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Global Expert Mission Agri-Tech Innovation in New Zealand 2019

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Welcome

Innovate UK global missions programme is one of its most important tools to support the UK's Industrial Strategy's ambition for the UK to be the international partner of choice for science and innovation. Global collaborations are crucial in meeting the Industrial Strategy's Grand Challenges and will be further supported by the launch of a new International Research and Innovation Strategy.

Innovate UK's Global Expert Missions, led by Innovate UK's Knowledge Transfer Network, play an important role in building strategic partnerships, providing deep insight into the opportunities for UK innovation and shaping future programmes.

The Agri-Tech Expert Mission travelled to Wellington, Palmerston North, Christchurch and Auckland in March 2019, and in this publication we share the information and insights gathered during the delegation's time in New Zealand.

A full list of the UK and New Zealand participating organisations is included in Annex 1.



Agri-tech collaboration discussions in the British High Commission, Wellington

Executive Summary

Both the UK and New Zealand face the challenge of clean growth, and agri-tech innovation holds the key to enhancing productivity in human nutrition whilst protecting our environment.

The extent of the cultural and environmental similarity between the agricultural sectors in New Zealand and the UK is striking, and existing personal links are strong. Many of the people who met with our delegation had experience of working in the UK, at a high level or in their early careers. Both countries face the moral responsibility to produce more food as a result of climate change, there being near-neighbours in both hemispheres where food production is likely to become progressively more challenging as temperatures rise and populations increase.

Agri-tech is already recognised by New Zealand as a significant export opportunity, and the UK has developed game-changing technology in robotics and artificial intelligence, low carbon energy and high-speed communications which feed directly into this. Coupled with the capacity of the City of London to deliver investment, along with the UK's well-respected capacity in agricultural research, and we have a unique opportunity to encourage clean growth worldwide.

Both countries have highly-innovative food producers, motivated to provide the highest quality, traceable food with minimal environmental impact. Traceability and adherence to environmental standards have been particularly encouraged in the UK by intense pressure from both government and supermarkets in a way which has obliged systems to evolve to the point where the UK is now a global leader in food assurance. These systems are directly applicable to New Zealand, where, as in the UK, animal welfare and environmental protection are of great importance to consumers.

Many collaborations between academic and commercial organisations in both countries exist and building on these arrangements is low-risk. The UK has a network of data-connected farms created as part of the Agri-Tech Strategy, which can be utilised for benchmarking innovative commercial ideas. A range of facilities exists in both countries which can provide a "soft landing" for businesses taking their first step on a global journey.

Having a presence on opposite sides of the world has particular benefits in agri-tech development. It makes it possible to squeeze two seasons of testing into one twelve-month period, greatly speeding up advances in both plant and animal-based systems. The similar maritime climate and comparable terrain in both countries makes this kind of approach particularly straightforward.

Looking at the social aspects of technology adoption, any issues are very similar in both countries, to the extent that end-users in either country can give feedback on products or services directly to the originator in either country, without any cultural barrier.

In summary, the basis for a coordinated approach to agri-tech collaboration between the UK and New Zealand would be three-fold and would:

1. secure commercial investment;
2. deliver environmental protection and animal welfare;
3. improve the development and adoption of technology.

1. New Zealand Agri-Tech Policy, Funding and Investment Landscape

1.1 Overview

There are striking similarities in the outlook of New Zealand and British farmers. The landscapes and challenges are similar, and farming operations are generally on a similar scale to those in the UK. The relatively small community of agri-tech early adopters makes it easier for innovative producers in New Zealand to collaborate and communicate with each other. In contrast to the UK, New Zealand’s export focus appears to reduce competition over the internal market, facilitating communication and collaboration in agri-business. This is one significant point of difference between the UK and New Zealand. In the UK, whilst collaborative effort up and down the supply chain is gathering some momentum, the power of the supermarkets (in a relatively small market) is suppressing producer margins meaning that there is often intense competition between individual producers. UK supermarkets do make an effort to facilitate the sharing of best practice among their producers, but that is often in the form of anonymised benchmarking. New Zealand producers are much more export-focussed.

While we think of farmers in the UK as a pretty resilient group, it is worth remembering that New Zealand’s farmers had their subsidies taken away more or less overnight in the mid-1980s as part of a number of economy-wide reforms (Rogernomics¹) aimed at improving the competitiveness of the New Zealand

economy. This means that businesses that have survived have done so through hard work, tenacity and not a little ingenuity, as we saw for ourselves.

Connections to the land are strong in New Zealand, where legislators and financiers often have a direct farming background, which can be hugely beneficial, resulting in pragmatic decision making. This situation tends to be less likely in the UK, where policymakers are often further removed from rural issues.

This Expert Mission was held against the backdrop of Brexit in the UK. The Second Secretary for Trade at the British High Commission in Wellington explained to our group that one of his roles is to communicate about the potential Brexit opportunities for the New Zealand economy, including trade agreements and that the High Commission “is working hard to make a trade agreement happen”.

The mission was well-briefed by the UK’s Science and Innovation Officer, also based at the British High Commission in Wellington, much of whose work is aimed at supporting preparations for a UK/New Zealand free trade agreement. We also met with a representative from the UK’s Department for International Trade, who works closely with the London office of New Zealand Trade and Enterprise. They support UK companies looking to set up in New Zealand and vice versa.



Grazing livestock in Tokomaru

¹ https://en.wikipedia.org/wiki/History_of_New_Zealand#The_radical_1980s_reforms

1.2 New Zealand Government Department's Involvement in Agri-Tech

As part of our March 2019 briefing in Wellington, the UK's Science and Innovation Officer explained that New Zealand's Minister David Parker is promoting agriculture as a growth sector for New Zealand, and he is well-placed as he is not only Minister for the Environment, but also Minister for Trade and Export Growth. As UK observers it is interesting to note that before politics, David Parker had a business career in agri-biotechnology², as well as being a litigation partner in a law firm.

Our first day of meetings in Wellington included a round-table discussion with the New Zealand Government. We met with key figures from:

- Ministry of Business, Innovation and Employment (MBIE), the government's business-facing ministry;
- New Zealand Trade and Enterprise (NZTE), the economic development and trade promotion agency;
- Ministry of Foreign Affairs and Trade (MFAT) charged with advising on international relations and trade policy;
- Ministry for Primary Industries (MPI), charged with overseeing farming, fishing, food, animal welfare, biosecurity and forestry sectors.

This became an interesting and information-rich session in which we heard from MPI about work on the behavioural and regulatory barriers to adoption of agri-tech; a matter close to all our hearts. MPI spoke of unlocking regulatory barriers, an area where we have our own challenges in the UK. New Zealand faces the same challenges around disruptive technology, which often wrong-foots the regulatory community in a way which causes progressive concepts to stumble before they've taken their first commercial steps.

We heard from the team responsible for what are termed "contestable investments" in research and development at the business ministry, MBIE. They explained MBIE's drive towards "triple bottom line" investments that deliver not just economic but social and environmental benefits. There is a clear intent to sustain high-value jobs while transitioning to a low emissions economy, in line with New Zealand's clean and green ethos. From what we were told, it is the environmental space that secures the largest share of investment from MBIE. Next in the priority order is "food systems innovation", taken in the context of whole river catchment systems (i.e. not single-point innovation). MBIE's strategy here is to utilise

big data in an attempt to link back and better understand these complex systems. Sensors too, have a role in precision farming and robotics, which is enjoying a significant upsurge, driven by critical labour issues in the kiwi fruit and meat sector (where robotic systems are beginning to be used for processing). MBIE was keen to stress that they aim to ensure fair and just transitions, rather than overnight step change. We guessed that New Zealand farmers had experienced their fair share of overnight step changes, and that MBIE seemed to be working to ensure that change was digestible for the farming community, with the help of policy instruments in the form of specific allocation of provincial growth funding for rural areas.

The delegation was told about the main source of contestable funding for New Zealand's fundamental "blue skies" research in science and humanities: the Marsden Fund, administered by the Royal Society of New Zealand. This fund was launched in 1995 and has become intensely competitive with success rates of just 10%. Winning a Marsden grant has become a real research accolade³.

Rather more applied research is funded through the Endeavour Fund, which is open to 50% non-New Zealand collaboration. Applications are assessed for impact against the triple bottom line, and this again is a potential UK/New Zealand collaboration opportunity, although it was stressed that these applications were for excellence in high risk, high stretch science.

MPI explained how New Zealand's Ministry of Primary Industries supports projects in biosecurity, food safety, and helping companies grow. A broad range of funding is delivered at different levels:

- short projects around NZ\$100k for tackling on-farm issues
- three-year projects around NZ\$600k investigating bio-control of pests/diseases
- a five-year transformational project with a NZ\$10 million budget.

Many of MPI's projects are focussed on land use and how to improve sustainability as well as productivity. This was beginning to sound a lot like the "sustainable intensification" discussion in the UK.

Potential opportunities for collaboration in technical as well as more sociological areas were suggested, with the New Zealand Farm Women's Initiative being highlighted. This initiative delivers business management training targeted at

² [https://en.wikipedia.org/wiki/David_Parker_\(New_Zealand_politician\)](https://en.wikipedia.org/wiki/David_Parker_(New_Zealand_politician))

³ https://en.wikipedia.org/wiki/Marsden_grant



Round table discussions

women in the rural community, recognising that it is often partners and mothers who keep rural businesses on the financial straight and narrow.

Understanding the regulatory barriers to the adoption of new technology is an important strategic focus for MPI. Work looks at ways to accommodate innovation without strangling it in red tape. Current investigations include drones and fishing nets, and MPI's team looks at both regulatory and behaviour change to encourage adoption, with a refreshing focus on "fair farmer engagement". This resonates with the broader discussion about New Zealand's concern for championing the inclusive world view and intergenerational responsibility. We were reminded that millennials were digital natives with a low tolerance for inequity.

New Zealand's innovation agency Callaghan Innovation supports this, and we heard how their backing of research and development through growth grants is delivering international results. They have around 200 scientists near Wellington who deliver "science as a service" to companies, providing support with advanced materials, big data and food, in a similar way to catapults in the UK. They have a group of "customer managers" dedicated to agri-tech and provide foresight data that has fed into the New Zealand Government's Agri-Tech Task Force.

Callaghan Innovation's agricultural capability is seen as good behind-the-farm-gate (e.g. sensors on the land) but less good at the global value chain integration and investment (which could be a UK opportunity). Callaghan Innovation commented that New Zealand's trade deficit in agri-tech was widening but that emergent start-ups should help redress the balance. In short, New Zealand has some circa NZ\$100 million companies

in agri-tech, but no NZ\$1 billion ones just yet.

Our delegation was keen to learn more about the GRA's "Small Advanced Economies Initiative" (SAEI)⁴, formed by New Zealand's chief science advisor Sir Peter Gluckman in 2011. This is an interesting initiative, founded on the premise that science can be a valuable tool for projecting the voice of small countries like New Zealand. Outside of Europe, there are only three advanced countries with populations under 10 million: Israel, Singapore and New Zealand and these formed the core membership along with three further European countries who were invited to join: Denmark, Ireland and Finland⁵.

This helps explain the closeness of relations between New Zealand and both Ireland and Israel, which we were to see further evidence of later in the week.

The New Zealand Ministry of Foreign Affairs and Trade spoke about the emerging ERA-NET public-to-public partnership work under the EU's Horizon 2020 funding instrument, in which countries outside of the EU are encouraged to participate, including Canada and the USA. The delegation was keen to highlight this as another strong area for potential collaboration between the UK and New Zealand. A multitude of such collaboration opportunities exist in the already close ties between UK and New Zealand institutes, the question is how to play a more strategic role by nurturing these more effectively. One way the UK may be able to help with this is through the sharing of case studies of funded work in the UK that has resulted in successful on-farm adoption. The development of livestock breeding databases is one such area where adoption has been good, and there would be merit in sharing experiences.

MPI highlighted work in the New Zealand beef sector looking at what makes a good steak. Funded work in this area has included sensory analysis and processing for good repeatability, and there is evidence that this has been impactful as benchmarking data that has fed through to behaviour change on the farm.

MBIE highlighted the counter-seasonal opportunities in New Zealand and saw that as a strong driver of synergy with the UK, and there are opportunities for commercial beta testing at scale in New Zealand.

Our delegation wanted to understand more about New Zealand's digital policy. MBIE explained that there is a working group on artificial intelligence in industry (including agriculture). We were to see evidence of New Zealand's digital progress later in the week, when our delegation met with Robotics Plus, an especially impressive exemplar of New Zealand's capacity to become significant tech exporters.

⁴ <http://www.smalladvancedeconomies.org/>

⁵ https://www.pmcsa.org.nz/wp-content/uploads/Speech_Science-Diplomacy_Trieste-June-2015-final.pdf

1.3 Agritech New Zealand: Driving Strategic Change

During the early part of 2019, we know that there have been significant high-level discussions on New Zealand's agri-tech strategy. Much of this work is being driven by Agritech New Zealand⁶, a membership organisation which connects innovators, investors, regulators, researchers and interested public.

Agritech New Zealand is funded by around 100 members, and works to build relationships with overseas funders, particularly in Australia and the US. The organisation is part of the NZ Tech Alliance⁷ which covers NZ Tech, the IoT Alliance, the AI Forum, Biotech NZ, Blockchain NZ and FinTech NZ. A quick look at the Executive Council of Agritech New Zealand tells you that sectoral representation is important to the success of the organisation.



Presenting the structure of Agritech New Zealand

Representatives on the Agritech New Zealand Executive Council include:

- **Callaghan Innovation**, the New Zealand Government's innovation agency (which is approximately equivalent to Innovate UK).
- **NZTE**, the New Zealand Government's business development agency (approximately equivalent to the UK's Department for Business, Energy and Industrial Strategy (BEIS), but also responsible for some functions carried out by the Department for International Trade).
- **The NZ Venture Investment Fund**, established by the New Zealand Government in 2002 to build a vibrant early-stage investment market in New Zealand. They have

NZ\$245 million of funds under management, invested through two vehicles:

- the NZ\$195 million Venture Capital Fund;
- the NZ\$50 million Seed Co-investment Fund.
- **The Livestock Improvement Corporation**, a farmer-owned tech co-op providing genetics, analytics, testing and benchmarking data to livestock farmers.
- **Spark**, New Zealand's leading digital services and telecoms company.
- **Farmlands**, New Zealand's leading farmer-owned rural supplies co-op.
- **Fonterra**, New Zealand's leading farmer-owned dairy co-op (and the biggest company in New Zealand).
- **Gallagher**, who pioneered New Zealand's first electric fencing system and now leads in innovation and marketing of animal management products.
- **Tech Futures Lab**, who deliver innovative, future-focused training and education programmes for professionals and executives.
- **Sprout Accelerator**, an accelerator and agri-tech hub based in Palmerston North (adjacent to Massey University, with whom we met later in the week).
- **The Precision Agriculture Association New Zealand**.
- **Blinc**, an agri-tech networking organisation based at Lincoln University, New Zealand.

It is clear that Agritech New Zealand is having an impressively positive impact and has been tasked by the New Zealand Government to lead on agri-tech strategy. NZTE is happy to have Agritech New Zealand leading in this area, having not worked in agri-tech before.

When we met with Agritech New Zealand later in the week at the Blinc facility on the Lincoln University campus, we were told how the New Zealand Government has moved from a position of "siloes thinking" around agricultural technology. Agricultural inputs (such as fertiliser and crop protection products) were dominated by two players: Ravensdown and Balance, and competition rather than collaboration was the focus. The New Zealand agri-tech sector has got a lot closer together in the last two years, as there seems to have been a collective realisation that whilst New Zealand's quality dairy, beef and horticulture sector is very progressive, the country will only ever be able to produce enough to feed 40 million

⁶ <https://agritechnz.org.nz/>

⁷ <https://techalliance.nz>

people. As a result, the concept of “innovation as the export” crystallised as a policy concept and the five agencies we met in the round table session earlier in the week were galvanised to pull together as a task force.

Agritech New Zealand has been working hard on developing important relationships to conquer New Zealand’s twin tyrannies of distance and lack of capital and has been reaching out to the US, where the scale of production is quite different (the example of a Washington State apple orchard producing more apples than New Zealand’s entire crop was cited). Agritech New Zealand sees the opportunity for New Zealand tech to drive huge efficiency gains around the world.

Agritech New Zealand’s big coup appears to have been the positioning of New Zealand as the first country outside the US to be involved with Farm2050⁸, set up by former Google Chairman Eric Schmidt. Farm2050 plans to channel US\$2.5 billion into global agri-tech ventures, leveraging support from the likes of PepsiCo, Google, Microsoft, BASF, Syngenta, Agco and Trimble and combining this with expertise from sector funders, Innovation Endeavors and Finistere Ventures.

Earlier in the week, the UK’s Science and Innovation Officer in New Zealand had briefed the delegation on New Zealand’s attitude to genetic modification (GM) technology in crop production, explaining that New Zealand is generally very risk-averse when it comes to GM technology, although it is possible that there may be some dialogue soon over gene-editing technologies. In general, New Zealand farmers are against, in so far as they feel it could damage the clean, green New Zealand image.

Part of the reason for this sensitivity, it was explained, are three recent bio-security related issues that had demanded coordinated responses. The first of these was a mycoplasma bovis outbreak which caused significant mastitis issues in the dairy sector, which responded by culling affected animals over the past few months. This has had a negative impact on the dairy sector, where prices are down in any case, and Fonterra is in deficit. This financial pressure is being felt across the whole dairy sector. The second response was to combat fruit fly, and a trapping programme is currently underway involving 150–200 MPI employees. The third response was to mertyl rust, a serious fungal disease affecting the manuka plant. This pathogen has been blown into the North Island from Australia but is spreading south.

These three issues, it is believed, are contributing to the relatively conservative approach to GM among New Zealand farmers.

⁸ <http://www.farm2050.com>

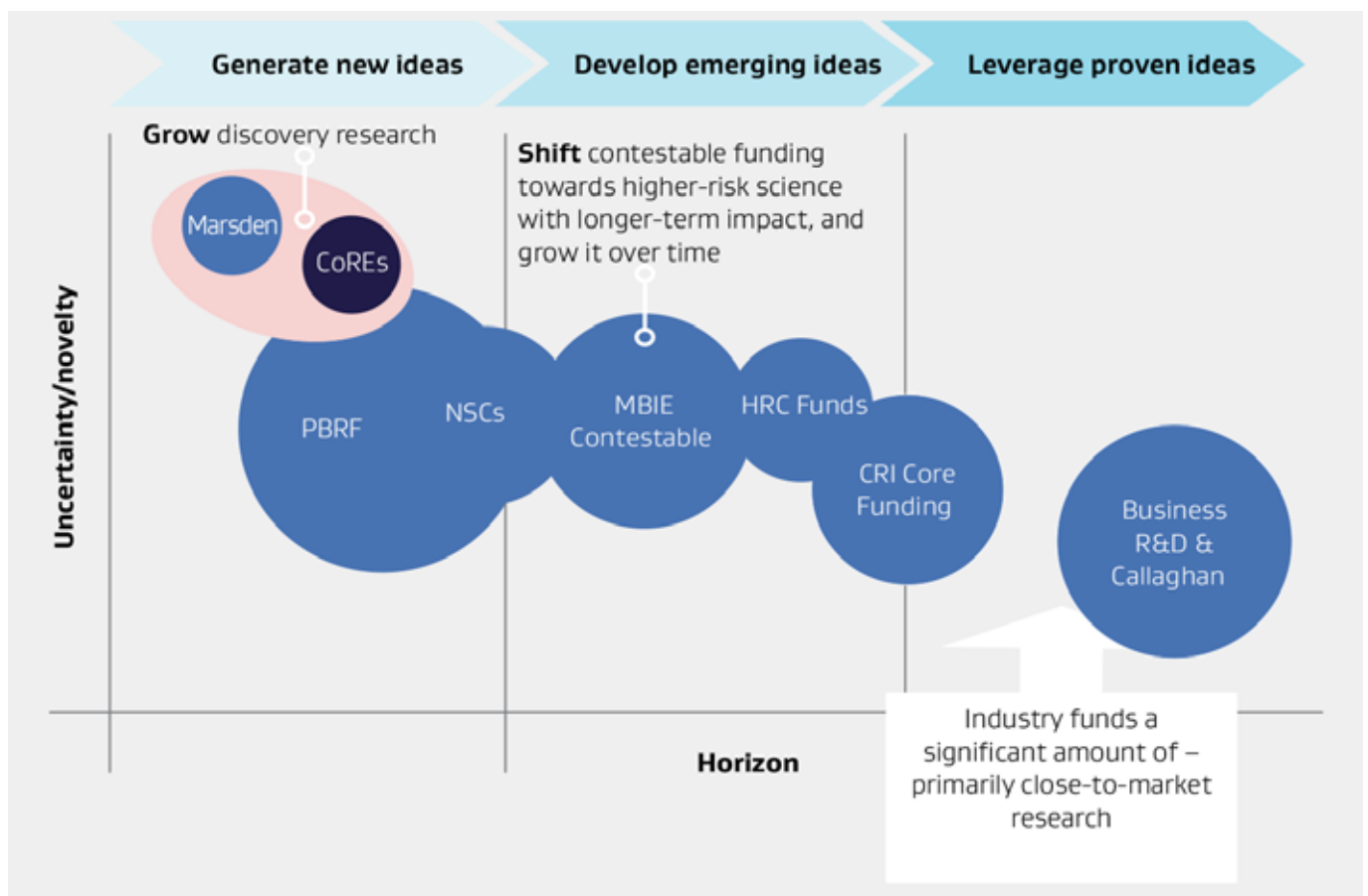
2. New Zealand Agri-Tech Innovation

2.1 Overview

Ahead of our departure for New Zealand, the Science and Innovation Officer provided the delegation with the following background information on the relevant funding bodies for agri-tech.

The Ministry of Business, Innovation and Employment (MBIE) is the body responsible for the majority of Science Funding in New Zealand. This ministry sets policy direction and determines strategic science investments. Their key policy document for science investment is the National Statement of Science Investment 2015-2025 (NSSI)⁹ and evaluates research applications on the basis of two pillars: impact (economic, environmental, health and wellbeing, social and Vision Mātauranga); and excellence.

MBIE separates its science funding into distinct programme areas to assist research from pure discovery through to applied product development (as outlined below)¹⁰.



Aligning government’s investment

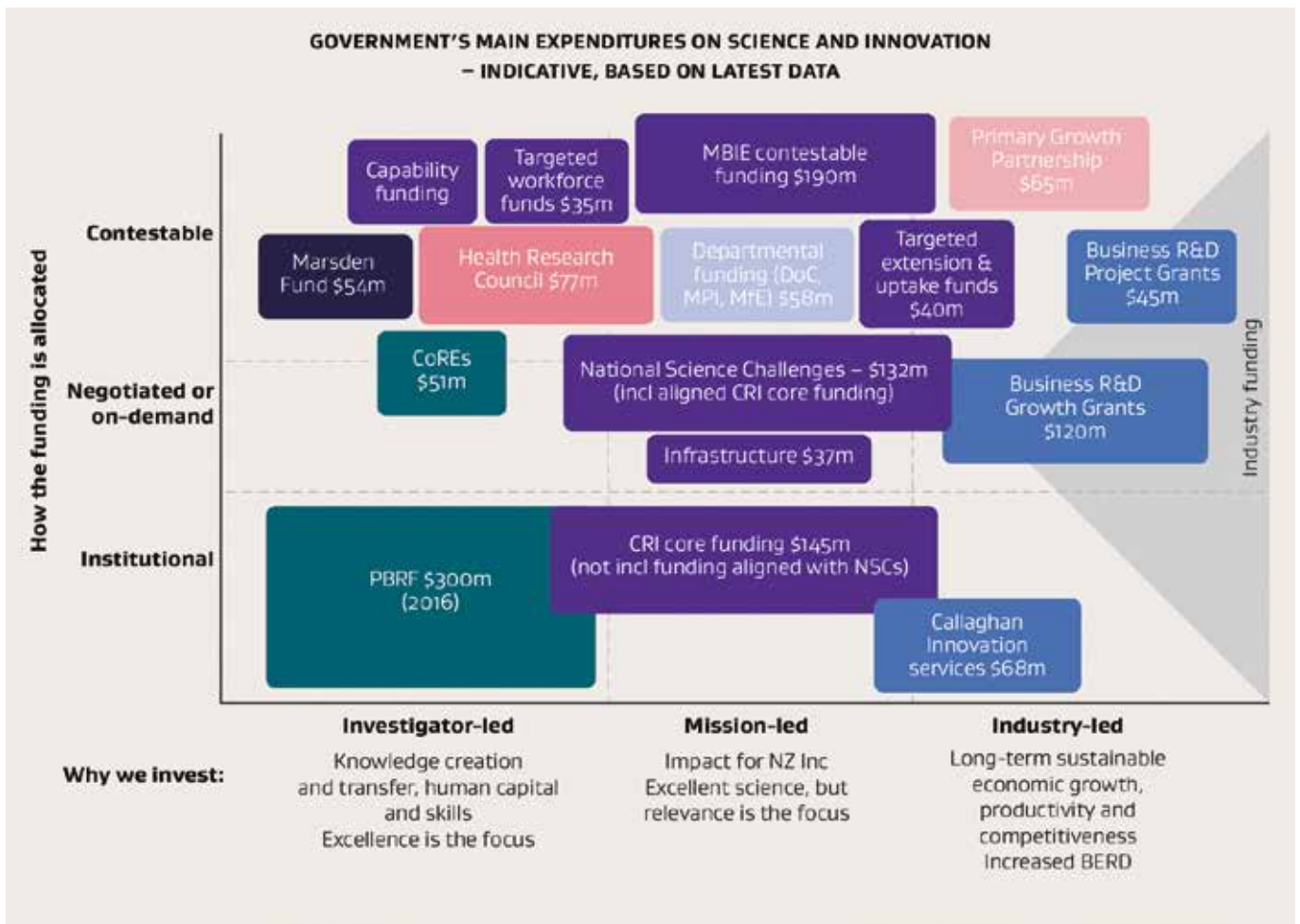
Source: New Zealand Government’s National Statement of Science Investment 2015-2025¹²

⁹ <https://www.mbie.govt.nz/science-and-technology/science-and-innovation/funding-information-and-opportunities/national-statement-of-science-investment/>

¹⁰ <https://www.mbie.govt.nz/assets/2eaba48268/national-statement-science-investment-2015-2025.pdf>

Funding is also divided into investments in investigator-, mission- and industry-led science, rather than through sector-based programmes. The change from sector-based funding happened a few years ago to encourage multidisciplinary research. A few of these funding programmes have changed names and emphasis has shifted slightly, but the diagram below gives a good impression of the overall landscape.

The Crown Research Institutes (CRIs)¹¹ are effectively privatised Crown entities charged with conducting scientific research. Crown Research Institutes date from 1992, formed out of parts of the former Department of Scientific and Industrial Research (DSIR) and elements of various government departments. CRIs are not expected to maximise profit, but to cover the costs of capital, allowing them to deliver on both commercial and scientific objectives.



Government's investment in science

Source: The New Zealand Government's National Statement of Science Investment 2015-2025)¹²

¹¹ <https://www.mbie.govt.nz/science-and-technology/science-and-innovation/agencies-policies-and-budget-initiatives/research-organisations/cri/>

2.2 Innovation Support for New Zealand Agri-Tech R&D



Te Pari digital drench gun *Photo: fwi.co.uka*

The delegation met with New Zealand's innovation agency, Callaghan Innovation at New Zealand Trade and Enterprise's impressive building in Auckland, where Callaghan Innovation highlighted the global trends felt to be important in driving agri-tech investment in New Zealand. The delegation was briefed on the drivers behind the New Zealand Government's agri-tech focus:

- Global caloric demand up 70% whilst crop demand will increase 100%.
- The Power of the Connected Farm. Callaghan Innovation cited the example of the Te Pari drench gun which is available in the UK. This is a medication delivery system for sheep which uses radio frequency identification technology to identify the animal and "personalises" the dose based on the individual's data.
- The Autonomous Farm. Precision sprayers were cited, along with spreaders and pasture measurement equipment company C-DAX, who are working in association with New Zealand agri-inputs group Ravensdown.
- Disruptive Tech including indoor urban farming and fermented foods to replace meat/milk (plant breeding tech company Biolumic was given as an exemplar start-up which has succeeded with a combination of New Zealand and US funding).
- Improved Environment Management (RE GEN was cited, a New Zealand irrigation scheduling software company).

Callaghan Innovation is proud that agri-tech exports from New Zealand are worth NZ\$1.5 billion; this appears to be the result of:

1. Innovative farmers (who have not had any subsidies to rely on since the 1980s, which has driven efficiency and innovation).

2. Strong connectivity between Callaghan Innovation and NZTE.
3. Recognition of the sector as investable by New Zealand angels and good connectivity with global funding sources (typically the US, but this could become more of an opportunity for UK-based investors).

Callaghan Innovation estimates that around 20% of the science they undertake is in the area of agri-tech, and they take no share in IP; they operate a fee-for-service model. They also fund training activity and provide stipends for students which represents around 40% funding for research.

New Zealand agri-tech exports are worth NZ\$1.5 billion

Callaghan Innovation's agri-tech lead was clear that companies using Callaghan Innovation are measurably more successful, but he was equally adamant that Callaghan Innovation is not content and are keen to scale-up activity. They are working hand-in-hand with NZTE and the MPI who have a significant research fund, worth AU\$100 million over seven years.

2.3 Agri-Tech Investment in New Zealand

We also met with the Investment Manager from NZTE, who has a strategic investment background at KPMG and has worked in the UK as an investment analyst and as a consultant to UKTI. Their position leads them to work with New Zealand companies to help secure investment and become investment-ready in a similar way to the UK's UKTI team.

They have been involved in putting together New Zealand's agri-tech investment strategy at the request of the incoming government last year.



NZTE explaining the New Zealand Agri-Tech Investment Strategy

They explained the main points of this strategy, which unpicks the agricultural value chain, looking at a simplified range of activities needed to get New Zealand goods or services to market. They consider that, within the farm gate, these activities include obvious inputs such as labour, R&D, equipment and energy to deliver production in the various sectors (crops, livestock, horticulture etc). Beyond the farm gate, they identify the need for post-harvest processing and storage, along with distribution and sales activities (including retailers).

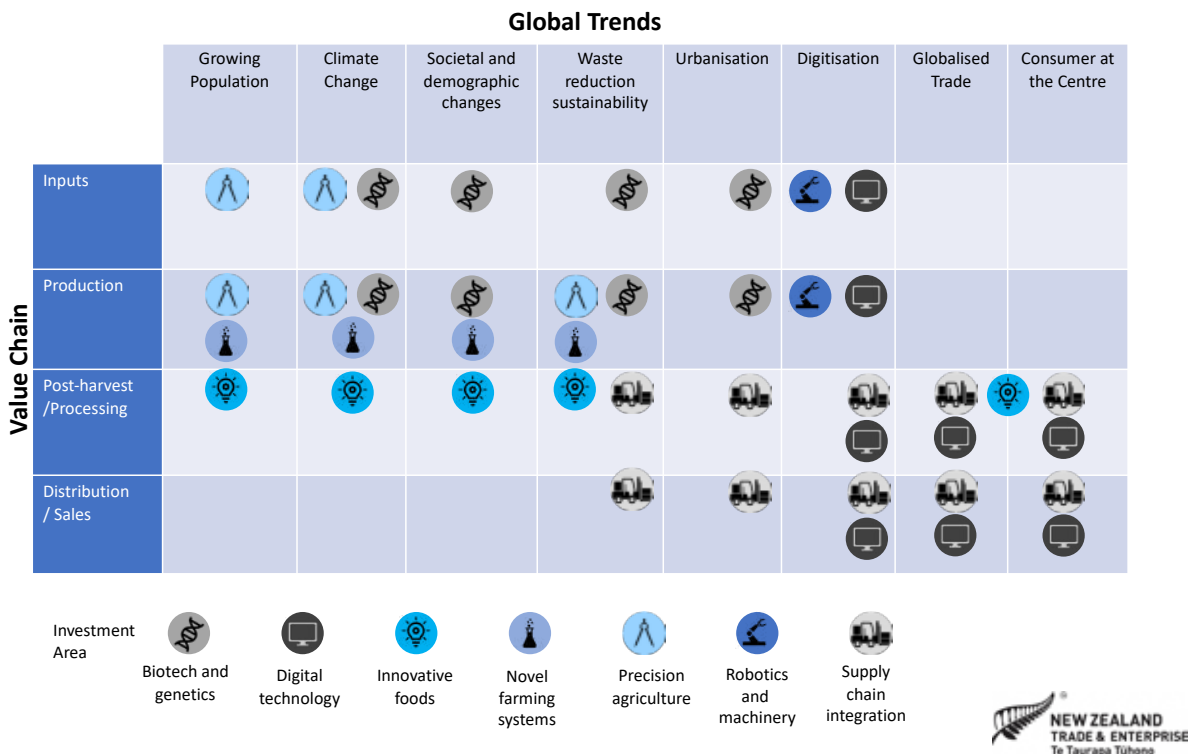
They set this alongside a PESTEL analysis of global trends which are well understood, to highlight population growth, climate change, demographics, sustainability, urbanisation, digitalisation, globalisation and, interestingly, “consumer at the centre” (which plays well to the focus on “the producers story” and differentiating the New Zealand brand).

They went on to examine the specific areas of agri-tech research that are attracting investment: biotech and genetics, digital technology, innovative foods, novel farming systems, precision agriculture, robotics and supply chain integration.

Capital flows into the agri-tech sector were discussed, and the fact that these are shaped by global trends as outlined

previously. The key concept is that agri-tech is very much a horizontal “cross-cutting” sector which leverages technology from other sectors to drive productivity and sustainability. NZTE maps these different technologies into a matrix which sets global trends against the value chain activities. Their analysis is similar to outputs from sector workshop activities that have been carried out in the UK, but the matrix below bears some examination, as it highlights specific features of the New Zealand situation (very similar to the UK) but the focus on the “consumer at the centre” on the right of the matrix is something that perhaps could be looked at more in a UK context. “Social license” was something the UK delegation heard a lot about in New Zealand. Perhaps the fact that New Zealand consumers are a little more connected to New Zealand agriculture makes public opinion a little better informed so that the consumer’s voice has a little more credibility with the farming community?

International engagement by NZTE is impressive, with around 80 New Zealanders representing their country at the Australian Evoke^{AG} conference in March 2019. NZTE also coordinates a presence at the Forbes AgTech Event in Salinas, California (26-27 June 2019) and the Irish Ploughing Match (17-19 September 2019), as well as the UK Dairy Day in Telford which precedes this on 11 September.



New Zealand Agri-Tech Investment Matrix
 Recreated based on graphic shown by NZTE



Workshop session with Deloitte

2.4 Workshop Exercise in Auckland

Our delegation participated in an interesting and entertaining workshop session presided over by Deloitte NZ.

In terms of farmer-led innovation, we could not fail to be impressed. The apparent ease of access to start-up funding from enthusiastic, ag-focussed angels, willing to back innovators with early-stage investment was impressive. The domestic investment network appears to run out of steam somewhat when it comes to the more expansive second-tier investments, highlighting the need for international engagement, and it seems that much of the funding at the million-dollar-plus scale comes from California, Israel and Japanese corporations (e.g. the investment by Yamaha in Robotics Plus).

What impressed us, however, was the level of “joined-up” government support available to innovators, and the integration of the innovation agency with the international trade and investment activity. The more intractable problems are not shied away from either. New Zealand is actively embracing the big robotics challenges, and we were told about a huge collaborative seven-year research programme which has been funded centrally.

2.5 Agricultural Robotics

We met with the CEO of Robotics Plus in a hotel in central Auckland. Originally a molecular biologist from Leeds, the CEO made the move to a New Zealand biotech start-up in the late 1990s.

Since then they have worked in strategic consulting for Fonterra, the farmer-owned dairy co-op that is New Zealand’s largest company. Immediately prior to Robotics Plus, they were the CEO at Hill Laboratories in Hamilton, employing a team of 400. They have been instrumental in securing a US\$10 million investment from the Yamaha Motor Ventures in October 2018.

Robotics Plus have developed robotic apple-grading technology which is already implemented in commercial fruit



packing lines. This delivers a revenue stream which helps to support the more innovative areas of the business which include the development of field robotics including a kiwi harvester and forestry robotics.

The kiwi harvester we were shown appears to be at a relatively-advanced commercial prototype stage, and it will be interesting to see how their business develops, now that they have secured significant investment from Yamaha Motor Ventures.

As well as significant investment, Yamaha brings practical robotics experience from mobile phone manufacturing, and seem alive to the potential for the big corporation approach to decision making to slow things down at Robotics Plus. Yamaha Motor Ventures see real benefits to a dual-hemisphere strategy. They bring expertise from high speed “pick-and-place” robots capable of placing 13 microchips-per-second into circuit boards. Their engineers felt that the design efficiency of the system that Robotics Plus founders



CEO of Robotics Plus speaking to the delegation in Auckland

developed could not be improved upon. The company’s founders were mentioned several times in the CEO’s presentation as ag-robotics visionaries. Indeed one of the founder’s broad knowledge of the soft fruit value chain from breeding to logistics was referenced by George Kellerman of



The founders of Robotics Plus
Photo: Robotics Plus



Kiwi fruit harvesting robot at work
Photo: Robotics Plus

Yamaha Motor Ventures at the New Zealand Techweek Event in 2018¹².

The CEO explained that the focus at Robotics Plus is on a collaborative approach, and the range of companies and government agencies involved is impressive. However, they highlighted a significant skills gap, and it seems that this is an area where some UK/New Zealand collaboration might bear fruit. This could build nicely on the existing UK/New Zealand collaboration between Lincoln University (NZ) and Lincoln University (UK). They highlighted the fact that both countries share the same challenges. Not long returned from a UK visit, they put it quite succinctly: “graduates (in both countries) are often not ready for teamwork or project management”. This is the same sentiment that lay behind Dr John Parnaby championing the launch of the UK’s Engineering Doctorate

programme in the 1990s, and this problem doesn’t seem to have gone away. To help address this, Robotics Plus are working closely with the New Zealand Robotics Institute at the Lincoln Hub Ag Tech Centre (which is also being sponsored by Yamaha Motor Ventures), where the focus is on developing skills in project management and delivery.

In his talk to the group, the CEO of Robotics Plus made an amusing contrast between the progress achieved with automation in the car industry, compared to intensive horticulture, quipping that the only difference between now and 50 years ago is colour TV! They make an interesting point, as shown below.

Progress of automation in the vehicle industry compared with agriculture:



Photos: Robotics Plus, from a presentation delivered to the delegation, also delivered at the Techweek NZ in June 2018 by Steve Saunders

¹² <https://www.youtube.com/watch?v=5g9DT9vFkWE>

2.6 Environmental Issues



The delegation being shown the lysimeter at Lincoln University's Ashley Dene Research Station

We travelled to the Ashley Dene Research and Development Station on the Canterbury Plains where we were shown the challenges of leaching nutrients from irrigated intensive pasture. This is a particular challenge on the shallow soils of the Canterbury Plains, where nitrates leach through into the underlying gravel and so into the groundwater.

The environmental cost of agriculture is a concern for New Zealand, particularly in relation to groundwater quality. The UK has significant expertise in catchment sensitivity and modelling of water quality within specific catchments, and collaborations might be possible to make use of this capability.

Our delegation's view was that compliance and farm assurance schemes are a little more advanced in the UK, and there are opportunities for systems to transfer to New Zealand. Environmental concerns were a recurrent theme throughout our visit, and it was felt that the UK has something to offer New Zealand in areas of modelling, sensor technology and environmental impact mitigation.

2.7 The New Zealand Dairy Sector



The delegation being shown around the dairy facility near Palmerston North

The New Zealand dairy sector is dominated by one farmer-owned cooperative, Fonterra, who are also significant in disseminating best practice. We went to meet a Manawatu dairy farmer whose family saw the removal of subsidies as an opportunity back in the 1980s. There are, however, worries about how to decarbonise the dairy sector given that they are fully expecting a carbon tax to be levied in the next year or so.

The farmer had just hosted a hackathon with Massey University and the Rural Innovation Lab on the farm and is keen to encourage smart farm technology that helps build a regional story and delivers total traceability of product. Their other objective is around environmental compliance, and how to achieve this on one single platform. They are using software from Farm IQ and Landseer (which allows effective benchmarking), but taking inspiration from Ian Taylor, who develops the real-time graphics for the TV coverage of the America's Cup. They had also hosted Microsoft on the farm, when Ranveer Chandra had the idea to tape a mobile phone to a helium balloon (rather than an expensive drone). This concept has since been taken up by Microsoft's Farmbeats project¹³.



Equipment at Stewart Dairylands

¹³ www.gatesnotes.com/Development/FarmBeats



Zeddy smart mobile feeders being brought back to the yard for re-filling

2.8 Precision Livestock Farming

We travelled a little out of Palmerston North to meet the CEO of Zeddy who makes mobile livestock feeders equipped with a basic telematics-system that allows the user to monitor and control the feed consumption of individual animals from their mobile phone.

The Zeddy business is a good example of strong venture capital engagement in New Zealand. The products we were shown have been available on the market for around a year and have been very thoroughly engineered, robust enough to withstand the weather and bumped about by cattle.

Our delegation was impressed by the “just get on with it” attitude, and the support available from the team to develop the Zeddy concept, which started as a problem on the farm.



An introduction to the Zeddy concept

2.9 Abacus Bio

We met with Abacus Bio in Wellington and got into interesting discussions with the senior team.

Abacus Bio are active in over 20 countries and have offices in New Zealand (Dunedin) and the UK (Edinburgh). Their particular expertise is in livestock genetics, having recently redesigned the breeding index for the American Angus Society.

The Abacus Bio business relies on gathering and analysing big data from quantitative genetics. Their customers include Dairy NZ, SRUC and farmers. They have two farm consultants working on farms with sheep, beef and deer, and have very large data sets, and their model lends itself well to the intern model. A key challenge for Abacus Bio is how to integrate farmer perceptions with actual varietal reliability, and they are keen to explore the economic impact of reliability traits in plants and animals. They see huge potential in “International Smart Farms” for gaining insights like this, and are working with New Zealand Universities in Lincoln and Hamilton, as well as NIAB’s Innovation Farm in the UK.

Another area of interest is in understanding the impact of pursuing profit to the detriment of ecosystems, and overall, the evaluation of ecosystem services. This is an area that the UK is beginning to understand rather better, and represents an opportunity for future collaboration. The mounting environmental pressure on New Zealand’s dairy sector to clean up the country’s water resources is massive.

2.10 FoodHQ

We were taken to a business development facility called The Factory adjacent to Massey University in Palmerston North, where we met FoodHQ’s CEO and their Programme Manager. They explained how FoodHQ works as a food-tech accelerator by offering food companies and innovators access to world-leading food science and expertise.

FoodHQ works in a whole variety of areas from helping a company produce scaffolding for engineered meat to aquaculture. They have scientists working on digestion and metabolism, food proteins, food safety, sustainable food chains and post-harvest management. One new development is their work with a team investigating links between human gut microbiota and mental health.



Annex 1

List of UK Participants

Agri-EPI Centre	www.agri-epicentre.com
British Beet Research Organisation	www.bbro.co.uk
Department for International Trade	www.gov.uk/world/organisations/british-high-commission-wellington
IceRobotics Ltd www.icerobotics.com	
Innovate UK	www.gov.uk/government/organisations/innovate-uk
Institute for Global Food Security and Queens University Belfast	www.qub.ac.uk
Knowledge Transfer Network Manager	www.ktn-uk.co.uk www.ktn-uk.co.uk
Lincoln Institute of Agri Food Technology (LIAT), University of Lincoln	www.lincoln.ac.uk/home/liat/
Science and Innovation Network New Zealand	www.gov.uk/world/organisations/british-high-commission-wellington
Scotland's Rural College Beef and Sheep Research Centre	www.sac.ac.uk

List of New Zealand Participants

Abacus Bio

Agritech New Zealand

Autogrow

Beef+Lamb New Zealand

Biolumic

Blackhills Farm

Blinc Innovation

Bragato Research Institute

Callaghan Innovation

Deloitte

Federated Farmers

FoodHQ

GPS-it

Horticulture New Zealand

Lincoln Agritech

Lincoln University

Ministry of Business, Innovation and Employment

Ministry of Foreign Affairs and Trade

Ministry for Primary Industries

New Zealand Space Agency



