



Science, strategies, roadmaps and MPI

Ian Ferguson

Growing and Protecting New Zealand

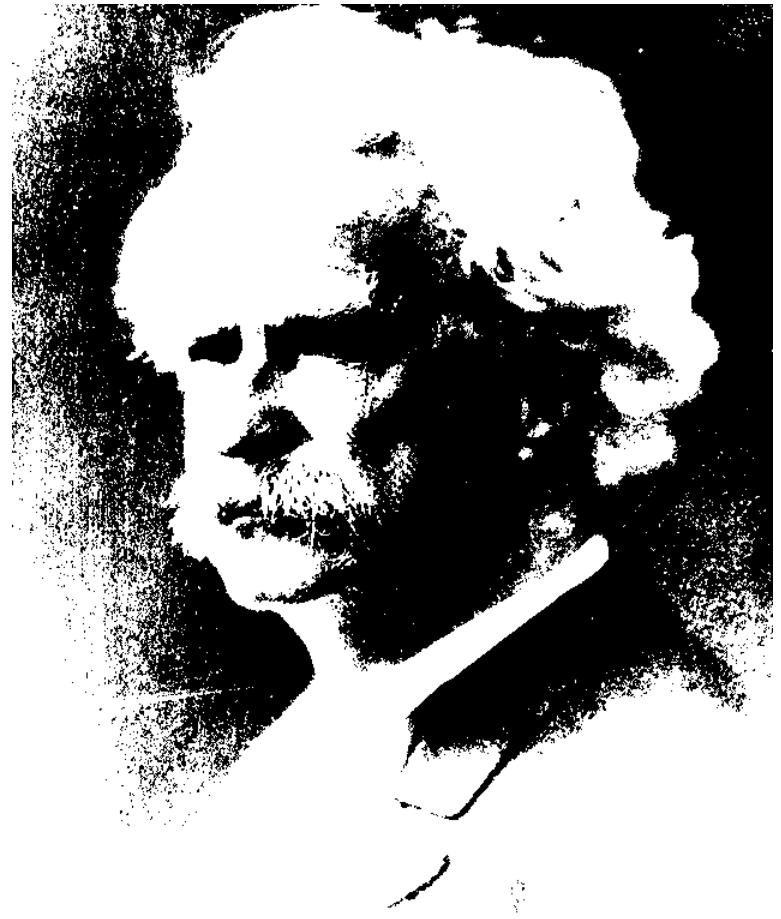


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*The trouble with the world
is not that people know too
little; it's that they know so
many things that just aren't
so.*

Mark Twain

Internet and public ability to access data, or
more commonly access opinion, and then
popularise through social media.



What is evidence and the realities of providing evidence for policy making

Evidence means *“robust and verifiable knowledge, derived from processes ... used to establish the case for a specific policy response.”*

“The role of science is to provide processes that significantly reduce subjectivity, bias and uncertainty in our understanding of our natural, built, and social environments.”

Sir Peter Gluckman: The role of evidence in policy formation and implementation
A report from the Prime Minister's Chief Science Advisor, September 2013

Ministry for Primary Industries
Manatū Ahu Matua



What is evidence and the realities of providing evidence for policy making

Evidence:

(1) Information that feeds directly into regulations and standards but still will be interpreted e.g. setting standards

(2) For policy, is not linear but complex and is only one input, so there must be different expectations.



*It takes many
good deeds to
build a good
reputation, and
only one bad one
to lose it.*

- Benjamin Franklin



MINISTRY FOR PRIMARY INDUSTRIES

Science Strategy

Rautaki Putaiao





Te Ao Tūroa

Primary Sector Science Roadmap

Strengthening New Zealand's Bioeconomy for Future Generations

Growing and Protecting New Zealand





Primary Sector Science Roadmap

Te Ao Tūroa

Strengthening New Zealand's
bioeconomy for future generations

- Determining future science needs and opportunities may not be the hardest part of thinking into the future.
- The hardest part might be “how” we can ensure we benefit from science - how it can be enacted; how it can be acceptable

Purpose of the Project

- The primary industries have been identified by government agencies, industry bodies, and the Prime Minister's Chief Science Advisor as being in need of an integrated, longer term view of science and research needs.
- The targets set out in the Business Growth Agenda will need science and innovation.
- Need an integrated whole of sector view of science and technology needs and opportunities.
- Strategic guidance and priorities for science investment

Purpose of the Project

- The Roadmap aims to provide a long-term view (10-20 years) of primary sector science and technology needs
- It will provide guidance on key priorities for all those investing in R&D related to the primary industries in New Zealand
- It covers all of New Zealand's primary industries across the whole of the value chain, including food and fibre, and land and water-based production systems.
- The Roadmap is co-sponsored by Minister Guy (Minister for Primary Industries)and Sir Peter Gluckman (Prime Minister's Chief Science Advisor)

National Statement of Science Investment 2015-2025 (MBIE)

“A highly dynamic science system that enriches New Zealand, making a more visible, measurable contribution to our productivity and wellbeing through excellent science.”

IMPACT & EXCELLENCE



*Primary Sector
Science Roadmap*

*Conservation and
Environment Science
Roadmap (2017)*

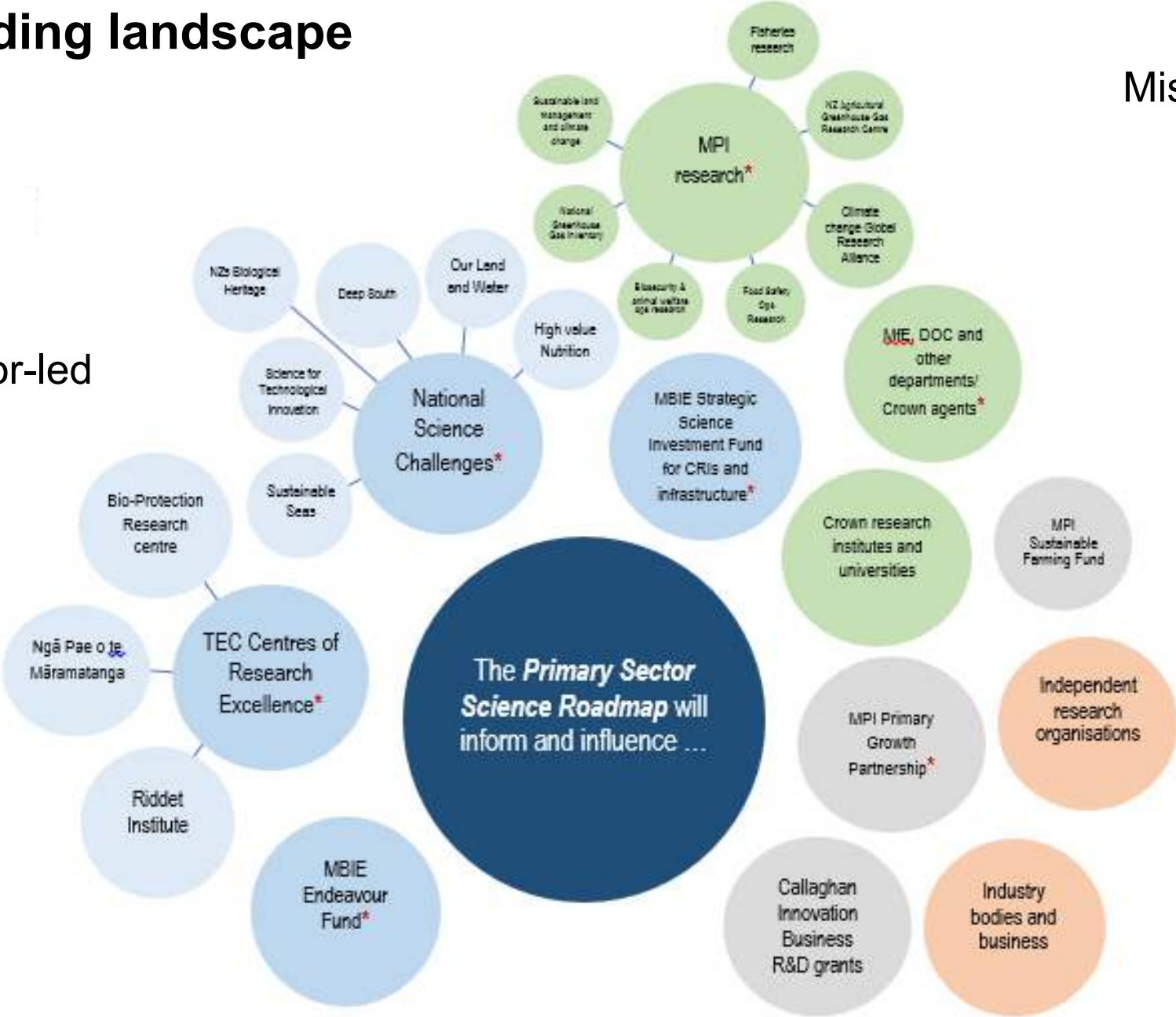
*MPI
Science
Strategy
(2015)*

Business
Growth
Agenda:
Innovation;
Natural
Resources

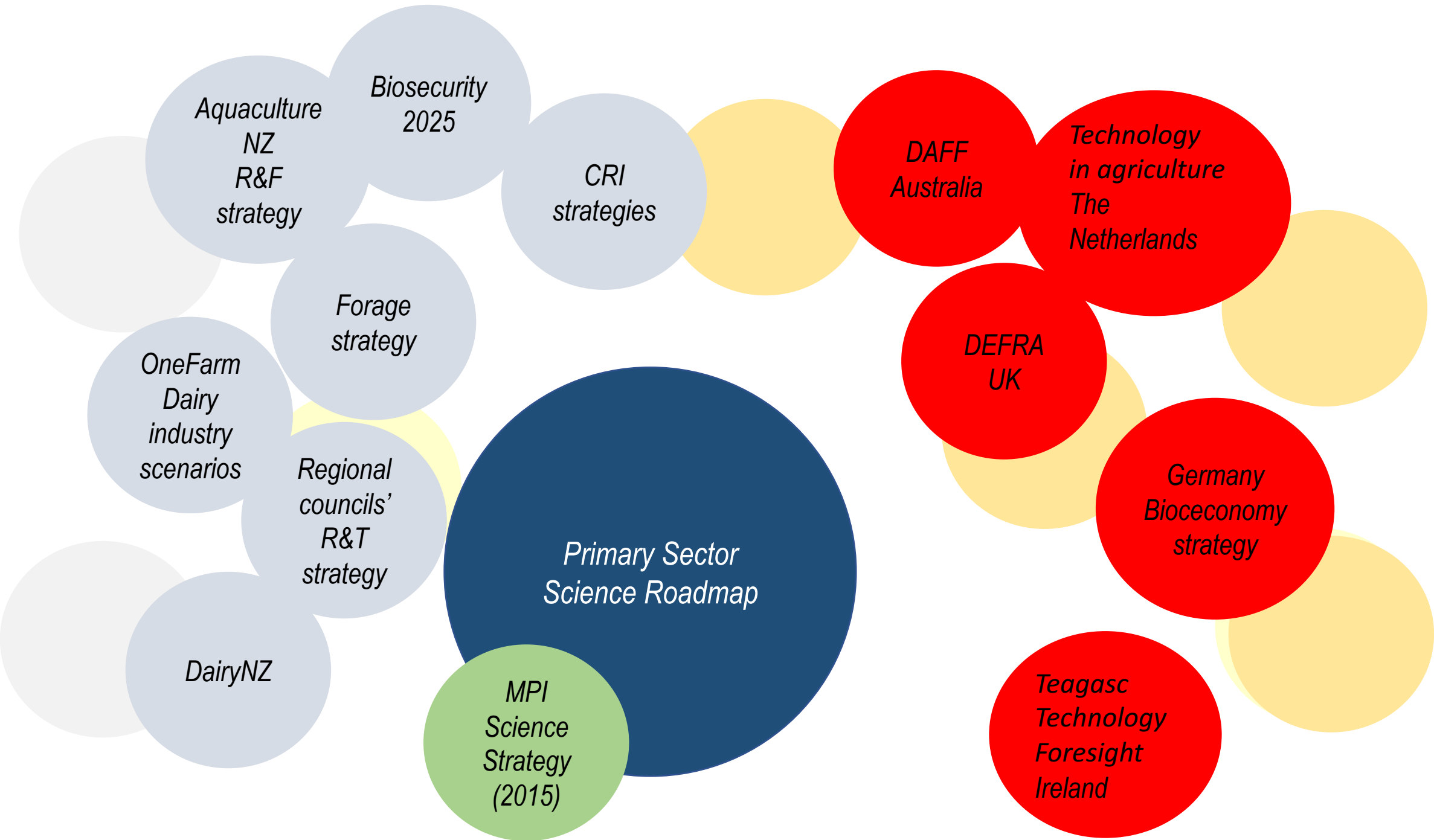
The funding landscape

Investigator-led

Mission-led



Industry-led



Conservation and Environment Roadmap

A Conservation and Environment Roadmap was developed in parallel with this Primary Sector Roadmap.

Released February 2017

The teams involved in each of the two documents have been working closely to align and manage areas of overlap.

New Zealand Government



Conservation and Environment Science Roadmap

DISCUSSION PAPER

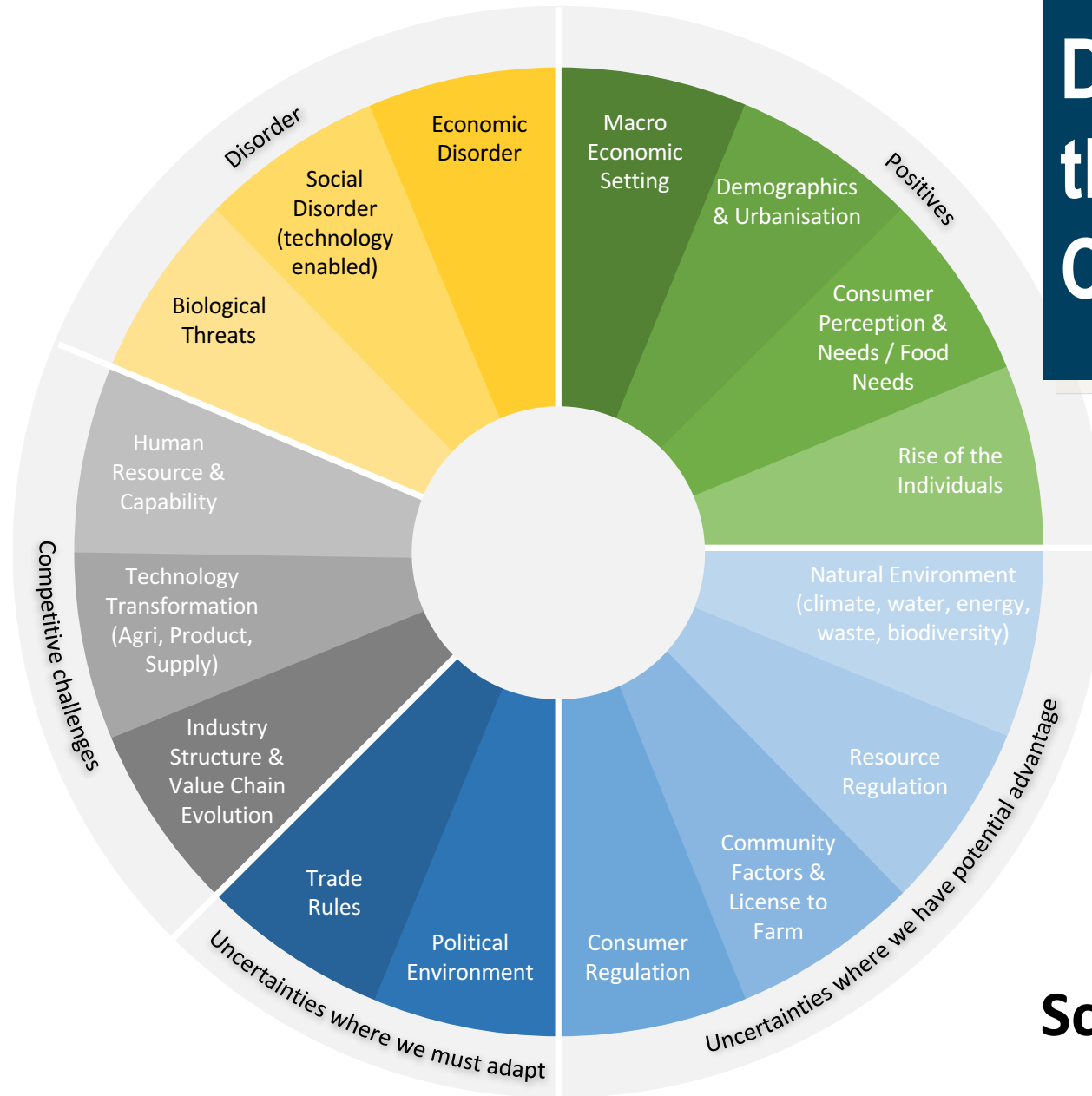
Processes

- Working Group – to produce a draft consultation document.
- Strategic Advisory Group - will provide strategic guidance, oversee progress and keep the project within scope and meeting its purpose.
- Consultation across the sector, industries, science providers, government

Timeline

- 8 March – Targeted engagement begins
- 15 March - BGA Innovation – Update on progress and direction of Roadmap
- 20-31 March – Targeted engagement
- 7 April – Targeted engagement closes
- 8 May – Final Roadmap to the Minister
- 24 May – EGI
- 29 May – Cabinet
- 14 June – Fielddays launch

Demand for Science in the Primary Industries is Changing

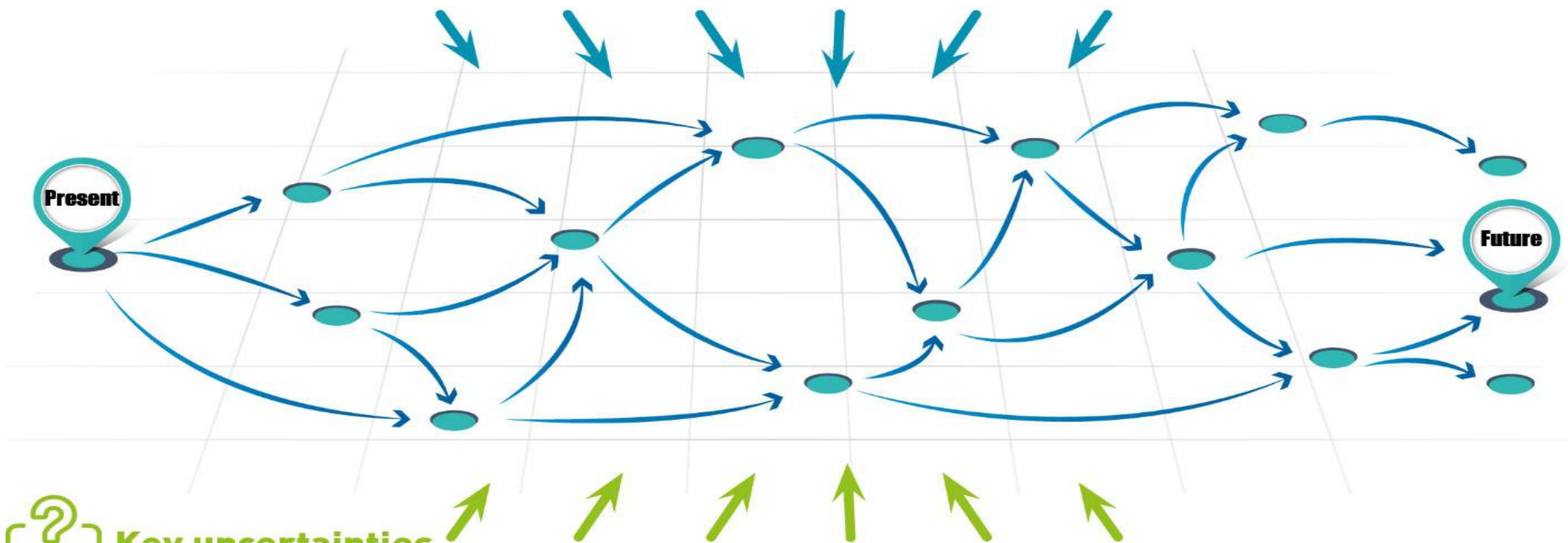


Science in an uncertain world



Key drivers

- Shifting patterns of trade and globalisation
- Accelerating pace of technological change
- Changing consumer markets
- Increasing importance of food safety, quality and security
- Increasing global demands for water, food and energy
- Growing concerns about environmental degradation and climate change
- Empowerment of citizens including through enabling technologies



Key uncertainties

- Trade rules and globalisation
- Biological threats
- Natural environment and resources: value, availability and limits
- Social and economic impacts of technology
- Community and cultural factors
- Regulation of resources
- Impacts of climate change and ability to adapt
- Human resources and skills
- Consumer perceptions about food safety and animal welfare

Demand for Science in the Primary Industries is Changing

The Roadmap identifies 4 key areas of changing demands for science:

- Sustaining, protecting and adapting our natural resources
- Growing productivity and profitability with environmental, social and cultural acceptability
- High value products for consumers
- Integrating primary production systems, people, communities and values

Science Needs

Science needs and opportunities (themes):

1. Adding value
2. Harnessing the value and power of data
3. Innovating with advanced technology
4. Innovating through genetics
5. Innovating through Kaupapa Māori
6. Protecting and sustaining resources
7. Deriving value from complex systems
8. Integrating people and values

A vision for science and technology in New Zealand's primary sector in 10-20 years

Science and technology accelerates innovation, growth for intergenerational economic and environmental sustainability of the primary sector leading to increased well-being for all New Zealanders.

Sustaining, protecting
and adapting our
natural resources

High value products for
consumers



Growing productivity and
profitability with environmental,
social and cultural acceptability

Integrating primary
production systems,
people, communities
and values

The science we need

1. Adding value for consumers
2. Harnessing the value and power of data
3. Innovating with advanced technology
4. Innovating through genetics
5. Protecting and sustaining resources
6. Deriving value from complex systems
7. Innovating through kaupapa Māori
8. Integrating people and values

Capability needs for primary sector science

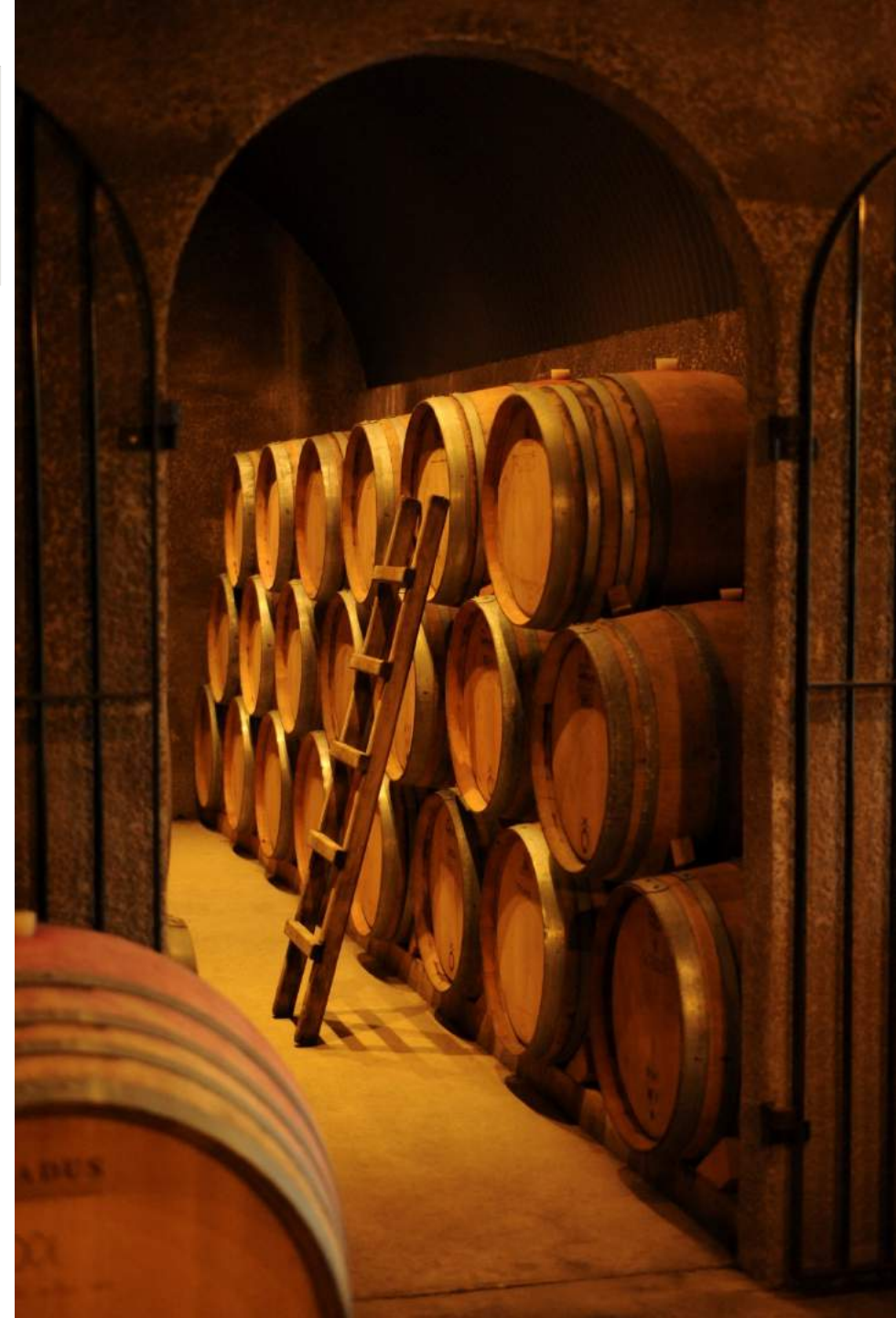
Critical science expertise • Infrastructure • International partners • Science capability in industry

Adding value

Science in this theme needs to support the primary sector to achieve greater profitability across the supply chain from high-value products sold in local and international markets. This will be driven by consumer and market insights and co-innovation and will result in a greater diversity of high-quality products and services.

e.g.

- Bioeconomy
- New food
- Value chain
- Blockchain technology
- Mātauranga and tikanga
- Consumer preferences/ digital technologies/ social media.
- Co-creation, participatory action and co-innovation
- High health food functionality



Harnessing the value and power of data

Science in this theme needs to lead to production systems that are more efficient, adaptable and have a more positive impact on the environment through harnessing the value and power of complex data. This will require major advances in collection of critical data, smart use of connected data sources for real-time data driven decision-making, and optimising advances in data handling, and management and governance.

e.g.

- Sensors/sensor network/data analytics
- Managing big data
- Complex networks
- Internet of Things
- Blockchain

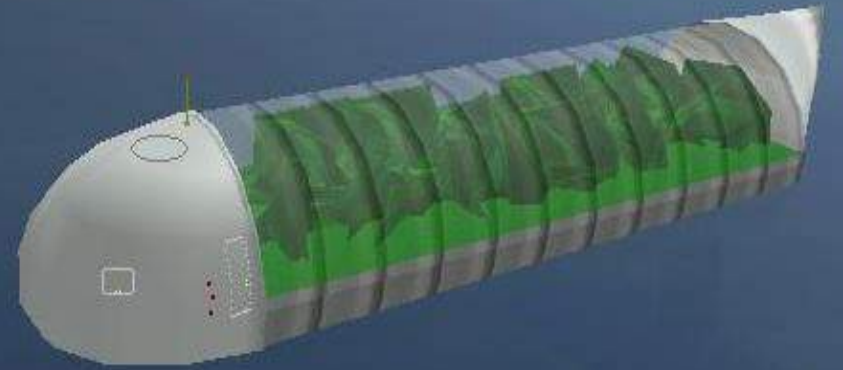


Innovating with advanced technology

Science in this theme needs to ensure a globally competitive NZ primary sector through the development and implementation of new technologies, including advanced disruptive and transformational technologies such as reproductive biotechnology, information and communications technology, synthetic biology, automation and robotics.

e.g.

- High-value products/ deepwater fishing/ocean seafood farming.
- Traceability
- Synthetic biology
- Artificial intelligence/self-learning decision support systems
- Machine learning.
- Barriers to uptake and implementation



Innovating through genetics

Science in this theme needs to lead to plant and animal production that is more efficient, safer and adaptable, while minimising negative environmental impact, allowing rapid development of new generations of food and fibre products.

e.g.

- Germplasm /breeding
- Gene editing
- Public, consumer and Māori acceptance.
- Molecular phenotyping/food/livestock
- Gene drive/biosecurity incursions
- Informatics
- Preservation and maintenance of genetic diversity.



Innovating through kaupapa Māori

Kaupapa Māori research approaches need to provide distinctive and transferable primary sector innovation informed by tikanga Māori, mātauranga Māori and science working together

e.g.

- Māori/science and innovation sector/effective partnerships.
- Co-creation of knowledge using Mātauranga Māori
- Māori values such as te ao tūroa (intergenerational sustainability) and kaitiakitanga/support business models.
- Co-development/co-delivery
- Developing integrated frameworks and improved tools for Māori land- and water-use decision-making
- Increasing Māori participation at all levels in research and innovation by establishing effective partnerships with Māori organisations and Māori enterprise



Protecting and sustaining resources

Science in this theme needs to ensure that new and existing production systems are future-proofed so that terrestrial and aquatic resources, both physical and biological, are mapped, measured and monitored to protect the resources and support appropriately adaptive and multiple uses under rapidly changing conditions

e.g.

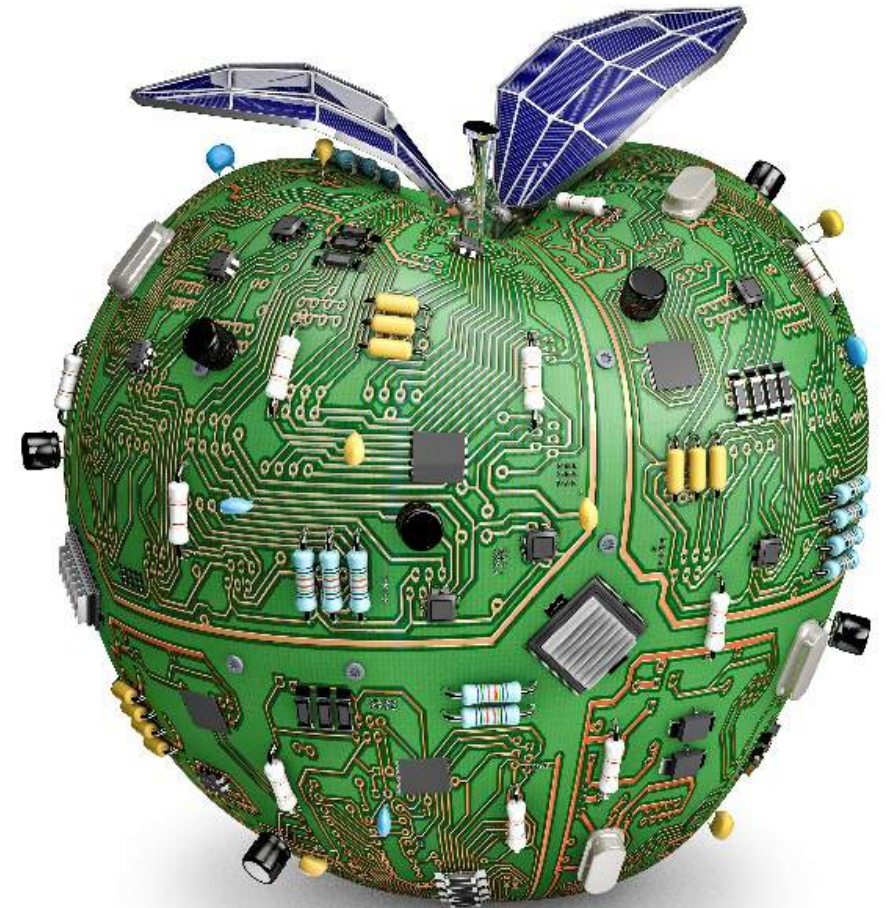
- Preservation/modification of landscapes/climate change
- Resilience Integrated modelling/ whole farm systems
- Ecosystem/catchment/farm levels
- Limits and sustainability of resources.
- Databases and collections



Deriving value from complex systems

Science in this theme needs to enhance sustainability of diversified, multi-functional, terrestrial- and aquatic-based systems and the development of novel products through an improved understanding, analysis and use of the concepts of complex biological and physical systems, feedbacks, networks and the microbiome. e.g.

- Plant-microbial associations/production systems.
- Complex systems and networks
- E-genomics, sequencing and systematics
- Soil microbiome/diversity /environmental change
- Ruminant microbiota and/greenhouse gas emissions.
- Data/decision/artificial intelligence/machine learning
- Marine microbiome/microbial ecosystems/aquaculture/fisheries



Integrating people and values

Science in this theme needs to support the development of future primary production systems that are publically and socially integrated, both domestically and internationally, and enable uptake of science and technology.

- e.g.
- Drivers/barriers/behaviour change
 - Values from ecosystem services
 - Intergenerational environmental benefits and costs/decision-making.
 - Attitudes/values/diverse communities
 - Consensus positions/transformational change.
 - Knowledge/“licence to operate”/consumers.



Threads.....

- People, people, people
- Values
- Whole supply/value chain
- Ecosystem approaches
- Scale – farm, catchment
- Complex networks
- Integrated approaches
- Diversification
- Its not the technology – its how we can use it
-

Outcomes

- Future-proofing of the primary industries for predicted and over-the-horizon science and technology, including identification of science capability requirements
- Optimisation of resourcing of current and predicted gaps in science and technology in government and industry

Outcomes

- Better incorporation of Mātauranga Māori into primary sector science issues, and facilitated sharing of knowledge with Māori
- Greater efficiency and reduced duplication in R&D investment
- New opportunities for innovation in the primary sector in progressing towards sustainable growth objectives



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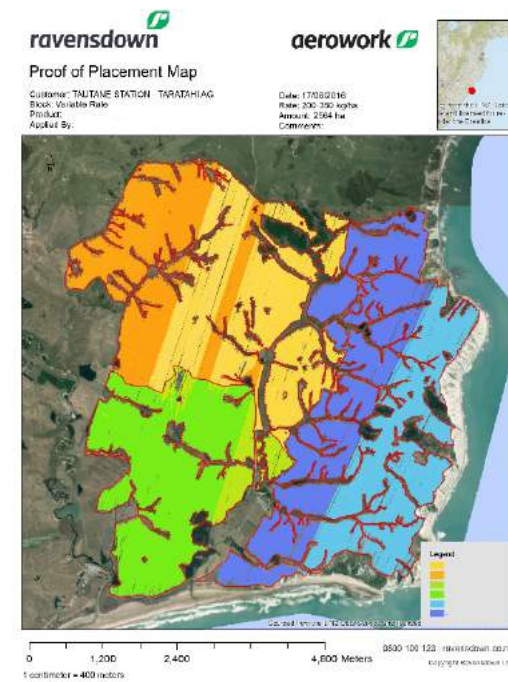
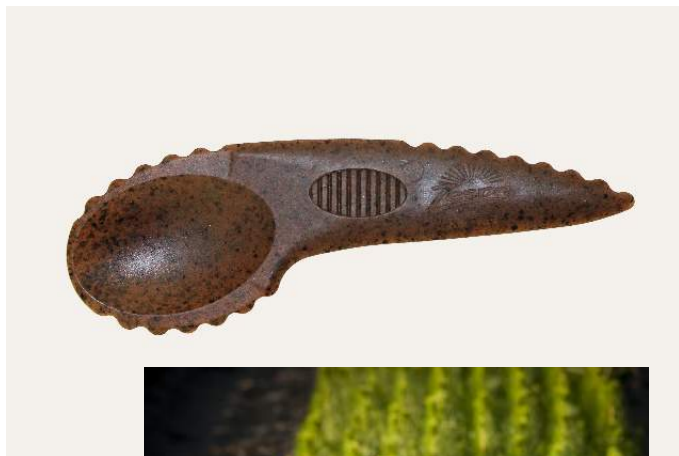
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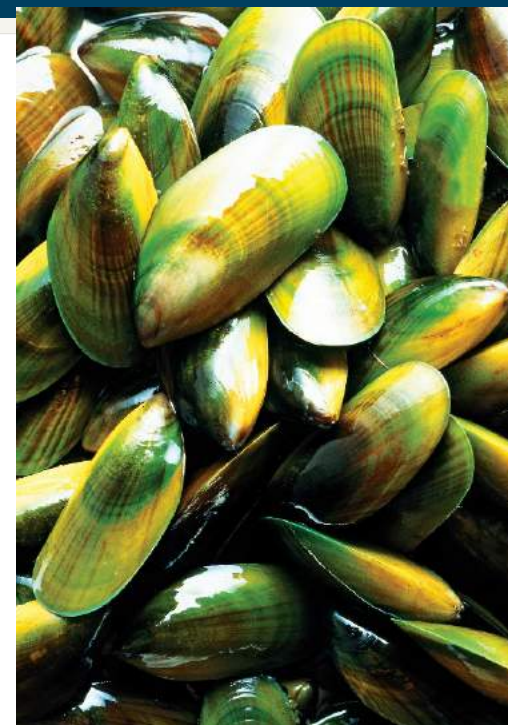
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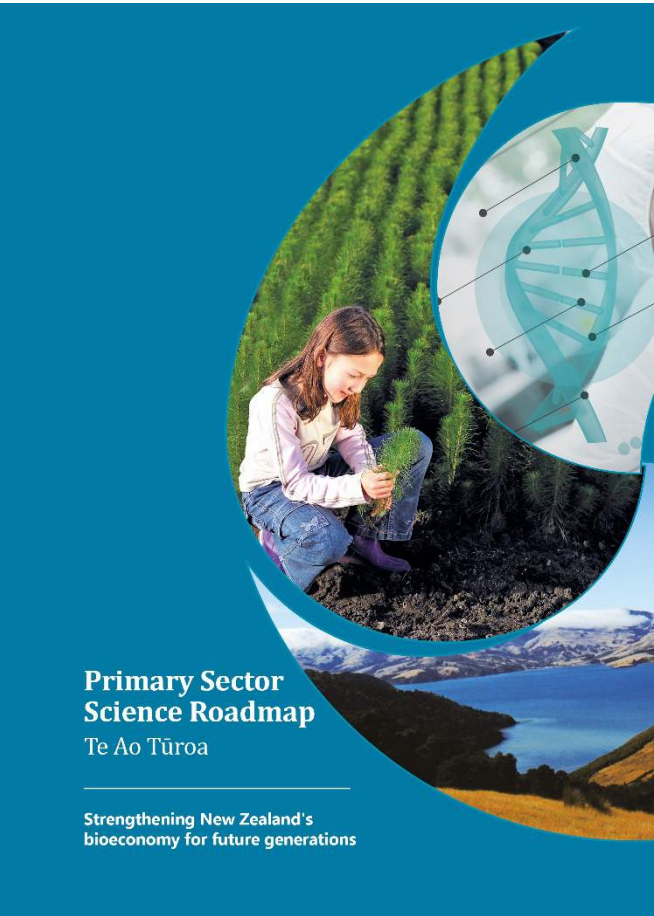
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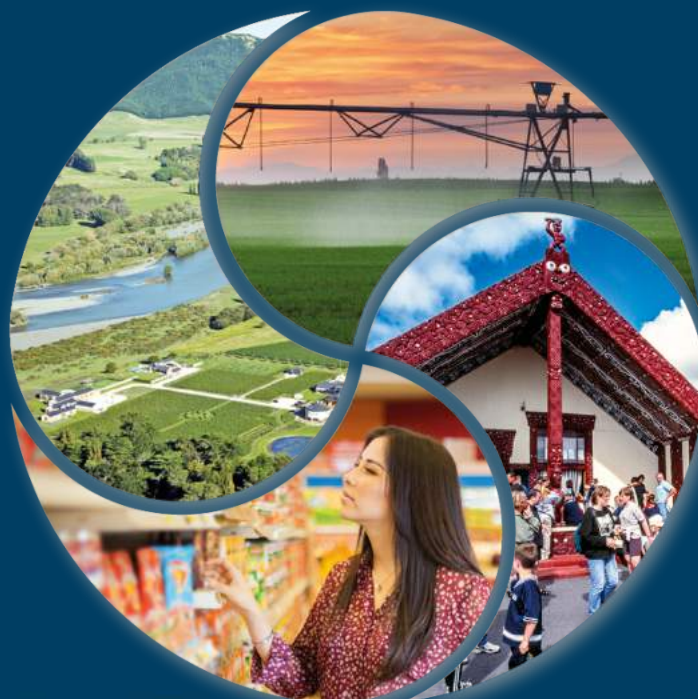












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