



Addressing consumer demand for protein: supply-side opportunities and challenges

Prof. Maeve Henchion

Joint Bord Bia and Teagasc Conference
Bridging Science and the Consumer:
Key market trends and implications for the Irish food industry

19th November 2019



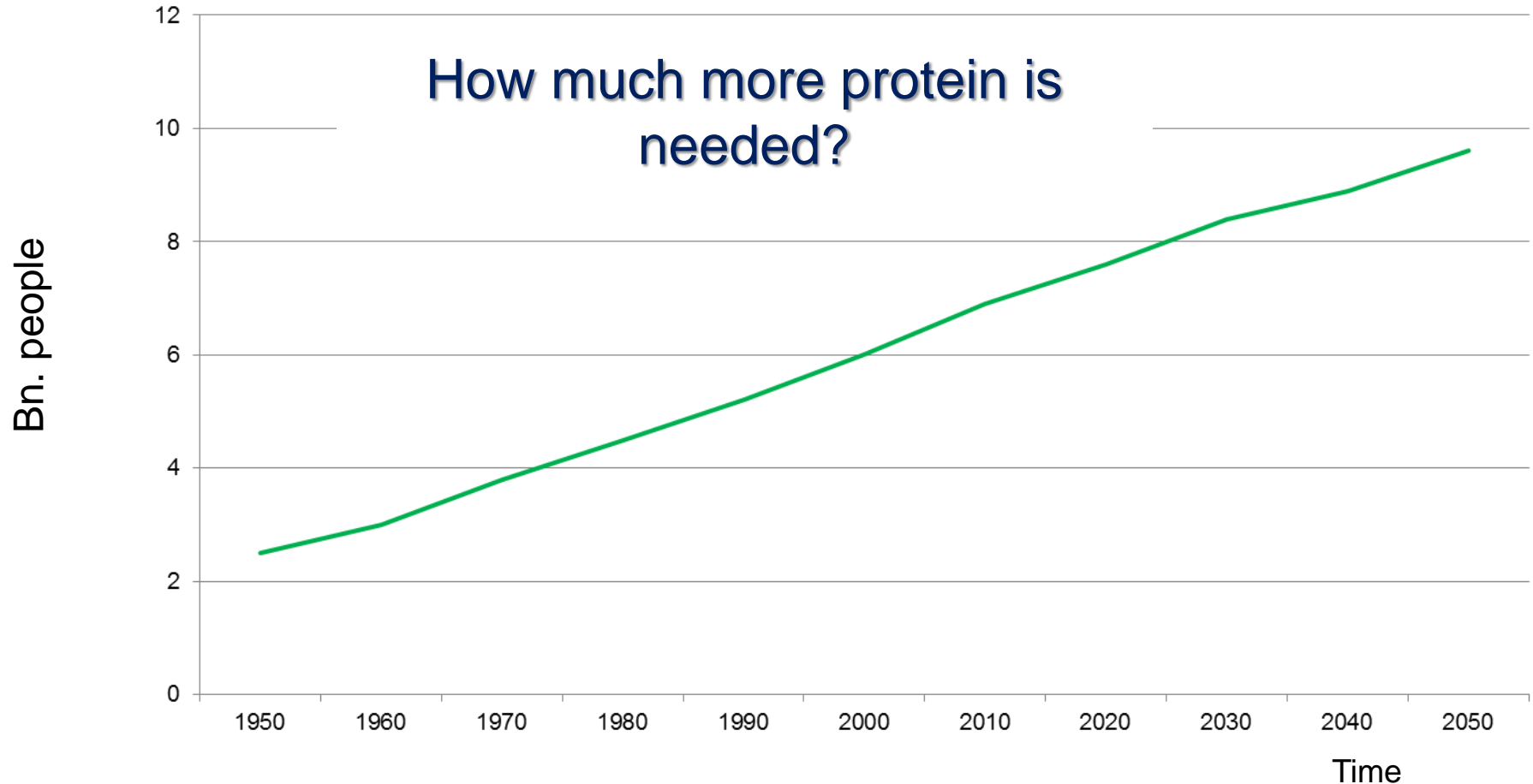


Agenda

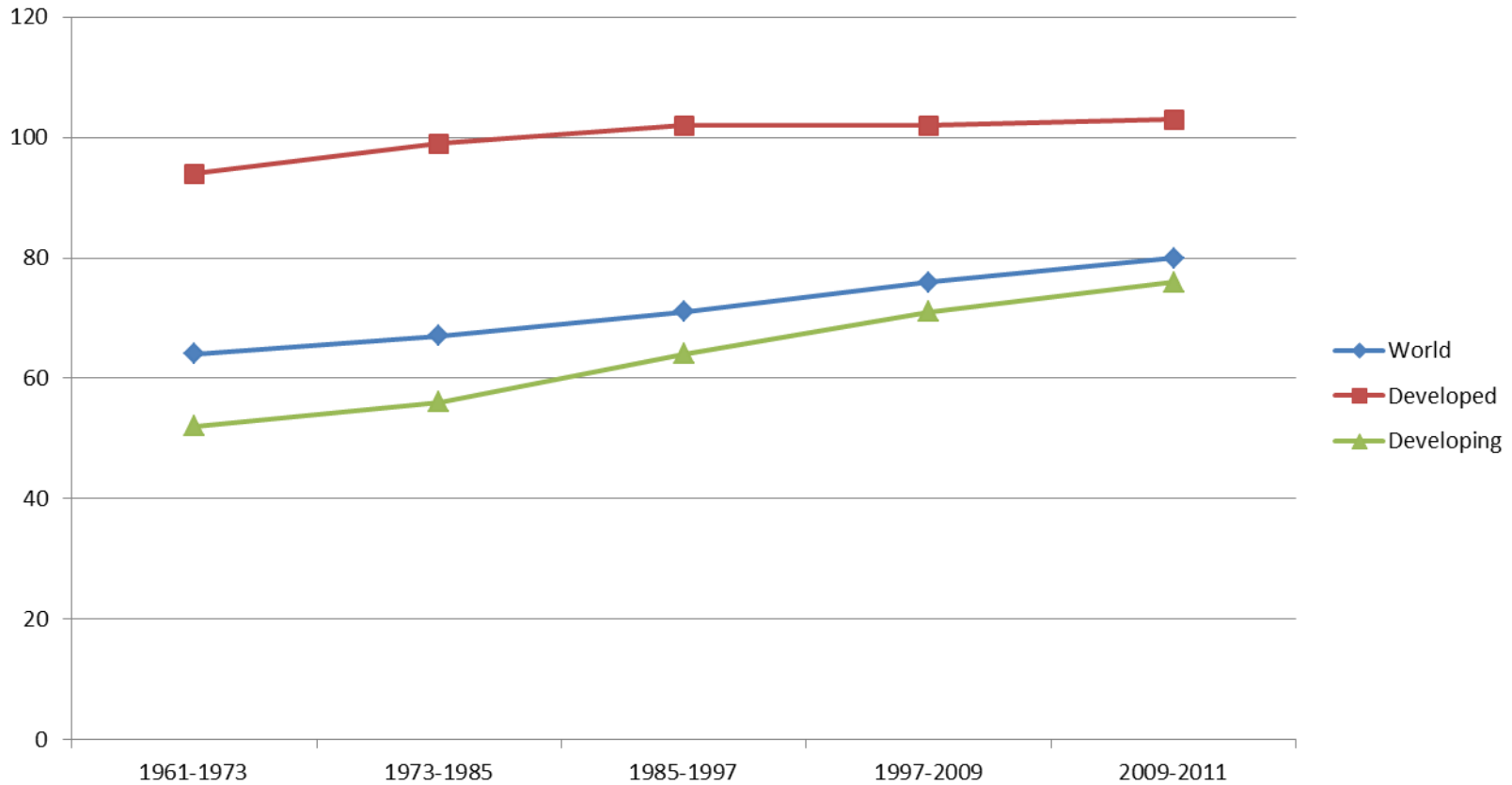
- Brief overview of current and future protein demand
- Current protein supply
- The Ying and Yang of different protein sources
- Scientific research addressing challenges of animal-based protein
- Conclusion

World population 1950-2050

Population size

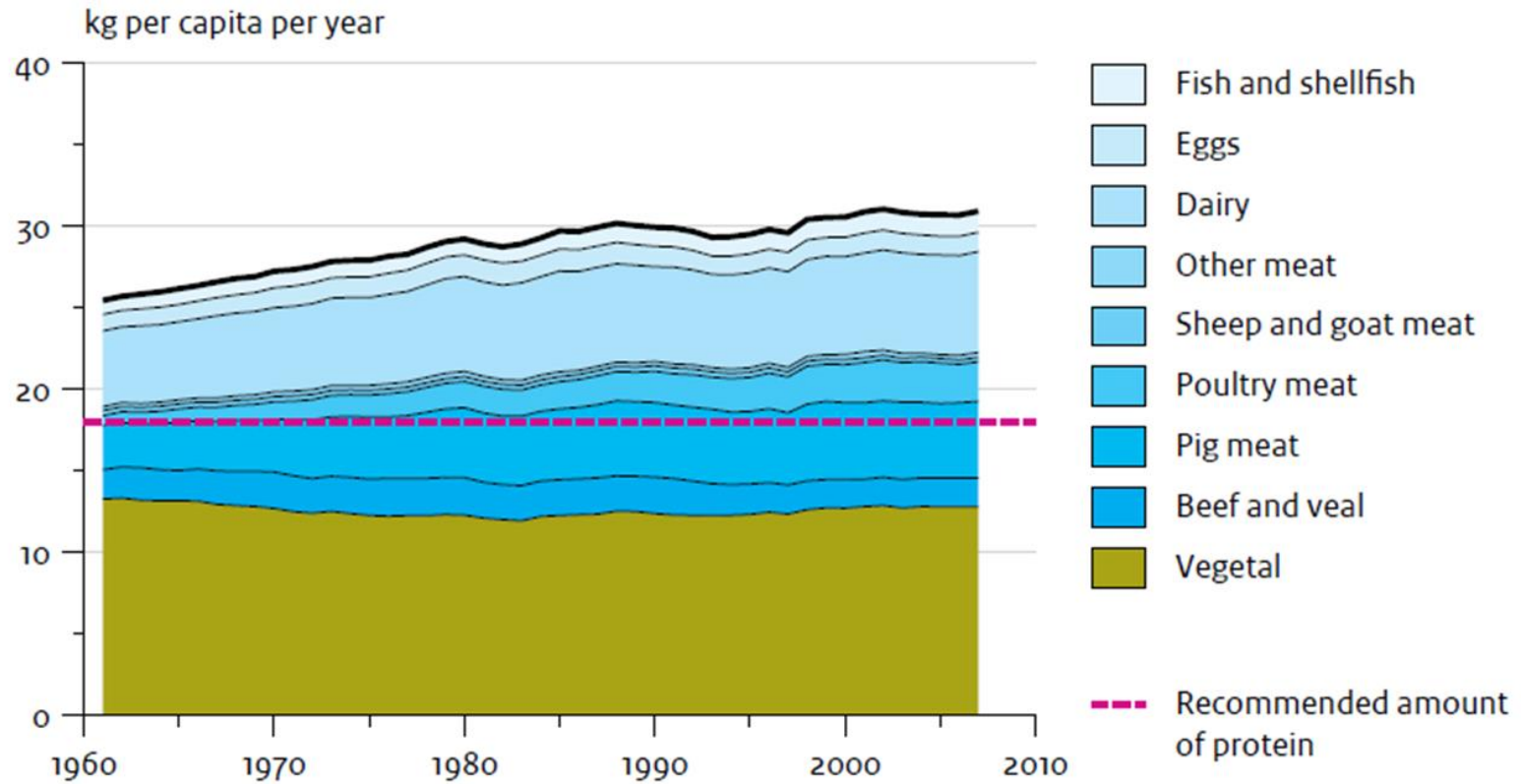


Evolution in protein consumption per capita (g/capita/day)



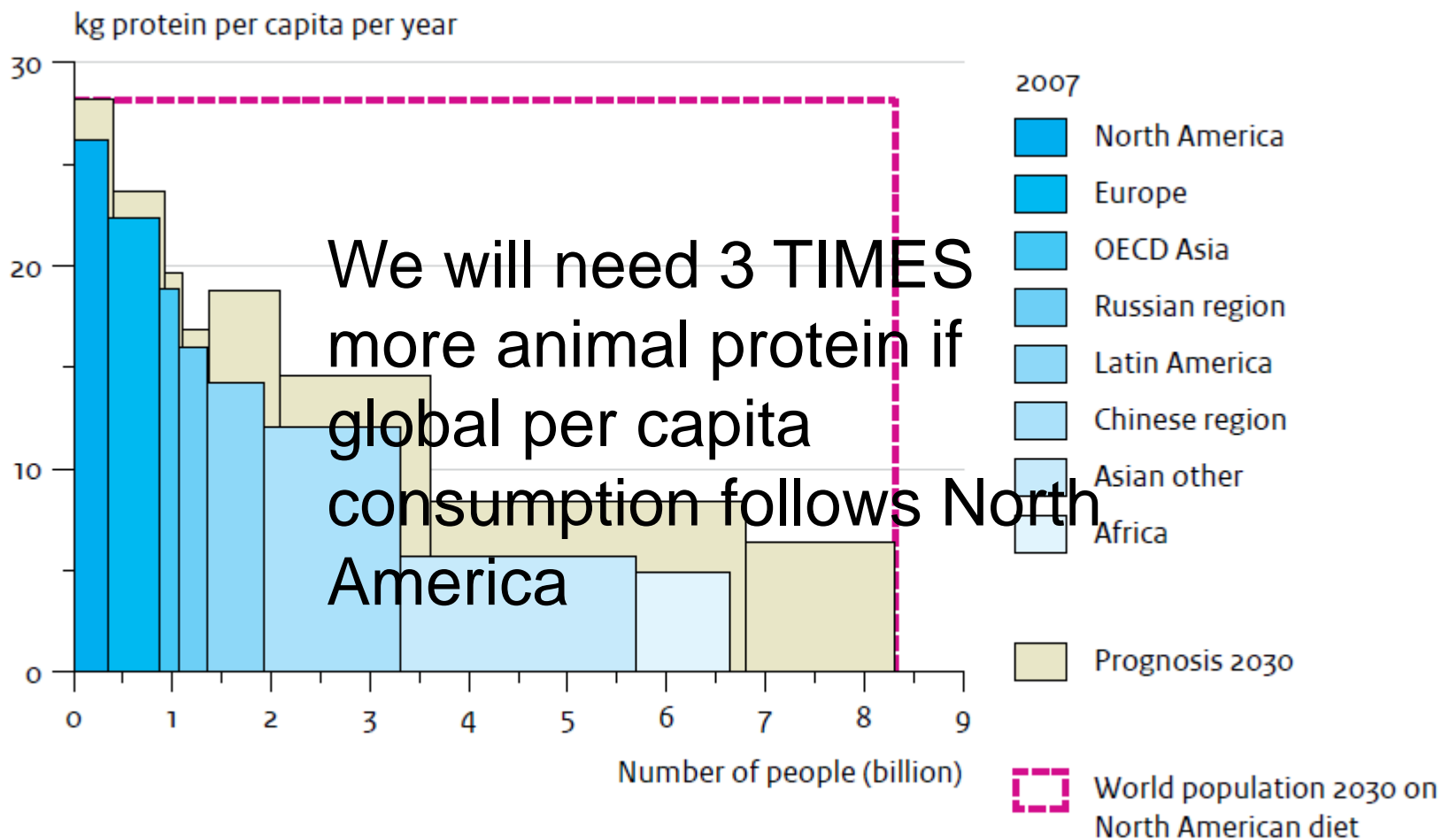
Source: FAOSTAT

Protein Intake in EU27



Source: Westhoek et al., 2011

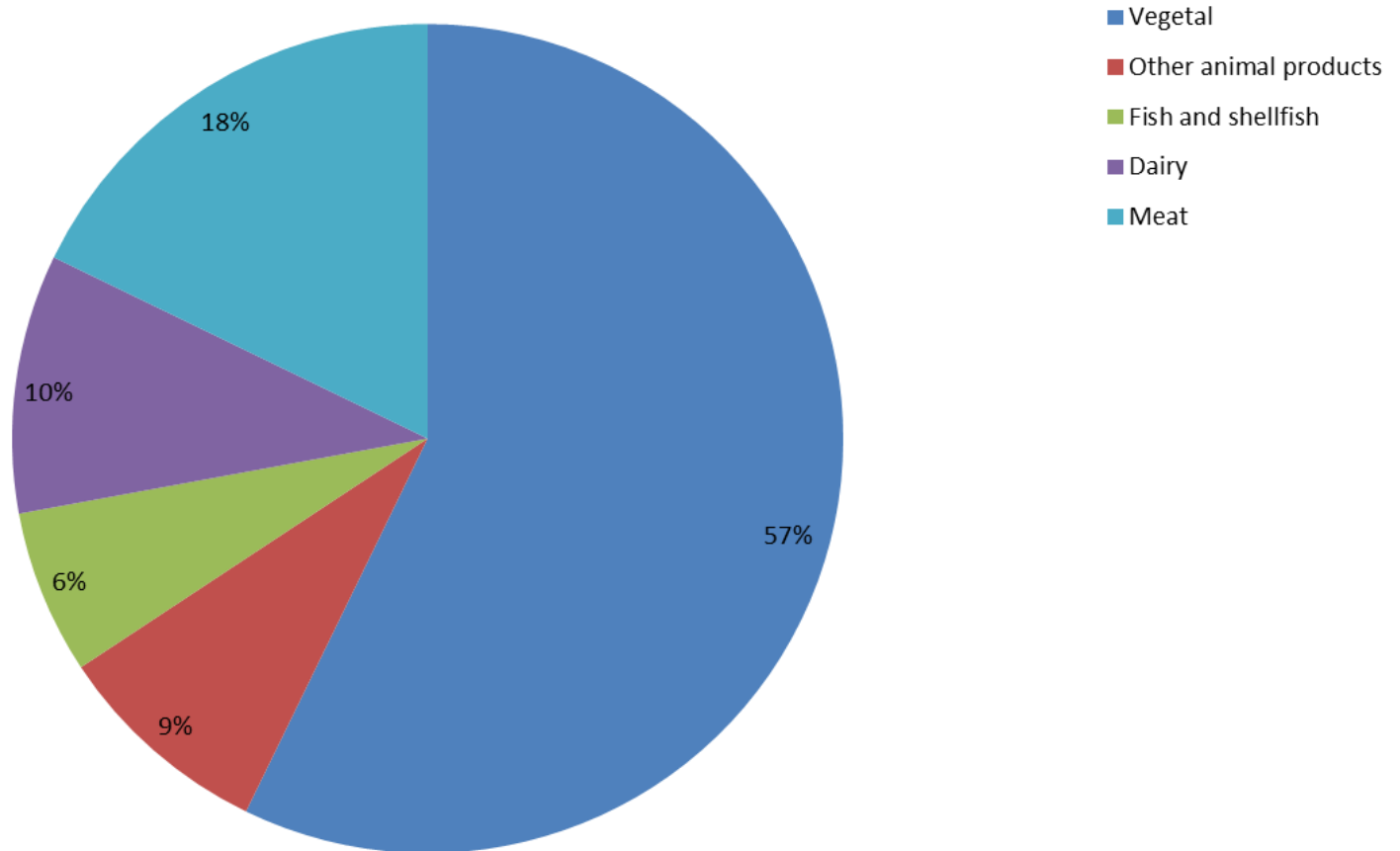
Global intake of animal protein per region



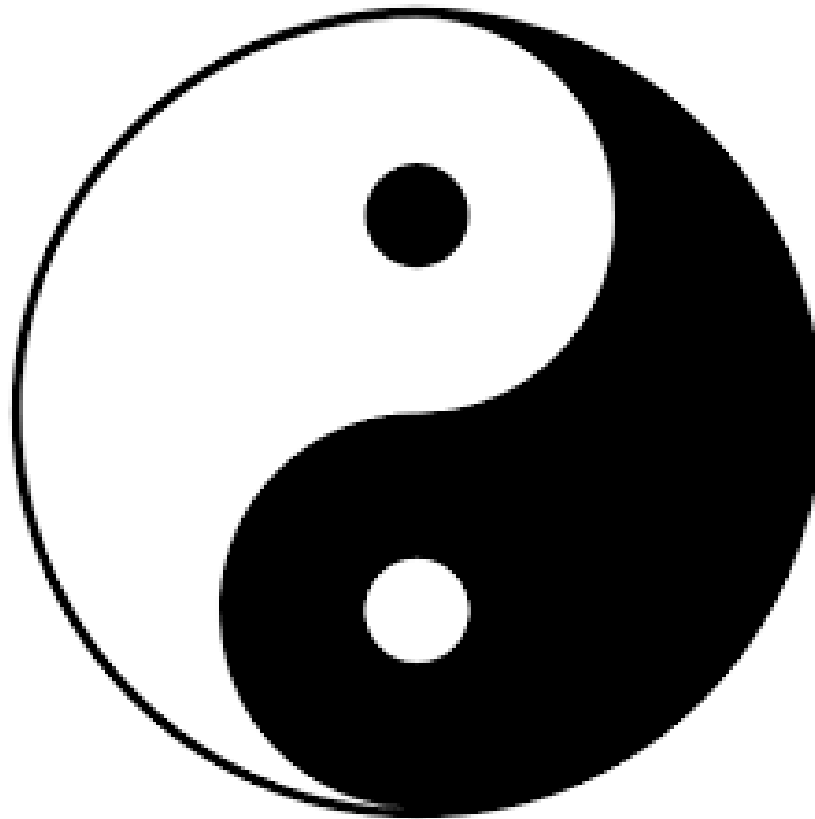
Source: Westhoek et al., 2011

What are our options?

Current sources of protein



Source: FAO, 2010



Review

Future Protein Supply and Demand: Strategies and Factors Influencing a Sustainable Equilibrium

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Challenges of animal based-protein

LESS MEAT=LESS HEAT



Join the global Meatless Monday movement
It's a simple step to help cool the planet

#MeatlessMonday **MEATLESS MONDAY** MeatlessM



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21

Planetary health plate



A planetary health plate should consist by volume of approximately half a plate of vegetables and fruits; the other half, displayed by contribution to calories, should consist of primarily whole grains, plant protein sources, unsaturated plant oils, and (optionally) modest amounts of animal sources of protein.

Benefits of animal-based protein



Fish

Good source of protein
Low in saturated fats
Good source of omega-3 fatty acids - can reduce risk of heart disease and stroke.

Overfishing
Heavy metals
Concerns about environmental impact of aquaculture



Plant based protein

Major portion of dietary protein intake globally - high level of social acceptance

Generally cheaper

Contains bioactive peptides giving nutrition and health benefits

Associated with lower level of GHGs and land use compared to animal-based protein

Some plants have unique benefits from envt. perspective, N fixing legumes

Gluten intolerance and allergies

May lack one or more essential amino acids

Gives rise to GHGs and requires significant land use

Level of social acceptance of vegan/vegetarian diet/meat alternatives some markets?



Emerging protein sources



Some do not require land

Some do not produce GHGs

Add value to bio-based feedstocks

High cost of some (at the moment?)

Some may not have all essential amino acid

Food safety concerns with some

Animal welfare concerns with some

Allergies

May not fulfil role of food beyond basic nutritional need

Social acceptance?



How can science contribute to addressing supply challenges?

Animal-based protein as a case study

- Dairy and meat largest contributors to GAO and exports in Ireland
- Cattle (for dairy and beef) largest contributors to GHGs from agr.
 - In 2018 agriculture accounted for 34% of national GHGs
 - Emission arising from enteric fermentation account for 19% of Ireland's overall GHG emissions (almost 60% of agr emissions) (EPA, 2019)
- Arguably most contentious



What is science doing to respond to GHG concerns?

Vaccination or inhibitors

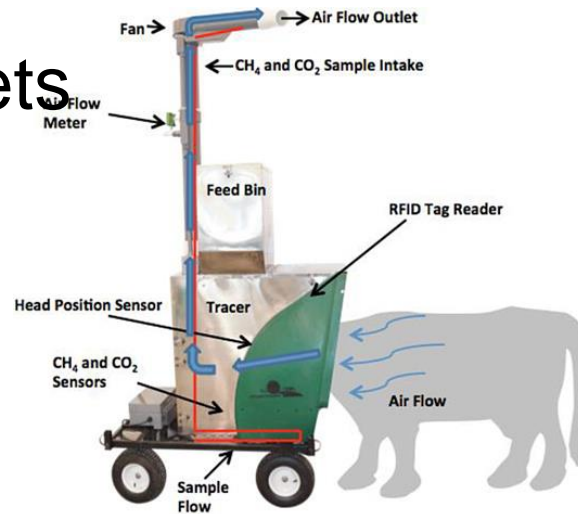
Selective breeding

Changing animal diets

Synthetic meat?



VistaMilk



METH-ABATE



RUMENPREDICT

Predicting appropriate GHG mitigation strategies based on modelling variables that contribute to ruminant environmental impact.

SeaSolutions



The Irish Agriculture and Food Development Authority

What is science doing about animal health and welfare?

Animal health



Vaccines or inhibitors

Diagnostics (rapid) and sensors

Feed additives

Breeding (genomic selection)

Biosecurity

Husbandry management

Economics

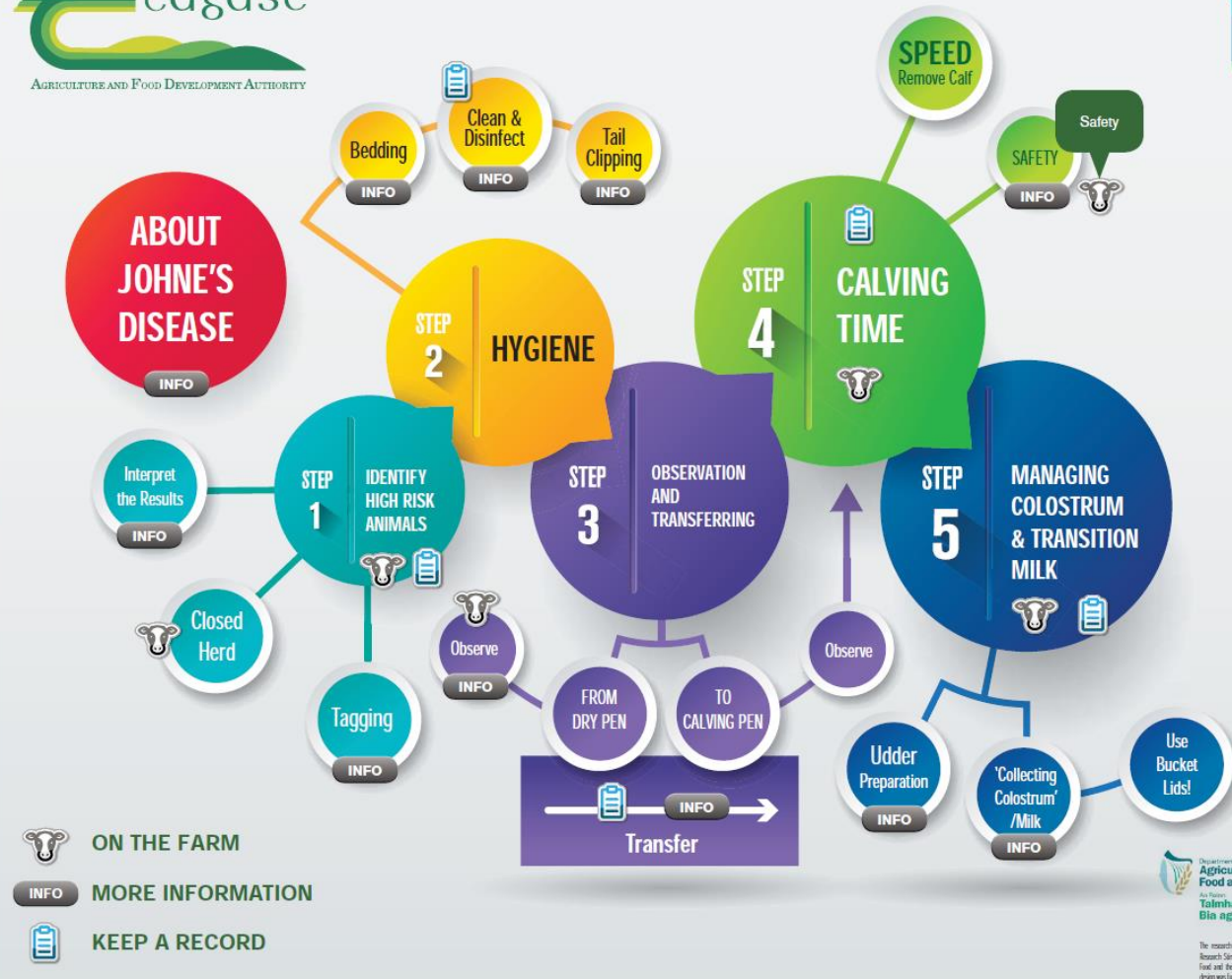
Changing practices

Designing (social science informed) control strategies

Johne's Disease

A Control Strategy

Johne's is a disease of cattle that affects the gut, causing diarrhoea and wasting. The disease is caused by bacteria called MAP (*Mycobacterium avium* subspecies *paratuberculosis*) which is mainly in the dung of infected cattle, but also in their milk and colostrum. Cattle are generally infected as calves but do not show any signs until adulthood. One-off tests to diagnose Johne's only pick up some infected animals. However, if you test regularly over time, with the help of your vet in reading results, you will know a lot more about Johne's in your herd than if you don't test at all.



Source: <https://www.teagasc.ie/media/website/about/farm-advisory/JohnesDisease.pdf>

What is science doing about animal health and welfare?

Animal welfare



Livestock Science
Volume 212, June 2018, Pages 57-60



Short communication

Effect of floor type on performance, lying time and dirt scores of finishing beef cattle: A meta-analysis

Michael P. Keane ^{a, b}, Mark McGee ^c, Edward G. O'Riordan ^d, Alan K. Kelly ^b, Bernadette Earley ^{a, 2, 3}



J Anim Sci. 2018 Mar; 96(3): 880–889.

Published online 2018 Feb 24. doi: [10.1093/jas/sky007](https://doi.org/10.1093/jas/sky007)

PMCID: PMC6093521

PMID: [29529234](https://pubmed.ncbi.nlm.nih.gov/29529234/)

Performance and welfare of steers housed on concrete slatted floors at fixed and dynamic (allometric based) space allowances

Michael P Keane,^{1,2} Mark McGee,³ Edward G O'Riordan,⁴ Alan K Kelly,² and Bernadette Earley¹


Assessment at farm level (animal welfare index);

Science based recommendations; animal housing for finishing beef cattle (space and floor type);

Husbandry management (disbudding; castration);

Animal transport (National & EU policy); OIE guidelines (World Organisation for Animal Health)


What about AMR?



PROTECTING ANTIBIOTICS FOR THE FUTURE

ANTAIBHEATHAIGH A CHOSAINT DON TODHCHAÍ

IRELAND'S NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE 2017 - 2020



An Roinn Sláinte DEPARTMENT OF HEALTH

Táirneabóidín, Úna agus Éireann DEPARTMENT OF AGRICULTURE, FOOD AND THE MARINE



Journal of Applied Animal Research

ISSN: 0971-2119 (Print) 0974-1844 (Online) Journal homepage: <https://www.tandfonline.com/loi/taar20>

Antimicrobial drug usage from birth to 180 days of age in Irish dairy calves and in suckler beef calves

B. Earley, A. Arguello, E. O'Riordan, P. Crosson, A. Cappelleri & M. McGee



Assessing the situation
Contributing to improved
animal health
Contributing to development
of protocols

Nutrition and health



Can be high in fat and cholesterol

Association with CHD, Type 2 diabetes, some cancers

Role in reducing NCD

Important source of complete protein

Important source of some key minerals (e.g. Ca, Fe) and vitamins (e.g. D)



Nutrition and health



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Plants Still Hot But Meat is Not Off the Menu

November 08 <http://www.fdbusiness.com/plants-still-hot-but-meat-is-not-off-the-menu/>



Research Article

The Impact of Message Source on the Effectiveness of Communications About Climate Change

Science Communication
2019, Vol. 41(4) 464-487
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DOI: 10.1177/1075547019863154
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Toby Bolsen¹ , Risa Palm¹,
and Justin T. Kingsland¹

- Provide balanced evidence base regarding the role of meat and dairy in nutrition and health at different life-stages
- Provide evidence on the role of meat and dairy as part of a sustainable diet
- Understand the context so as to inform science communication and engage other stakeholders in communication activities

Meat and dairy as part of a healthy, sustainable diet....

Meat Science 98 (2014) 445–451



Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci



Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci



Red meats: Time for a paradigm shift in dietary advice

Mary Ann Binnie^{a,*}, Karine Barlow^b, Valerie Johnson^c, Carol Harrison^d

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^b Canada Beef Inc., 2000 Argenta Road, Mississauga, Ontario L5N 1W1, Canada

^c Nutrition Wise Communications, 1 Palace Pier Court, Suite 605, Toronto, Ontario M8V 3W9, Canada

^d 46 Wembley Drive, Toronto, Ontario M4L 3E1, Canada



Meat Science

journal homepage: www.elsevier.com

Review

Red meat in global nutrition

Available online at www.sciencedirect.com



Nutrition Research 30 (2010) 375–381



Lean beef contributes significant amounts of key nutrients to the diet of US adults: National Health and Nutrition Examination Survey 1999–2006

Michael Zanovec^a, Carol E. O’Neil^{a,*}, Debra R. Keast^b,
Victor L. Fulgoni III^c, Theresa A. Nicklas^d

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Received 21 April 2010; revised 2 June 2010; accepted 3 June 2010

Review

The role of meat in strategies to achieve a sustainable diet lower in greenhouse gas emissions: A review

John J. Hyland^a, Maeve Henchion^a, Mary McCarthy^b, Sinéad N. McCarthy^{a,*}



International Journal of Food Science and Technology 2017, 52, 2505–2512

Original article

Dietary emissions patterns and their effect on the overall climatic impact of food consumption

John J. Hyland¹, Marv B. McCarthy², Maeve Henchion¹ & Sinéad N. McCarthy^{1,*}

Public Health Nutrition: 20(4), 726–738

doi:10.1017/S1368980016002573

Nutr Res The climatic impact of food consumption in a representative sample of Irish adults and implications for food and nutrition policy

John J Hyland¹, Maeve Henchion¹, Mary McCarthy² and Sinéad N McCarthy^{1,*}

¹Department of Agrifood Business and Spatial Analysis, Teagasc Food Research Centre, Ashtown, Dublin 15, Republic of Ireland; ²Department of Food Business & Development, University College Cork, Cork, Republic of Ireland

Submitted 1 March 2016; Final revision received 26 July 2016; Accepted 5 August 2016; First published online 26 September 2016



The Irish Agriculture and Food Development Authority

Contribute to changing the narrative

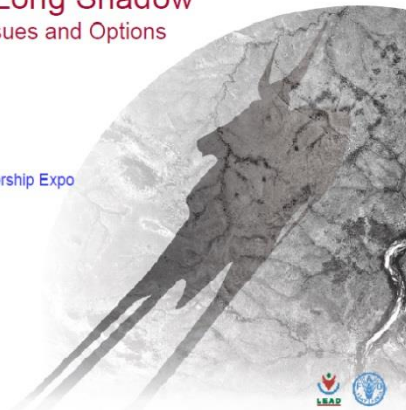
2006: “the problem”

“Livestock are one of the most significant contributors to today’s most serious environmental problems. Urgent action is required to remedy the situation”.

Livestock’s Long Shadow Environmental Issues and Options

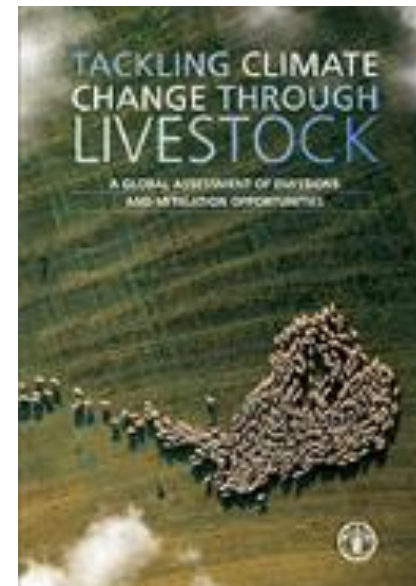
Pierre Gerber
Methane to Markets Partnership Expo
Beijing - 30 October 2007

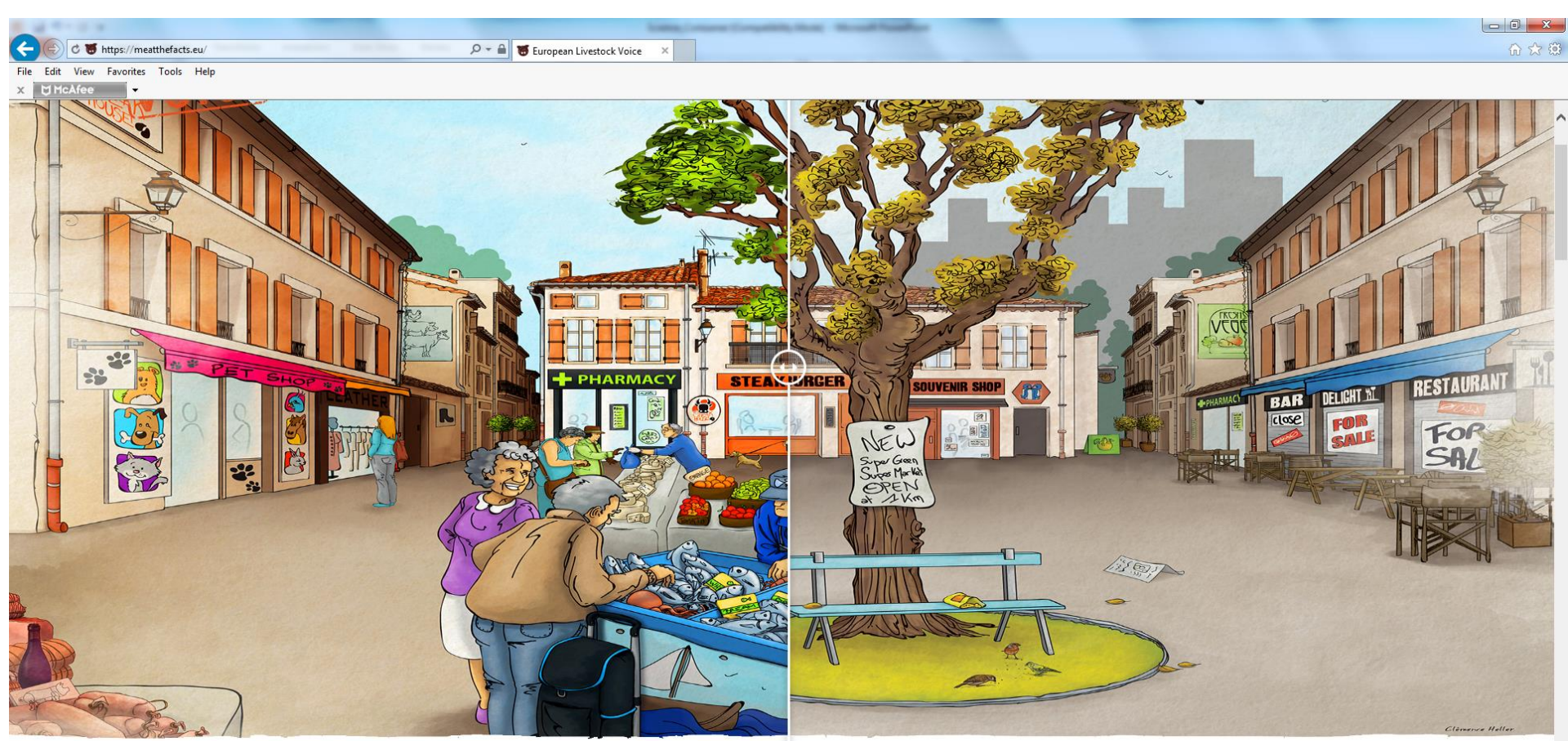
Henning Steinfeld
Pierre Gerber
Tom Wassenaar
Vincent Castel
Mauricio Rosales
Cees de Haan



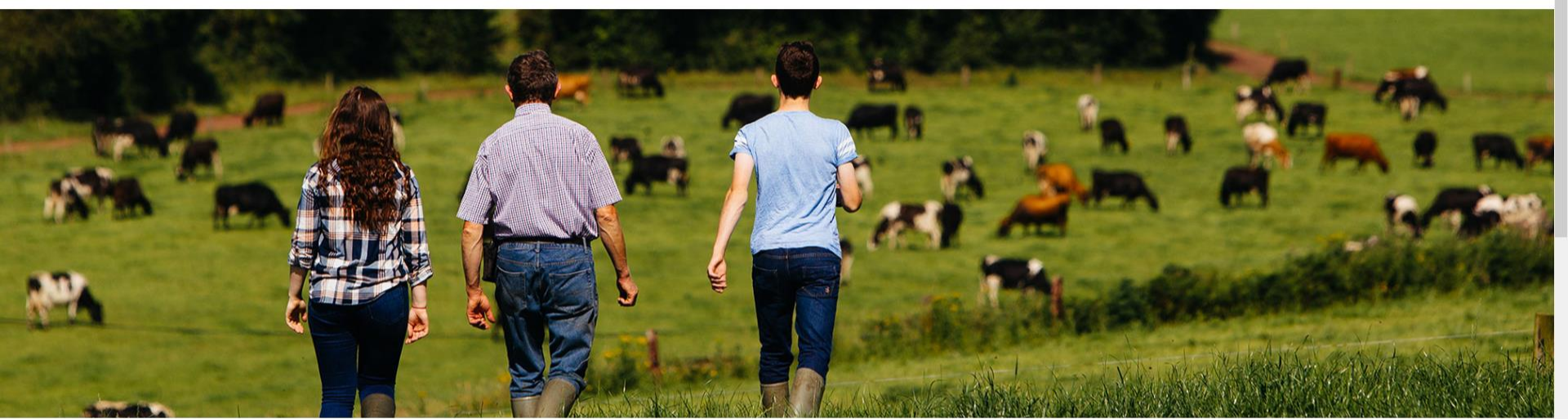
2013: “part of the solution”

“An important emitter of greenhouse gases (GHG), the livestock sector also has a large potential to reduce its emissions”.





We won't tell you what to eat, drink or wear, but it's good to hear the two sides of the story about livestock. Because when you make a choice, you also choose all of the consequences!



Farmers, processors and representative organisations have joined forces to explain the vital role of meat and dairy in a balanced diet and to demonstrate how the Irish meat and dairy sectors are taking major steps to protect the environment and guarantee the highest possible standards in animal welfare.

Irish meat and dairy ranks among the world's best for producing quality and delicious food in a way that ensures animals are properly cared for and that

Science has already made significant contributions.....leverage existing technologies and practices

Sizeable reductions within reach

“Sector emissions could already be brought down significantly just through the *wider use of existing best practices and technologies*. *Technologies and practices* that contribute to reducing emissions *already exist, but could be used more widely*.”

A 30% reduction of GHG emissions would be possible if producers in a given system, region and climatic zone adopted the technologies and practices currently used by their least emission intensive (emissions per unit of animal product) peers”.

FAO, 2013



How do we bring all of this science into practice and how can we improve practices?

EU paradox being addressed through emphasis on understanding the context and seeing innovation as a (political) socio-technical process, which requires social science based research

Can be realised through for example the multi-actor approach

EU-funded BovINE project

- Will form a transnational ecosystem linking researchers, advisors, farmers and relevant actors to address the sector's sustainability challenges
- - 10 member states, 18 partners
- Socio-economic resilience
- Animal health and welfare
- Production efficiency & quality
- Environmental sustainability
- Start Jan 2020



Conclusions

- Feeding the world in the future is truly a global challenge
- All sources of protein will be required
- Cascading and circularity principles will become more important
- Science is contributing to addressing some of the challenges with existing sources
- However, solutions need to be socially accepted so social science needs to work with physical and life sciences to ensure social acceptance of solutions
- There is a greater role for science communication given the contested space regarding the environmental, health and other aspects associated with different foods
- It's a time for collaboration.



Acknowledgements

With thanks to Dr. Sinéad Waters, Dr. Bernadette Earley, Dr. Áine Regan and Dr. Maria Hayes, Teagasc....all errors my own....