IPR Food Science Workshop

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Need for technology transfer for a resilient food industry

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In 2015 Serbia accounted for more than 21% of entire world raspberry production.
Greater than 10 fold in value
Greater than 25 fold in value

The Irish Agriculture and Food Development Authority
Greater than 100 fold in value
Outline

- Introduction
- Global Dynamics
- Consumer Trends
- Technological Opportunities
- Challenges to Effective TT in Food
- Actions and Responses
- Conclusions
“To support science-based innovation in the Irish food sector that will underpin profitability, competitiveness and sustainability”
Nutrition & Food Systems face "perfect storm“ (Bell, 2016)
Some Current Challenges

- 50% increase demand by 2030, 100% by 2050
- 805 million still hungry (781m in developing countries)
- Vast majority live in rural areas with low income, poor infrastructure, excessive food waste, poor sanitation
- Land and water use limited
- Climate change affects these areas
- Animal based foods questioned
“there are also growing incomes, and an increasing sophistication of consumers with specific demands for food to deliver lifestyle benefits and innovative solutions for different life-stages”.

but....
Food waste – latest estimate EU-28

**EU-28 PRODUCES** 88 MILLION TONNES of food waste per year

amounting to an estimated 143 BILLION EUROS

For more information on data and quantification, access the March 2016 FUSIONS reports "Estimates of European Food Waste" & "Food Waste Quantification Manual to Monitor Food Waste Amounts and Progression"

173 kg pro-capita food waste

- Equivalent of **20%** of all produced food in EU
- **143 billion euros**
- ~ **304 Mt CO2 eq** (6% of total emissions of GHG in EU28%)

![Food waste pie chart](chart.png)

Production 11%
Processing 19%
Food service 12%
Wholesale and retail 5%
Households 53%
Global food losses and waste: estimated at 1.3 billion tonnes / year

Source: FAO. 2011. Global food losses and food waste
1. Shifts in the balance of world economic power

The world economic order has changed. Economies in the South and East are now leaders in terms of GDP. China is ranked number 2 in the world, Brazil number 7 and Russia and India 9th and 10th.
2. Increasing empowerment of women

Though inequalities remain, women are making huge strides in education, employment and commerce.
3. Global urbanisation

Urban living will increasingly be the norm across the world, raising issues about quality of life and community dynamics.

By mid-century, two-thirds of the world’s population will live in cities, compared with just over half today.

Rapid urbanization is accelerating the dietary transition.
4. Changing attitudes to ageing

Old age will be reinvented. Longer life expectancy will radically alter societal perceptions and priorities related to work, leisure and health.

The 85-and-over population is projected to increase 351 percent between 2010 and 2050.
5. Changing household structures and family roles

The concept of the ‘household’ will be more diverse and unconventional, and this will also be reflected in more fluid family roles and responsibilities.
6. Increasing economic inequality

The disparity between rich and poor — both within and across regions — is growing.
7. Global rise in lifestyle diseases

Across the world, rising prosperity and modern conveniences are leading to a higher incidence of life-threatening health conditions such as obesity, diabetes and heart disease.
8. Rise in the use of mobile technology

Mobile technologies are rapidly becoming the preferred means of Internet access, especially for leapfrogging emerging markets.

Smartphone subscriptions will more than double by 2020, reaching 6.1 billion.
Science and technology critical

Key transformative technologies
1. Plant and animal genomics and related technologies
2. Human, animal and soil microbiota
3. Digital technologies
4. New technologies for food processing
5. Transformation in the food value chain system

Linkages between these technologies obvious
Global Opportunities (examples)

- Gut Microbiome
- Develop healthy food products for different life stages
- New automation and IT-tools in food handling
- Improve food product shelf life
- Novel ingredients
- Sell sustainability
- Smart ingredients

Increasing need for technological solutions by industry and policy makers
But from change and challenge comes opportunity.

Understanding consumer trends is the key to unlocking that opportunity.
Integrated Approach

On Farm
- Pasture
- Animal Breeding
- Animal Welfare
- Sustainable Systems

Off Farm
- Quality
- Meat safety
- Markets
- Consumer
- Health
- New products
- Processing
Points of Focus
Innovation Eco-system

1. Idea
2. Concept Developed
3. Proof of Concept
4. Technology Validation in Lab
5. Technology Validation in Relevant Environment
6. Demonstration in Relevant Environment
7. Demonstration in Operational Environment
8. System Complete and Qualified
9. Successful Mission Operations

Public Research Performers

Public Funded Pre-competitive Research

Industry Funded Competitive R & D

Businesses
Teagasc-industry engagement model

R & D → MARKETS → CONSUMERS → INDUSTRY NEEDS → € IMPACT
Impact of collaborative research between industry and PRO.
Innovative Technologies at Farm Level

Drones with Sensors

Satellite

Sensor attached for monitoring health and wellbeing

Sensor

Drones with Sensors
Precision Livestock Farming

Areas to Monitor a Dairy Cow

Bewley et al., 2014
Example in meat

- Animal Cleanliness
- Hide/Fleece removal
- Evisceration
- Carcass interventions
- Carcass chilling
- Aerial decontamination
- Boning out
- Meat packaging and distribution
- Meat: In pack interventions
- Spoilage bacteria impacting on shelf-life
- Quality factors impacting on shelf-life
- Shelf life prediction models
Drivers of emerging and sustainable technologies in the meat industry

- Regulation
- Surface cleaning and disinfection
- Food safety and shelf life extension
- Nutrient and sensory aspects
- Consumer and processor acceptability
- Technology advances
- Cost and profitability
- Environmental impact
Processing technology

Past

Chemical additives
Chilling
Freezing
Pickling/Curing
Dehydration
Smoking
Irradiation
Aseptic
Processing
Non-thermal Technologies

- Ensure food safety
- Improved shelf life
- Nutrient retention
- Environmental friendly
- Process efficiency
High Pressure Processing

Pressures of up to 1000 MPa (typical pressure range: 300 to 700 Mpa) is
Innovation is a key driver of growth

- **Innovation** – the introduction of a new or significantly improved product (good or service), process, or method

- **Entails investment** aimed at producing new knowledge and using it in various applications
Economic Imperative

- Innovation will be one of the keys to accelerating recovery and putting countries back on a path to sustainable – and smarter – growth.

- Yet the crisis itself poses a number of serious risks and challenges to the innovation ecosystem.
Why innovate??

- **Quality**: Develop better products and services
- **Costs**: Develop products and services cheaper
- **Time**: Develop products and services faster

**Improve competitive position**

**Enhance profitability, strengthen stability**
Requirements for Innovation

- Strong infrastructures that support innovation including human capital and physical resources
- Public and private investment
- Linking mechanisms that help match supply and demand
- Scientific and technological platforms
- Well educated personnel
Innovation Ecosystem

The innovation ecosystem is a connection between the generation of knowledge and the application of that knowledge on a commercial basis.
Specific Issues in Food Innovation

- Food is perishable
- Part of a complex chain
- Seasonable
- Consumer awareness
- Fragmented industry
- Retailer dominance
- Don’t touch my food (highly regulated)
- Conservative industry
- Low absorption capacity and low research and development spend of food sector
- Food innovation is highly contextual
- Must meet a consumer demand
- Consumer and industry conservatism
Issues that Need to be Addressed

- Greater understanding of knowledge transfer is required between researchers and industry in order to commercialise research outcomes.
- Potential opportunities are not always recognised by either party.
- Researchers and industry have different agendas where research is concerned.
- For researchers, success is often regarded as producing publications and winning new grants, this does not necessarily incentivise them to focus on translating their research into business opportunities.
- Both are approaching research with two very different mandates requiring expectations to be managed.
- Extent of direct personal involvement (relational intensity)
- The relative importance of transfer channels varies.

“Capture latent value in stranded projects, and accelerate the path to market for innovation.”
Barriers to effective TT

- Lack of spend by companies
- Talent investment
- Absorption capacity
- Assimilate and understand new information
- Cost and risk of getting involved
- Lack of time
- Innovation before its time.
- Fragmented industry and research community
- Lack of effectiveness of interactions with scientists
- Lack of market knowledge
- Lack of senior management commitment
Key People and Supports Needed

- Researcher – fully committed, aware of technological opportunity and our strategy, customer friendly and focused, entrepreneurial skills
- Industry- fully committed, solution focused, appropriate absorption capacity
- TTO- fully supportive, coordinated, empathic, time conscious, IP identification and management, a conduit to bring funded projects to commercialization stage, clear process, use of ICT
Teagasc Technology Transfer Channels

• IP Exploitation (patents, licenses, spin outs)
• Collaborative Research Agreements
• Contract Research
• Strategic Partnerships
• Training
• Services
• Pilot Plant Leasing
• Partnerships
• Workshops
• Demonstrations
• Placements (in-company or in Teagasc)

• New!! Food Innovation Hub
Food Technology & Knowledge Transfer Strategy
Overall objective

“To implement a systematic, effective and flexible technology transfer process which supports commercial exploitation of our research outputs and scientific capability through various channels”

Central proposition: every researchers’ responsibility
Development of a Technology Marketing Portfolio

- The Portfolio is updated on a six monthly basis and is re-issued before a Food Innovation Gateways event.
- The feedback in relation to our Portfolio from companies is very positive.
- Web based, hard copy, USB, DVD forms available.
- The potential to develop an app and also to engage in more social media are being explored.
Teagasc Gateways Events

- Four themed events (2 per year)

Brexit Challenge
Brexit Technological Response

- Shelf life
- Add value
- Waste streams
- Implement new technologies
- Clean labels
- Lean
- Reformulation
- Diversification
- Food for life stages
- New product development
Ornua opens new €20m cheese plant in Saudi Arabia

As well as supplying Saudi, facility will serve as hub for MidEast and North Africa region

© Wed, Mar 14, 2018, 07:21 | Updated Wed, Mar 14, 2018, 08:22

Extn. Barbara Keenleyside

Licence2Market award
Teagasc Collaborating Universities in China

Extraction optimization of Fortunella margarita (Lour.) Swingle

Hongliang Zeng a, Yi Zhang a, Shan Lin a, Yeye Jian a, Song Miao b, Baodong Zheng a

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Modern Technology Transfer Offices

Too much bureaucracy kills innovation

HELP
Pushing Research to Achieve Economic Impact
Conclusions

- Complexity in system – Gateways Portfolio, CRM
- People focused- trustworthy, measures and incentivises, leadership development
- Dialogue initiated- Gateway events, accessibility of resources, promote awareness and successes, shared vision, increase mobility including students
- The “Valley of death” – collaborate with industry
- TTO bureaucracy – need to deliver impact, pro-active, easier to do business with, translational metrics
- National innovation landscape- collaborate with other agencies
- Senior management support and buy -in
Teagasc Innovation Actions

- Develop an industry-based Walsh Fellowship Postgraduate scheme to enhance the scientific absorption capacity of the food SME sector.
- Teagasc to develop proposals for a Food Innovation Hub at its Moorepark campus to deliver a step change in innovation activity in the food industry.
- Teagasc will lead research in collaboration with other research institutions and industry to derive applications from the significant state investment in foods for health.
- Teagasc and the dairy industry to complete the €10 million upgrade of Moorepark Technology Limited pilot plant.
- Exploit potential of genomics to add value at farm level
- Establishment of the Meat Technology Centre
- Create a virtual multi-campus centre of excellence for seafood development in Ireland,
Executive Summary

Vision

We have built a strong research and innovation base in Ireland
We will become a Global Innovation Leader
We will increase public and private investment in research and development
We will enhance the impact of research and innovation for enterprise
We will ensure that education drives innovation
We will focus research and innovation activity on social and economic development
We will support Innovation through the protection and transfer of knowledge
We will engage with the rest of the world in becoming a Global Innovation Leader
We will effectively implement this strategy to become a Global Innovation Leader
Innovation Serbia Project

€8.4 million, financed by the EU through Instrument for Pre-Accession Assistance (IPA) funds and administered by the WB

- **C1**: Capacity building of the Innovation Fund
- **C2**: Piloting financial programs supporting enterprise innovation
- **C3**: Provision of technical assistance to selected Research and Development Institutions (RDI)
Conclusions

Business needs to proactively engage with knowledge providers with capability
Knowledge providers need to make it easy / easier to do so.
Big drivers and trends make this more urgent
Research and development landscape can be exploited
Identification of business opportunities is critical
Increased technological absorption capacity by companies is essential
Sectoral opportunities needs to be articulated especially in the PCF sector, joint agency / industry effort needed
Need for technology transfer for a resilient food industry

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