### ag research *āta mātai, mātai whet*ū

# Farming for the Future

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# Outline

AgResearch

Public science sector

Farming challenges

Our research priorities

Farm case studies

Questions



WHO WE ARE

Our core purpose is to deliver research to enhance the value, productivity and profitability of New Zealand's pastoral, agri-food, and agri-technology sector value chains to contribute to economic growth and beneficial environmental and social outcomes for New Zealand.



#### OUR MISSION

Enabling a strong, sustainable pastoral agricultural sector for the benefit of New Zealand.





# AgResearch is one of seven Crown Research Institutes in Aotearoa New Zealand

We are responsible for delivering innovative science and research outcomes specifically for the agricultural sector.





# **Public Science Sector Merger**



Plant & Food

anachau Ahumāra Kai

Research



E/S/R Science for Communities

#### Environment watchdog flags worries over Govt science sector shake-up

 By Jamie Morton Multimedia Journalist • NZ Herald • 13 Feb, 2025 05:38 PM () 4 mins to read
Parliamentary Commissioner for the Environment Simon Upton has weighed in on the Government's bold plans to shake up the science system
In a letter to Minister Shane Reti, Upton said merging New Zealand's seven Crown Research Institutes in the way proposed could cause "grave damage"

to national research capability

Reti says he expects to make decisions on a detailed design of the sector revamp within coming weeks





C Manaaki Whenua Landcare Research

Environmental stewardship is clearly a more pressing concern in our modified landscapes than it is for our natural ecosystems

> ...but it's about more than just protecting our ecosystems and way of life – its about finding ways to thrive while we protect what's precious to us all.





## **External Drivers of Change**

### Food Provenance

Food miles, fair trade, cottage industry, buy local, buy fre<u>sh</u>

### Ecological Stewardship

Water supply & quality, biodiversity, air pollution deforestation

### Food Safety

Residues, contamination, adulteration, food labelling, antibiotic resistance Food Security

Population growth, food demand, world hunger, sustainable supply, affordability Animal Welfare

Animal health, shelter & nutrition, mgt practices, byproducts

#### Global, socially-conscious consumers



## **Global movements gaining momentum**



The challenges facing future farmers will exceed those of the past



## **On-Farm Drivers of Change**



On-farm pressures are driving technology adoption and diversification



## **Unforeseen challenges**

- Protectionism, nationalism and ideology driven trade alliances
- NZ exports 90% of its primary produce, >50% of all NZ exports
- The US consumes 12.7% (\$9b) of our primary produce annually
- A global down turn would diminish alternative markets for this produce





# Many farmers feel under siege and short on options

#### **Uncertainty can motivate or stagnate**

- Uncertainty undermines confidence
- Hinders investment in change
- Harmful to rural families & communities
- Is polarising our society for little gain

#### Science offers some hope

- Science has a long gestation time
- Incremental solutions, no silver bullets
- Most solutions come at a cost
- Choosing the right options is hard



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# **Options for farmers under pressure**

#### Traditional response:

- Cut input costs
- Intensify operations (add inputs)
- Diversify production system
- Prioritise production volume

#### **Emerging responses:**

- Automate to reduce labour costs
- Sensory data for faster decisions
- Analytical tools for better decisions
- Diversify land use / business model
- Equity partnerships & investors
- Eliminate waste and inefficiency

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#### Potential impediments:

Awareness of the opportunity Awareness of the need to change Finance to invest in change Time to learn and change

Support for change Motivation to change Confidence to change Loyalty to suppliers

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# Evolution of Digital Agriculture in NZ

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Digital Revolution

Precision Agriculture On-Farm IoT Enabled

Arguably this is the countdown to the true start of the digital agriculture revolution

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# **Our research priorities**

	Market Market Market Market				
RESEARCH PRIORITIES	Sustainable pastoral agriculture in a changing climate	Thriving Māori agribusiness and enterprise	Integrated biosecurity	Future farming systems	Emerging foods
FLAGSHIP SCIENCE PROGRAMMES	Plants and microbiomes of the future Animals of the future Partnering for sustainable agricultural innovation	Supporting land use transitions to enhance Māori agribusiness, enterprise, and communities	Biosecurity for plants and animals	Transitioning agri-food systems	Enabling emerging foods
	Early-stage product development – Identify and support opportunities for commercialisation				

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# **Environmental Research**

### Water quality

- Studying the impact of land use on water quality & opportunities to minimise impact
  - Sheep grazing 4x *E. coli* runoff than dairy
  - Riparian impact on sediment & nutrient
  - Improving our water quality models
- Focus on critical source areas & grazing strategies to improve water quality

### Catch crops

- High density oats or Italian ryegrass after intensive grazing of winter forage
  - 60% reduction in N leaching
  - 40% reduction in sediment runoff
  - Reduce phosphate losses
- Deep rooting, fast growing, dense canopy, high N uptake, cold tolerant, allelopathic

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# **Farm Systems Research**

### Land use optimisation

- Optimisation of the lands productive potential under alternative uses
  - Retire fragile / low production land
  - Reversion, silviculture, carbon farming
  - Smaller scale, proportionally more value
- Mosaic land use is becoming a mainstream farming concept (quadruple bottom line)

### **Regenerative agriculture**

- Its about farming with the environment, not against it, but it comes at a cost
  - Improved soil health & fertility
  - Improved soil structure & organics
  - Enhanced biodiversity & resilience
- Quantifying benefits to welfare, soil health, emissions, water and produce quality

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# **Plant Science Research**

### **Methane inhibitors**

- Feed supplements, crops & grasses that reduce methane production in the rumen
  - Organic compounds ( $\sqrt{20-30\%}$ )
  - Fodder beet, brassica, plantain ( $\sqrt{15-30\%}$ )
  - Anti-methanogen vaccines ( $\sqrt{-20\%}$ )
- Multifaceted approach that complements animal breeding and systems research

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IEW ZEALAND GRICULTURAL GREENHOUSE GA Research Centre

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### **Improved endophytes**

- Symbiotic microorganisms that live within plants in a mutually beneficial relationship
  - Improves plant health & vigour
  - Improves pest & disease resistance
  - Improves stress tolerance
- Identifying new bacteria and fungi with different attributes AR37 \$3.6b impact

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# **Animal Production Research**

### **Animal breeding**

- Selective breeding of efficient, resilient and adaptable livestock
  - Improve stock survival & heat tolerance
  - Improved facial eczema tolerance
  - Improved efficiency with lower emissions
- Cost effectively measure important traits for inclusion in breeding programmes

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### Life Cycle Assessment (LCA)

- Calculate environmental, social & cultural footprint to support agricultural exports
  - Validate NZ production efficiency claims
  - Scientific land use change assessment
  - Integrated with fresh water farm plans
- Improving data integration & automation to make it available to more for less cost

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Note: data presented is experimental in nature and requires further research to validate the potential impact in field conditions

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# Case study 1: Can we intensify sustainably with hill country beef

#### Sherlock Farm – Otorohaea

- Very steep, mixed sheep & beef
- Virtual fencing dairy bull beef
- Intensive rotational grazing
- Extensive environmental monitoring

Observations to date:

- Remnant bush blocks protected
- Exotic forest on low quality land
- 75 day round, 4x productivity increase
- 2x profit with modest capital outlay

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# Case study 2: Validating woody forages in dairy systems

Miraka Farm – Moungatautari

- Small scale silvo-pastoral dairy system
- Paulownia is one of the fastest growing trees
- High value timber and good stock feed
- Rapid carbon sequestration

Observations to date:

- 30% drop in pasture (shade), 25% less milk
- 50% reduction in net GHGe
- ETS revenue could be \$900/ha
- Timber break even \$150/stem (~\$500m<sup>3</sup>)
- Additional benefits (shade, high protein)

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# Case study 3: customised AI agents to support precision dairy

Amco Farms – Matamata

- Medium size share milking herd owner
- No formal IT or engineering training
- Developed a personal custom AI agent
- Trained on best practice & farm data
- Informed by soil/herd test, sensor data

Observations to date:

- Powerful predictive tool for decision support
- Mating plans fully automated (his breeding goal)
- Custom culling reports on demand (real time)
- ROI calculations underpin all key decisions
- Financial agent now in development

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In a world of shrinking resources, vulnerable ecosystems, and increasingly conscientious consumers, precision agriculture is simply a must for the sustainability of our rural industries and communities

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