



Stakeholders' Perspectives on Climate Change

Overview

- Dairy supply chain on the Island of Ireland
- Exposure of the supply chain to climate change vulnerability
- Stakeholders' perspectives

Mapping the Dairy Supply Chain



Mapping the Dairy Supply Chain



- How will climate change affect various parts of the chain?
- Where will the costs and/or benefits fall?

Inputs

INPUT



- Main farm inputs
 - feed, fertiliser, energy & veterinary services
- Grass less important in NI than in IRL
- NI farmers higher purchased feed dependence
 - Vulnerable to feed availability & price volatility
- IRL farmers more exposed to
 - weather conditions (production risk - grass)
 - movements in fertiliser prices (imported)

Dairy Farming North & South

PRODUCTION



	Ireland	Northern Ireland
Aggregate milk pool (millions of litres)	6,395	2,266
Number of Farms	15,588	2,655
Average Herd Size	70	115
Average Income 2015	€62,141	£45,728

- Farm size may provide more resilience to economic shocks
- Different policy jurisdictions
 - may be exposed to different policy pressures



Processing

- Some processors operate in both IRL/NI
- NI 12 processors
 - 8 processing > 80% of NI milk.
 - generally not owned or controlled by dairy farmers
- IRL 16 processors
 - 6 largest processing >80% of IRL milk pool
 - mainly co-operative ownership structure

Marketing & Consumer



- International consumer
 - Distance to market may be a challenge
 - Domestic consumption in IRL & NI (<20%)
- Exports of IRL dairy to 130 markets worldwide
 - top five UK, CN, NE, DE, US.
 - butter, cheese & infant formula main exports
- Exports of NI dairy
 - milk powders and cheese
 - 1/3rd NI production, exported to IRL



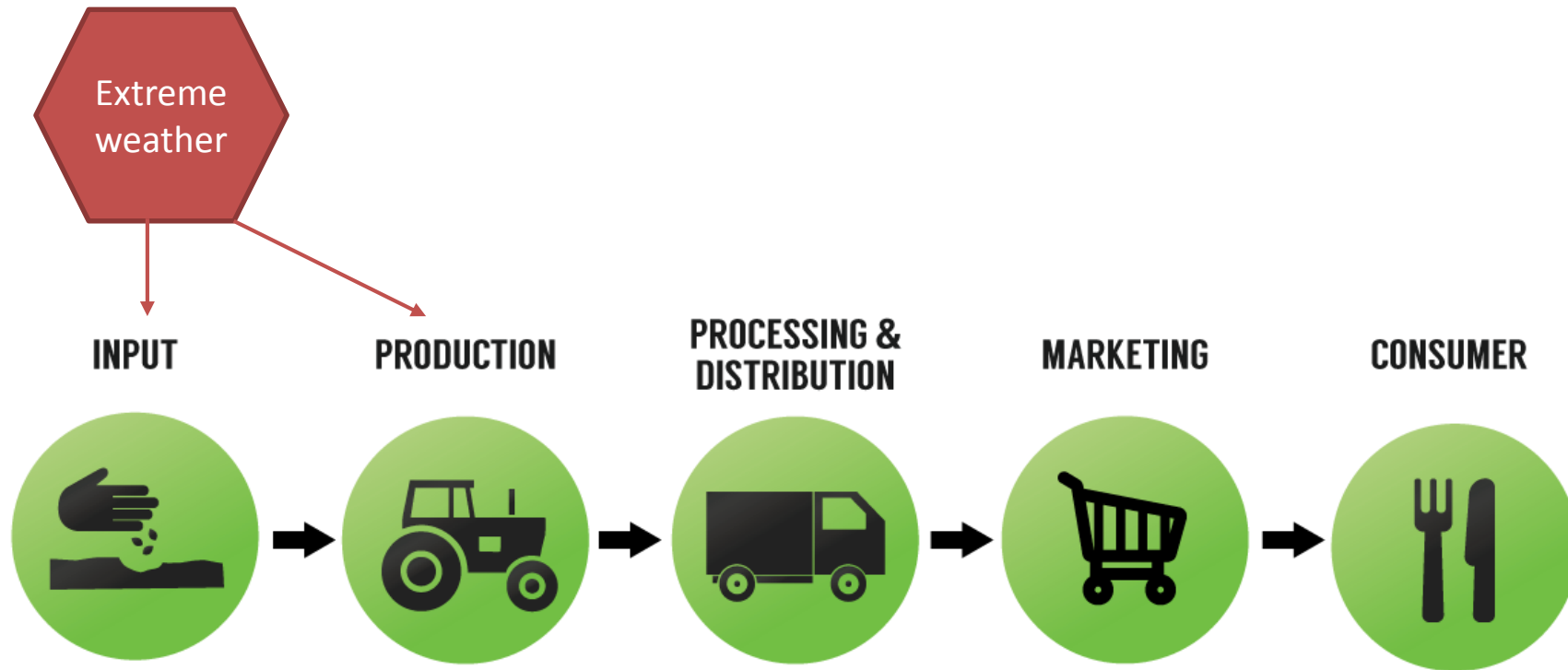
Transportation

- Transport spans the whole supply chain
 - inputs to farm - milk from farm to processing facilities
 - final products transported to sale destination
- Transportation costs affected by
 - price of fuel
 - distance to final consumer an issue
 - spatial relationship between farms and processing plants
 - truck and tanker size

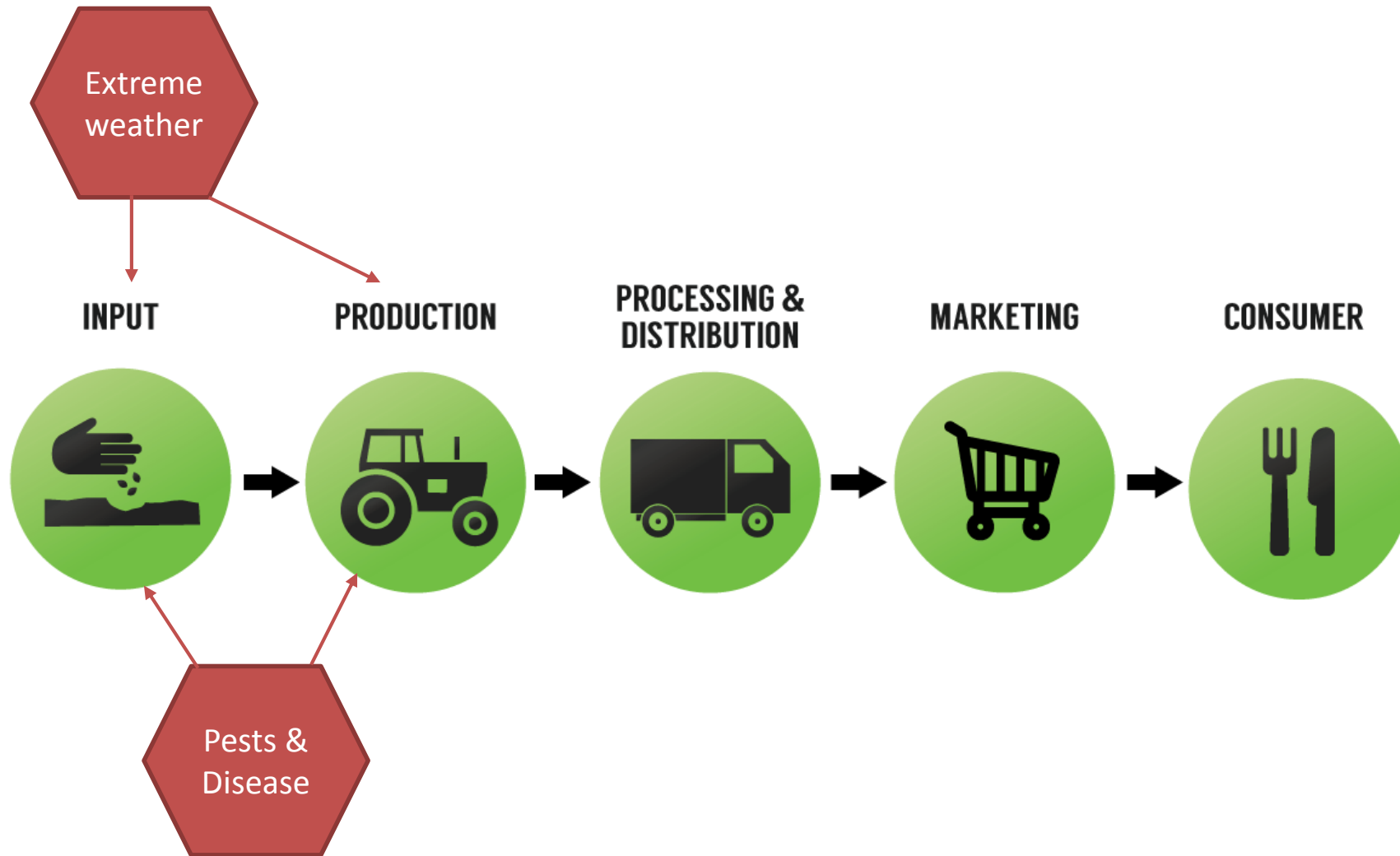
Climate Change Vulnerabilities



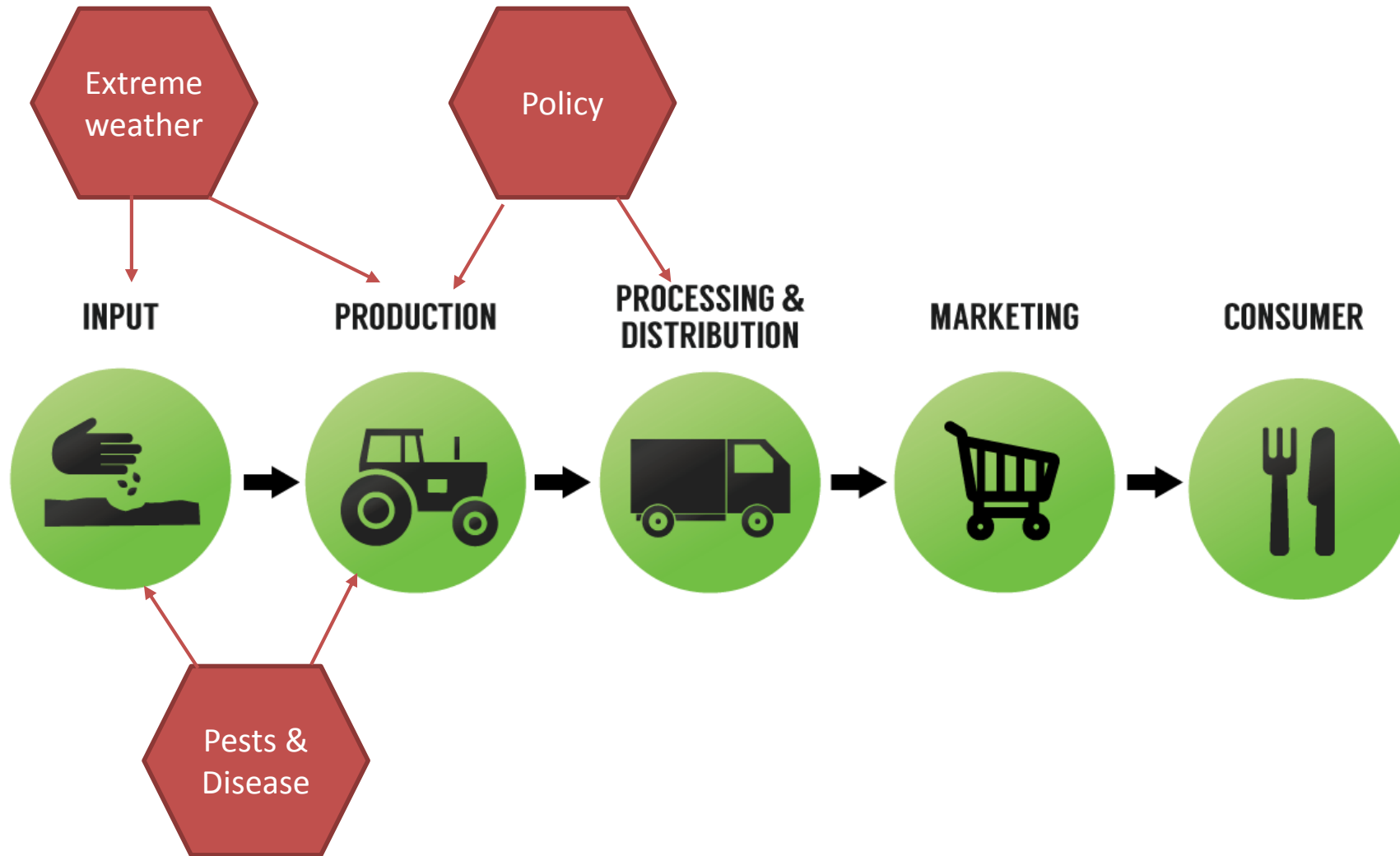
Climate Change Vulnerabilities



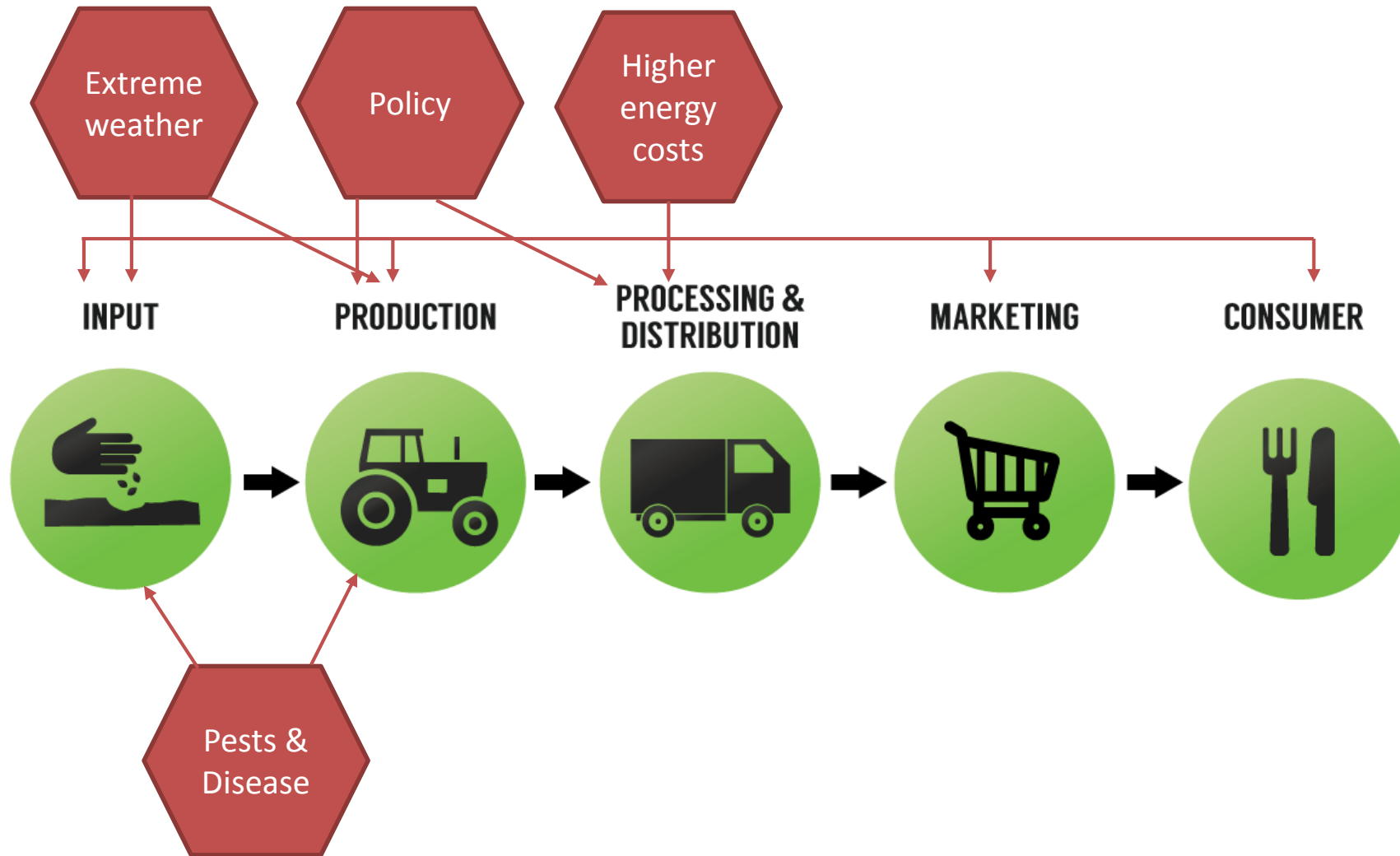
Climate Change Vulnerabilities



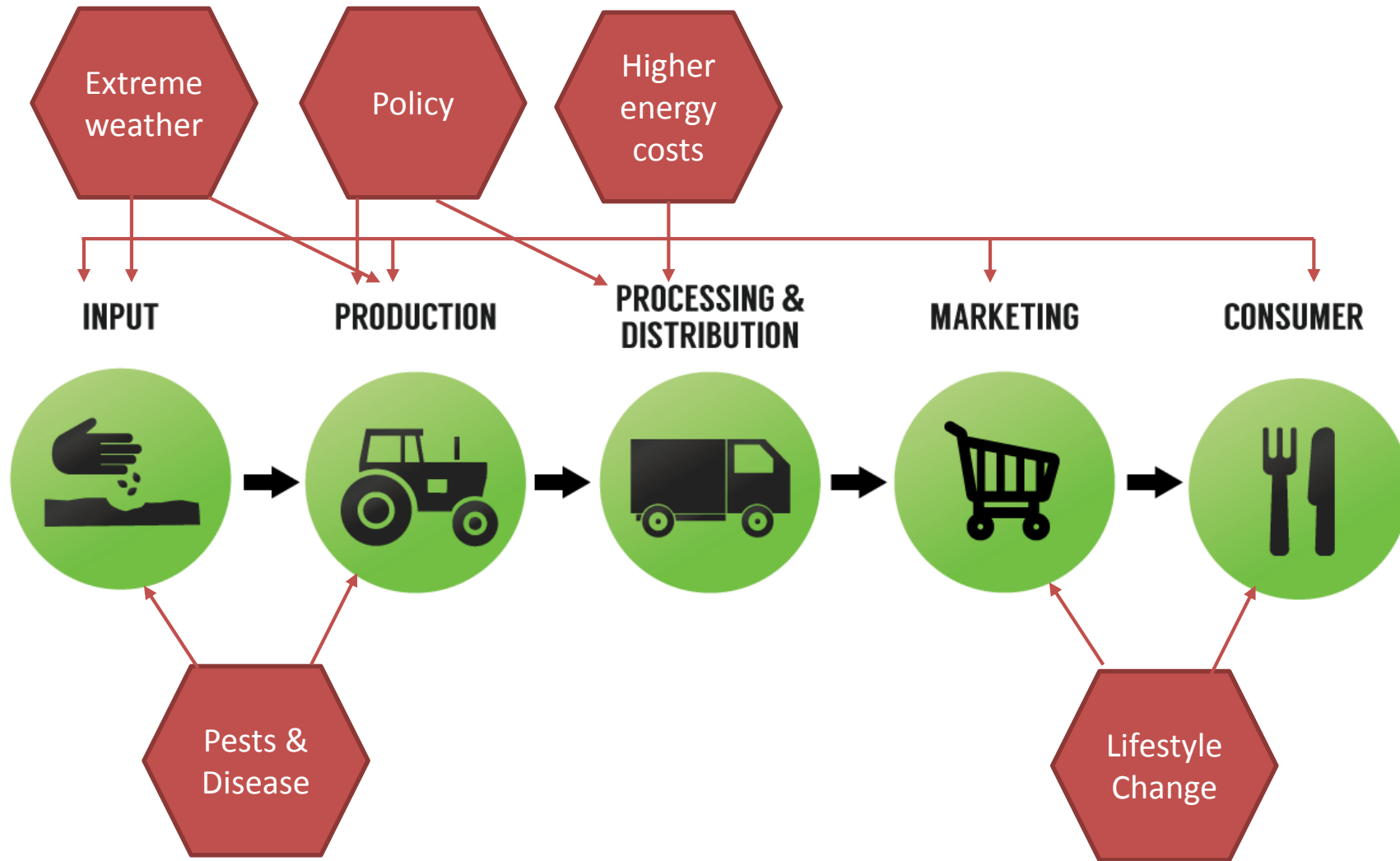
Climate Change Vulnerabilities



Climate Change Vulnerabilities



Climate Change Vulnerabilities



Mitigation Strategies

- Farm
 - Improved genetics
 - Dietary changes
 - Abatement technologies
- Processing
 - Energy use
- Consumer
 - Carbon efficient consumption
 - Local consumption

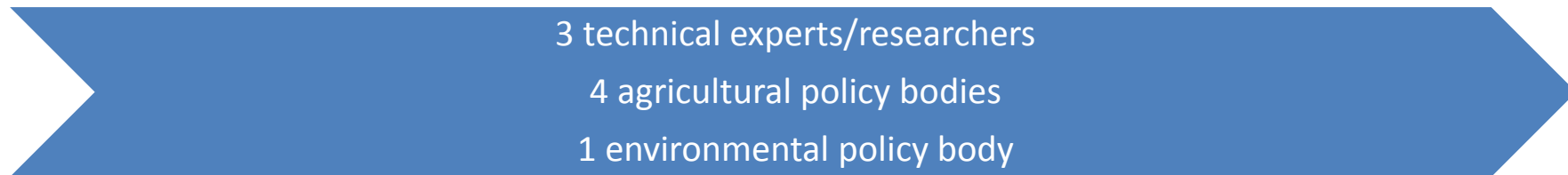
Climate change & the supply chain

- Threats to all parts of the supply chain
 - More concentrated on primary production
- All parts of the chain can engage in mitigation
- Impacts will travel up and down the supply chain
- Collective action essential
 - Sharing of costs and benefits required
 - Co-operative structure beneficial
- How prepared are the various supply chain actors?



Results of Interviews

Selection of Experts for Interviews



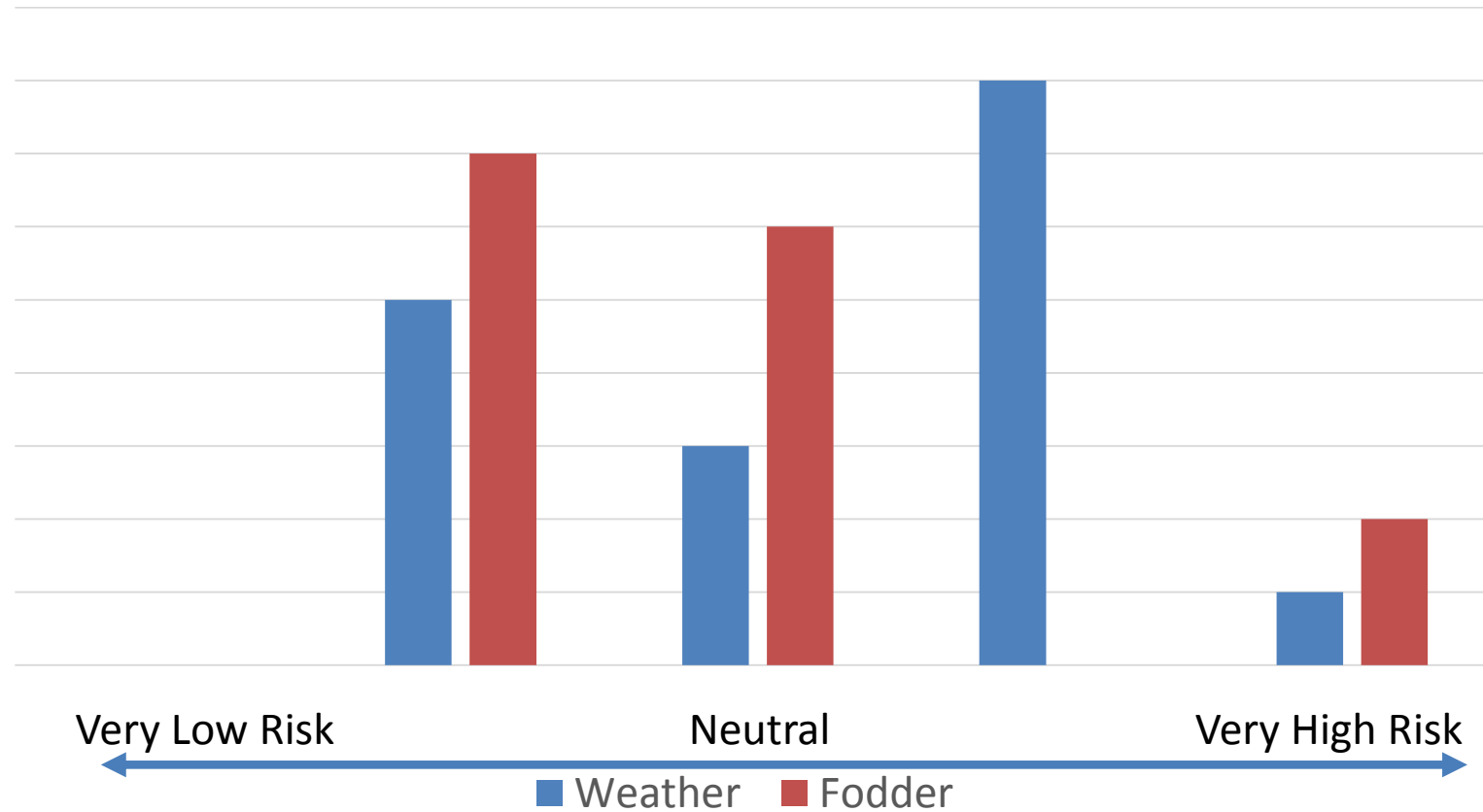
Summary of Stakeholder Interviews

- Rank vulnerabilities identified from the literature
 - in terms of the potential effect on their business
- Rank mitigation strategies
 - in terms of effectiveness
- Open ended questions
 - a number of themes emerged

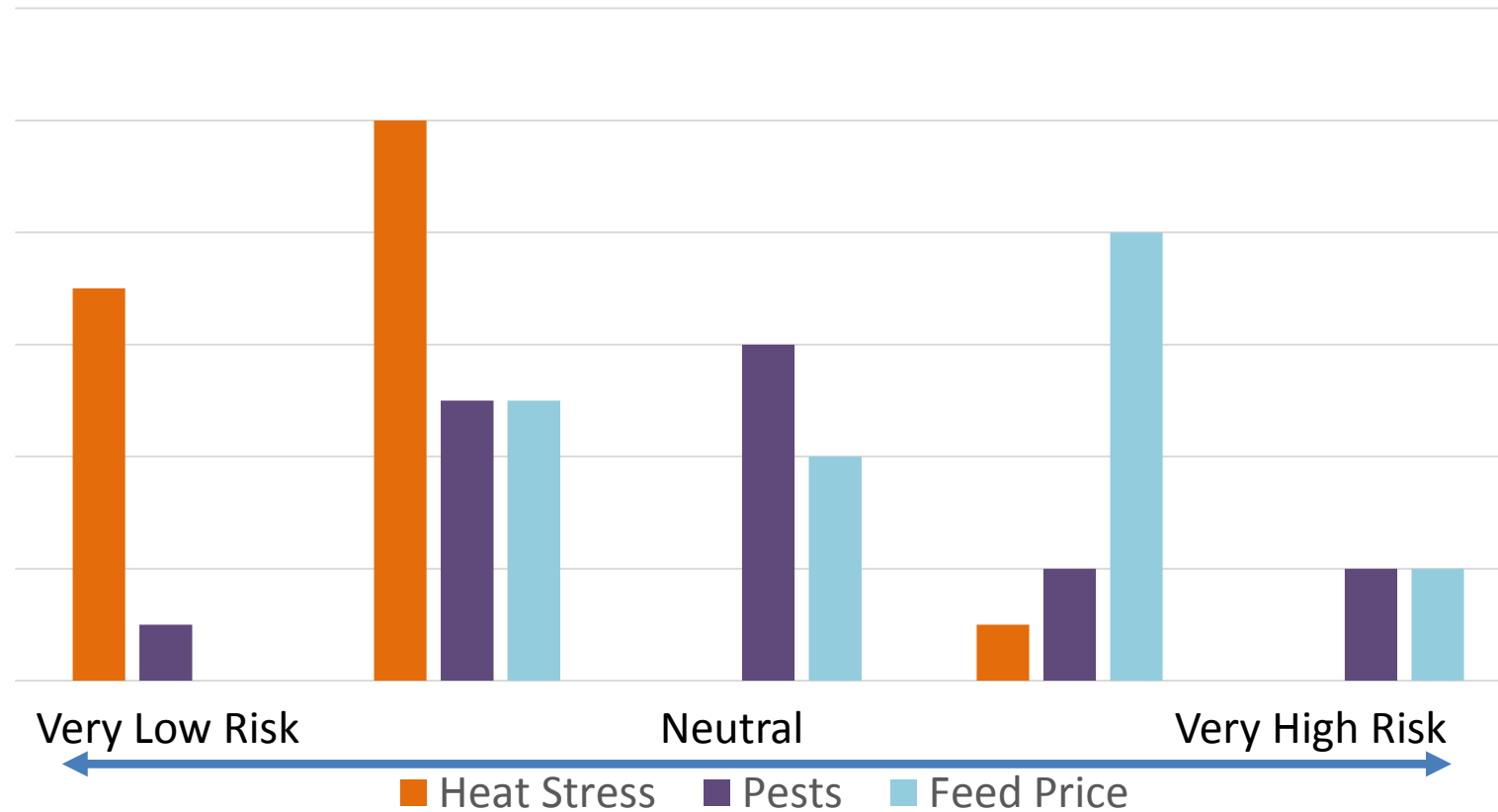
Ranking of Vulnerabilities

Rank	Risk	Score
1	Impact of extreme weather events	4.7
2	Impact of increased animal feed prices	4.6
3	Changes in fodder and grass production	4.0
3	Emergence of new diseases and pests	4.0
3	Consumer concerns negatively impacting on consumption	4.0
4	Policies aimed at reducing greenhouse gas emissions	3.9
5	Impact of heat stress on animals	2.0

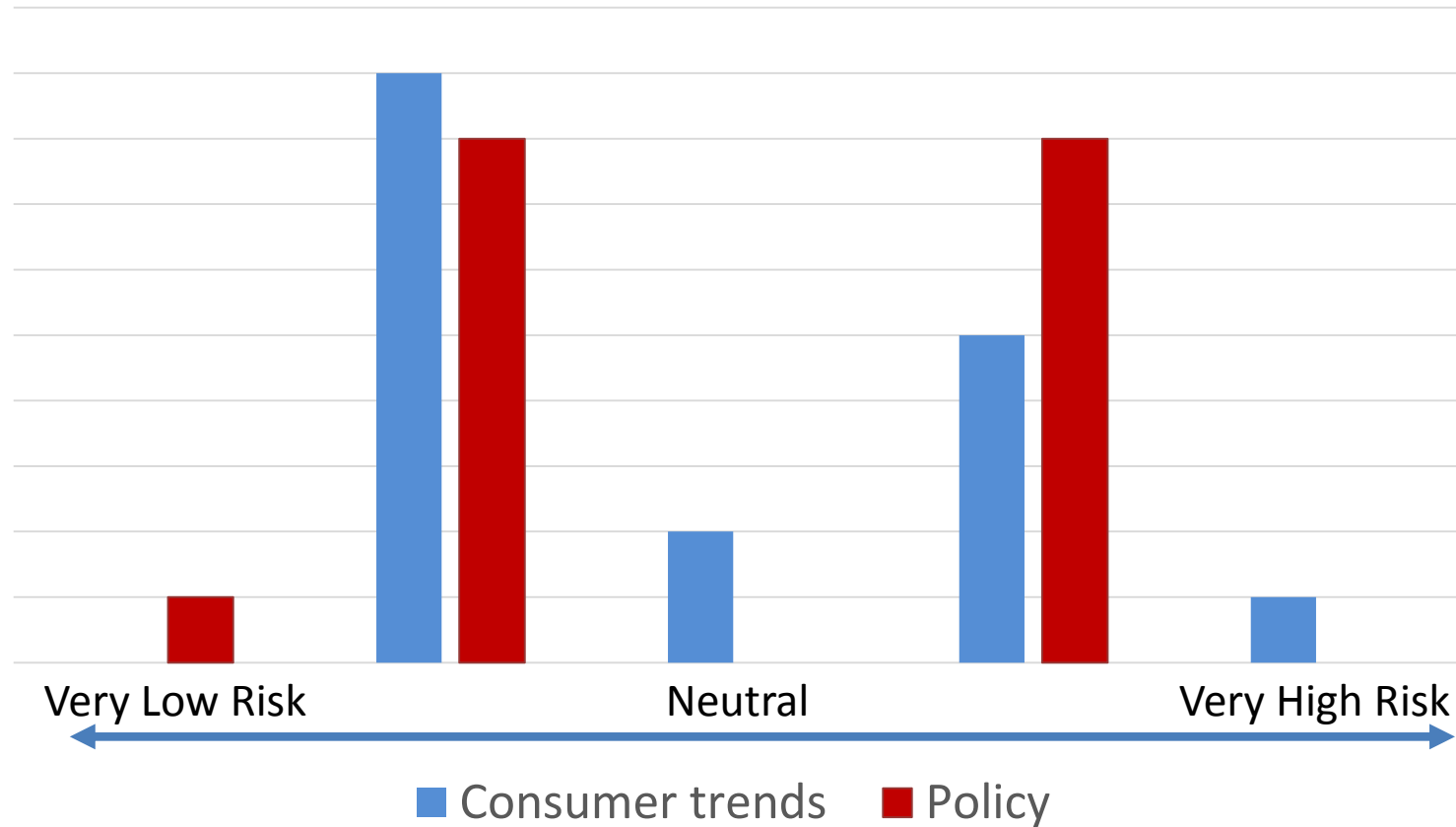
Ranking of Vulnerabilities



Ranking of Vulnerabilities



Ranking of Vulnerabilities



Ranking of Vulnerabilities

- Ranking of vulnerabilities very variable
- Differed by part of the supply chain
- Differing views may hamper action
 - Lack of consensus on what are the real threats

Ranking of Mitigation Strategies

Rank	Risk	Score
1	Improved animal genetics to reduce emissions	5.8
1	State provided training on means to reduce carbon footprint	5.8
2	Increased forestry for sequestration	5.2
3	Incentives for producers to reduce their carbon footprint	5.0
4	Efforts/policies to reduce consumption of dairy products	1.5

Theme 1: The level of awareness of climate change and the need for collective action is high

- High awareness of climate change
- Broad agreement collective action required
- Good foundations already in place
 - Origin Green (IRL)
 - Greenhouse Gas Reduction Strategy & Action Plan (NI)
 - Going for Growth (NI)
 - Climate change committees & working groups (IRL)

Theme 2: Climate change may present an opportunity

- Climate change may present an opportunity
 - contraction of production elsewhere
 - changes may facilitate grass growth
- Low carbon footprint for NI/IRL milk production
 - Selling point
 - Origin Green successful eco-messaging and marketing
- Potential of the win-win scenarios for farmers
 - increase economic performance & reduce carbon footprint
 - But better dissemination of win-win scenarios needed

Theme 3: the challenge of putting research into practice

- Research ‘highly important’ or critical
 - low emission fertilisers
 - methane reduction technologies
 - genetics used for adaption
- Gap between research and real world feasibility
- Distinctly different groups of farmers
 - only some engaged with research and education
- Farmer peer groups important medium
 - could be more climate change focussed

Theme 4: Policies relating to climate change are a concern for the sector

- Concerns
 - carbon leakage
 - emission quotas
 - poorly thought out policies (damage productivity)
 - policies to reduce dairy food consumption
- Uncertainty regarding future climate change policy
 - particularly in a global context
- Need for 'respectful' consultation

Conclusions

- Multiple threats and some opportunities arising from climate change
- Impacts on different parts of the supply chain
 - Primary production most impacted
- Collective action across the supply chain essential
- Starting from a good base

Recommendations

- Climate resilience - supply chain
- Research
 - Technology transfer now as important
 - Co-creation to test feasibility
- Action
 - National plan to protect from extreme weather events
 - Role for technology & insurance
- Policy
 - Global but must take cognisance of Irish concerns
 - Get credit for sequestration
- Food Safety
 - Technology and monitoring systems

Acknowledgements

- Our research funders *safe*food
- The 20 stakeholders/ interview participants
- Mary Brennan

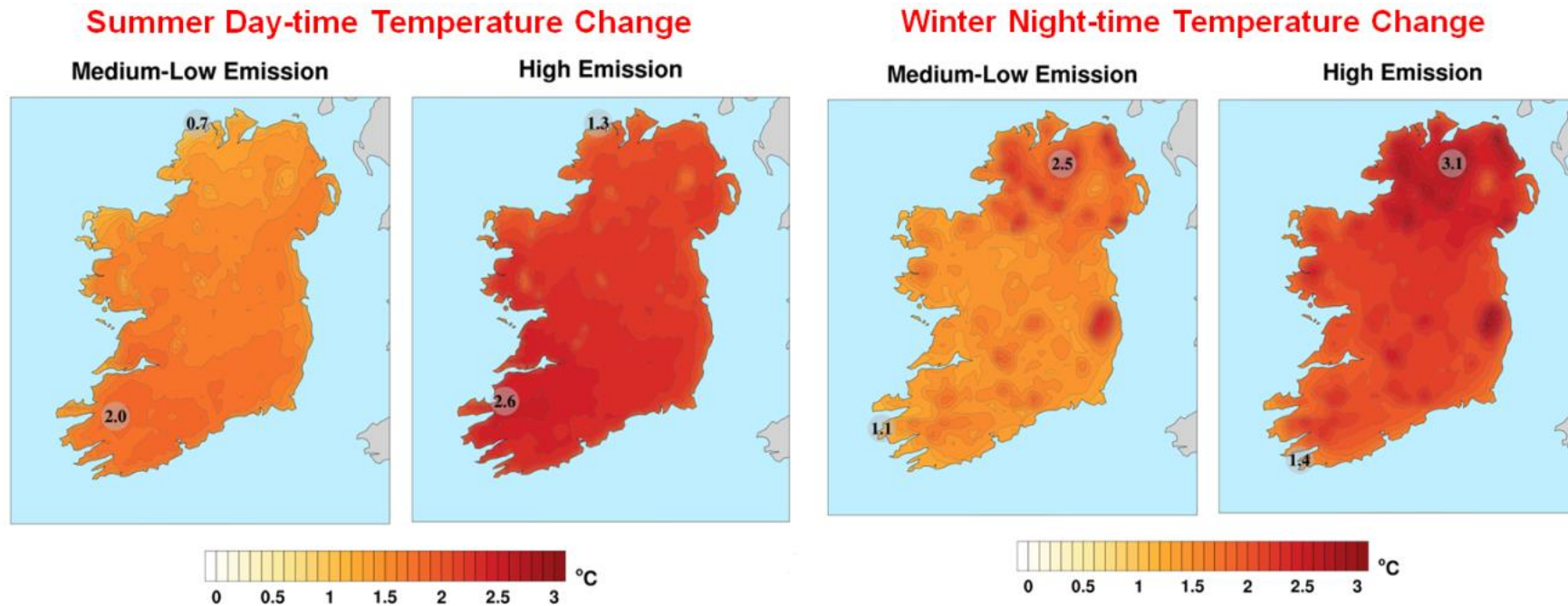
Food Safety Recommendations

- More research will be required to ensure the unknown is accounted for in order to prevent threats to both animal and human health.
- New innovative technology and monitoring systems must be invested in to help ensure climate change consequences do not become a threat from the beginning point of the dairy food chain.
- Extra care must be taken to ensure any pathogens present in raw milk are eliminated through the processing phase. This will prevent the presence of pathogens in the final dairy product which may impose a threat to the consumer.
- Those within the production and manufacturing sector should be made more aware of the fluctuations which climate change could pose to pesticide use.
- Greater exploration of new drugs or better use of existing drugs specifically for livestock may need to be addressed to further reduce the risk of residues entering the food chain.
- New testing methods to detect the contaminant may need to be investigated in order to prevent transmission through the food chain and human consumption.
- Careful monitoring and control measures that may be performed may mitigate against the presence of these mycotoxins during milk processing.

Specific Recommendations on Food Safety

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Projected summer day-time (highest 5%) and winter night-time temperature changes (lowest 5%) - comparing 2041-2060 to 1981-2000



Source: Nolan (2015)

Climate Modelling and Projections: Ireland Temperatures

- Nolan (2015) climate change IRL/NI
- By middle of century mean temps will increase
 - by 1 to 1.5°C in the summer and 0.5 to 1.5°C in the winter
 - changes in the extremes of temps are more important
- Winter nights will be warmer
 - north +2.5°C compared to south +1.1°C.
- Summer daytime temps will be higher
 - highest 5% of summer daytime temps expected to increase
 - south increasing more than the north (+ 0.7°C to +2°C)
- Number of ice and frost days to decrease significantly

Climate Change Risk Assessment: Dairy Chain

- Make producers, processors & distributors aware of risks
 - Identify potential hazards & impacts /contingency plans
- Promote mitigation & adaption measures
- Develop new national policies towards adaption
- Assess competitiveness/sustainability of chain
 - towards climate change impacts (flooding, heatwave etc)
- EU Policy
 - Climate & Energy Package 2020
 - EU Climate and Energy Framework 2030,
 - binding targets of greenhouse gas emissions
 - indirect effect upon the production levels of dairy products

Categories of Major Risks Facing Agricultural Supply Chains

Type of Risk:	Examples:
Weather Related Risks	Periodic deficit and/or excess rainfall or temperature, hail storms, strong winds
Natural Disasters (including Extreme Weather Events)	Major floods and droughts, hurricanes, cyclones, typhoons, earthquakes, volcanic activity
Biology and Environmental Risks	Crop and livestock pests and diseases, contamination related to poor sanitation, human contamination and illnesses, contamination affecting food safety, contamination and degradation of natural resources and environment, contamination and degradation of production and processing processes
Market Related Risks	Changes in supply and/or demand that impact domestic and/or international prices of inputs and/or outputs, changes in market demands for quantity and/or quality attributes, changes in food safety requirements, changes in market demands for timing of product delivery, changes in enterprise/supply chain reputation and dependability
Logistical & Infrastructural Risks	Changes in transport, communication, energy costs, degraded and/or undependable transport, communication, energy infrastructure, physical destruction, conflicts, labour disputes affecting transport, communications, energy infrastructure and services
Management and Operational Risks	Poor management decisions in asset allocation and livelihood/enterprise selection, poor decision making in use of inputs, poor quality control, forecast and planning errors, breakdowns in farm or firm equipment, use of outdated seeds, not prepared to change product, process, markets, inability to adapt to changes in cash and labour flows, etc.
Policy and Institutional Risk	Changing and/or uncertain monetary, fiscal and tax policies, changing and/or uncertain financial (credit, savings, insurance) policies, changing and/or uncertain regulatory and legal policies, and enforcement, changing and/or uncertain trade and market policies, changing and/or uncertain land policies and tenure system, governance related uncertainty (e.g., corruption), weak institutional capacity to implement regulatory mandates
Political Risks	Security-related risks and uncertainty (e.g. threats to property and/or life) associated with politico-social instability within a country or in neighbouring countries. Interruption of trade due to disputes with other countries. Nationalization/confiscation of assets, especially for foreign investors.

Climate change risk assessment

- Focus on risks from altering climate patterns
 - understand exposure to risk along supply chain
 - improve upon risk management strategies
- Detailed literature review undertaken
 - analysed all sectors of dairy chain
 - inputs, production, processing, transport, distribution, sale/retail

Concentration of Risk

- Majority of risks at production stage
- Dairy highly reliant on grass for production
- Determines
 - level of inputs needed
 - level of production
 - quality of milk available

Discussion & key findings

- Many actors in supply chain
 - face many risks
 - climate is just one of those
- Production of inputs/outputs need appropriate climate
 - climate change has positive/negative impact
 - Temp/rainfall changes impact on global agriculture
- Climate risk to dairy supply chain
 - affect both average temps & precipitation levels
 - incidence of extremes