

Meat Industry Research across the ditch (NZ)



Cameron Craigie PhD
Science Impact Leader
Meat Products & Supply

About me

- Grew up on a farm in South Canterbury
- Worked for Quality Meat Scotland for 5 years, monitor farms, meat processing, animal health projects etc.
- PhD in Edinburgh looking at objective techniques for carcass evaluation
- **My own research interests are in how to maximize/capture value from carcasses.**
- Joined AgResearch in January 2014 as a Science Impact leader in meat products & supply
- Strategic overview of meat research activity internally and externally
 - Linkages
 - Gaps



My Objective today

- To provide a snapshot of meat industry R&D in NZ
 - High level as don't have time to cover everything
 - Focus on hot topics rather than specific research programmes
 - Happy to follow up later on these

Contents

- Background
 - About AgResearch
 - Context and Industry snapshot
- Profile 5 Meat R&D topic areas
 - Some examples
- Research gaps
- Question Time

AgResearch is the lead CRI in:

- Pasture-based animal production systems
- New pasture plant varieties
- Agriculture-derived greenhouse gas mitigation and pastoral climate change adaption
- Agri-food and bio-based products and agri-technologies
- Integrated social and biophysical research



AgResearch Meat Science & Food Safety

Our goals are to conduct research which delivers:

- Meat Products and Processes which consistently meet the needs of new and existing markets
- Improved processing efficiency

Leading to: Improved Returns from Meat products

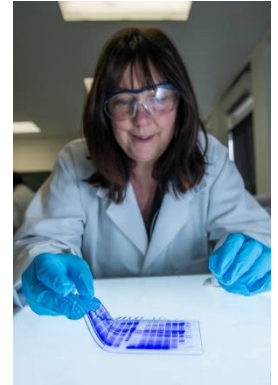
- Formally MIRINZ



Meat Science and Food Safety Themes

- Research output areas:
 - Meat Quality and yield attributes
 - On-line sensors for product quality and composition
 - New Meat Products and Uses
 - Longer shelf-life of chilled meat
 - Food Safety, Provenance and assurance
 - Processing efficiency/ co-product recovery

Approx. 20 FTE working in these area

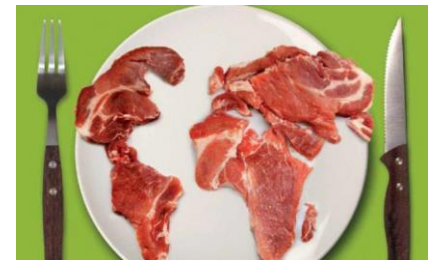


Why Research meat?

- \$\$\$
- Improved efficiency of production and processing
- Improved returns from whole of carcass
- Better value capture and retention
- We farm animals for meat, milk and fibre.
- Meat is human food
- Try and produce food **for a market**
- Not produce meat and try and find a market.
- Move from Commodity to food!
- Happy consumers
- Increase \$\$\$ for producers & processors

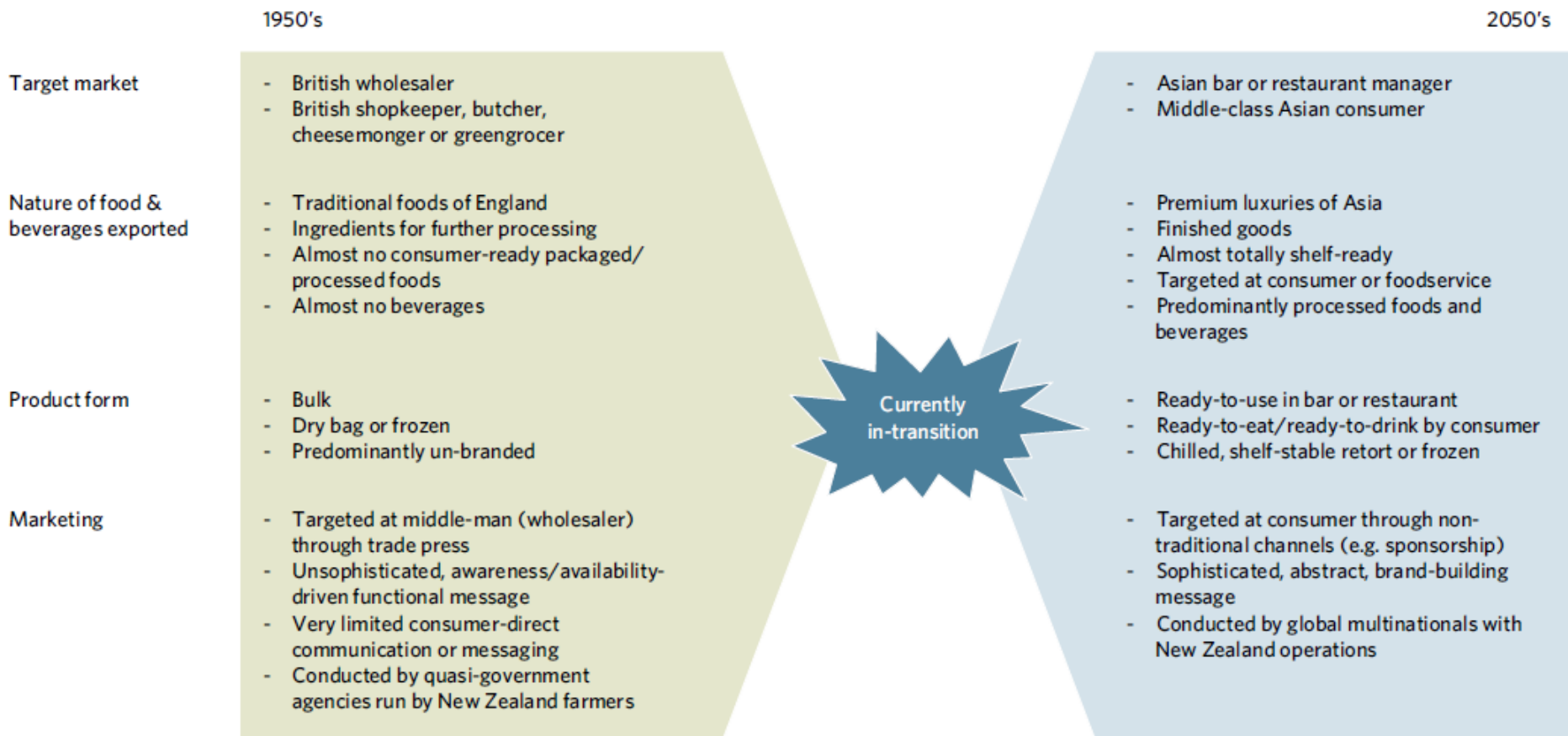
Global Context

- Emerging markets predicted to grow fastest over next 5 years – likely to see boom in eating out.
- Implications for meat industry:
 - Growing emphasis on eating good quality food as a definition of luxury, a belief that paying more = higher quality
 - Strong interest in authenticity when purchasing food. Provenance is important for emerging markets.



Global Context: Transition for meat industry

Model of changing nature of New Zealand's food & beverage exports and export marketing system
2014



NZ Meat industry

NZ meat industry facts:

- \$7.5b in export revenue year ending March 2016
- Processes ~25m sheep, ~5m cattle pa
- >1 million tonnes of red meat & co products to more than 120 markets

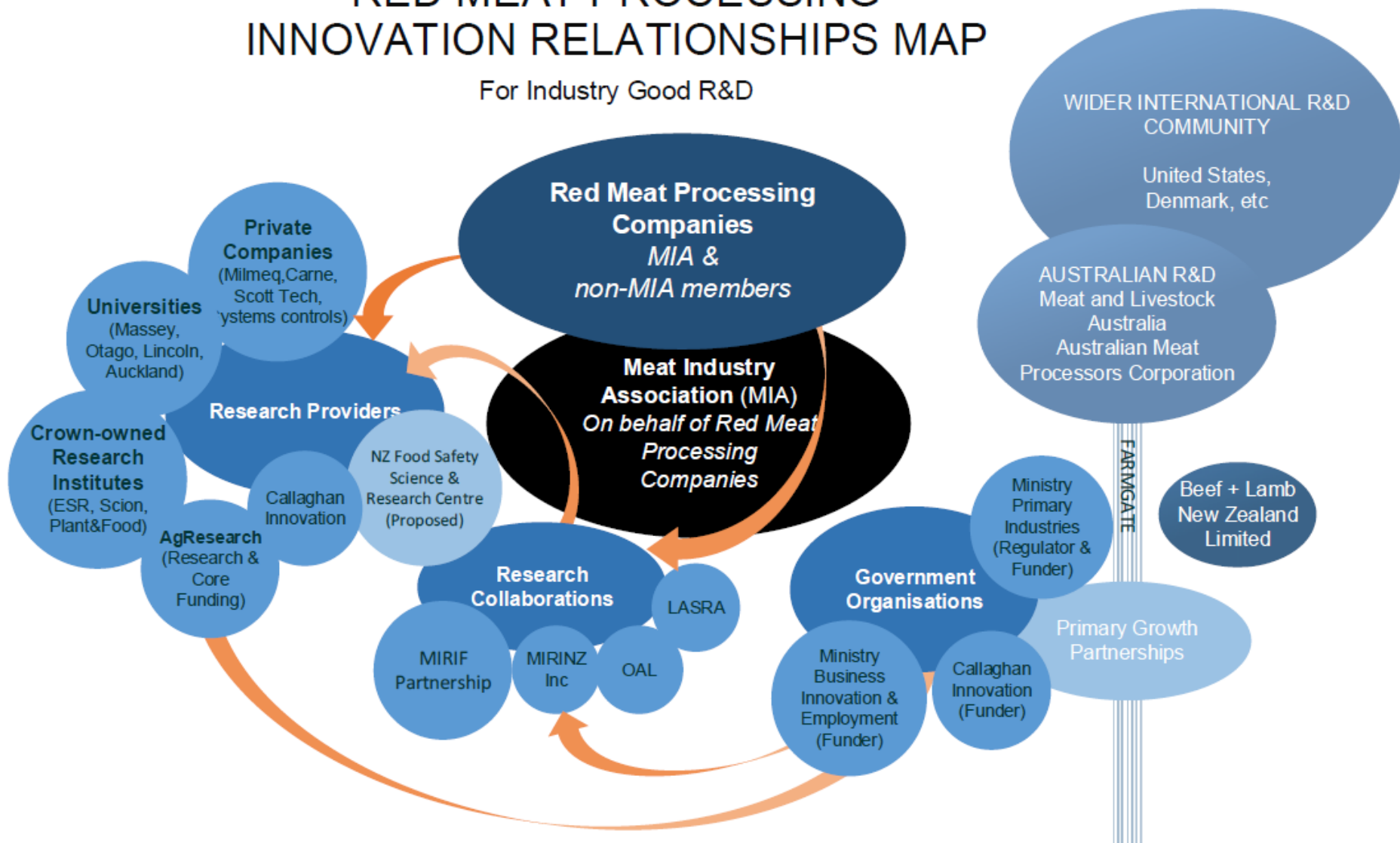
Industry bodies:

- Beef & Lamb New Zealand
- Meat Industry Association
 - (voluntary trade organisation)



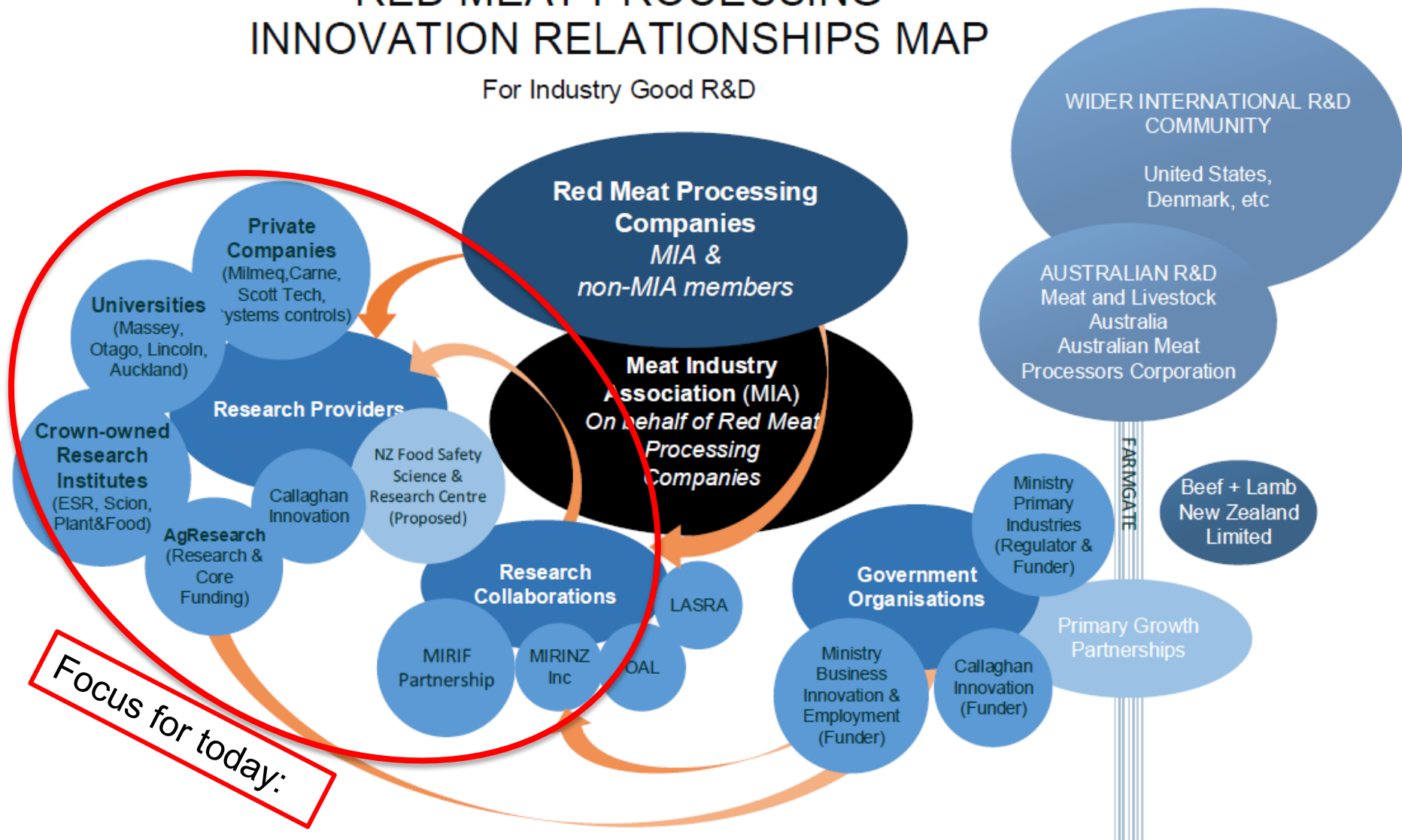
RED MEAT PROCESSING INNOVATION RELATIONSHIPS MAP

For Industry Good R&D



RED MEAT PROCESSING INNOVATION RELATIONSHIPS MAP

For Industry Good R&D



Hot Research topics today (in no order)

1. Food Safety and Assurance
2. Chilled (and frozen) shelf life
3. Product quality & functionality
4. Underpinning the NZ story with measurable and defensible product quality parameters
5. Application of non-invasive sensors & integration of data from multiple sources to drive meat production, processing and storage decisions

1. Food Safety and Assurance

- Market Access
 - Religious slaughter requirements
- Newly established Centre





New Zealand
**FOOD SAFETY SCIENCE
& RESEARCH CENTRE**



Purpose of the Centre

Protect and enhance reputation of food produced in New Zealand

- Increase and maintain confidence in food safety system
- Maintain and enhance exports
- “An investment in collective market access”

Protect public health

NZFSSRC Partnership

- Investors:
 - Industry: Primary production - processing - retail/export
 - Government/Regulatory Standard setting bodies: MBIE; MPI; MoH; FSANZ
- Research Providers

FUNDERS:



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

Ministry for Primary Industries
Manatū Ahu Matua

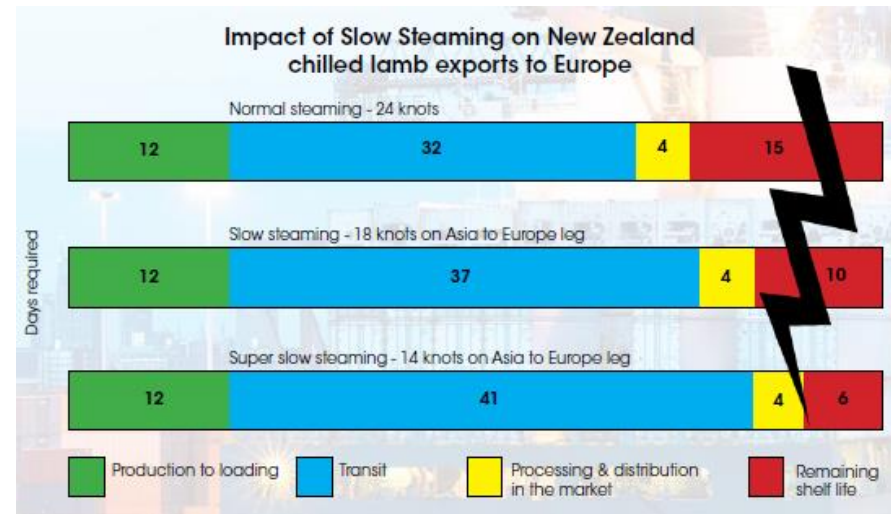


COLLABORATING PARTNERS:



2. Chilled and Frozen meat shelf life

- Goal is to extend chilled shelf life of meat >110 days
- Fundamental research spoilage bacteria population dynamics
- Succession and quorum sensing
- Impacts of time and temperature
- Product integrity and quality (chilled and frozen)



MIA, 2012, Annual Report – Meat Industry Association of New Zealand, downloadable from http://www.mia.co.nz/docs/annual_reports/MIA%20Annual%20Report%202011-12.pdf

2.1. *Extending Lamb shelf life*

What variables can be measured?

- Product type
- Initial bacteriological counts
- Cold-chain monitoring
- Bacteriological investigation at intake
- Organoleptic assessment



Future work:

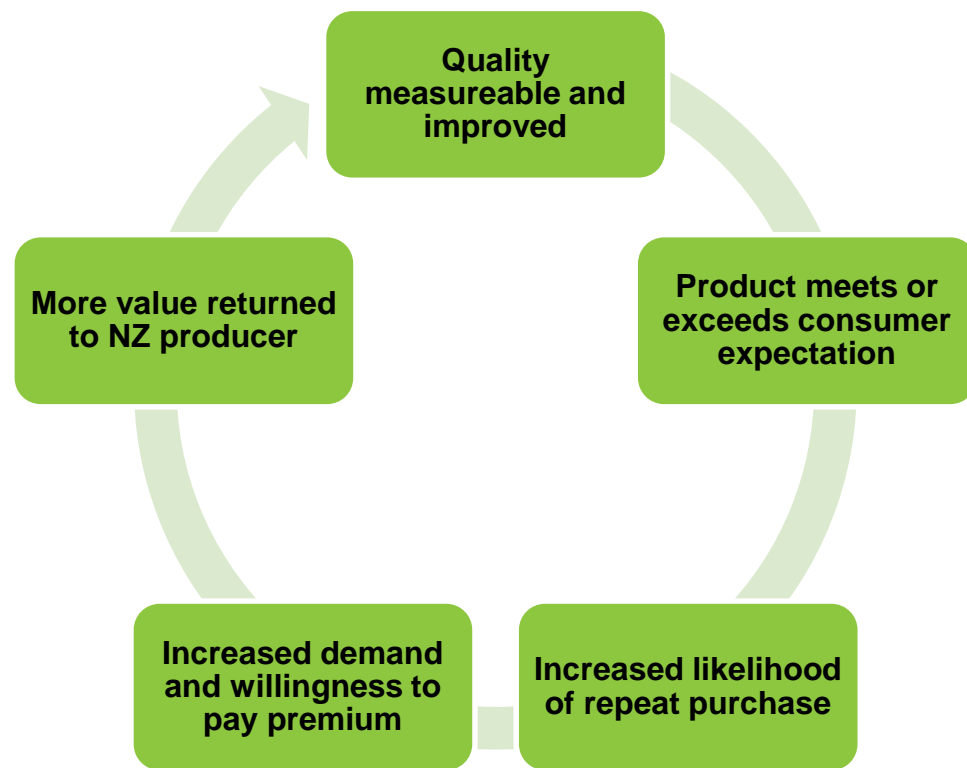
- Determining which bacteria in a consortium do and don't cause spoilage
- Complete utilisation studies for other bacteria
- Linking metabolism to spoilage volatiles
- Objective measures of evaluation e.g. metabolite profiling, electronic nose, microarrays and pcr.

3. Meat product quality, functionality

- Meat product quality
 - Animal genetics, tenderness, intramuscular fat
 - Products for emerging markets
 - Moving up the value chain by producing retail-ready meat products in NZ
- Measurable and marketable quality factors to enable product differentiation
- Grass-fed, extensive pasture-based system
- Intramuscular fat

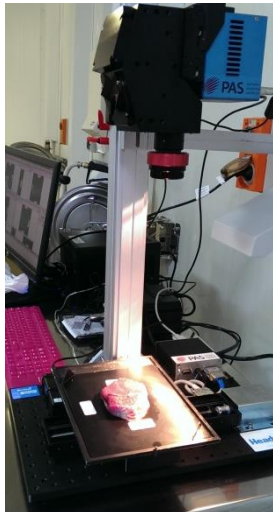
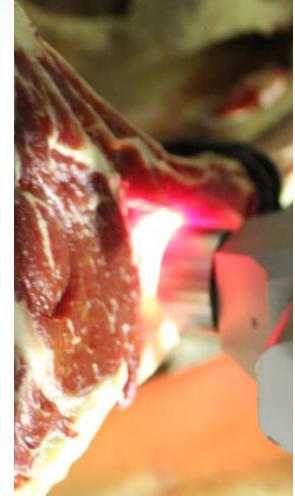
3.1. Intramuscular fat and pH in lamb

- These traits are **extremely important** to consumer acceptability and are now a key priority for the NZ sheep industry:
- IMF% > Meat eating quality but antagonistically correlated with selection for growth traits.
- pH > Key quality parameter for lamb shelf life, and as an indicator for stress-free lambs
- How to measure on-line?

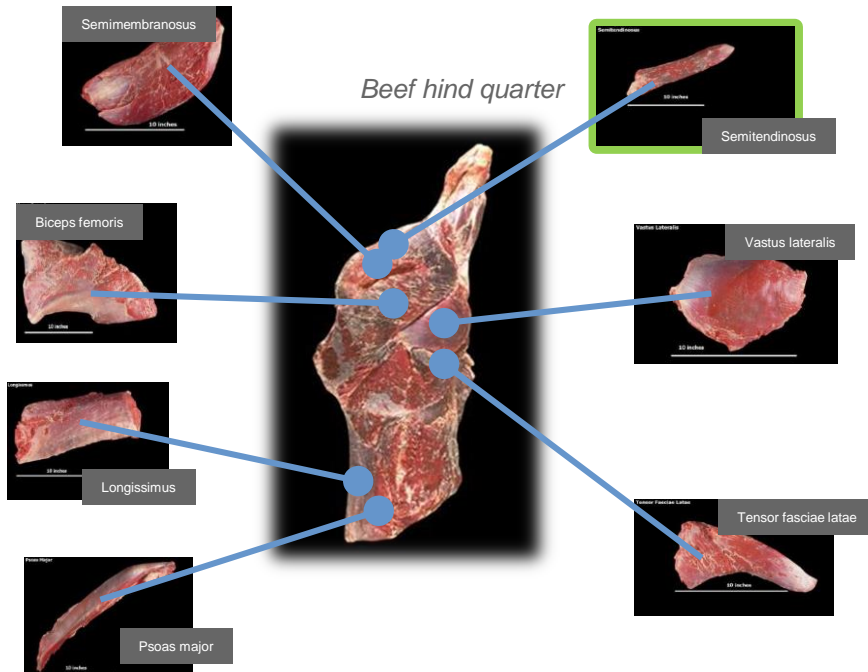


AgResearch Imaging systems we are using for meat research

- Visible-Near Infrared spectroscopy (NIRS) spectral range 350-2500 nm
- Hyperspectral imaging (HSI) spectral range 550-1650 nm. – similar principle to NIRS, but added advantage of a spatial dimension.



3.2. Unlocking Red Meat Protein Function



- Map muscle proteins, their relative abundance and modifications
- Correlate to properties and function
- Develop viable extraction protocols to preserve/create/enrich function
- High-value meat-derived ingredients
Enhanced processing properties
- Consumer-targeted functionality
(Health, lifestyle)

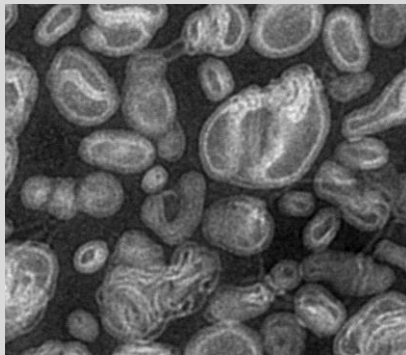
4. Underpin the NZ story

- With measurable and defensible product quality parameters
- Food structure and digestion
- Health Claims?



4.1. Food Structure & Digestion

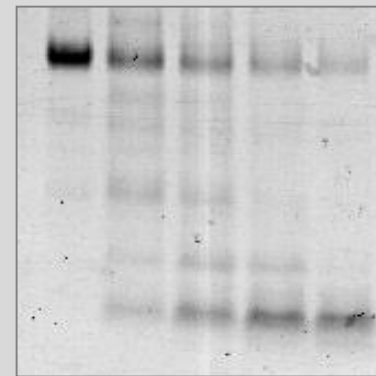
Structure



Characterisation of key food structures

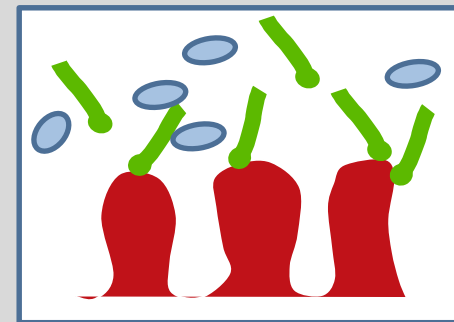
Digestion and the gut surface

Can food structure be modified to alter digestion of key ingredients?



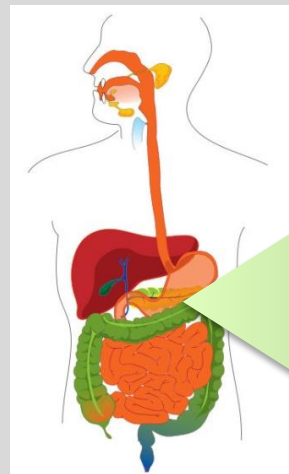
In-vitro digestion assays

Can we use food structures to target functional ingredients to the gastrointestinal surface?



Gut surface models

4.2. *FOOD-MICROBE-HOST* Interaction



>25,000 food components



Areas of delivery

- Intestinal barrier function
- Microbiota diversity and intestinal homeostasis
- Molecular nutrition (personalised nutrition and nutrigenomics)
- Probiotics
- Gut-Brain-Axis
- Biomarkers

4.3. Food Molecular Mapping

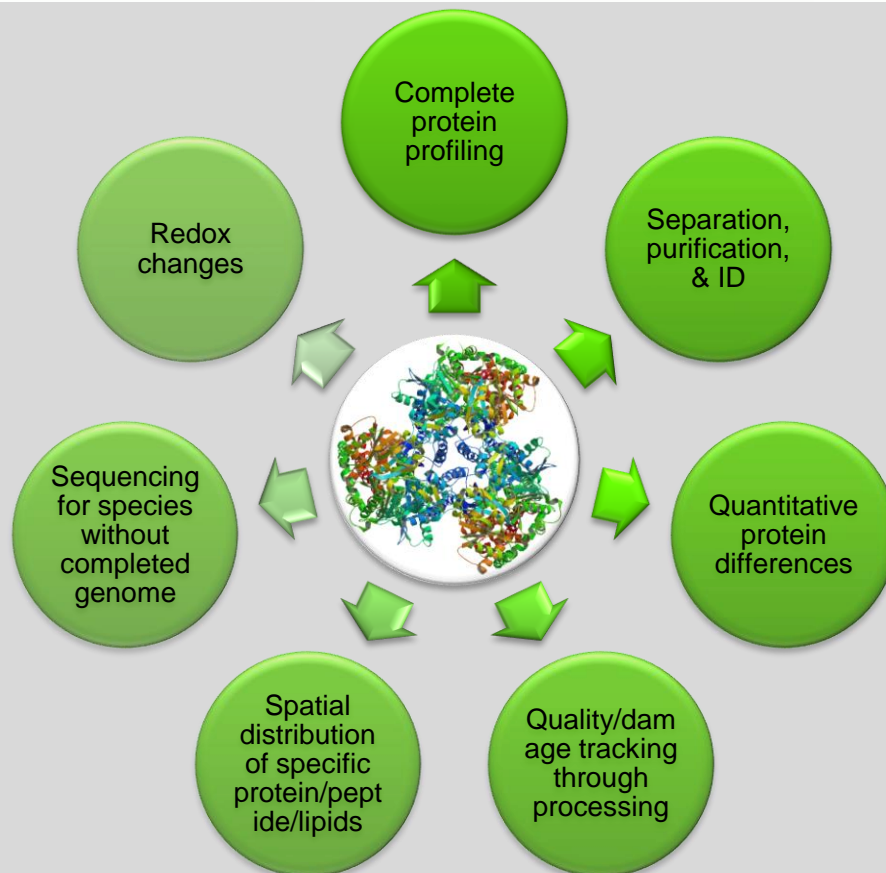
PROTEOMICS/METABOLOMICS

Proteins
Peptides
Lipids

Mass spec &
bioinformatics:

- Identify
- Quantify
- Validate

Food, Fibre, Tissue



5. Non-invasive sensors and data integration

- Seen as a large opportunity
- Measurable and Marketable
- Feedback loops enabling product quality and value outcomes to be linked to production and processing factors
- New 5 year collaborative research project just started in this area
 - Design-lead approach to developing sensors for measuring meat texture, composition and pH



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Research Gaps

- Understanding of how to “dial-up” product characteristics within the farming system
- Food Provenance and assurance from farm to fork
- Understanding “optimal” fat
- Carcass evaluation that is more related to real value, both meat yield and meat quality
- Real-time measurement of “value” implemented in-plant
- New uses for meat and meat products
 - Meat as an ingredient
 - Food-grade processing of co-products
- What will meat processing look like in 20 years time?

Questions?

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