FOOD stars — Innovative Food Product Development Cycle: Frame for Stepping Up Research Excellence of FINS

European Commission

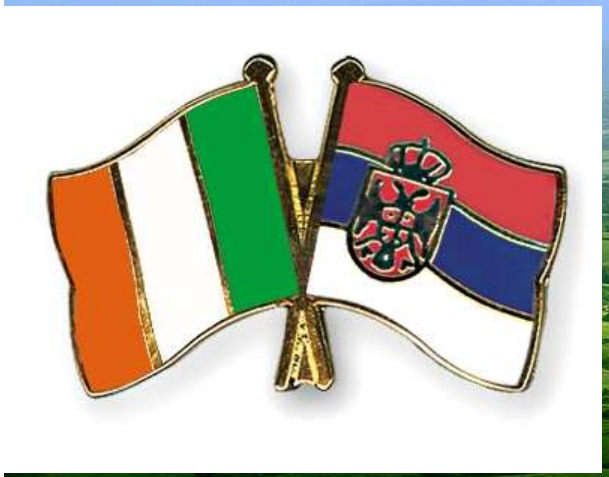
IPR Food Science Workshop

FINS, Novi Sad, 11-12th December 2017

Horizon 2020 | European Union funding for Research & Innovation
Grant Agreement number: 692276 — FOODstars | H2020-TWINN-2015

Need for technology transfer for a resilient food industry

Declan J. Troy, Assistant Director of Research,Teagasc, Ireland.



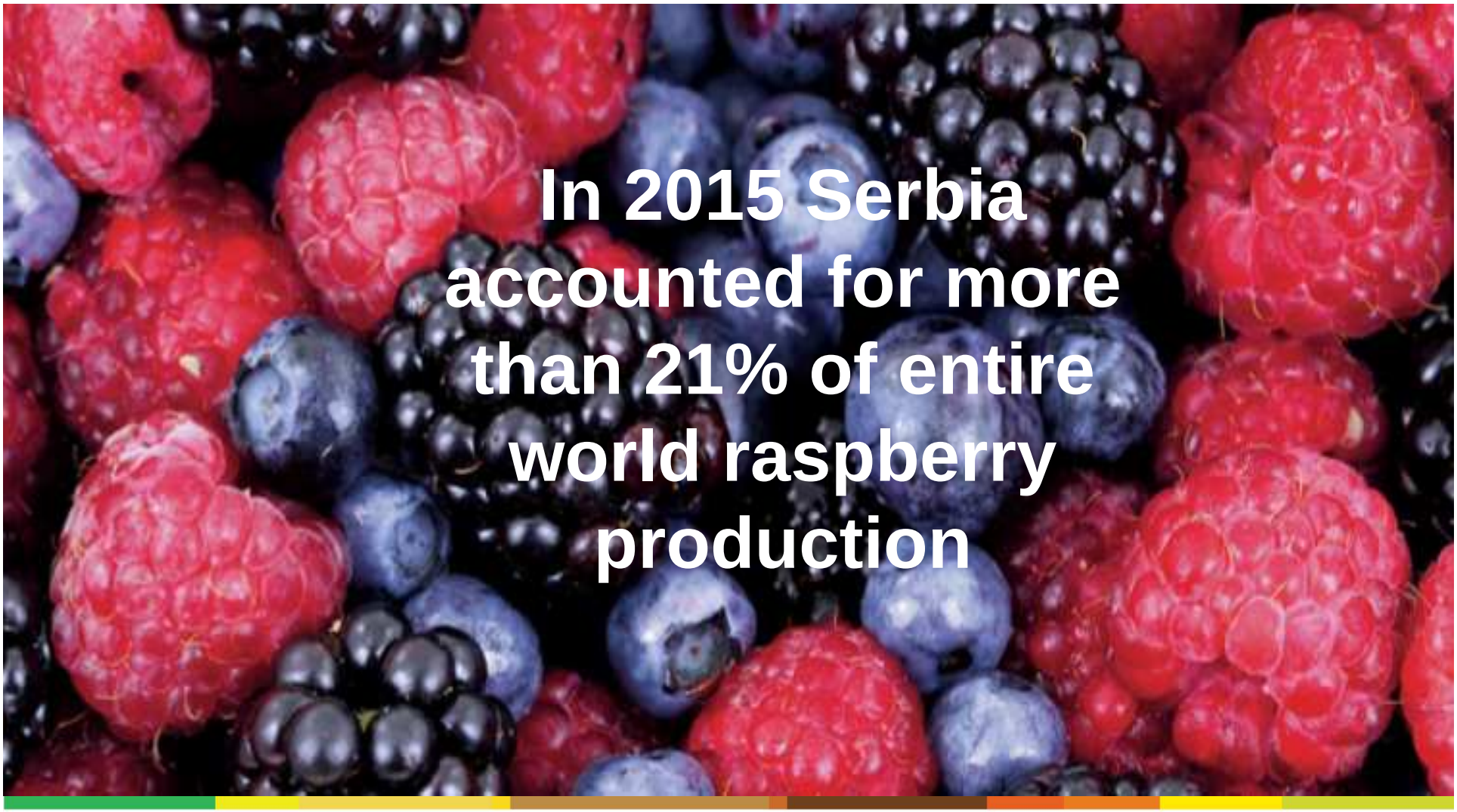
FOOD stars

Innovative Food Product Development Cycle: Frame for Stepping Up Research Excellence of FINS

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

EXPORTS


In 2015 Serbia accounted for more than 21% of entire world raspberry production


MAKE IT
EASY

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

Greater than 10 fold in value

Greater than 25 fold in value

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

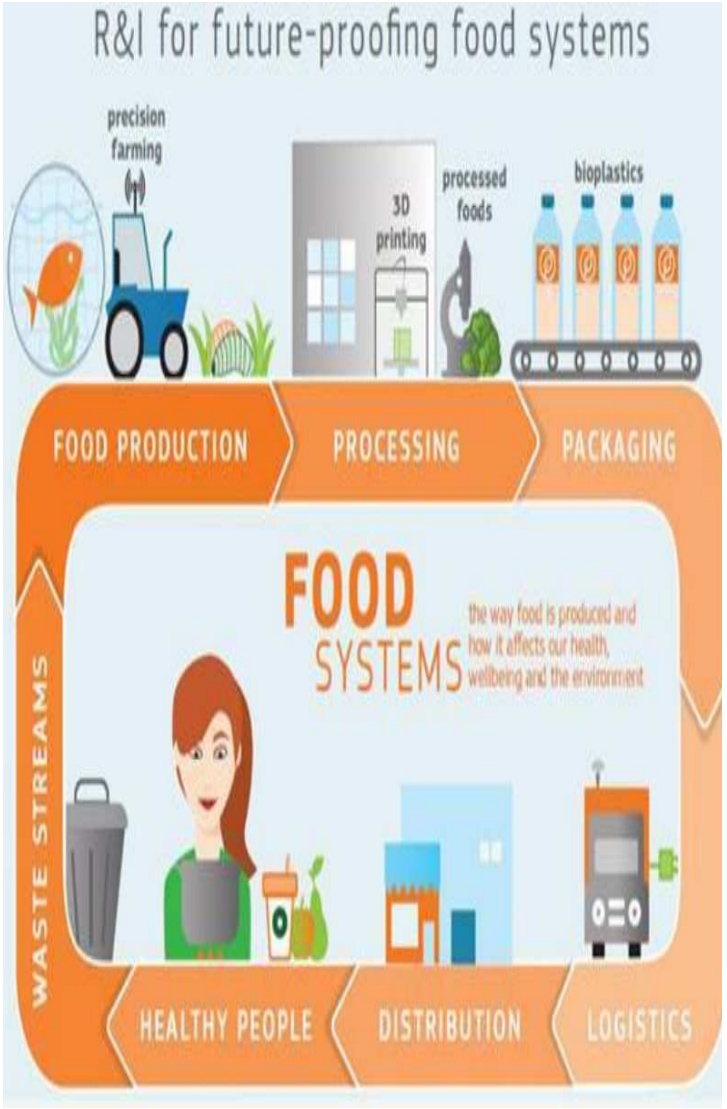
Greater than 100 fold in value

teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

Outline

- Introduction
- Global Dynamics
- Consumer Trends
- Technological Opportunities
- Challenges to Effective TT in Food
- Actions and Responses
- Conclusions



Teagasc
Agriculture and Food Development Authority

“To support science-based innovation in the Irish food sector that will underpin profitability, competitiveness and sustainability”

Teagasc
Agriculture and Food Development Authority

Nutrition & Food Systems face "perfect storm“ (Bell, 2016)

Teagasc
Agriculture and Food Development Authority

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

teagasc
Agriculture and Food Development Authority

but….

“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”.

Teagasc
Agriculture and Food Development Authority

Food waste – latest estimate EU-28

EU-28 PRODUCES

88 MILLION TONNES of food waste per year

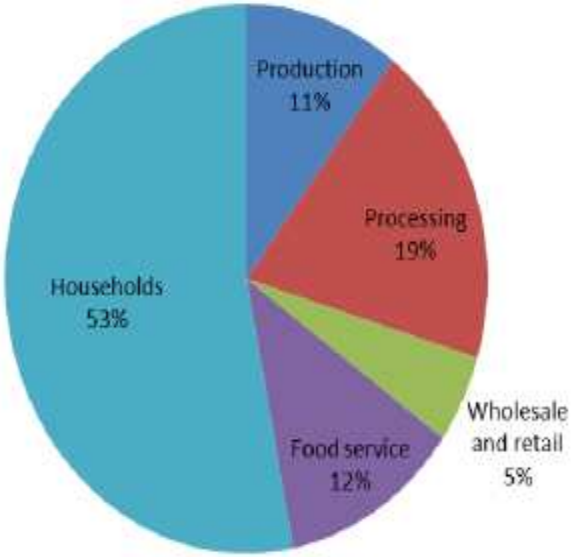
amounting to an estimated

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"**

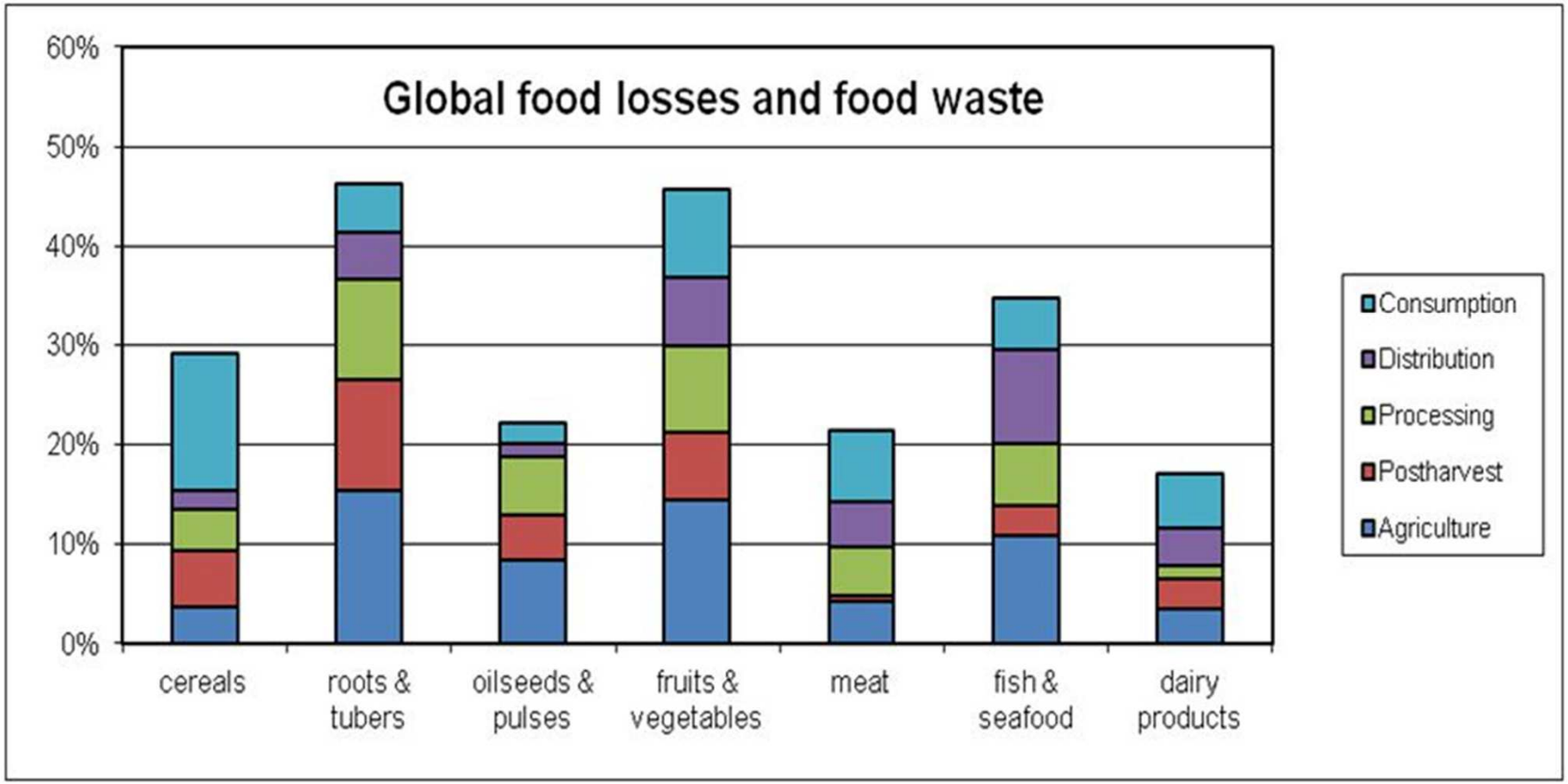
173 kg pro-capita food waste

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



Wageningen Food & Biobased Research

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

Teagasc
Agriculture and Food Development Authority

2. Increasing empowerment of women

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

Teagasc
Agriculture and Food Development Authority

3. Global urbanisation

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

Rapid urbanization is accelerating the dietary transition

Teagasc
Agriculture and Food Development Authority

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.

Teagasc
Agriculture and Food Development Authority

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.

Teagasc
Agriculture and Food Development Authority

6. Increasing economic inequality

The disparity between rich and poor — both within and across regions — is growing.

Teagasc
Agriculture and Food Development Authority

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.

Teagasc
Agriculture and Food Development Authority

8. Rise in the use of mobile technology

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

Teagasc
Agriculture and Food Development Authority

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

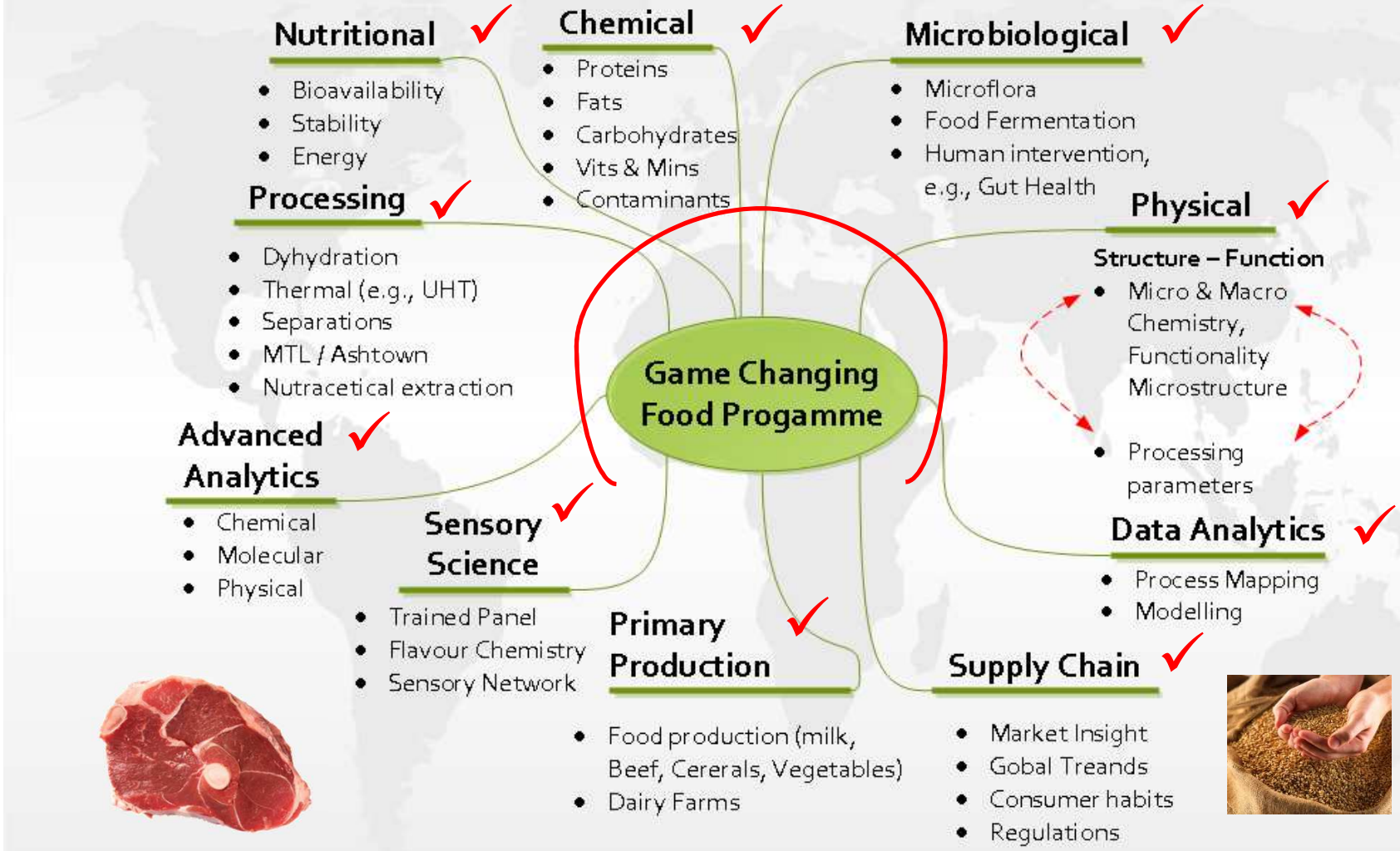
But from change and challenge comes opportunity.

Teagasc
Agriculture and Food Development Authority

teagasc

Agriculture and Food Development Authority

Teagasc Food Research and Innovation Programme



Agriculture and Food Development Authority

Integrated Approach

On Farm

Pasture

Animal Breeding

Animal Welfare

Sustainable Systems

Off Farm

Quality

Meat safety

Markets

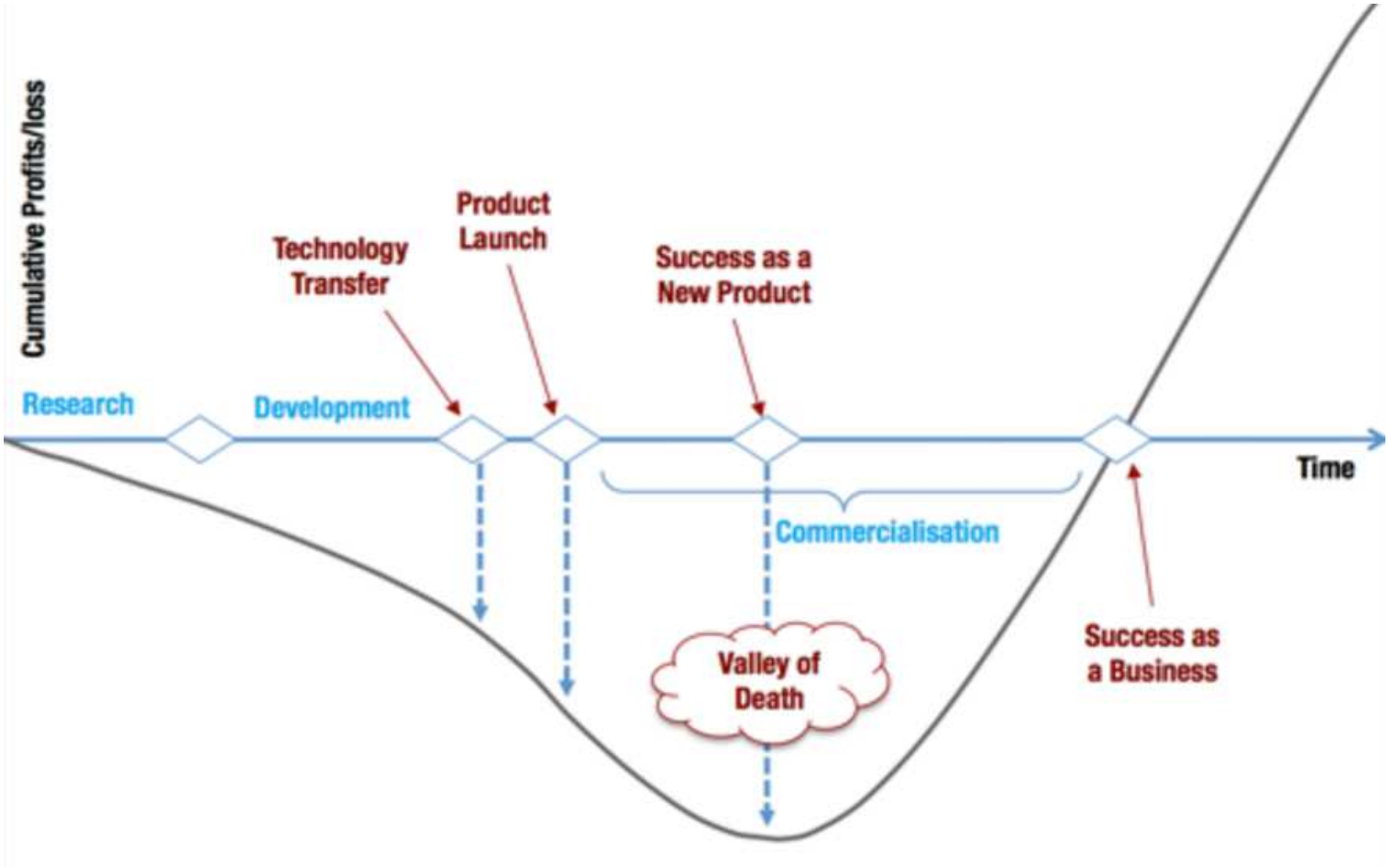
Consumer

Health

New products

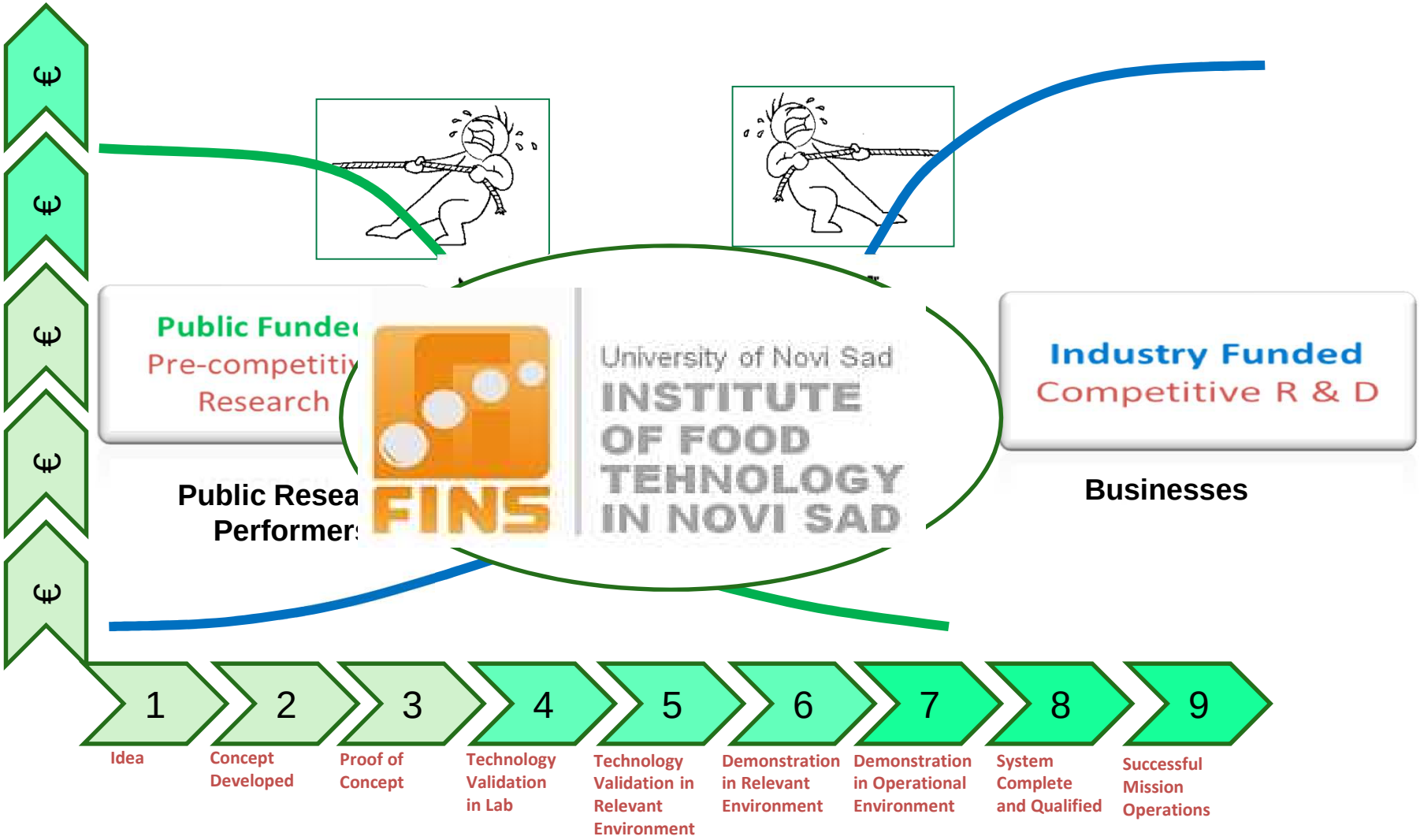
Processing

Points of Focus



Teagasc
Agriculture and Food Development Authority

Innovation Eco-system



teagasc
Agriculture and Food Development Authority

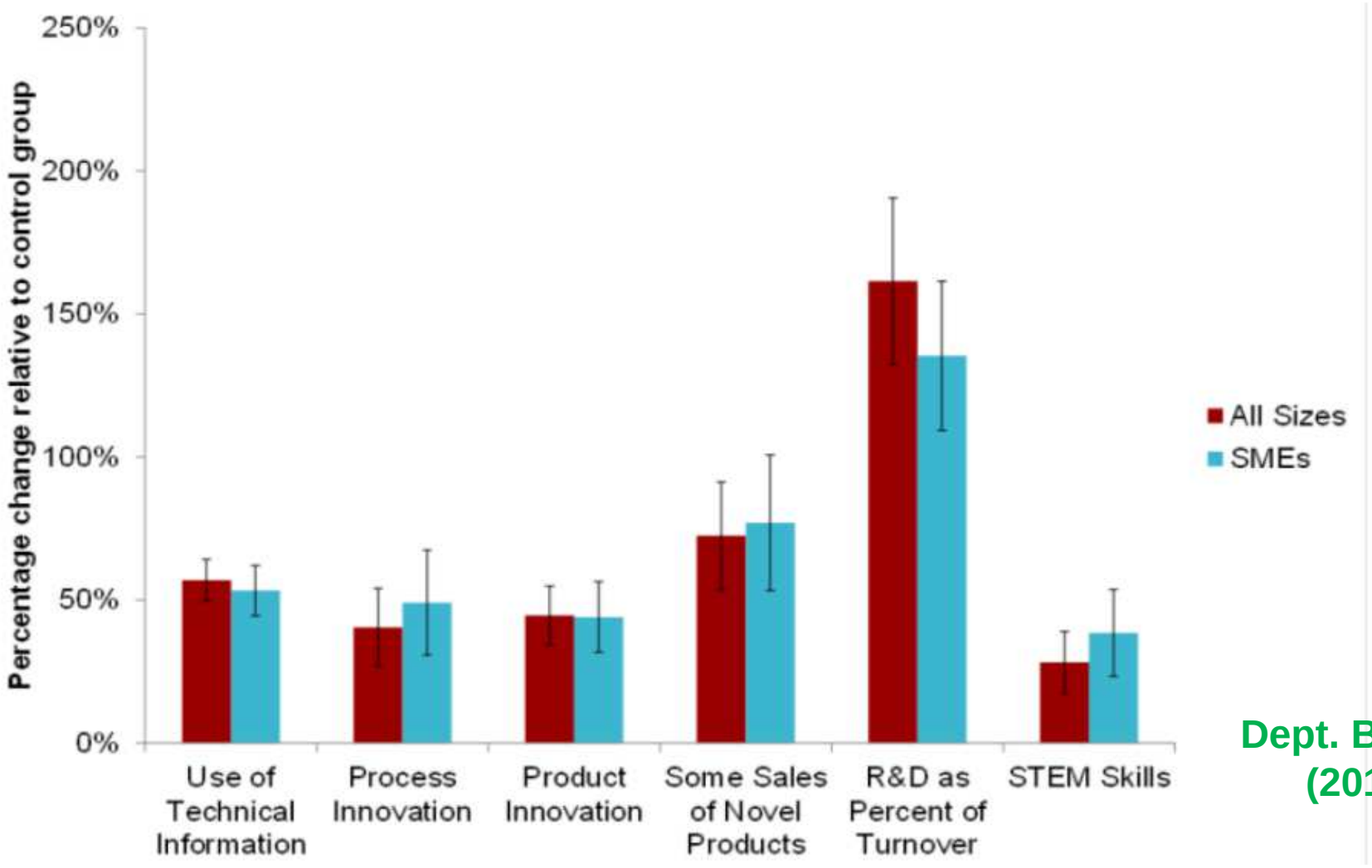
Teagasc-industry engagement model

R& D → MARKETS CONSUMERS INDUSTRY NEEDS → € IMPACT




Teagasc
Agriculture and Food Development Authority

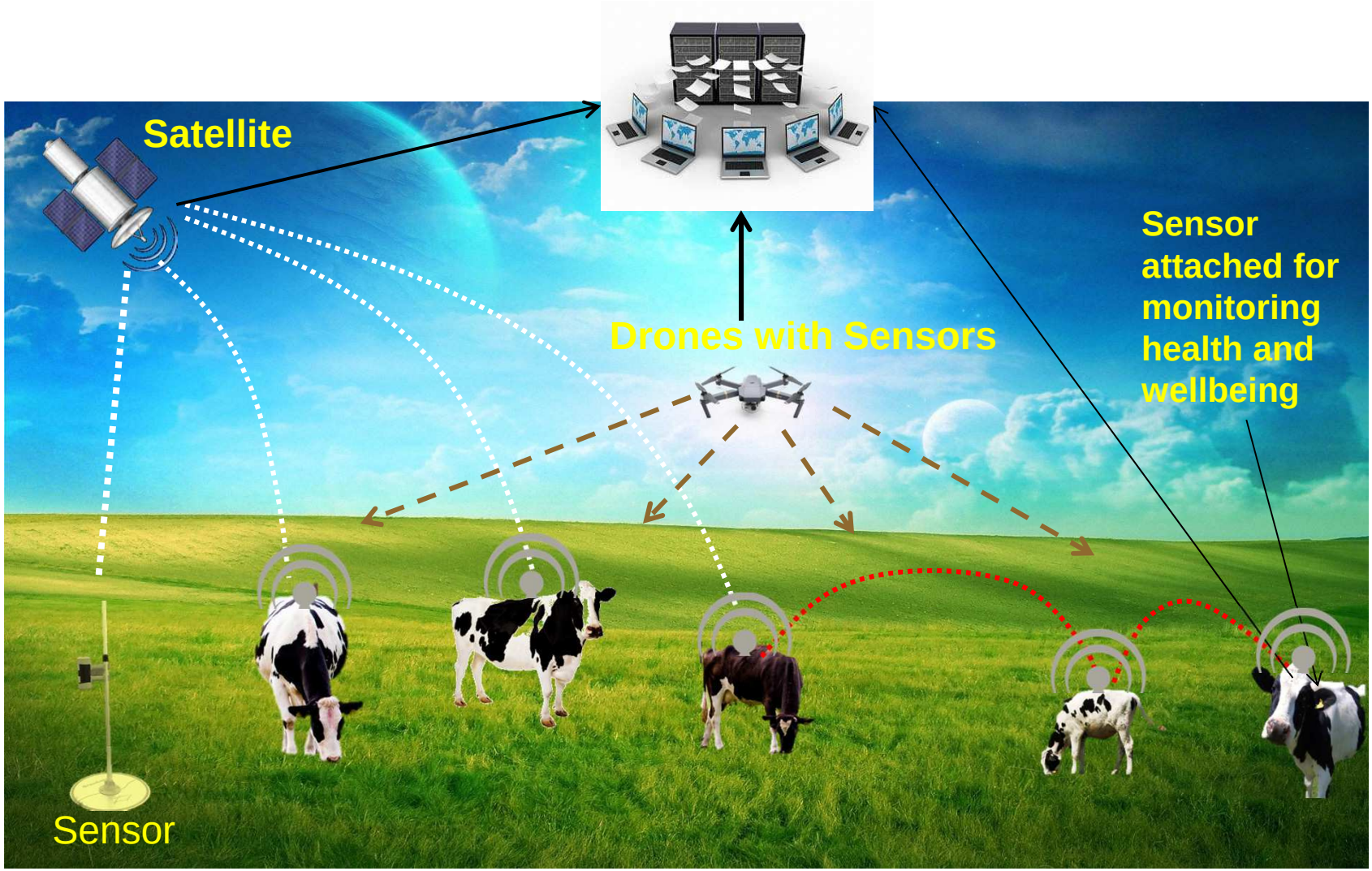
Impact of collaborative research between industry and PRO.



Dept. BIS UK (2014)

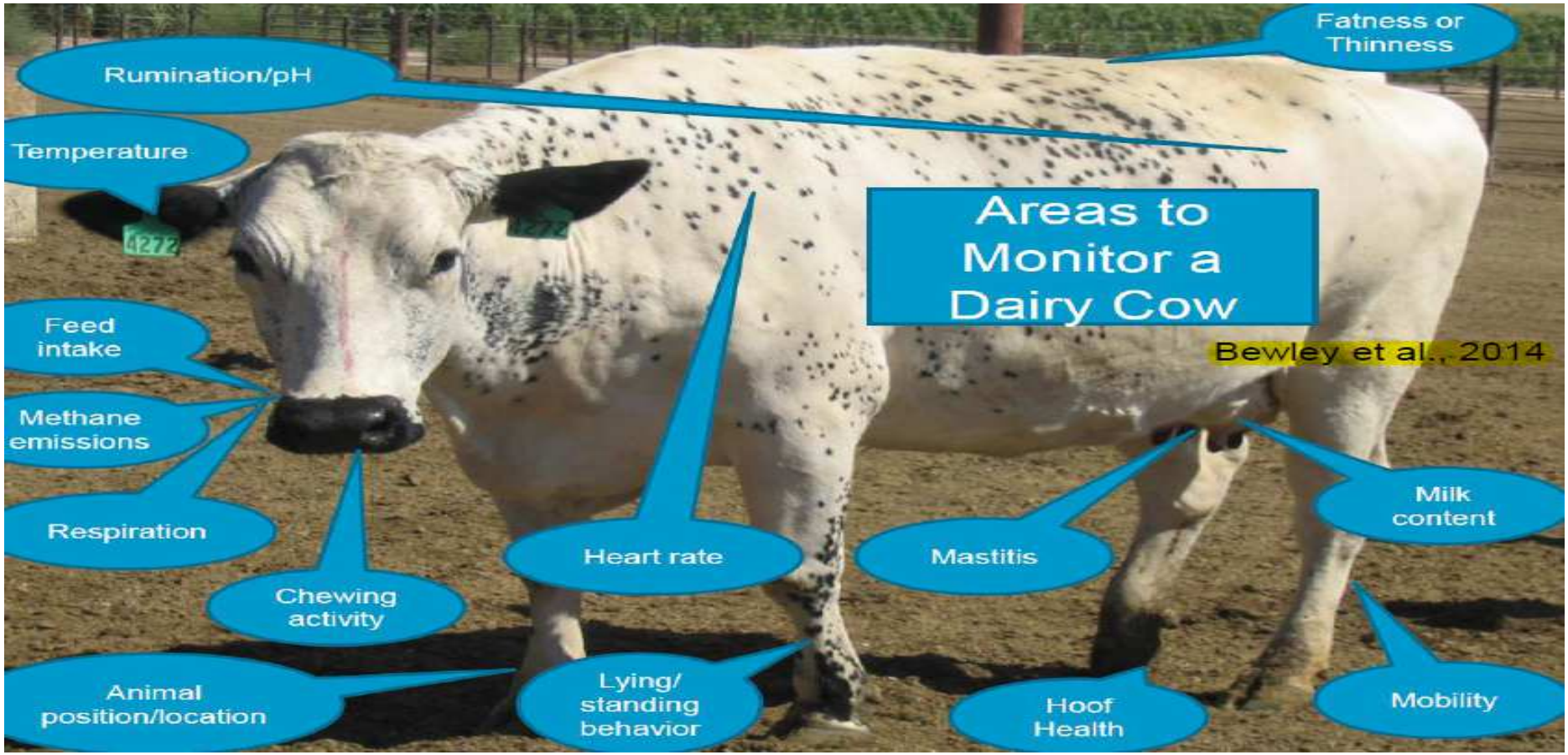
Teagasc
Agriculture and Food Development Authority

Innovative Technologies at Farm Level



Agriculture and Food Development Authority

Precision Livestock Farming



Teagasc
Agriculture and Food Development Authority

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

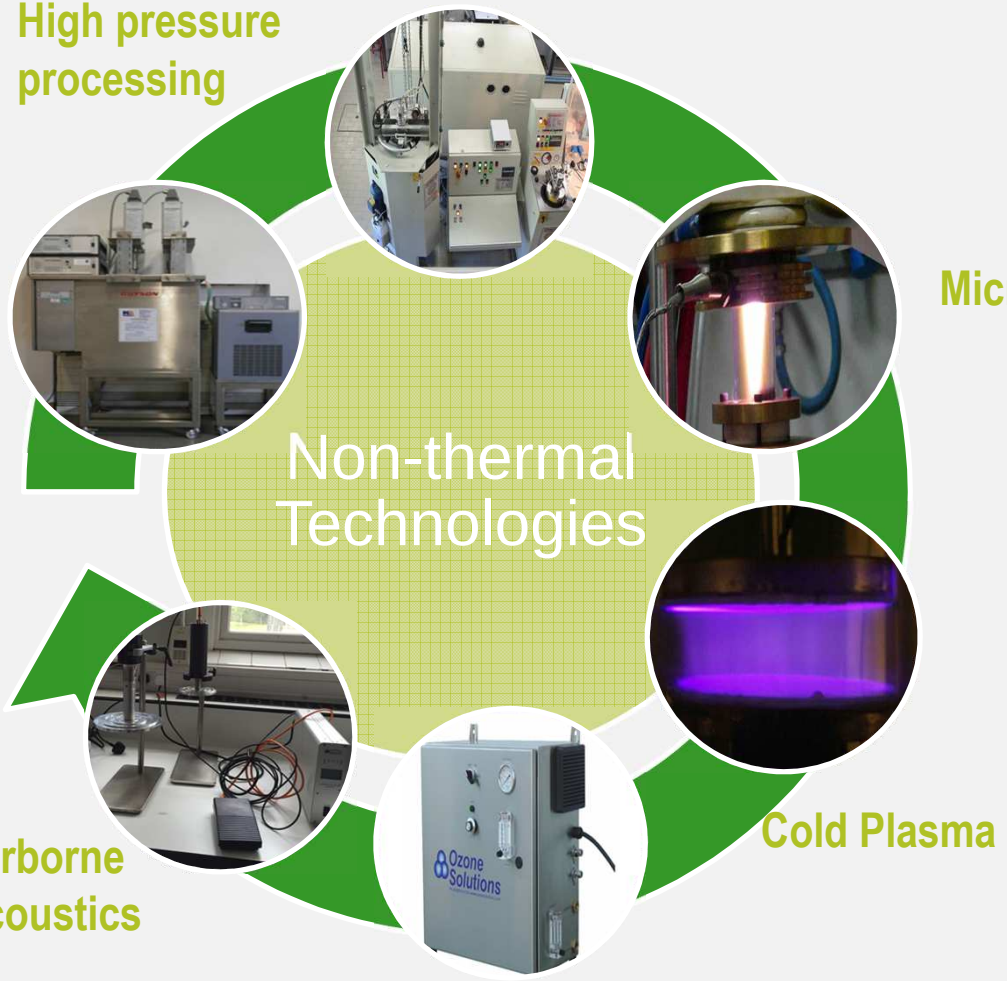
- Regulation
- Surface cleaning and disinfection
- Food safety and shelf life extension
- Nutrient and sensory aspects
- Consumer and processor acceptability
- Technology advances
- Cost and profitability
- Environmental impact

teagasc
Agriculture and Food Development Authority

Processing technology

Chemical additives
Chilling
Freezing
Pickling/Curing
Dehydration
Smoking
Irradiation
Aseptic Processing

Novel food processing technologies @Teagasc Food Research Centres



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

teagasc
Agriculture and Food Development Authority

High Pressure Processing

Pressures of up to 1000 MPa (typical pressure range: 300 to 700 Mpa) is

Agriculture and Food Development Authority

Innovation is a key driver of growth

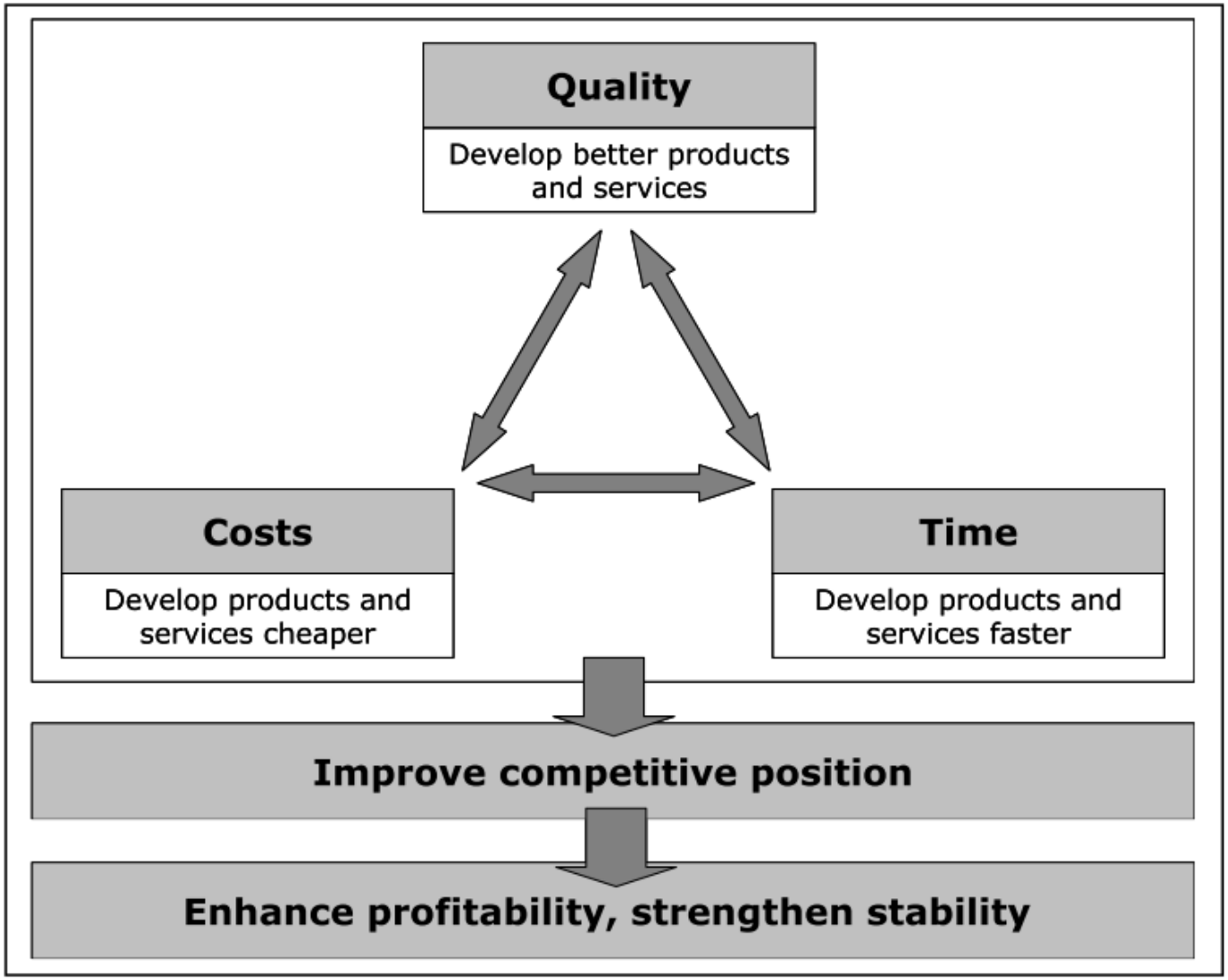
- **Innovation** – the introduction of a new or significantly improved product (good or service), process, or method
- **Entails investment** aimed at producing new knowledge and using it in various applications

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??



gasc
Agriculture and Food Development Authority

Requirements for Innovation

- Strong infra structures 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

Teagasc
Agriculture and Food Development Authority

Innovation Ecosystem

The innovation eco-system is a connection between the generation of knowledge and the application of that knowledge on a commercial basis.

teagasc
Agriculture and Food Development Authority

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

teagasc
Agriculture and Food Development Authority

Issues that Need to be Addressed

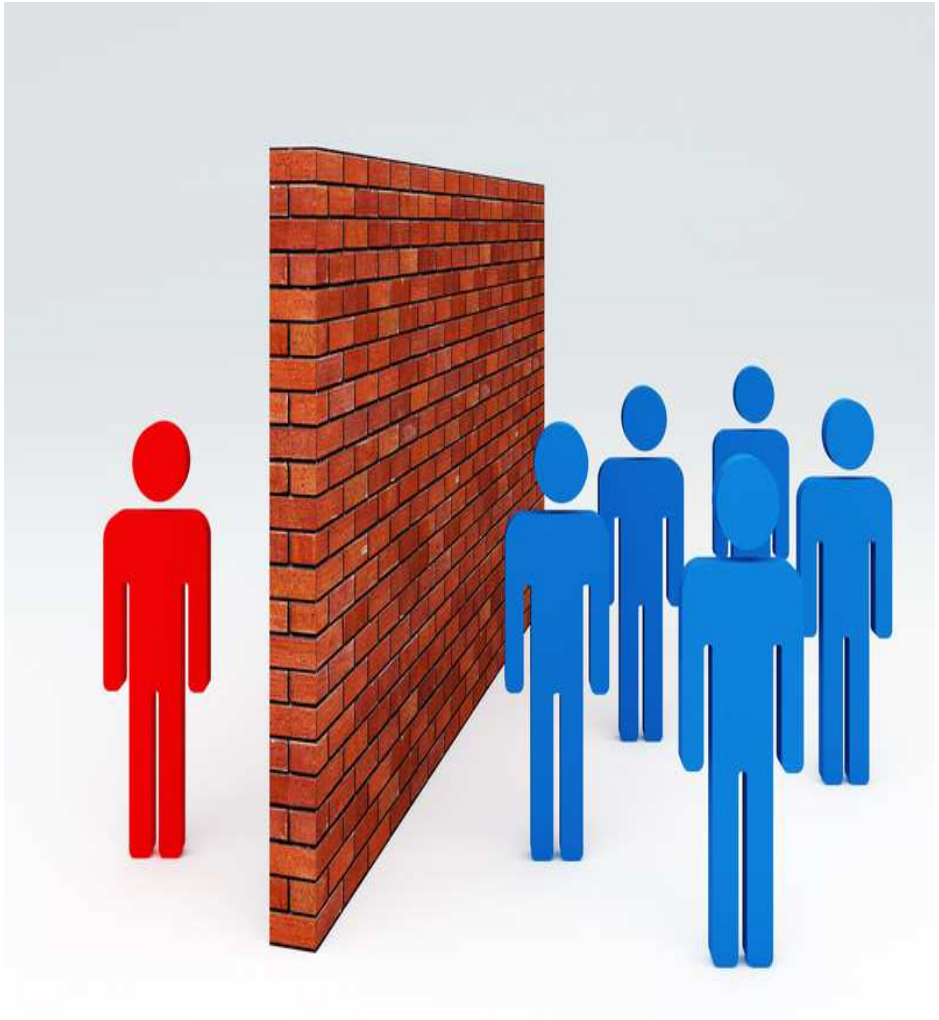
- **Greater understanding of knowledge transfer is required between researchers and industry in order to commercialise research outcomes**
- **Potential opportunities are not always recognised by either party.**
- **Researchers and industry have different agendas where research is concerned.**
- **For 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."

eagasc
Agriculture and Food Development Authority

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



teagasc
Agriculture and Food Development Authority

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
Agriculture and Food Development Authority


MAKE IT
EASY

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

Teagasc
Agriculture and Food Development Authority

Food Technology & Knowledge Transfer Strategy

teagasc
Agriculture and Food Development Authority

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

FOOD
INNOVATION
GATEWAYS

eagasc
Agriculture and Food Development Authority

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.

eagasc
Agriculture and Food Development Authority

Technology OFFER

Technology UPDATE

Technology EXPERTISE

Technology SERVICE

Technology PROFILE

Dr. Martin Danaher

E-mail: martin.danaher@teagasc.ie
Phone: +353 (0)1 8059552

Education

Ph.D. in Analytical Chemistry, University College Cork 2003

B.Sc. Industrial Chemistry, University of Limerick, 1997

Career

2002–Present: Teagasc Food Researcher

1997–1998: R&D Chemist, Gerard Laboratories

1998–2002: PhD student – "Teagasc Walsh Fellow".

Expertise

- Analytical chemistry: Chromatographic separations, sample purification, mass spectrometry, biosensors and immunoassays.
- Residue analysis: Agrochemical, environmental, natural toxins and medicinal adulterants.

Selected Publications

1. O'Mahony, J., Moloney, M., McConnell, R.I., Benchikh, E.O., Lowry, P., Furey, A., and Danaher, M., (2011). Simultaneous detection of four nitrofuran metabolites in honey using a multiplexing biochip screening assay. *Biosensors and Bioelectronics* 26 (10), pp. 4076–4081.
2. Vinogradova, T., Danaher, M., Baxter, A., Moloney, M., Victory, D. and Haughey, S.A. (2011). Rapid surface plasmon resonance immunobiosensor assay for microcystin toxins in blue-green algae food supplements. *Talanta*, 84 (3), pp. 638–643.
3. Whelan, M., Kinsella, B., Furey, A., Moloney, M., Cantwell, H., Lehotay, S.J. and Danaher, M. (2010). Determination of anthelmintic drug residues in milk using ultra high performance liquid chromatography-tandem mass spectrometry with rapid polarity switching *Journal of Chromatography A*, 1217 (27),

Teagasc
ELOPMENT AUTHORITY

Teagasc Gateways Events

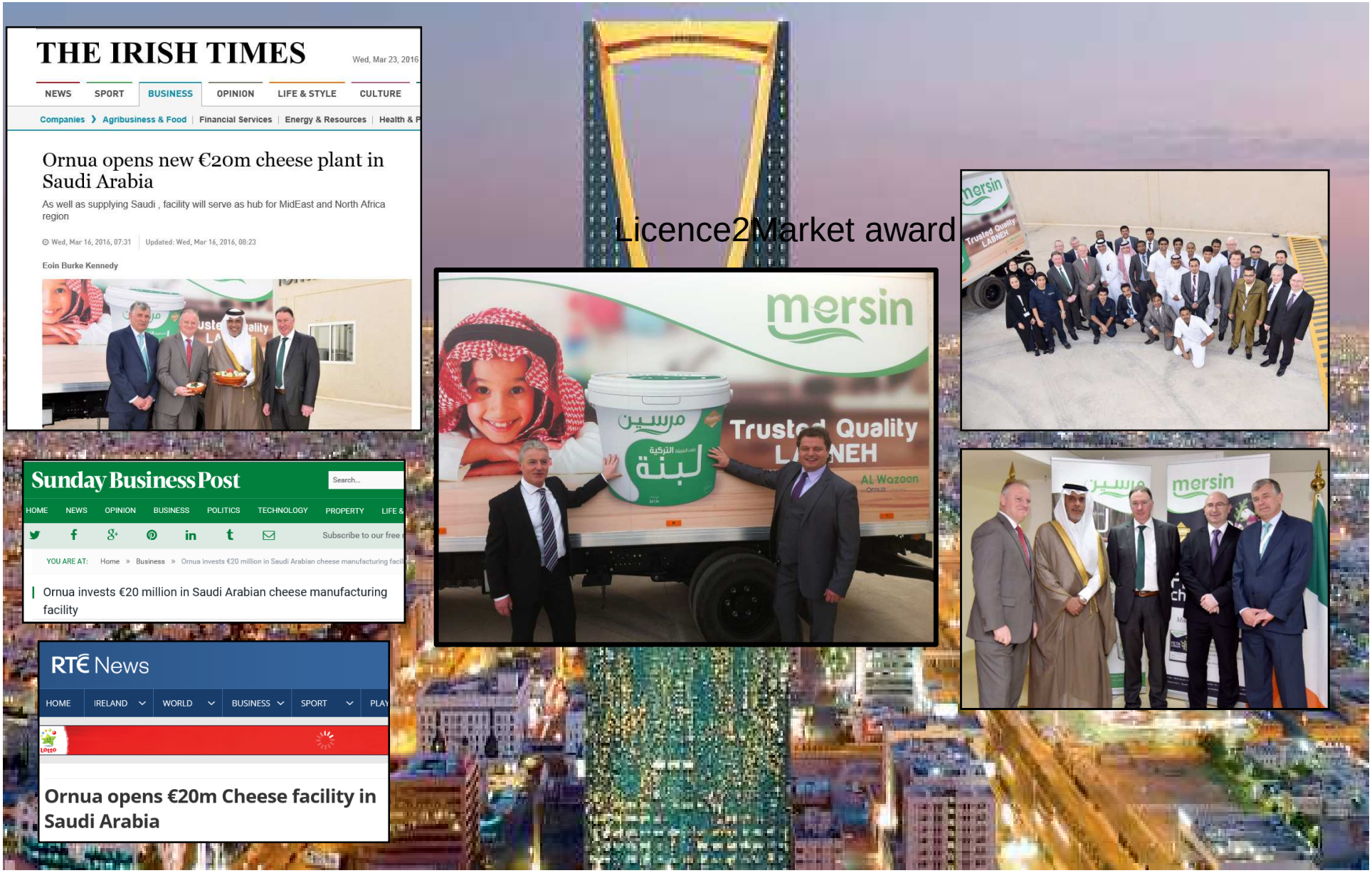
- Four themed events (2 per year)

Agriculture and Food Development Authority

Brexit Technological Response

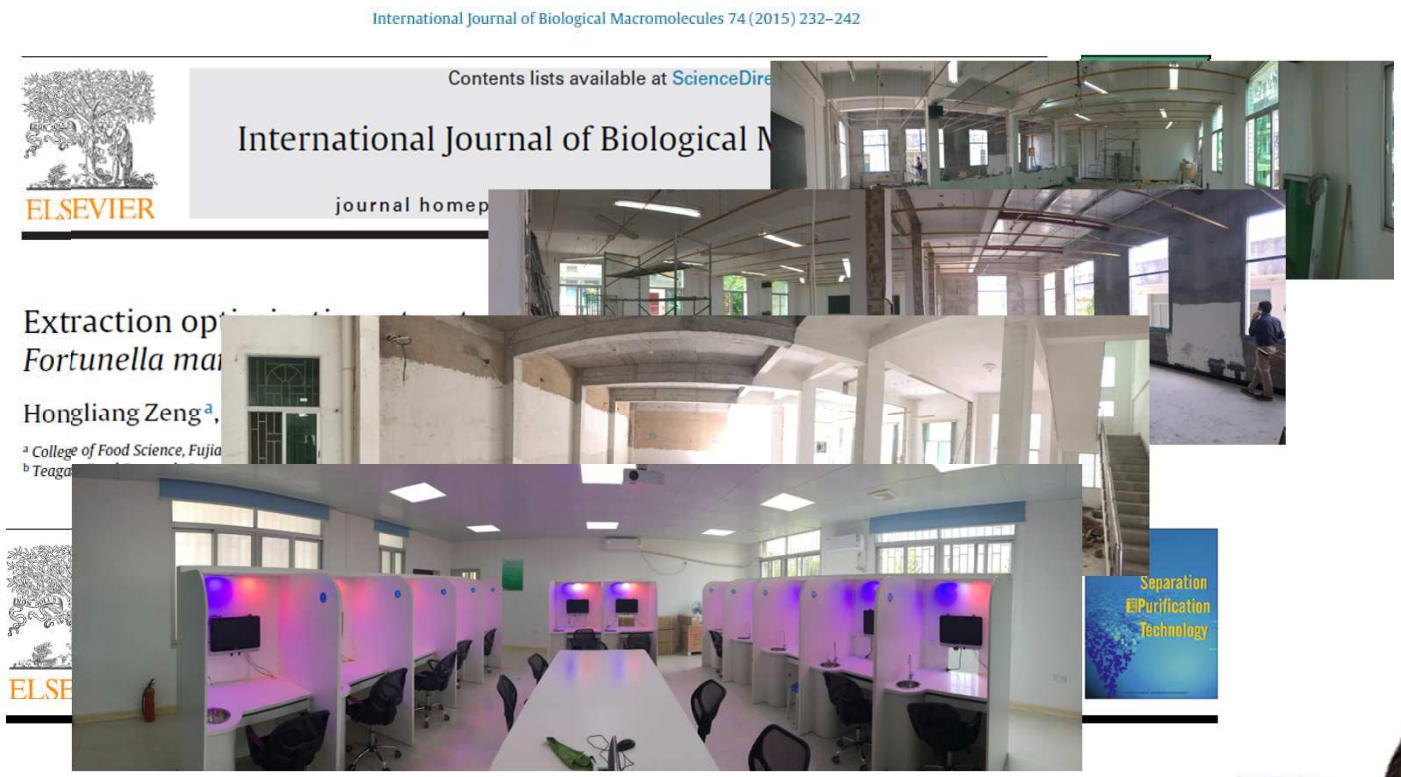
- Shelf life
- Add value
- Waste streams
- Implement new technologies
- Clean labels
- Lean
- Reformulation
- Diversification
- Food for life stages
- New product development

Teagasc
Agriculture and Food Development Authority



Agriculture and Food Development Authority

Teagasc Collaborating Universities in China

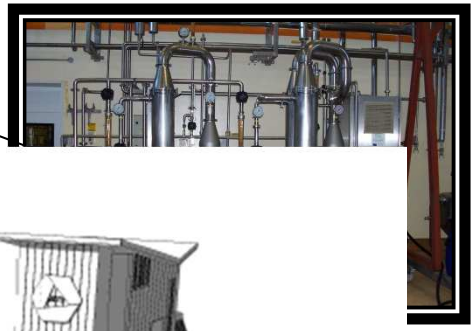


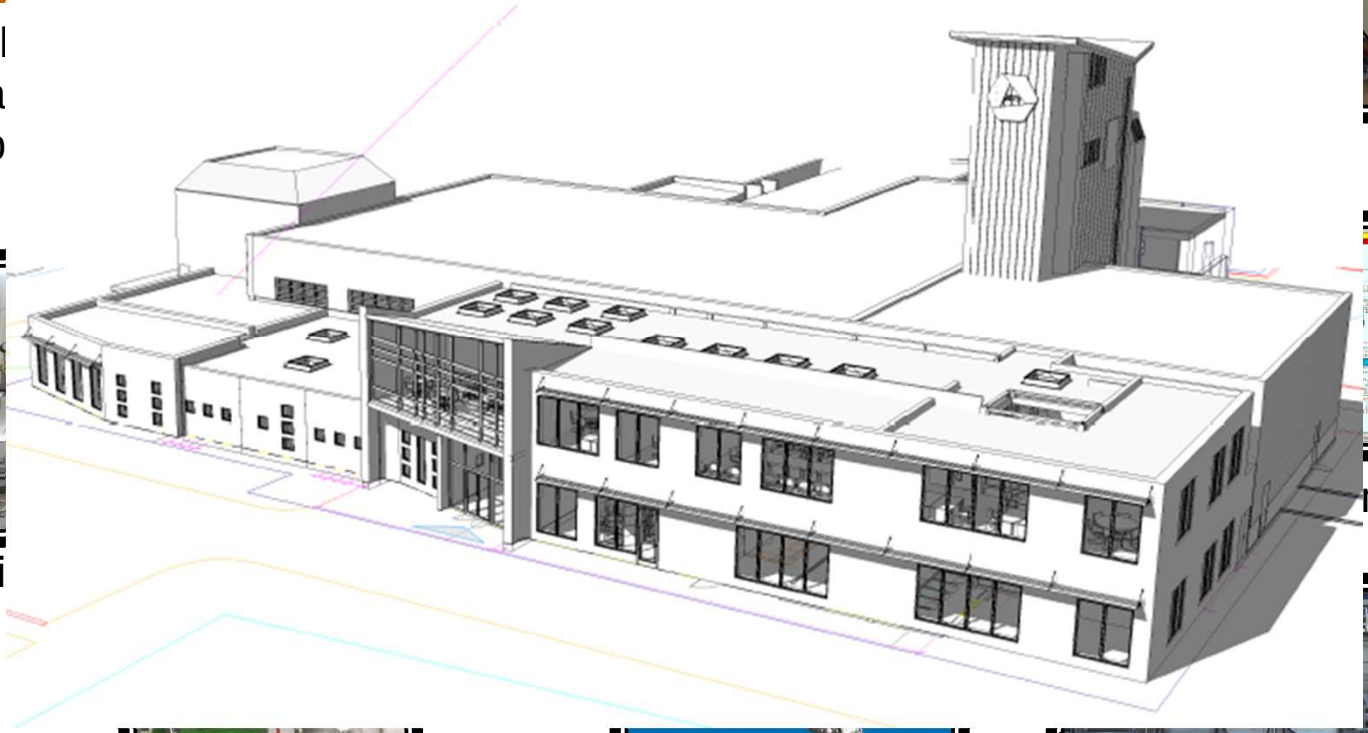
Ultrasonic–microwave synergistic extraction (UMSE) and molecular weight distribution of polysaccharides from *Fortunella margarita* (Lour.) Swingle

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

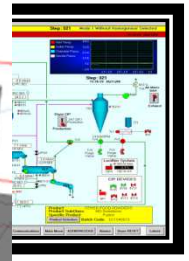
[a] College of Food Science, Fujian Agriculture and Forestry University, Fuzhou, Fujian 350002, PR China
[b] Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland

Thermal
dehydra
prototyp

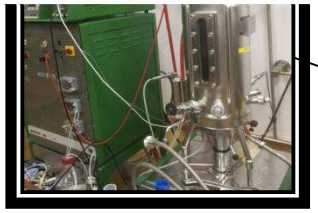




Food Applicati

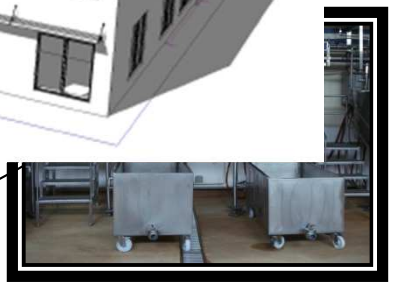


nd Drying



Fermentation

Ingredient development



Cheese-making

Teagasc
Agriculture and Food Development Authority

Issues that Need to be Addressed

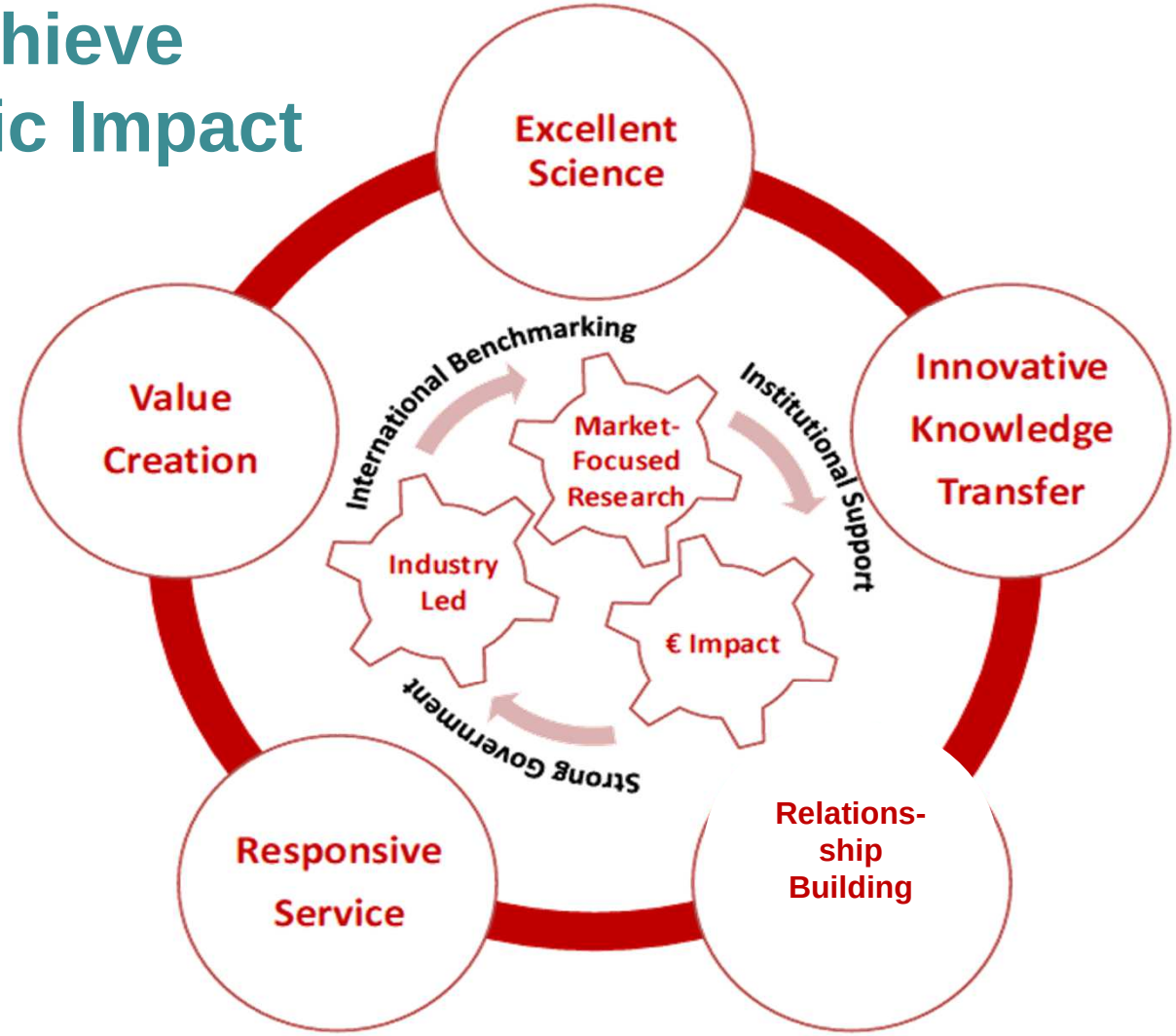
- Greater understanding of knowledge transfer is required between researchers and industry in order to commercialise research outcomes
- Potential opportunities are not always recognised by either party.
- Researchers and industry have different agendas where research is concerned.
- For researchers, success is often regarded as producing publications and winning new grants, this does not necessarily incentivize 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

teagasc
Agriculture and Food Development Authority

Modern Technology Transfer Offices

Agriculture and Food Development Authority

Pushing Research to Achieve Economic Impact



Agriculture and Food Development Authority

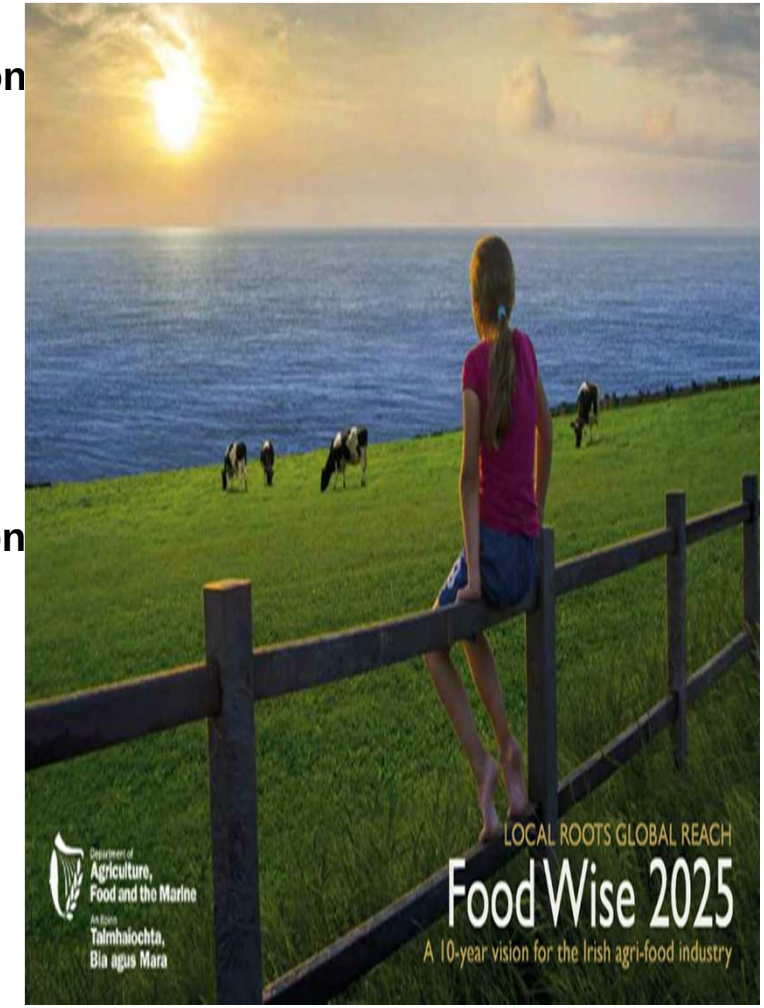
Conclusions

- Complexity in system – Gateways Portfolio, CRM
- People focused- trustworthy, measures and incentivises, leadership developent
- 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

eagasc
Agriculture and Food Development Authority

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,**



teagasc
Agriculture and Food Development Authority

INNOVATION

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

EXCELLENCE TALENT IMPACT

Ireland's strategy for research and development, science and technology

teagasc

Agriculture and Food Development Authority

THIS PROJECT IS FUNDED BY THE EUROPEAN UNION

Ministry of Education, Science and Technological Development

INNOVATION FUND

WORLD BANK GROUP

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)**

eagasc

Agriculture and Food Development Authority

Conclusions

Business needs to proactively engage with knowledge providers with capability

Knowledge providers need to make it easy / easier to do so.

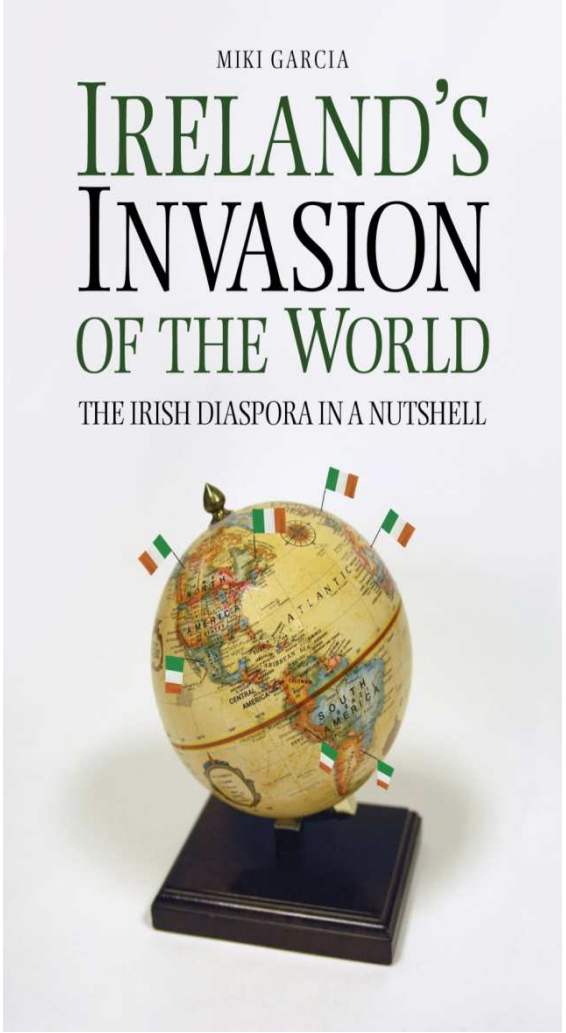
Big drivers and trends make this more urgent

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



Teagasc
Agriculture and Food Development Authority

Need for technology transfer for a resilient food industry

Declan J. Troy, Assistant Director of Research,Teagasc, Ireland.

Teagasc
Agriculture and Food Development Authority