers participating in industry engagement and

training, measured by the trend in field day attendance. The base line in the 2013-14 year was 257 people. Since 2016-17, attendance has consistently exceeded 1,000 at industry events per year.

3.3 The Approach 2019-2022

An extension to the PGP Go Global programme was approved by MPI and signed by the Director General on the 31st May 2019.



The PGP extension aimed to evolve the Premium Avocados from New Zealand story to demonstrate with evidence the specific differentiated elements of avocados from New Zealand. It had four core projects:

- Market insights
- A trusted supply chain
- Evidence based sustainability
- Feasibility of an industry breeding programme

3.3.1 Market insights

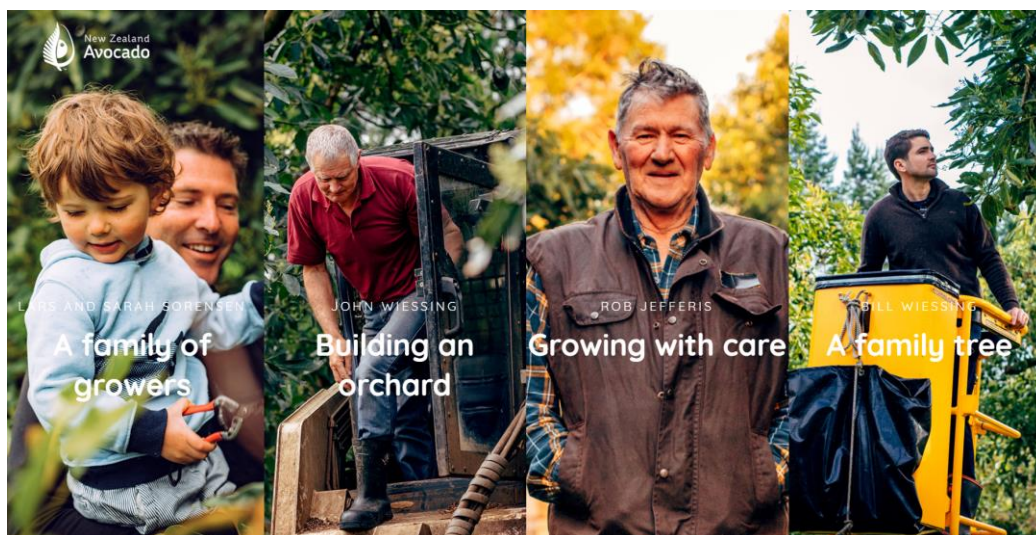
The Market Insights project aimed to further develop a differentiated avocado to support exporters to achieve shelf space, maintain a premium, and sell increasing volumes at value. In-market consumer

testing and insights informed continued research to strengthen evidence of a unique avocado to meet evolving consumer needs.

Exporter workshops contributed to the development of a differentiated story for avocados from New Zealand, with a focus on markets in Asia where volumes from South American supply countries continue to increase.

Multiple stories leveraging unique qualities of avocados grown in New Zealand were developed and evaluated with consumers in key markets, to identify a story that is differentiated, defensible and compels consumers to purchase. Differentiated story development was facilitated by Launchsight, who are an NZTE approved partner for brand and experience design.

Mindfood creative team were contracted to create New Zealand avocado grower and industry stories to support consumer collateral in Asian and NZ markets.



Sustainability messaging were developed and published by competitors, and these were captured and fed into the differentiated story development process with exporters. The FRESH FOCUS publications and related online portals were central to these insights. The project included a focus on making the industry more sustainable, including:

- Smart irrigation.
- Energy efficient packhouses.
- Greener post-harvest treatments and packaging.
- Waste reduction.

- Social compliance.
- Responsible production and sustainability messaging.

Qualitative interviews with target consumers in Korea, Thailand and China provided insights relating to consumer decision making and trigger points around their food and where it comes from, and perceptions of avocados from New Zealand and other countries. Findings reminded us that functional health benefits of produce are a key driver of consumers' purchase decision making in these markets. Exporters use the differentiated story guidelines and associated imagery developed by NZ Avocado. This includes the Triple Active New Zealand Avocados proposition to highlight the functional benefits of omega fatty acids, antioxidants, and the unique folate content of New Zealand avocados. This positioning is supported by the Respectful Harvest trust mark and associated website developed to signify and communicate to consumers that avocados that carry this badge come from a natural origin and are certified to have been grown to specific orchard, environment, and management conditions.

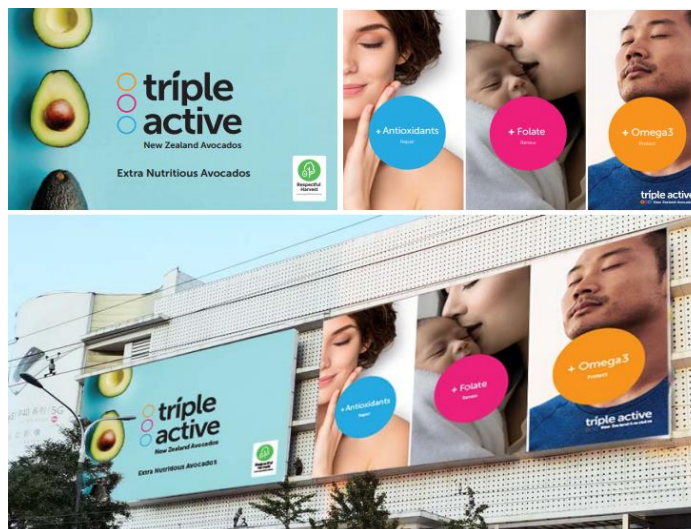
Research indicated that Asian consumers have a favourable view of New Zealand as a trusted supplier of various safely grown, nutritious, premium fresh produce. However, we increasingly compete in many of the Asian markets with Peru, Chile, Mexico, Colombia, USA, the Philippines and now Kenya. The importance of our industry telling a compelling and substantiated story to differentiate our supply remains critical.

NZ Avocado continues to work closely with exporters and NZTE approved Better by Design agency Launchsight to develop a differentiated story for avocados from New Zealand. Consumer insights from this project highlighted an opportunity to shift the positioning of the New Zealand avocado story from passive produce to a functional food. Consumer testing found a high degree of confidence and connection with the concepts. Final designs and brand guidelines have been developed and shared with exporters. There are two layers to the story for this positioning:

Triple Active

Triple Active New Zealand Avocados highlights the functional benefits of omega fatty acids, antioxidants, and the unique folate content of New Zealand avocados.

The story positioning leverages is familiar to consumers because the “triple action/active” concept is utilised already in the beauty industry, through nutrition supplements and toothpaste marketing. It enables exporters to engage with customers in market with a story that can help their retail partners grow the avocado category and at the same time differentiate avocados from New Zealand in a positive way adding to the value of their overall avocado offering.



Respectful Harvest

The premise that respectfully harvested avocados are better for the world resonates well with consumers. New Zealand avocados are grown with genuine integrity, in a gentle climate with plentiful fresh rains that nourish fertile soils. Respectful Harvesting rules demand specific orchard practices, environmental management conditions and fruit maturity and harvesting methods - which cause elevated levels of nutritious and enriching vitamins.

The Triple Active and Respectful Harvest logos and content have now been trademarked in New Zealand and there are plans to trademark these in priority Asian markets.



3.3.2 Trusted supply chain

The programme objective was to optimise quality, food safety and build stronger recognition of industry systems and inform best practice across the supply chain. A number of areas were identified that closely align with the goals of the trusted supply chain including:

- Evaluating new processes and technology for maturity monitoring.
- Evolving Avogreen and related technology for orchard pest monitoring.
- Dedicated post-harvest systems related to water blaster effectiveness, fruit quality and export compliance.
- Setting water blaster specification standard for optimal phytosanitary and quality outcomes.
- Updated operator manual for use of water blasters in avocados.
- Water blaster commissioning processes.
- Reviewing and trialling post-harvest phytosanitary treatments and water sanitisers.

- Post water blaster fungicide treatments.
- Fungal Infection modelling on orchard (Plant & Food Research project).

NZ Avocado, its supply chain partners, and the research community explored specific areas of the supply chain to target further research and trials to improve quality. Projects included:

- Seeking alternative fungicides both pre- and post-harvest.
- Trials looking at unsound fruit and possible causes through the supply chain.
- Understanding how calcium impacts fruit quality.
- Influence of supply chain temperatures and fruit maturity on quality.

Reliance on quality, food safety and provenance to differentiate the NZ avocado requires evidence of best practice from across the supply chain. This project has driven applied research and data gathering to direct on-orchard growing systems, cool chain and export requirements that align with consumer expectations.

NZ Avocado consulted with Regional Councils, growers, and service providers to provide growers with a series of online resources via the NZ Avocado website. These online resources consist of six essential areas of knowledge a grower will require to be able to build their individual eco credentials in water. These essential areas of knowledge are:

- Use of water.
- Measuring water use.
- Optimum amount of water to use.
- Water consents.
- Good management practice for water.
- Understanding the rules (legislation, policy, and plans).

3.3.3 Digitisation of industry systems

The mapping of industry systems coupled with future data and reporting requirements showed critical needs for IT solutions in the areas of weekly monitoring and reporting, online PPIN application, Xero Integration, online Avogreen registration, and Global Gap food safety assurance systems.

3.3.3.1 *Weekly Monitoring and Reporting*

This acts as a data warehouse and reporting tool that allows packhouses and exporters to report of fruit quantities being sent for export. This allows fruit levies to be calculated for billing and also produces reports that can be sent to stakeholders.

3.3.3.2 Online PPIN Application

A PPIN application is initiated when a new orchard registers to grow avocados. The online PPIN application is used to collect information about the orchard such as its size and the trees on the orchard as well as ownership and voting information at various points in the process.

3.3.3.3 Xero Integration

Agiloft is the primary system for weekly monitoring and reporting and information housed in Agiloft can be passed into Xero for seamless invoicing.

3.3.3.4 Online Avogreen registration

The functions of Avogreen are wide ranging and require significant administrative oversight in the areas of compliance and reporting. Moving to an online platform has benefited growers, Avogreen operators, and NZ Avocado staff.

3.3.3.5 GAP review

Global Gap food safety assurance systems provide clarity to growers around legislation, industry systems and retailer requirements. This work aligns with central and regional government requirements relating to fresh water, Farm Environment Plans, and emission reporting.

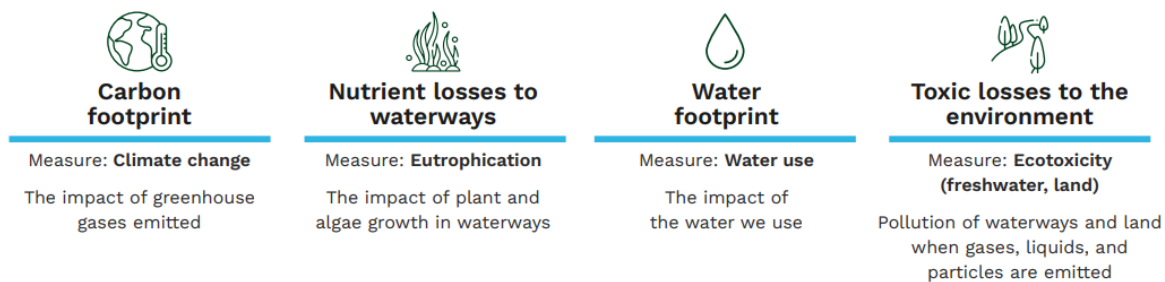
Grade training has upskilled quality staff and ensured training resources are available to meet industry quality standards. Growers are increasingly wanting to ensure post-harvest handling practices are standardized between staff as well as between facilities.

The research collaboration to produce a novel Near InfraRed (NIR) maturity clearance system to provide faster dry matter measurements was trialled and validated. It is now in commercial use for maturity clearances in the current season.

3.3.4 Sustainability

A KPI to define industry sustainability and establish baseline data was created during the programme. Stakeholder consultation revealed the four most important environmental sustainability topics for our industry which were well aligned with the areas of sustainability being discussed internationally in relation to consumer demand, market acceptance and future environment policy.

This project established an understanding of the environmental footprint of avocados in New Zealand and achieved consensus on performance indicators and data standards for environmental monitoring and reporting of the industry's eco-credentials.



The project engaged over 200 growers who completed an online survey on the challenges and opportunities across environmental, economic, and social sustainability. Following the survey, sustainability workshops and then online workshops (through Covid-19 lockdown) captured views on where the industry’s focus should be. The key themes were:

- Questioning how the industry remains viable especially for small growers.
- Consistent production.
- Water availability and its management.
- Market development and market returns.
- Fruit waste/low grade fruit.

Consultation extended across the supply chain with priority areas ranked based on business impact and ability for industry to influence.



Projects supporting the sustainability objectives included nutrient removal assessments through the harvest of fruit in New Zealand Hass avocado orchards. The work increased understanding of how

relevant nutrient removal data from overseas is to New Zealand. It has initiated the collection of baseline crop nutrient removal data for the development of a tool to enable growers to identify the potential environmental impacts of their fertiliser inputs while also offsetting the wider carbon footprint of the wider industry.

3.3.4.1 *Alternatives to Methyl bromide*

A number of fumigation trials were undertaken to understand any resulting fruit quality issues when applying pest fumigants. The goal is to continue exploring alternative pre-export insect and mite treatments for avocados that maintain fruit quality and reduce the pest loads on export fruit. Through the course of the programme Vapomate (Ethyl formate), Eco2fume (Phosphine) and Bluefume (hydrogen cyanide) were trialled. Fruit quality impacts and ability to integrate the required treatment times and required infrastructure into the tight supply chain timelines has proven difficult to date.

3.3.4.2 *Bio fungicide trials*

Trials evaluated the efficacy of bio fungicides compared with a control (water) and copper treatment against avocado fruit rot diseases. The most efficacious bio fungicides will be selected and integrated into the industry spray programme with a view to reduce the sole reliance on copper to reduce post-harvest fruit rots.

3.3.4.3 *A scientific and evidence-based approach - Life Cycle Assessment (LCA)*

To better understand the environmental performance of New Zealand avocados, the industry commissioned a Life Cycle Assessment (LCA) which evaluated the environmental attributes of a 1Kg of avocado throughout all stages of the value chain from production through to markets in Asia and our domestic trade.



Results across all the modelled impact categories were at the lowest end of the range in all other global studies where they have been calculated. Being the first avocado industry globally to quantify this at such an in-depth and industry-wide level presents the industry as a responsible, transparent and forward-looking player among our competitors.

National results: The national score is a weighted average of regional results (based on production volumes) for 1 kg of avocados.

■ Production (mature orchards)
■ Packaging and processing
■ Distribution



A key learning was that greater productivity and sustainability go hand-in-hand. Yield per hectare affects environmental impacts, especially climate change. Meaning the higher the yield per hectare, the lower the climate change effect and vice versa. This means that making the industry more productive and economically sustainable makes it more environmentally sustainable too.

The industry is using these insights to improve environmental and business performance through:

- Guides to help industry use water as efficiently and responsibly as possible.
- Better understand fertiliser loss from our orchards to optimise its use.
- Alternative production systems to reduce resource use and operate as efficiently as possible.
- Options to manage pests and diseases.
- Ongoing collection of environmental data and reporting on sustainability progress.
- Advocacy with regulators for science-based policy.
- Collaboration with supply chain partners to educate consumers.

NZ Avocado is now investigating the value of developing the world's first Environmental Product Declaration (EPD) for avocados, based on the information in the LCA. An EPD tells the environmental story of a product over its life cycle in a clear, simple format that a wide audience can understand.

3.3.5 Avocado breeding programme

Avocados are native to Central America, so New Zealand's cool, wet and windy climate makes avocado production a challenge. This project was about delivering future resilience to the New Zealand Avocado industry by understanding the challenges and steps required to breed a cultivar that performs well in New Zealand, meets consumers' needs and is potentially different or unique. Groundwork was needed to assess the viability and potential of a breeding programme. A KPI was added to the programme which was to produce a feasibility report to inform decision-making for an industry breeding programme. This project included the following:

- Literature review on current programmes in avocados and other related sectors.
- Survey of stakeholders, growers, and marketers to build knowledge base and understand acceptance of novel breeding techniques.
- Workshops with research and breeding programme providers.
- Workshop with experts, including University of Queensland.
- Stocktake of available genetic material (varieties) within NZ and their PVR status.
- Tendering of a project with leading tissue culture researchers/laboratories in NZ to undertake trial in avocado tissue culture.
- Exploration of the legislative environment and establishment of relationships with regulatory bodies.
- Working group to understand and select priority markers and achieve agreement on potential funding options.
- A business case to support or otherwise a breeding programme for avocados in New Zealand.

Brainstorming workshops were held with members of the Avocado Nursery Association (ANA), Plant & Food Research and NZ Avocado to document an approach to the feasibility study. This was a valuable meeting bringing together those within the industry that are propagating new and emerging cultivars with the scientists who are actively working on a number of other sectors breeding programmes. Actions from this meeting included planning visits to other breeding facilities and meeting the operators of these programmes, initiating a review of the available cultivars (gene pool) already in New Zealand, establishing a formal exchange with other industry groups involved in breeding programmes and aligning this work with the newly created genetic consortium in an aim to understand traits in different environments.

There were clear examples provided of where other sectors have succeeded because of new varieties. In an increasingly competitive international market, the future viability of the avocado industry relies on both a unique product and optimized growing system. An interesting topic of discussion at the meeting was 'how' we grow avocados now and how this will look in the future with potential covered systems and different tree architecture and size. It was therefore agreed that future growing systems and emerging technology had to remain a core consideration in the work plan going forward.

The consultation process identified what traits would be beneficial to focus on when prioritising research, technology needs and international collaborations as it related to either rootstocks or fruiting scions:

Rootstocks

Dwarfism

Calcium uptake

Scions

Anthracoise

Uniformity of production

Boron uptake	Later flowering
Uniformity of production	Fruit quality
Delayed flowering	Set fruit at lower temperatures
Cold hardiness	Precociousness
Soil born pathogen tolerance	Eating quality

In parallel to this study, a service agreement was signed with Arbogen Ltd to undertake Tissue Culture trials with the industry's commercial rootstock varieties. Although beneficial to expedite breeding methods in future, a successful trial will also have more immediate spill over benefits by providing the opportunity to radically reduce the complexity and lengthy process of clonal propagation.

Visits to other breeding facilities and meeting the operators of these programmes were delayed due to Covid-19 restrictions yet work internally and with Plant & Food Research to review the available cultivars (gene pool) already in New Zealand has progressed with all known cultivars present in NZ now documented.

The final output was a business case based on an analysis of the risks, costs and benefits whilst identifying co-investors and research partners for a future breeding programme. The report concludes that to successfully implement a breeding programme the following are seen as critical:

- Co-ordination from a centralised point.
- Endorsement and support from the growers.
- Clear funding pathway including access to Government funding.
- Exporter commitment to the programme in order to realise the opportunity.
- Consumer insights in key markets to drive trait selection.
- Increased genetic diversity.
- Partnerships in New Zealand will need to include breeding research, ANA nurseries and possibly commercialisation partners.
- Offshore breeding programme partnerships to accelerate the breeding programme in New Zealand and potentially reduce cost.
- A commercialisation partner to maximise return on investment through the strategic divestment of PVRs and licence rights offshore.

Aligned projects that continue to support the potential of this work include:

- Data analysis of impact of weather factors on orchard productivity.
- Digital collection of orchard data.
- FOPS (Future Orchard Production).

The recent import of new avocado genetic material in 2023 will contribute to the longer-term focus of understanding how cultivar traits can influence higher yields and better-quality fruit. Imported rootstock plants from the United States and Israel are currently in the Auckland quarantine/containment facility.

3.4 Programme Performance

3.4.1 Key Performance Indicators

Key performance indicators show positive results relating to improved and more consistent yields from orchards, supply chain efficiencies, and export diversification. A strong, high-value New Zealand market has been achieved.

Go Global Key Performance Indicator	Measure	Baseline year 2012	Current situation (2022)	
Increased productivity of New Zealand avocado orchards	National average tonnes / ha (4-year average)	4.0 tonnes/ha 3.4 tonnes/ha in 2012-13	9.95 tonnes/ha 11.7 tonnes/ha in 2021-22	↑
An efficient and productive New Zealand avocado industry	Industry volumes tonnes (3-year average)	21,607 tonnes	45,073 tonnes	↑
New Zealand avocado industry supplying diversified export (non-Australian) markets	Percentage of exports to Australia versus Asia & other markets	Asian/other markets 12% Australian market 88%	Asian/other markets 42% Australian market 58%	↑
Higher returns to growers, packers, exporters in the New Zealand avocado industry	Total Industry value (3-year average) Industry Orchard Gate Return (OGR) (4-year average)	\$70 million \$39 million	\$170 million \$116 million	↑
A strong, high-value New Zealand market	New Zealand market value	\$28 million	\$63 million	↑

3.4.2 Contribution to industry success

An independent review of the NZ Avocado Go Global PGP programme acknowledged the major contribution the programme has made to the industry, confirming that the additional leverage provided by PGP investment has facilitated important steps for industry research, collaboration, and resilience.

Go Global achieved a step change in the way that the industry operates. The programme has driven the industry to be more trusting, collaborative, cohesive, communicative, and co-ordinated, with a correspondingly greater public profile. It is now in a strong position to respond to the growing demand for avocados, the increasing need for market diversification, heightened phytosanitary and compliance requirements and the implementation of some different ways of growing avocados that are more productive and more consistent in their yield.

The administrative burden of meeting compliance across the supply chain and providing for more accurate and timely reporting has been eased by advances in data collection and the digitisation of industry systems. Better access to orchard and value chain data enables efficiency and proactivity. Industry practices and regions needing focus are highlighted by industry metrics collected from across the supply chain. With benchmarks established, improvements are now measurable. Case studies and data collected of orchard and environmental performance provides input to communications around what factors are drivers of optimising production and resource management.

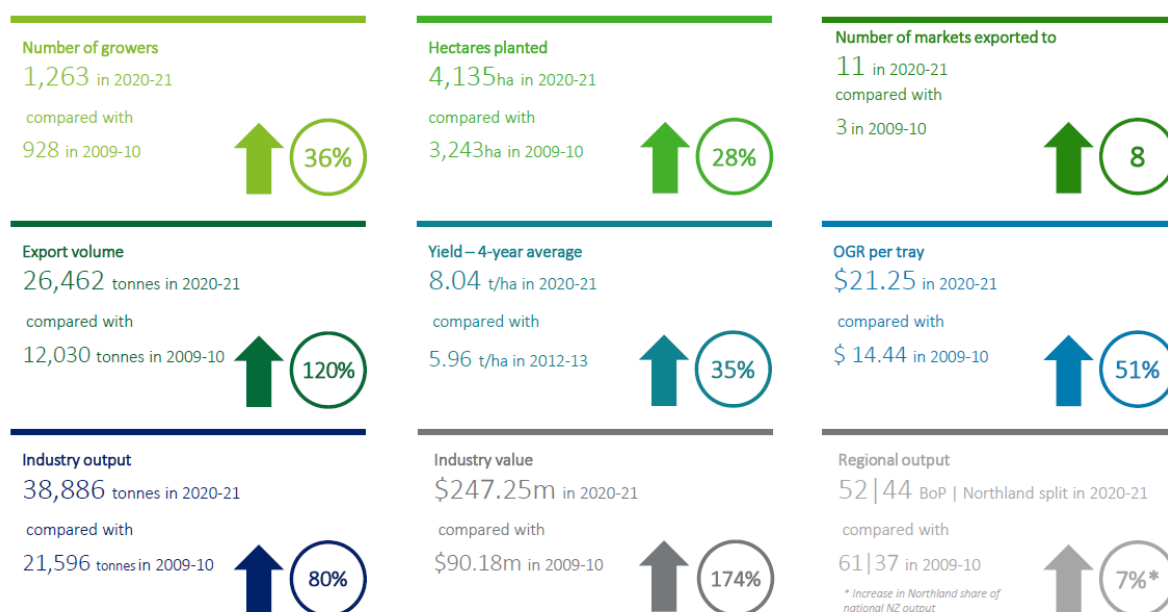
Cause and effect relationships between the impact of the PGP programme and the improved state of the industry are complicated by the fluctuating global price of avocados. Spill over learnings to other industries is an important aim of PGP programmes. It is evident that the step change achieved by the avocado industry has been observed by other horticultural industries that have consulted New Zealand Avocado on how to make similar gains.

From market diversification, revenue to expansions in hectares and growers, the industry has seen increases across most industry metrics. Go Global performance goals have been achieved through increases in collaboration between supply chain partners, productivity, market diversification and returns. The upgrading and digitisation of industry systems enabled the sector to keep pace with the demand for increased product traceability, food safety, industry compliance and reporting.

Regular industry surveys show that 70% of growers have changed orchard practise as a result of new information. Good turnouts at field days have been achieved, and collaboration increased with field days now often hosted in partnership with post-harvest operators. Yield increase is necessary for growers to remain economically sustainable, and adoption of best practice has resulted in yields slowly increasing.

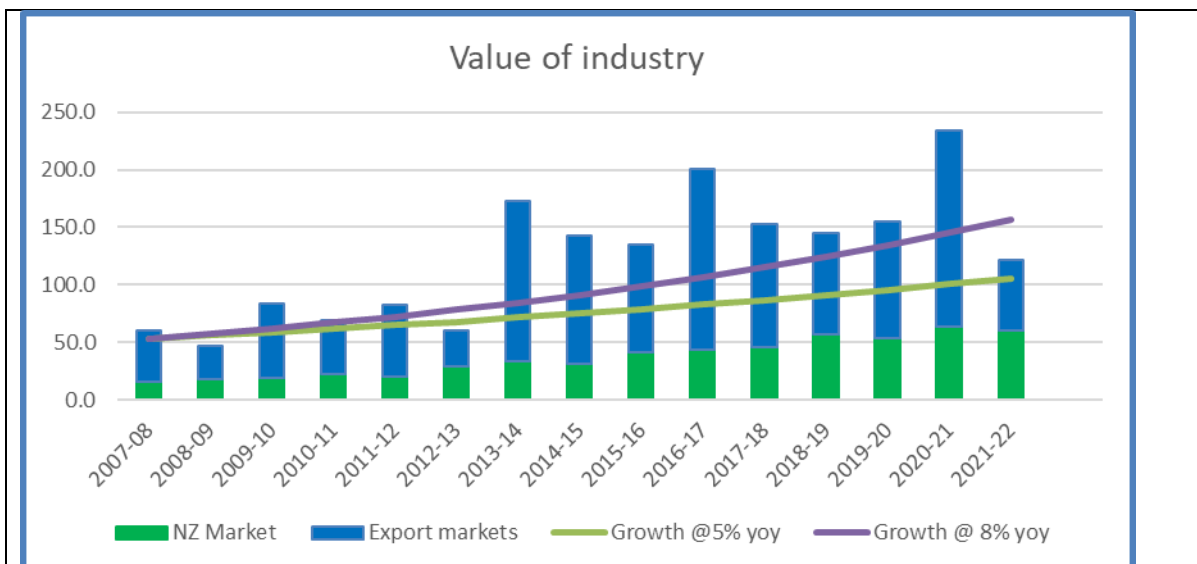
Go Global has developed capability within the avocado industry through direct employment in research and communication roles. The unique co-investment model of Go Global has proved invaluable by strengthening and formalising supply chain partnerships. Research capacity has increased through co-funded projects and extension has been achieved through joint Plant & Food Research and MBIE initiatives. With the proposed industry targets around grower and supply chain returns, the industry will continue to attract both growers and a skilled workforce across an expanding primary industry.

Deloitte was commissioned by NZ Avocado to report on sector performance and the table below sets out the metrics they used to describe the growth of the sector to the end of 2021.



3.4.3 Impact on value creation

To better understand the impact of the Programme on the avocado sector, industry value growth at both 5% year on year and 8% year on year were presented at the Special General meeting of NZAGA in April 2023. The charts below show the 5% and 8% growth lines against the actual industry values achieved.



The value of the NZ avocado industry noting the additional value created over and above growth at 5% year on year and 8% year on year.

The additional return to New Zealand and to the sector from 2012-13 to 2021-22 is calculated as \$600m additional return over and above a 5% year on year growth and \$400m over the 8% year on year growth.

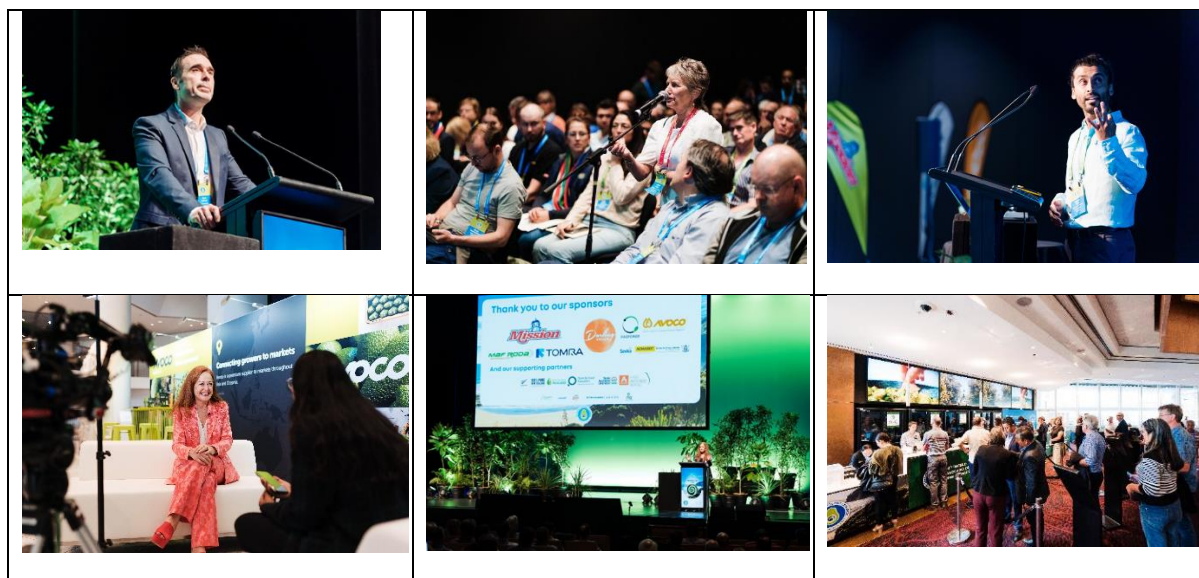
3.4.4 World Avocado Congress

The 10th World Avocado Congress hosted by NZ Avocado and WAC NZ Ltd was held in Auckland New Zealand in April 2023. This global congress was a perfect platform to extend the learnings from the PGP programme into tangible deliverables to a global audience. The event attracted 1,160 passionate avocado lovers to Aotearoa with 750 attendees traveling across New Zealand growing regions to 10 different field day locations.



The event enabled the sector to share learnings, initiatives and strategies around the sustainability of our sector globally. There were 8 keynote speakers and 130 presenters from 16 countries, across every topic on the avocado value chain from genomics to pest and disease, from pollination to drone technology from technology to biosecurity, sustainability to market demand. Attendees also included New Zealand growers, services providers and researchers and 750 global participants. Through its global reach, breath of themes and ability to connect with producers, marketers, investors, innovators, regulators and the research community it delivered on the concept of directly supporting the intended benefits of the programme of extending PGP learning and increasing collaboration.

The World Congress offered a powerful opportunity for NZ Avocado staff, and NZ Avocado stakeholders to increase capability as they prepared and presented to a global audience at a world congress. NZ Avocado staff played a major role in the Scientific and Marketing Organising Committees which reviewed and selected the presentations for the impressive academic programme. Capability was enhanced through new connections; ones that will continue long past the end of the Programme.



4 Conclusions and Recommendations

Investment under the NZ Avocado Go Global programme since 2014 has enabled continued growth in industry value, diversification in markets, and the development of systems and relationships to support industry growth. The programme transformed the avocado industry from a small lifestyle industry to a collaborative, cohesive and professional industry that is globally competitive and can return sustainable value for New Zealand.

New plantings of avocados during the programme demonstrate confidence in the industry. This confidence is particularly evident in Northland with increases in avocado plant propagation and nursery numbers themselves. Northland produces nearly 40% of the industry's avocados and will be a focus in the years ahead, with ongoing engagement with others already active in strategies to improve economic development in this region. The growth of value in the industry has seen large commercial players invest heavily into large greenfield orchards, with 1,200 hectares of new plantings in Northland alone. Spill over benefits include the regional economic growth of Northland including job creation particularly of work which compliments other seasonal labour requirements. Sustainable Food and Fibre Futures (SFF Futures) invested in a coordinated study of the requirements to drive growth of volume, value, and visibility of avocados in Northland looking at economics, land, water,

labour, and infrastructure. The report provided a holistic view of how avocados can be part of Northland's resilience strategy to both climate and economic challenges.

Lifting productivity has been critical to establishing New Zealand's position in export markets and ensuring the value chain is competitive. Go Global leveraged research to deliver a consistent predictable supply of avocados. Current benchmarking data on yields collected from across the supply chain has enabled additional industry metrics such as grower classifications and irregular bearing to drive measurable improvement which has highlighted industry practices and regions needing focus. Analysis of orchard data through the existing Plant & Food/MBIE research programme continues to guide field trials focused on understanding factors that may influence yield, irregular bearing, and tree decline. Although the Programme has concluded, there remains a large number of enduring activities, initiatives and systems which will support the sector going forward.

Viable orchard gate returns for growers of all scale will continue to be a priority and industry will need to continue to invest in research to inform strategies to increase fruit quality and productivity per hectare. There has been widespread adoption of best practice, underpinned by streamlined collection, analysis, and dissemination of industry knowledge to drive performance. Regular industry surveys consistently showed that 70% of growers have changed orchard practice as a result of new information, evidenced by the record turnouts at field days, which are now often hosted in partnership with post-harvest operators.

Case studies and data collected of orchard and environmental performance have helped to document and communicate factors that drive optimal production and resource management. New understanding of what inputs and activities are contributing to our environmental footprint enable focus on specific areas. Future steps will look at the nutritional value of the fruit, as opposed to just weight, which for avocados may provide a very positive plus alternative perspective. Massey University is currently developing a proposal for this 'nutritional LCA' work in avocados as they study various protein sources and their relative carbon footprints.

Industry relies on accurate data to drive productivity outcomes and is more efficient, proactive, and strategic in its planning due to greater access to and management of orchard and value chain data. The upgrading and digitisation of industry systems enabled the sector to keep pace with demand for increased product traceability, food safety, industry compliance and reporting. The way the industry captures, assess and reports on data requires continual advancement into more digital and interconnected systems.

The industry needs to continue to become more efficient in every component of the supply chain with shipping and logistics also needing to considerably improve. Supply chain issues including higher

shipping, fertiliser, petrol, and labour costs will remain a challenge for avocado growers and exporters in the near to medium term.

Throughout the Go Global programme, an integrated industry has worked together through a unified marketing strategy and category story to drive demand for New Zealand avocados in priority markets. An opportunity remains to create demand from the wealthy, health conscious, Chinese consumers seeking safe, healthy, exciting produce. The large avocado producers, Mexico, Chile, and Peru were already exporting to China. NZ Avocado and exporters are aware of both the opportunity and the challenge of developing a niche within the largest market in the world. To maintain relevance in an ever-increasing environment of global competition, exporters will need to continue investment in a differentiated story. Avocado growers in New Zealand will face increased competition in Asian markets from South American growers and possibly Australian growers as they are investing heavily in Asian market access strategies. There remains continued success in the digital promotional space in Asian and NZ markets with PGP themes and imagery through television and magazine advertising, supermarket avocado sampling events and social media activity.

The industry has become more collaborative, cohesive, communicative, and co-ordinated, with better systems and processes established. Visibility of the sector has increased markedly, better enabling growth by attracting people to the industry across orchards, stakeholders and science. A 2018 independent review of the programme acknowledged the major contribution it had made to the industry, confirming that the additional leverage provided by PGP investment facilitated important steps for industry research, collaboration, and resilience. Research, marketing, and grower collaborations and working groups set up under the programme continue to provide a forum for information exchange and the setting of strategies for market development and research. Investment in building capability and knowledge has transformed the avocado value chain because Go Global developed capability within the avocado industry through direct employment in PGP related activities for both research and communication roles.

Spill over learnings to other industries is an important aim of PGP programmes. The step change achieved by the avocado industry has been observed by other horticultural industries that have consulted New Zealand Avocado on how to make similar gains.

The value of the avocado industry, and most importantly the returns to growers per hectare Orchard Gate Returns (OGR) have grown considerably in the last 10 years. The NZ Avocados Go Global programme has helped make that growth possible. There are now more than 1,400 avocado growers and 4,400 hectares producing avocados with about half in the Bay of Plenty and half in Northland.

The low cost and modest magnitude of the programme relative to industry production, increasing sales revenue, multiplier effects and tax generated arising from a better performing industry are likely to substantially exceed the costs of the programme, implying a sound return on Crown investment.

In summary, Go Global enabled the industry to become more globally competitive, high value, and sustainable as both an export industry and domestic market. The programme supported exporters to diversify into new export markets, supported growers improving yields from orchards, saw supply chain efficiencies being implemented, and improved information and data systems. It validated sustainability credentials and identified cultivar breeding opportunities for the sector. As global supply continues to grow, the industry's focus is on maintaining market access, and investing in markets that enable a premium from New Zealand grown avocados. Focus must remain on industry compliance, increasing productivity, and supporting new orchard development. The industry is now in a position to make the next step change and grow to a half a billion-dollar industry by 2040.

5 Acknowledgements

NZ Avocado would like to thank the below co-investors of the PGP programme whose support helped achieve a number of Go Global programme objectives. This includes all avocado growers whose levies helped co-fund this programme and the growers, post-harvest operators and exporters who directly contributed their time and resources towards the programmes research trials and projects.

