KET’s in Agri-Food
Northern Ireland perspective

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Unique Selling point
Long Term Focus on quality niche areas

- Medium Term Development
- Cost reduction
- Medium/Long Term development
- Quality and niche areas
Need for Integration

Scientific Capability

&

Exploitation Capability
Need for Integration

Vertical Integrated Agri-Food Business

- Feedmill
  - Breeder
    - Feed
  - Farming
    - Live Animal
    - Farm
  - Processing
    - Fresh Meat
    - Food
  - Adding Value
    - Packaged Food
Presentation Structure

• Agri-food Context
• Issues
• Opportunities
• Vision
• Key Enabling Technology Mapping (MATRIX)
• KET mapping recommendations
• Focus areas & Leadership areas
• World class research
• Conclusions
• Sources
Agri-Food Context

• £4 billion turnover in 2011
• 20% of total NI manufacturing sales
• Employs 50,000 people
• 18,000 in food processing
• Continued growth
• Potential of 15,000 new jobs by 2020
• Multiplier effect within NI economy
Agri-Food Context

Percentage of Total Sales

<table>
<thead>
<tr>
<th>Category</th>
<th>External Sales</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adv Man</td>
<td>91%</td>
<td>72%</td>
</tr>
<tr>
<td>Adv Mat</td>
<td>99%</td>
<td>90%</td>
</tr>
<tr>
<td>Life Sci</td>
<td>94%</td>
<td>74%</td>
</tr>
<tr>
<td>ICT</td>
<td>58%</td>
<td>27%</td>
</tr>
<tr>
<td>Agrifood</td>
<td>68%</td>
<td>27%</td>
</tr>
</tbody>
</table>

External Sales: 0% to 120%
Exports: 0% to 100%
# Agri-Food Context

## Table 2: Agriculture: general data, 2011

<table>
<thead>
<tr>
<th></th>
<th>NI</th>
<th>Scot</th>
<th>Wales</th>
<th>Eng</th>
<th>UK</th>
<th>ROI</th>
<th>EU27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of total GVA (%)</td>
<td>1.6</td>
<td>0.7</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>2.5</td>
<td>1.7</td>
</tr>
<tr>
<td>No. employed in agriculture forestry &amp; fishing ('000)</td>
<td>25</td>
<td>41</td>
<td>35</td>
<td>271</td>
<td>371</td>
<td>80</td>
<td>N/A</td>
</tr>
<tr>
<td>Share of employment (%)</td>
<td>3.1</td>
<td>1.6</td>
<td>2.6</td>
<td>1.1</td>
<td>1.3</td>
<td>4.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of farms ('000)</td>
<td>24</td>
<td>53</td>
<td>41</td>
<td>105</td>
<td>223</td>
<td>140</td>
<td>13,449</td>
</tr>
<tr>
<td>Average farm size (Ha)</td>
<td>41</td>
<td>118</td>
<td>37</td>
<td>85</td>
<td>77</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td>LFA (% Agricultural area)</td>
<td>70</td>
<td>86</td>
<td>80</td>
<td>17</td>
<td>48</td>
<td>75</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. 2010, 2. 2007
3. CSO Quarterly National Household Survey, 4th quarter, 2011
4. Relates to commercial holdings only as defined by EU regulation.

Due to National Accounting principles, GVA figures do not include Single Farm Payment

Source for UK employment data (SIC 2007, main job) - Labour force survey (Quarter 1, 2012)
# Agri-Food Context

## Table 4: Agri - food sector GVA and employment, 2011

<table>
<thead>
<tr>
<th></th>
<th>NI</th>
<th>UK</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£m</td>
<td>% of GVA</td>
<td>£m</td>
<td>% of GVA</td>
</tr>
<tr>
<td>Gross value added¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>437</td>
<td>1.6</td>
<td>8,845</td>
<td>0.6</td>
</tr>
<tr>
<td>Food and drink</td>
<td>686²</td>
<td>2.4²</td>
<td>21,158³</td>
<td>1.7³</td>
</tr>
<tr>
<td>processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>'000 persons</td>
<td>% of total</td>
<td>'000 persons</td>
<td>% of total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>employment</td>
<td></td>
<td>employment</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>25⁴</td>
<td>3.1⁴</td>
<td>371⁵</td>
<td>1.3⁵</td>
</tr>
<tr>
<td>Food and drink</td>
<td>27⁴</td>
<td>3.4⁴</td>
<td>388⁵</td>
<td>1.3⁵</td>
</tr>
<tr>
<td>processing³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. GVA figures are at basic prices
2. DARD Size and Performance of the NI Food and Drinks Processing Sector, Subsector Statistics, 2010 Provisional estimate. (This includes an estimate of the value added of those food and drinks processing businesses with a turnover of less than £250,000.)
3. UK 2009 figures
4. % of total LFS employment (802,000 in NI at Q1, 2012)
5. % of total LFS employment (29,147,000 in UK at Q1 2012).
6. Includes SIC 2007 10.11 - 11.07
Figure 3 - Gross turnover and full time equivalent (FTE) workforce by food processing subsector, NI (Provisional 2010)
Figure 4 - Proportion of gross turnover by subsector, NI (Provisional 2010)

Share of gross turnover by subsector 2010 provisional

- Beef and sheepmeat: 26%
- Drinks: 10%
- Eggs: 2%
- Fish: 2%
- Fruit and vegetables: 5%
- Milk and milk products: 23%
- Pigmeat: 7%
- Poultrymeat: 17%
- Animal by-products: 1%
- Bakeries: 7%
Agri-Food Issues

• Maintain Quality
• Innovation through value chain
• Access to information
• Supply chain efficiencies- cost savings
• Excellent Innovation and R&D
Agri-Food Issues

- Food security and bio-based economy
- Climate Change and resource efficiency, including raw materials
- Secure, clean and efficient energy
Opportunity

- 31% innovation active (33% Uk)
- Some world class highly commended research in Global food Security (Traceability & contamination)
- World class producers and processors
- Opportunity to be world class in quality
- Opportunity to integrate value chains
- Opportunity to integrate science and exploitation capability
Vision

• By 2020:-
  • Large scale export of dairy to Asia
  • Large scale exports of meat to Africa
  • Exports to Russia and Baltics
  • Accessing quality information
  • Resources to interpret information
  • Increased Innovation and R&D - consumer led
Vision
Agri-Food strategy board 2012

• 9 Industry representatives
• 4 Government representatives
• Call for evidence 2012
• Innovation and R&D top priority
“Cross sectoral market opportunities”
Key Enabling Technology mapping

- 13 members (9 from industry)
- Focus on strategic markets not sectors
- ‘Now sight’ then Foresight
- Involving 100 companies
- R&D and science and technology issues

- Emerging relevant technology priorities
- Promotion of innovation, R&D, and creativity
- Promotion of Collaboration
- Overcome the perceived disadvantage of SME dominated economy
- Reports build on regional strengths and skills capabilities
Key Enabling Technology mapping

“First Identified Strategic Markets (Cross Sectoral)” by MATRIX
### Key Enabling Technology mapping

**Northern Ireland Strategic Markets MATRIX Foresight**

<table>
<thead>
<tr>
<th>KET’s</th>
<th>Advanced Manufacturing</th>
<th>Advanced Materials</th>
<th>Sustainable Production &amp; Consumption</th>
<th>Life &amp; Health Sciences</th>
<th>ICT</th>
<th>Electronics &amp; Photonics</th>
<th>Agri-Food</th>
<th>Sustainable Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Micro-nanoelectronics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Photonics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>nanotechnology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Industrial biotechnology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Advanced Materials</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Advanced Manufacturing</td>
<td>✓</td>
<td></td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Key Enabling Technology mapping

Technology Capability Study – 2006- Business Identified Priorities

• **Strategic Markets** (Cross Sectoral)

• **Key trends**
  – Higher education numbers, Private Sector Capability analysis, Public sector capability analysis, Academic sector analysis

• **Benchmarking**
  – Regional, Technological Scoring, environment, Technology Readiness levels, Technological Infrastructure

• **Framework Conditions**
  – Degree of Clustering, Business environment, markets, collaborations, skills & training, Funding, Government support, FDI sectors, Technology transfer

• **Conclusions**
  – Northern Ireland Technology Capability, Technology Capacity, Priorities for Northern Ireland
Sustainable Production & Consumption Capability in Northern Ireland

Figure A: Sustainable Production and Consumption Capability in Northern Ireland.

Identify how to improve capability

- Food Technology, Human Nutrition & Consumer Concerns
- Energy Generation
- Animal Health & Welfare
- Animal Production & Husbandry
- Plant Breeding & Biotechnology
- Environmental Technologies
- Aquaculture & Fisheries
- Plant Production & Protection
- Forestry & Management of Natural Resources
- Engineering, Mechanisation & ICT
- Breeding & Biotechnology

Support and Encourage

Potential impact on NI economy

- Small
- Medium
- Major

Timescale to realise impact

- Current (<2 years)
- 2-5 years
- 5-10 years
- 10 years

Consider strategically how to support

Build exploitation pathway

Weak Scientific Capability → Strong
# Key Enabling Technology mapping

## Overview of Strategic Markets

<table>
<thead>
<tr>
<th>MATRIX Sectors</th>
<th>SIC 07 Sectors</th>
<th>Key Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Engineering</td>
<td>7</td>
<td>Engineering Electronics</td>
</tr>
<tr>
<td>Advanced Materials</td>
<td>7</td>
<td>Rubber and Plastics Scientific R&amp;D</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>4</td>
<td>Pharmaceuticals Technical Testing</td>
</tr>
<tr>
<td>ICT</td>
<td>4</td>
<td>Computer Programming Telecommunications</td>
</tr>
<tr>
<td>Agri-food</td>
<td>2</td>
<td>Food Products Chemicals</td>
</tr>
</tbody>
</table>
Key Enabling Technology mapping

- Advanced Manufacturing
  - Nortel
  - Michelin
  - Wrightbus
  - Thales
  - FG Wilson
  - Schrader Electronics
  - Bombardier
  - Seagate
  - Perfecseal
  - Randox

- Advanced Materials

- Life & Health Sciences
  - Norbrook Laboratories (GB) Limited
  - Warner Chilcott
  - Almac

- Telecoms & ICT
  - BT
  - Northgate
  - Allstate

- Agri-food
  - Moypark
  - United Dairy Farmers
  - Kerry Foods
  - Dale Farm
Key Enabling Technology mapping

Foresight

Scanning

Scenario Planning

Analysis & Selection

Transformation

System Scanning
Creates shared understanding of issues

Scenario Planning
Conceptual modelling of market opportunity scenarios

Analysis & Selection
Prioritisation through negotiations among stakeholders

Transformation
Establish relationship between future and present for a change programme

Action Plan
Create structural and behavioural transformations to exploit markets
Key Enabling Technology mapping 2008

• Priorities
• Collaboration
• Timescales

“Exploiting capabilities and market opportunities”
## Key Enabling Technology mapping

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>2020 CAPABILITIES REQUIRED</th>
<th>EXISTING NI CAPABILITIES IDENTIFIED</th>
<th>GAP TO BE BROUGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Sciences</td>
<td>Human Genomics, Enzymes, Epidemiology, SHIK and Gene Regulation</td>
<td>Strong capability identified in genomics and epidemiology. Some degree of overlap with the diet and food science.</td>
<td>The scale of this capability is most likely to be insufficient to create a future food industry. Additionally, the focus of epidemiology, enzymes and genomics on food interactions with the human body needs to be further examined.</td>
</tr>
<tr>
<td>ICT</td>
<td>Computational Science (Modelling/ Simulation of Genomics), Management of Animal Disease, Processing and safety profiles, ICT tools to demonstrate interactivity in energy networks</td>
<td>Strong capability in computational science (Bioinformatics), very strong capability in managing animal disease (once a leadership position in Northern Ireland), food processing etc.</td>
<td>Whilst the capabilities do exist at a component level in Northern Ireland, there is a need for an advanced level of the capabilities creating solutions that track and trace, enhance existing animal disease tracking etc.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Probiotics, Nutragenomics, Nutraceuticals</td>
<td>Some capability identified however not sufficient for a future food industry.</td>
<td>This is a particular gap that has to be addressed in scale and scope.</td>
</tr>
<tr>
<td>Advanced Manufacturing</td>
<td>Pharma Robotics, Advanced Processing techniques</td>
<td>Excellent advanced manufacturing capability in Northern Ireland is seen in this sector, Life Sciences, aerospace etc.</td>
<td>This capability resides primarily around processing and needs to be further extended to the food industry.</td>
</tr>
<tr>
<td>Advanced Materials</td>
<td>BioMaterials, Active Packaging, Intelligent Packaging, Coatings, Sensors, Advanced Materials for use in energy generation</td>
<td>Excellent advanced materials capability in BioMaterials, Coatings, Sensors etc., rarely seen in the Agri-food space and most likely seen in the space in Aerospace, Electronics etc.</td>
<td>These existing capabilities need to be applied to the packaging of foods and the integration of packaging with function in foods.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Market Knowledge, Agri-food Intelligence Databases, Econometric Modelling</td>
<td>Some degree of capability but this is not replicated consistently.</td>
<td>Gap in understanding international food markets and updating this intelligence rapidly so that Northern Ireland industry knows how to respond.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Coagulation, Flocculation, Insulation, Purification, Water Management</td>
<td>Some degree of capability in Northern Ireland although this is &quot;hidden&quot; in a number of other sectors. The entire spectrum of Environmental Technologies or Clean Technologies needs to be further evaluated. There are some clear capabilities in this space in Northern Ireland but they tend to be fragmented.</td>
<td>Need to align all the existing capabilities into a consistent framework for CleanTech within Northern Ireland.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Animal and Plant Genetics, Animal and Plant Breeding, Animal Biotechnology, Soil Science and Soil Management</td>
<td>Strong area of capability for Northern Ireland. Excellent capability in AFBI, CAFRE, CAPRE (see Appendix 2).</td>
<td>Need to leverage more of this capability into the future of the industry in Northern Ireland.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Releasing embedded energy (Anaerobic Digestion etc), Catalysts in energy saving, construction science, storage technology, photovoltaics</td>
<td>Strong area of capability in Northern Ireland that is building on experiences in Holland, Denmark and creating new sustainable solutions.</td>
<td>Need to leverage this capability to create some structural changes of critical mass.</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>The multifunctional use of land - land farming, bioenergy, bioaugmentation, biostimulation, bioenergy, energy generation, biodiversity, biological genomics,</td>
<td>Strong area of capability in Northern Ireland that is building on US, Austria, Sweden, UK and other experiences. Excellent leadership position.</td>
<td>Need to leverage this capability to create some structural changes of critical mass that augment Northern Ireland leadership in this area.</td>
</tr>
</tbody>
</table>
# Key Enabling Technology mapping

## Table 5.2: A Summary of the Capabilities Required to Realise the 20120 Vision

<table>
<thead>
<tr>
<th>Sector</th>
<th>Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Sciences</td>
<td>Human Genomics, Enzymes, Epidemiology, RNA and Gene Regulation</td>
</tr>
<tr>
<td>ICT</td>
<td>Computational Science (Modelling/Simulation of Genomics), Management of Animal Disease, Processing and safety profiles, ICT tools to demonstrate intermittency in energy networks</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Probiotics, Nutrigenomics, Nutraceuticals</td>
</tr>
<tr>
<td>Advanced Manufacturing</td>
<td>Pharma Robotics, Advanced Processing techniques</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Market Knowledge, Agri-food Intelligence Databases, Econometric Modelling</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Coagulation, Flocculation, Irradiation, Purification, Water Management</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Animal and Plant Genetics, Animal and Plant Breeding, Animal Biotechnology, Soil Science and Soil Management</td>
</tr>
<tr>
<td>Advanced Manufacturing</td>
<td>Ambient temperature, Magnetic Resonance, Pharma Robotics</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>Releasing embedded energy (Anaerobic Digestion etc), Catalysis in energy saving, construction science, storage technology, photovoltaics,</td>
</tr>
<tr>
<td>Sustainable Production and Consumption</td>
<td>The multifunctional use of land - landfarming, bioventing, bioaugmentation, biostimulation, bioreactors, energy generation, biodiversity, biological genomics,</td>
</tr>
</tbody>
</table>
Key Enabling Technology mapping

FIGURE B: THE FUTURE OF NORTHERN IRELAND AGRI-FOOD DEPENDS ON CAPABILITIES FROM MULTIPLE SECTORS®

- **Life Sciences**
  - Genomics
  - Biological Enzymes
  - Epidemiology
  - Bioinformatics
  - New processing techniques
  - New packaging techniques (active, edible etc)
  - RNA and Gene regulation

- **Advanced Materials**
  - (and processing)
  - Biomaterials
  - Computational Science
  - New functional materials
  - Sensors
  - Nano Technology
  - Bioremediation
  - Energy Materials (Catalysis, Photovoltaics)
  - Fuel Storage
  - Biomarkers
  - Coatings

- **Agri-food**
  - Farming (production)
  - Proteins
  - Animal and Plant Genetics
  - Processing & Packaging
  - Alternative Energy
  - Soil Science
  - Water Management
  - Environmental Science
  - Land Use

- **ICT**
  - Computational Science
  - Modelling
  - Knowledge Management
  - Traceability
  - Analytical Toolsets
KET mapping recommendations 2008

1. Fill the Gaps!

2. Commercial Intelligence

3. Aligning Research base with Industry

4. Support SME base

5. Enable producers to be innovative in line with 5 leadership areas.
Commercial Intelligence

Collaborative Networks “working together to achieve a common goal”

“Government provides Industry Experts as Honest Brokers”
Aligning Research Base with Industry

Competence Centres

Led by Industry

Competence Centres

Academia
Aligning Research Base with Industry

- Basic principles observed
- Demonstrated in a laboratory environment
- Prototype demonstration on operational scale

**TRL:**

1. Research Push
2. Basic principles observed
3. Demonstrated in a laboratory environment
4. Prototype demonstration on operational scale
5. Market Pull

**Universities**

**Competence Centres**

**Industry (Large & SME’s)**

Alignment of research base with industry involves moving from basic principles observed in a laboratory environment to a prototype demonstration on an operational scale, bridging the gap between research and industry through the competence centres.
Aligning Research Base with Industry

Competence Centre Vision

Industry Steering Board
- Industry Chairperson
- Industry Reps
- University Reps

Centre Director

Research Strategy

Research Project
- Research Project
- Research Project
- Research Project

Committees:
- IP & Commercialisation Committee
- International Advisory Committee
- Technical Committee
Aligning Research Base with Industry

• A critical mass of research activity involving a mix of locally based SMEs & multi national companies alongside international participants, in sectors strategically important to the N. Ireland economy

• Funding Model:
  75% public sector
  25% Industry (Contribution in Kind -CiK )

• Total revenue £1.35m pa (or greater); with £350k pa from businesses

• Centres must leverage other funding sources e.g. TSB, Horizon 2020, US/Ireland
Support SME base

- EU & UK R&D support
- TSB competitive calls
- R&D tax credits
- Innovation vouchers
- Grant for R&D
- Collaborative R&D
- Collaborative networks
- Competence Centre (in development)
Support SME base

“A wide range of Innovation programmes”

Technology Led

- Innovation Advice
- Innovation Vouchers
- Business Innovation Link
- Short Term Reward

Market Led

- TDI
- Design
- Proof of Concept
- Developing Capacity

Long Term Reward

- Grant for R&D: Experimental Development
- Knowledge Transfer Partnership
- Intellectual Property
- Collaborative R&D
- Open Access Facilities
- Applying New Knowledge
- Driving New Knowledge
- Competence Centres
Innovative Public Procurement (SBRI)

Un-met Need

Competition Phase

Proof of Concept

Proof of Concept

Proof of Concept

Proof of Concept

Prototype

Prototype

Full Open Procurement

Department of Enterprise, Trade and Investment

SMART SPECIALISATION PLATFORM
Focus areas and leadership areas

FIGURE C: THE REFINEMENT OF 2020 TO FOCUS AREAS AND LEADERSHIP POSITIONS BASED ON EXISTING CAPABILITIES IN ALL SECTORS AND THE GLOBAL MARKET OPPORTUNITIES.

Global trends

FOUR KEY CATEGORIES
- Leading edge food and ingredients
- Integrating food, diet and health
- New alternative enterprises
- Mastering change and risk

BE COMPETITIVE

EIGHT FOCUS AREAS
- Food components and ingredients
- Processing/supply chain excellence
- Food products and innovation
- The consumer of Northern Ireland foods
- Food safety and security
- Building a knowledge based sector
- Creating viable community energy
- Developing Agri-food alternatives market

BE WORLD-CLASS

FIVE LEADERSHIP AREAS
- Leading differentiated foods
- Innovative processing and packaging
- Enhanced consumer knowledge
- Leveraging computational science and bioinformatics
- Exploring embedded energy and agricultural by-products

FRAMEWORK CONDITIONS
- Capacity to absorb and exploit knowledge
- Science and technology knowledge creation
- Regulatory framework
- Networks and collaboration
- Competition regime and entrepreneurship
- Customers and suppliers
- Access to finance

MATRIX Panel Report 2008
Enable producers to be innovative in line with 5 leadership areas

- Functional Foods (Life & Health Science)
- Shelf life, reduce costs, convenience, safety (ICT, Life & Health science, advanced materials)
- Communicate safety, security purity, traceability (ICT)
- Food modelling, food security, benchmarking (ICT, advanced materials)
- Reduce energy costs, intelligent energy systems, release embedded energy
The key to success for a region the size of Northern Ireland is to focus on areas where there is the potential for international leadership in research that feeds into global food markets. The focus areas described above are too broad to create sufficient focus for leadership positions. Therefore, these focus areas have been further refined into five Leadership Areas for Northern Ireland to be underpinned by framework conditions to achieve long term success within the sector. These leadership areas have been selected because they allow Northern Ireland to create market growth in a developing aspect of the global Agri-food sector and can also be used to spearhead the development of the sector.

1. **Leading Differentiated Foods**
   The development of world leading foods, using pharmaceutical techniques to produce differentiated (e.g. functional) foods that can be customised to individual needs and produce vitality protein products that are focussed on the Premiumisation, Beyond Health and Convenience markets;

2. **Innovative Processing and Packaging**
   The development of existing processing and materials skills, (drawing on other areas of Life Sciences and advanced materials) to produce innovative processing and packaging mechanisms that meet the requirements of enhanced shelf life, reduced preservation costs, consumer convenience and safety;

3. **Enhancing Consumer Knowledge**
   The development of knowledge based toolsets that enhance and communicate the safety, security and purity aspects of products (e.g. traceability) and provide assurance through to the consumer;

4. **Leveraging Computational Science**
   The further development of existing Computational Science capability to advance the sector in terms of food and process modelling and to master change and alleviate risks associated with food security, food risk, etc. and overall industry risk;

5. **Exploiting a multifunctional nature of Agri-food and finding mechanisms to release the embedded energy in the sector**
   The creation of a complete supply chain of the Northern Ireland Agri-food sector that looks at the multifunctional usage of the sector to increase the productivity of the sector and also seeks to release the embedded energy within Northern Ireland food products thereby creating energy security and reducing costs. These two areas can then be used to displace energy and waste costs by a mixed model of food and alternatives usage. This includes an 'end to end' perspective of energy including storage and construction, and supported ICT to alleviate fluctuations in demand and to develop sophisticated models for effective land use. Additionally, the alternatives from by-products from Agriculture and land (animals, plants etc) are to be integrated into an Northern Ireland system of energy recapture and new product creation in terms of Biorefineries for packaging, fuel and other novel products.
World class research
World Class Research

Institute for Global Food Security

• Prof Chris Elliott, Director, heads up an international team of world renowned experts, focusing on major research themes:
  • Food Safety and Food Integrity;
  • Human nutrition and Health;
  • Animal Health and Welfare;
  • Parasitology
  • Plant and Soil Science;
  • Climate Change.
World class research

Welcome to the Centre for ASsured, Safe and Traceable food (ASSET) at Queen’s University Belfast. Launched in January 2009, ASSET is a new Research Centre within the Institute for Global Food Security that is based in three Schools - the School of Biological Sciences; the School of Planning, Architecture and Civil Engineering (SPACE) and Queen’s University Management School.

ASSET’s Vision:

- A food supply chain which is safe, transparent, rapidly traceable and sustainable;
- Innovative, state-of-the-art scientific techniques that will create a niche food forensic strength to develop a new dimension in animal and human health, food safety monitoring and traceability;
- A major All Island research centre that brings together four key research groups on the Island.

The Institute for Global Food Security are delighted to announce that the 2nd Food Integrity and Traceability Conference (ASSET 2014) will take place at Queen’s University Belfast during 8 – 10 April 2014.

This Project is supported by the Department for Employment and Learning through its “Strengthening the all-Island Research Base” initiative.
World Class Research

PiGIS® - Carcass quality graphs

Top 10% ‘best’

Summary Information

<table>
<thead>
<tr>
<th>Slap No.</th>
<th>xxxx</th>
<th>Top 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Pigs</td>
<td>7742</td>
<td>15813</td>
</tr>
<tr>
<td>Ranking</td>
<td>51%-75%</td>
<td>n/a</td>
</tr>
<tr>
<td>Code 1</td>
<td>71.5%</td>
<td>92.1%</td>
</tr>
<tr>
<td>Code 2</td>
<td>18.2%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Code 3</td>
<td>10.2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Avg Probe</td>
<td>11.4mm</td>
<td>9.7mm</td>
</tr>
<tr>
<td>Variability</td>
<td>2.45</td>
<td>1.82</td>
</tr>
<tr>
<td>Condemned(1)</td>
<td>0.3%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

(1) % Number condemned due to being:
(a) Dead on arrival
(b) Dead in livestock pens
(c) Totally Condemned
(d) Other
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**BovIS - Benchmarking carcass quality**

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### Summary Data

- **Report Date Range:** 01/11/2011 to 30/11/2012
- **Animal Type:** Steers
- **Breed Category:** Pure Dairy
- **Breed:** Holstein
- **Animal Count:** 71
- **Carcass Gain Rank:** 97 out of 556

### Summary of Your Performance

<table>
<thead>
<tr>
<th>Animal Count</th>
<th>Weight (kg)</th>
<th>Fatness</th>
<th>Conformation</th>
<th>Age (mths)</th>
<th>Carcass Gain (kg/day)</th>
<th>In Spec (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Steers</td>
<td>71</td>
<td>330.2</td>
<td>3=</td>
<td>O-</td>
<td>23.8</td>
<td>0.46</td>
</tr>
<tr>
<td>Top 10%</td>
<td>419</td>
<td>290.0</td>
<td>2+</td>
<td>O-</td>
<td>16.8</td>
<td>0.58</td>
</tr>
<tr>
<td>All Producers</td>
<td>4,285</td>
<td>299.2</td>
<td>2+</td>
<td>P+</td>
<td>25.7</td>
<td>0.40</td>
</tr>
<tr>
<td>My Aberdeen-Angus</td>
<td>18</td>
<td>344.0</td>
<td>4-</td>
<td>O=</td>
<td>24.4</td>
<td>0.46</td>
</tr>
<tr>
<td>Nov 2010 - Oct 2011</td>
<td>72</td>
<td>298.7</td>
<td>3+</td>
<td>P+</td>
<td>21.1</td>
<td>0.47</td>
</tr>
</tbody>
</table>
Greenhouse Gas Emissions

Grammes of Carbon Equivalent (CO$_2$e Per kg of Milk Produced)

- Total emissions: 1085
- Methane from enteric fermentation: 551
- Concentrate production/transport: 168
- Purchased forages: 0
- Manure emissions: 225
- Fertiliser production/application (inc lime): 269
- Land use and land use change: 39
- Carbon sequestration: -238
- Fuel & electric: 39
- Veterinary products, silo cover etc.: 32

Carbon Footprint of a Northern Ireland dairy farm feeding 2.1 tonnes of concentrate and producing 6800 litres per cow
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Milk output per herd in NI

- 1986-2006 milk yield +110 litres/cow/year
- Over ¾ of increase could be attributed to genetics
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*Bovine brucellosis - molecular genetics*

- Collaboration with Veterinary Laboratories Agency and Broad Institute MIT, Boston
- Characterised DNA markers which discriminate between strains of *Brucella abortus*
- Routine analysis of *Brucella* isolates to inform on source of infection
- Molecular epidemiological advice helps DARD implement effective containment / eradication measures
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Bovine Tuberculosis

- Investigation of genetic susceptibility to bTB in cattle (BBSRC)
- TB biosecurity study (DARD)
- An evaluation of IFNg (interferon gamma) use in NI (DARD)
- Development of vaccines for strategic use as control measures for bovine tuberculosis (Ferret Model) (EU FP7: TB STEP)
- Helminth co-infection as a modulator of the bovine immune response (Science Foundation Ireland, University Collage Dublin)
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Plant health and crop improvement

Challenges for industry and policy:
- EU policy on reductions in agrochemical availability
- Plant quarantine for agriculture, forestry and horticulture
- Emerging risks from climate change and EU expansion
- Increased threats to long-term sustainability of production

What AFBI Science is doing:
- Developing lower input pest and disease strategies
- Enhanced molecular diagnostics of pests and diseases
- Major threats to forest trees – Chalara fraxinea, Phytophthora ramorum, & P. lateralis
- Disease and pest monitoring – during summer/pest risk analysis
- Practical advice to help industry adjust to new threats
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**Plant genetics and crop improvement**

**Challenges for industry and policy:**

- A competitive and sustainable local agri-food industry
- Changing EU requirements and developing market needs
- Access to the best varieties for local farming conditions
- Optimum use and management of crop and grassland varieties

**What AFBI Science is doing:**

- Identifying traits for higher yields and disease resistance
- Improving quality and seasonality of crops and grassland
- Commercial breeding partnerships and development of tools for selection- spectroscopy & somatic embryogenesis
- Recommended varieties and agronomic advice to industry
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Food quality
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Eating quality of beef versus dairy breeds
“Free range” grass fed beef and milk

Two new E&I projects funded by DARD and LMC
- aiming to make the most of NI beef and milk

• Can differences in eating quality between dairy and beef breeds be explained and exploited?

• Do outdoor grass-fed cattle give increased vitamins in beef and milk?
Functional Food: Reduced fat cheese fortified with omega-3 fatty acids

Aims:

- To produce reduced-fat Cheddar cheese fortified with omega-3 fatty acids
- To optimise quality of reduced fat cheese

Outcomes to date:

- Optimised transfer of fatty acids into the cheese
- Identified appropriate omega-3 supplement to take forward
- Scale-up study at Loughry College in January 2013
- Sensory panels will be conducted
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AFBI Economics

**Micro Models**
Optimising farm business and farm household incomes under different market, policy and technology conditions

**Sector Models**
Projecting the impacts of policy changes on animal, crop and biofuel sectors and on GHG emissions at EU and UK levels

**Systems Models**
Mapping the regional economic system, contributions of agri-food/rural sectors and economic multiplier effects
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Fisheries & Aquatic Ecosystems

- R&D, monitoring and technology transfer in support of sustainable management of fisheries and aquatic resources in Northern Ireland
Examples of AFBI Resource Maps

- Annual Seed Mussel stock assessment
- Adult mussel beds (aerial photography)
- Stock assessment of *Nephrops* (Marine Fisheries)
Conclusions

• The return on investment from research in Northern Ireland has been shown to be very positive
• Opportunity for more growth
• Linkages with all stakeholders at each stage in the R&D process
• KET’s play a large part in the Agri-food industry
• Highly complex to provide a clear policy framework
Sources

- MATRIX reports - http://www.matrix-ni.org/#/publications-reports/4570999724
- DARD - http://www.dardni.gov.uk/
- Institute for global food security- http://www.qub.ac.uk/research-centres/InstituteforGlobalFoodSecurity/
- AFBI- http://www.afbini.gov.uk/
- CAFRE- http://www.cafre.ac.uk/