

GROWING INNOVATIVE INDUSTRIES IN NEW ZEALAND

Agritech in New Zealand

TOWARDS AN INDUSTRY TRANSFORMATION PLAN

DRAFT STRATEGY FOR THE AGRITECH SECTOR

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DRAFT FOR CONSULTATION

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NZ Story & NZTE

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**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

New Zealand Government

Introduction

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

Agricultural technology has significant interest for New Zealand. An essential input into the wider primary sectors, Agritech has been a major shaping factor in the economic history of New Zealand and remains a key driver for increasing productivity, quality and sustainability across the entire value chain of production and supply for New Zealand. Agritech is also important to the wider economy, as a significant amount of our manufacturing and services are dependent on the productivity of the primary sector.

In addition to driving productivity improvements, these technologies will also be central to driving more efficient land use and management for better environmental outcomes spanning water quality, reduced methane, nitrous oxide and CO2 emissions; both domestically and across export markets.

The Agritech sector in and of itself also has a role in the economy, particularly in the export sector. Agritech contributes approximately \$1.5b to New Zealand’s goods exports and has the potential to grow significantly.

The commercial, environmental and export potential of Agritech are why the sector has been selected as a priority area under the Government’s refocused industry policy.

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 novel product, service and value chain solutions for the primary sector (agriculture, horticulture, aquaculture and fishing), with the aim of improving yield, efficiency, profitability, sustainability and quality. Figure 1 below shows the different aspects captured by ‘Agritech’.

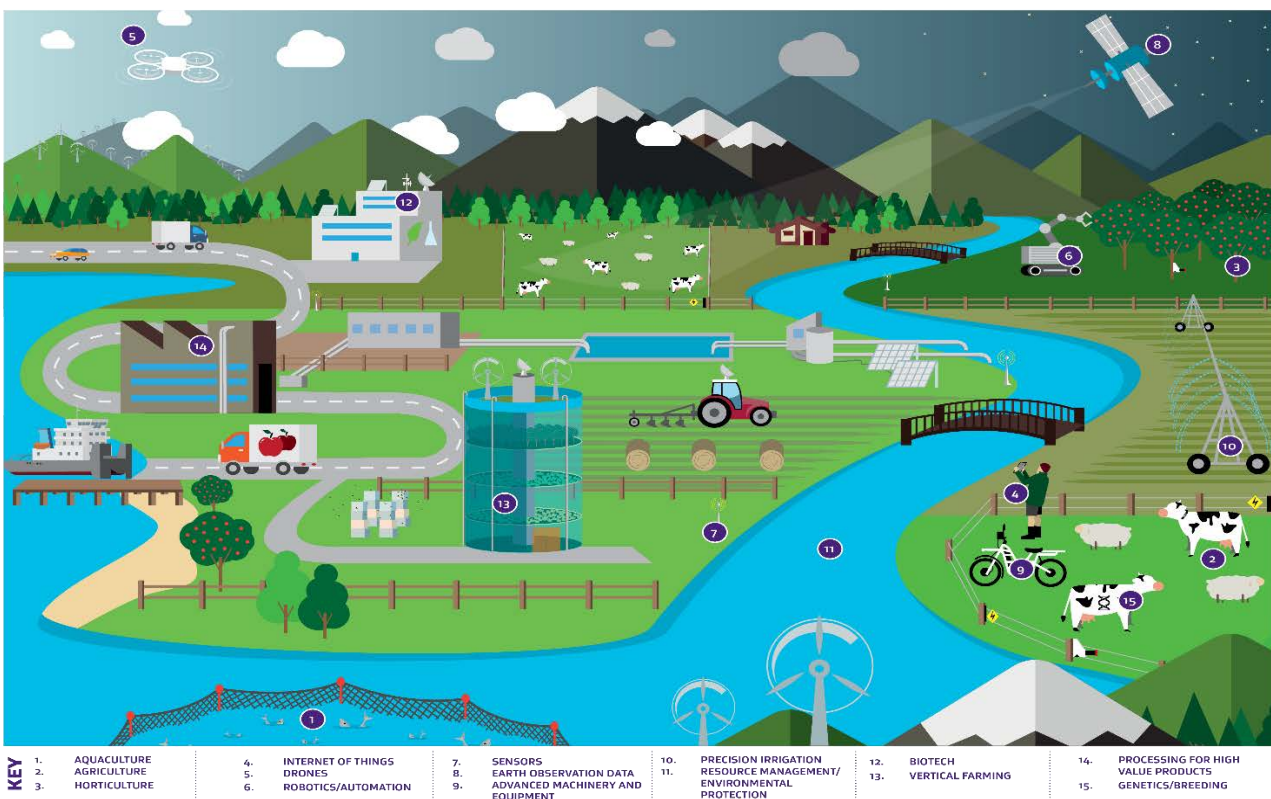


Figure 1 – Agritech’s broad applicability

Document overview

This draft document sets out an 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.

It is a work in progress, with more to be done in consultation with stakeholders from across the sector. We intend to identify knowledge gaps, strengthen the evidence base for action, agree upon a vision for the sector, and set out actions for the sector's transformation in a way that allows for ongoing monitoring and evaluation.

In part 1 of this document, we present the context, challenges and opportunities for the sector. We start with an overview of the context and history of the sector, outlining why Agritech is of importance and interest to New Zealand.

We will examine some of the major factors impacting the sector globally, and their implications for Agritech in New Zealand. We look at the constraints and obstacles to growth for the sector and explore why Agritech has failed to meet its potential.

We will also look at New Zealand's advantages and opportunities for growth, and what other countries are doing in response to the global challenges.

In part 2 of this document, we outline a possible response to the above, focussing primarily on the factors that industry, government, workers and the broader Agritech ecosystem, can collaborate together on.

We propose a possible vision for the sector, and a theory of change, which outlines an industry transformation logic. We'll consider this in relation to other work underway or planned, and who the major stakeholders would be for the transformation response.

In the final section, part 3, we outline a proposed action plan for this work, noting that some items are already underway, and others will need more planning and scoping work.



Source: NZ Story & NZTE

Relationship to industry policy

While Agritech has always been present in New Zealand's innovative history, we believe it is an industry that can benefit from increased focus and support from government and other parties.

This is why Agritech has been selected as a priority sector under the Government's refocused industry policy. New Zealand Agritech will be transformed through the application of the guiding principles of industry policy: taking a partnership approach; building a strong evidence base for action; using specific sector strategies/roadmaps; leveraging international connections; and, providing clear and consistent signals from government.

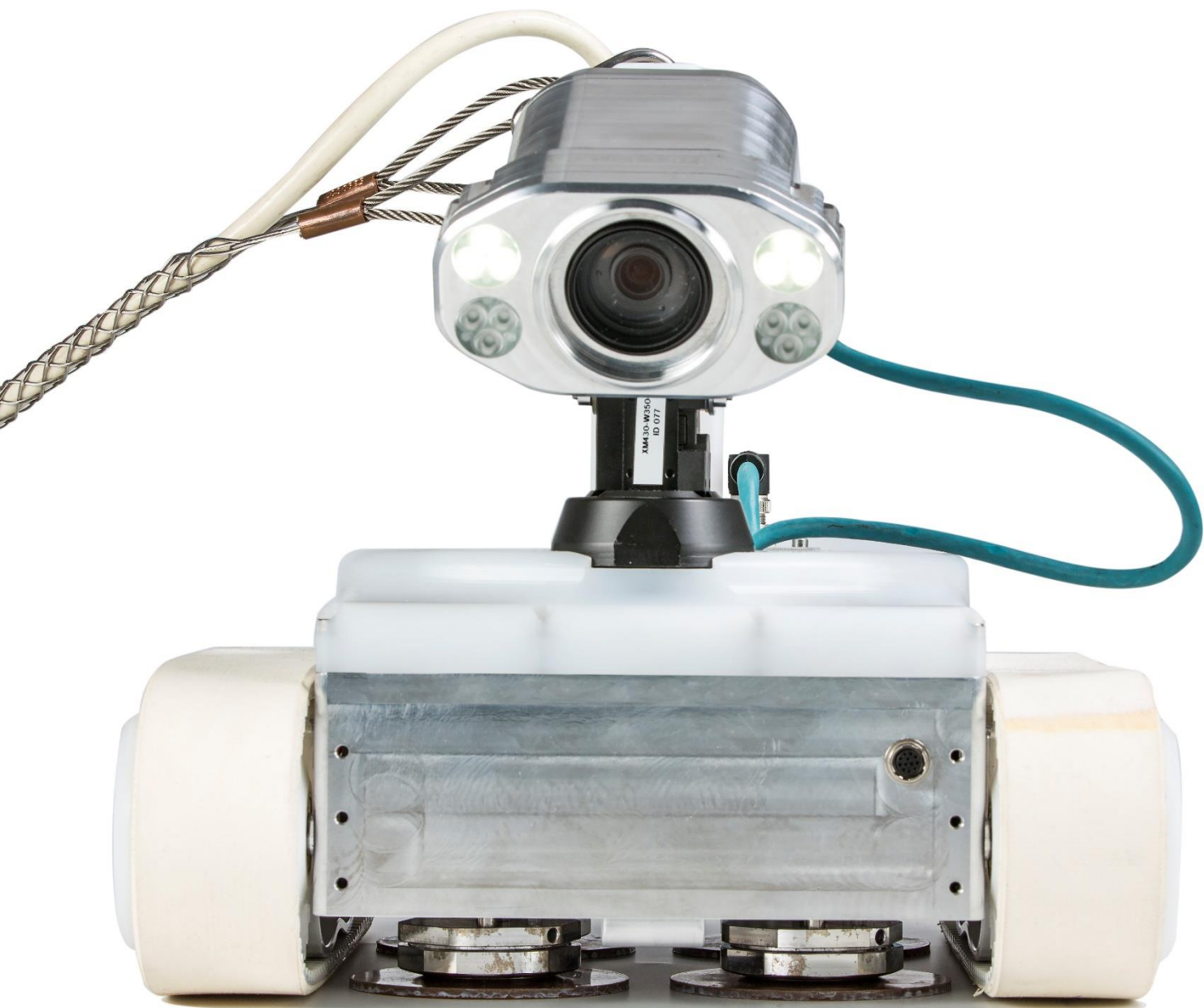
For each priority area selected an Industry Transformation Plan (ITP) will be developed. An ITP is a long-term strategy developed with key industry players across the wider sector ecosystem that provides a clearer picture of the challenges and opportunities, agrees on a long-term vision and sets out an action plan that span a wide range of areas, including Research, Science and Innovation, Trade, Education and Skills.

This strategy and action plan are designed to invite comments and discussion, and this Agritech Strategy is intended to provide a foundation for the development of an Agritech ITP.

We anticipate that an Agritech ITP will build on this document to also include:

- A discussion of historical productivity in the sector, including the impact of Agritech on primary sector productivity;
- Assessments of the opportunities and risks from increasing digitalisation, including interoperability;
- Assessments of the opportunities and risks from the future of work, and skills training needs in the sector;
- Decarbonisation pathways;
- Ways to increase exports;
- Assessments of capital and labour constraints;
- Opportunities to collaborate with other sectors, especially the primary sector and manufacturing;
- An investment attraction strategy.

The future shape of the primary sector is the subject of a review by the Primary Sector Council. In many ways, this Agritech Strategy should be seen as an input into the Council's work, with clear dependencies and alignment.



Source: NZ Story & NZTE

Part 1: Context, Challenge and Opportunities

Context and history

Agricultural innovations have long been a vital part of Aotearoa New Zealand's economy. Innovation comes from necessity, and the first settlers to New Zealand, the Māori, 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 innovative cooperative models, allowed New Zealand to establish ourselves as a leading provider of globally trade 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 primary sector to be the major factor in growing New Zealand's economy.

With 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 primary 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 and 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 NZ' formed as part of NZ Tech's 'Tech Alliance', and has successfully brought together a number of industry parties and companies. They have also announced a partnership with the Precision Agriculture Association of New Zealand (PAANZ), and this combined industry group provides a good counter party for government activity into the sector.

DEFINING THE PRIMARY SECTOR

In the context of this document, when we refer to the primary sector we are referring to agriculture, horticulture, aquaculture and fishing, and excluding forestry and mining/extraction. Below shows the different aspects captured by 'Agritech'.

Agritech and the primary 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 primary sector has had impressive growth, but not to the degree anticipated. On-farm productivity has grown at a compounded annual rate of 3.5 per cent over the past ten years. 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 primary sector remains a huge part of our economy. In addition to the direct benefits there are significant flow-on impacts to the wider economy. The majority of our manufacturing output depends on the primary sector as its key input and a huge number of service industries exist to support either the primary sector or the manufacturers adding value to our primary products. Including processing and commercialisation activities, it accounts for 11 per cent of GDP, and 15 per cent of employment¹. Additionally, the sector contributed \$36.3b in exports, over 45 per cent of New Zealand's total exported goods and services.

It's also the cornerstone of our regions. Far and away the majority of economic activity outside of our cities is dependent on our primary sector.

In terms of export goods revenue, the Agritech sector has remained fairly stable between \$1.5b and \$1.6b for the last five years. This is a relatively static and unimpressive number when considering the strength of our primary sector, and that the level of investment in Agritech worldwide has increased by 52 per cent per year for the five years to 2018. However, it should be noted that this figure only includes goods not services, due to the lack of data specific to the Agritech sector.

Why Agritech?

There are three major benefits for New Zealand from focusing on Agritech:

1 – Improving sustainability and productivity

Agritech provides opportunities for New Zealand to improve the sustainability and productivity of its primary 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

¹ These figures include forestry.

consumers are increasingly concerned with food quality and health, and with the sustainability of the environment

Additionally, smart use of technology will enable industry and companies to move beyond 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.

2 – Growing high-value exports

Supporting Agritech also positions the sector to seize growing high-value export opportunities and allow for further diversification of our economy. New Zealand possesses a number of comparative advantages when it comes to Agritech. If we can effectively exploit this advantage, we stand in a good position to increase our share of the global market. Some of these advantages include:

- Our strong complementary primary industry;
- Our small market size – ideal for testing technologies;
- Our ingenuity in developing solutions;
- Our strong pasture based management systems; and
- Our ability to respond relatively quickly from a regulatory and policy point of view to allow for new approaches to be developed and tested.

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.

3 – 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. Adopting a more global focus will help us break out of our domestic market orientated path dependency, which is particular focused on pastoral based systems. As agricultural emissions make up nearly half of our greenhouse gas emissions, it also represents one of our most powerful tools for reducing emissions and combatting climate change.

Megatrends affecting Agritech

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

Changing consumer demands

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 are driving changes around food presentation and packaging, business models and the operation of global value chains.

Growing awareness about the pressures that primary production is placing on the environment and communities is also driving demand for sustainable, ethical, low carbon production and processing techniques. We are already seeing this in here 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 requires the primary sector to be better able to demonstrate its credentials and tell its story more effectively than in the past.

Increased market risk

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 and shifting to value-added products and services will be the best way to insulate ourselves from these threats.

Demographic changes

Whereas a changing population in market will impact the sector, our changing demographics and culture will also have an impact, particularly across the Agritech and adjacent sectors workforces. Our future is likely to be more culturally diverse; for example Māori are expected to make up more than 30 per cent of the working age population by 2030. And 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 primary 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 primary sector.

Labour supply shortages

Another key factor impacting the global primary sector is the increasing labour shortages that happen, 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.

The changing environment

How the primary 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

Globally, new business models, technologies, and processes are reinventing food and fibre production and consumption, posing both a threat and opportunity to the primary 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 (e.g. social enterprise) and platforms (e.g. 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 primary sector but rather, the biotechnology or digital sectors.

An evidence base for action

Obstacles and constraints

There are several obstacles and constraints that have held back New Zealand's Agritech sector. In considering the current state of the Agritech sector, we have developed a base hypothesis for the slow growth of the sector. There is no single factor; rather there are a number of interrelated issues, as outlined below. Some of these are contextual and high level, while others are more specifically 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 two 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 straight-forward 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).

2. Agritech innovation has been for largely domestic use

While there have been a large number of technological innovations, many have largely focused on domestic production and haven't sought out international markets. This can be seen in two distinct forms: New Zealand products and innovations 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 primary 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.

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 intellectual property (IP), a significant proportion of which has applicability into the primary sector.

Though New Zealand is significantly underperforming on R&D spending as a proportion of GDP compared with the OECD average, Agritech and primary sector R&D is one area of strength. \$680m was spent on R&D for the primary industries in 2018² (\$330m by business, \$275m by Government and \$74m by higher education). The primary sector is the largest recipient of Government R&D funding.

However, Agritech per se is not as strongly represented in the investments made into research, resulting in a lessened amount of IP ready for commercialisation.

Furthermore, there is a sense that institutions are not always able to bring 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 internal factors such as gaps in required commercialisation skillsets and experience; and external factors such as regulatory settings. There could also be a disconnect between the actual market demand for the IP versus the perceived demand. Further work needs to be done to better understand these constraints.

This situation should be helped by the Government's recent changes to the R&D tax credit system.

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 to fund products and international growth. Government's recent announcement of a new \$300m venture capital investment fund will be significant in addressing this capital gap, but further work will still be required to attract additional necessary capital and expertise.

To some extent the flow of commercialisation activity is curtailed by a relatively lower amount of corporate venture activity (eg intreprenurship) 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)

To some extent, 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. Slow uptake of technology innovations by the farming sector

Though innovations are being developed, uptake amongst New Zealand farmers has been slow. This inhibits both the growth of Agritech companies and improvements in on-farm productivity and sustainability. 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;

² This figure includes spending on forestry and mining/extraction.

- 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;
- Skills shortages overall in the primary sector;
- The skills required to implement significant change are quite different to those required for traditional food production; and
- There is uncertainty about whether change will actually deliver benefits or create stranded assets in the face of other requirements (this is particular issue when considering efforts to deal with water quality and climate change mitigation).

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

THE EXTENSION SERVICES MODEL

The Extension Services Model initiative is a pilot programme that will support farmers in improving their environmental performance and value creation. Agricultural extension is the sharing of knowledge, innovation, and technology to improve farming systems. The Extension Services Model initiative will build on existing programmes to ensure farmers use information on environmental sustainability and value creation as part of their farm planning. The programme aims to help:

- Expand and deepen the skill base among farmers;
- Support coordination and sharing of ideas;
- Encourage use of multiple channels to get information to target groups; and
- Support capacity and capability building among rural professionals.

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

Currently, in order to incorporate the range of technologies available to improve primary production, it is necessary to use a variety of systems which may not be cross-compatible e.g. 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.

8. A lack of a skills and focussed skilled 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 primary 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) focussed 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. Recently announced reforms of vocational education may 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 leading 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. The completion of an Agritech Industry Transformation Plan should address this issue, 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. 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 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. 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 that often motivates action. New Zealand has relatively large productive land and sea resources, yet our productivity has remained low.

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 agriculture 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. This is more a matter of long-term focus and direction, rather than needing to build new capacity.

3. Geographic advantage – at the crossroads between East and West

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 compared with 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 primary 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.



Source: NZ Story & NZTE

7. Structured towards a long-term approach

There are a significant number of organisations across the primary 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 primary sector and Agritech.

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. The Ministry for Foreign Affairs and Trade and New Zealand Trade and Enterprise 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.

What are other countries doing in this area?

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

More work needs to be done here, with the assistance of MFAT & MPI, to ensure we understand and can learn from the activities of countries such as the Netherlands, Singapore and Israel.



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 this Agritech Strategy and Action Plan, and ultimately an Agritech ITP. The Taskforce includes representatives from: the Ministry of Business, Innovation and Employment; New Zealand Trade and Enterprise; Callaghan Innovation; the Ministry for Primary Industries; the Ministry of Foreign Affairs and Trade; and the New Zealand Venture Investment Fund.

Vision

Our Agritech vision is:

“To create a globally competitive, vibrant, funded, growing Agritech ecosystem, producing capable, ingenious value-adding companies that are good for the world, solving New Zealand and the world’s sustainability problems (environmental, social, economic and cultural).”

Strategic decisions

The vision statement outlined has some embedded strategic decisions:

Thinking globally

A measure of success for the Agritech Strategy 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 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. The interventions and actions need to ultimately have impact for companies; specifically companies that contribute positively to the wellbeing of New Zealanders.

Choice of value-adding

One of the key themes of the government’s industry policy is to move from volume to value. An example of this is to expand from producing commodities such as milk powder, to value added consumer goods such as infant formula or specialty foods. The companies we seek to work with will be those who innovate to enable the delivery of high-quality, highly valued goods and services.

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 (SFFF) program.

This definition should not be limited to environmental issues but include business models that support high value employment and thriving regional economies. Sustainability incorporates the concept of inclusive growth; ensuring we have a sector that provides high skill, high value, secure and rewarding jobs.

Funding the change

We know that a 'business as usual' approach will not result in a transformation. Funding the activities and initiatives resulting from this work will be a critical part of ensuring the actions lead to meaningful growth.

This includes focusing on early stage capital and enhancing international connections, especially around funding ('connected capital').

SUSTAINABLE FOOD & FIBRE FUTURES

Sustainable Food & Fibre Futures (SFF Futures) funds innovative projects that will 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.

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.

A Theory of Change

In this document, we have outlined the context for the Agritech ecosystem, and the challenges and opportunities including a number of global megatrends that will influence its future. We have also identified a list of twelve obstacles and constraints the sector faces plus an additional list of eight advantages and opportunities.

This provides a firm foundation for the completion of an evidence base for action. It is now up to the actors from across the Agritech ecosystem to complete it. Doing so will mean drawing on existing work and data, while there will also be a need for additional original research. This may include doing more work around global markets so that new opportunities for export to meet market demand can be identified and assessed. It may mean looking again at the science system to see how well it is currently aligned to meeting the market led demands of the sectors. It will also include doing more work on workforce issues. This will require an analysis of the impacts of increasing automation on existing workforces, and what is required to build the skilled workforce of the future necessary to support a highly productive sector and the wider role of the sector in providing high quality jobs across adjacent sectors and in sustaining vibrant regional economies.

The transformative potential of the Industry Transformation Plan lies in the breadth of the research behind it and those involved in its formulation and delivery.

The Agritech Ecosystem

In developing a plan, we consider the overall interdependent system for the Agritech sector. No one specific item will create a step change transformation for the sector, but a number of activities in parallel will allow the sector to respond to the challenges and opportunities.

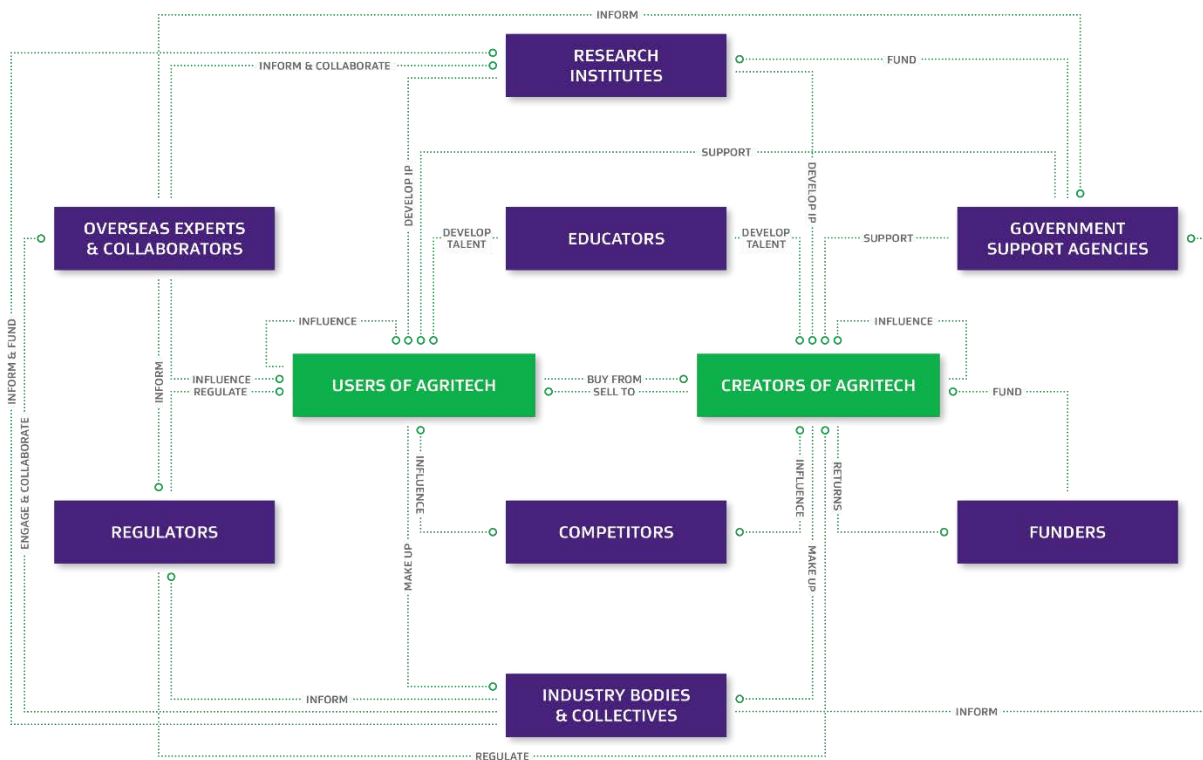


Figure 2 – The Agritech Ecosystem

Simplistically, the system involves

- Users of Agritech (typically workers, and also purchasers of Agritech);
- Creators of Agritech (typically companies, often in partnership with the science system and through international technology transfers);
- Industry bodies and collectives;
- Funders of Agritech companies;
- Educators / Academia ;
- Research institutes (typically universities and CRIs);
- 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 primary sector and related activity. As well as historical contributions to the use of technology in farming, Māori have key roles as producers, consumers and funders of technology, and across most associated activity.

In order to stimulate the ecosystem, we propose the changes to address the following imperatives:

Stimulating company growth and accelerating commercialisation

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. 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.

Streamlining government support

A better coordinated and focussed government sector will be more productive. Government support for Agritech companies can appear fragmented and lacking logic. Companies are expected to navigate government agencies and processes, often without visibility of the overall support system. Within the agencies involved in the Taskforce we have the opportunity to streamline and improve this.

Enabling a more even and globally competitive regulatory environment

International connections are key. Ensuring there is a consistent and relevant set of standards and rules around the sector will ensure that the products and solutions developed are competitive globally, not just in New Zealand.

Ensuring global relevance

Providing global productivity and sustainability solutions. New Zealand needs to maintain an outward view on the growth opportunity and ensure we are developing globally valuable products and services, especially when it comes to helping the world create more productive and sustainable food systems. Clearly connecting the innovation ecosystem to international demand and opportunity, and seeking international collaborations, will be key.

Outcomes

The net result of these changes 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;
- 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 primary sector; and
- Improved economic stability in the primary sector through more efficient land use and more sustainable business models.

Dependencies and linkages

The Industry Transformation Plan should incorporate adjacent strategies and plans being developed by the Primary Sector Council in addition to the government's Te Hono, Sustainable Food & Fibre Futures, the Forestry Strategy and One Billion Trees programmes and the biosecurity review. It should also look at related policy programmes that could support the sector such as the Future of Work and Just Transitions work programmes, the implementation of the new R&D tax incentive regime, the opportunities arising from the \$300m boost to early stage capital funding announced in the 2019 Budget plus potential funding options through the Green Investment Fund and Provincial Growth Fund. The potential of the Digital Economy work programme to drive innovation across the sector should also be considered, as should the Research, Science and Innovation, Renewable Energy and Forestry Strategies as well as the work programmes of relevant Crown Research Institutions.

The Agritech Industry Transformation Plan is just one of four initial plans to be developed, with other sectors to follow over time. Those leading its development should also meet with those leading the development of other plans to ensure synergies are identified, such as the application of drone and space sensing technologies that would otherwise fall under the Aerospace sector, or how the Creative sector can help build the New Zealand Agritech brand and add value to packaging for example. 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.



Part 3 – Action Plan

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.

At the R&D stage there are broader programmes to support R&D that 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, 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.

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 Fielddays, including support for specific Agritech content and other promotion for Agritech at events such as technology showcases or Innovation Walks/Tours.

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 e.g. evokeAG (Australia), Forbes Agtech (USA) and Irish Ploughing Competition (Ireland).

NZTE has 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 Irish Plough, Agroleche 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.

In addition to government support, Agritech NZ an industry body representing Agritech is engaged in a wide range of work and programmes to support the industry. These include partnerships with Farm 2050 and Western Growers, hosting an innovation day at Fielddays, supporting inbound and outbound missions and seeking collaborations with Australian and Irish Agritech groups.

Potential additional areas for action – to be further developed

Through our initial engagement with industry and other stakeholders, possible actions to grow the Agritech ecosystem in New Zealand have been proposed, with several key areas of action emerging. These opportunities are currently under investigation and most require further definition. Phase two of the Agritech Taskforce work plan in developing the Industry Transformation Plan is to further investigate specific actions in these and other areas through broader consultation with the Agritech ecosystem, and create business cases for implementation projects.

The action areas identified through initial engagement were:

1. Strengthening investment options

Ensuring there is growth capital available, both from New Zealand and international sources, to address the historical shortage of growth capital, and leveraging the strong supporting institutions we have.

2. Ecosystem development - Research & development

Further understanding any barriers to commercialisation of research, to address the disconnected commercialisation flow, and ensure our world-class research is well utilised and exploited.

3. Ecosystem development - Skills

Setting up appropriate skills development interventions to build the required talent for the sector, and address the lack of a systemic skills model for Agritech.

4. Ecosystem development - Regulatory issues

Examining opportunities for national standards and consistent approaches where required, to ensure a consistent and predictable set of regulations exist for company growth; promote interoperability; and better use of data.

5. Improving connections to global opportunities

Building New Zealand's connections with the rest of the world to ensure our research and company development is informed by global challenges and opportunities, and is leveraging our international networks. Ensuring our Agritech story is well understood and leveraged for competitive advantage, and that we get access to the best skills and opportunities for international learning.

6. Government support for growing Agritech companies

Streamlining and making more transparent 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.

Appendix 1: Parties engaged

In the development of this document, and the Industry Transformation Plan, the following parties will be consulted.

Organisation / person
Agritech NZ
MPI
MBIE – Science
MBIE – Industry
MBIE – He kai kei aku ringa
NZTE
Callaghan Innovation
Te Puni Kōkiri
MFAT
MFE
Treasury – Export Credit office
NZ Story
Primary Sector Council
Te Hono
Federation of Māori Authorities
Office of Hon David Parker
Office of Hon Damien O’Connor
Office of Hon Megan Woods
Office of Hon Chris Hipkins
Council of Trade Unions
Others TBC, especially other Māori groups





New Zealand Government