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How new technologies will define the primary sector?
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Who is Federated Farmers

• An independent, voluntary-member primary sector organisation.

• Part of the nation’s Food Industry by representing land-based, primary sector business owners & employers.

• Advising, supporting and advocating for members and the primary sector.

• Representing 14,000 memberships (approx. 25,000 people) nationally.

• National structure with Provincial Presidents elected by members, who then elect a National Governance Board.
## Major Primary Sector Exports:
**December 2004 versus 2014.**

<table>
<thead>
<tr>
<th>Product</th>
<th>2004 $b</th>
<th>2014 $b</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Powder, Butter, Cheese</td>
<td>5.1</td>
<td>14.5</td>
<td>9.4</td>
</tr>
<tr>
<td>Meat</td>
<td>4.4</td>
<td>5.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Logs &amp; Wood Products</td>
<td>2.0</td>
<td>3.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Fruit</td>
<td>1.2</td>
<td>1.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Fish</td>
<td>1.1</td>
<td>1.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Wine</td>
<td>0.4</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Wool</td>
<td>0.8</td>
<td>0.7</td>
<td>(0.1)</td>
</tr>
</tbody>
</table>

Statistics NZ
The world’s population is growing at approximately 77m per year, and it is expected to reach nearly 10 billion by 2050 - 70% in cities

Food production will need to increase by over 70%
Estimated to be losing over 12 million hectares agricultural land each year

How do we produce safe, sustainable foods, when there are fundamental environmental issues to overcome, including:

- Water quality and quantity
- Ecosystem management, including soils and pests
- Climate change
The Rate of Change in the next 10 years will Accelerate!

The first I Phone was launched in 2007 - 9 years ago!

Who doesn’t have a Smart Phone?

We quickly take things for granted

What will happen in the next 10 years?
“Climate change, new technologies, population growth, a burgeoning global middle class and informed and empowered consumers - that will change what the farm sector produces and how it markets and sells products”.

Agricultural success will depend on the sector's ability to diversify and engage with consumers about how their food and fibre is produced.
A hungrier world
Population growth will drive global demand for food and fibre

A bumpier ride
Globalisation, climate change and environmental change will reshape the risk profile for agriculture

A wealthier world
A new middle income class will increase food consumption, diversify diets and eat more protein

Transformative technologies
Advances in digital technology, genetic science and synthetics will change the way food and fiber products are made and transported

Choosy customers
Information empowered consumers of the future will have expectations for health, provenance, sustainability and ethics
What do New Zealand farmers need to remain competitive?

NZ’s Place & Consumers

Farm Productivity
- New Pastures
- Networked Farms
- Robotics
- Indoor Farming
- Bio-factories
- Biologics
- Regulations
Our Future Challenge

NZ will continue to be a major producer of commodity foods & fibre in the years ahead, particularly for international food manufacturers.

But will this be enough, given increasing global competition, particularly from Europe and the Americas?

Do we need to better understand consumers, market segments & focus more on direct engagement via different channels or new distribution systems utilising new technologies (e.g. restaurants, internet based, 4D printing)?

What about our future mix of products and services?
Where is NZ Place?

Feeding the 1-2% of wealthy consumers globally
Do we understand their attitudes and wants in 5 years, 10 years, 20 years?
How will we segment the market?
What does it mean for what we produce in 10-15 years time?
What does it mean for new technologies & affordability?
Accelerating Research

We need to “free up” our government research system (less governance & micro management”) & spend more.

We need to make it attractive for more agri-multi nationals to establish research capabilities in NZ where NZ has global competitive advantages (e.g. soil, plant genetics). We need to build stronger linkages between farmers & key research organisations.

We need to keep our options open regarding biotechnology, particularly in relation to enhancing productivity and new products/services- our competitors certainly are!
Accelerate Farm Productivity
“the data driven farm”

Collecting, using detailed information

Precision farming
- Reduced nutrient loss
- New farming systems
- Collecting & using detailed “networked” information

Improved soil, pasture, animal & plant genetics

Advances in animal feed

Robotics- including machines with multiple sensors talking to each other

New effluent systems and by-products, including fertilisers and energy.
An AgResearch Example
Forage Biotechnology

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3 synthetic technologies to improve the quality and productivity of a broad range of animal feed crops.

1. more metabolisable energy in the leaf
   more leaf biomass
   reduced methane
   reduced saturated fats in milk and meat

2. more root biomass
   more leaf biomass
   increased drought tolerance
   increased nutrient scavenging

3. more oil in the seed

Patent granted
USA, EUR, CHINA

Patents (x2)
filed PCT

Patents (x3)
under examination
USA, EUR, CHINA
Precision farming

Information driven (billions of sensors), software orientated, networked smart machines (robotics), detailed information.

Examples:
Data collection
Remote sensing
Spatial mapping
Precise navigation
Automatic record keeping
Cloud computing
Soil & water management
Rounding up cattle
Crop irrigation
Breeding habits in animals!

BUT: How do you get it to work at a local level on small farms? (e.g. Broadband coverage)
Robotics

Robotic Milking Equipment

Tractor and planter has an operator at the wheel, but it's being driven by satellite guidance.
Networked Farms

Robot milking machines save farmers time and give cows the freedom to be milked when they want.

Robot livestock feeders save farms money and consistently feed a herd.

Cow heat detection devices increase pregnancy rates.

Electronic ear tags identify domestic livestock.

Aerial drones used to spot weeds, calculate fertilizer needs and scare pigeons.

Combine harvester yield meters monitor, display and record grain yield.

Smartphones used by farmers to communicate, check soil depth, register animals and more.

Driverless tractors not yet commercially available but could save farmers time.

GPS Steering systems guide tractors in straight lines to save seed, fertiliser and fuel.

Farm management software is used to manage all aspects of a farm.
Indoor Agriculture

Industrialisation of Farming!

Scaling Food Production—controlling everything from light, heat, humidity and carbon dioxide levels—up to 10X more productive than traditional farming.

Holland—over 11,000 hectares
America—30 currently under development.
Vertical Farming

One farm in Japan is 25,000 square feet (with 17,500 LED lights)
Its producing 10,000 lettuce per day (100 times more per square foot than traditional methods) with 40% less power, 80% less food waste and 99% less water usage than outdoor fields.
Bio-Factories

Biomass

Biorefinery

Sugar-Extractives-Lignins

Biopolymers

Chemicals & Monomers

BIOFUELS

Bioplastic Products

Polymerisation

Extrusion Moulding
New Biologics?

Plants for new healthy superfoods and drugs.

Many of the major chemical companies are focusing their attention on using biological organisms to battle weeds, insects and diseases.
Future Trends: 10-20 Years?
Post 2025-commercially viable?

- Water, salt resistant crops (with sensors)!
- Synthetic Biology
- Farming for pharmaceuticals & nutraceuticals
- New protein sources
- Micro home micro farms
- Closed ecological waste systems
Do we Dismiss?
Disruptive Technology-Synthetic Foods

Will synthetic foods provide cheaper alternatives to feed a hungry world?

2013: $325,000 synthetic Hamburger produced in the Netherlands. Today it costs less that $12.

Synthetic Milk is being produced in America.

Silicon Valley is interested!
Synthetic Milk
New Protein Sources!