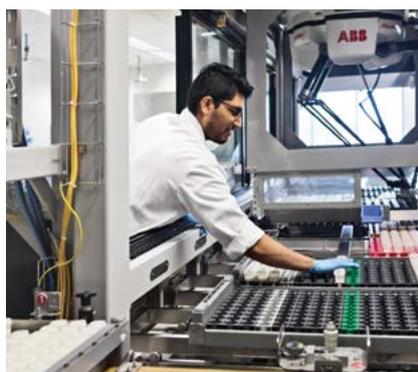
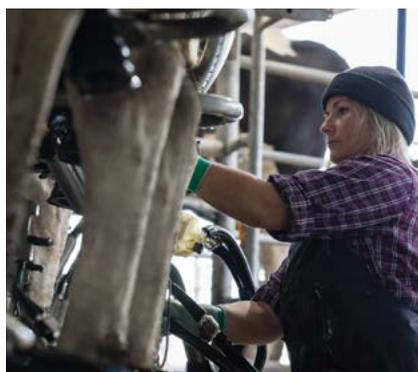


GROWING INNOVATIVE INDUSTRIES IN NEW ZEALAND

Agritech Industry Transformation Plan

JULY 2020



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Foreword

HON PHIL TWYFORD, MINISTER FOR ECONOMIC DEVELOPMENT

In New Zealand, agritech is in our blood.

New Zealand's first innovation was in agricultural technology. Our earliest settlers – both the Māori and the Europeans who followed them many years later – found a land rich with opportunity and potential, but also with challenge. They needed to learn how to work with the whenua, the land, to nourish and feed themselves, and the technology they created helped New Zealand become a world leader in farming innovation.

Today the world needs healthy and trustworthy food and fibre products more than ever before. While we are not perfect, New Zealanders have been on a journey to work out how best to be productive and sustainable in our farming practices and we believe we have value and ideas to offer the world.

We know we need to learn from others, and accelerate our efforts, and that is why I am pleased to introduce this 'Industry Transformation Plan', which is a blueprint for how to build on New Zealand's traditional strengths while also accelerating our development of technology for use on the farms, oceans and orchards of Aotearoa, and beyond.

New Zealand has the opportunity to be a world leader in this area, and to see significant economic benefit from our activities, while also using technology to reduce our impact on the land. Agritech is right at the nexus of New Zealand's past, and future.

In recognition of the importance of the agritech sector, the Government has committed \$11.4 million in funding as part of Budget 2020 to support the implementation of this plan.



The plan outlined in this document will be a collaboration between government, industry, investors and the research communities working in unison to grow the agritech sector. It will evolve as we learn more about how best to work together to achieve our vision of a globally competitive agritech ecosystem, producing ingenious value-adding companies that provide meaningful jobs, solving New Zealand and the world's sustainability problems

We believe that New Zealand Agritech is good for the world. ■

A handwritten signature in black ink, appearing to read 'Phil Twyford', written over a horizontal line.

Hon Phil Twyford

Foreword

PETER WREN-HILTON, EXECUTIVE DIRECTOR, AGRITECH NEW ZEALAND

The opportunity for New Zealand to be a global leader in agritech is clear.

It's this opportunity that brought the industry together to form Agritech New Zealand, representing a wide cross-section of over 130 members of New Zealand's agritech ecosystem – industry, research, government & investment.

Over the past year, Agritech New Zealand has hosted over 500 sector professionals at workshops around the creation of the Industry Transformation Plan (ITP) and that input has helped us collectively ensure the ITP meets the needs of the sector and is focussed on the opportunity we have. That's critical.

Agritech New Zealand has acted as the key sector interface with the government's agritech taskforce, and we are delighted to see the depth of collaboration between government and industry in the preparation of this Plan. It has been inspiring to watch the real and valuable inter-agency collaboration that has taken place.

Collectively, we have successfully transitioned our sense of shared purpose into a meaningful set of actions and initiatives. I believe this can only assist with the next phase of the Plan's roll-out – its delivery.



Agritech New Zealand looks forward to working with government and the wider New Zealand agritech ecosystem as we move onto this next critical phase. ■

A handwritten signature in black ink, appearing to read 'Peter Wren-Hilton', enclosed within a long, horizontal, slightly curved line that tapers at both ends.

Peter Wren-Hilton

The future for New Zealand agritech



This document captures an overview of the agritech sector in New Zealand and outlines a series of actions to accelerate its growth.

Agricultural technology, or agritech, is an area of significant interest for New Zealand. Historically, agritech has been predominantly valued for its input into New Zealand's food and fibre sectors and as a key driver for increasing productivity, quality and sustainability across the entire food and fibre production and supply value chain for New Zealand. Agritech is central to driving more efficient land use and management for better environmental outcomes spanning water quality, reduced methane, nitrous oxide and carbon dioxide emissions; both domestically and across export markets.

While the above remains true, it is also clear that our strong food and fibre sector and expertise in this area represents an opportunity to grow the agritech sector as an economic driver in its own right, particularly as an export industry. This is the primary reason why the sector has been selected as a priority area under the Government's refocused industry policy.

Through this Industry Transformation Plan (ITP), the Government aims to provide the agritech sector with the support to accelerate its growth, attract necessary investment, increase commercialisation of New Zealand agritech intellectual property (IP), address global opportunities and increase exports, develop needed skills and address regulation and data interoperability issues. ■

DEFINING AGRITECH

We use the phrase 'agritech' broadly. For the purposes of this document, the 'agritech' sector refers to manufacturing, biotech and digital-based technology companies that are creating product, service, IP and value chain solutions for the agriculture, horticulture, aquaculture, apiculture and fishing sectors, with the aim of improving yield, efficiency, profitability, sustainability, reliability, quality or adding any other kind of value. Forestry is excluded because forestry and wood processing is the focus of another dedicated ITP.

Figure 1 opposite shows some of the different aspects captured by 'agritech'.

Halter

CASE STUDY

➤1

Harnessing Natural Intelligence

Halter's innovative animal management system opens up new possibilities for livestock farming.

Halter features a GPS-enabled, solar-powered cow collar that uses sound stimuli to gently direct livestock on-farm and keep them away from waterways or hazards, all controlled via smartphone or tablet.

The system lets farmers shift livestock remotely or bring them in for milking without even stepping outside. It also tracks individual feed intake and gives early alerts for potential health concerns – all adding up to time and labour savings, healthier animals, and the potential to transform pastoral livestock farming.

www.halter.co.nz ■



RELATIONSHIP TO INDUSTRY POLICY

In July 2019, the Government released its refocused approach to industry policy. This approach was subsequently updated in June 2020 in response to the impacts of COVID-19. The core of this new approach is the development of sector plans or Industry Transformation Plans (ITPs) for selected sectors of the economy where there are opportunities to lift productivity and growth, and for those sectors where significant transition is required.

For some selected sectors, an ITP will be developed. An ITP is a long-term strategy developed with key stakeholders across the wider sector ecosystem that provides a clear picture of the challenges and opportunities faced by each sector, agrees on a long-term vision and sets out an action plan that spans a wide range of areas, including research, science and innovation, trade, education and skills.

Agritech was selected as a priority sector because of its importance to New Zealand's transition to a highly productive, low-emissions future, its adjacency to our strong food and

fibre sector, and our existing expertise and investment in this area. The emergence of Agritech New Zealand and their role in providing a cooperative partner for the Government in this sector was also an important factor.

New Zealand agritech will be transformed through the application of the guiding principles of industry policy: taking a partnership-led approach; building a strong evidence base for action; using specific sector strategies; leveraging international connections; providing clear and consistent signals from government and industry; ensuring activity is supporting better jobs ; working in partnership with Māori; ensuring short-term actions are consistent with our long-term vision; and ensuring our activity is contributing positively to sustainability goals.

We know that a 'business as usual' approach will not result in transformation. Funding the activities and initiatives resulting from this work will be a critical part of ensuring the actions lead to meaningful growth. Reflecting this, the government has committed \$11.4 million as part of Budget 2020 to implement the action plan of this agritech ITP. ■

A VISION FOR AOTEAROA'S AGRICULTURE, FOOD AND FIBRES SECTOR

A future vision for the food and fibre sectors of New Zealand, developed by the Primary Sector Council, was launched in December 2019.

The vision, *Fit for a Better World*, is ambitious and provides a guiding point to the overall direction of the food and fibre sectors. It speaks to the role of our food and fibre sectors through the values of integrity, guardianship, ingenuity and respect. It can be found at www.fitforabetterworld.org.nz.

Though the agritech ITP work has a distinct focus, the agritech sector has an important role to play in the realisation of the vision, and the agritech ITP will help enable this by describing the actions and industry progress that need to happen to deliver on elements of the overall food and fibre vision.

PROCESS FOR CREATING THIS INDUSTRY TRANSFORMATION PLAN

The ITP process is an iterative and continuing one beginning in February 2019, with engagement between industry and government agencies on the concept of developing a transformation plan. Over the subsequent months, progressively more complete drafts were developed and released for comments and consultation. Between July 2019 and March 2020 a series of workshops and 1:1 meetings were held to revise the draft plan and develop the set of actions that make up this final agritech ITP. In all, well over 500 people and organisations have helped to strengthen this plan.

In developing the detailed action plan, it is apparent that the plan will continue to evolve as we have a number of activities that can be accelerated, and some High Impact Projects that are suitable for additional focus. In addition, there are other activities we have highlighted that will require further refinement and definition, and workstreams will continue to develop.

After an analysis of the potential impact of the COVID-19 restrictions on global travel mobility, we have reworked aspects of the action plan to accelerate activities that are within New Zealand's control and borders. We will work to ensure we keep relevance and market share in international markets of interest, but while we await a more normalised travel environment, we will work quickly on the items of the plan with a strong domestic focus initially.

This shows how this ITP should be seen as a 'living document', and a continuing process of definition, refinement, execution and measurement as we continue to work on ways to accelerate the growth of the sector. ■

AGRITECH AND MĀTAURANGA MĀORI

We acknowledge the special role of mana whenua in all discussions relating to the land and we believe Māori have important roles across many parts of this ITP.

As a treaty partner, Māori have rights and interests in the development of a vision and action plan for the agritech sector, but beyond this obligation, they also provide a unique viewpoint that improves the ITP as a whole. As such, a deliberate effort has been made to include their perspective in this document and this will continue as the ITP evolves and throughout implementation.

Māori are involved as kaitiaki of the land, as creators of agritech businesses, and as users of technology. They are investors, researchers and help to govern and regulate the agritech ecosystem. In this way, the representation of mana whenua cannot be understated.

In addition, we see that the results of the work outlined in this ITP will help create high-skilled work opportunities both on-farm, and within agritech companies.

We intend to continue with consultation with Māori as we implement the action plan, and as it becomes clearer how the agritech ITP works alongside other initiatives in the food and fibre sector. ■



Part 1 – Context, Challenges and Opportunities

Agricultural innovations have long been a vital part of Aotearoa New Zealand's economy.

CONTEXT AND HISTORY

Innovation comes from necessity, and the first Māori settlers to New Zealand were faced with that necessity on their arrival. Finding the climate too temperate for growing their favoured crop, the sweet potato, they created a way to build small walls around the pits the kumara were grown in. This allowed the rays of the sun to be absorbed during the day, and warm the earth in the evening, elongating the growing period.

New Zealand's agricultural technology sector was born.

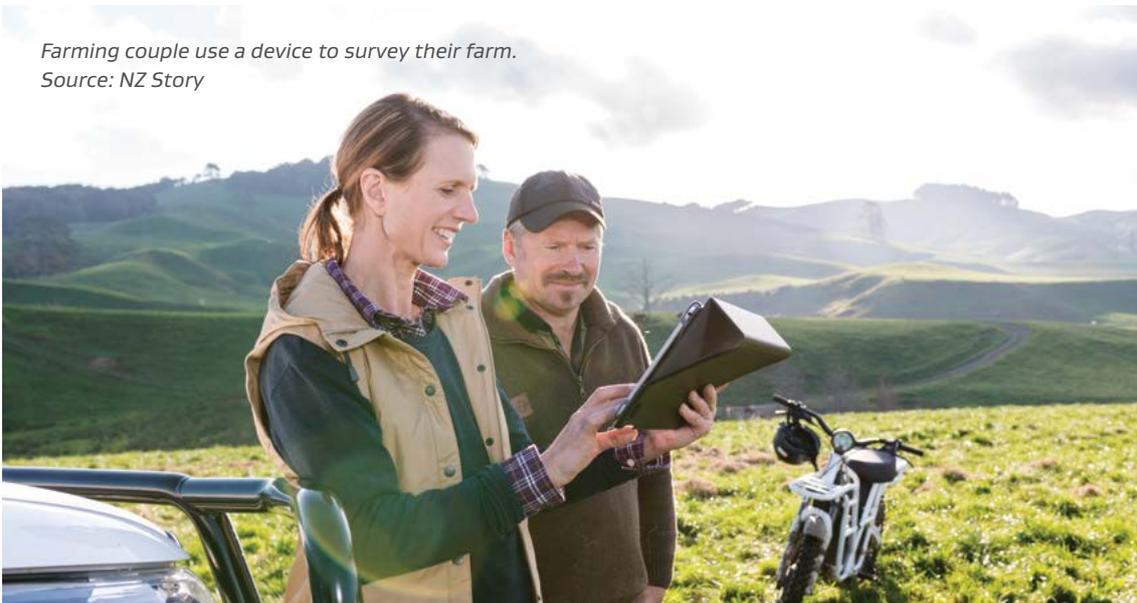
The story of New Zealand is entwined with the story of the land and sea, and how ingenuity has allowed the last major land mass on the planet to be populated. From the early settlers learning to work with New Zealand's incredibly varied landscapes, to the variety of crops and animals the land has come to support, technological

innovation has allowed us to further improve the productivity of our work and serve new markets.

The innovation of refrigerated shipping in 1882 allowed New Zealand to sell meat overseas, adding to the export staple of wool. New breeds of sheep and new farming techniques increased the variety and yield of the agriculture sector. Dairy farming innovations and novel cooperative models allowed New Zealand to establish ourselves as a leading provider of globally traded dairy products.

The 20th century saw the creation and adoption of technology that propelled New Zealand to a leading position in agritech. Innovation such as the electric fence, the milk meter, improved grass cultivars, and selective breeding techniques and understanding of genetics all allowed for higher productivity and helped the food and fibre sector to be the major factor in growing New Zealand's economy.

*Farming couple use a device to survey their farm.
Source: NZ Story*



In response to the shock of the UK's entry into the European Economic Community in the 1970s, and the rapid restructuring of the economy through the 1980s and 90s, the food and fibre sector continued to diversify into new areas like deer farming, wine production, aquaculture, honey and a large variety of horticultural crops. Each stage of growth has required innovation, an increasing reliance on the benefits of technology and an eye to changing global markets.

In 2001, the country considered the role of disruption and innovation during the 'Knowledge Wave' conference, co-hosted by then Prime

Minister Helen Clark. The activities and initiatives set in motion from that conference set to further diversify the New Zealand economy and reinforce the strategy of a diversified, value added economic development approach.

In 2018, the agritech industry group 'Agritech New Zealand' formed as part of NZ Tech's 'Tech Alliance' and has successfully brought together a number of industry parties and companies. They have subsequently joined with the Precision Agriculture Association of New Zealand (PAANZ), and this combined industry group provides a good counter-party for government activity in the sector. ■

DEFINING THE PRIMARY SECTOR AND THE FOOD & FIBRE SECTOR

In the context of this document, when we refer to the primary sector, or the food and fibre sector, we are referring to agriculture, horticulture, aquaculture, apiculture and fishing, and excluding forestry and mining/extraction.

Forestry is excluded because forestry and wood processing is the focus of another dedicated ITP.

Additionally, throughout this document phrases such as 'farmers' or 'on-farm' are used. These should generally be interpreted in a broader context e.g. farmers refers to those individuals directly involved in producing primary products, including growers, beekeepers or fishers; while on-farm refers to the area where primary activity is occurring, including orchards, vineyards, or marine farms.

AGRITECH AND THE FOOD AND FIBRE SECTOR

Since 2001 however, while there has been progress in many dimensions, it is also true that we have not achieved the productivity levels expected, given our favourable economic settings. The food and fibre sector has had impressive growth, but not to the degree anticipated. On-farm productivity of the agricultural sector has grown at a compounded annual rate of 3.5 per cent over the ten years to 2018¹. Yet, when considered alongside related manufacturing, the sector overall is still not reaching its potential, and our farmers continue to face many challenges. So while agritech has enabled improved productivity, quality and yield, it has yet to provide a breakthrough

to the levels of sustained growth and value creation the sector would like to see. Nor has it adequately addressed a number of sustainability and environmental issues such as those around water quality, climate change and the provision of secure, high-value jobs.

Today, the food and fibre sector remains a huge part of our economy. In addition to the direct benefits the sector provides, there are significant flow-on impacts to the wider economy. The majority of our manufacturing output depends on the food and fibre sector as its key input and a huge number of service industries exist to support either the food and fibre sector or the manufacturers adding value to our food and fibre products. Including processing and commercialisation activities, the sector

¹ Labour productivity of agriculture 2008-2018, Productivity Statistics, Statistics New Zealand, MBIE analysis.

accounts for 11 per cent of GDP, and 15 per cent of employment². Additionally, the sector contributed \$36.3b in exports, or 44 per cent of New Zealand’s total exported goods and services in 2018³.

It is also the cornerstone of our regions. Far and away the majority of economic activity outside of our cities is dependent on our food and fibre sector. ■

NEW ZEALAND’S AGRITECH SECTOR

Due to the absence of a universally agreed definition of agritech and the cross-cutting nature of the sector, providing statistics on the make-up of the sector is challenging. Improving the measurement of the sector and developing more useful agritech statistics will be an important part of our work.

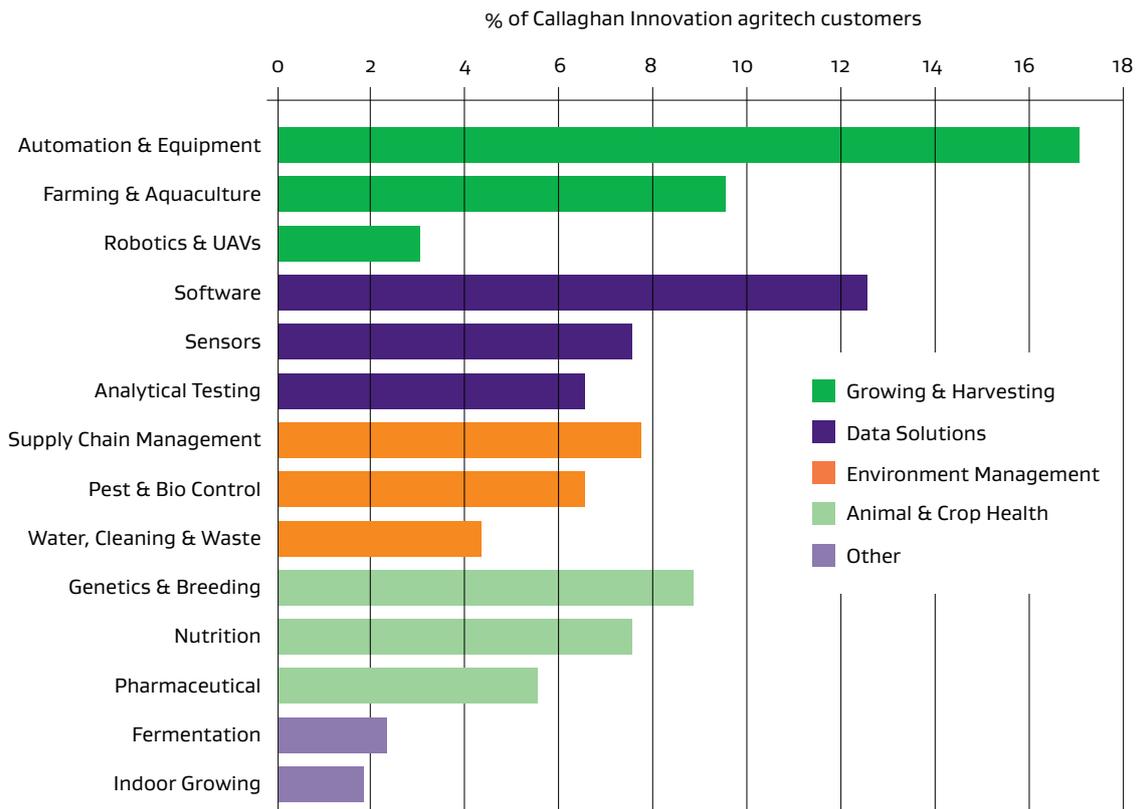
Size of the New Zealand agritech industry

Government is aware of over 950 likely agritech companies that have engaged with Callaghan Innovation, New Zealand Trade and Enterprise (NZTE) or are members of Agritech New Zealand⁴. This is only a subset of the broader agritech sector but is expected to capture the most significant firms in the sector.

Agritech firms’ areas of activity

For Callaghan Innovation customers we can provide a breakdown of areas of activity by firm number. The largest sector is ‘Growing & Harvesting’, with ‘Data Solutions’, ‘Environment Management’, and ‘Animal & Crop Health’ of a similar size⁵.

Callaghan Innovation agritech customers areas of activity



² Due to data limitations, these figures include forestry. Situation and Outlook for Primary Industries June 2019, Ministry for Primary Industries.

³ Situation and Outlook for Primary Industries June 2019, Ministry for Primary Industries; Goods and services trade by country: Year ended December 2018, Statistics New Zealand.

⁴ Analysis by MBIE of Callaghan Innovation, New Zealand Trade and Enterprise, Agritech New Zealand databases.

⁵ Callaghan Innovation database.

Agritech start-up activity

The New Zealand agritech sector is showing a healthy level of start-ups and new entrants actively emerging. These companies outnumber

mature firms amongst Callaghan Innovation managed customers⁶.

Callaghan Innovation agritech customers by life stage

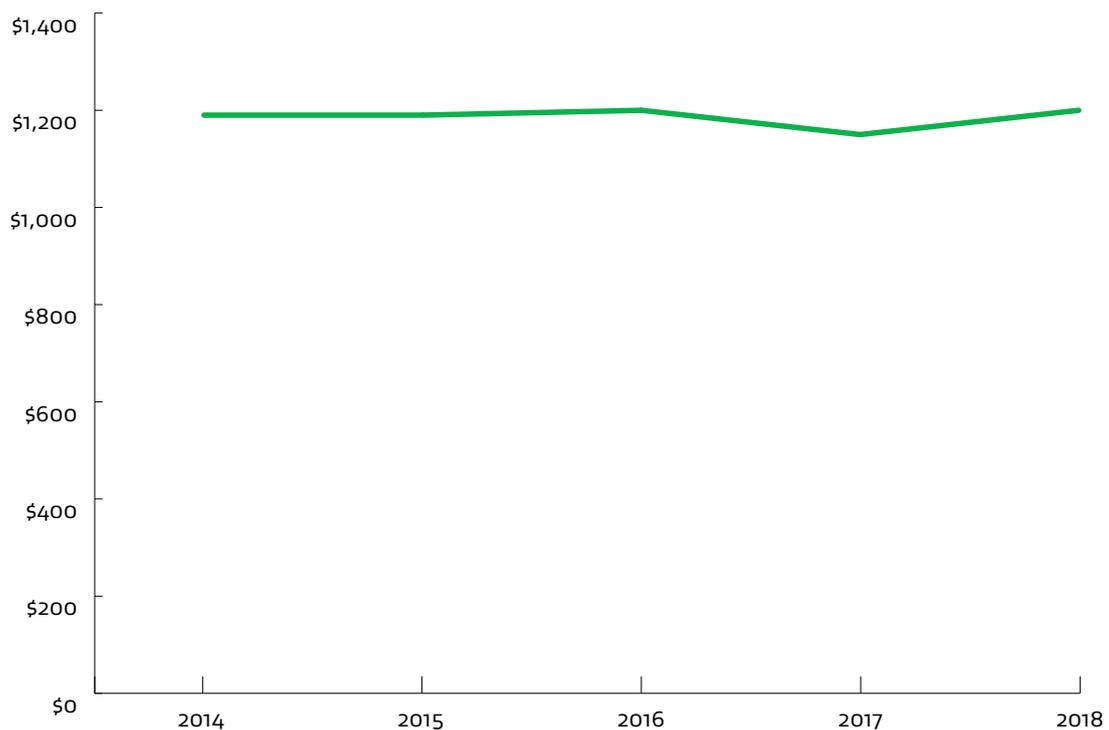


Agritech sector export trends

In terms of export goods revenue (according to limited, but best available data), the agritech sector has remained fairly stable between \$1.1b and \$1.2b over the last five years⁷. This is a relatively static and unimpressive number when considering the strength of our food and

fibre sector, and that the level of investment in agritech worldwide has increased by 36 per cent per year for the five years to 2018⁸. However, it should be noted that this figure only includes goods not services, due to the lack of data specific to the agritech sector. ■

Value of New Zealand agritech exports over time (\$ millions)



6 Callaghan Innovation database.

7 Analysis of trade codes by MBIE using the method described by Coriolis, September 2014, New Zealand's Agritech Sector. The estimate relates only to agritech exports for pastoral farming and it should be treated with extreme caution due to the limitations of the analysis.

8 Upstream Annual Financings, AgFunder, AgriFood Tech Investing Report 2018.

WHY AGRITECH?

The main intention behind the Government's focus on agritech is to grow the sector as an economic driver in its own right, with particular emphasis on high-value export opportunities and further diversifying our economy.

The Government's ambition is to grow the agritech sector so it is better equipped to service both the domestic and international market. New Zealand possesses a number of comparative advantages when it comes to agritech. If we can effectively exploit these advantages, we stand in a good position to increase our share of the global market. Some of these advantages include:

- › Our strong complementary food and fibre industry;
- › Our small market size – ideal for testing technologies;
- › Our ingenuity in developing solutions and world-class research;
- › Our strong pasture-based management systems;
- › Increased international investment activity.

Adopting a more global focus will help us break out of our domestic-market-oriented path dependency, which is particularly focused on pastoral based systems. Digital technology is also a key part of the agritech sector, allowing for 'weightless exports' to be a feature of the sector and helping overcome some the challenges of our geographic isolation.

In addition to this primary objective, growing the New Zealand agritech sector will drive other major benefits for New Zealand:

Improving sustainability and productivity

Agritech provides opportunities for New Zealand to improve the sustainability and productivity of its food and fibre sector. This is crucial for us to achieve many of the goals we have for the sector and the wider economy, particularly in terms of reducing emissions and preventing environmental degradation. These in turn are important for maintaining social license for farming, as well as a competitive advantage as consumers are increasingly concerned with food quality and health, and with the sustainability of the environment.

Additionally, smart use of technology, together with a skilled workforce, will enable industry and companies to shift from volume to value, in their output and exports, supporting a broader aim to move New Zealand up the value chain globally. As markets are increasingly more sophisticated, and business models expand (eg to include service elements), innovation in technology will allow New Zealand businesses to retain leading market positions.

Contributing to global challenges

The global market for agritech is driven by increasing food demand resulting from population growth and increasing environmental challenges, linked to climate change impacts. In order to meet the nutritional needs of up to ten billion people by 2050, food production will need to increase drastically. Clearly, New Zealand cannot feed the world on its own. However, New Zealand has the ability to develop production-improving technology that could conceivably have a global impact.

As agricultural emissions make up nearly half of our greenhouse gas emissions⁹, agritech also represents one of our most powerful tools for reducing emissions and combatting climate change. ■

⁹ New Zealand's Greenhouse Gas Inventory 1990-2017, published April 2019.

MEGATRENDS AFFECTING AGRITECH

The landscape of the food and fibre sector and agritech globally is changing rapidly. There are a number of ongoing trends that will impact our agritech companies and farmers.

Changing consumer preferences are impacting demand for food and fibre products

With a growing, increasingly urban middle class, especially in our key Asian markets, the demand for safe, healthy and convenient food is increasing. There is a growing preference for spending on services and experiences rather than basic nutrition. This includes a drive towards convenience meals and other value-added foods as well as products for restaurants and hotels, which are driving changes around food presentation and packaging, business models and the operation of global value chains.

Growing awareness about the pressures that food and fibre production is placing on the environment and communities is also driving demand for sustainable, ethical, low carbon production and processing techniques, including fair treatment of workers. We are already seeing the impacts of changing consumer demands in New Zealand, as well as internationally. Provenance and traceability from farm to plate is also growing in importance. These trends are being amplified by social media and community opinion on purchasing decisions, requiring the food and fibre sector to be better able to demonstrate its credentials and tell its story more effectively than in the past.

Increased market risk due to global political shifts and volatility

Along with increased market demand, we expect to see increased market risk. Increasing protectionism, threats to multilateral institutions and geopolitical volatility are all likely to disrupt market access and the competitiveness of commodity products. Continued investment in supporting rules-based international trade systems and agreements, reducing risks by diversifying markets and products and shifting to value-added products and services will be the best way to insulate ourselves from these threats.

Demographic changes are affecting the available workforces for agritech and adjacent sectors

Whereas a changing population in market will impact the sector, our changing demographics and culture will also have an impact, particularly across agritech and adjacent sectors' workforces. Our future is likely to be more culturally diverse; with an increasing proportion of the workforce identifying as non-European. Additionally, as their participation in the workforce increases, our young people have different expectations and aspirations for the work they want to do and the sectors they work in. Sectors, including the food and fibre industry and agritech, will need to adapt to match those expectations and aspirations if they wish to attract upcoming talent. Some of this is driven by perceptions around social licence and working conditions in the food and fibre sector.

Policies to support skills and workforce development will need to reflect the cultural shift in our workforce and better meet the needs of different cultures and ensure that they are developing the wide range of skills needed to participate in meaningful employment across the agritech, and food and fibre sectors.

Labour supply shortages are affecting the agritech and food and fibre sectors

Another key factor impacting the global food and fibre sector is the increasing labour shortages that occur, particularly around key seasonal demand peaks. The labour issues act both as a constraint to the sector, and a major motivator for innovation. We are already seeing some businesses in the sector struggling to find seasonal staff, often in low wage positions. This situation raises questions about the sustainability of such business models and the typically regional communities that may rely upon such work.

There are additional shortages of higher skilled labour, both in the food and fibre sector (where it is needed to facilitate uptake of agritech) and in the agritech sector itself (where it is needed to develop agritech). Shortages exist in a number of areas, including robotics, data science and software development.

Climate change is changing growing conditions for the food and fibre sector and adaptation is required

How the food and fibre sector interacts with the environment is a major driver for change. The changing climate is already resulting in more frequent and severe extreme weather events, as well as rising sea levels and more destructive storm surge events. Over the medium- to long-term, changing rainfall, temperature and drought patterns are changing growing characteristics in some regions. These changes also increase the risk of biosecurity incursions and have flow-on effects onto biodiversity outcomes. All of this requires an agritech-driven adaptive response to increase the resilience of our farming and processing systems.

Technology and business model innovations are evolving rapidly, posing both threats and opportunities

Globally, new business models, technologies, and processes are reinventing food and fibre production and consumption, posing both a threat and opportunity to the food and fibre sector. Examples of trends that are likely to disrupt the way food and fibre are produced in the future are:

- › Changes to production processes, such as internet enabled sensors, data analytics, artificial intelligence, robotics, high-tech extraction/packaging techniques, increased automation, gene editing and biotechnology;
- › Relocated and replicated farming environments – vertical urban farming, hydroponic greenhouse production;
- › Reinvented food production techniques – lab grown meats, genetically synthesised foods and 3D printed food; and
- › The emergence of new business models (eg social enterprise, change in ownership models such as corporate farming) and platforms (eg blockchain).

Some of these trends will mean that the food and fibre producers and workers of the future will not necessarily emerge from the current food and fibre sector but rather, the biotechnology or digital sectors.

COVID-19 brings a new set of challenges for agritech companies, but accelerates some opportunities

The impacts of COVID-19 and the restrictions in place to prevent its spread bring difficulties for almost all parts of the global economy. Though impacts have been softened by agritech's strong link to the primary sector, which has maintained strong levels of demand, agritech is no exception.

In New Zealand agritech firms are struggling to connect internationally. Some are limited in their ability to access customers, with cancelled or delayed projects as a result, while others are prevented from developing overseas connections and future business opportunities.

Start-ups are particularly impacted as there is an overall hesitancy to invest from international investors due to the ongoing economic uncertainties, and travel restrictions limit the ability for start-ups to meaningfully engage with overseas investors and demonstrate the value of their business. In an April 2020 survey conducted by Agritech New Zealand, 36% respondents noted access to funding as a big issue. Start-ups also have a limited ability to ride out these negative impacts. In a survey during COVID-19 lockdown restrictions, 42% of Callaghan Innovation agritech customers report either a cashflow runway that is either 'very short' or 'run out or nearly gone', which highlights the urgency of the problem for firms.

However, COVID-19 is also bringing forward some opportunities as its impacts increase the demand for agritech products. For example restrictions on the movement of migrant workers are exacerbating labour shortages in the horticulture sector and increasing demand for automation solutions. ■

Tiaki : Precision Seafood Harvesting

A new approach to an old way of fishing

The Tiaki modular harvesting system is an innovative new fishing method and handling system with the potential to change the way the world fishes.

It uses Precision Seafood Harvesting technology. With this technology fish are contained and swim comfortably underwater inside a large flexible PVC liner, where the correct size and species can be selected before being brought on-board the fishing vessel.

The design of the harvesting system allows fishing vessels to target specific species and

fish size, and greatly increases protection for small fish that can swim free through 'escape portals' and non-target fish (by-catch), which are released unharmed.

Developed in New Zealand and driven by the desire to deliver better quality seafood and safeguard the future of our oceans and fish stocks, Precision Seafood Harvesting is a great Kiwi story; the outcome of a Primary Growth Partnership programme between the Ministry for Primary Industries, Sealord Group, Moana New Zealand and Sanford Ltd.

www.tiaki.com ■



*MTS snapper in trawl.
Source: Tiaki*

OBSTACLES AND CONSTRAINTS

There are several obstacles and constraints that have held back New Zealand's agritech sector, which help create an evidence base for action.

In considering the current state of the agritech sector, we have developed a hypothesis for the slow growth of the sector. There is no single factor; rather there are a number of interrelated issues. Some of these are contextual and high level, while others are more specific issues where government intervention is warranted. In Part 3 of this document we will build on this to create an action plan to address the key issues.

1. Our agritech expertise has historically been in relatively specialised areas

New Zealand's agricultural expertise has predominantly been in pasture-based management systems, reflecting the country's longstanding economic comparative advantage in this area. Sheep and dairy farming have relied on a pastoral model which has led to technology being developed to support this approach.

This has had a number of impacts:

Firstly, a lack of applicability to a broad range of international markets. Only a relatively limited number of international markets have similar pastoral systems to New Zealand (eg Ireland, Chile, Argentina and Uruguay) and the predominant farming systems used globally (ie feed lots and animals housed in barns) largely do not utilise the same sorts of technology developed in New Zealand. This has led to a limited global demand for New Zealand agritech.

Secondly, the product spaces where expertise has been developed do not have straightforward adjacencies in these more common systems. Developing expertise in pasture-based systems doesn't mean we easily have the ability to apply these into other farming methods (partially because, for example, we lack the production testing facilities).

In addition, the focus on pasture-based agriculture has had an opportunity cost, and meant we have not developed as fully opportunities in horticulture, aquaculture and other alternative growing systems.

2. Agritech innovation has been for largely domestic use

While there have been a large number of technological innovations, many have primarily focused on domestic production and haven't sought out international markets. This can be seen in two distinct forms: products and innovations developed for New Zealand are not being adapted for offshore markets; and New Zealand innovators are not looking outside of New Zealand for problems to solve. There are obvious and clear counterexamples to this, but the domestic ecosystem has tended to dominate activity.

Large players in the agriculture and food and fibre sectors have not necessarily had the mandate or desire to develop technology with a broader focus than their own production needs, meaning large potential contributors to the innovation export ecosystem are not participating.

Both the commercial and innovation sectors have limited international links and exposure to global agritech issues. Significant effort and investment is required to develop these links and to sufficiently understand issues and be in a position to develop solutions.

The Innovative Partnerships model led by MBIE has created successful frameworks and models for addressing the challenges of working with international partners to focus on global opportunity. More can be done to build on this work.

In addition, some of the actors in the innovation ecosystem are directed by legislation, and by historical priorities, to focus on the domestic market. This means that developing tech for a global market will be a significant shift in operating model and structure for many of them.

3. A disconnected flow of commercialisation activity

Our research institutes are producing high-quality, valuable research, a significant proportion of which has applicability into the food and fibre sector.

Though New Zealand is significantly underperforming on R&D spending as a proportion of GDP compared with the OECD average, agritech and food and fibre sector

R&D is one area of strength. \$640m was spent on R&D for the food and fibre sector in 2018¹⁰ (\$310m by business, \$260m by Government and \$70m by higher education). R&D for the food and fibre sector made up one-third of Government R&D spending in 2018.

However, there is a sense that New Zealand struggles to bring research-based agritech ideas to market, meaning they are not fully exploited or commercialised into finished products and services.

This could be for a number of factors, including gaps in required commercialisation skillsets and experience, or regulatory settings. There could also be a disconnect between the actual market demand for research/IP versus the perceived demand, particularly if product development is not sufficiently informed by customer/user needs. Further work needs to be done to better understand these constraints.

Organisations like Kiwinet and Return on Science as part of the Commercialisation Partner Network address some of the challenges in this area, and Callaghan Innovation's funding of a specialist agritech incubator from April 2020 show that progress has been made, but it is clear that more is required to smooth out the commercialisation flow.

The Government's introduction of the R&D tax incentive in 2019 is expected to increase private sector investment in R&D and consequently increase commercialisation but will not solve other constraints.

4. A shortage of growth capital

There is a general lack of growth capital in the New Zealand technology sector, particularly in the venture capital / series A space. This general shortage is also true in the agritech space, and there historically haven't been specialist funds or investment expertise in New Zealand to fund products and international growth. Government's recent announcement of the new \$300m Elevate NZ Venture Fund to be run by New Zealand Growth Capital Partners (formerly New Zealand Venture Investment Fund) will be significant in addressing this capital gap,

but further work will still be required to attract additional necessary capital and expertise.

There is also a perceived gap in seed funding for the agritech sector that is hindering growth and limiting commercialisation and the emergence of spin outs. More work is required to determine the existence or size of any gap in seed funding.

To some extent the flow of commercialisation activity is curtailed by a relatively lower amount of corporate venture activity (eg intrapreneurship) in New Zealand compared to other countries, which in turn has some connection to our large cooperative based organisations, which dominate the agritech sector.

5. Geographic spread and lack of collaboration (weak agglomeration)

New Zealand's geographic spread has hindered collaboration between parties, leading to some duplication of effort, and a lack of innovation diffusion. We have a small number of clusters of expertise nationally, particularly around Lincoln University outside Christchurch, around Massey University outside Palmerston North, and lately (particularly in the horticulture sector) in the Bay of Plenty. However, these are generally sub scale and tend to be missing components that would be present in similar clusters globally, where national centres of expertise form more naturally due to a smaller geography eg the Dutch Wageningen University & Research (WUR) centre.

6. Barriers to uptake of some technology innovations by the farming sector

Though innovations are being developed, uptake of some technology amongst New Zealand farmers has been slow. This inhibits both the growth of agritech companies and improvements in on-farm productivity and sustainability. Landcare research's 2017 Survey of Rural Decision Makers asked about uptake of precision agriculture and automation and robotics. Overall uptake of precision agriculture was low, with almost 90% of respondents indicating no use of precision agriculture, and 97% indicating no uptake of automation or robotics. Uptake varied by sector, with 44% of arable farms reporting

¹⁰ StatsNZ and Ministry of Business, Innovation and Employment R&D Survey, 2018. Due to data limitations, figures include spending on forestry R&D.

uptake of some novel technologies, while only 19% of dairy farms reported uptake. Some of the reasons for this include:

- › Owner/operators tend to rely on their peers rather than experts as a key source of information when making change; new ideas take time to gain favour;
- › Production systems based on biological systems tend to be more difficult to adapt to change because of their complex nature and long production timeframes;
- › New ways of doing things can introduce risk (even if it is just perceived risk) into the system (especially when it comes to food safety), potentially damaging the integrity of the food system, so risk and change need to be balanced carefully;
- › There are difficulties accessing relevant independent advice or capital to adopt innovations;
- › Many farmers already have significant amounts of capital tied up, reducing their appetite or ability for further investment;
- › The skills required to implement significant change are quite different to those required for traditional food production;
- › Skills shortages overall in the food and fibre sector;
- › There is uncertainty about whether change will actually deliver benefits or create stranded assets in the face of other requirements (this is a particular issue when considering efforts to deal with water quality and climate change mitigation);
- › Some rural infrastructure limitations (such as rural wifi) hinder uptake; and
- › Some technologies are not being developed with the needs and abilities of the end user in mind; if the value proposition is not clear, then uptake will be limited.

However, we must recognise that in many areas, New Zealand farmers are rapid adopters of technology, especially relative to their overseas counterparts. This is particularly true where there is a clear value proposition and the impact is proven and understood.

We should also note that there is a significant response in progress to these issues from the Ministry for Primary Industries (MPI), through its Extension Services Model, and in time they will publish more information on this initiative.

THE EXTENSION SERVICES MODEL

MPI’s Extension Services Model is a farmer-led, farmer-focused approach to support sustainable land use decisions and improve economic, environmental and wellbeing outcomes for farmers and their communities. Extension is about farmers working together in their community groups along with rural professionals, industry groups, and government to ask tough questions of one another within trusted circles and coming up with practical solutions to issues. The programme aims to help:

- › Expand and deepen the skill base among farmers through peer to peer learning;
- › Support coordination and sharing of ideas; and
- › Build on existing capability and networks within local communities.

7. A lack of openness, interoperability and defined standards for technology and data

Currently, in order to incorporate the range of technologies available to improve food and fibre production, it is necessary to use a variety of systems which may not be cross-compatible eg an irrigation management platform, fertiliser management platform and animal tracking

platform all on one farm. This means farmers are required to learn and operate multiple systems simultaneously. This is challenging, inefficient, and inhibits adoption of these technologies. This is particularly true when the data produced by systems cannot be easily integrated into other systems. Data standards exist but are commonly passed over in favour of individual approaches.

Data related to agritech is sometimes locked in silos with limited data sharing occurring. This protective approach inhibits innovation, and companies and researchers are not able to generate benefit from data that lies dormant and may be of limited benefit to the data holder. This approach occurs because of the investment required to produce data and related free-rider problem, and the reluctance of giving up any possible competitive advantage.

MPI is seeking to address some of these issues through their Integrated Farm Planning work.

8. A lack of skills and focused skills development approach

The skills required to create high-value agritech businesses come from a mix of disciplines: a knowledge and empathy for the real-world problems of food and fibre production, plus a deep knowledge of technology, and in particular emerging technology such as the Internet of Things, 5G data exchange, and blockchain technology. This needs to also be coupled with good insights into human behaviour and decision making, and of course how to run a strong and growing business. At a number of levels, skillsets need to be consciously lifted.

Other countries have specific initiatives to lift skillsets across the range of required disciplines (eg Wageningen University & Research in the Netherlands) focused on agritech.

In New Zealand, there are some attempts to address skill development, and some universities have some programs to address gaps, but not on a national or sustained scale. New Zealand's ongoing reform of vocational education is expected to assist in this area.

9. A lack of sustained and coordinated commitment from Government and industry

To some extent the lack of growth in the agritech sector is due to the lack of a clear signal from government through policy and other mechanisms about the importance of the sector to New Zealand. Agritech has been largely neglected as a focus while the agricultural sector has received more attention. Initiatives have not been looked at as multi-year interventions, leaving them vulnerable to change.

Similarly, it has only been very recently that the agritech industry has coalesced into an industry representative group focused on the common issues and opportunities for the sector.

We expect that this agritech ITP will help address this issue by setting a long-term vision for the sector and the actions to realise it.

10. Measurement

The agritech industry is not clearly defined. Agritech is a crosscutting industry that includes goods and services across a wide range of sectors. The lack of an agreed definition of the agritech sector makes it difficult to quantify and to track the sector's growth and this in turn may inhibit investment into the sector. These issues have also led to a lack of data sharing on agritech, which limits coordination and effective government work in the area.

11. Regulatory differences, both at a national and regional scale

Differences in regulations occur both domestically, making for an uneven playing field and hindering adoption, and internationally, making it difficult for New Zealand agritech companies to export overseas. When seeking to register new products and innovations in foreign markets there are often strict regulatory settings that have to be met, and which typically vary from market to market. This means agritech exporters must invest significant time and resources to fully understand and navigate the regulatory environments of each new market. Our international engagement systems, run by NZTE and the Ministry of Foreign Affairs and Trade (MFAT), have a key role to play here.

12. Complacency

There appears to be a common perception among the wider New Zealand population that we are already a world leader in agritech. This is an assumption which is not borne out by the evidence (eg exports, level of investment). To some extent this is a factor in the lack of focus on agritech and lower-than-expected activity and investment into the creation of novel technologies.

In contrast with other global agritech leaders, such as Israel, the Netherlands or Singapore, New Zealand hasn't had a significant and immediate crisis or constraint in our food and fibre sector that often motivates action. New Zealand has relatively large, naturally productive land and sea resources, meaning historically we were less reliant on agritech and have now fallen behind global leaders in food and fibre productivity. ■

ADVANTAGES & OPPORTUNITIES

We enjoy some advantages and opportunities when it comes to the agritech sector. These should provide conditions and incentives for growth.

1. New Zealand's strong agricultural reputation in pastoral systems

We are known for our agricultural excellence and our products have a reputation for being high-quality, ethical and environmentally friendly. This reputation also extends to agritech products and provides a strong foundation for future expansion. Maintaining and building this reputation will become increasingly important as traceability becomes more ubiquitous; the New Zealand brand will grow as a selling point in itself, as long as this reputation is maintained.

2. Existing world-class research

We have collectively invested substantially in food and fibre, and agritech research. We have a high level of expertise in the research space, and also develop a lot of IP. If commercialisation skills and funding gaps are addressed, the scientific foundation for commercial opportunities is already in place. The issue is one primarily of long-term focus and direction, rather than lack of capacity.

3. Geographic advantage

New Zealand's geography also offers a unique opportunity for increasing two-way tech transfer. New Zealand provides a base for ongoing research & development as well as testing during the northern hemisphere's 'off-season'. By leveraging this dual seasonal dynamic, New Zealand has the opportunity to attract more offshore investment into its agritech sector, as northern hemisphere businesses look to capitalise on our geography.



*Technology makes it easier to monitor and manage the stock.
Source: NZ Story*

New Zealand's geographical proximity to Asia and cultural proximity to Europe and the United States puts us in an advantageous position from a trade perspective. To the extent that New Zealand firms can effectively use these dual links, it provides them with a comparative advantage over many other global players. Companies who target both the Asian and American markets benefit from favourable time zone overlaps.

4. Existing Free Trade Agreement (FTA) framework

We are party to a number of trade agreements (eg CPTPP, China FTA) providing favourable terms with some of the largest markets in the world. This means that New Zealand agritech firms will have broad preferential access to global markets. Work is also underway to expand this access further through additional agreements such as the FTA with the European Union.

5. Strong supporting institutions and responsive regulatory models

Our institutions have a reputation for being robust and reliable, but also adaptive when it comes to regulations. This allows New Zealand to be highly flexible to market changes and acts as a strong encouragement to investment and partnership with overseas firms looking for testbeds or other opportunities. In some cases, joint recognition of regulatory approvals can mean no additional testing is required in some markets.

In addition, as shown later in this document, there is already some significant work and programmes from government (central and local) to assist the agritech sector's growth.

6. New Zealand as a testbed/knowledge partner

New Zealand has established itself as a good proving ground and testbed for new technologies, generally, as in the IT and space sectors, and in agritech, including the integration of drone technology into food and fibre production systems. Our small, advanced economy offers the opportunity to test products and approaches in a mature environment with relatively little effort in terms of managing compliance issues and low consequence of failure.

7. Structured towards a long-term approach

There are a significant number of organisations across the food and fibre sector that are run as cooperatives. Notwithstanding pressures around debt repayment and the need to maintain dividends and pay out, cooperatives are generally less focused on short-term performance for stock price gains, they are more able to invest for the long term.

This long-term planning approach is also a feature of Te Ao Māori, and Māori make up a significant part of the food and fibre and agritech sectors.

8. Links to foreign markets and knowledge of supply chains and regulations

Our existing strengths in the agribusiness and food and beverage sectors mean that we have strong institutional knowledge of global supply chains, and market access requirements and distribution networks, including dealing with complex regulations. MFAT and NZTE have significant links and knowledge of other markets, and work closely with companies to transfer this knowledge. The more this can be diffused throughout the sector, the more it will provide opportunities across the agritech industry and allow for more partnership-based approaches to exports. ■



Growth facilities containing plant tissue culture pots for multiplication of plants.
Source: NZ Story

Part 2 – The Response

To respond to these challenges and opportunities a cross-agency agritech taskforce has been formed with the aim of engaging with the broad agritech ecosystem and designing and coordinating an agritech ITP.

The taskforce includes representatives from: the Ministry of Business, Innovation and Employment (MBIE); New Zealand Trade and Enterprise (NZTE); Callaghan Innovation;

the Ministry for Primary Industries (MPI); the Ministry of Foreign Affairs and Trade (MFAT). Other agencies have also given input, especially New Zealand Growth Capital Partners (formerly NZVIF), Te Puni Kōkiri and The Treasury. MBIE is the overall lead agency responsible for the development and execution of this ITP.

This taskforce has worked closely with Industry, Investors, Academic and Research organisations on the creation of this ITP.

VISION

The vision for the agritech sector shared by industry and government is:

A globally competitive agritech ecosystem, producing ingenious value-adding companies that provide meaningful jobs, solving New Zealand and the world's sustainability problems

New Zealand Agritech – good for the world.

STRATEGIC DECISIONS

The vision statement has some embedded strategic decisions:

Thinking globally

A measure of success for the agritech ITP will be our impact globally, not just on New Zealand's production processes. Our aspiration is to create a sector that is good for the world and has global relevance, especially as a provider of solutions to global productivity and sustainability challenges.

An ecosystem perspective

The agritech sector is an ecosystem with many players, and any intervention needs to take into

account the multiple parties and the interplay between them. See figure 2, on page 26, for more detail.

'Companies' as a unit of measure

The unit of measure for our work will be the companies: the economy and sector will grow as the result of growing individual, and groups of, companies; specifically companies that contribute positively to the wellbeing of New Zealanders. Through our interventions and actions we wish to increase both the size of individual companies (eg through revenue, value, employment) and number of companies in the agritech sector.

Choice of value-adding

One of the key themes of the Government's industry policy is to move from volume to value. We will support companies to deliver, and enable their customers to deliver, high-quality and highly valued goods and services.

Importance of quality employment

The types of companies that we want to support are those that grow inclusively and provide highly skilled, high-value, secure and rewarding jobs.

Sustainability at the core

Sustainability is at the core of the Māori value of kaitiakitanga, an idea which New Zealand is embracing more fully. We feel there is a significant advantage and resonance in positioning New Zealand as a home for highly sustainable products, and that we need to keep a broad definition as to the meaning and interpretation of sustainability. This links in with MPI's Sustainable Food and Fibre Futures (SFF Futures) programme.

This definition is not limited to environmental issues and includes business models that support high value employment and thriving regional economies. ■

SUSTAINABLE FOOD & FIBRE FUTURES

Sustainable Food & Fibre Futures (SFF Futures) funds innovative projects that will increase sustainability and create more value from the food and fibre industries.

Projects could be about developing new products or services, or ideas for creating new jobs, increasing skills and capability, or encouraging better collaboration and information sharing. They can range from small, one-off initiatives requiring a small grant, to long running, multi-million-dollar partnerships.

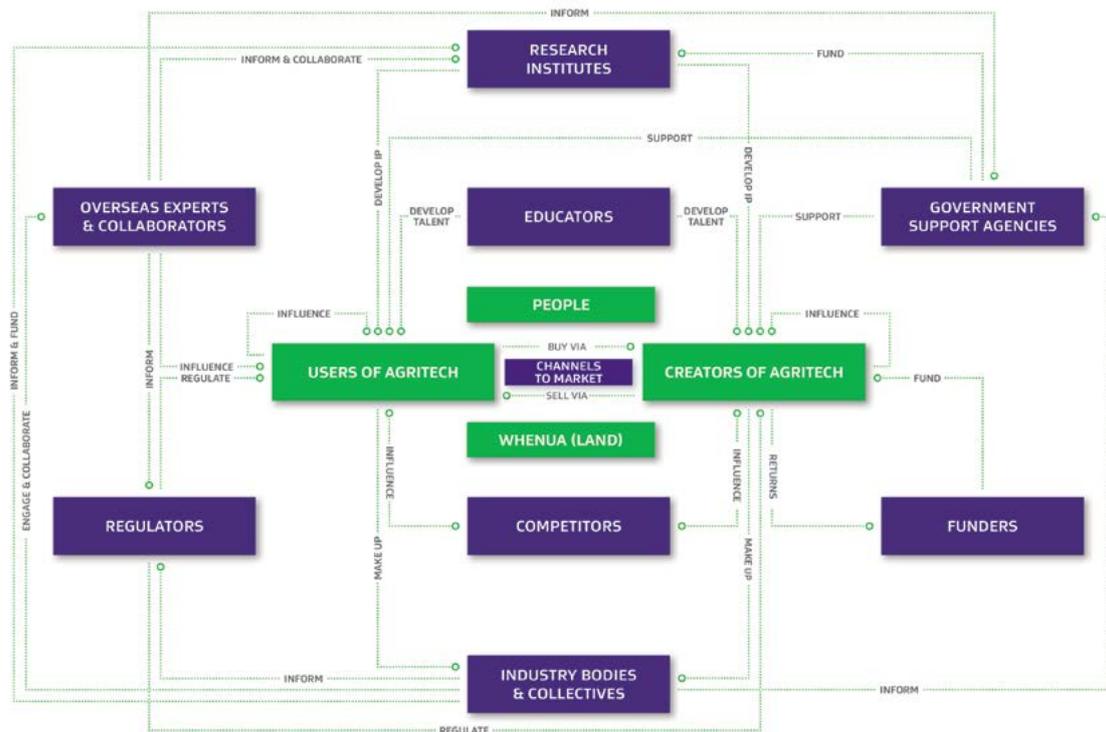
For example, one recent SFF Futures project is investigating how farm data can be used to inform land diversification on remote Māori farms and aims to ensure that farms without ICT connectivity will be able to be part of a traceable New Zealand story.

SFF Futures supports projects from all over New Zealand, created by businesses, non-government organisations, researchers, training institutions, Māori landowners, community groups, and industry bodies. Applications are expected to prioritise value over volume.

THE AGRITECH ECOSYSTEM

In developing this ITP, we considered the overall interdependent system for the agritech sector. We cannot make a transformative change by addressing parts of the ecosystem in isolation and must develop and implement actions that collectively address the broader agritech sector.

Figure 2 – The Agritech Ecosystem



Simplistically, the system involves:

- › **People:** these are the consumers of the food the agritech system contributes to. People are looking for safe and healthy food and the overall system needs to contribute to that. Additionally, they are the workers across the ecosystem, enabling the creation, development and use of agritech;
- › **The whenua / the land and sea:** virtually all agritech will have a relationship with the environment, and protecting the natural environment needs to be a core consideration of agritech;
- › **Users of agritech:** typically workers, and also purchasers of agritech, whether in New Zealand or overseas;
- › **Creators of agritech:** typically (though not exclusively) companies, often in partnership with the science system and through international technology transfers;
- › **The channels** between Creators and Users: these include agents, resellers, distributors, or co-op purchasing departments;
- › **Industry bodies and collectives;**
- › **Funders** of agritech companies;
- › **Educators** and academia;
- › **Research institutes** (universities, Crown Research Institutes, and Independent Research Organisations);
- › **Regulators** (eg MPI, MBIE);
- › **Government support agencies** (eg NZTE, Callaghan Innovation, MPI, MBIE);
- › Offshore expertise and collaborators; and
- › **Competitors** (learn from best practice, be early adopters). ■

THE ROLE OF MĀORI IN AGRITECH

Māori are a key part of the overall agritech ecosystem (see figure 2), having a core role across many aspects of the food and fibre sector and related activity. As well as historical contributors to the use of technology in farming, Māori have key roles as producers, consumers and funders of technology, and across most associated activity. Māori are holders of significant primary industry assets, have rights and interests in key resources (e.g. water), and are cultural/spiritual kaitiaki.

DEPENDENCIES AND LINKAGES

This ITP is linked to a number of adjacent strategies, plans and policy programmes, including:

- › The 'Fit for a Better World' Vision developed by the Primary Sector Council;
- › The Te Hono programme;
- › Sustainable Food & Fibre Futures;
- › The Forestry Strategy;
- › The One Billion Trees programme;
- › Future of Work, including the Future of Work Tripartite Forum;
- › Just Transitions work;
- › Early-stage capital;
- › The Green Investment Fund;
- › The Provincial Growth Fund;
- › The International Growth Fund;
- › The Research, Science and Innovation work programme, including R&D Tax incentive;
- › Renewable Energy strategy work programme; and
- › The existing research and innovation ecosystem (Crown Research Institutes, Independent Research Institutes, Universities, Science policy).

The agritech ITP is just one of a number of sector plans that will be developed. Those responsible for the agritech ITP are coordinating with those leading the development of other plans to ensure synergies are identified to maximise the effectiveness of plans. Areas where common solutions may be required should also be explored to ensure that work is not replicated, and cross-industry solutions can be developed. ■

OUTCOMES

It is important that we are able to measure and evaluate the effectiveness of our actions; to identify where we are succeeding and where there are still issues to overcome. Our efforts are only one of many factors influencing the outcomes for the sector and so we cannot definitively evaluate our efforts solely based on outcomes, and should also consider evaluating our own processes and outputs.

The net result of our actions compared with the status quo should be:

- › A measurable growth in export revenue for companies in the sector;
- › A measurable increase in jobs, and in particular high-value jobs, coupled with increased skill levels;
- › Wages growing faster in the agritech sector than other sectors.
- › A measurable growth in productivity of companies utilising agritech, both in New Zealand, and globally;
- › A more rapid uptake of technology for productive purposes;
- › An increased flow of investment into the sector and into our regions;
- › An increased number of new companies and coalitions formed, and new products launched;
- › An increased amount of IP taken through the research and commercialisation system to prototype or Minimum Viable Product (MVP) stage;
- › An increased number of international connections and parties collaborating and active in New Zealand;
- › Improved environmental outcomes from the food and fibre sector; and

- › Improved economic stability in the food and fibre sector through more efficient land use and more sustainable business models.

The above list is indicative at this stage. A detailed measurement and evaluation approach will be developed to ensure ongoing accurate evaluation of the effectiveness of our actions, overall and in distinct workstreams. ■

EXISTING AGENCY WORK PROGRAMMES

It is important to acknowledge the breadth of support that already goes into the agritech sector. This support extends from early-stage research, all the way through to increasing farmer adoption, or accessing foreign markets.

R&D and innovation support

At the R&D stage there are broad programmes to support R&D that also benefit agritech research, such as the R&D tax incentive or MBIE's Endeavour Fund, Partnerships Scheme, National Science Challenges and Strategic Science Investment Fund, which have supported specific agritech research. More agritech specific is MBIE's investment through the Regional Research Institute Fund in the PlantTech Research Institute. PlantTech is focused on digital automation of devices in horticulture.

Another key initiative is MPI's Sustainable Food & Fibre Futures programme (which superseded the earlier Sustainable Farming Fund and Primary Growth Partnership programmes) to co-fund innovative projects to increase the value of the food and fibre sectors.

Increasing adoption

There are also efforts underway to increase uptake of agritech technologies such as Callaghan Innovation's Emerging Technology workshops, MPI's Extension Services Model and MBIE's arable farming small business uptake of ICT pilot. Also included in this is the vital sponsorship that a number of agencies provide to Fieldays, including support for specific agritech content and other promotion for agritech at events such as technology showcases or Innovation Walks/Tours.

Direct firm support

Agritech businesses receive support in a number of ways, particularly through the efforts of NZTE and Callaghan Innovation. Callaghan Innovation works directly with approximately 300 New Zealand agritech organisations and supports initiatives such as the Sprout Accelerator, the Capital Education Workshop and overseas Missions. These Missions, often run in partnership with NZTE, include on farm visits and innovation centre tours based around targeted events, eg evokeAG (Australia), Forbes Agtech (USA) and Irish Ploughing Competition (Ireland).

NZTE works directly with approximately 130 New Zealand agritech companies, primarily supporting individual businesses' global growth strategies. They have supported the staging of, or New Zealand participation in, a number of events and workshops, both in New Zealand and internationally. This includes supporting New Zealand agritech businesses at the Irish Ploughing Championships, Agroleite Brazil, Dairy Day in the UK and many more. NZTE also runs market research into specific markets for the benefit of the agritech sector as a whole. NZTE manages the International Growth Fund, supporting New Zealand businesses, including in the agritech sector, through co-investment in international growth projects that will have a positive impact on the New Zealand economy. ■

INDUSTRY (AGRITECH NEW ZEALAND) WORKPLAN



Agritech New Zealand (the industry body for agritech in New Zealand) has developed a comprehensive programme of activity to grow the sector and support the delivery and implementation of the ITP, including:

Partnering with the Precision Agriculture Association of New Zealand (PAANZ)

A key milestone for Agritech New Zealand is the integration of the Precision Agriculture Association of New Zealand (PAANZ) into the organisation. It provides New Zealand's agritech sector with a more powerful industry voice.

PAANZ will become the 'adoption of agritech' workgroup within Agritech New Zealand, complementing the original focus on scaling New Zealand's agritech sector to grow export sales and become a more significant player in the global market. By combining the skills and resources of both organisations into a single entity, Agritech New Zealand will represent the widest interests of the country's agritech community.

New Zealand Agritech Story

Agritech New Zealand has been working with NZTE & NZ Story since the end of 2018 to build a compelling and cohesive New Zealand Agritech Story. The Agritech Story was previewed in June 2019 at National Fieldays by the Minister for Trade and Export Growth and formally launched internationally at the Irish Ploughing Championships in September 2019.

The intention is to transfer the New Zealand Agritech Story portfolio to Agritech New Zealand for ongoing development in 2020. This will support the ambitions of Agritech New Zealand and the Government to take New Zealand agritech sector's message out to the global market.

Supporting the delivery & implementation of the ITP

Agritech New Zealand has worked closely with the Government's agritech taskforce since its inception in March 2019. This industry engagement has been a critical element in the development of the Agritech ITP. It hosted a number of consultation workshops through 2019 and 2020 in Auckland, Hamilton, Tauranga, Palmerston North, Wellington & Lincoln as well as inputting directly into the development.

Agritech New Zealand will continue to work closely with the Government to ensure ongoing industry involvement in the delivery of the agritech ITP action plan.

Farm2050 Country Partnership

In August 2018, New Zealand became the first 'country partner' of Farm2050. Farm2050 is a global agritech initiative that brings together world-leading researchers, farmers, entrepreneurs, manufacturers, and distributors to solve the global food challenge by accelerating the path for new disruptive agritech ventures. Agritech New Zealand is working pro-actively with multiple Farm2050 partners around future initiatives including:

- › Identifying disruptive technologies around nutrients: a 3-year initiative that will see New Zealand and offshore agritech companies field trialling nutrient technologies in New Zealand to improve plant yield and mitigate against negative environmental impact such as run-off. See the High Impact projects section below.
- › Potential focus on automation.
- › New pathways to connected global capital.

Western Growers partnership

In August 2018, Agritech New Zealand signed a partnership agreement with Western Growers. Western Growers members produce 50% of all North American fresh produce: vegetables, fruit, nuts & organics. The key purpose of the Agreement is for New Zealand agritech companies to provide automation solutions to Western Grower members. This provides a significant commercial pathway for New Zealand agritech researchers and companies working in the robotics & automation space.

This connection has led to the Horticultural Robotics Institute project, described further on page 33.

The Australia New Zealand Agritech Council

The Australia New Zealand Agritech Council was launched at the Australia New Zealand Leadership Forum (ANZLF) meeting in Auckland in September 2019. The Council will work closely with Agritech New Zealand, but it is a distinct separate entity. Its first mission is to promote the trans-Tasman region's agritech sector to global investors.

The Council provides several other opportunities to scale New Zealand's agritech sector through co-operation with Australia's agritech ecosystem. The intention is to develop a desk in both San Francisco and Singapore in its first year of operation to support this work. Other opportunities include the potential creation of landing pads in target markets to ensure that agritech companies from both countries can receive in-market support.

The Council supports the vision of the ANZLF and plans to work with both public and private sector partners on both sides of the Tasman. Its immediate mission will scale through 2020/2021.

EvokeAG 2020 & 2022

Almost 100 New Zealand agritech researchers & entrepreneurs attended the evokeAG conference, held in Melbourne, in February 2020. Although organised by AgriFutures Australia, the intent is for evokeAG to be viewed globally as a trans-Tasman agritech vehicle.

Agritech New Zealand's Executive Director sits on the evokeAG steering committee. Working closely with the AgriFutures leadership team, he is working to develop more trans-Tasman (New Zealand) content into the evokeAG program. Next year's evokeAG 2021, scheduled to be held in Perth has been delayed until 2022 due to the impacts of COVID-19. Agritech New Zealand will work again with Callaghan Innovation, NZTE and MBIE to support the participation of New Zealand firms and organisations at this event.

Supporting inbound & outbound missions

Agritech New Zealand works with Callaghan Innovation and NZTE to support inbound and outbound missions. In 2019, outbound missions included:

- › evokeAG in February;
- › Forbes Live, Salinas in June; and
- › Irish Ploughing Championships in September;

Agritech New Zealand also supported in-bound delegations, including Innovate UK in March and an international delegation (through Finistere Ventures) during Fielddays week. ■

Bluelab

CASE STUDY

3

Smart simplicity for water-based growing

Hydroponics are enabling a new wave of urban-based, clean food production with less water use and environmental impact, but accurate sensors and automated processes are vital for good results.

Bluelab is a world-recognised leader in meters and controllers for water-based plant growing systems – offering accurate controls for digital pH, conductivity, nutrient formulations, temperature, analysis, and automation technology.

Its products include the Pulse handheld root zone meter, which provides moisture, nutrient and temperature information with a single button press – all collected on a dedicated smartphone app for instant crop health management.

www.bluelab.com ■



Bluelab.
Source: NZTE



Farmer starts up the rotary milking system for the first milking session of the day.
Source: NZ Story

Part 3 – Action Plan

In addition to the existing work plans for government, and for the industry group, we have highlighted new activity that will accelerate the growth of the New Zealand agritech sector.

Some of the actions require further detailed definition and implementation planning, while others can begin execution more quickly. A programme plan has been established

to manage a number of workstreams and some high impact projects, to maximise the opportunity to move quickly where possible.

The programme action plan has two major components: actions that grow the overall ecosystem, and so may be longer term and require coordination across agencies; and some projects which can be accelerated for high impact in the near term.

HIGH IMPACT PROJECTS

A number of projects have been highlighted as having the opportunity for making significant impact in a short period of time and have been selected for further exploration as part of this plan.

Project 1 – Horticultural Robotics Institute

The opportunity exists for New Zealand to develop a Robotics, Automation & Sensing Institute to take a global leadership role in this significant area of agritech.

New Zealand already has a number of outstanding research teams working in this space, providing an opportunity for New Zealand to take a global leadership role in horticultural robotics. Found in universities, crown research institutes and private companies, the challenge has been that these teams are small in size and much of the research has been focused on addressing New Zealand food and fibre sector problems.

The Institute would help to address this. As a centre for collaboration it would help to overcome the issues of scale, emphasise more of a global focus and ensure that New Zealand researchers and entrepreneurs can lead the world in this space.

Horticultural labour remains the most significant issue in the sector globally. In New Zealand this is felt particularly for the kiwifruit, apple and grape sectors. The need for on-farm and on-orchard automation to help address this issue is only going to grow, providing New Zealand with a multi-billion dollar commercial opportunity.

Globally, awareness of New Zealand's capability in this area has grown.¹¹ In August 2018, Agritech New Zealand signed a strategic partnership agreement with Western Growers. Western Growers members account for approximately 50% production of all fresh produce in North America (fruit, vegetables, organics). They are looking to New Zealand to help their members address the major challenge of labour shortages and costs by automating a number of on-farm processes.

¹¹ This has been assisted by Yamaha Ventures NZ \$12M investment into Bay of Plenty-based Robotics Plus, together with Finistere Ventures more recent investment into Invert Robotics.

A delegation of over 20 New Zealand robotic and sensing researchers and entrepreneurs visited Western Growers in Salinas, Northern California to understand the scale of the problems Western Grower members are facing and how New Zealand research and robotics and automation could help address them. This partnership offers a significant new commercial pathway for New Zealand researchers and businesses to scale their sights.

Development of a New Zealand Horticultural Robotics, Automation & Sensing Institute will help industry to seize this opportunity. It will act as a means of collaborating across the sector, help to foster greater innovation and knowledge sharing, grow capability and drive New Zealand's international competitiveness.

The Bay of Plenty has been identified as a potential venue for such a site. It is home to the regional research institute, PlantTech, as well as leading robotic and automation companies such as Robotics Plus, BlueLab & GPS-it. These companies are already commercialising the robotic and automation research output of several of New Zealand's universities and research institutes.

An early area of focus is likely to be the commercialisation of an automated asparagus harvester developed by Waikato University researchers. This is an existing project with strong potential that can be maximised through Academy support.

A scoping phase is underway and a business case is being created for this initiative.

Project 2 – Hosting the Farm2050 Nutrient Initiative

Farm2050 is a global agritech initiative that brings together world-leading researchers, farmers, entrepreneurs, manufacturers, and distributors to solve the global food challenge by accelerating the path for new disruptive Agritech ventures.

Identifying disruptive technologies in nutrients is the first major joint initiative being proposed for New Zealand's agritech sector by Farm2050 and Agritech New Zealand. How to achieve more sustainable farming is a key issue, not only in New Zealand but globally, and will help address some of the serious environmental concerns that the poor application of traditional nutrients can create, such as run-off.

As government and the public's focus on the negative environmental impact of farming increases (specifically the dairy sector), this Initiative provides a significant proactive opportunity for New Zealand to address these issues. It also provides New Zealand with the opportunity to take a global lead in this work and is an area that has significant commercial export potential.

To achieve this New Zealand needs to create scientifically valid/statistically significant trials that allow for analysis, optimisation and automation of farming activity, coupled with exploring new biological methods of improving soil nutrition. The Initiative will focus initially on trials of technologies across:

- › soil sensor technologies to accurately measure water and nutrient movement, supported by sampling and data analytics to prescribe better nutrient application and use efficiency;
- › imaging analysis of crop/pasture biomass, nutrient uptake and correlation of soil data;
- › automation of irrigation/fertigation based on agronomic prescriptions generated from analytics/sensors to improve yield/uptake and test minimisation of run-off;
- › biological/microbiome soil amendments to increase soil health and productivity including alternative nutrient technologies (vs fertilisers); this could also include increasing carbon sequestration;

- › a practical working solution for management with New Zealand application (in line with Agritech New Zealand’s participation in Farm2050); and
- › a commercial framework for application of technologies with local New Zealand farming and supply chain partners.

The Initiative has potential to bring wide benefits across the value chain, creating a number of new roles in existing New Zealand companies as well as new businesses focusing on the use of biological/microbiome technologies. Given the regional nature of the sector, this is where the majority of these new jobs will occur.

Project 3 – Creation of a specialist agritech venture capital fund

Lack of available investment capital is a key constraint to the emergence and expansion of start-ups, and the commercialisation of research in the New Zealand agritech ecosystem. While globally investment into the agritech sector has exploded in recent years, we haven’t seen the same level of investment into the New Zealand domestic sector (according to Pitchbook), although there have been notable exceptions, such as recent international investments into Invert Robotics and Robotics Plus.

In May 2019, Government announced the establishment of a \$300 million, 15-year venture capital fund as part of Budget 2019. This fund will be managed by New Zealand Capital Growth Partnerships (NZCGP, formerly known as the New Zealand Venture Investment Fund) and governed by the Guardians of New Zealand Superannuation. This fund, called the ‘Elevate NZ Venture Fund’, includes the possibility of the development of specialised funds within the larger venture capital pool.

A number of parties have approached NZCGP expressing interest in establishing a specialised New Zealand agritech venture capital fund. It is expected that given this interest, a significant fund will be established with matched funds from a partner and the venture capital fund. Such a fund will be effective at addressing the gap in early-stage funding for New Zealand agritech.

Discussions around this opportunity are ongoing between NZCGP and possible partners.

ECOSYSTEM DEVELOPMENT PLAN

A series of actions have been prepared to grow the New Zealand agritech industry. These actions have been developed to address the constraints and opportunities identified in Part 1 of this ITP, and help achieve the vision described in Part 2. These actions cut across the wider agritech ecosystem and have been grouped broadly into six workstreams. These workstreams overlap and are complementary, both to each other and to the existing work identified above.



Workstream One: Global

Global Lead Agency: MFAT

There are three areas of focus within the Global workstream:

- › Connecting the New Zealand agritech ecosystem to global opportunities
- › Learning from global agritech leaders
- › Collaborating with Australia

Improve awareness and engagement with global opportunities amongst the New Zealand agritech ecosystem

Currently New Zealand agritech researchers and firms are overly introverted, focusing primarily on the problems and needs of the New Zealand food and fibre sector, and largely ignoring the broader global issues that could be addressed. Due to the relatively specialised pastoral nature of the New Zealand farming system, there are limited opportunities to export these domestic-focused solutions to the profitable international market. Increasing the focus on international challenges and opportunities for New Zealand agritech can provide significantly larger economic returns due to the larger possible target market.

We see a major opportunity in better connecting local agritech firms and the innovation ecosystem to international demand and opportunity, as well as seeking international collaborations. This may be achieved by fostering direct connections or by using government as an intermediary, working to understand international agritech needs and problems and relaying that information through to the New Zealand ecosystem.

Work is also required to ensure that New Zealand agritech companies, including start-ups can go out to foreign markets and receive the support they need to succeed and develop export opportunities.

The global agritech market is diverse, with different requirements, methods of farming and challenges for the food and fibre sector. Therefore, to achieve any meaningful success, targeting is necessary to identify focus geographic locations and agritech areas.

COVID-19 has brought new challenges to efforts to engage globally. New Zealand companies must now overcome not only physical restrictions limiting the development of international connections, but also a world that is grappling with recession and increasingly insular.

ACTIONS IN PROGRESS

- 1.1 Define global problems which match our vision for New Zealand's impact (eg robotics/ automation, nutrients, clean water).
- 1.2 Agree, in consultation with the agritech sector, a set of priority geographical markets to focus on (interventions, business development, New Zealand capability promotion, trade diplomacy, etc.).
- 1.3 Consolidate a shared NZ Inc feedback loop of global opportunities in offshore markets, for the New Zealand agritech ecosystem (key trends, evolution of regulations, etc.).
- 1.4 Develop a framework for improved information sharing and closer ongoing cooperation across NZ Inc to more effectively and consistently support New Zealand agritech businesses with global ambitions.
- 1.5 Continue our work examining trade policy settings to ensure they are meeting the needs of the New Zealand agritech sector.
- 1.6 Ongoing development of the New Zealand Agritech Story, leveraging the Agritech Story with collateral and a toolkit companies and agencies can utilise quickly.
- 1.7 Define a joint approach to NZ Inc planning for international promotion: starting with developing a clear plan for promoting the Agritech Story in a set of offshore markets in the next 18 months, and identifying events leveraging opportunities.
- 1.8 Define a joined-up NZ Inc partnership development strategy (to provide routes to accelerate New Zealand agritech businesses go-to-market), based on existing models within NZ Inc agencies, and define targets for business development and partnerships in the next 18 months.
- 1.9 Establish a central fund for international events leveraging between agencies.
- 1.10 Create relationships and New Zealand presence with key international Landing Pads (a number of possible locations have been identified).

Improve understanding of world-leading agritech policy practice

There is also benefit to be gained from policymakers looking beyond our borders and understanding how success is being achieved in the agritech sector in other countries.

A number of other countries have identified agritech as key focuses for their economies and have developed comprehensive strategies to support the sector including the UK, Australia and Ireland. Others have identified specific areas of disruption and are investing heavily into those.

Understanding the activities of countries considered global leaders in agritech can provide vital insights for future policy design and action development. Five such leaders that, like New Zealand, are also small advanced economies have been identified and analysed, primarily through our relevant offshore posts. We are in the process of assessing their critical success factors and whether there are lessons that could be applied in the New Zealand context. The five countries are:

- › **The Netherlands** – second largest exporter of agriculture products in the world, after the United States, due to strength in agriculture and food processing technology. Home to the world's number one ranked agricultural university and a large number of agriculture innovation hubs.
- › **Ireland** – pastoral farming style and strength in agritech means we have a close comparator and potential collaborator. Ireland is potentially further ahead of us in several areas of agritech.
- › **Israel** – world leading research in agritech with high level of commercialisation, investment, incubators and accelerators and multinational involvement.
- › **Denmark** – major food and dairy producer supported by food tech and agritech innovation.
- › **Singapore** – investing significantly and considered a leader in vertical farming and agritech more broadly, particularly aiming to tackle problems of lack of space, labour and water.

ACTIONS IN PROGRESS

- 1.11 Based on analysis of leading agritech countries, identify and implement suitable changes to New Zealand agritech policy and work programmes where overseas experiences and approaches can be effectively applied to the New Zealand context.

Collaboration with Australia

Improving collaboration with Australia in the agritech sector provides both countries with advantages, efficiencies and opportunities. A stronger relationship can improve our attractiveness to foreign experts or investors, provide for more affordable/achievable engagement in overseas markets and identify areas for joint research or development. This work is well under way with several strands strengthening the relationship.

New Zealand and Australia have agreed to explore creation of a trans-Tasman innovation ecosystem through the 2017 bilateral Research, Science and Innovation Cooperation Agreement. Agritech is an area the Ministry of Business Innovation and Employment and its Australian science counterpart – the Department of Industry, Science, Energy and Resources – have identified as a potential area for further collaboration.

The Commonwealth Scientific and Industrial Research Organisation and its New Zealand partners, particularly AgResearch and Plant & Food Research, have been working together for the past two years to identify and roll-out new initiatives in related science areas. MBIE is considering how these initiatives can be integrated with the agritech ITP.

The Australia New Zealand Agritech Council was launched at the Australia New Zealand Leadership Forum in Auckland in early September 2019. It aligns with government priorities and will increase trans-Tasman collaboration. Its objectives are:

- › that Australia and New Zealand collaborate to promote the agritech sector; and
- › to position Australasia as an attractive destination for investment.

With only a fraction of the \$6.9 billion global investment in agritech in 2018 being invested in Australia and New Zealand, New Zealand and Australia need to work together to develop scale and have the ability to attract venture capital funds from offshore.

New Zealand had a stand at evokeAG 2020, the major trans-Tasman agritech trade show in Melbourne, in February 2020 and will be looking to participate in a significant way in the next evokeAG, to be held in Perth in 2022.

The formal establishment of the Australian Agritech Association in February 2020 will enable greater levels of collaboration with Australia by providing a coordinating body and counterpart to Agritech New Zealand.

Strong collaboration with Australia is now even more important given the isolating effects of COVID-19 and the possibility of a trans-Tasman bubble. Collaborating will give both countries greater pulling power and ability to connect with large international opportunities.

Workstream Two: Commercialisation

Commercialisation Lead Agency: Callaghan Innovation

There are three areas of focus within the Commercialisation workstream:

- › Accelerating commercialisation of research institute IP
- › On-farm technology prototyping
- › International research collaboration

Accelerating commercialisation and spin-outs of research institute IP

Innovation is the engine of productivity. Fundamentally, the growth of the sector must be driven by a fast path from research idea, to new product in market.

The current state of agritech innovation is not achieving this. Furthermore, New Zealand's significant investments into agritech R&D are not resulting in a significant flow of companies and product spin-outs. More work is needed to increase our understanding of commercialisation of research, and ensure our world-class research is well utilised and exploited.

Government's draft Research, Science and Innovation strategy also sets out the importance of connections as a central theme. This includes proposed actions to develop a world-class research commercialisation system, and ensure knowledge is able to flow easily and fluidly both domestically and internationally.

Stimulating the development and diffusion of innovation and growing companies are the core of the system. Part of this will require a better visibility of others' work so that duplication can be avoided, and collaboration encouraged.

There is currently IP in research institutes that has the potential for commercial value. This IP may not have been commercialised due to a number of reasons including undervaluing or overvaluing the IP; lack of effective mechanisms for researchers to transition into and/or back out of a new business; lack of effective commercialisation partners and/or business models.

We can build on the work done by the Commercialisation Partner Network to look into the systemic issues for commercialisation, learning from the work of organisations such as Kiwinet and Return on Science.

ACTIONS IN PROGRESS

- 2.1 Hold a detailed design workshop with representatives of the research community along with key officials, to highlight issues and look for solutions to improving the rate of commercialisation and spin-outs from research.

Based on this workshop:

- 2.2 Promote better linkages between industry and research organisations' IP eg joint Return On Science and Kiwinet agritech event with industry
- 2.3 Investigate new models for research organisations to transition into and out of spin-out companies
- 2.4 Investigate new models for research organisations' employee incentives/payments for spin-out companies
- 2.5 Investigate the creation of a specialist agritech 'Activator' (resources charged with partnering with research organisations and industry to ensure IP is commercialised).
- 2.6 Set targets for commercialised agritech ventures in collaboration with relevant parties.

Prototyping technology in partnership with farmers

Adoption of new technology is both a constraint and an opportunity when it comes to agritech. As has been outlined above, farmers are naturally cautious and conservative in adopting new technologies or practices that are unproven, or with unclear benefits, and so care must be taken to make it easy for farmers to trial new agritech products. Likewise, for creators of agritech the opportunity to prototype and pilot technology usage in a real world environment is a key step to scaling their impact.

A number of organisations exist in New Zealand that are concerned with technology adoption on-farm¹², and the opportunity exists to partner with these organisations to accelerate prototyping of solutions to address adoption barriers, and also provide real-life test scenarios.

ACTIONS IN PROGRESS

- 2.7 Establish better (and more formal) linkages into farmer groups for education; idea generation; and testing new products and services.
- 2.8 Develop specific initiatives with these organisations eg technology showcases with Federated Farmers and Young Farmers at Fieldays.
- 2.9 Look into the creation of 'demo farm' and 'test farm' facilities to facilitate research and development, and farmer uptake within New Zealand as is done in other parts of the world ('Centers of smart farming').

International research collaboration

Given the imperative for international focus, it will also be key for creators of New Zealand agritech to have access to international markets to trial and test their technology, and to understand the nuances of markets. Without direct experience, it can be challenging for researchers and smaller agritech companies to understand the commercialisation opportunities in international markets. This challenge has been exacerbated by the impacts of COVID-19.

There is opportunity to leverage the growing international networks of MFAT, NZTE and Callaghan Innovation, as well as the industry-led international partnerships, to streamline access to offshore test markets and collaborations.

ACTIONS IN PROGRESS

- 2.10 Government agencies to further coordinate and collaborate on major international events and missions (possibilities include evokeAG; Forbes Agtech; and Irish Plough/UK Dairy Day) including pre and post engagement.
- 2.11 Establish international research collaboration eg with the United States Department of Agriculture and Innovate UK to allow New Zealand companies to work in partnership with international organisations.
- 2.12 Investigate New Zealand joining international online collaboration tools eg www.smartagrihubs.eu.
- 2.13 Formalise 'paths to market' alongside larger or more established New Zealand agritech companies who have international presence, to look for opportunities where smaller companies can learn from their experiences and opportunities.

¹² Examples include: Rural Innovation Lab, PIRIC Collaborative Innovation network, Agritech New Zealand's adoption of agritech workgroup (formerly PAANZ), Future Farm, Foundation for Arable Research, New Zealand Wine, Dairy NZ.



Workstream Three: Investment

Investment Lead Agency: NZTE

There are two areas of focus within the Investment workstream:

- › Specialist early-stage capital funding
- › Maximising global funding links and opportunities

Specialist early-stage capital funding

A lack of investment capital, significantly in the series A stage, but according to some, at seed stage also, is commonly cited as a major impediment to the creation of new products and companies.

In particular the need for ‘smart, connected capital’ is regularly raised for consideration. While global venture investment over the past 5 years has increased exponentially into the agritech sector, New Zealand has only attracted a very small percentage of this funding. One key trend over the recent years is that venture investment deals have grown in size per investment deal vs pure volume of deals.

This reflects a maturing investment landscape where Series B and C deals are becoming more common. This trend has not been reflected in New Zealand to-date where dealflow tends to be earlier stage.

This investment is essential to helping companies grow. The key action to address this issue is the creation of a specialist agritech venture capital fund, as described in the High Impact Projects section. However, more work can also be done to understand additional capital issues, and in particular the need for an agritech seed fund.

ACTIONS IN PROGRESS

- 3.1 Document and respond to any remaining issues around the capital landscape for investing in agritech beyond those being addressed by the specialist agritech venture capital fund.
- 3.2 Investigate the possibility of a specialist seed fund for New Zealand agritech.

Maximise global funding links and opportunities

Access to capital provides for more than merely investment dollars; the right investment partner also brings networks, experience and skills to the deal and can work in partnership with New Zealand-based capital providers to accelerate a company’s progress. Offshore funds with these skills and attributes are valuable in the New Zealand marketplace and can bring new capability to the investment landscape in New Zealand.

In addition to capital funding, debt funding is also essential to many agritech companies and it is important that firms can access the debt products necessary to help them grow. Working with New Zealand Export Credit is one way to achieve this.

In addition, there are existing mechanisms within government for helping fund, or coinvest with companies, into global growth. Where possible, we will further develop and focus these mechanisms to help the agritech sector grow.

ACTIONS IN PROGRESS

- 3.3 Strengthen the pipeline of offshore investment capital into the New Zealand's agritech sector by strengthening connections to global capital pools and VCs and maximising investment opportunities that arise.
- 3.4 Further promote to industry New Zealand Export Credit, government's existing loan guarantee scheme, and engage with New Zealand Export Credit to ensure their product suite meets the needs of agritech companies.
- 3.5 NZTE, Callaghan Innovation, MPI and MBIE will examine their funding models for companies, and their grant programmes, to look for opportunities to accelerate company growth.



Workstream Four: Data Interoperability and Regulations

Data Interoperability and Regulations Lead Agency: MPI

There are two areas of focus within the Data Interoperability and Regulations workstream:

- › Data interoperability and open data
- › International and regional variations in regulatory standards and requirements

A lack of agritech offering and data interoperability and openness limits uptake and innovation

Agritech systems, machinery and services are often designed in isolation without considering how one agritech offering will operate alongside other offerings as there are no uniformly recognised or adhered-to standards for agritech products to ensure interoperability across offerings. This results in a fragmented market where products and services are not interoperable or cross-compatible. A modern farmer who is incorporating agritech across his operations may be asked to use a large number of different systems that do not communicate, which produce data in different formats, which cannot be easily amalgamated and analysed. This results in decreased on-farm productivity, lower uptake of agritech and limited innovation as complementary services are more difficult to develop due to the fractured market.

In addressing this issue several considerations must be made. Government is not seeking to arbitrarily designate certain standards and enshrine those into law, as a flexible approach that can keep up with rapidly evolving technology is needed. Any approach to standards must also consider international approaches, to ensure that products and services developed in New Zealand can be exported overseas, and so that our food and fibre sector that links into global supply chains will have agritech systems that are internationally compatible. Better and directly linking interoperability with commercial incentives could be effective at creating an agritech ecosystem that is better aligned, compatible with overseas offerings and encouraging increased uptake and usage on farm.

The issue of open data remains actively debated within the agritech industry. Proponents for open data claim that increasing the openness and sharing of food and fibre sector and agritech data is essential for innovation, encouraging competition and developing a secondary market that uses this data to produce valuable services for the food and fibre sector. Data that could be of broader use is often locked in silos. Others would say data is a key commercial advantage generated through long-term investment by companies. Making that data open would reduce or eliminate the incentive to invest in gathering this data in the first place and stifle the innovation that results from it. An ideal solution must find a balance between these contrasting perspectives.

Also to be considered is the ownership of farm data generated. Does the farm owner have a right to ownership over data produced from their farm? Do they have the rights to receive and share data collected from their farm? If this is the case, then the possibility of a farm data exchange platform that follows the same principles as 'open banking' could be explored.

ACTIONS IN PROGRESS

- 4.1 A workshop held in February 2020 explored the issues of interoperability and open data and started the process of identifying possible solutions that would encourage cooperation and openness within a commercial framework. Options for possible use cases to take this work further are now being explored together with industry. This action will continue jointly as part of the agritech ITP and MPI's Integrated Farm Planning work programmes.
- 4.2 Look into the barriers to the adoption of existing standards (both global and New Zealand-based standards) and better understand the appropriate use cases for standards.
- 4.3 Review international best-practice policy settings around interoperability and open data as part of the Global workstream focus on improving understanding of world-leading agritech policy practice.

Based on this work:

- 4.4 Define a future state for adoption of standards and create an implementation plan in collaboration with industry and other stakeholders.

Regional and international inconsistency in measurement and reporting requirements inhibit product development

There is a lack of consistency across the measurement and reporting requirements of councils across New Zealand, particularly with environmental standards. This is contributing to the fragmenting of the agritech market as agritech companies are unable to produce one product that will address the regulatory needs of farmers across the country. Having a large number of small markets with different needs means that the possible return for any product is reduced and investment is disincentivised. Differences between New Zealand regulations and international regulations similarly reduce the possible application of agritech products. Eliminating these differences where possible can make agritech products designed for New Zealand also applicable offshore.

ACTIONS IN PROGRESS

- 4.5 Examine the drivers behind regional variations in regulations, data standards and measurement methods.
- 4.6 Explore approaches to encourage or require national alignment.
- 4.7 Examine drivers behind differences between New Zealand and international standards and explore opportunities to improve alignment.

LIC Automation

CASE STUDY

4



*Dairy cow being drafted.
Source: NZ Story*

Connected thinking, by farmers, for farmers

LIC Automation provides advanced farm automation and sensor technology systems for dairy farmers around the world.

LIC Automation is a subsidiary of New Zealand's Livestock Improvement Corporation, a farmer owned cooperative that's delivered world leading innovations since 1909. Over 1,700 New Zealand farmers

use LIC Automation technologies.

LIC Automation's Saber modules form a connected system that gives farmers access to powerful information about their cows, enabling better herd management, easier decision-making, and increased profit.

www.licautomation.com ■



Workstream Five: Skills and Workforce

Skills and Workforce Lead Agency: MBIE

There are three areas of focus related to agritech skills and workforce:

- › Skills required to develop agritech
- › Skills required to use agritech
- › The impact of agritech on the workforce

Specialist skills are required to develop agritech products and services

A wide range of skills are required to create high-value agritech products and IP, particularly a knowledge and empathy for the real-world problems of food and fibre production, and a deep knowledge of technology, including emerging technology.

Anecdotal evidence from industry suggests that a shortage of specialist skills is an issue for the sector, particularly in the fields of data science, robotics and product management, as well as software development more generally. From the broader ecosystem, there also appears to be a shortage of commercialisation skills in research institutes.

There is evidence for a shortage of these types of specialist skills globally, as well as within New Zealand. Global market research with 100 large agritech businesses found that 55 per cent of agritech companies reported a shortage in cyber security personnel and 53 per cent a shortage of analytical and data science skills.¹³ Our shallow labour market makes it even more challenging to find specialist skill sets. The 2018 *Digital Skills for a Digital Nation* report concluded that not enough local, digitally skilled people are being developed, the sector lacks diversity and there is a high reliance on skilled immigration (5,500 technology visas were granted in the year prior to publication, more than the 5,090 computer science and information technology graduates in 2015).

Skills shortages are known to exist in New Zealand's manufacturing sector, which encompasses some agritech firms, primarily in trade/technical and leadership roles.¹⁴

Universities and other institutes of learning will be key partners in addressing these skill shortages.

ACTIONS IN PROGRESS

- 5.1 Survey agritech firms about current and likely future demand, the skills they need most and the skills that are hardest to find.

The answers will inform further actions we prioritise to address any skills gap. We also propose the following actions:

- 5.2 Agritech New Zealand will input to the Reform of Vocational Education currently underway, to ensure future agritech skills needs will be considered. This includes identifying and providing input to the establishment of Workforce Development Councils and Centres of Vocational Excellence for the food and fibre, and technology sectors.
- 5.3 Agritech New Zealand will input to the development of the skills component of the Digital Technologies ITP to ensure agritech skills needs are considered.
- 5.4 Agritech New Zealand will consider developing a coordinated, agritech branded presence in the Summer of Tech to raise the industry's profile.

¹³ "Research finds skills shortages in agritech holding back Internet of things innovation" in UK Farmers Guardian, 16 Jan 2018.

¹⁴ "Securing a Bright Future for Manufacturing in New Zealand" presentation by Dieter Adam, Manufacturers' Network, 21 July 2018.

- 5.5 Callaghan Innovation will work with Agritech New Zealand to assess the applicability and uptake of Student Grants for agritech firms, and promote their value, to improve pathways from study to work.
- 5.6 Callaghan Innovation and Agritech New Zealand will utilise the skills of alumni of networks such as the Edmund Hillary Fellowship, Nuffield New Zealand Farming Scholarships and the Kellogg Rural Leadership Programme, including creating a skills list and highlighting agritech expertise.
- 5.7 As part of its 'peer to peer networks', NZTE will establish a network for leaders in agritech to share best practice and learn from each other.
- 5.8 Explore new types of degrees and teaching that combine technological skills such as engineering, data or biotech with agriculture.
- 5.9 Increase student grants and student hackathons with industry.

Digital literacy and information are required to inspire investment in, and best use of, agritech

While agritech generates a wide range of benefits for the food and fibre sector, these benefits are contingent on workers in the food and fibre sector being able to understand and operate these new technologies. An increasingly technologically complex workplace requires higher skilled food and fibre workers. In order for agritech uptake to increase digital literacy is essential and other higher skills such as data management and analysis are also required.

The Food & Fibre Skills Action Plan 2019-2022, launched on 29 October 2019, was developed by the Primary Industries Skills Leaders Working Group. The Plan aims to support the development of a workforce that has the skills to deliver on the current and future needs of the food and fibre sectors, including dairy and meat processing. Many of the actions proposed in the plan are highly relevant to agritech. A more highly educated, skilled and informed workforce is more likely to understand the potential benefits of new technologies and feel comfortable using them.

One example is the action to commission research into the current state of university-based agriculture and horticulture education. This would include looking at the current courses available, their relevance to industry, and delivery models, as well as overseas models (eg Wageningen University). There is an opportunity for Agritech New Zealand to co-ordinate with, or participate in, the Skills Establishment Group that has been set up to implement the Action Plan.

ACTIONS IN PROGRESS

- 5.10 The Ministry for Primary Industries and Agritech New Zealand will work together to ensure farmers' Extension Services have access to impartial information about available agritech solutions and identify regional successes to promote.
- 5.11 Agritech New Zealand will identify opportunities to engage with the Establishment Group for the Food & Fibre Action Plan 2019-2022 to discuss potential involvement in delivering relevant actions and how to ensure agritech needs and priorities are recognised in delivery of the Action Plan.

Agritech is likely to impact on some workers, particularly those in lower skilled and seasonal roles

All jobs will be impacted by increasing automation and digitisation, but some will be impacted more than others. Jobs that are routine, dangerous or highly labour intensive are more likely to be automated.

Horticulture, in particular, experiences large seasonal fluctuations in labour demand and a shortage of labour to undertake routine picking, harvesting and packing roles.

Current means to address this seasonal labour requirement include Ministry of Social Development (MSD) declarations of seasonal labour shortages and the Recognised Seasonal Worker Scheme.

In April 2019 MSD reported that 375 people were placed in horticultural work between January and March, and the Bay of Plenty had a current shortage of around 3,800 people.¹⁵

The Recognised Seasonal Worker Scheme allows the horticulture and viticulture industries to recruit workers from overseas for seasonal work when there are not enough New Zealand workers. The cap of 14,400 places in October 2019 will be extended to 16,000 for 2020/21. The Minister of Immigration has challenged the industry to make the sectors easier and more attractive for New Zealanders to work in, including considering paying more and increasing the use of automation.

Travel restrictions as a result of COVID-19 are making the recruitment of overseas seasonal workers more difficult. This is increasing the demand for automation solutions and may accelerate the long-term replacement of harvesting jobs.

We expect that automation in the horticulture and viticulture industries (and more widely across agriculture) will increase and that this will likely reduce the demand for these low-skilled routine jobs in these industries.



Workstream Six: Government

Government Lead Agency: MBIE

There are three areas of focus within the Government workstream:

- › Promoting and improving transparency of government support
- › Encouraging communication and streamlining across government
- › Improving understanding of the agritech sector

Promoting and improving transparency of government support

Government support for agritech companies can appear fragmented and unclear. Companies are expected to navigate government agencies and processes, often without visibility of the overall support system. Within the agencies involved in the agritech taskforce we have the opportunity to streamline and increase transparency of the government support provided to the sector, to further enhance the strong institutions we have, and to drive coordination and support in a sustained way.

ACTIONS IN PROGRESS

- 6.1 Develop a simple guide to make agritech resources, support and funding more transparent and accessible. This guide will also link to suitable resources around standards, legislation and compliance.
- 6.2 Develop a national technology platform view for agritech, outlining where expertise, equipment and support exists and how it can be accessed, along with a roadmap for further development.
- 6.3 Examine any systemic infrastructure barriers to the creation and adoption of agritech (eg rural wifi/broadband) and develop a plan to remediate with relevant parties.

¹⁵ Ministry of Social Development "Seasonal Labour Shortages in Hawke's Bay and the Bay of Plenty" 5 April 2019.

Encouraging communication and streamlining across government

Improved coordination and alignment within and across government agencies working on agritech can improve the policies and actions developed by government and enable government to better support the agritech sector. It can also improve productivity within government as work is not duplicated and the different specialty knowledge and connections of different groups/agencies contribute to a more efficient overall process for supporting agritech. The Agritech Taskforce will play a key role in improving communication and coordination across Government.

ACTIONS IN PROGRESS

- 6.4 Government will share information among agencies on funding provided to agritech companies.
- 6.5 Create a shared knowledge base across government so that agency insights for the sector can be accessed and used easily.
- 6.6 Define the growth enablers, and common constraints for companies to inform creation of new services and interventions.

Improving understanding of agritech sector

Currently data and evidence for the agritech sector is difficult to obtain due to the cross-cutting nature of the sector. Agritech does not match with conventional industry, occupation or export statistical codes. This not only limits our understanding of the industry, its challenges and needs, but also impacts on our ability to accurately track the impact of government work to support the sector. Developing approaches to better measure agritech could lead to a more accurate picture of the sector in New Zealand and more targeted and effective actions. It will also allow us to evaluate the effectiveness of the actions of this ITP, with a specific measurement and evaluation plan to be developed for this action plan.

ACTIONS IN PROGRESS

- 6.7 Callaghan Innovation and Agritech New Zealand to create a registry of agritech companies and products as part of Scaleup.nz.
- 6.8 Government will work with the TIN200 to publish a report on the agritech sector.
- 6.9 Callaghan Innovation and NZTE will develop a playbook for setting up an agritech company.
- 6.10 Create a customer journey map, to understand a company's experience and constraints, including understanding the barriers to adoption of technology.
- 6.11 MBIE will lead work to improve measurement of the New Zealand agritech industry to improve our evidence base and understanding of the sector, including exploring the possibility of a survey of agritech companies.

Conclusion and next steps



In this Industry Transformation Plan we have outlined our approach to the long-term transformation of the agritech sector to make it more productive, sustainable and inclusive as part of a zero-carbon economy.

We have described the context, challenges and opportunities for New Zealand's agritech sector and, in response, proposed a vision for the future of the sector.

To help achieve this vision, and building on existing work by both government and industry, we have outlined a proposed action plan including High Impact Projects and ecosystem development across six workstreams.

While this plan has now been launched, we also know that we need to be responsive and make changes as our work progresses. The plan is a 'living document', which will evolve to meet the changing needs of the sector and the markets we aim to serve.

As we move onto the implementation phase of the ITP, a governance group will be established to guide our work and ensure we're achieving the goals of both Government and industry for the sector. Industry representatives will play a key role within this governance group.

The government has committed \$11.4 million as part of Budget 2020 funding to implement this plan. This will allow us to now proceed in earnest and in partnership with industry to make this plan a reality and start progressing towards our vision for New Zealand agritech. ■



Farmer on Ubco bike with drone.
Source: NZ Story

Smart simplicity for water-based growing

UBCO was founded on the idea of a two-wheel drive Utility Electric Vehicle (UEV) that would transform the way people ride, work and play. Since then it has evolved into a digitally connected UEV platform including on- and off-road transport, portable power, accessories, and cloud-based software.

The UBCO 2x2 is a lightweight, quiet vehicle that produces zero emissions in use and is safe and easy to operate – making it ideal for a wide range of applications.

In 2017, UBCO raised US\$1 million from American investors to support the company's efforts in the United States, with an additional \$9.2 million since raised from New Zealand and Australian investors to aid growth in those markets.

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