Ministry for Primary Industries
Manatū Ahu Matua

MINISTRY FOR PRIMARY INDUSTRIES

Science Strategy

Rautaki Putaiao

Growing and Protecting New Zealand

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Preface

In addressing MPI's purpose of growing and protecting New Zealand, we need to substantially increase the value of primary sector exports while managing risk, strengthening environmental performance, and meeting societal needs. Our four major systems, Biosecurity, Food Safety, Primary Production and Trade, are fundamental to the future of New Zealand, and all are underpinned by science.

MPI is a science funder, policy maker, deliverer and very much a science user. With this depth and breadth of science activity and interest, we must have an integrated, forward-looking view of how we and the primary industries access, use and invest in science. We need to show how our Science System informs and is aligned with our MPI strategic direction and outcomes.

This strategy represents a substantial step forward for MPI and underpins our MPI strategic priorities. We are a science-based organisation and have strong science capability across the organisation. MPI is committed to the science principles described in this Strategy, and to confirming that our policy decisions and the setting of regulations and standards are firmly grounded in fit-for-purpose science-based evidence. We are also committed to ensuring that strong science underpins the continued growth of the primary industries.

I hope that all who read this strategy will recognise this commitment, the advances that this Strategy entails, and be stimulated to engage in continually improving the way in which we use science as evidence in all MPI's areas of responsibility.

Let us continue to strive forward in the world of science and new discoveries.

Tēnā koutou, tēnā koutou, tēnā tātou katoa

Tihei wā mauriora

Martyn Dunne
Director-General

Foreword

A Science Strategy for MPI

MPI, and its predecessor organisations, has had a long history of relying on scientific information to carry out its functions and achieve its goals. This has involved providing science-based evidence for our regulatory functions in food safety and biosecurity, and backing our policy-making in resource management and sustainable primary production with robust data collection, analysis, and interpretation. As a trading nation, robust risk assessment is a cornerstone of ensuring favourable trading arrangements and enhanced market access. In addition, the boundaries of our science are expanding, with an increasing need for social science, particularly in the areas of risk assessment and management, and science and technology uptake.

We are in an era of remarkably rapid change in science and technology. We can now measure chemical contaminants in soils and foods to levels not achievable in the past; we can sequence genomes quickly and cost-effectively and thus identify new organisms and confirm new threats from incursions at high levels of sophistication. This all puts pressure on our resources: both people and facilities. There is also considerable pressure on MPI, from the public, the media and social networks, from industry, trading partners and Government to ensure that all decisions, policies, standards, and advice are based on the most robust and secure scientific evidence possible.

This *Science Strategy* has, therefore, been designed to provide guidance on how we access, commission, use, interpret and disseminate science across the range of our activities. It includes a description of what our Science System entails. In addition, this strategy is important for our external stakeholders in Government, industry, the science community and international partners. It will help to provide national and international visibility for the integrity of our processes and credibility of our policies.

Science is critical to MPI. This strategy will help drive continuing improvements and effectiveness in science generation and uptake.

Ian Ferguson
Departmental Science Adviser

1 Strategic direction for MPI science

Purpose

The Ministry for Primary Industries (MPI) has core roles in protecting, regulating, and growing. To carry out these roles effectively, MPI is fundamentally reliant on science, and on high quality science evidence, to inform its policy development, regulations and decision-making. Science and science evidence are critical inputs into how we work with the primary sector to maximise export opportunities, meet our international trading obligations, improve sector productivity, increase sustainable resource use, and protect New Zealand from biological risk.

As a major funder, user and generator of science it is imperative that MPI has a robust and efficient Science System that is closely aligned with its strategic vision "to grow and protect New Zealand".[1] We need to get this right to realise our MPI outcomes and address increasing public scrutiny of science-based decision-making in Government.

This *Science Strategy* describes the role and use of science and science evidence in MPI to support a robust and aligned MPI-wide Science System. It will be used internally to provide strategic direction for planning and prioritising our science needs and future investment, guiding and monitoring external investment and the delivery and uptake of our outputs for the benefit of New Zealand. This Strategy is also intended to be used externally by our partners and providers to gain a clear understanding of our Science System, and support working in partnership.

This *Science Strategy*:

- presents a vision for the future of science within MPI;
- articulates principles that will underpin the MPI Science System;
- describes the current state of the MPI Science System;
- discusses the importance of Te Ao Māori;
- sets out the strategic science outcomes for the MPI Science System for the next 5 years;
- explains the approaches that will ensure our science activities contribute to the strategic directions of MPI;
- outlines the approach for implementation.

Vision for the MPI science system

Policy, regulation-setting, and decision-making must be based on robust, fit-for-purpose, up to date and comprehensive science and science evidence to be effective and credible.

While recognising what is currently being achieved within MPI to produce, fund, and make science and science evidence available to the sector and external stakeholders, we have identified areas where improvements can be made.

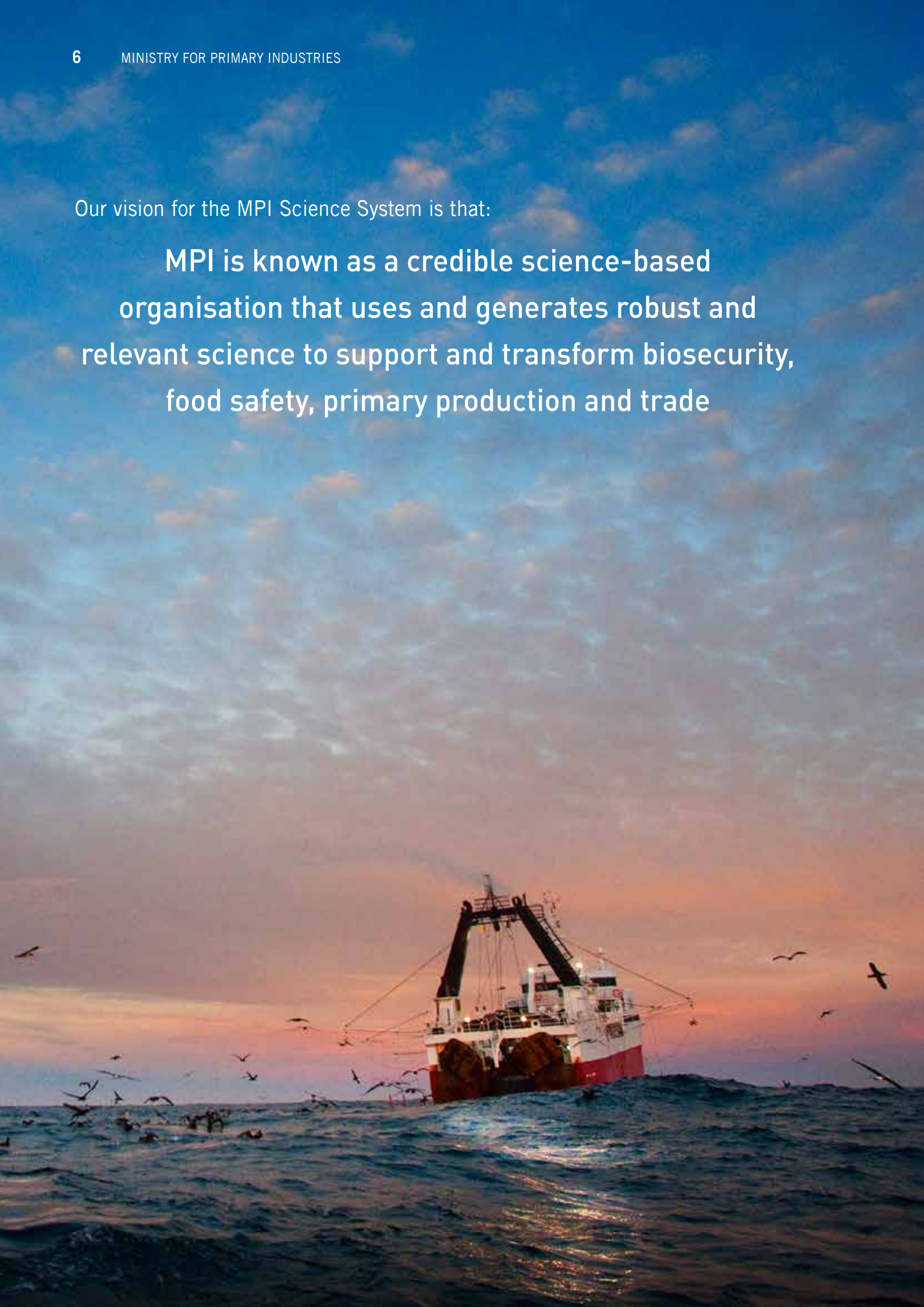
We need to work more effectively and efficiently across the Science System to maintain and update our science, to be prepared for future needs, and to ensure robust, high quality science evidence is available and accessible within MPI, and to external stakeholders. We also need to ensure that science evidence is routinely and consistently used to inform policy, regulation and decision-making within MPI.

Science has the potential to fundamentally transform both MPI and the primary industries. To achieve this, key decision-makers must have confidence in the MPI Science System, and the outputs and evidence that are being produced and used in the primary industries. There needs to be high visibility for our internal and external stakeholders over the processes and systems applied, as well as the evidence produced.

1 [MPI] *Our Strategy 2030.*

Our vision for the MPI Science System is that:

MPI is known as a credible science-based organisation that uses and generates robust and relevant science to support and transform biosecurity, food safety, primary production and trade



The principles that will underpin the MPI Science System are presented below. An explanation of how we will enact these principles is provided in Appendix 1.

Principles

1. Scientific excellence

- We will commission, generate and use robust, fit-for-purpose high quality science in accordance with accepted scientific practice.
- We will evaluate the quality, accuracy and relevance of our science through peer review and consultation.
- We will enhance our science capability through ongoing professional development and ensuring our science facilities are future-proofed.

2. Ethics and integrity

- We will adhere to the highest ethical standards relating to the delivery, collection and use of scientific data and information, and science research practices.
- We will promote and support scientific integrity and objectivity in the pursuit of science and the communication of science evidence.
- We will be clear about the role of science in policy and decision-making.

3. Partnering and collaboration

- We will actively engage across Government and with the wider scientific community, Treaty Partners, and domestic and international stakeholders to identify, prioritise, commission, deliver and promote scientific research.
- We will promote internal MPI partnership and collaboration to meet common goals and outcomes.

4. Accessibility

- We will make science research findings available to the New Zealand public and international audiences and support open access where appropriate.
- We will support effective uptake of science research findings to enhance impact.

Optimising the MPI Science System

Given MPI's fundamental reliance on science we need to ensure that our science functions are well-aligned across the organisation, that we are working together to prioritise our science needs and those of our sectors, to future-proof our capability and infrastructure, and that there is greater understanding and visibility of the role and importance of science in everything we do. The logic model in Figure 1 below describes how we will work from our underpinning principles to meet the vision of the Science System. The strategic science outcomes and activities are explained in more detail in sections 3, 4 and 5.

Figure 1: Logic model for the MPI Science System

2 Current state

Current State of the MPI science system

As an organisation, we rely on science and science evidence to:

- support Government targets, including the Business Growth Agenda, under which MPI aims to help achieve the goals of increasing the ratio of exports to GDP from the current 30 percent to 40 percent by 2025;
- inform decision-making across all of the MPI systems:
  - identify and respond to risks, including through our investigation and diagnostic services;
  - develop and maintain regulations and standards that ensure the safety, integrity, and sustainability of our primary production, food safety, biosecurity and animal welfare systems and allow our sectors to be responsive and innovative;
  - provide critical input into the development and implementation of MPI and sector policy;
  - help our sectors achieve their growth strategies through increasing productivity and higher value-added products within environmental limits;
- meet our international trade obligations and support the development of international standards such as those relating to food safety, biosecurity, climate change, conservation and management of fisheries;
- meet Treaty of Waitangi obligations and partner with Māori to protect our natural resources;
- provide knowledge of our stakeholders and client's perceptions, values, and attitudes.

Our science activities

In supporting the MPI strategic priorities, we:

- access and evaluate science information (our own, plus national and international);
- provide evidence-based advice and risk assessment;
- provide science input into sector strategies and policies;
- commission research to inform policy and regulation;
- regulate science activities relating to our systems;
- fund and manage research projects and programmes;
- maintain laboratory facilities for plant, environment, and animal health diagnostics;
- undertake research, identifications and diagnostics in our labs and in partnership with others;
- provide end-user input and co-funding to external research and development (R&D);
- advise on, and provide input into, other national science initiatives;
- provide relevant science and risk assessment input to international bodies;
- evaluate and review the effectiveness of our knowledge and technology extension strategies and return on investment from science activities.

Science governance

MPI has established a Science Advisory Governance Board, which is charged with ensuring that our Science System embodies excellence and best practice.

The Board's mandate includes:

- providing an overview of our Science System;
- guiding how we access, fund and deliver science and science evidence;

- interacting internally and externally on science-related issues;
- ensuring that we have best practice, credibility and robustness in all aspects of MPI science.

The Science Board reports to the MPI Senior Leadership Team and makes recommendations in respect of the Science System. The Science Board is chaired by the Departmental Science Adviser (DSA) who has general responsibilities for overview and advice on the MPI Science System, including external engagement, and how MPI uses science. The DSA reports directly to the Director-General on science issues.

Science capability and science profile

People are central to our Science System. Science and technical staff include personnel in our diagnostic laboratories, experts handling science issues in food safety, biosecurity, fisheries, animal health and welfare, sustainable agriculture and forestry, and climate change, and those working at the interfaces of science and policy and advice. It is critical that there is adequate internal and external science capacity, capability and associated infrastructure to meet our strategic needs. This ranges from high levels of science expertise in certain parts of our business through to broader science literacy for all MPI staff.

Risk analysis is a critical capability that underpins a large proportion of MPI science activity. We have extensive expertise in addressing trade issues, obligations and equivalence agreements, prioritising risk management activities, and choice of measures. It is essential that MPI fosters this expert capability, and promotes the importance of risk communication. Risk analysis is an area of continual improvement and there are a number of current initiatives underway in this critical area.

An area of focus for MPI is ensuring there are clear career pathways for science and technical personnel. There is also a recognised need for retaining and developing expertise to meet the continuing changes in science and technologies that MPI encounters.

To support MPI staff capability-building, and raise the profile of our science activities, MPI runs regular science seminars, a science email network, and an annual science conference. We are also developing a science forum of key MPI experts to discuss current and future science issues.

Research and development investment

With an R&D budget of approximately $130 million per annum,[2] MPI is the third largest funder of R&D in New Zealand after the Ministry of Business, Innovation and Employment (MBIE) and the Tertiary Education Commission (TEC). MPI-funded research in sustainable production, fisheries management, food safety, biosecurity and animal welfare is an important component of the national R&D effort (Figure 2).

The R&D investment for MPI is spread over a number of funds, each with its own scale, drivers, performance framework and mandate (including Cabinet direction, legislation, or departmental expenditure). These sit alongside investments from other organisations (refer Appendix 2 for more details). Our investments encompass a spectrum of activities, from operational research to government-industry partnership programmes, including but not restricted to:

- Operational research – This provides science evidence for decision-making across MPI, including the regulatory areas of biosecurity, food safety and animal welfare.
- Fisheries research – This underpins Ministerial and MPI decisions on the use and sustainability of our fisheries and aquaculture resources, and supports our international fishing and biodiversity obligations.
- Sustainable agriculture and climate change research – This includes research commissioned through different funds, alliances or centres that ranges from fundamental research into mitigating greenhouse gases to supporting applied research and extension projects.
- The Primary Growth Partnership (PGP) – This supports government-industry partnerships to boost the economic growth and sustainability of our sectors.

2 2014-15 data

As part of this spectrum of research activity, MPI continues to develop new initiatives such as:

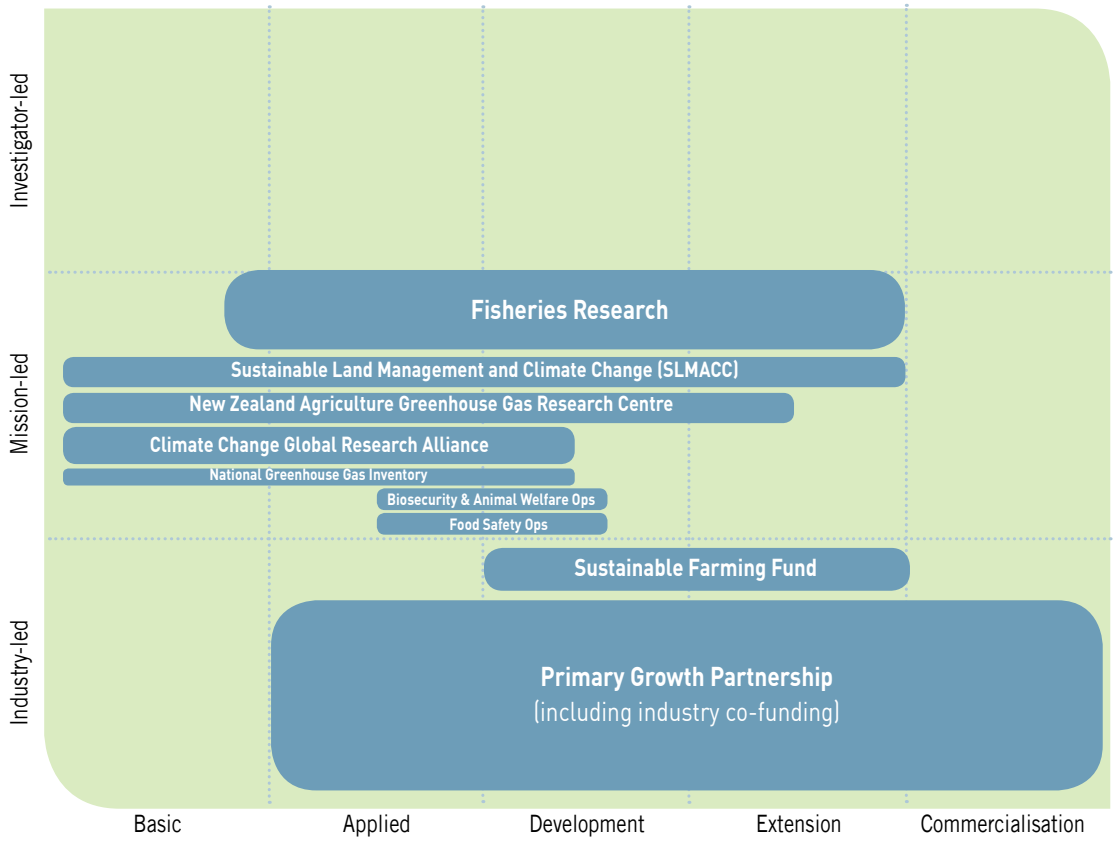
- identifying emerging risks to strengthen biosecurity risk management;
- a new Primary Growth Partnership forum for screening proposals and addressing roadblocks;
- partnerships with industry in Government Industry Agreements (GIA) where MPI agrees biosecurity priorities with industry partners and jointly funds agreed activities;
- cross-government activities including partnerships with:
  - the Ministry of Health on food safety emergencies and responses;
  - MBIE on handling big data;
  - the Department of Conservation on expanding the Kauri Dieback programme;
- partnering with Māori to sustainably increase the productivity of their primary assets.

New Zealand context

MPI's science activities are part of the wider context of New Zealand R&D investment and uptake. We have multiple roles within the New Zealand science environment, and therefore work closely with other science investors, science end users, science policy-makers and science providers.

We also work to ensure that MPI's strategies are aligned with those outside the organisation and contribute to national priorities through linkages such as the Natural Resource Sector (NRS) or with large research programmes like the National Science Challenges. The external funding landscape is constantly changing, and MPI-funded research is undertaken by a wide range of external research providers, including the private sector, Crown Research Institutes (CRIs) and universities. We therefore recognise the need to be closely aligned with external R&D activities, strategies and developments within New Zealand, and to be an effective part of the national Science System.

Figure 2: Current MPI research and development investment distribution, highlighting the areas where MPI does and does not invest (e.g. investigator-led research)



International context

MPI's science activities have an important international context that operates across different layers. Scientific justification is critical for our food safety and biosecurity import measures, our activities on climate change and increasingly on aspects of sustainable production and biodiversity. Science evidence influences the technical content of international trading standards to reflect New Zealand systems and interests.

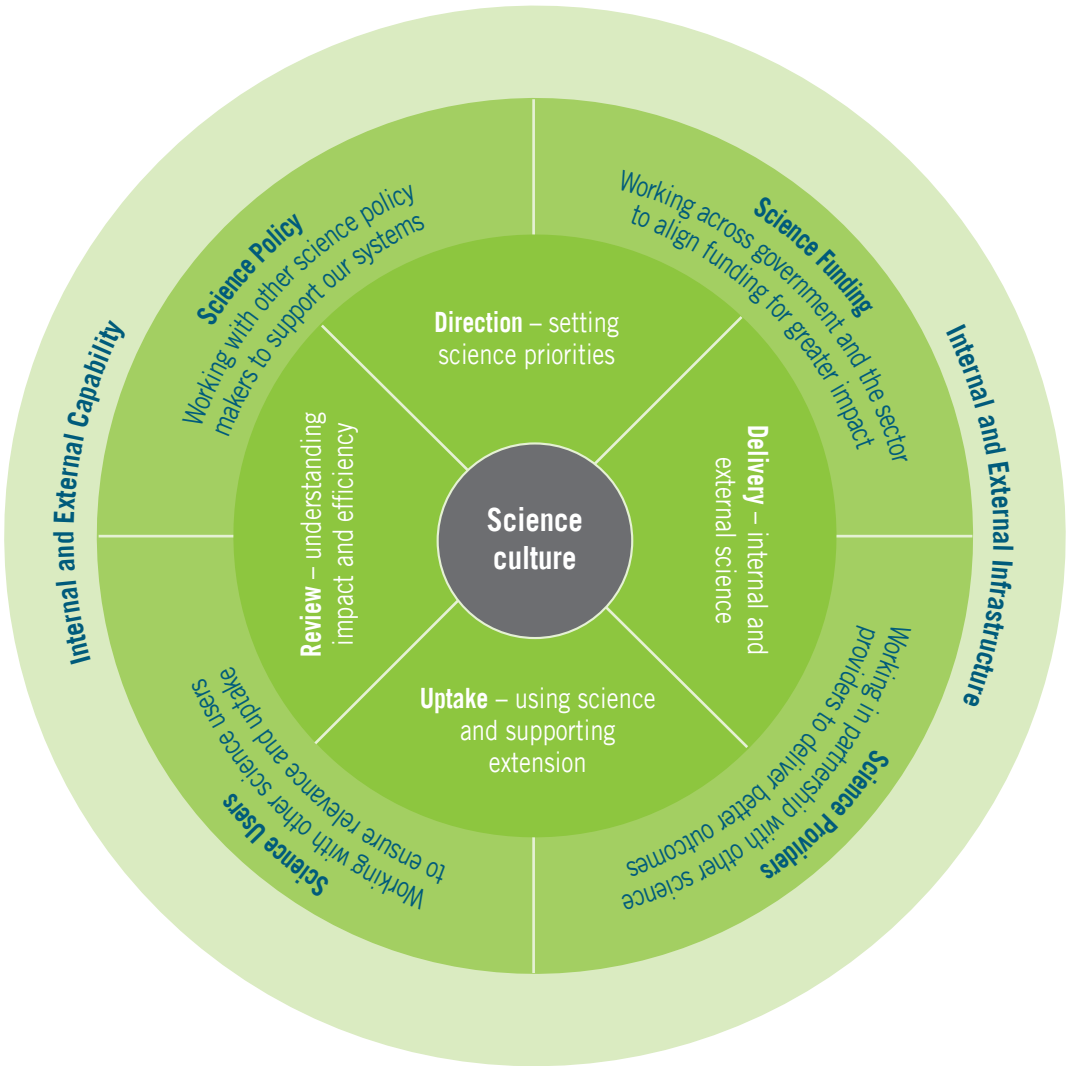
Science helps us gain better market access and cost-advantages for New Zealand export industries through equivalence negotiations with trading partners and helping to ensure trust and confidence in our export assurances.

We also rely on our collaborations with international science agencies and organisations to access the latest information in science and technology, and to ensure that MPI has science credibility and relevance in the international arena.

The MPI Science System at a glance

Figure 3 below provides a summary of the key components of the MPI Science System. It highlights the key internal processes that are critical for MPI's areas of responsibility – direction, delivery, uptake and review (further details are provided in section 4), and the importance of our external interactions in supporting science for MPI's areas of responsibility. Capability and infrastructure internal and external to MPI underpin the system.

Figure 3: MPI Science System highlighting the core components internal and external to MPI



Te Ao Māori – Combining traditional and contemporary knowledge

As tangata whenua and Treaty Partners, Māori have a special relationship with the natural environment, culturally, scientifically and spiritually.

Tikanga and mātauranga Māori have developed through generations of intense observation of the natural environment. Over time, these observations have resulted in an intimate understanding of natural resource processes and the development of management practices aimed at long-term sustainable use of those resources. While tikanga and mātauranga Māori apply observational science in different ways to western science, the desired outcomes are often the same. Mātauranga Māori contains a wealth of resources and experience that enables us to design more effective science tools to achieve common objectives.

Māori take a very integrated approach to resource management, where environmental, economic, social and cultural values are considered holistically. This leads to an outcomes-focused approach, as illustrated by the Māori indicators of environmental health. This integrated approach is of considerable value to western science and is increasingly being looked to in strategy development and investment decision-making.

While mātauranga Māori is based on intense and long term observation, it is also open and adaptive to new observations and information. Māori typically consider a question and will use traditional knowledge alongside other sources of evidence and a range of methodologies to answer it.

To be able to use bodies of tikanga and mātauranga Māori knowledge effectively, MPI needs to understand the similarities and differences between mātauranga Māori and western science, and the challenges inherent in reconciling these different world views. We also need to be open to its incorporation into science programmes, and build trusting relationships with iwi/Māori to whom that knowledge belongs, to ensure this knowledge is used appropriately.

3 The Future of the MPI Science System

Strategic science outcomes for MPI

We need a set of strategic science outcomes that will enable us to move from our current state to one where the quality of our science and science evidence is recognised by all our stakeholders and as a consequence, is used to improve economic and social outcomes in MPI's areas of responsibility.

In the future we will have:

- improved science-informed policy, standards, regulations, investments and decision-making across MPI;
- strategic prioritisation of internal and external science investments;
- strengthened and enduring internal connectivity, and external partnerships and alignment of science;
- improved access and uptake of scientific knowledge and technology for greater impact across our systems;
- future-proofed science capability and infrastructure across our systems.

These outcomes will be supported by measurable indicators and activities developed through the Action Plan that will support implementation of this *Science Strategy* (see *section 5*).

Future state – what success looks like

Success across these outcomes would include the following:

Optimised systems: Our current processes for critical operations of our Science System are good, but not all are optimised. We have initiatives underway aimed at aligning our investments, procurement, grant and contract management and evaluation systems. These include an integrated grant management system and an Investment System Programme.

Optimised systems will result in better strategic decisions on priorities and investment, a clear view of our science investment profile, and evidence of uptake and outcomes from investments.

Recognition for quality and integrity: Science needs to be consistently used by advisors and key decision-makers for the purposes of developing policy, setting standards and guiding primary industries. As well as ensuring we have robust processes, we will continue participation in programmes such as the cross-government Open Data Programme, promote open access of published findings, and have sustainable and future-proofed data maintenance and technologies. Risks and costs associated with digital continuity will be appropriately managed. We also need to provide strong support for professional development in critical science areas.

We will be recognised for our reliable and expert science advice, science evidence and data handling.

Effective external science engagement: We must build on our current relationships with the broader science sector, nationally and internationally, to collaborate on producing high quality science and science evidence that informs the activities of the primary industries sector. This

includes partnerships such as GIA, and relationship management plans with science providers such as CRIs. MPI also has a major role in core systems that support science in the sector. Examples are the National Aquatic Biodiversity Information System (NABIS) which enables users to map and display New Zealand marine biodiversity information, and the New Zealand Organisms Register (NZOR).

We will sustain an enduring suite of science-based partnerships and collaborations.

Providing clear advice on priorities: MPI needs to be able to better advise MBIE and other funders in areas relating to research, strategy development and alignment, prioritisation, and evaluation. We are a major stakeholder in MBIE contestable research funding and Partnership Programmes; CRI core funding; the National Science Challenges; and the Food Safety Science and Research Centre. It is important, therefore, that we strengthen our relationships to better support science.

MPI will be a leader in setting priorities for research in all MPI's areas of responsibility.

Sharing responsibility – tikanga Māori and mātauranga Māori: There are opportunities to acknowledge and value mātauranga within our strategy to ensure that we get the greatest value from New Zealand's environment and natural resources and increase New Zealand's economic performance.

Iwi/Māori have a unique relationship with the land as tāngata whenua and duties to exercise kaitiakitanga to sustainably manage natural resources in their rohe. Iwi/Māori have specific legislated management duties relating to a range of natural resources in some areas. These resources need to be managed to achieve outcomes that include Māori values. The Crown as a Treaty Partner has responsibilities arising from Treaty settlements and legislation to provide for the input and participation of tangata whenua into sustainability processes and to consult with Māori with regard to all issues associated with kaitiakitanga. Therefore MPI needs to ensure that where Māori are among those who will be using the science, they will be involved in formulating the questions and methods, so the right evidence is being generated in the right ways. Similarly, when technological development is undertaken to solve problems or realise opportunities of significance to Māori, they need to be participants from the beginning and key stakeholders in the development and any subsequent implementation and extension activities.

MPI and Iwi/Māori have an interest in building and strengthening our relationship and our strategies and processes to enable all parties to work together to understand and utilise our shared knowledge and to discharge our responsibilities. We acknowledge that engagement will have regional nuances.

We will have improved capability and capacity for working with Māori perspectives, tikanga and mātauranga Māori, which will better enable iwi/Māori to use their mātauranga and undertake kaitiakitanga to achieve better outcomes for all.

4 Strategic approach for MPI science

To achieve the vision for the MPI Science System and strategic science outcomes, our future Science System will have aligned and consistent processes for prioritising, managing, reviewing, monitoring and evaluating the science we commission, both internally and externally. Our efforts will be focused across four dimensions of activities within the MPI Science System. These dimensions are:

Direction – science investments and work programmes will be organised to align with the strategic goals of MPI, in accordance with Government and primary industry sector goals and with Treaty partnerships.

Delivery – high quality science and science evidence will be produced through best practice procurement and contracting systems that support the two-way relationships between research users and providers, and result in usable, relevant research outputs.

Uptake – successful uptake and use of science and technology by MPI decision-makers and sector users will be supported by effective extension strategies and high quality capability.

Review – continuous improvement across the Science System will be supported by co-ordinated science processes and timely reviews. We will be responsive to feedback and will review the effectiveness of the science evidence used in policy making and regulation-setting.

These four dimensions will underpin activities aligned to four strategic areas. These areas are:

- primary sector priorities and interests;
- MPI priorities and interests;
- Government goals;
- emerging science issues.

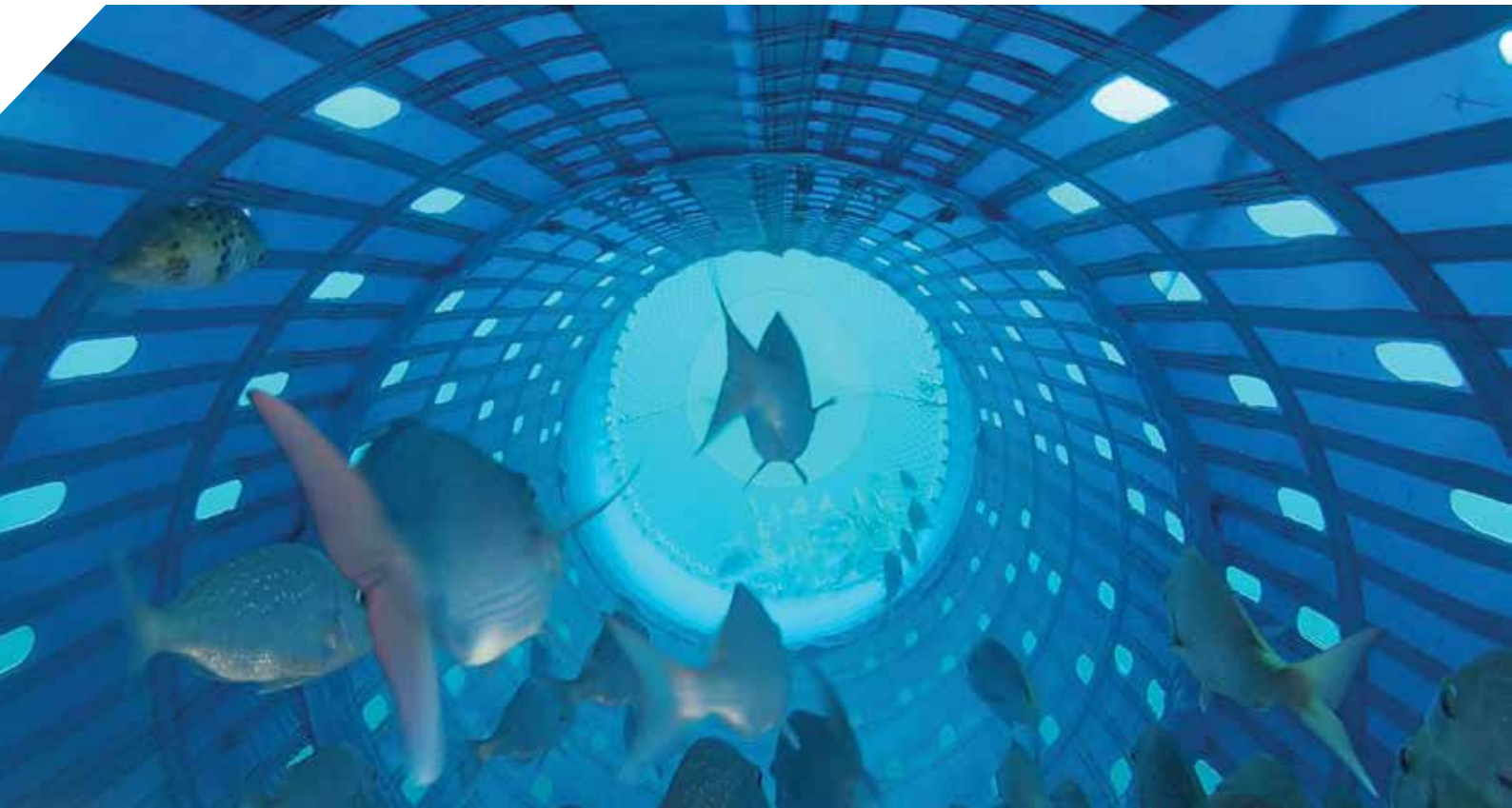
Science capability and culture are also critical in underpinning these dimensions.

Table 1 presents a framework which outlines critical areas of science output needs for MPI's areas of responsibility. We will use this framework to develop evidence plans to support future prioritisation of investment, internally and externally. Prioritisation of activities, particularly in those areas likely to have the most impact, will be a critical part of the Action Plan to be developed for implementation of this *Science Strategy*, and will inform and be informed by MPI's Investment System Programme.

Table 1: Strategic Framework for MPI-relevant Science – strategic areas and critical outputs

Sector priorities and interests	
Cross cutting issues including recognition of social science contributions	There are a number of cross-cutting outputs required for a more comprehensive evidence base. These include: • environmental economics and fisheries, forestry and agriculture production economics; • understanding of Māori socio-economic aspirations including agribusiness; • understanding of critical skill and labour needs; • understanding community needs and risk perceptions, particularly as informed by social science research; • strategies to respond to barriers for knowledge and technology development and uptake; • global trend analysis and New Zealand foresight work to identify the impacts on future land use, management and consumer preference.
MPI priorities and interests	
Food safety	Food safety requires outputs in a wide range of operational activities including those related to the new Food Act 2014. These include: • evidence base for standards related to imported, New Zealand-produced, and exported food; • improved diagnostic and surveillance technologies; • integrity, traceability and verification systems; • improved consumer understanding and behaviour; • guidance to support health claims.
Biosecurity	Science outputs are required across the whole of the biosecurity system and to support the requirements of the Biosecurity Act 1993 and the direction provided by Biosecurity 2025. These include: • evidence base for standards for imported and exported biosecurity goods; • risk assessment, management, and mitigation; • optimised interventions into pathways; • improved detection, diagnostic and surveillance practices and technologies; • improved management of pests, weeds, and diseases; • improved understanding of values and behaviour in creating and managing biosecurity risks.
Sustainable production	New Zealand has to meet international requirements under the Climate Change Response Act 2002 and resource use within environmental limits under the Resource Management Act 1991. Outputs required include: • enhanced land management and development practices including crops, nutrients, soils, contaminants and waste, to underpin sustainable production across New Zealand, including hill and high country, and organic approaches; • increased productivity within environmental and societal constraints including those related to Māori agribusiness; • reduced greenhouse gas emissions, increased carbon sinks, and greater understanding of the impacts and adaption to climate change; • improved primary production within water constraints; • increased water quality and improved irrigation systems; • research to underpin the development, review and implementation of animal welfare standards; • improved land use related to forestry, agriculture, horticulture, cropping and urban planning; • improved precision production practices and technologies including real time measurement and monitoring; • increased support of the primary sectors through adverse events including flooding, drought, snow, volcanic, and infrastructure disruption and their environmental, economic and social consequences.

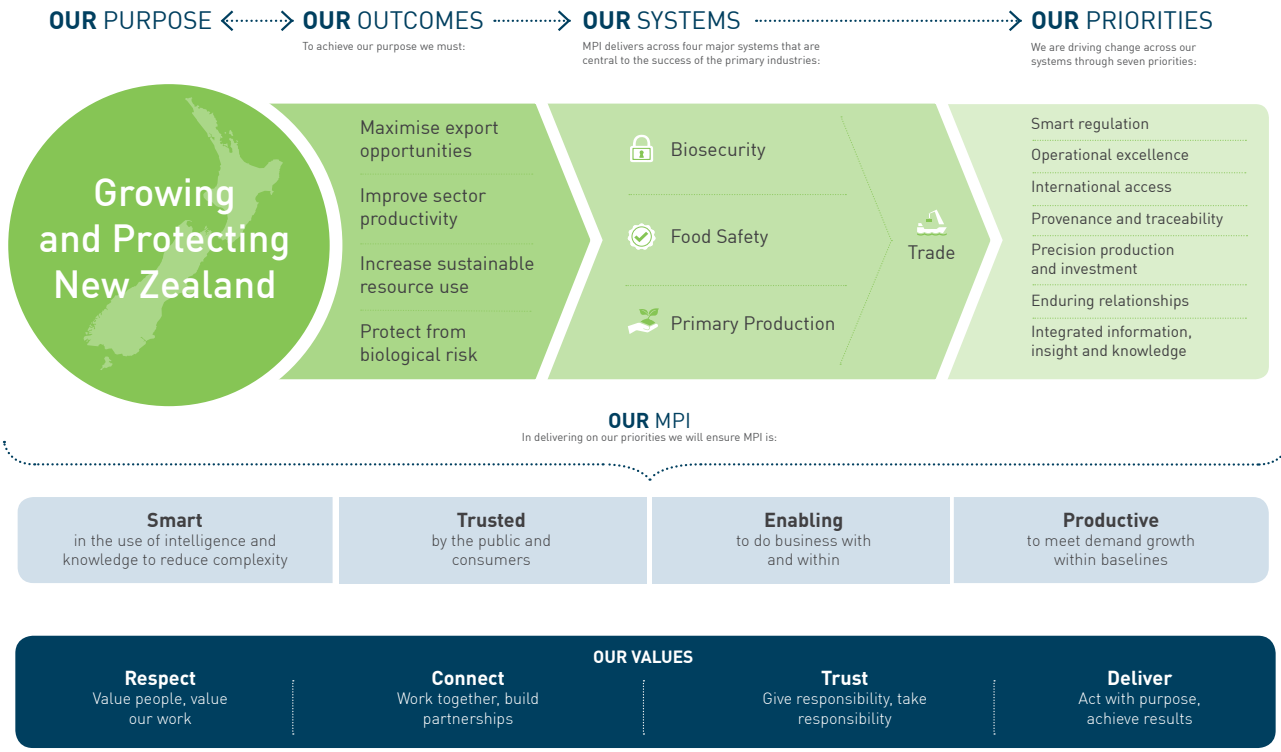
Fisheries (resource management)	MPI has strong engagement with fisheries research driven by the needs of the quota management system, the Fisheries Act 1996, other acts and international agreements. Examples of outputs required include: • development and application of stock assessment methodologies; • improved marine oceanography, ecology, biodiversity, and ecosystem services; • sustainable use and management of marine and freshwater resources, including aquaculture; • investigation and mitigation of the effects of fishing on the aquatic environment; • meeting international obligations in resource management; • meeting Treaty of Waitangi obligations.
Government goals	
Optimising and value add	Driven by the Government's Business Growth Agenda and MPI's strategy to both grow and protect the primary sector, there is a clear need for more value added activities throughout production processes and to drive down cost by optimising current and future value chains. Examples of outputs required include: • optimised sustainable production systems and value chains; • technologies for traceability and provenance; • identification of primary products to meet new consumer demands; • maximised value add to primary products.
Emerging science issues – we also need to be able to respond effectively to emerging science and technology developments	
Emerging science issues	MPI needs to establish a longer-term view of future science and technology needs and developments to ensure that it is providing the most effective evidence in an evolving science world and to be ready to handle the impacts of new science and technology developments. Current areas include: • biotechnology and genomic technologies – important, for example, in molecular diagnostics, new organisms, and smart genetics; • precision agriculture practices – important for increasing productivity under environmental and social constraints, water limitations and labour costs; • new enabling technologies for innovation – examples include advances in fishing technology that will reduce the impact on the environment, remote sensing for border protection and production analysis; • data handling and analysis, which are important across the whole current and future range of MPI activities; • increasingly sophisticated research infrastructure such as containment laboratories and associated technologies; • monitoring and evaluation practices focused on the impact of our science and technology across multiple dimensions of well-being.



Direction

Our science investments, activities and work programmes need to be organised to clearly align with the strategic goals of MPI, as outlined in *Our Strategy* provided below in Figure 4, and in accordance with broader Government and primary industry sector goals.

Figure 4: Our Strategy 2030 – Growing and Protecting New Zealand



MPI priorities

To support the MPI outcomes, MPI is organising its work around seven priority areas as part of the Four Year Plan. This *Science Strategy* will support the seven priority areas by ensuring that the contribution of science and science evidence has the maximum impact internally, with a consequential impact on the primary industries sector. Table 2 identifies how science supports each of the priorities.

Table 2: Science supporting the Seven Priorities

MPI Seven priorities	Science support
1. Smart regulation The quality of our regulation system has a significant impact on our sectors, our resource, our market access and New Zealand's reputation as a producer of primary products.	MPI uses high quality, robust science to achieve our regulatory objectives. MPI will continue to develop partnerships such as GIA in joint approaches to biosecurity responses and readiness.
2. Operational excellence A significant part of our economy depends on the quality of our operational functions – food safety, biosecurity, and primary production systems. As the economy grows, these functions need to evolve to counter threats and take advantage of new technologies.	MPI has the science infrastructure to support operational excellence in a timely manner e.g. databases, containment facilities, laboratories, access to collections. MPI uses best practice in procuring and evaluating science evidence for decision-making for regulations and standards. There is public and stakeholder trust in MPI science and science evidence. Providing the tools for improved operations.
3. International access To double the value of exports by 2025 we must maintain and enhance market access, amidst a complex international trade dynamic.	Regulations for access will be based on science evidence. Science will be applicable to different countries and cultures. MPI science evidence is open, unbiased and trusted by our trading partners.
4. Provenance and traceability Traceability and transparency are key criteria for entering premium markets and major retail chains.	MPI will have the evidence base to support verification of track and trace systems for our overseas partners and other regulatory agencies. Customers will have confidence in MPI's science and science evidence for a Government-based certification system for track and trace.
5. Precision production and investment MPI will support emerging technologies that bring precision to primary production.	MPI will make the best use of any MPI-funded IP to ensure it is fully utilised. MPI will continue to support science in the development of robust decision support systems. MPI will give high priority in its science activities to new technologies and innovation in precision production and investment.
6. Enduring relationships MPI will communicate, educate and build trust in working with our sector, agencies and research organisations.	Relationship plans are established and functioning effectively with key domestic science providers. MPI will establish and maintain key international science relationships. MPI has established appropriate science relationships with industry stakeholders and understands their science needs and priorities. MPI has strong Iwi/Māori relationships enabling parties to work together to utilise shared knowledge, achieve shared outcomes and create new opportunities.
7. Integrated information insight and knowledge We will provide knowledge and information that industry and decision-makers can rely on, and the public can trust. We will use information to better target our activities and interventions.	Everyone in MPI understands that fit-for-purpose information is critical in evidence-based decision-making. MPI staff have direct and immediate access to the latest published science to support policy decision-making. MPI staff have direct access to science experts nationally and internationally to source necessary science advice. MPI ensures that appropriate MPI funded science is easily accessible to MPI staff, industry and other stakeholders, and acts as a custodian for these data.

MPI Investment System

The MPI Science System will provide support for the MPI Investment System currently in development. In particular the science activities will support a shift in focus of MPI investment towards a more substantive emphasis on adding value to primary sector products and protecting our resources.

Key goals that need to be addressed in the Action Plan to ensure the Direction dimension is enacted include:

- specific evidence plans for each of MPI's science strategic areas (as given in Table 1);
- clear forward plans for MPI science investment, both financial and strategic, to provide greater clarity and financial stability for MPI internal science delivery and for research providers.

Delivery

To produce high quality science and science evidence we require quality delivery of internal MPI science and procurement and contracting systems that support the two-way relationships between research users and providers, and result in usable, relevant research outputs.

The creation of science knowledge is a critical part of the MPI Science System. We have four science delivery mechanisms that help us achieve the strategic science outcomes set out in Section 3:

- Internal delivery;
- Commissioning internal and external research;
- Contributing to external research endeavours;
- Te Ao Māori – working in partnership.

Internal delivery

MPI has extensive science capability. We need to ensure that there is sufficient in-house retention and development of scientific capacity and capability to use the full spectrum of relevant evidence and to know how to access it to support policy- and decision-making. This is particularly important for our specialist groups in the biosecurity, food safety, risk assessment, fisheries, and verification.

MPI has investigation and diagnostic centres that provide highly specialised, flexible, responsive, and accessible input to the business-as-usual MPI work activities and in response situations. They deliver low volume, non-standard, and high complexity tests that fit with MPI's needs. From a risk assurance perspective, these in-house laboratories support an end-to-end integration and accountability for highly sensitive animal and plant biosecurity activities.

MPI also draws on individuals and organisations adept at working in the "knowledge brokering" capacity. For example, we use the expertise of CRIs, universities, and individual experts, both domestic and international. Internal expertise is critical for getting the most value from these interactions.

It is important, therefore, that we are resourced to an appropriate level to deliver and use the standard and quality of science we require.

Key goals that need to be addressed in the Action Plan to ensure the Delivery dimension is enacted include:

- a capability plan and targeted needs analysis for ensuring science personnel and infrastructure within MPI is fit-for-purpose, now and in the future;
- the role of science is recognised across all of MPI and informs internal strategic directions and priorities;
- high quality and fit-for-purpose science advice is available to inform the development of policy, regulations and other relevant functions within MPI.

Commissioning internal and external research

There is a considerable amount of current work being done to improve the contracting, procurement and project management environment within MPI. Alignment of programmes and projects in the new Grants Management System is a critical first step. It is important that MPI continues to incorporate all research and development in this system to maximum benefit.

There also needs to be ongoing co-ordination and communication across MPI in commissioning research to ensure that potential links or impacts are understood and any risks or opportunities well managed.

Key goals that need to be addressed in the Action Plan to ensure the Delivery dimension is enacted include:

- co-ordinated Grants Management System for the commissioning, procurement and monitoring of provider contracts;
- prioritised management of research funds through development of evidence plans;
- effective management of provider information;
- an integrated process for accessing science literature.

Contributing to external research endeavours

MPI currently has relationship management plans in place with some CRIs, with others under development. However, MPI engagement with external research providers could be further improved to ensure an appropriate level of input and expertise to external research programmes to support greater impact (e.g. the National Science Challenges).

Key goals that need to be addressed in the Action Plan to ensure the Delivery dimension is enacted include:

- relationship management plans for all key research providers with the aim of establishing and maintaining more strategic relationships;
- enduring structures and processes for identifying, prioritising and agreeing research inputs to external research programmes.

Te Ao Māori – working in partnership

MPI needs to achieve durable capacity to ensure that we have enduring Iwi/Māori relationships, incorporating Māori values and perspectives into our science activities, and helping us realise economic opportunities. To do this we need to adopt a systematic approach and build internal capability so staff have an understanding about Māori as partners, and an understanding of how the Treaty of Waitangi applies to their work. We also need to build on the capability of Māori to be decision-makers over their own affairs, or participating in collective forums, identifying opportunities that currently exist for Māori to act in this capacity.

Key goals that need to be addressed in the Action Plan to ensure the Delivery dimension is enacted include:

- ensuring staff have basic skills in te reo, understand the Treaty of Waitangi, tikanga and mātauranga Māori, and understand the implications of this for their science work;
- science advice criteria and policy documents include Māori perspectives and mātauranga as appropriate.

Uptake

The successful uptake and use of science and technology by policy- and decision-makers and sector users will be supported by effective extension strategies and high quality capability.

Achievement of the future vision for MPI science will be impacted by the effective uptake of high quality science advice by internal and external stakeholders. For uptake to be successful, the right extension approaches and support strategies are required. In all cases, successful extension relies on the knowledge and technology being relevant and accessible. The strategies used to support uptake must take into account understanding of the target audience and context, including Treaty of Waitangi implications.

Relevance is increased if research and development is undertaken in partnership with members of the intended audience. The accessibility of research findings and technologies developed can be increased through better communication and early inclusion of partners and key stakeholders, and information management systems. This includes the routine provision of metadata allowing stakeholders to readily identify research of direct relevance to their interests. For example, access to recent MPI published reports is good, but these are not always maintained long-term. In the future, we will put in place arrangements for information to be made available to science users in a format that is more useful to key audiences.

We will actively encourage the uptake and usage of research findings and development of technologies by using the MPI extension framework (*Appendix 3*) to help identify the most effective approach to uptake and, therefore, the type of extension strategies required to maximise the impact.

Key goals that need to be addressed in the Action Plan to ensure the Uptake dimension is enacted include:

- systems to ensure early involvement of partners and key stakeholders;
- a centralised research register, as part of the Grants Management System, to classify research according to key attributes, including sector, thematic area (e.g. climate change, food safety, biosecurity) and alignment with MPI's *Strategy 2030* and other priorities;
- MPI Science Publications Policy implemented across MPI;
- the placement of all non-sensitive MPI-commissioned research reports on the MPI website and ensuring stakeholders have public access to plain English summaries of science work to allow for broader understanding and uptake;
- extension framework implemented across MPI as appropriate.

Review

To support continuous improvement the Science System and processes will be subject to timely reviews. We will be responsive to recommendations made as a result of feedback. We will also review the effectiveness of science evidence in policy-making and regulation-setting.

Review is an important part of the MPI Science System. We need to ensure that we regularly and effectively review our systems and processes for direction, delivery and uptake. Review is also important for ensuring the quality of the science we commission and/or use.

MPI has many separate and variable methods for reviewing the quality of the science-based evidence we produce and procure. While many of these methods are fit for purpose with respect to individual programmes or funds, MPI would benefit from a common standard for science quality assurance. The Research and Science Information Standard for New Zealand Fisheries is an effective and essential framework for ensuring that high quality information underpins all fisheries management decisions, fisheries policy and standards. This standard is now being modified to provide guidance on reviewing science and ensuring high science quality for all relevant MPI programmes and funds.

Within MPI, there are also a number of different methods for reviewing the direction, delivery and uptake of science and science evidence at the project and programme level. This can be strengthened through a more consistent, systematic approach to review within individual programmes and funds and across MPI's internal Science System.

Key goals that need to be addressed in the Action Plan to ensure the Review dimension is enacted include:

- the MPI Investment System Programme identifies clear objectives and performance metrics at the front end of all investments, and consistent uptake and evaluation are key elements of the review;
- active relationships with Māori and key stakeholders to ensure involvement in review occurs before, during and after initiatives to guard against feedback being sought after key decisions have already been made;
- an MPI-wide science quality assurance standard.

Capability and culture

Capability

Pressures from rapid changes in science and technology (e.g. data handling, genomics and diagnostics) and increasing demands from external engagement with research initiatives such as the National Science Challenges, are providing a challenge in maintenance and development of appropriate levels of key staff.

Meeting this pressure will be helped by science and technology capability mapping and strengthening of relevant career pathways. To ensure success in achieving our strategic science goals it is critical that high quality candidates are selected and retained for scientific and technical positions and that a full appreciation of resource needs is established.

The particular issues of succession planning and potential loss of expertise within an ageing MPI science demographic need to be addressed in the Action Plan.

MPI staff also need to be more actively engaging with Māori perspectives. This includes a wide understanding of how the Treaty of Waitangi applies to their science activities, and working towards basic skills in te reo, to provide greater confidence in engagement and a view of engagement as a partnership. Appreciating Māori perspectives of a wider world view, high level of outcome focus and the interweaving of traditional perspectives with current science approaches will create value and success in MPI science outcomes. Māori capability in MPI science and technical positions needs to be considered.

Culture

To be recognised and trusted for the excellence and robustness of our science, it is important that our Science System is underpinned by strong professional ethics and integrity. The principles supporting this *Science Strategy* are set out in Section 1. To ensure that our science practice reflects these principles we will promote an internal culture of scientific integrity including:

- compliance with all legal and regulatory requirements;
- putting in place appropriate mechanisms to resolve science-based disputes;
- guaranteeing protection for those who uncover and report allegations of research misconduct or other violations of scientific integrity in accordance with the Protected Disclosures Act;
- acknowledging Te Ao Māori.

We will hold our staff to the highest standard of professional and scientific ethics and integrity, as described in this strategy.

5 Implementation of the Science Strategy

To ensure that this *Science Strategy* is adopted and implemented across all science interests within MPI and recognised by all MPI partners and stakeholders, we will develop an implementation approach that aligns current initiatives and builds the additional systems and processes required to be successful.

The Science Advisory Governance Board will oversee routine monitoring and evaluation of the *Science Strategy* actions and strategic science outcomes that will be put in place to ensure that it continues to provide relevant guidance for the performance of the Science System.

Science Action Plan

This *Science Strategy* will be supported by a separate operational Action Plan that provides detailed measures, indicators and milestones and sets out how we will deliver results across the Science System, and in accordance with the priorities set out in Table 1. This will be agreed to and co-ordinated by the Science Advisory Governance Board (refer *Science Governance*: *Section 2*).

The Action Plan will align with the MPI Science System logic model (refer figure 1). The activities and strategic science outcomes identified in the logic model provide the starting points for developing measurable indicators to monitor progress, and evaluate success related to the impact of the Science System. Baseline measures will be established, and data collected on progress towards the achievement of the *Science Strategy* goals. Regular monitoring is key to ensuring activities and outputs are modified or refined to optimise positive outcomes, and mitigate any unforeseen negative impacts.

Risk identification and management

There are a number of risks that need to be managed over time. These concern both the *Science Strategy* and the MPI Science System and its operation and need to be further elucidated, along with appropriate mitigation strategies, as part of the Action Plan. A comprehensive risk management process will provide us with the best opportunity to successfully implement this *Science Strategy*. Broadly, the risks can be categorised as:

Risks to the successful implementation of this Science Strategy.

Specific risks in this category include a lack of alignment with the wider MPI strategy; poor quality business processes and systems to support the Science System; and capability and resource deficits that create barriers to the implementation of this strategy. In addition, we need to carefully manage discrete risks that include poorly targeted research, and inadequate alignment with external science strategies, development and investment.

Risks in how science and science evidence are used within MPI, and by the sector.

There are also specific risks that will need to be managed in relation to the uptake and use of science and science evidence by MPI for the purpose of policy- and regulation-setting, and decision-making. Similarly, we need to be aware of how our science outputs are used by sector interests. In particular, there are specific risks relating to the ability and confidence of sector stakeholders to use the science and science evidence appropriately.

Risks in maintaining and developing science capability.

Employing, retaining and developing key science personnel in science and technical roles, and in managerial career pathways is critical to the continuing functioning of MPI's Science System. This impacts on both the enactment of this *Science Strategy*, and in the science operations of MPI at large. It also applies to the need for staff to engage with and incorporate Māori perspectives. These risks can be mitigated by initiatives including:

- strong career pathways;
- employing high quality staff;
- career opportunities, and ensuring that there is on-going assessment of the scale of science and technical resource available for MPI functions;
- ensuring staff acknowledge and have an understanding of Te Ao Māori.

Initial actions

To achieve the strategic science outcomes in this *Science Strategy*, the following actions (to be further detailed and expanded on in the Action Plan) will be taken over the next 5 years to meet the goals outlined in Section 4.

2016:
• Commence development of evidence plans to support prioritisation for each of MPI's strategic areas (Table 1).
• Develop systems to ensure early involvement of partners and key stakeholders.
• Develop a centralised research register, as part of the Grants Management System, to classify research according to key attributes, including sector, thematic area (e.g. climate change, food safety, biosecurity) and alignment with MPI's *Strategy 2030* and other priorities.
• Complete relationship management plans for all key research providers with the aim of establishing and maintaining more strategic relationships.
• Scope options to support staff to have basic skills in te reo, understand the Treaty of Waitangi, tikanga Māori and mātauranga Māori, and understand the implications of this for their science work.
• Develop an MPI-wide science quality assurance standard.
• Develop an integrated process for accessing science literature.
• Develop enduring structures and processes for identifying, prioritising and agreeing research inputs to external research programmes.
• Develop an implementation plan for using the MPI extension framework.
2017:
• Finalise development of evidence plans for each of MPI's science areas.
• Develop a capability plan and targeted needs analysis for ensuring science personnel and infrastructure within MPI is fit-for-purpose, now and in the future.
• Finalise and implement the MPI Science Publications Policy across MPI.
• Placement of all non-sensitive MPI-commissioned research reports on the MPI website, and ensure stakeholders have public access to plain English summaries of science work to allow for broader understanding and uptake.
• Further develop the MPI Investment Programme to identify clear objectives and performance metrics at the front end of all investments, and consistent uptake and evaluation are key elements of the review.
• Implement approach for supporting staff to more effectively engage with Māori in their science work.

2018-2020:
• Evaluate the use and impact of evidence plans.
• Clear forward planning in MPI science investment, both financial and strategic, to provide greater clarity and financial stability for MPI internal science delivery and for research providers.
• Evaluate the role of science in MPI and how science informs internal strategic directions and priorities.
• Evaluate quality and fit-for-purpose science advice is available to inform the development of policy, regulations and other relevant functions within MPI.
• Monitor science advice and policy documents with regards to the inclusion of Māori perspectives and mātauranga as appropriate.
• Evaluate the use and impact of the extension framework across MPI.
• Maintain active relationships with Māori and key stakeholders to ensure involvement in review occurs before, during and after initiatives to guard against feedback being sought after key decisions have already been made.

By 2020 we should be in the position to evaluate our success in achieving the strategic science outcomes presented in *Section 3*.

Appendix 1: How we will enact the principles

Scientific excellence

We will use and generate robust, high quality and relevant science.

- All science will be based on quality practices.
- Scientific information will be used appropriately and accurately, and comply with all relevant statutory and regulatory standards and procedures.
- Information will be available on the methodology, data and models used to develop scientific conclusions, including a clear explanation of underlying assumptions and uncertainties, and probabilities.
- Extensive and timely peer review will be sought to establish the quality, accuracy and contemporary relevance of our science activities findings.
- Appropriate and genuine consultation will be undertaken to ensure relevance of our science activities and findings.
- Career pathways will be developed that value competencies related to scientific excellence and professional development opportunities support.

Ethics and integrity

We will promote a culture of scientific integrity including operating openly, and adhering to the highest ethical standards in the science we conduct and the way in which it is used.

- Science data, analysis, findings and conclusions, and their use in policy-making, will be free from inappropriate interference and influence.
- Science and technological findings will not be suppressed or altered.
- Scientific findings or conclusions will be openly communicated, and be consistent with applicable statutes, regulations and document-handling procedures and policies.
- MPI will support robust and open debate on scientific issues.
- Appropriate ethics approvals will be obtained for research, and where possible, the use of animals will be minimised.
- There will be a clear understanding of the role of science-based evidence in policy- and decision-making.

Partnering and collaboration

We will actively engage across Government, with the wider scientific community, with Treaty of Waitangi Partners, and with domestic and international stakeholders to commission, carry out, and promote scientific research.

- External stakeholder engagement will be done in a manner that is consistent with Government rules of ethics, Treaty of Waitangi obligations, job responsibilities, and existing Ministry policies.
- A culture of collaboration and engagement with key stakeholders and Māori Treaty partners will be promoted to prioritise research investments, and ensure that outcomes are fit-for-purpose.
- Engagement with Iwi/Māori will ensure appropriate tikanga and mātauranga Māori protocols and perspectives are included.
- A “best-teams” approach will be used in the commissioning of research.
- Science staff will engage in external research programmes that are a priority to MPI and will work across Government to align investment and outcomes for the benefit of the primary industries.
- Strong relationship management will be supported among science and non-science personnel within MPI to ensure that common goals and outcomes in the use of science are achieved.

Accessibility

We will make the results of our science and science evidence available to the public, the primary industry sectors, the wider science community, and international audiences as appropriate.

- Scientific findings and outputs will be communicated to a wide external audience through interactive conversations about their implications and requirements for effective uptake.
- Open access will be supported where appropriate.
- Publication of research findings in peer-reviewed, professional, or scholarly journals will be encouraged.
- Scientists will co-ordinate with supervisors and the communications office to support active engagement with stakeholders and the media regarding their scientific findings.
- Internal and external scientists will communicate their findings without interference or inappropriate influence, while at the same time complying with MPI policies and procedures for planning and conducting scientific activities, reporting scientific findings, and reviewing and releasing science outputs.

Appendix 2: Science and innovation funding of relevance to primary industries

Overview of main Government science and innovation funds of relevance to the primary industries, and all MPI research funds that include a significant science and innovation component.

	Fund	Agency responsible for administration	Recipients
Both investigator and mission-led	The **Performance-Based Research Fund (PBRF)** funds research and research-based teaching in tertiary education organisations on the basis of the measured quality of research.	Tertiary Education Commission (TEC)	Tertiary education organisations
	Centres of Research Excellence (CoREs) funding is for co-operative tertiary research in areas of research strength.	TEC	CoRE partnerships, which must include a tertiary education organisation
Primarily investigator-led	The **Marsden Fund** is for excellent fundamental research.	Royal Society of New Zealand	Researchers
	Crown Research Institute (CRI) core funding is direct funding to CRIs to enable them to contribute to the outcomes in their Statement of Core Purpose.	MBIE	CRIs
Primarily mission-led, including research to inform/support regulation and meet international obligations	**National Science Challenges (NSCs)** are research collaborations seeking answers to the most pressing issues of national significance facing New Zealand.	MBIE	NSC collaborations, which include public and private research organisations
	MBIE Sector-based Research funding is awarded through contestable processes, and goes to a variety of sector-specific research projects.	MBIE	Research organisations
	Contestable funding for health research is similar in nature to contestable funding (above), but is administered by the **Health Research Council (HRC)** through a separate process.	HRC	Researchers and research organisations
	Sustainable Land Management and Climate Change funds the development and implementation of climate change policies and practices for the agricultural and forestry sectors.	MPI	Research organisations
	Sustainable Land Management and Climate Change Tech Transfer funds the uptake of new technologies and practices for the measurement and mitigation of greenhouse gas emissions.	MPI	Research organisations
	The **New Zealand Agriculture Greenhouse Gas Research Centre** funds R&D, technologies and practices to grow agriculture's ability to create wealth for New Zealand in a carbon-constrained world.	MPI	Research organisations
	The **Climate Change Global Research Alliance** funds principally joint domestic and international research and scholarships to reduce greenhouse gas emissions from pastoral livestock systems and to enhance productivity.	MPI	Research organisations

	Fund	Agency responsible for administration	Recipients
Primarily mission-led, including research to inform/support regulation and meet international obligations	**National Greenhouse Gas Inventory Research Grants** fund the provision of information to compile New Zealand's national agriculture and some planted forestry greenhouse gas inventory, in order to meet the annual reporting requirements of the United Nations Framework Convention on Climate Change (UNFCC).	MPI	Research organisations
	Fisheries Research funds the stock assessment and aquatic environment and biodiversity research that underpin MPI and Ministerial decisions on the utilisation and sustainability of marine resources to meet the requirements of the Fisheries Act, relevant policy, and international obligations.	MPI	Research organisations
	Biosecurity & Animal Welfare Operational Research funds direct contracting of research to provide the science evidence base for biosecurity and animal welfare decision-making across MPI.	MPI	Research organisations
	Food Safety Operational Research funds direct contracting of research and scientific services to provide MPI with a scientific evidence base for standard development and market access support.	MPI	Research organisations
Primarily industry-led	The **Primary Growth Partnership** invests in long-term programmes of research and innovation aimed at increasing the value of primary industries. Government funding is matched by industry co-funding.	MPI	Primary industry business
	The **Sustainable Farming Fund** supports farmer, grower, and forester-led communities of interest to undertake applied research and extension projects to tackle a shared programme or develop a new opportunity.	MPI	Communities of interest
	Callaghan Innovation is a Crown entity that works with businesses to help them turn their knowledge into successful commercial products and services, and to improve their growth and competitiveness. Its focus is businesses in the manufacturing and services sectors. It provides services to businesses and distributes the business R&D funds noted below.	Callaghan Innovation	Businesses
	Business R&D funding consists of a variety of funds and projects to assist businesses to engage in research and development.	MBIE and Callaghan Innovation	Businesses
	International, Infrastructure, Science in Society, and other smaller funds.	MBIE	Varies

Appendix 3: MPI Extension Framework

The MPI extension framework shows how research, development and extension processes work together to support innovation and high performance in the primary industries. More importantly it provides a tool for helping to ensure that the extension approach taken for any area is fit-for-purpose and delivers maximum impact. The spectrum ranges from technology transfer at one end, which might include publishing on a website, to co-innovation at the other, which requires working with end-users and other key parties collaboratively from day one.

Supporting Innovative and High Performing Primary Industries

Research	Development	Extension
Process of establishing new knowledge.	Process of developing technology (Products/Practices/Systems) that are fit for purpose to meet a need or realise an opportunity.	Process of enabling change of individuals, communities and/or industries through supporting them to use or further develop new knowledge and/or technology.

Four broad approaches to extension are identified:

Transfer

Adoption

Adaptation – requires further development and/or research to tailor

Co-innovation – fully merges research, development into extension

Transfer	Adoption	Adaptation	Co-innovation
Appropriate if the focus of the extension: • is known and wanted by target audience; • simple or easily understandable to target audience (often an improvement on existing knowledge/technology); • requires no (or minimal) change to user context for successful embedding.	Appropriate if the focus of the extension: • is wanted or needed by target audience; • is relatively simple or clearly links to current knowledge/technology already in use; • requires changes to be made in the user context (e.g. change in attitude, practice, product use, system setup); • has impacts that are easy to see and reversible.	Appropriate if the focus of the extension: • is largely unknown to or not well understood by the target audience; • is complex/includes multiple ideas/technologies working together; • requires tailoring to ensure fit-for-purpose across different contexts; • requires changes to be made in the user context (e.g. change in attitude, practice, product use, system setup); • has impacts that are significant and are able to be argued as a clear priority for the user or other key stakeholders (often impact is not easily reversible).	Appropriate if: • there is no clear problem definition and/or; • existing knowledge and technologies are not suitable for use; and the nature of change: • impacts on a range of stakeholders/communities; • is very complex and/or has conflicting drivers; • has significant system-wide implications; • requires exploration and critique of current assumptions, outcomes etc; • requires new research and/or development work to solve problems or realise aspirations fit for most/all stakeholders involved.
Minimal support required. Support should focus on: • effective communication of availability; • providing a means of access.	**Medium** level support required. Support should focus on: • enabling users to identify changes needed to their specific context; • trialling, monitoring and modifying as necessary; • providing adequate technical knowledge; • understanding and working with user's current attitudes, values, knowledge and practices; • understanding and working with users' contextual constraints and opportunities.	**Significant** level of support required. Support should focus on: • the establishment and maintenance of a network that allows a range of stakeholders to effectively work together – may require additional brokers; • ensuring expertise from all key stakeholders (including tacit knowledge) informs tailoring decisions; • employing strategies to ensure attitudes, values, current practices, contextual constraints and opportunities are understood by all stakeholders and these understandings inform key decisions; • decision-making is informed by monitoring and evaluation.	**Extensive collaboration** between a range of stakeholders required. Collaboration should provide: • opportunity for stakeholders and brokers to work together to create effective networks; • access to a range of knowledge and skill bases including and in excess of that held by stakeholders, to maximise opportunity for innovation; • a culture of trust where valuing of multiple perspectives is inherent and the nature and direction of change is negotiated and agreed; • participatory learning environments where research and development is driven by all stakeholders; • decision-making is informed by monitoring and evaluation; • opportunity to extend resulting knowledge or outcome to wider group.