



# Climate Change Related Dairy Sector Risks

# Context

- Importance of dairy sector/ plans for **growth**
- **Horizon scanning** – climate change
- Some international research on climate change **vulnerabilities**
  - Food safety, economic viability etc
  - No studies for dairy chain in IRL/NI
- How will **impact of climate change** manifest itself?
- Are **actors** across the supply chain **aware, prepared or active?**
- Current study fills this **knowledge gap**



# Aims of the Project

1. Based on a literature review
  - i. **Identify** key climate change **vulnerabilities**
  - ii. **Identify** parts of the **supply chain** affected
  - iii. **Identify** possible **mitigation strategies**
2. **Consult** dairy supply chain **actors**
  - i. Elicit views about the potential vulnerabilities
  - ii. Possible mitigation strategies
  - iii. **Rank Vulnerabilities**
3. Provide basic elements of an ERDSS
  - Emerging Risk Detection Support System



# Project Team

- Teagasc (Irish Agriculture and Food Authority)
  - Trevor Donnellan, Maeve Henchion, Mary Brennan & Paula Cullen
- University College Cork/Teagasc
  - Thia Hennessy
- Queen's University Belfast
  - Katrina Campbell
- Project funded by *safefood* and conducted through 2016

# Overview of presentations

## 1. Climate change

- Background

## 2. Dairy supply chain

- Description of supply chain and its various actors in IRL/NI
- Possible implications for supply chain

## 3. Interviewing

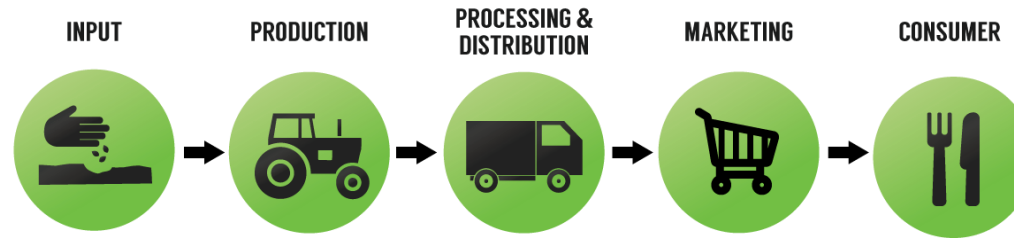
- Selection criteria and methods used

## 4. Food Safety Considerations

- Pathogens, etc

## 5. Results of interviews

- Key themes that emerge and ranking of concern:



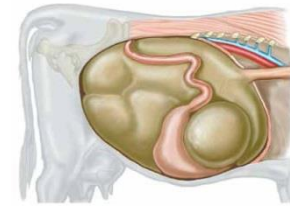
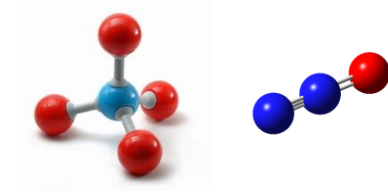




# Climate Change

# Background to Climate Change

- Non-CO<sub>2</sub> emissions from Agriculture
  - Key source is enteric fermentation & ag. soils
- Enteric fermentation
  - methane - normal digestive processes of livestock
  - feed characteristics are significant factor
- Agricultural soils
  - nitrous oxide produced in soil
  - more nitrogen via fertilisers & animal manure
  - increases amount of nitrous oxide emitted



# Climate Modelling and Projections: Temperatures mid century

- Higher **Global** surface temperatures
  - +0.3 to +4.8°C by the end of century
  - **not** expected to be **regionally uniform**
  - Arctic vs Europe (different latitudes)
- Higher **IRL/NI** temps
  - by up to 1.5°C in summer/winter (plus **greater extremes**)
  - **winter nights** south/north (+1.1°C/+2.5°C)
  - **summer daytime** south/north (+ 0.7°C/ +2°C)
  - fewer ice and frost days





# Climate Modelling and Projections: Precipitation mid century

- Higher **Global precipitation** levels
- Lower **IRL/NI precipitation** levels
  - fall of 0 - 10% in annual precipitation
- Reduction **not equal** over year
  - higher reductions in summer
- **Heavy rainfall events** (>20mm rain days) to increase
  - Approx. 20% more during autumn & winter months
- Number of **droughts** to increase
  - 7 to 28% increase in dry periods



# Climate change and agriculture IRL/NI

- **Positives**
  - **warmer** average temps for grass growth
  - longer growing season 35 to 40 days
- **Negatives**
  - more **heavy rainfall** (flooding/waterlogging)
  - new **pests** and diseases
  - livestock **heat stress** (extreme days)
- More **volatile** (unpredictable) climate
  - extremes changing much more than averages
- How do **negative events** affect dairy chain ?



# Direct and Indirect Effects of Climate Change for Dairy Chain

- **Direct risks**
  - fluctuating weather patterns
  - extreme weather events (prolonged heatwaves/flooding)
- **Indirect risks**
  - economic issues arising from the direct effects
  - loss of farm productivity
  - pest or disease development
  - policy to adapt to or mitigate climatic changes
  - switch from traditional fossil fuels to renewable energy
- **Risks concentrated at farm production stage**



# Direct Risk: Weather

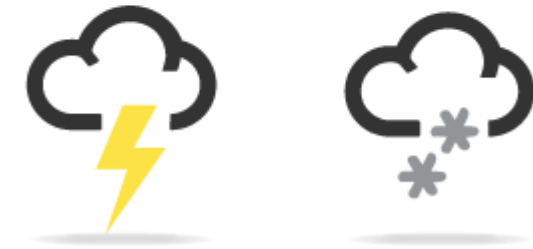
- Climate change: threat/opportunity for **grass production**?
  - increase in **temperature**
  - higher **CO<sub>2</sub> levels**
  - fewer **frost days**
  - increased **dry periods** and drought (irrigation required?)
- **Heat stress** for animals
  - a reduction in milk yield
  - lower milk quality
- **Indirect effect of weather related risks**
  - more adverse climate impacts beyond IRL/NI
  - may present **opportunities** for IRL and NI dairy sector
  - **higher prices/market share**





# Direct Risk: Natural Disasters

- Increased prevalence of **natural disasters**
  - flooding, storms and droughts
  - Increased frequency, degree and duration of flooding
- **Adverse Consequences**
  - evacuate livestock, damage to pastures, yield loss,
  - damaged drainage systems & field infrastructure
  - soil biodiversity / animal disease
- **Associated Costs** include
  - feed, reseeding, repairs to infrastructure
  - use of machinery to clear debris
- **Benefits for others**
  - flooding beneficial to input suppliers
  - need for repairs, increased need for purchased feed



# Indirect Risk: Economic/Market

- **Market related risk** for inputs and outputs
  - changes in supply/demand
  - price, quality impacts
  - e.g. volatile animal feed prices
- Calls to **reduce** meat/dairy **consumption**
  - limit the environmental impact
  - may change consumer behaviour



# Indirect Risk: Biology and Environment

- **Biological risks**
  - yield and quality reductions
- **Consumers and environment**
  - **environmental footprint** a growing concern
  - risk to downstream processors and distributors
- **Pests and pathogens**
  - **negative effect** on both **animals and crops**
  - increased need for **veterinary services**
  - **more livestock inputs** (less productive livestock)



# Indirect Risk: Public Policy/Institutional

- Irish government has committed to **reducing GHG emissions**
  - by **30%** compared to 2005 levels by **2030**
- Potential **regulations** that directly affect supply chain
  - Require mitigation strategies to control emissions
- Direct **caps on dairy emissions** in future?
  - limits production
  - reduce profitability (purchase emissions quota rights)
- **Negative effects** on profitability of dairy farming
  - could lead to underinvestment
- **CAP reform** another factor
  - threats or opportunities to the dairy supply chain







# Interviews

# Expert Interviews

- List agreed by project team and Safefood
  - range of stakeholders in IRL/NI
  - policy makers, researchers,
  - dairy farmer & dairy processing reps.
  - agri-input suppliers
  - environmental interests
  - retailers
- Strong positive response from experts
- 20 interviews conducted, mainly face to face
  - months of October and November 2016.



# Expert Engagement

- **Semi-structured interview** approach
  - wide ranging discussion between interviewee/interviewer
  - in depth exploration
- **Considerations**
  - **Pinpoint key negative impacts** and their size
  - Potential for mitigation strategies
- Develop the basic elements of an ERDSS
  - system for stakeholders from industry and government
  - identify & control emerging hazards in chain
  - likened to a specialised predictor RASFF
  - risks are scored based on impact
  - likelihood are scored based on potential occurrence



# Analysis and conclusions

- **Interviewees ranked various threats**
  - by potential impact on their business
  - most significant threats discussed in detail
- **Interviewees ranked potential mitigation strategies**
  - by their perceived potential effectiveness
- **Interviewees were asked series of open ended questions**
  - Responses were documented and analysed
  - Six major themes emerged
- **Themes and rankings provide basis for**
  - main findings of the report
  - key recommendations

