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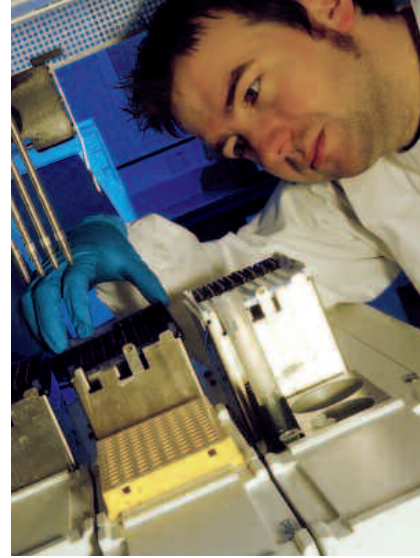


Food Strategy Implementation Partnership  
Report of the Foresight Leadership Group



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## Chairman's Foreword



**John Gilliland, OBE**  
Chairman

Northern Ireland, FSIP  
Foresight Leadership Group  
September 2006

As the second largest employer in Northern Ireland, the Agri-Food sector is at a defining moment in its future development. Some would call it a tipping point; others would call it a crossroads. What we do know is that the 'Status quo' is not an option and that change and change management is the only sustainable solution.

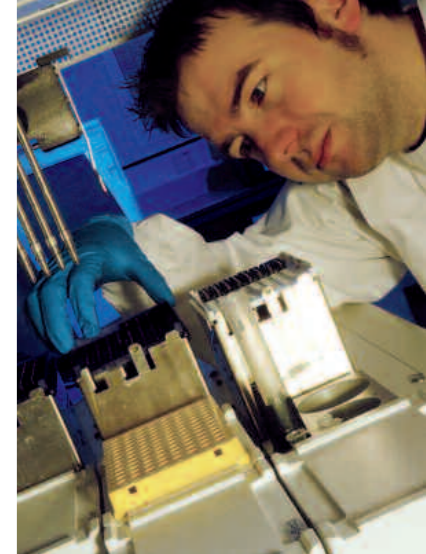
Events around the World Trade Organisation (WTO), which threaten to remove all agriculture's export subsidies by 2013; and the ever increasing supply chain pressure, created by the continued rationalisation of our modern retail system to meet changing consumer demands, confirm the necessity for change.

Since joining the Common Agriculture Policy, our Agri-Food Industry has been mainly focused on commodity markets, which often received supported prices. Having reviewed the evidence, engaged with stakeholders and considered various options of what this Industry would look like by 2020, the Foresight Leadership Group unanimously believe there can only be one collective vision for the future of this sector.

This vision is of a Northern Ireland Agri-Food Sector that has exponentially invested in Research, Development and Innovation and where the results are in the form of:

- distinctive and innovative products which command a premium and a space, within an evermore sophisticated market;
- a developed legacy of intellectual property that fuels further investment;
- an acceleration in the decrease of our environmental footprint; and
- an acceptance that this sector plays an integral part, in a new innovative and knowledge based economy within Northern Ireland.

As Chairman, I have had the privilege and pleasure to work with some of the most farsighted and visionary participants within this sector and who have made up the membership of this Group. Never once did any of us doubt that this vitally important sector of our economy did not have a dynamic future.





I ask the readers of this report just to reflect a moment and look beyond our shores to other geographically remote areas of the World. To countries such as Finland and Iceland, which have put their faith and investment behind entrepreneurial skill, local talent and an Research and Development (R&D) Expenditure, three times greater than anything we are currently doing here. They are reaping the rewards of their farsighted investment and have been inspired to continue and reach further.

Can the Northern Ireland Agri-Food Sector do this? Yes it definitely can, but it will only be through a collective approach, where we leave behind our fear of internal competition and focus on the big prize, our external competitiveness and Regional distinctiveness. We must leave our silo mentality behind, to cross inter and intra public and private sector barriers. We need to see a future for our country which inspires us to co-operate at all levels. And we must do it with urgency.

I would like to take this opportunity to thank the Chairman and the members of FSIP, who put their confidence in this group and challenged us to give the leadership and create the vision that is so dearly needed in such a vital sector of the Northern Ireland Economy.

The challenge is for us all. A Northern Ireland without an Agri-Food Industry, is a Northern Ireland without a heart and soul.



**John Gilliland, OBE**  
Chairman



## Executive Summary and Key Recommendations

Following the government acceptance of the 'Fit for Market' Report in November 2004, the Food Strategy Implementation Partnership (FSIP) was tasked to deliver its recommendations. The FSIP has generated significant momentum in the implementation process and sponsored a portfolio of new support measures for the Agri-Food industry across marketing and innovation, capability and supply chain development. Within the priority relating to innovation, the FSIP viewed the development of a longer-term perspective on innovation as crucial in shaping effective delivery strategies. The FSIP therefore commissioned an expert panel – the Foresight Leadership Group - to create a vision for innovation looking ahead to 2020 and identify a coherent strategic agenda for the future.

The Foresight Leadership Group met on seven occasions between December 2005 and May 2006, reviewed recent seminal works and consulted with sectoral stakeholders, subject experts and other leading relevant bodies.

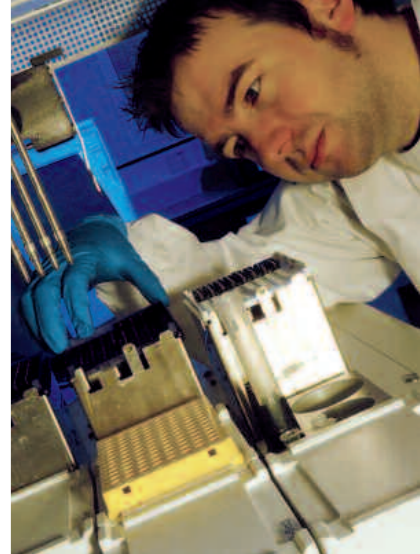
In formulating its recommendations, the Foresight Leadership Group analysed challenges ahead drawing the following conclusions.

The Agri-Food industry is central to the wider economic development of Northern Ireland over the next 15 years. **Changes in agricultural policy will be a key driver** in the need for economically, socially and environmentally sustainable Agri-Food systems. This is likely to change the patterns of land use in Northern Ireland and create a more pronounced multi-functional character to Northern Ireland farming and processing activities.

**Farming will be influenced by changes in both WTO agreements and CAP payments.** Successful farmers will change to more/less intensive systems (depending on sector and commodity), diversification into alternative food and non-food products (as payments are no longer linked to products) and to provision of wider public good, such as water and waste management, tourism and responding to climate change.

The farming sector will also need to adapt to changes arising from the **enlargement of the EU**, an increase in **environmental regulation and restriction** and the consequences of climate change.

**Competitive challenges will be raised by new market dynamics** including an ageing population, changing consumer demand and developments in the food service and retail sectors. In turn these will stimulate the need for high quality safe foods with increased standards of traceability. Differentiation of what Northern Ireland





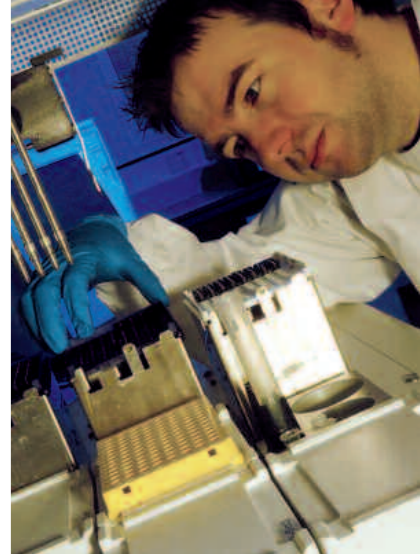
offers across the spectrum of food, ingredients and public goods will be a crucially important factor in this context. There is an increased need to leverage Northern Ireland's natural land and water resources more fully, both as a platform for delivery of products and services, as well as a basis for creating distinctiveness in the marketplace.

**Aspects of human health** will be an important driver in the future of food, fuelled by increasing concerns over health, levels of obesity and related non communicable disease in the population. Additionally, current and emerging infectious diseases in animals and plants and concerns over the use of antibiotics and chemical inputs represent enduring problems to be overcome. The rapid increase in knowledge of human genetics and functionality of food ingredients present opportunities for future developments in customising foods for highly segmented consumer markets.

**The implications of social sciences and advances in technologies** such as nanotechnology, computer science, robotics, life sciences, biotechnology and others converging with the Agri-Food industry are vast. Their application offers transformative potential to food production and processing in the future. The convergence of key enabling technologies will also revolutionise many aspects of the sustainability agenda for the Agri-Food industry over the next 15 years.

**A growing challenge and possible opportunity for Northern Ireland will be the need to monitor and respond effectively to public attitudes** and the complex nature of a wide range of consumer concerns. This together with an understanding of volatility, change and risk with well developed decision support systems will be important features for successful enterprise development in farming and food in Northern Ireland.

**The growth in scale, diversity and complexity of scientific knowledge makes networking vital** and means that no single country or institution can handle all aspects of science. Strategic alliances with others, nationally and internationally, and effective collaboration across scientific disciplines will be increasingly important to Northern Ireland. However, relevant local expertise and skills need to be available to feed through to application in a commercial setting and for effective knowledge and technology transfer.



## Key Recommendations

The Foresight Leadership Group submit that the following recommendations are pivotal if Northern Ireland is to build a sustainable and competitive Agri-Food sector and maximise its future contribution to an enterprising, knowledge based economy:-

## Innovation

### Recommendation 1

We firmly believe that a four component Vision forms the basis for creating a distinctive and sustainable Agri-Food sector in Northern Ireland:

- Integrating food, diet and health
- Developing leading edge food and ingredients
- Investing in new alternative enterprises
- Mastering risk and change

To realise effectively this Vision we **recommend a series of 18 Innovation Programmes** with associated technology platforms for comprehensive and intensive development. Our work has shown that the future of this industry is dependent on a multi-disciplined and multi-faceted approach and that all 18 Innovation Programmes need to be implemented.



### Vision for a Distinctive and Competitive Agri-Food Sector



## Implementation

### Recommendation 2

We **recommend that a champion be put in place** to provide strong leadership and oversee implementation of the 18 Innovation Programmes. This needs to be an effective integrated vehicle engaging both public and private sector stakeholders and spanning across departmental roles and responsibilities.

In managing delivery we suggest that success would have the following characteristics:

- A strong, multi-disciplinary research base;
- Effective capacity at the applied level;
- Business leadership within a responsive and technically competent commercial sector;
- Links with the Northern Ireland Science-Industry Panel.

### Recommendation 3

We further **recommend a series of inputs and actions to achieve success**. These fall in the areas of:

- Funding and Support;
- Collaboration and transfer of skills and technology;
- Consumer confidence;
- Cultural change.

### Recommendation 4

With specific reference to our recommendations on funding we believe that to achieve the breadth of innovation envisioned, the total historic spend in R&D in this sector, of approximately £19m per year, is woefully inadequate, when benchmarked against other geographically remote countries like Finland and Iceland. We therefore **recommend an annual spend of £45m over the next 10-15 years** will be needed to allow the Agri-Food sector to play its role as a dynamic, knowledge-based industry in a future innovative economy in Northern Ireland.

### Recommendation 5

With specific reference to our recommendations on collaboration and transfer of skills we **recommend the creation of virtual and physical internationally recognised centres of excellence** by encouraging the Northern Ireland Universities and Agri-Food and Biosciences Institute (AFBI) to establish complementary and collaborative initiatives and linkages at domestic and international levels, drawing effectively on their respective expertise and resources.

## 1. Agri-Food - The Leading Private Sector of the Northern Ireland Economy

- 1.1 The production and processing of food continues to play a vitally important role in the Northern Ireland economy. The Agri-Food industry creates 2.1% of Northern Ireland's Gross Valued Added, employs approximately 11% of the private sector workforce and annually generates £1.55 billion in external sales. This is substantially augmented by the economic contribution associated with the distribution, packaging and retail sectors as well as ancillary industries supporting farm and food sector businesses.
- 1.2 Primary agricultural production is dominated by grass-based enterprises with grazing livestock accounting for almost two thirds of gross industry output. Put another way, nearly 80% of the one million hectares of the land resource in Northern Ireland, farmed by some 27,000 farms, is grass-based. Of the balance, approximately 14% of the land resource is hill or rough land, some 5% supports crop and horticulture production and 2% is used for woods, plantations and set aside. It is important to note that primary agriculture also produces non-food products and public goods such as the rural landscape.
- 1.3 The food-processing sector has a gross turnover of £2.5 billion (2004) accounting for 19% of the total sales of the Northern Ireland manufacturing sector. The milk/milk products and beef/sheepmeat sectors together contributed 46% of this total gross turnover. External sales, i.e. outside Northern Ireland represented some 60% of total sales at £1.55 billion and export sales i.e. outside United Kingdom of £573 million formed 25% of total sales. Great Britain remained the principle external market with sales worth £924 million. The Republic of Ireland is the largest export market with sales worth £325 million. Some £302 million of sales are exported to other European Union and rest of the world destinations. In terms of value added, in 2004, food and drink processing activities generated some £482 million of value added, an increase of 2.6% over the previous year.
- 1.4 Northern Ireland has a well developed science capability in many areas related to Agri-Food technologies primarily centred within the recently established AFBI and the two Universities. These are complemented by the technology development support infrastructure within the College of Agriculture Food and Rural Enterprise (CAFRE), the network of FE colleges as well as product development facilities within the agri-business sector and related chemical and pharmaceutical industries. Over the last five years technology centres of excellence have been established in the red meat and dairy sectors with governmental support. Annex 1 summaries key themes of Agri-Food science and research activity across the relevant institutions in



Northern Ireland. It is noted that capacity is modest in some areas of science important for the future strategic research agenda for Agri-Food including some of the disciplines within the social and consumer sciences areas.

1.5 In summary, the Agri-Food industry is central to the wider economic development of Northern Ireland over the next 15 years. For the industry to reach its full potential by 2020, it must transform away from commodity-based production to a platform competing on the basis of differentiation, distinctiveness and diversification whilst at the same time reducing its environmental footprint.



### VISION 2020 STATEMENTS

Today, in 2020, everyone has taken full, active control of their diet, lifestyle and health. 'Personal Fitness Assistants' (PFAs) are the most visible sign of what is a dramatic change. PFAs, drawing on personal medical data, are used by everyone to make diet and lifestyle choices, both long-term and in 'real-time'. They are continually updated with quality-assured external information. People can now make specific diet and lifestyle changes which they know will help them to avoid adverse health conditions and diseases.



## 2. The Challenges Facing the Northern Ireland Agri-Food Sector

2.1 The Agri-Food industry faces its most significant period of change since joining the Common Agricultural Policy in 1973. The Foresight Leadership Group expects the industry will have to accelerate exponentially the rate of change over the next 15 years if it is to rise to the new challenges it faces and address the major issues both in the external and internal environments in which it operates. A step-change is required and the status quo is simply not an option. These challenges are summarised under the following headings:

- National and International Policy Developments;
- Market and Consumer Trends; and
- Cross Cutting Technological opportunities.

### National and International Policy Developments

2.2 Over the next decade the Northern Ireland Agri-Food industry will face a more liberalised world agriculture trade regime. Despite postponement of the World Trade Organisation (WTO) negotiations in July 2006, the direction of future reform is signalled in the WTO DOHA Declaration. This declaration aimed to commit the EU and WTO participants to negotiations to substantially reduce levels of domestic support, improve market access for all products through tariff reductions and reduce export subsidies. This political thrust towards trade liberalisation will inevitably have consequences for Northern Ireland particularly in the areas of increased competition from imports and a need to build profitable exports in the absence of export subsidies. Addressing the uncompetitiveness of Northern Ireland commodity agriculture in this global context is crucial although realistically the gap in relative production costs may be too big to close (see Table below).

### Relative Production Costs for Milk And Beef

Milk US cents per litre	Beef US dollars per 100kg carcase weight
Argentina 14	Argentina 80
New Zealand 19	Brazil 110
UK (including NI) 32	Ireland/Northern Ireland 300

Costs on full economic costs = cash costs + depreciation + opportunity costs and are on the same basis for all countries

Ref:IFCN Dairy and Beef Reports 2004

### CAP Reform

2.3 The reform of the Common Agricultural Policy in 2003 constituted a fundamental change in the way the EU supports the farm sector, introducing direct income



payments (Single Farm Payment) and severing the link between subsidies and production (decoupling). Over the next decade agriculture policy at EU level is anticipated to follow a reducing market management role via traditional export refunds, intervention purchasing and tariff barriers.

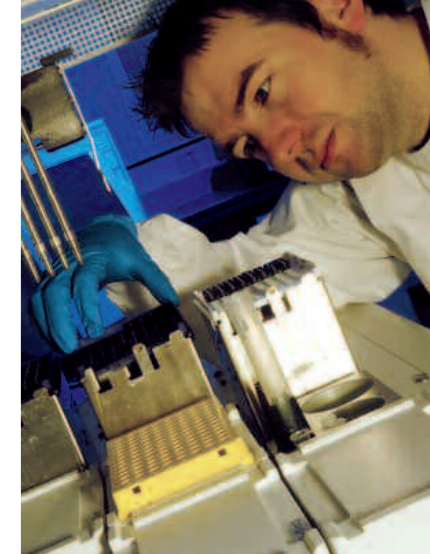
- 2.4 In this new situation market forces will increasingly drive the production decisions of farm and food businesses. The motivation to produce will depend on market returns leading to much greater volatility and fostering a period of uncertainty. Volume of production in some commodities will be subject to significant variability with production estimated to fall by up to 25% dependent on market prices. This fall will seriously impact food processing operations and other sectors ancillary to agriculture. Farming activity will increasingly be undertaken as a part-time activity. A proportion of the remaining population of farms however will be commercially focused. These will have to reflect high levels of productivity, technical efficiency, marketing ethos and focus on value added products.

### VISION 2020 STATEMENTS

Other advances in knowledge and technology, although less visible, have been pivotal: improved understanding of relationships between the genome at an individual level and diet, all built into decision support tools; the availability of Networking Tools that integrate PFAs into the developing 'World-Wide Health Web'; and the availability of Knowledge Bases that store, mine and make sense of complex data relevant to fitness and health. The companies that have developed the technologies now enjoy an international profile, sell their services overseas and bring in new money flows to Northern Ireland.

### EU Enlargement

- 2.5 The expansion of the EU in 2004 and the further enlargement of the EU community in the coming years will continue to have implications for Northern Ireland. On the one hand, there is a risk of progressive reduction in share of EU structural funds in the future, with implications for the proportion of EU funding for rural development expenditure. Most recently, concerns have been voiced over the levels of funding allocation to the United Kingdom under the 2007-2013 Rural Development Programme. While on the other hand, the new EU Member States, with a combined population of 76 million and significant emphasis on strengthening agriculture within their economies, present opportunities for trade and investment as well as capitalising on intellectual property and technology transfer. It is also clear that as



the EU expands to the East the axis on which the EU hinges also moves eastwards making Northern Ireland even more peripheral to these emerging markets.

### Compliance Pressures

- 2.6 Environmental regulations and restrictions will be increasingly important to both primary production and processing and will lead to changes in the nature of farming systems employed in Northern Ireland. These changes will impact on the cost dynamics associated with many traditional methods of production. EU Directives on water, waste and nitrates are already being implemented. Particularly affected will be the intensive livestock and milk production sectors. Additionally those in receipt of the Single Farm Payment must cross-comply with 18 EU Directives. Non-compliance can result in financial penalties reducing the level of Single Farm Payment. This will require a response from the agriculture sector to minimise potentially harmful effects of farming activity on the environment as well as enhancing measures to protect the natural environment. While the precise impact in the medium and longer term remains uncertain, it is likely that these environmental polices will exert downward pressure on production of agricultural commodities and raw material for the processing sector.

### Climate Change

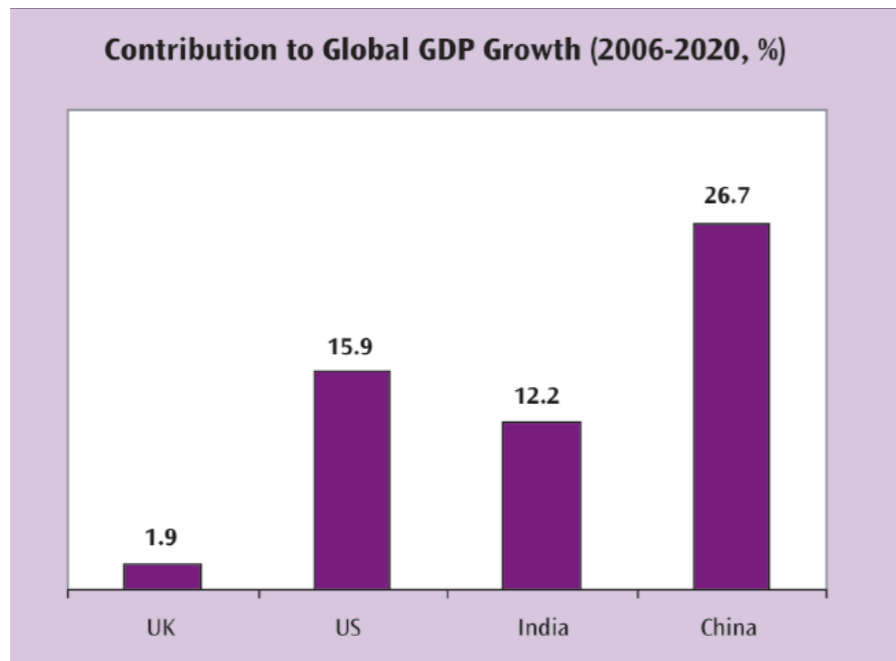
- 2.7 With agriculture contributing 22% of Northern Ireland's total greenhouse gas emissions, the sector is at the centre of the escalating agenda on climate change. This agenda will require the farm business sector to adapt to any effects of climatic conditions to ensure economic viability, while at the same time continuing to improve sustainable practices to reduce agriculture's impact on greenhouse gas production (Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>) and Nitrous Oxide (NO<sub>3</sub>)). It should be noted that the land sector is the only sector of the economy which can currently lock up carbon. At regional level, Northern Ireland is fully committed to implementing policies and programmes to reduce greenhouse gas emissions to help contribute to the United Kingdom's Kyoto target and domestic goal. DEFRA's recently published Climate Change Programme and Northern Ireland's Sustainable Development Strategy, launched in May 2006, will inject considerable impetus to the sustainability agenda. The Climate Change Programme commits the United Kingdom's agriculture forestry and land management sector to promote resource efficient farm management in order to reduce agriculture's contribution to greenhouse gas emissions and to examine the scope and feasibility of an emissions trading scheme for the sector.
- 2.8 Emerging strategies to counter climate change and adapt to its effects will also provide an increasing opportunity for the exploitation of renewable energy sources. While the extent to which climate change will negatively affect Northern Ireland agriculture through to 2020 may be limited, in the longer term, a number of issues will need to be considered. These include the future choices of food and non food



crops, adaptation to potential pests and diseases of crops and livestock, managing the effects of extreme weather and sustainable energy use. Other issues for consideration will be water resources, quality and flooding as well as policies for conservation and bio water diversity.

**Market and Consumer Trends**

2.9 In terms of the global market, world population growth is increasing. This growth together with growth in incomes worldwide will stimulate world food demand. The world economy will be two-thirds bigger in 2020. Global GDP will grow at an average annual rate of 3.5% up to 2020, propelled in particular by vast growth in China, India, and the USA. Increasing economic prosperity in the Far East and India together with the emerging economies in the enlarged EU and South America will fuel dietary shifts and alter global patterns of food production and consumption. As the Pacific Rim becomes more affluent, consumption of meat will continue to rise.

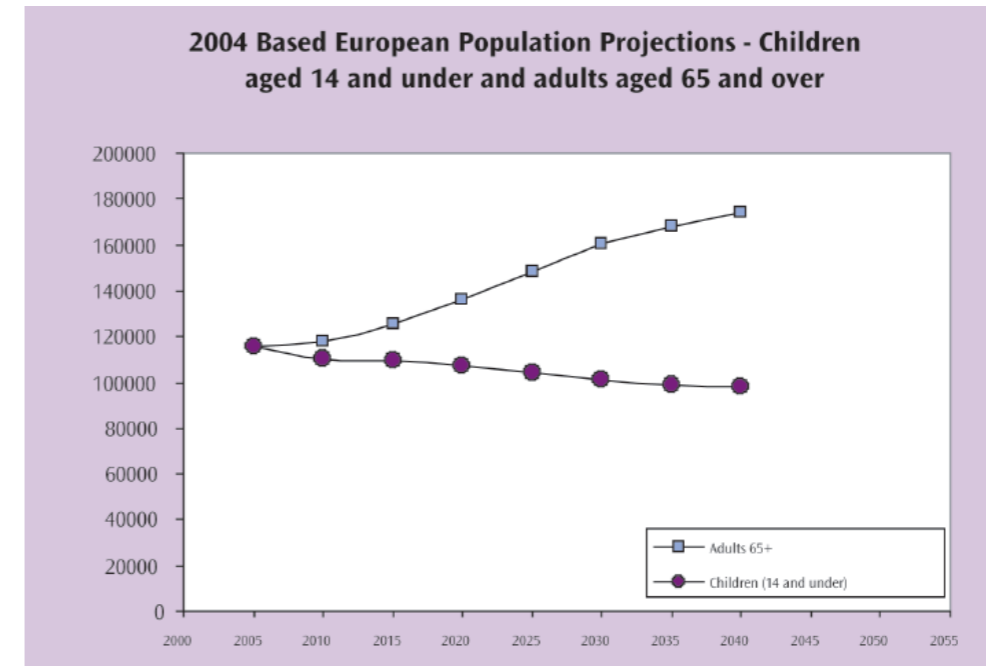


Increase in countries GDP as a share of increase in Global GDP  
Source: Economist Intelligence Unit 2006

**Ageing Population**

2.10 The Northern Ireland population is projected to increase by over 6% to 1.8 million people by 2019. Population demographics will continue to evolve with the age profile of the population gradually becoming older. The number of children under 16 will decrease by some 9% from 2004 levels by 2019, and the number of people

of pensionable age (as currently defined females aged 60 and males aged 65 and over) is projected to increase by 35% to reach 372,000 by 2019. This demographic feature is replicated across Europe.



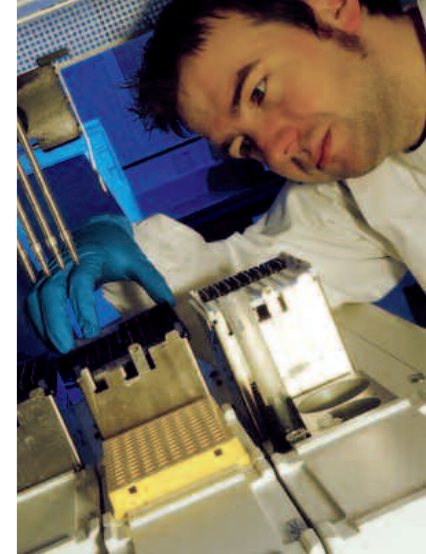
United Nations: World Population Prospects 2005

**VISION 2020 STATEMENTS**

The change to the way people manage their lifestyles and diet has also redefined food! Today, we buy food products not from stores but 'on subscription'. There is no mass market. For food companies, all products are designer products – manufactured to meet specific individual needs. It is now simple for minority groups with rare diseases or health conditions to obtain food tailored precisely to their requirements.

**Food and Consumer**

2.11 Within developed economies the growth in the food market has been less than 1% annually and the relative proportion of expenditure on food is declining. The movement from an industrial economy towards a service economy has changed





employment patterns, time usage profiles, consumer segmentation and eating habits, and exerted an impact on food consumption. An increasingly affluent and aware consuming public has led to growth in 'premium' foods and products positioned in the market according to a feature of the product itself. These features include attributes such as taste or functionality, characteristics linked to provenance and health, standards of animal welfare, or production and environmental factors. It also includes the need for cheaper but wholesome products for lower socio-economic groupings. Segmentation of consumer groupings continues to intensify and more and more consumers are looking for their requirements and behavioural patterns to be met by the market.

### VISION 2020 STATEMENTS

Moreover, the radical food processing, extraction and purification technologies developed in Northern Ireland have given us healthy food that tastes good. Today the watch-word is 'just right in time'. This personalisation has stretched back into the manufacturing and distribution process.



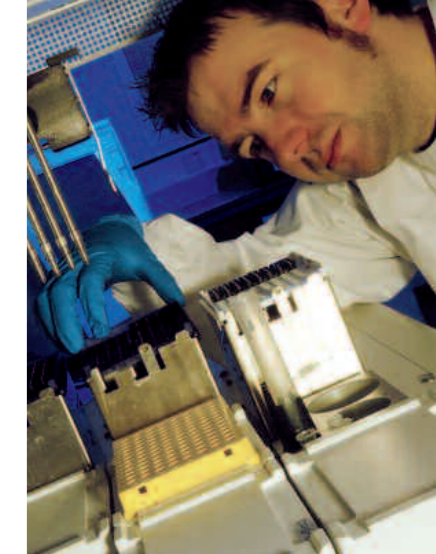
### Public Health

2.12 Concerns with health and well-being will increasingly impinge on the Agri-Food sector. Some concerns, such as those relating to obesity, are primarily rooted in consumer behaviour rather than in any intrinsic characteristic of a given class of food product. Nevertheless evidence suggests that both diet and obesity play a role in the aetiology of a number of diseases (type II diabetes, high blood pressure, cardio vascular diseases, a range of cancer types and arthritis). The cost of obesity to society and to the health service is substantial and is increasing year on year. WHO estimates that between 2% and 7% of health service expenditure is used to treat obesity and its consequences. In analysis conducted in 2002, obesity and its consequences in Northern Ireland was estimated to be causing 450 deaths each year, was resulting in 260,000 working days lost annually and was costing the economy £500 million. It is estimated that the incidence of diabetes will double in Northern Ireland over the next decade. Currently diabetes care in Northern Ireland is costing 5% of Health and Personal Social Services (HPSS) expenditure and a total of 10% hospital in-patient resources. Mapping the human genome and the discovery of a range of food related triggers provide a platform for increased understanding of the mechanisms of nutrition and well-being. The application of genomic healthcare is already starting to provide commercial opportunities in the USA and elsewhere.



### Food Safety

2.13 Food safety and security continues to be a priority issue for consumers as well as for industry and government. Consumers expect natural, functional and nutritional foods and to have confidence in their integrity and safety. Consumers also have concerns about the security of the food chain and the threat of accidental or malicious contamination. In addition to food-related safety risks associated with micro-biological, chemical and physical contamination and allergens, food related scares may relate to animal diseases that have little direct human food risk eg Foot and Mouth Disease and avian influenza. The impact of diseases (real or perceived) such as Foot and Mouth Disease and avian influenza can be diminished by surveillance and robust traceability systems.



#### Summary of Trends in the Consumer Market for Food

- Mega trends continue to be convenience, health, value for money, well being and indulgence
- Increased individuality and spontaneity in eating patterns
- More food consumed outside the home
- Greater interest in functional foods
- Emerging interest in personalised nutrition
- Continued concerns regarding obesity and health
- Continuing demand for new eating/drinking experiences
- Continuing demand for better traceability and safety.



### Food Retail

2.14 The concentration of the United Kingdom retail sector is a feature unlikely to change substantially in the years ahead. The top five supermarkets have some 75% of the retail food market in the United Kingdom. In Northern Ireland Tesco, Sainsbury and ASDA control approximately 40% of the market. A further significant development in the Northern Ireland retail sector has been the entry of European discount retail chains Aldi and Lidl, increasing the competitive pressures in the market place. Looking ahead, corporate responsibility in the retail sector may have a stronger focus and some retailers may seek social, ethical or environmental driven approaches as competitive advantage.

2.15 Additionally retailers are responding to consumer demands for convenience through on-line shopping and home delivery. In 2003 total estimated sales through on-line shopping was £1.7 billion with food retailers having 60% of this total. With this trend expected to escalate, customising products for home delivery distribution channels and finding ways of promoting new products remotely to consumers will pose future challenges for food suppliers. Progress in kitchen and home cooking





technology will also impact the food supply chain. Advances in the use of sensors in appliances and product identification systems will simplify and automate cooking processes. These will also provide further safety functions to protect consumers eg signalling the presence of allergens or the under-cooking of food. Instant market research feedback at point of product usage may also be facilitated.

## VISION 2020 STATEMENTS

A key to this success in integrating food, diet and health has been the Northern Ireland Network model, which clusters together prestigious university teams with local firms to commercialise knowledge.



### Food Service

2.16 The food service sector continues to grow and diversify and an increasing share of food consumption in the United Kingdom and Ireland is taking place outside the home via purchases in restaurants and food service outlets. In the USA, food service sector accounts for some 50% of all food expenditure. In the United Kingdom and Northern Ireland the corresponding shares are 37% and 33% respectively. With growth in the food service sector approaching 3% per year in value terms (compared to 1% for retail sales growth), it is estimated that in the United Kingdom by 2020, 50% of food and drink will be consumed outside the home. An emerging trend of interest in the USA is that instead of supermarket shopping, some are now attending Food Service Centres where under supervision customers prepare meals with given recipes, advice and ingredients. This return to a sort of 'home cooking' has social and potentially health implications.

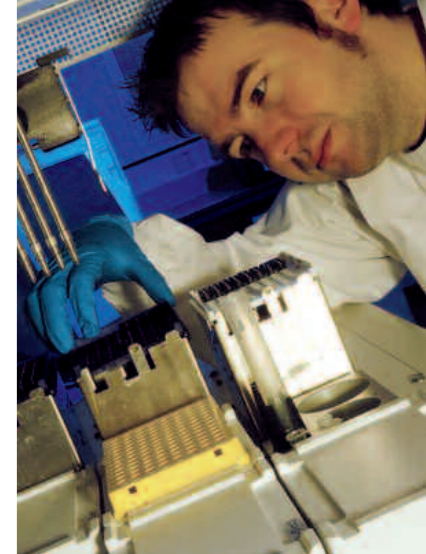
### Cross Cutting Technologies

2.17 The implications of advances in social sciences and technologies such as nanotechnology, computer science, life sciences, robotics, biotechnology and others converging with the Agri-Food industry are vast. Their application offers transformative potential to food production and processing in the future. The convergence of key enabling technologies will also revolutionise many aspects of the sustainability agenda for the Agri-Food industry over the next 15 years. These are additional to emerging developments in specific food related technologies which will impact all aspects of food composition, safety and quality. For example, minimal processing techniques relevant to the maintenance of compositional quality include micro-wave and radio frequency processing, ohmic and inductive heating, high pressure processing, pulsed light technology and high voltage arc discharge.



### Social and Consumer Sciences

2.18 Socio economic and consumer sciences have vital relevance in a future technologically advanced world. Techniques and methods used to expand social scientific understanding continue to be developed, reflecting the increasing importance of consultation with the public in respect of policy development and decision-making in science and technology. Alongside such consultations, continued refinement in social scientific techniques will enable the analysis of variations in, and complex and deep seated cultural responses underlying, public reactions to scientific and technological innovation. These emerging insights into factors impacting public opinion and personal choice as well as a more disciplined approach to evaluating 'unintended consequences' of innovation will have escalating influence on the complex process of innovative development.



### Nanotechnology

2.19 Physical nano sciences seem certain to have a broad range of applications in food processing, packaging and distribution. Assembling surface structures, coatings or barriers layer by layer using techniques such as chemical vapour deposition (CVD) and plasma-enhanced CVD will produce new materials and new surface properties. These innovations will lead to novel surfaces that resist contamination, that can identify and repel bacteria or become self-cleaning. Active and intelligent packaging, exploiting nano fabrication will produce new materials to extend shelf-life, optimise food quality and safety and allow in-home preparation of foods. Nano science will also lead to selection and creation of natural nano structures in food, creating vehicles for delivery of nutrients, flavours or functionally active ingredients. The same technology also underpins many aspects of sensor technology. Flexible displays based on polymer light emitting diodes will offer enhanced ways to display information on source, history since production and nutritional status of products.



### Computer Science

2.20 The application and importance of computing is set to grow dramatically across all the Agri-Food and environmental sciences towards 2020. Powerful predictive models of the complex and interactive factors that influence the environment and the effect of human activities on climate will be available to test strategies for counteracting environmental damage and climate change. Geographical information systems and advances in meteorology will have applicability across food production and land use. New computational tools will enable scientific advances in new sources of low carbon or renewable energy including biomass, marine, photovoltaic and fuel cells, and the development of carbon management technologies. The advent of quantum computing and cryptography will provide analysis of large data sets in areas such as genomics, proteomics and metabolomics leading to improvements in food safety, nutrition and authentication. Expected progress in personal computing and communication will allow individuals to access more information about the source, history and storage of specific foods, their nutritional characteristics and their suitability to their genetic makeup and lifestyle.



## VISION 2020 STATEMENTS

Today, in 2020, Northern Ireland is seen internationally as a leading Centre for Innovation in Food Products and Ingredients. Northern Ireland Food – ‘The Green Stuff’ as it is now known and branded – is renowned across the world. People who have never been near Northern Ireland have a vivid picture of what Northern Ireland food represents.

### Life Sciences

2.21 Progress in life sciences from the level of DNA up to systems biology – understanding human behaviour based on the concerted action of all genes – will lead to breakthroughs in health and nutrition such as diet-induced immune modulation, prevention of cognitive decline and increased availability of foodborne bioactive compounds customised for individual consumers. Advances in DNA technologies and single nucleotide polymorphism genotyping will introduce enhanced livestock and crop production traits, eg carcass confirmation, disease resistance, yields and fertility. Application of the sciences of genomics and proteomics will markedly improve food safety across the supply chain, creating better testing methods for the detection, identification and characterisation of human enteric pathogens as well as effective countermeasures.

### Robotics

2.22 Advances in engineering and robotics may alter employment patterns and reduce the number of unskilled employees in food processing operations. Exploiting developments in remote sensing systems, process automation and computerised control, will enable increasingly sophisticated operations such as carcass butchery and product assembly operations.

### Biotechnology

2.23 New biotechnology processes and genetic engineering will emerge to facilitate improved disease control and fertility in livestock. Advances in plant biotechnology will lead to production of botanical therapeutic extracts and plant based functional and medicinal food ingredients. However, such developments must seek to avoid antagonising public opinion. This underlines the need to integrate cross cutting sciences such as psychology, sociology and human geography in studying public reaction.

### Investment in R&D

- 2.24 At the regional level Northern Ireland’s general expenditure on R&D (GERD) – which is a total of business, academic and government expenditure – continues to lag behind comparable European and United Kingdom regions (see Table 1). In 2004 Northern Ireland’s GERD was £272.7 million, of which £136 million (50%) was spent by the Higher Education Sector, £124 million (46%) by businesses and the remainder was other government expenditure. While investments by the Higher Education sector is one of the highest of any United Kingdom region, the business expenditure recorded the second lowest regional figures in the United Kingdom (11th out of 12).
- 2.25 The level of R&D spend in Northern Ireland is very weak and there is significant potential to increase the level of expenditure in R&D including the Agri-Food sector. It has been difficult to determine the total levels of expenditure on innovation within the Northern Ireland Agri-Food sector. This in part reflects variable specifications for what constitutes innovation funding, a lack of a simple survey system to monitor sectoral innovation funding and the multi-disciplinary, cross cutting nature of the research, development and technology relevant to the Agri-Food sector. At a macro level it is estimated that the annual business sector spend,

TABLE 1 COMPARATIVE R&D INVESTMENT STATISTICS - 2004

	GERD <sup>2</sup> (% of GDP)	BERD <sup>3</sup> (% of GDP)	GOVERD <sup>4</sup> (% of GDP)	HERD <sup>5</sup> (% of GDP)
Northern Ireland	1.2	0.5	0.1	0.6
United Kingdom	1.8	1.2	0.2	0.4
Republic of Ireland	1.2	0.8	0.1	0.3
EU 15	2.0	1.3	0.2	0.4
EU 25	1.9	1.2	0.2	0.4
Finland	3.5	2.5	0.3	0.7
Norway	1.6	0.9	0.3	0.5
Sweden	3.7	2.8	0.1	0.9
Denmark	2.6	1.8	0.2	0.6
Iceland	3.0	1.7	0.6	0.6
Czech Republic	1.3	0.8	0.3	0.2
Poland	0.6	0.2	0.2	0.2
New Zealand	1.2	0.5	0.4	0.3

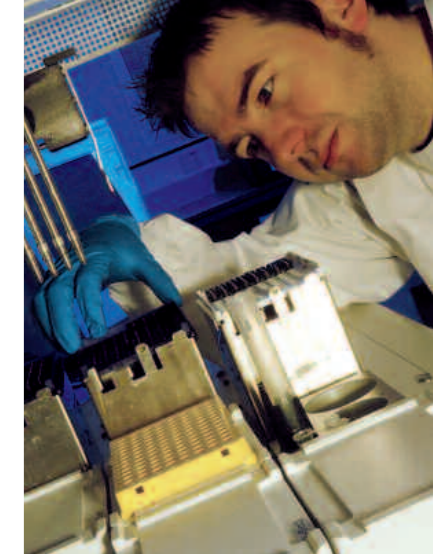
<sup>1</sup>Sources: Eurostat R&D Statistics, DETI R&D Statistics, New Zealand R&D Statistics

<sup>2</sup>GERD General Expenditure on R&D

<sup>3</sup>BERD Business Expenditure on R&D

<sup>4</sup>GOVERD Government Expenditure on R&D

<sup>5</sup>HERD Higher Education Expenditure on R&D





including grant support, is some £5 million with expenditure by the higher education and research sector some £14 million ie a total in the order of £19 million.

Consequently increasing investment in R&D and promoting innovation represents a key strategic priority within the wider economic policy agenda. This priority is articulated in the economic vision for Northern Ireland and the Regional Innovation Strategy. The Regional Innovation Strategy identifies the agriculture and food sector as one of five priority technologies considered to be of greatest relevance to the future growth of the Northern Ireland economy. Government plans to establish a focused expert advisory panel – the Northern Ireland Science-Industry Panel (NISIP) – as part of the implementation of the Regional Innovation Strategy. NISIP's flagship initiative will be a 'niche technology horizon scanning programme' to undertake Foresight style investigations in identified technology areas.



## VISION 2020 STATEMENTS

Managers and technologists from the food industry in Asia now actively seek out food products from Northern Ireland. This is because these products are tailored to the needs of local markets (for example, tastes in meat differ greatly from the European tradition). Asian companies are really impressed by the skill and determination shown by the Agri-Food sector in Northern Ireland to understand their markets. Also, in these health-conscious times, Asian companies know they can trust the provenance of food from Northern Ireland. For them, it is very important to buy products that are 'disease free'.



## 3. Background and Approach

- 3.1 The Food Strategy Implementation Partnership (FSIP) was established in November 2004 by the Ministers responsible for Agriculture and Economy in Northern Ireland. The Partnership, Chaired by Dan Flinter, comprises eight members representing a range of Agri-Food stakeholder interests and is responsible for overseeing the delivery of the 'Fit for Market' strategy. This strategy recommended 31 key priorities to support the development of the Agri-Food industry across the themes of marketing, supply chain, capability and innovation against an assigned two-year timeframe for delivery.
- 3.2 'Fit for Market', inter alia, emphasised the dependence of a successful Agri-Food industry in Northern Ireland on an enhanced capability to constantly innovate more effectively than competitors. The identification and understanding of the future problems and opportunities facing Northern Ireland was declared critically important in this regard. Facilitating a systematic process was considered essential to develop a consistent and focused agenda to deliver prioritised innovation programmes for the sector. Consequently, in exercising its strategic responsibility, the FSIP commissioned, with endorsement from key governmental and industry stakeholders, an expert panel – the Foresight Leadership Group – to develop a science and technology based vision for a sustainable agriculture and food sector through to 2020. This work, over a six-month timescale would identify proposals for Innovation Programmes to address the defined needs and emerging opportunities for the region.
- 3.3 The Group's Chair, John Gilliland, Vice Chair, Dr Clare Passmore and membership was drawn from various sectors, with individuals invited on the basis of their expertise, experience and leadership. Its remit spanned the food supply chain and the related aspects of sustainability consistent with the scope of the 'Fit for Market' report. The detailed terms of reference and membership are set out in Annex 2.
- 3.4 From the outset it was recognised that the Foresight Leadership Group's work was intrinsically connected to the wider economic agenda in Northern Ireland and to a number of important works and associated key policy initiatives. These are listed in Annex 3. These policies all emphasise, regardless of sector, the need for an increase in creativity, innovation and enterprise in Northern Ireland. As part of the pre-work of the Foresight Leadership Group, engagement and dialogue with Government and private sector organisations took place. The FSIP Chairman, Dan Flinter, consulted with the Ministers responsible for Agriculture and Economy as well as their Department's Permanent Secretaries in advance of establishing the FSIP Foresight Leadership Group. The FSIP Chairman also consulted with the Economic Development Forum's Innovation sub group and received endorsement and support for the FSIP Foresight Initiative. Participation by senior representatives from DETI, DEL, DARD and Invest NI on the Foresight Leadership Group additionally supported an integrated and co-ordinated approach.

*The Economic Development Forum (EDF) was established in 1999 as a formal mechanism to advise government on issues relating to the development of future competitiveness of the Northern Ireland economy. The EDF is a partnership body chaired by the Economy Minister, with membership drawn from business organisations, trade unions, the further and higher education sectors, the voluntary and community sector, the agriculture sector as well as local and central government. In 2005 the EDF formed 4 subgroups to identify key priorities and actions required for the 4 productivity drivers of the economic vision for Northern Ireland – innovation, enterprise, skills and infrastructure.*

**Approach**

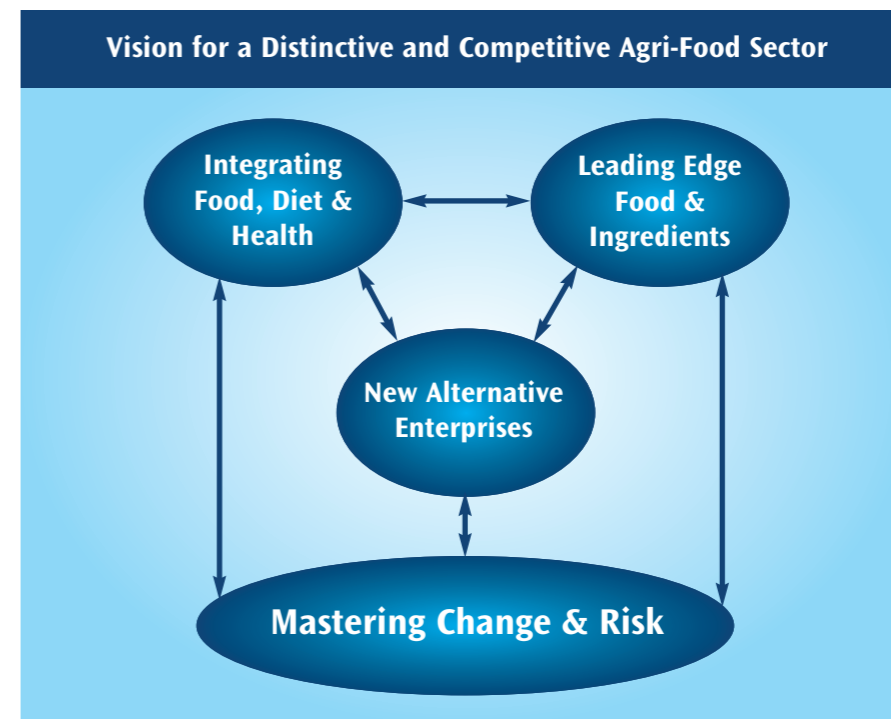
- 3.5 The work plan adopted by the Foresight Leadership Group involved review of existing material and previous reports; a facilitated group workshop; critical review by relevant subjects experts; and a stakeholder consultation event.
- (i) The Group reviewed recently published reports of Foresight Ireland, Strategic Research for Scottish Executive Environment and Rural Affairs Department (SEERAD) and the Sustainable Farming and Food Research Priorities Group and noted the themes and technologies identified. Annex 4 summaries the key research themes from these reports.
  - (ii) In December 2005, the Foresight Leadership Group participated in a facilitated workshop. The programme included a series of stimulus presentations by 5 members of the Group. This progressed the identification and development of science based Agri-Food visions and the related Innovation Programmes for Northern Ireland.
  - (iii) The Foresight Leadership Group secured further development and validation of the science based Vision and supporting Innovation Programmes through critical review by recognised subject experts.
  - (iv) In March 2006, the Foresight Leadership Group hosted a stakeholder consultation workshop. Participants were drawn to reflect industry, academic, consumer, student and governmental interests. Independent specialist analysts, 'New Game Plan', were invited by the Foresight Leadership Group to design, facilitate, analyse and report this workshop. This employed a unique form of "brain pool" consultation to capture individual contributions and to enable participants to review and build on the contributions of others.
- 3.6 The Foresight Leadership Group met on seven occasions and members of the Foresight Leadership Group also observed the Stakeholders Consultation process. Additionally, the Group welcomed opportunity for engagement with the significant stakeholder bodies, DARD's Research and Education Advisory Panel and DEFRA's Research Priorities Group, during its work.



**4. Vision and Recommendations for Innovation**

4.1 The fundamental changes facing the Agri-Food sector outlined in Chapter 2, present a future of exciting new opportunities as well as some formidable competitive challenges. The Foresight Leadership Group concluded that it was appropriate to place its recommendations for Innovation Programmes in this future context and present defined visions for a distinctive and competitive Agri-Food sector through to 2020. These Vision statements aim to capture the key deliverables and strategic benefits to Northern Ireland following effective implementation of the Innovation Programmes. A four component Vision was developed to describe positive future states and to set out a distinctive and creative picture of Northern Ireland Agri-Food in 2020. The Vision statements (at Annex 5) were designed to be stimulating, rather than to be entirely comprehensive and cohesive. The diagram below illustrates the four components of the Vision central to developing a distinctive and competitive Northern Ireland Agri-Food sector.

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



4.2 In devising the Innovation Programmes, the Foresight Leadership Group established a series of principles and criteria. These criteria were also used during the stakeholder consultation workshop and provided a consistent basis for the development of the Innovation Programmes as well as a framework for assessment. These principles and criteria are set out below.

**(i) Importance to Achieving the Vision**

A measure of the importance of the Innovation Programme to delivery of the components of the Vision for 2020.

## VISION 2020 STATEMENTS

The success of this major global supplier to the Asian food market has owed much to the company's ability to bring together science, technology, and market insights, to develop products which deliver just what the consumer wants. The investment made from 2006 in reducing and maintaining low levels of plant and animal diseases in Northern Ireland has also enabled it to capitalise on a distinct geographical Northern Ireland brand. It is a remarkable success story!

**(ii) Creating Northern Ireland Product Distinctiveness**

**Superior skills:** Exploiting distinctive expertise already available locally or investing in new skills which will make it easier to deliver the Innovation Programmes and create a distinctive expertise base in Northern Ireland.

**Natural resources:** Capitalising on local, distinctive resources to delivering the Innovation Programme and differentiate Northern Ireland in the marketplace eg land, soils, water, types of crops or livestock, husbandry skills or manufacturing facilities.

**Energising entrepreneurship:** Building local skills in managing change, tackling challenges and making the right decisions that will support delivery of the Innovation Programmes and give Northern Ireland a leading edge in enterprise development.

**(iii) Delivering Sustainable Benefits**

**Economic:** Assessment of the extent to which the innovation programme will provide sustainable economic benefits (or dis-benefits) compared with the position in 2006. This will include enduring economic benefits throughout the Northern Ireland Agri-Food sector, the wider Northern Ireland economy and global economy.

**Social:** A measure of the extent to which the innovation programmes will provide sustainable social benefits (or dis-benefits) compared with the situation in 2006. It will embrace social benefits to Northern Ireland consumers, the wider Northern Ireland population and people beyond Northern Ireland.

**Environmental:** Capacity for the Innovation Programmes to aid compliance and provide sustainable environmental benefits (or dis-benefits) compared to the position in 2006.

**(iv) Assessment of Feasibility**

A measure of the level of risk, uncertainty and fit within the 2020 timescale associated with the Innovation Programme and an assessment of the capacity to deliver.

**(v) Passion**

Attendees at the Stakeholders Consultation Workshop were invited to register up to six Innovation Programmes they felt most passionate about.

## Proposed Innovation Programmes

4.3 The Foresight Leadership Group recommends a series of Innovation Programmes to support delivery of the Vision for 2020. These Innovation Programmes by necessity will require a mix of activities spanning the continuum of near to market, applied and basic research and development and will require investment in science and technology, knowledge transfer, design, enterprise and supply chain advances.

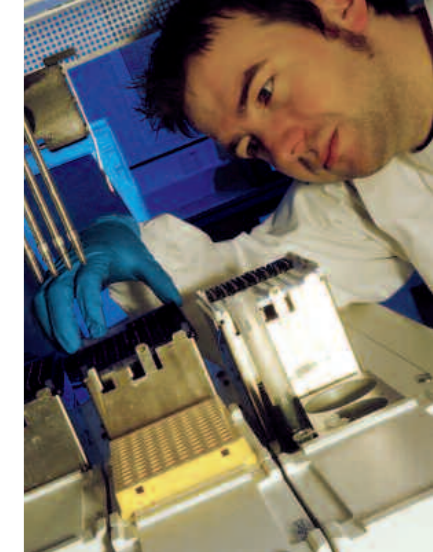
4.4 The Innovation Programmes were developed by recognising the contributions and systematic assessments captured during the stakeholder consultation workshop in March 2006.

The Synthesis Report of the Workshop is available at the FSIP Website, [www.fsip-ni.com](http://www.fsip-ni.com). The set of 18 proposed Innovation Programmes to deliver the four components of the Vision are captured in summary form below and the wording reflects the iterative process of their development.

### Distinctive NI – Integrating Food Diet and Health

#### Innovation Programme 1: Personalised Diet Management

Develop technologies for personalised, life-time and real-time management of diet. Draw on emerging knowledge of how genes and nutrients interact to explain disease susceptibility. Specifically, identify how 'markers' can provide early warnings of disease. Maximise use of ICT/Web to network and mine information. Include real-time health management. Ensure instant access to personalised health information. Aim to make this available to the entire population (including excluded groups). Enable these technologies to speak to the supply system to trigger production of personalised products and facilitate consumer choice. Include biomarkers. Take systems biology approach. Be food-type specific.





**Strategic Technology Platform**

- Biosciences
- ICT
- Nano-technology
- Nutrition Sciences
- Social and Consumer Sciences
- Genetics
- Bioinformatics
- Bioethics

**Distinctive NI - Integrating Food Diet and Health**

Innovation Programme 2: **New Processing Techniques**

Develop radical food processing techniques to create foods that are healthier but still attractive to consumers. Consider using new extraction and purification techniques to make currently undervalued food components with potential health benefits commercially viable. Consider creating 'designer' foods to meet the health and welfare needs of specific population groups. Enhance ability of processors to make tailored products by health, age, etc. Ensure sound science is applied to evaluation of functional ingredients and develop evidence-based data to substantiate product attributes. Reduce damaging components and add beneficial components. Establish a Northern Ireland 'functional food' cluster. Also consider supplements and pharmaceuticals. Make sure products can extend to all population groups (income etc). Include modifying animal/plant nutrition as means to affect human nutrition. Take early account of consumer acceptability.



**Strategic Technology Platform**

- Robotics
- Process Engineering
- Nano-technology
- Biosciences
- Nutrition Sciences
- Social and Consumer Sciences



**VISION 2020 STATEMENTS**

One Northern Ireland company has developed a new range of ingredients using a biological process on an artificial substrate in high-tech factories (based on a long-established technique of producing vaccines in chicken eggs). Early problems with product stability were resolved by the development of 'intelligent packaging'. This has also provided consumers with a wealth of product and health information, via built-in communication devices which can be read by 'Personal Fitness Assistants'.

**Distinctive NI - Integrating Food Diet and Health**

Innovation Programme 3: **Genetics and Diet of Pregnant Mothers**

Improve health by applying emerging knowledge of how the genetic make-up and diet of pregnant mothers determine long-term expressed characteristics in children (e.g. immune function, risk of allergy). Build on existing research in nutrigenomics particularly metabolomics. Build on existing Northern Ireland strength in understanding and treating heart disease, diabetes and cancer. Establish multidisciplinary teams covering genomics, proteomics, metabolomics, systems biology, dietetics and nutrition to identify gene-environment interactions relevant to health. Build on existing ability to screen for genetic predisposition to diseases.

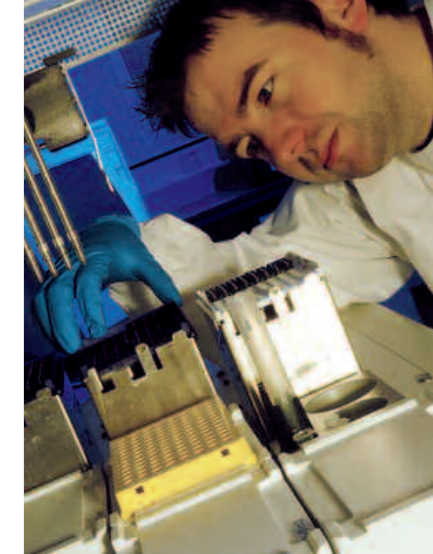
**Strategic Technology Platform**

- Clinical Sciences
- Biosciences
- Immunology
- Genetics
- Nutrition Sciences
- Oncology
- ICT
- Nano-technology
- Bioinformatics
- Bioethics
- Social Sciences

**Distinctive NI - Leading Edge Food and Ingredients**

Innovation Programme 4: **New NI Products**

Develop new products with a strong Northern Ireland identity. Consider both complete products and specific ingredients, ensuring credibility and legitimacy. Ensure that products







respond to consumer needs. Include knowledge products as well as physical products. Systematically survey and identify ingredient sources of specific health and nutrition benefits in Northern Ireland food.

**Strategic Technology Platform**

- GM
- ICT
- Process Engineering
- Clinical Sciences
- Nano-technology
- Social and Consumer Sciences
- Nutrition Sciences

**Distinctive NI – Leading Edge Food and Ingredients**

Innovation Programme 5: **Packaging**

Develop new forms of food and ingredient packaging to satisfy the emerging needs of producers, retailers and consumers in both domestic and export markets. Consider: ‘intelligent’ packaging to give consumers valuable information; packaging that extends the freshness of the food it contains; and packaging that is less burdensome for waste management, including bio-degradable packaging. Extend to include growing of renewable raw materials for packaging (e.g. polymers). Include edible and smart packaging (e.g. for traceability using Radio Frequency Identification (RFID)).

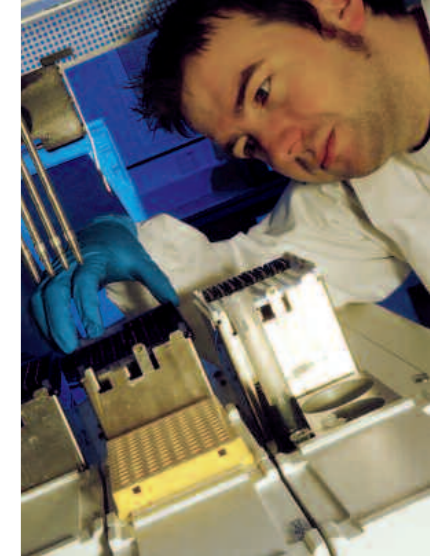


**VISION 2020 STATEMENTS**

Today, in 2020, following a period of rapid growth, Northern Ireland is a thriving enterprise cluster. Internationally, it is a beacon for Sustainable Development – particularly admired because its growth has been achieved by rural enterprises managing and creating wealth from indigenous land and water resources. This was unimagined in 2006.

**Strategic Technology Platform**

- Material Sciences
- GM
- Nano-technology
- Sensor Technology
- ICT/Wireless Technology
- Bio-remediation
- Social and Consumer Sciences



**Distinctive NI – Leading Edge Food and Ingredients**

Innovation Programme 6: **Bio-compounds**

Develop new technologies to produce large volumes of bio-compounds or other extracts through ‘bio-reactor’ systems. Develop, as ‘proof of concept’ a bio-reactor core technology with broad capability to manufacture diverse bio-materials. Broaden the capability of the established ‘bio-reactor’ approach by extending the range of bio-materials eg vaccine production in chicken eggs. Consider in particular, scope for tissue-based approaches to avoid potential problems of animal welfare. Build on work happening in other countries.

**Strategic Technology Platform**

- Biosciences
- Pharmaceutical Sciences
- GM
- Bioprocessing
- Nano-technology
- Clinical Sciences
- Social Sciences

**Distinctive NI – Leading Edge Food and Ingredients**

Innovation Programme 7: **Products for Emerging Markets**

Develop new plant and animal products to satisfy the emerging needs of fast-growing food export markets, including needs linked to local culture, lifestyle, and shifts in diet. Cover complete food products, specific ingredients and packaging. Needs to take account of key market segments (e.g. culture, ethnicity, ability to pay). Enhance nutritional benefits of locally-produced food to satisfy specific nutritional needs in export markets.



**Strategic Technology Platform**

- GM
- Bio- technology
- Social and Consumer Sciences
- Nutritional Sciences
- Genetics

**Distinctive NI – Leading Edge Food and Ingredients**

Innovation Programme 8: **Minimising Food Risks**

Develop systems to safeguard foodborne risks, food security and consumer safety. Develop new approaches and technologies for minimising the risk of disease outbreaks across a





## VISION 2020 STATEMENTS

Examples include: a farm that supplies human transplant organs from pigs and runs aquaculture projects to supply the pharmaceutical industry; a farm that solely grows and processes renewable raw materials for energy production and building construction; networked farms which deliver renewable feedstocks to biorefineries to produce high-effect chemicals for pharmaceutical companies (at the same time using processing waste to fuel district heating systems); and companies which take organic waste and re-configure it so that it can be used in bioremediation.

range of targeted plant and animal diseases. Develop 'contained' populations of crops and livestock belonging to defined gene-pools that are resistant to diseases. Develop focused management measures and technologies for diseases becoming resistant to treatment. Develop and disseminate techniques for detection and monitoring. Develop management models to predict disease outbreaks in plant and animal production by monitoring critical indicators. Specify and apply improved environmental regimes to contribute to disease avoidance. Develop rapid traceability and decontamination methods to identify and remove risk.

### Strategic Technology Platform

- Nano-technology
- Microbiology
- Sensor Technology
- Toxicology
- Traceability
- ICT
- Genetics
- Social Sciences

### Distinctive NI - New Alternative Enterprises

#### Innovation Programme 9: Renewable Energy

Develop a bigger, but economically viable, role for the production of raw materials as sources of renewable energy, driven by comparative assessments of options, through demonstration projects.

### Strategic Technology Platform

- Engineering
- Energy Technology
- Global Economics
- Microbiology
- Crop Science
- Social Sciences

### Distinctive NI - New Alternative Enterprises

#### Innovation Programme 10: Bioremediation

Develop new and more effective technologies for bioremediation which achieve high standards of land and water quality. Consider: emerging new technologies (e.g. new plant varieties), and include a focus on high-priority waste elements (including phosphorus in water). Focus on plant varieties developed with high-uptake traits.

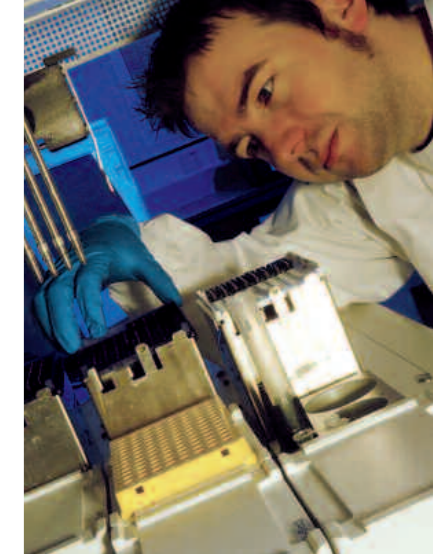
### Strategic Technology Platform

- Plant Sciences including GM
- Social Sciences
- Engineering
- Aquatics Sciences
- Environmental sciences
- Toxicology

### Distinctive NI - New Alternative Enterprises

#### Innovation Programme 11: Alternatives from Known Processes

Develop a range of renewable raw materials to satisfy emerging market opportunities. Consider raw materials including fibres produced using known processes. Focus on improving the quality of by-products and wastes (e.g. straw, hides, manure) and on developing new varieties of plants and animals. Include animal species new to Northern Ireland but with special potential in Northern Ireland. Ensure a diverse gene reserve as a source for breeding to meet future needs (e.g. animal hides).



**Strategic Technology Platform**

- Engineering
- Plant Sciences
- Bio-sciences
- Genetics
- Social Sciences

**Distinctive NI - New Alternative Enterprises**

Innovation Programme 12: **Alternatives from Novel Processes**

Develop a range of renewable raw materials to satisfy emerging market opportunities. Consider raw materials produced using novel processes. Consider using ‘bio-refineries’ as a core technology with the capability to produce diverse value added components (including medicines, pharmaceuticals and bio-fuels) from renewable raw materials. Build on existing high-technology solutions which are being applied to land. Emphasise versatility of materials suitable for a diverse range of uses in different markets. Include as sources vegetation and dairy. Consider alternative fermentation technologies.

**Strategic Technology Platform**

- Sensory Sciences
- Engineering
- Bio- sciences
- Nano-technology
- Pharmaceutical Sciences
- Flavour chemistry

**Distinctive NI - New Alternative Enterprises**

Innovation Programme 13: **Aquaculture**

Develop sustainable aquaculture in both inland and coastal waters. Consider: new enterprise models covering production and marketing, suited to Northern Ireland, guided by relevant international research and experience; and deriving economically-important complete products, or specific ingredients, from currently undeveloped species. Focus on meeting emerging needs in overseas markets (where demand outstrips supply). Exploit Northern Ireland assets of good water quality, disease-monitoring and marketing expertise. Consider the example of kelp farms to produce dietary supplements for both farm animals and humans.

**VISION 2020 STATEMENTS**

These businesses have all recognised and taken advantage of the much bigger markets beyond their doorstep. Today 50% of their overall profits are earned overseas, by trading in high –value expertise and distinctive physical products. They have been European leaders in seizing the opportunity to turn ‘environmental protection’ into a positive engine for growth! Today, nobody here talks about the ‘hard choices’ between economic growth and safeguarding the environment.

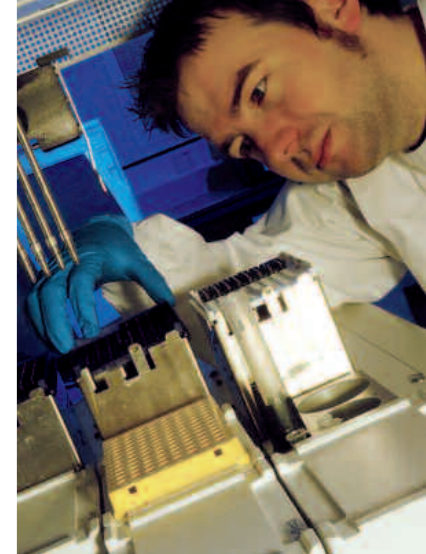
**Strategic Technology Platform**

- Molecular Sciences
- Aquatic Sciences
- Fish Genetics
- Plant Sciences
- Toxicology
- Environmental Sciences
- Fish and Human Nutrition

**Distinctive NI - Mastering Change and Risk**

Innovation Programme 14: **New Production Systems**

Develop new production systems for Northern Ireland which exploit opportunities and draw on existing strengths, yet are resilient under a range of future scenarios. Take account of potential negative public reactions (e.g. animal welfare). Take advantage of the Networks which have been developed in Northern Ireland to enable rapid implementation. Develop systems for sharing intellectual property within sector clusters. Include platform systems which can easily be flexed in response to changing market needs. Focus on strengths in grass-based and water-based systems.





## VISION 2020 STATEMENTS

All this has had a knock-on effect on the entire Northern Ireland scene. Northern Ireland is seen as the place to start-up alternative enterprises. As well as the attractions of the work itself, people are drawn here by the multiple job options available within thriving enterprise clusters, and by the excellent quality of a natural environment which itself has benefited from the application of technological innovations developed initially for foreign markets.

### Strategic Technology Platform

- ICT/Modelling software
- Consumer Sciences
- Economics Modelling
- Toxicology
- Social Sciences

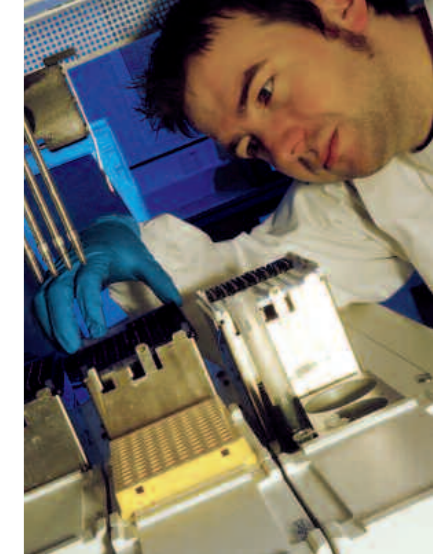
### Distinctive NI - Mastering Change and Risk

Innovation Programme 15: **Practices to Improve Sustainability**

Develop and implement good practices to improve sustainability in the Agri-Food sector, taking account of climate change, bio-diversity and habitat management. Include practical decision tools, and Key Performance Indicators aligned to sustainability. Review best practice globally for given product areas. Take a multidisciplinary and resilient approach (to tackle set-backs) and look to develop markets for these tools.

### Strategic Technology Platform

- Environmental Sciences
- Soil Science
- Aquatic Sciences
- Social Sciences



### Distinctive NI - Mastering Change and Risk

Innovation Programme 16: **Risk/Decision Support Tools**

Develop tools to help visualise and compare strategic options for innovation together with decision support tools, to facilitate adaptation and risk management. Build knowledge of the Northern Ireland context and relevant behavioural factors into these. Draw on expertise from diverse fields outside the Agri-Food sector. Develop risk management tools that can be used by micro-businesses and SMEs as well as larger businesses, informed by an understanding of their approach to risk. Include innovation in Networking itself. Include a focus on external parameters and drivers.

### Strategic Technology Platform

- Software Design
- Risk Assessment
- Communication
- Risk Management
- Social Sciences

### Distinctive NI - Mastering Change and Risk

Innovation Programme 17: **Improving Plant and Animal Genetics**

Build on the internationally-recognised genetic merit and breeding skills of the Irish equine industry. Transfer know-how developed in that industry to other species of plants and animals.

### Strategic Technology Platform

- Genetics
- GM
- Communication
- Social Sciences including Ethics
- Bioinformatics



**Distinct NI - Mastering Change and Risk**

Innovation Programme 18: **Water Quality and Management**

Exploit a holistic approach to the strategic management of water and water quality, recognising that water is becoming an increasingly scarce resource globally and Northern Ireland has abundant resources of high-quality water resources and expertise in water management. Northern Ireland water can then be viewed as a distinctive asset.

**Strategic Technology Platform**

- Environmental Sciences
- Aquatic Sciences

**VISION 2020 STATEMENTS**

Today, in 2020, individual enterprises are doing well, the economy as a whole is booming, there is high employment and the natural landscape has never looked better. The secret of this success lies not only in Northern Ireland's distinctive natural resources and unique expertise, but also – critically – in the really special way in which change and risk is managed here today.



**5. Implementation**

**Managing delivery**

- 5.1 The FSIP Foresight initiative aims primarily to develop a longer-term strategic agenda for innovation to meet the massive challenges ahead and to achieve a transformation of the Agri-Food industry in Northern Ireland. However, it is clear that there is a need to develop a delivery pathway between now and 2020. This section provides some pointers on how this innovation agenda can be implemented.
- 5.2 Achieving the innovation agenda will require effective and immediate responses from both government and industry to set in motion a step change in approach to stimulate applied, strategic and basic research and development. Additionally, increased levels of near market activity are urgently needed to awaken the industry to more immediate opportunities. The size of the challenge is self-evident. Success moving forward depends on leadership, focussed interventions and a way of working that promotes and comes from entrepreneurship.
- 5.3 The ownership and responsibility for the implementation of the proposed Innovation Programmes must be clearly identified and there is an urgent need to establish accountability for driving a co-ordinated action plan forward.

***The Foresight Leadership Group therefore recommends setting up a robust vehicle to champion responsibility for implementation and driving forward delivery of the Innovation Programmes.***

To assist further this process of delivery, the Foresight Leadership Group offered its views on the foundations needed for success and how it would define effective delivery. It also recommended a series of enablers to support this delivery. The contributions on enablers were invited as an integral part of the agenda for the Stakeholder Consultation Workshop. The inputs from this exercise have been factored into the following recommendations.

**Defining Success**

- 5.4 It is clear from the analysis of the challenges ahead that the key for future success is dependent on a multi-functional and multi-faceted approach. The following characteristics as prerequisites for success were identified.



• **A Strong, Multi-Disciplinary Research Base**

Northern Ireland needs a strong basic Agri-Food research base, multi-disciplinary in nature and focussed on the critical converging technologies identified in this report. A key characteristic will be the ability to forge links between disciplines and develop creative connections across disciplined areas. This will build on current capability and skill sets, particularly in health sciences and nutrition, food safety and animal health, as well as creating science capability in new specialisms for Agri- Food application, such as nano-technology, social sciences and pharmaceutical sciences.

• **Effective Capability at the Applied Level**

It is essential that the basic research base is supported by an equally robust and effective capability at the applied level. This will be characterised by a co-ordinated and complementary approach between institutions and the effective sharing of intellectual and scientific expertise. The Foresight Leadership Group recognise the central role that the newly established Agri-Food and Bio Sciences Institute, CAFRE and the wider FE sector have to contribute in this regard.

• **A Responsive and Technically Competent Commercial Sector**

The business sector in Northern Ireland must develop compatible strengths in its capacity to harness the scientific capital generated through basic and applied science research. Investments to anchor technical skills and expertise within the private sector and to consolidate a wider spectrum of business – research base interaction represent important features for delivery.



**Achieving Success**

The Foresight Leadership Group propose that in order to achieve these aims the following areas of activity should be considered:

**Funding & Support**

5.5 There is an urgent need to increase the total level of investment and funding for science and innovation in the Agri-Food sector. Regional coherency in governmental funding policy is critical to ensure effective resource allocation.

***A two to three-fold increase from the existing investment baseline across private, public and research stakeholders to £45 million per year would align Northern Ireland R&D expenditure with other successful knowledge-based economies.***



The Foresight Leadership Group urge that the goals of the 18 recommended Innovation Programmes form the focus for any funding allocations. This focus, in part, will be assisted by increased participation by the sector in existing schemes and support programmes. The high level of administrative burden and timelines for approval associated with public funding programmes must be addressed. Additionally opportunities to lever funding streams from non-public sources should be explored.

*Specific recommendations include:*

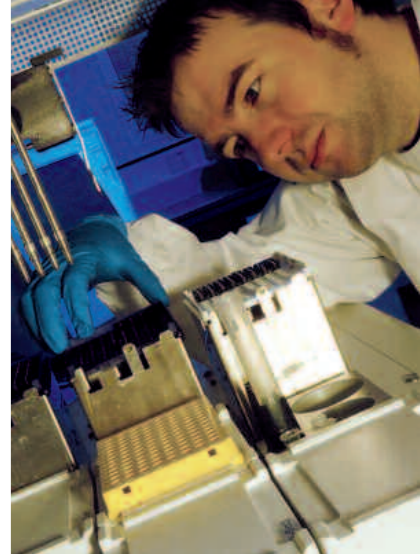
- Immediate introduction of an incentive to increase industry engagement in existing R&D and innovation support programmes;
- Tailoring investment to leverage in areas where other countries have already invested;
- Providing a specific collaboration fund to stimulate business networks with science suppliers;
- Considering “sponsorship models” with commercial companies and a facilitation structure to bring in venture capital;
- Making the “investor community” a specific target for communication of the vision and innovation programmes;
- Benchmarking the commitments of Northern Ireland Agri-Food businesses to R&D through introduction of simplified measures to monitor business spend on innovation and R&D; and
- Making available an innovation support team dedicated to mobilising company innovation efforts through working with business to raise awareness of the opportunities, broker links with innovation providers and build networks with suppliers and customers.

**Collaboration and Transfer of Skills and Technology**

5.6 The Foresight Leadership Group recommends that specific actions are introduced to foster more effective interaction across the key players in Northern Ireland in relation to science and technology, primary production, processing, marketing and

**VISION 2020 STATEMENTS**

Traditional businesses have thoroughly reviewed their businesses and sought to add value in new markets. Companies have spotted exciting emerging markets and brought science and technology together to deliver what the consumers want. While there have been setbacks, businesses have always found solutions by using their Networks and thinking ‘out-of-the box’.





distribution. The competitive success of agriculture and food sector businesses will continue to be inter-dependent and it is particularly important to stimulate intellectual asset flow, market research and technology solutions up and down supply lines. The Group also calls for increased co-ordination between the business sector and academia at the national and international levels to expand horizons and facilitate essential knowledge transfer. The government proposals to establish the Northern Ireland Science Industry Panel will provide a helpful forum to stimulate this interaction. Effective delivery of the recommended Innovation Programmes requires a strengthening of the links between institutions and the barriers between the many scientific disciplines involved – including social science, pharmacy and medicine – must be reduced. This delivery will require instruments to encourage and support multi-disciplinary inputs to the implementation process. Complementarity in the research agendas of the main institutions in Northern Ireland is also crucial.

*Specific recommendations include:*

- developing and promoting shared vision for innovation programmes in the Agri-Food sector
- *encouraging the Northern Ireland Universities and AFBI to establish complementary and collaborative initiatives and linkages at the international level, drawing effectively on their respective expertise and resources, thereby creating both virtual and physical internationally recognised centres of excellence*
- establishing strong linkages within industry through effective advisory boards.
- developing stronger programmes for secondment among industry, government and the universities
- developing Northern Ireland’s capacity as an “intelligent customer” for scientific collaboration and thereby its competence to leverage knowledge through managing effective linkages with the rest of the United Kingdom, with Europe and beyond.
- Fostering connectivity at the applied level and encouraging collaboration between AFBI, CAFRE and the FE Sector.
- reviewing the full range and diversity of public and private sector organisations involved with the Agri-Food sector and develop better models for the future

**Knowledge and Technology Transfer**

5.6.1 Critical to the success of the Innovation Programmes outlined will be the degree to which the cycle of creativity, innovation and enterprise is catalysed.

Of particular relevance to Northern Ireland is the dissemination and transfer of knowledge and technology to SME businesses which characterise the farm and food sector. The capability of SME businesses need to be significantly upgraded and supported to take developments in innovation out of research and academia through enterprise to the



market. The flow of trained people into industry is a key component of knowledge transfer. Facilitation will be needed to foster mutually beneficial alliances and the creation of clusters and networks to stimulate innovation. Proven models for support elsewhere, which recognise that SMEs find the process of innovation difficult are recommended for consideration in Northern Ireland.

*Specific recommendations include:*

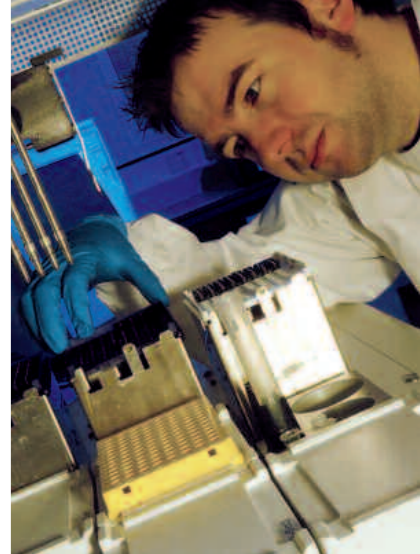
- researching best practice models for knowledge and technology transfer;
- putting a resource in place to work with companies to facilitate networks and clusters on a sectoral or technological basis;
- increasing participation in industrial Awards schemes for post graduate students;
- exploring opportunities for collaboration with other industries to lever knowledge and expertise; and
- regularly reviewing market and industry needs and basic research programmes to identify future needs.

**VISION 2020 STATEMENTS**

Businesses are today using diverse tools and techniques. Many are combining the long-established skills of story-telling to bring ‘scenarios’ to life, with support from powerful software tools. These really help them to consider the pros and cons of different options. Companies now develop game-plans as quickly as using a route finder on a map!

**Intellectual Asset Management**

5.6.2 Northern Ireland has a strong academic research base in several areas of technology relevant to the Agri-Food sector. However, the capacity commercially within the sector to exploit the scientific advances from this work is relatively weak. Progress in implementing the recommended Innovation Programmes will increase further the science and technology base and related areas of intellectual property. Stimulating much greater awareness and discipline in intellectual asset management and developing tailored programmes to support exploitation of Intellectual Property (IP) by the business sector will be essential. The need to protect IP to secure long-term rewards from investments in R&D is specially critical, given the vision to earn income in the future from ‘knowledge products’. This need will require a determination of how to develop IP policies associated with



institutional research within Northern Ireland. For example how far to strive for development and ownership of IP assets as a primary means of building income as compared with striving for open sharing of IP.

*Specific recommendations include:*

- raising awareness of the types of intellectual property businesses might own and exploit;
- developing protocols to capture inventions and IP within industry and research institutions; and
- build business sector capacity to absorb the IP developed by the research base.

## VISION 2020 STATEMENTS

Creative development of software originally used to assure the provenance of animal and plant materials has now delivered tools that guide decisions on land use and the environment. These have enabled Northern Ireland to become a model for improving sustainability and are now being used to manage positive change through innovation.

### Cross Cutting Technologies

- 5.6.3 The fundamental science base to support strategic and applied research and innovation for the Agri-Food sector will be based on a broad technology platform covering many different discipline areas. It will be vitally important that effective systems are in place to identify emerging technologies and to ensure a continual flow of appropriate knowledge and information to stakeholders. Given the rapid advances in science and knowledge, systematic identification and assessment of the cross cutting opportunities for the Agri-Food sector will be essential. Structured networks provide a model for engagement across centres of excellence with the Agri-Food sector and have the potential to establish gateways whereby knowledge and technology transfer projects might be delivered.

*Specific recommendations include:*

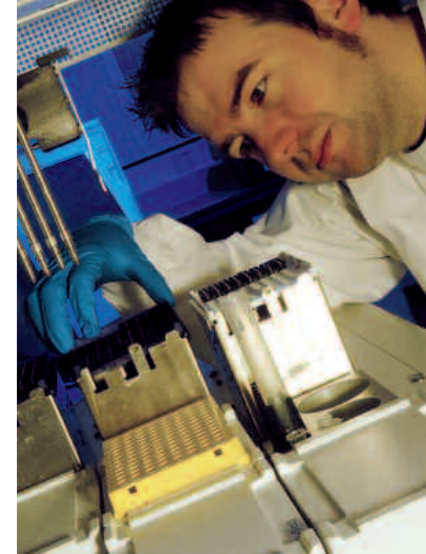
- putting in place a rolling review of horizon scanning to update knowledge of new technologies
- developing funding mechanisms to support and encourage multi disciplinary approaches
- charging a new championing vehicle to accelerate the effective exploitation and convergence of wider technologies to underpin a multi disciplinary and multi faceted innovation programme for the Agri-Food sector.

### Expertise and Skills Base

- 5.6.4 Investing and developing the right skills from the Boardroom to the factory floor is crucial. Leadership, skills in business, enterprise and entrepreneurship as well as technical competence are critical aspects of the skills base needed for the Northern Ireland Agri-Food industry in the future. Important disciplines linked to agriculture and food science such as engineering, chemistry, the physical sciences and biology are pivotal. Skills development must be a key priority for government and industry to embed the appropriate knowledge base within Northern Ireland. Government has a major responsibility to ensure that the necessary policies and infrastructure are in place and are effective in meeting industry's needs. Industry must be prepared to invest in continuing professional and skills development and contribute leadership in defining sector skills needs on an on-going basis. To address skills gaps in the short term the opportunity to recruit skilled resource externally must be fully and actively pursued. A much larger pool of post-graduate and post-doctoral research positions within local institutions should be supported

*Specific recommendations include:*

- developing a coherent overall framework to ensure continuous “succession paths” i.e. avoiding current weaknesses in key science subjects at under-graduate level.
- getting the balance right between potentially conflicting options of deeper specialism versus broader learning not aligned to traditional disciplines.
- changing university mindsets to encourage research with practical applications rather than that carried out purely for academic interest
- creating 20 to 25 new PhD and post doctoral positions within the research base and industry
- addressing skill gaps in specific areas such as entrepreneurship, commerce and marketing
- exploiting this “skills for business network” to secure research analysis of sector skills needs as validated by industry
- exploring potential models for technical apprenticeships within the sector
- ensuring the curriculum from primary to third level education accommodates the technical and basic science skills needed at all levels of the Agri-Food industry







**Consumer Confidence**

5.7 Building consumer confidence for new products, processes or goods derived through innovation is clearly crucial for success within the Agri-Food sector. Consumer perceptions about technology and standards are shaped by broader social trends eg in attitudes to risk, ethical and health issues. Science policy across academic and research institutions and Agri-Food businesses need to be informed by a richer understanding of consumer attitudes and behaviours, which cannot be achieved without suitable social science capacity. Critically important will be appropriate investment and developments in distinctive systems of traceability, surveillance and control to substantiate Northern Ireland's standards. Standards that are understandable and valued by consumers with maximum transparency represent significant competitive advantage. Strengthening confidence in the industry's future is also a key factor in attracting new entrants to the industry and stimulating next generation engagement. Building relationships between schools and industry will help to foster awareness of potential career opportunities.

*Specific recommendations include:*

- the promotion of the Vision and Innovation Programmes recommended in this report;
- developing a campaign to raise awareness of the standards applied to foods produced in Northern Ireland, not only for immediate benefits but also to inform future strategies for raising consumer awareness about new products and production systems; and
- reviewing and strengthening links between schools and industry.

**VISION 2020 STATEMENTS**

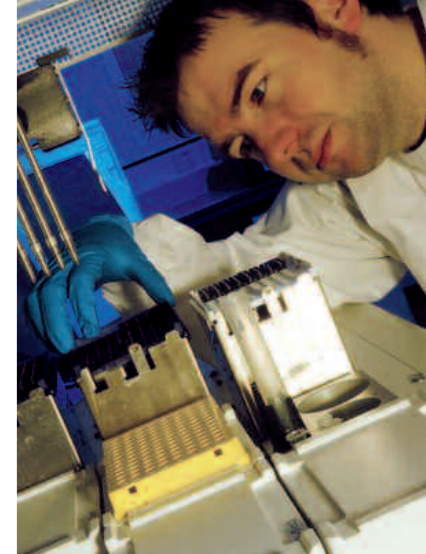
Businesses here have also been quick to recognise the value of Networks which tap diverse sources of expertise from home and abroad. The 'Network for Innovation', working out of a university, but bringing together more than 1,000 practitioners and thinkers, has established Northern Ireland as a leader in change and risk management. Its trading arm already has contracts worth over \$120 billion, helping overseas institutions to develop their capabilities.

**Cultural Change**

5.8 The Foresight Leadership Group underline the need to change culture and mindsets for the better. Crucially important is the need for a more collective ethos, putting aside internal competition to build external competitiveness and distinctiveness. Counteracting the characteristic of some in the private sector economy to be low-growth, low risk and insular in perspective is also important. It is recognised that an economic structure where the public sector produces two-thirds of the region's GDP and one-third of total employment does not provide the platform for long-term economic performance. Wider governmental instruments to stimulate entrepreneurial development and cross cutting supporting policies must include appropriate priority and allocation for the Agri-Food sector. Investment in mentoring support to overcome constraints and manage business risks in SME and start-up businesses will be an important feature. Introducing performance measurement for innovation based on business "churn rate" would also be consistent with incentivising an enterprise culture.

*The mindset required for the successful implementation of innovation programmes can be summarised as:*

- forward looking to 2020 and beyond;
- open minded and outward looking;
- "can do" and "will do";
- positive, creative and imaginative;
- calculated risk taking, willing to take chances to stay ahead of the pack, rather than risk-averse;
- a collective organisational responsibility for risk taking within funding bodies; and
- a desire for the common good of Northern Ireland.





## VISION 2020 STATEMENTS

Mastering change and risk in these ways is now yielding very tangible benefits. This is the place for those wishing to develop new production systems which exploit opportunities, yet are resilient under diverse future scenarios. The Agri-Food Sector in particular has become skilled at 'flexing' production systems to take rapid advantage of changing markets. As a result, these businesses are now some of the world's most successful!



## Annex 1

Key Themes of Agri-Food Research Activity in Northern Ireland

### Queens University Belfast

- Human nutrition and health
- Environmental economics and land use
- Food safety
- Human eating behaviour
- Food process engineering

### University of Ulster

- Human nutrition and health
- Obesity, lifestyle and satiety
- Nano technology
- Food safety
- Functional foods
- Retail and distribution
- Consumer studies

### Agri-Food and Bio Sciences Institute

- Sustainable livestock, crop and grass production systems
- Animal health and welfare
- Food quality and processing
- Food safety and consumer confidence
- Marine and freshwater fisheries
- Land use and management of natural resources
- Agri-Food and land use economics
- Renewable energy



## Annex 2

### FSIP Technology Foresight Terms of Reference and Membership

#### 1. Aim

- 1.1 The FSIP Technology Foresight aims to underpin sustainable competitive advantage and enhance the innovation capabilities of the Agri-Food Sector in Northern Ireland.
- 1.2 FSIP Technology Foresight will articulate a science and technology based vision for the future through to 2020 as it relates to agriculture and food. It will identify and strategically assess emerging science and technology critical to the growth and prosperity of the Northern Ireland Agri-Food Sector.
- 1.3 Technology Foresight will constitute a key vehicle for FSIP in its role in fostering greater cohesion in public policy and government resource allocation, particularly at a regional level. It will aim to inform government and other regional institutional structures supporting science and innovation in Northern Ireland of these technology foresight priorities.

#### 2. Terms of Reference

- 2.1 FSIP Technology Foresight will provide recommendation on the strategic priorities for science and technology in support of sustainable farming and food industries in Northern Ireland, consistent with the scope of the “Fit for Market” Strategy Report.
- 2.2 It will take account of anticipated market developments and the strategic direction of United Kingdom and EU farming policy.

#### 3. Delivery Model

- 3.1 FSIP will appoint a chair and committee - “the FSIP Foresight Leadership Group” - to provide appropriate project leadership and governance. The FSIP Foresight Leadership Group will comprise individuals from the business, academic and government sectors and work invited on the basis of their expertise, experience and individual leadership contribution.

- 3.2 The FSIP Foresight Leadership Group may seek agreement from the FSIP Chairman to commission specialist inputs and other relevant external contribution.
- 3.3 FSIP will assign secretariat support to assist the work of the Foresight Leadership Group.
- 3.4 The FSIP Foresight Leadership Group should aim to offer an interim report to FSIP for consultation with Stakeholders and submit a final report to FSIP by June 2006.

**Foresight Leadership Group Membership**

*John Gilliland  
 Prof Jenny Ames  
 Dr Ken Baird  
 Dr Gillian Barr  
 Prof Charlie Daly  
 Dr Maureen Edmondson  
 Fiona Hepper/Bernard McKeown  
 Rex Humphrey  
 Sam Kinghan  
 John McLenaghan  
 Dr Sydney Neill  
 Dr Clare Passmore  
 Prof Sean Strain  
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*Rural Generation  
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 Nestle, Switzerland  
 University College, Cork  
 Previously Mars Inc, Chair FSA's NIFAC  
 DETI  
 Organic Farmer  
 Invest NI  
 Poultry Farmer  
 DARD/Agri-Food and Biosciences Institute  
 FSIP  
 University of Ulster  
 Department of Employment & Learning  
 Secretariat – FSIP*



**Annex 3**

Summary of Related Strategy Reports

- DARD Strategy Plan 2006-2011
- DARD's Research and Education Advisory Panel
- DETI's Economic Vision
- DETI's Regional Innovation Strategy
- Economic Development Forums "Working Together for a Stronger Economy"
- DEL's Skills Strategy
- Invest NI Corporate Plan
- DHSS&PS – Investing for Health: Fit Futures



## ANNEX 4

Sustainable Farming and Food Research Priorities Group (2004)

### Research Themes:-

- Climate change
- Energy, water and waste
- Environment and landscape
- Quality and composition of food
- Food safety and dietary information
- Disruption of the food supply and sustainability
- Socio-economic and policy analysis

### Emerging technologies

- meteorology
- genomics
- Sensor technology
- Psychology of eating
- Population and natural environments

Scottish Executive Environment and Rural Affairs Department Strategic Research 2005-2010 (Environment Biology and Agriculture)

### Cross cutting themes:-

- Responding to climate change
- Protecting biodiversity
- Sustainability of rural Scotland

### Programme Areas:-

- Profitable and sustainable agriculture – plants
- Profitable and sustainable agriculture – animals
- Land use and rural stewardship
- Impacts on human health

## Ireland Technology Foresight (Natural Resources)

**Agri-Food strategic technologies**

- Ingredient technology
- Food micro-structure, flavour and quality
- Minimal processing
- Pathogen control
- High pressure technology
- Food irradiation
- Robotics
- Risk assessment
- ICT
- Reduced input farm systems
- Waste reduction
- Environmental modelling
- Bio-technology in crop and livestock production
- Market intelligence including consumer behaviour models

**Cross Cutting Theme – Biotechnology**

- Genomics
- DNA Chips
- Bio-informatics
- Proteomics
- Gene Chip Technology
- Trans-genics
- Robotics
- Bio sensors
- Bio –remediation
- Diagnostics



## Annex 5

**Vision 2020 Statements****Distinctive NI – Integrating Food, Diet and Health**

Today, in 2020, everyone has taken full, active control of their diet, lifestyle and health. ‘Personal Fitness Assistants’ (PFAs) are the most visible sign of what is a dramatic change. PFAs, drawing on personal medical data, are used by everyone to make diet and lifestyle choices, both long-term and in ‘real-time’. They are continually updated with quality-assured external information. People can now make specific diet and lifestyle changes which they know will help them to avoid adverse health conditions and diseases.

Other advances in knowledge and technology, although less visible, have been pivotal: improved understanding of relationships between the genome at an individual level and diet, all built into decision support tools; the availability of Networking Tools that integrate PFAs into the developing ‘World-Wide Health Web’; and the availability of Knowledge Bases that store, mine and make sense of complex data relevant to fitness and health. The companies that have developed the technologies now enjoy an international profile, sell their services overseas and bring in new money flows to Northern Ireland.

The change to the way people manage their lifestyles and diet has also redefined food! Today, we buy food products not from stores but ‘on subscription’. There is no mass market. For food companies, all products are designer products – manufactured to meet specific individual needs. It is now simple for minority groups with rare diseases or health conditions to obtain food tailored precisely to their requirements.

Moreover, the radical food processing, extraction and purification technologies developed in Northern Ireland have given us healthy food that tastes good. Today the watch-word is ‘just right in time’. This personalisation has stretched back into the manufacturing and distribution process.

A key to this success in integrating food, diet and health has been the Northern Ireland Network model, which clusters together prestigious university teams with local firms to commercialise knowledge.



**Distinctive NI – Leading Edge Food & Ingredients**

Today, in 2020, Northern Ireland is seen internationally as a leading Centre for Innovation in Food Products and Ingredients. Northern Ireland Food – ‘The Green Stuff’ as it is now known and branded – is renowned across the world. People who have never been near Northern Ireland have a vivid picture of what Northern Ireland food represents. Managers and technologists from the food industry in Asia now actively seek out food products from Northern Ireland. This is because these products are tailored to the needs of local markets (for example, tastes in meat differ greatly from the European tradition). Asian companies are really impressed by the skill and determination shown by the Agri-Food sector in Northern Ireland to understand their markets. Also, in these health-conscious times, Asian companies know they can trust the provenance of food from Northern Ireland. For them, it is very important to buy products that are ‘disease free’.



One Northern Ireland company has developed a new range of ingredients using a biological process on an artificial substrate in high-tech factories (based on a long-established technique of producing vaccines in chicken eggs). Early problems with product stability were resolved by the development of ‘intelligent packaging’. This has also provided consumers with a wealth of product and health information, via built-in communication devices which can be read by ‘Personal Fitness Assistants’.

The success of this major global supplier to the Asian food market has owed much to the company’s ability to bring together science, technology, and market insights, to develop products which deliver just what the consumer wants. The investment made from 2006 in reducing and maintaining low levels of plant and animal diseases in Northern Ireland has also enabled it to capitalise on a distinct geographical Northern Ireland brand. It is a remarkable success story!



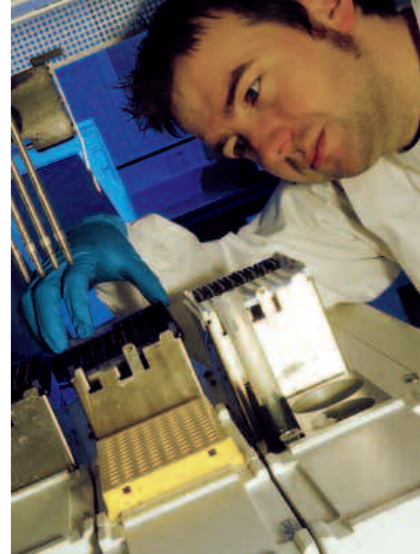
**Distinctive NI – New Alternative Enterprises**

Today, in 2020, following a period of rapid growth, Northern Ireland is a thriving enterprise cluster. Internationally, it is a beacon for Sustainable Development – particularly admired because its growth has been achieved by rural enterprises managing and creating wealth from indigenous land and water resources. This was unimaginable in 2006.

Examples include: a farm that supplies human transplant organs from pigs and runs aquaculture projects to supply the pharmaceutical industry; a farm that solely grows and processes renewable raw materials for energy production and building construction; networked farms which deliver renewable feedstocks to biorefineries to produce high-effect chemicals for pharmaceutical companies (at the same time using processing waste to fuel district heating systems); and companies which take organic waste and re-configure it so that it can be used in bioremediation.

These businesses have all recognised and taken advantage of the much bigger markets beyond their doorstep. Today 50% of their overall profits are earned overseas, by trading in high-value expertise and distinctive physical products. They have been European leaders in seizing the opportunity to turn ‘environmental protection’ into a positive engine for growth! Today, nobody here talks about the ‘hard choices’ between economic growth and safeguarding the environment.

All this has had a knock-on effect on the entire Northern Ireland scene. Northern Ireland is seen as the place to start-up alternative enterprises. As well as the attractions of the work itself, people are drawn here by the multiple job options available within thriving enterprise clusters, and by the excellent quality of a natural environment which itself has benefited from the application of technological innovations developed initially for foreign markets.



## Distinctive NI – Mastering Change and Risk

Today, in 2020, individual enterprises are doing well, the economy as a whole is booming, there is high employment and the natural landscape has never looked better. The secret of this success lies not only in Northern Ireland's distinctive natural resources and unique expertise, but also – critically – in the really special way in which change and risk is managed here today.

Traditional businesses have thoroughly reviewed their businesses and sought to add value in new markets. Companies have spotted exciting emerging markets and brought science and technology together to deliver what the consumers there want. While there have been setbacks, businesses have always found solutions by using their Networks and thinking 'out-of-the box'.

Businesses are today using diverse tools and techniques. Many are combining the long-established skills of story-telling to bring 'scenarios' to life, with support from powerful software tools. These really help them to consider the pros and cons of different options. Companies now develop game-plans as quickly as using a route finder on a map!

Creative development of software originally used to assure the provenance of animal and plant materials has now delivered tools that guide decisions on land use and the environment. These have enabled Northern Ireland to become a model for improving sustainability and are now being used to manage positive change through innovation.

Businesses here have also been quick to recognise the value of Networks which tap diverse sources of expertise from home and abroad. The 'Network for Innovation', working out of a university, but bringing together more than 1,000 practitioners and thinkers, has established Northern Ireland as a leader in change and risk management. Its trading arm already has contracts worth over \$120 billion, helping overseas institutions to develop their capabilities.

Mastering change and risk in these ways is now yielding very tangible benefits. This is the place for those wishing to develop new production systems which exploit opportunities, yet are resilient under diverse future scenarios. The Agri-Food Sector in particular has become skilled at 'flexing' production systems to take rapid advantage of changing markets. As a result, these businesses are now some of the world's most successful!





## **Acknowledgement**

The FSIP Foresight Leadership Group, gratefully acknowledge all those who have contributed to the preparation of vision **twenty** | twenty



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