

# **The Government's Response to the Foresight Report on Food and Farming**

**Bob Watson**

**Chief Scientific Advisor, UK Defra**

**Oxford Farming Conference**

**Oxford**

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# Recent Major Agriculture Assessments

- **International Assessment of Agricultural Science and Technology for Development** – Agriculture at a Cross-Roads (2008)
- **Royal Society** – Reaping the Benefits (2009)
- **Go-Science /Foresight** – The Future of Food and Farming (2011)
- **Commission on Sustainable Agriculture and Climate Change** – Achieving food Security in the Face of Climate Change (2011)



## **The Future of Food and Farming:**

Challenges and choices for global sustainability

## **Why this report now?**

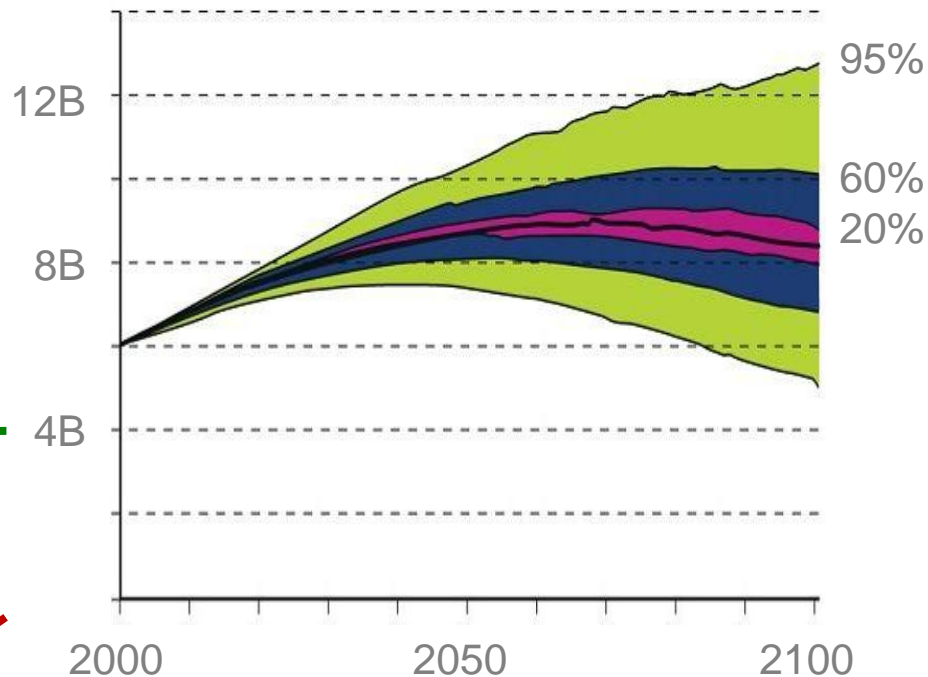
The global food system is experiencing:

- Increasing demand
- Threats to supply
- One billion hungry
- Lack of sustainability
- ... and new volatility

# Increasing demand

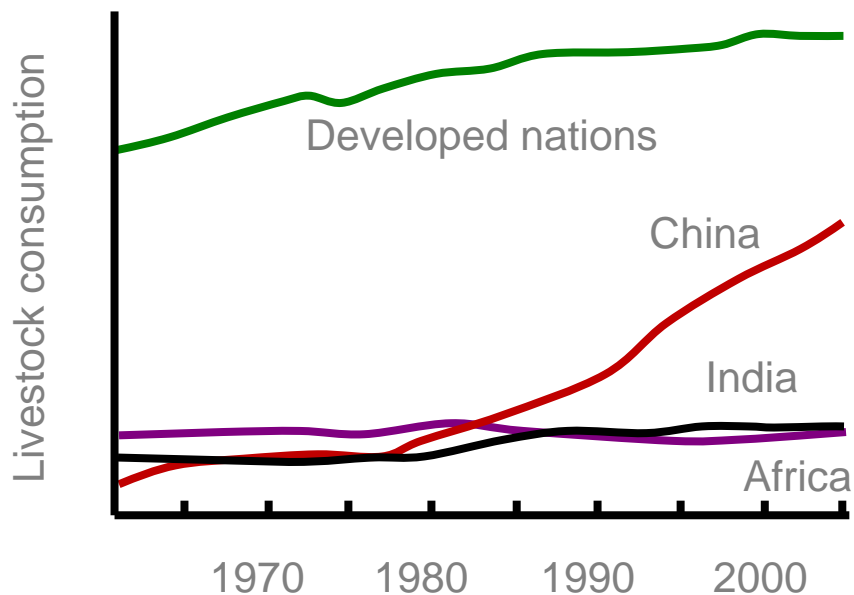
- Population most likely to peak ~1B

Population projection (Lutz & Samir 2010)



- People will be richer and demand higher quality diet

Livestock consumption (FAO 2009)





# The food system is not sustainable



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- Uses ~70% of global water, much non-renewable
- ~24% of vegetated land suffers soil degradation
- ~30% greenhouse gas emissions come directly or indirectly from food system
- Nitrogen and other pollution
- Many fisheries over-exploited



# ....and failing to end hunger

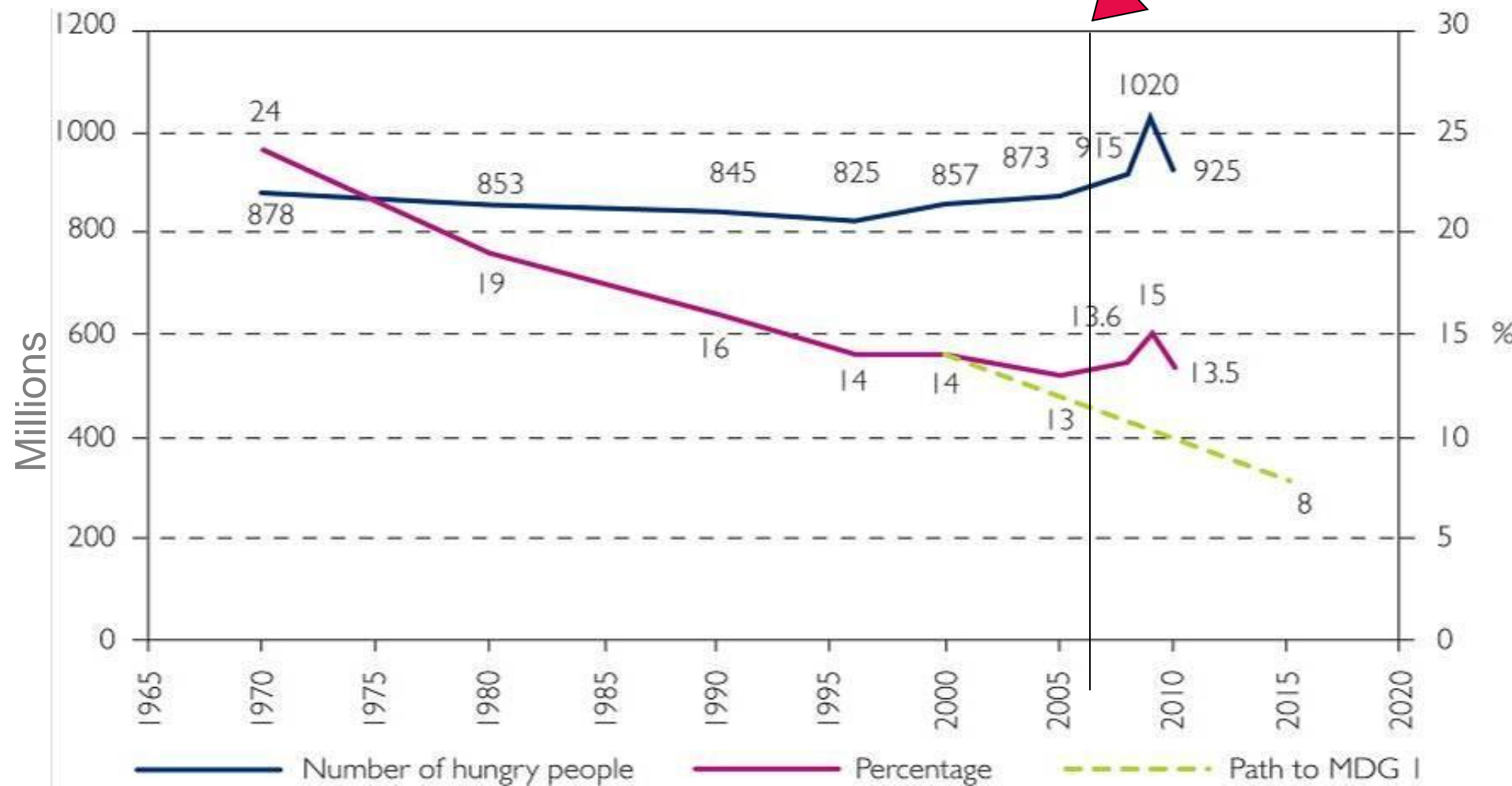


2007-08  
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## Undernourishment data versus the MDG target



spike



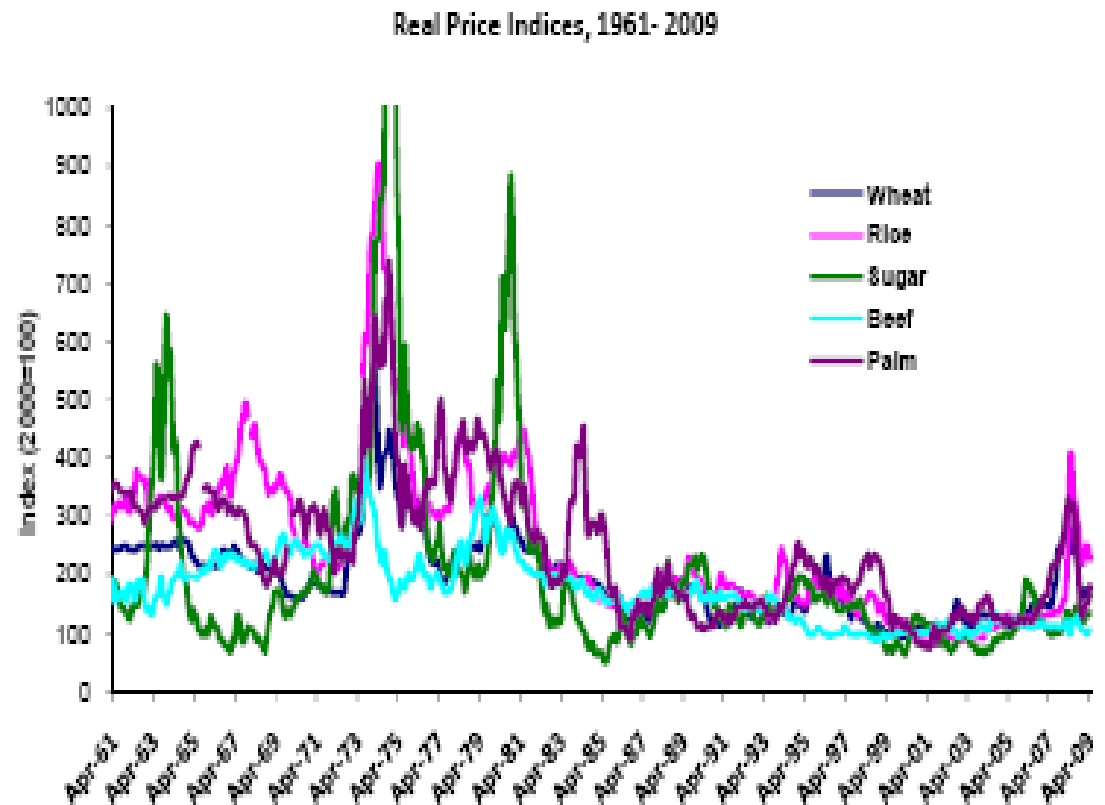
Source: Oxfam (2010) Data cited from FAO Hunger Statistics (from 1969 to 2006); UN (2009)

# The 2008 Food Price Spike

Prices rose in 2008,  
particularly maize, rice,  
soybeans and wheat

Due to:

- Lower world wheat production in 2006 & 2007 caused by adverse weather
- Increasing cereals consumption
- Concern about lower stock levels
- Export restrictions
- Rising energy prices
- Role of speculators?





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Foresight



## **The Future of Food and Farming:**

Challenges and choices for global sustainability

FINAL PROJECT REPORT

- Business-as-Usual will not work - “no action/change” is not an option
- Radical redesign of the global food system
- Policies and decisions outside of the food system are also critical – e.g., climate change policy



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# Current and Future Challenges

# Current Challenges

- Access to current technologies
  - Access to best seeds, agro-chemicals, and irrigation
  - Knowledge about agro-ecological practices – INRM, IPM, and use of seasonal climate projections to reduce vulnerability to current climate variability
  - Reduce post-harvest loss
- Rural development
  - Extension services
  - Financing
  - Roads – access to markets
- Trade reform
  - Eliminate OECD production subsidies
  - Eliminate tariff escalation on processed products
  - Recognize the special needs of the least developed countries through non-reciprocal market access

# Future Challenges

- The demand for food will double within the next 25-50 years, primarily in developing countries, **and** the type and nutritional quality of food demanded will change
- We need sustained growth in the agricultural sector (crops, livestock, fisheries, forests, biomass, and commodities):
  - to feed the world
  - to enhance rural livelihoods
  - to stimulate economic growth
- Meet food safety standards

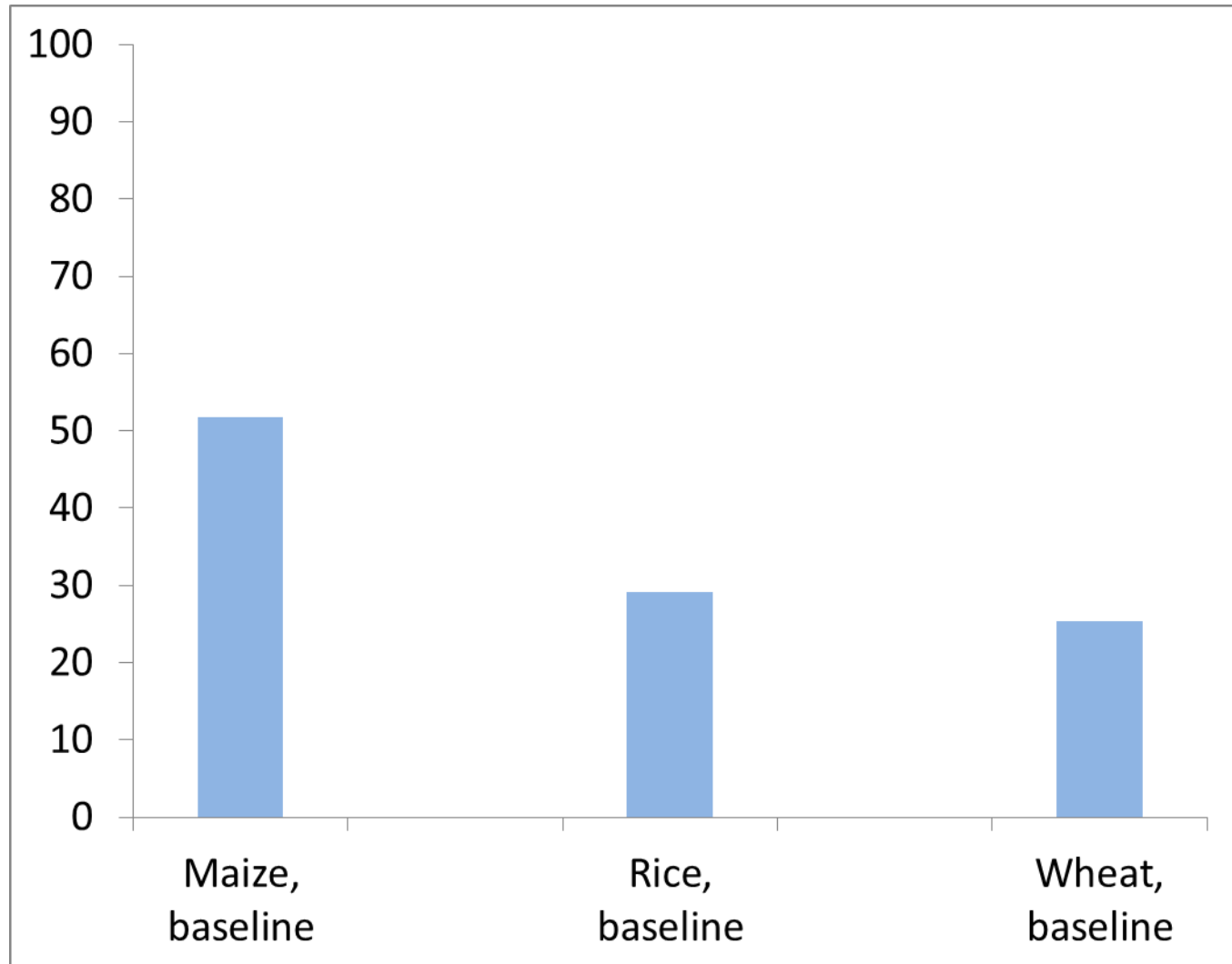
**environmentally and socially sustainable manner**

# The Context - Limitations

- **Less labor - diseases and rural to urban migration**
- **Less water – competition from other sectors and climate change in arid- and semi-arid areas**
- **Yield increases are slowing dramatically**
- **Less arable land – competition, e.g., bio-energy**
- **Increasing land policy conflicts**
- **Loss of biodiversity: genetic, species and ecosystem**
- **Increasing levels of pollution – ozone and acid deposition**
- **A changing climate – temperature and precipitation**

# Income and population growth drive prices

**higher** (price increase (%), 2010 – 2050, Baseline economy and demography)

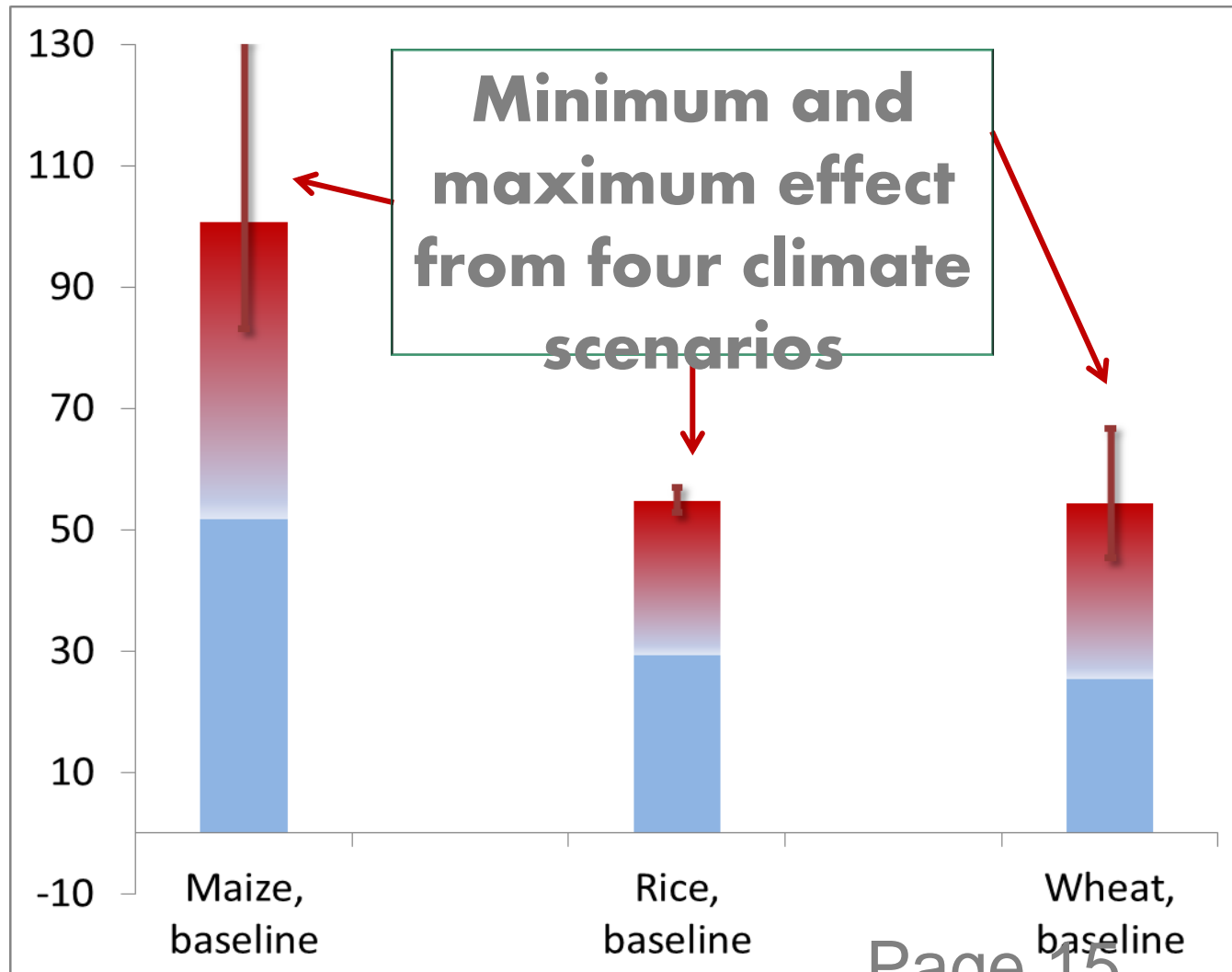


# Climate change scenario effects differ

(price increase (%), 2010 – 2050, Baseline economy and demography)



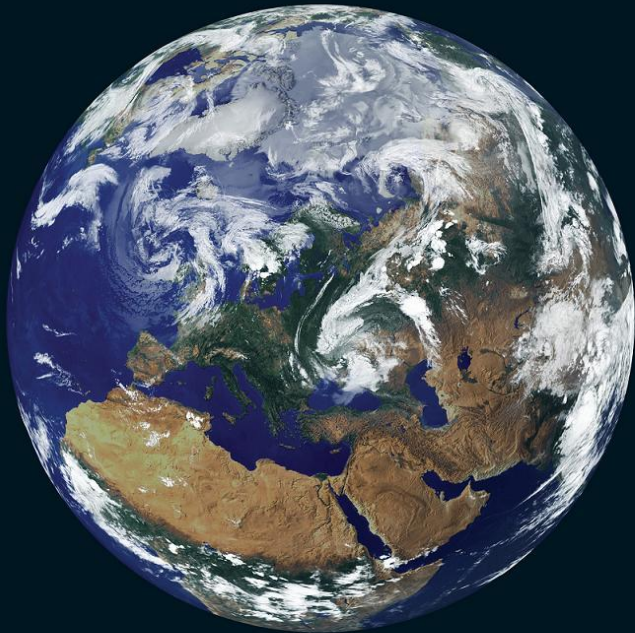
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# Current situation and Future Challenges

## The Way Forward

# Five Challenges



**The Future of Food and Farming:**  
Challenges and choices for global sustainability

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A

**Balancing future demand and supply sustainably**

B

**Addressing the threat of future volatility in the food system**

C

**Ending Hunger**

D

**Meeting the challenges of a low emissions world**

E

**Maintaining biodiversity and ecosystem services while feeding the world**

# Commission on Sustainable Agriculture and Climate Change



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- **Integrate food security and sustainable agriculture into global and national policies**
- **Significantly raise the level of global investment in sustainable agriculture and food systems in the next decade**
- **Sustainably intensify agricultural production while reducing GHG emissions and other negative environmental impacts of agriculture**
- **Develop specific programs and policies to assist populations and sectors that are most vulnerable to climate changes and food insecurity**

# Commission on Sustainable Agriculture and Climate Change



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- **Reshape food access and consumption patterns to ensure basic nutritional needs are met and to foster healthy and sustainable eating patterns worldwide**
- **Reduce loss and waste in food systems, targeting infrastructure, farming practices, processing, distribution and household habits**
- **Create comprehensive, shared, integrated information systems that encompass human and ecological dimensions**

# IAASTD: Options to increase production

- Today's hunger problems can be addressed with appropriate use of current technologies, emphasizing agro-ecological practices (e.g., no/low till, IPM, INRM), coupled with decreased post-harvest losses
  - Small-scale farmers need access to the best seeds, financing and access to markets
  - Advances in S&T are always a needed but cannot be fully utilized without rural development, institutional and governance reform

# IAASTD: Options for Action

- Embed economic, environmental and social sustainability into agricultural policies, practices and technologies
- Address today's hunger problems with appropriate use of current technologies, emphasizing agro-ecological practices (e.g., no/low till, IPM and INRM), coupled with decreased post-harvest losses
- Advanced biotechnologies may be needed to address future demands for increased productivity and emerging issues such as climate change and new plant and animal pests – but the risks and benefits must be fully understood
- Provide payments to the farmer for maintaining and enhancing ecosystem services

# IAASTD: Options for Action

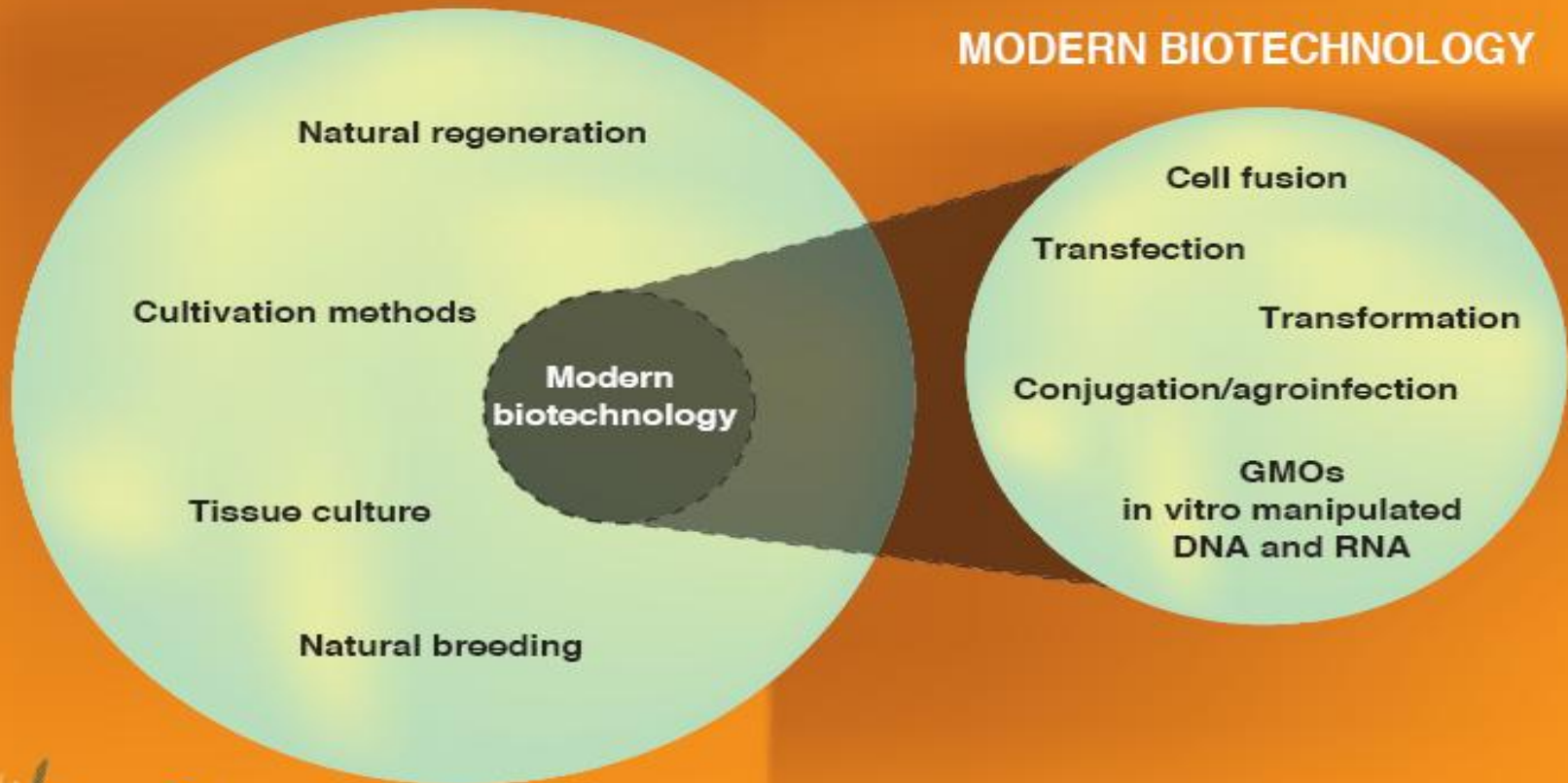
- Reform international trade, e.g., eliminate OECD production subsidies, eliminate tariff escalation on processed products, recognize the special needs of the least developed countries through non-reciprocal market access
- Increase public and private sector investment in research and development, extension services, and weather and market information
- Improve public-private-CSO involvement in AKST with accountability for social and environmental outcomes
- Build and reform AKST skill base (basic sciences, social, political and legal knowledge) and innovation capacities of rural communities and consumers

# A Robust Agricultural S&T Program

- to produce, by region, the diversified array of crops, livestock, fish, forests, biomass (for energy) and commodities needed over the next 50 years in an environmentally and socially sustainable manner
  - reduce post harvest losses
  - increase productivity per ha through sustainable intensification
  - address water deficit problems, e.g., through improved drought tolerant crops, irrigation technologies, etc
  - improve the temperature tolerance of crops
  - combat new or emerging agricultural pests or diseases
  - address soil fertility and salinization of soils
  - reduce external and energy-intensive inputs
  - improve the nutritional quality of food
  - improve nutrient cycling
  - improve food safety

# Biotechnology

## Biotechnology



## MODERN BIOTECHNOLOGY

Natural regeneration

Cultivation methods

Tissue culture

Natural breeding

**Modern  
biotechnology**

Cell fusion

Transfection

Transformation

Conjugation/agroinfection

GMOs  
in vitro manipulated  
DNA and RNA

# Role of Genomics and GM

- Genomics is the basis of improved crop traits – classical plant breeding and GM
- Potential to improve productivity, drought, temperature and pest tolerance and enhanced nitrogen use efficiency
- Insertion of genes is continuing to cause concern for some consumers and governments even though GM plants undergo extensive testing
  - Health risks – little evidence, robust EU safety processes in place
  - Environmental risks – need to understand gene transfer and manage
  - Role of companies – some lack consumer trust
  - Potential negative impact on poor farmers in developing countries – reliance on large multi-nationals

# Adaptation to Climate Change

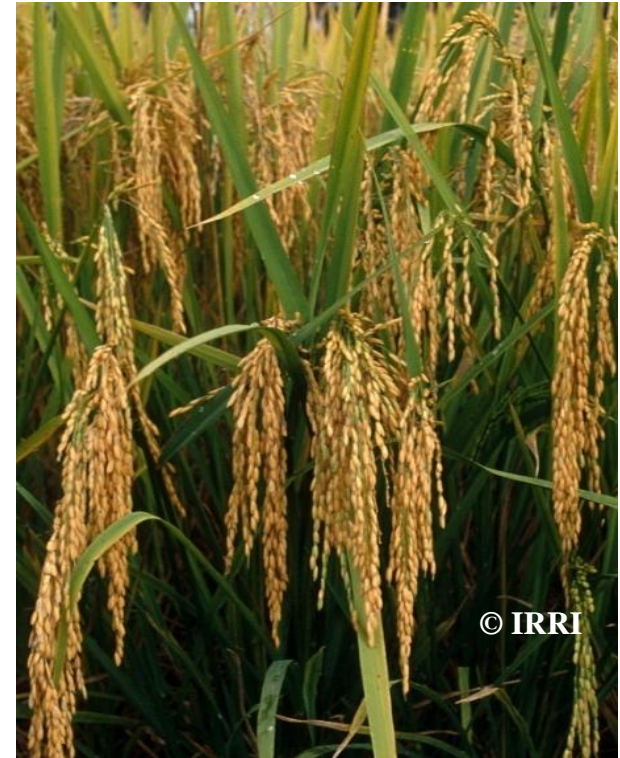


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**Maize**  
**C<sub>4</sub>**

**Genes**  
→



**Rice**  
**(C<sub>3</sub> → C<sub>4</sub>)**



**C<sub>4</sub> and C<sub>3</sub> comparison for current CO<sub>2</sub> conditions. WUE (transpiration) is water-use efficiency, RUE is radiation-use efficiency, PNUE is photosynthetic nitrogen-use effectiveness**

	<b>WUE</b> g DW/kg H <sub>2</sub> O	<b>RUE</b> g DW/MJ	<b>PNUE</b> mg DW s <sup>-1</sup> /gN
<b>Zea Maize</b>	<b>2.9</b> <sup>a</sup>	<b>3.3</b> <sup>b</sup>	<b>1.6</b> <sup>d</sup>
<b>Oryza Sativa</b>	<b>1.6</b> <sup>a,c</sup>	<b>2.2</b> <sup>b</sup>	<b>0.6</b> <sup>d</sup>
<b>C<sub>4</sub>/C<sub>3</sub></b>	<b>1.8</b>	<b>1.5</b>	<b>2.7</b>

**Maize is C<sub>4</sub> --- Rice is C<sub>3</sub>**

# Basis for Policy

- Safety must be the top priority
- Evidence-based approach and case-by-case assessment
- Open to the potential benefits – therefore research, coupled with open and transparent field trials, is needed to assess the potential risks and benefits
- Support proportionate and enforceable GM labelling rules to facilitate consumer choice
- Need to develop measures to manage the coexistence of GM and non-GM crops to minimise unwanted GM cross-pollination
- Consumers will need to see real benefits before they are accepted – at least in Europe

# Current UK Perspective

# Balancing future demand and production sustainably



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- **Growing more food at less cost to the environment**
- **Sustainable intensification**
- **Technology and knowledge transfer**
- **Reducing waste**
- **Investing for the future, e.g. infrastructure**



# UK is a Trading Nation

- **The UK currently grows about 100 mt of biomass annually, imports about 50mt and exports about 20mt**
- **The UK currently produces about 65% of the food we consume, 25% is imported from Europe and about 10% from the rest of the world**
- **The key question is whether climate change and changes in the global socio-economic-political situation will adversely impact on UK food security**

# UK Dependence on non-UK Ecosystems



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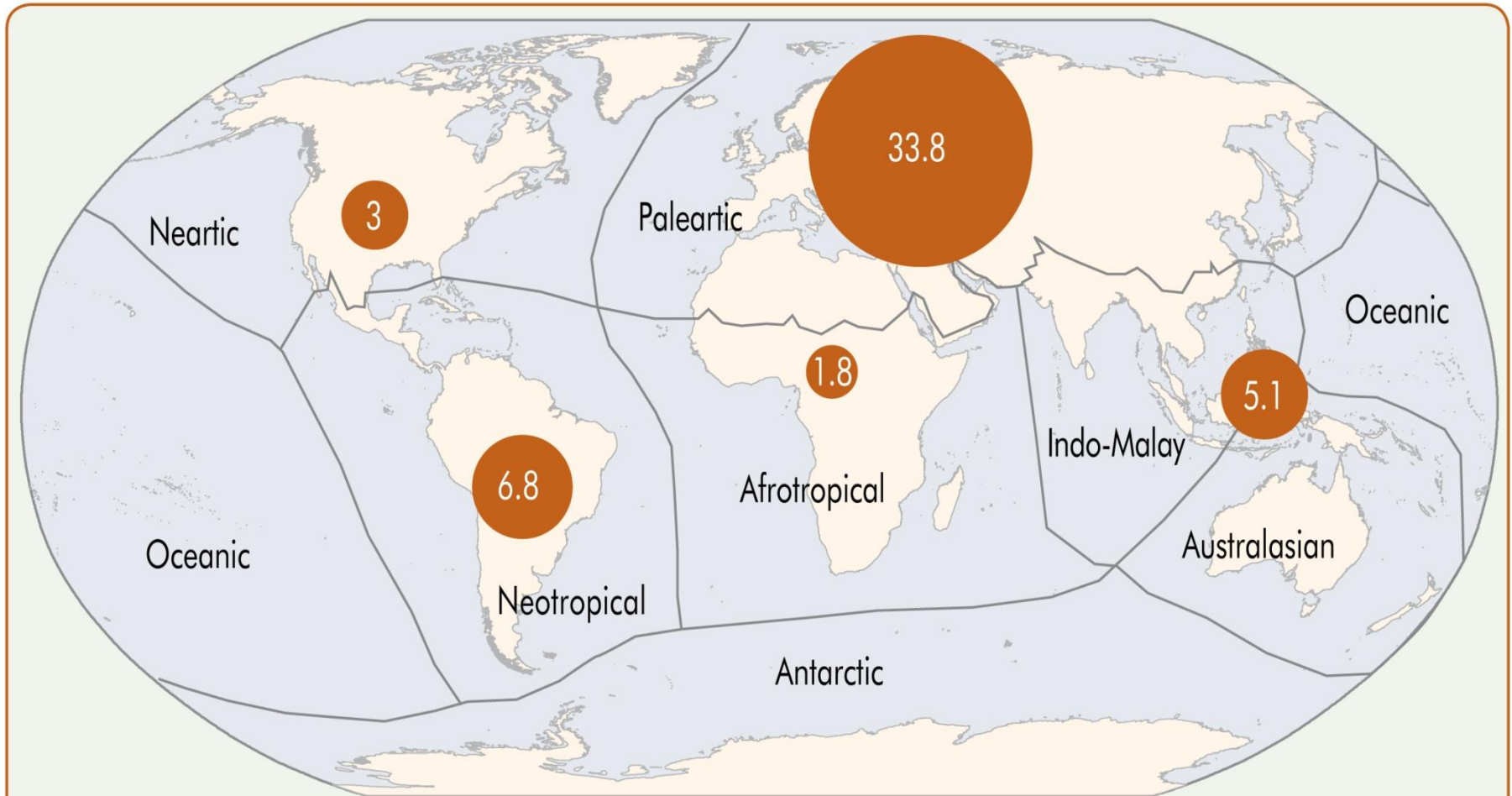


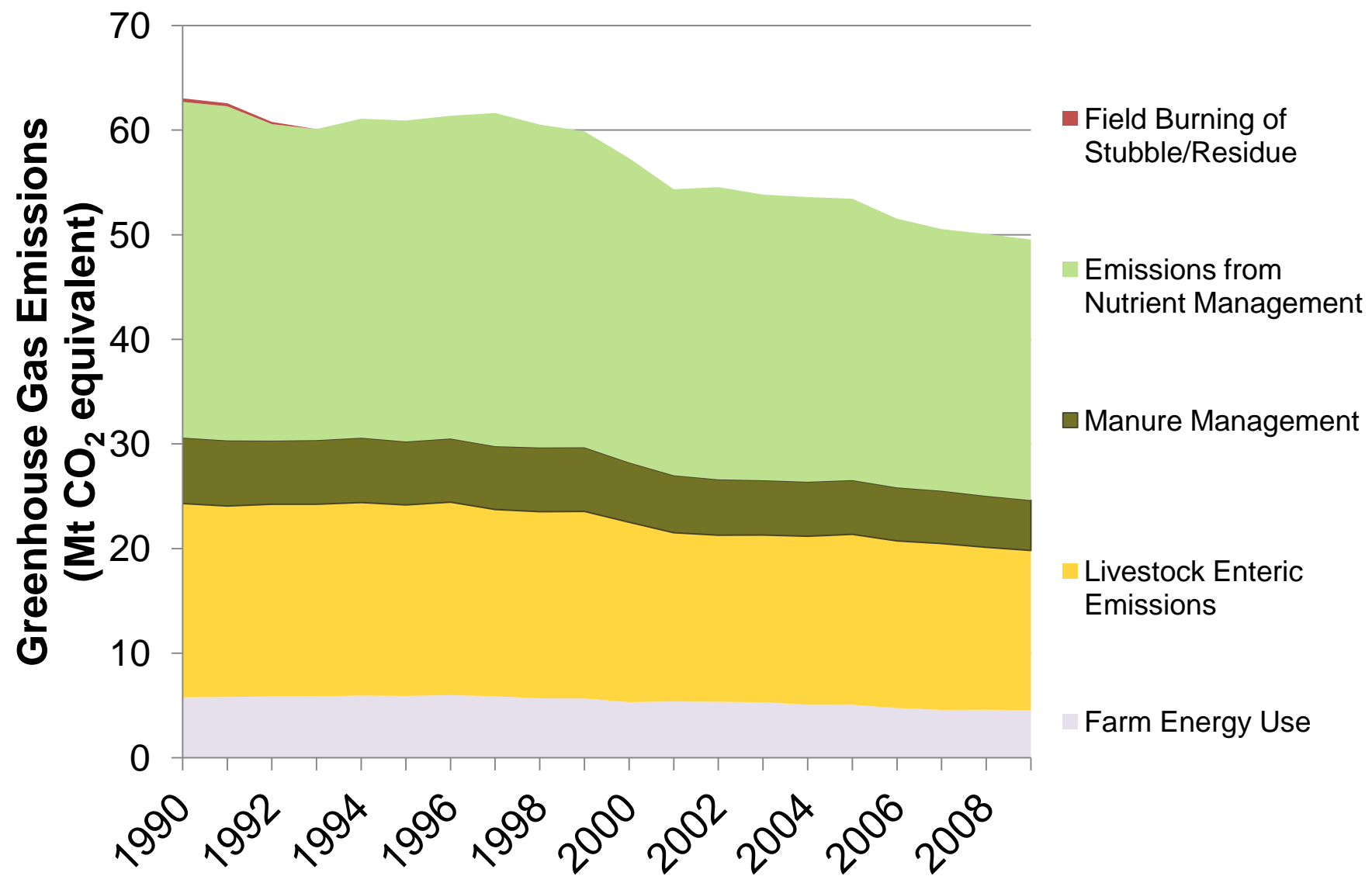
Figure 15 Source of biomass (millions of tonnes) imported into the UK by Biogeographical Realms in 2008. Source: data from HMRC (2008); underlying map based on Olson *et al.* (2004).

# Meeting the challenges of a low emissions world

- Addressing emissions from the food system, including agriculture
- Reducing waste
- Ensuring environmental resilience and adapting to climate change



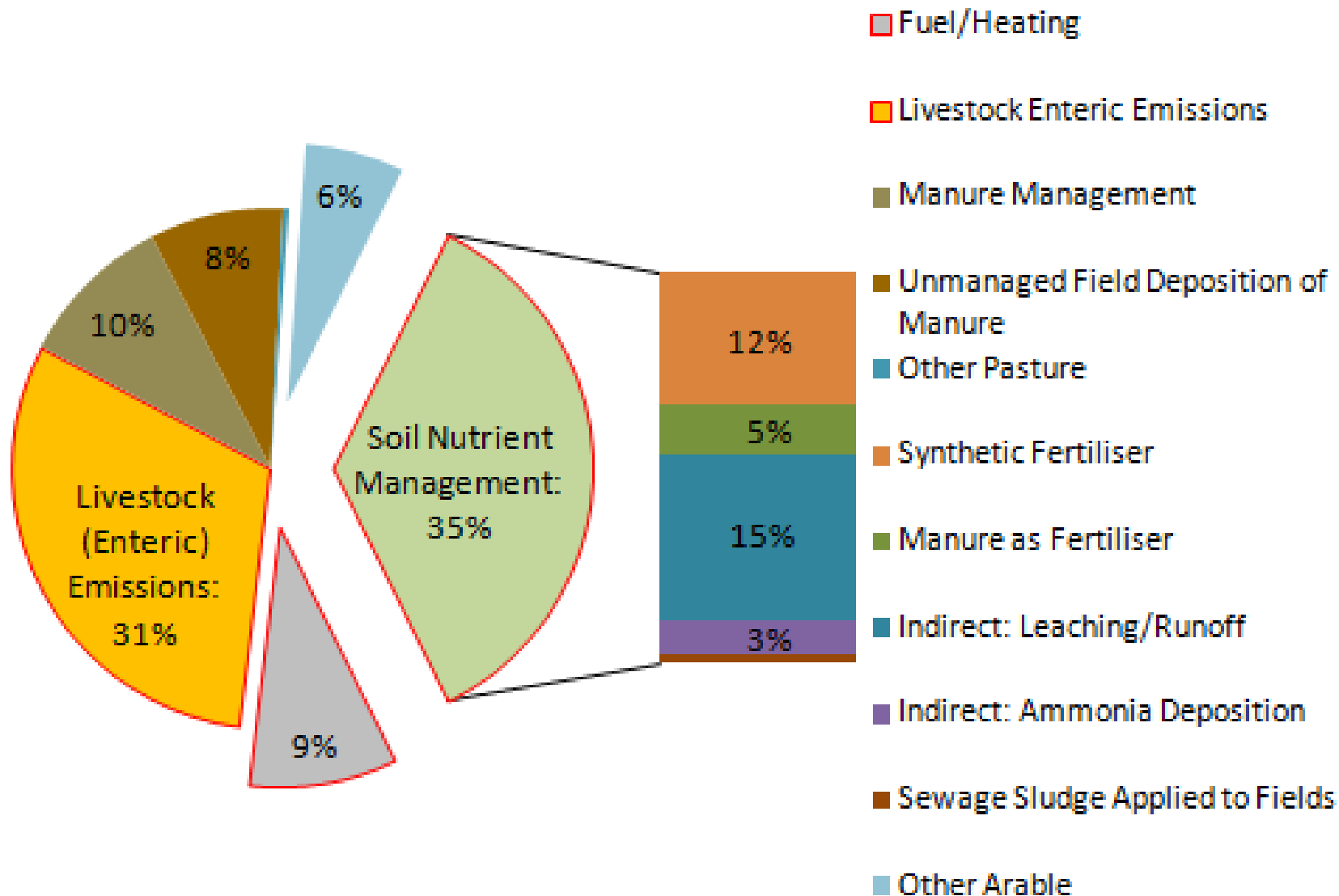
# UK Agricultural Emissions By Source



# UK Agricultural Emissions By Source: 2009 (latest available data)



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# What Research is Defra Doing to Help?

## Quantifying emissions to air (£12m program)

- Projects focus on the development and delivery of the UK agricultural inventory of GHGs
- The GHG inventory is now linked to the ammonia inventory to ensure conservation of total N in estimates.

## Agricultural GHG Abatement

- To assess GHG mitigation potential of:

### NUTRIENT MANAGEMENT

- Nitrification inhibitors
- Optimal N timing and application strategy
- Systemic changes e.g. min. till

### LIVESTOCK HUSBANDRY

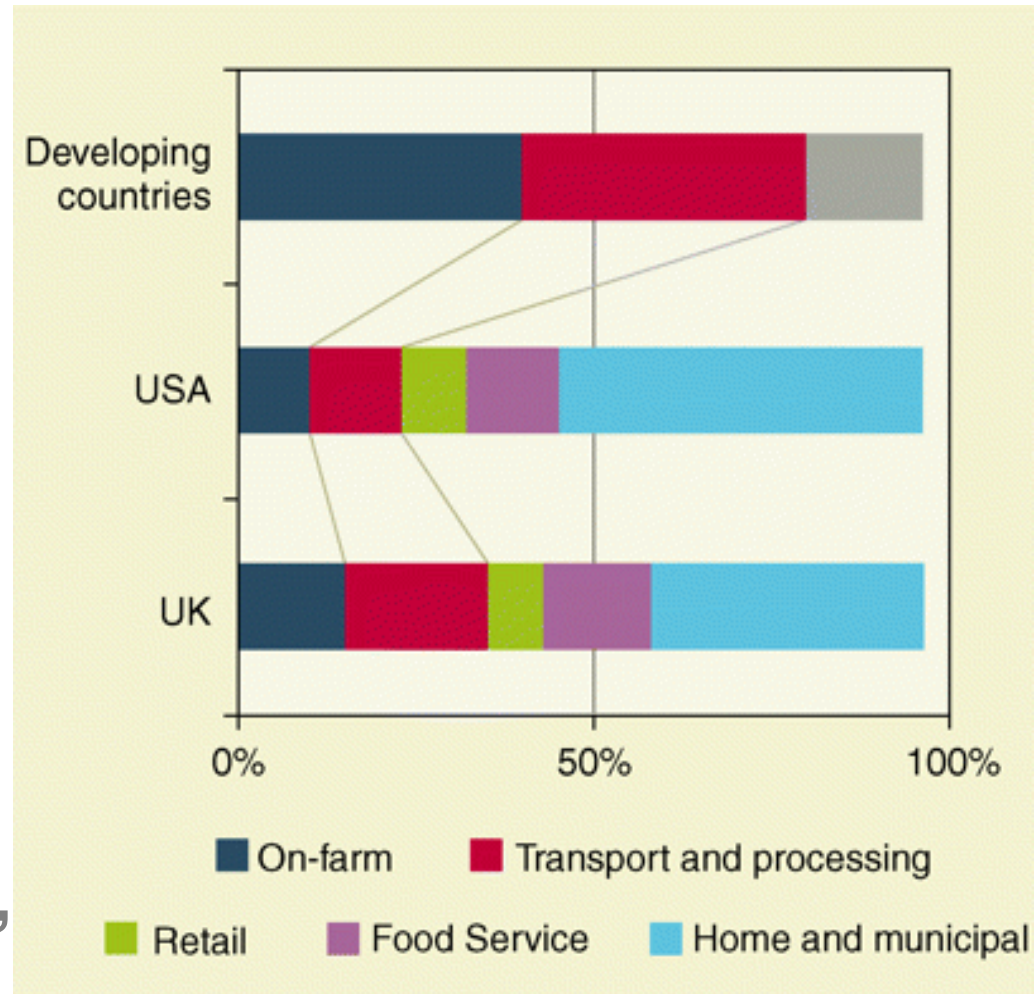
- Livestock genomics and breeding
- Reproductive efficiency
- Livestock dietary manipulation

# Action on waste and demand

- Determines supply challenge
- Incentivising the public and private sector
- Empowering the consumer
- Need to stimulate the debate on meat

Increase “food literacy”

Waste in different countries



# Maintaining biodiversity and ecosystem services while feeding the world

- Land and aquatic ecosystems management
- Strengthening links between food and environment policy
- Understanding environmental consequences of different food production practices
- Following up Nagoya



# Addressing the threat of future price volatility in the food system

- **Building trust and co-operation**
- **Increasing transparency about food stocks**
- **Open markets**
- **Boosting trade**



# We need to act now.....and in the longer-term

## Immediate actions for Defra:

- Championing an integrated approach to food security
- Press for integration of agricultural GHGs into UNFCCC process
- Take forward Nagoya work on international biodiversity
- Promote the importance of sustainable intensification
- Pressing for trade liberalisation and CAP / CFP reform
- Showcase what can be achieved on food waste reduction within the UK and share best practice
- Increase the productivity and competitiveness of UK food and farming and ensure that agriculture and the food sector can contribute fully to the green economy.

# Current Defra Actions

- Working with policy officials on Sustainable Intensification
- Exploring opportunities provided by the UN Conference on Sustainable Development (Rio+20 - June 2012), to move us towards a more sustainable and resilient global food system that recognises the inter-relationships between food security, climate change, biodiversity and development.
- Showcasing what can be achieved on food waste reduction, as part of a working agreement on Sustainable Food with the Dutch
- Taking steps to manage price volatility by improving market information and transparency by establishing an Agricultural Market Information System (AMIS) at the June 2011 G20 Agricultural Ministers meeting.

# Green Food Project

The Green Food project is a partnership project bringing together industry, environmental and consumer organisations to look at three areas:

- how we can improve growth and competitiveness in the farming and food industry;
- how we can increase domestic food production and address the role the UK can play in global food security, and;
- how we can improve our environmental performance.

# Green Food Project – Key Messages

- Growth and productivity in the agri-food sector are at the heart of Defra's business plan, alongside the environmental commitments in the NEWP - need to reconciling the tensions between these two objectives
- We need to use our rural land to increase food production, generate energy and protect our valuable natural assets, therefore we need to think cleverly and innovatively and work efficiently
- We want to ensure that the UK is making a contribution to the need for global food security and environmental improvement, and is demonstrating leadership
- The project conclusions will help us to develop a coherent policy for agriculture and food for the coming decades, and a trajectory for getting there.

# NEA – Key messages

- *The natural world, its biodiversity and its constituent ecosystems are critically important to our well-being and economic prosperity, but are consistently undervalued in conventional economic analyses and decision making.*
- *From the late 1940s onwards, emphasis in the UK was placed on maximising provisioning services to meet human needs for food, fibre, timber, energy and water*
- *While productivity increased, there was a decline in the delivery of a wide range of ecosystem services, particularly those associated with biodiversity and air, water and soil quality*

# NEA – Key messages

- *Reversing declines in ecosystem services will require the adoption of more resilient ways of managing our ecosystems, and a better balance between production and other ecosystem services – one of the major challenges is to increase food production, but with a smaller environmental footprint through sustainable intensification.*
- *Contemporary economic and participatory techniques allow us to take into account the monetary and non-monetary values of a wide range of ecosystem services. These techniques need to be adopted in everyday decision-making practice --- payment for ecosystem services (e.g., CAP pillar 2)*

# Natural Environment White Paper Published on 7 June



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Ambition to:

- Leave the natural environment in a better state than before
- Mainstream value of nature in decision making at all levels.

“Natural Environment” includes:

- Diversity of living things and their habitats
- Essentials of life
- Landscapes, natural heritage and urban greenspace

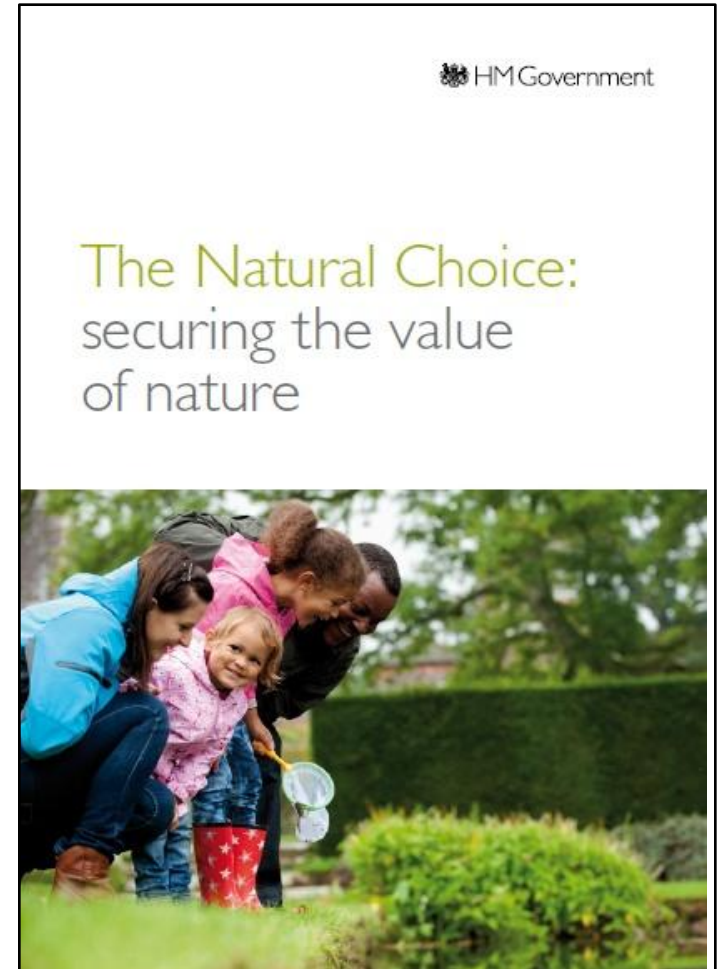
 HM Government

**The Natural Choice:**  
securing the value  
of nature



# The Natural Choice - in numbers

- 4 core themes
  1. Protecting and improving our natural environment
  2. Growing a green economy
  3. Reconnecting people and nature
  4. International and EU leadership
- 92 commitments
- Multi-disciplinary perspectives
- 30+ refs to UK NEA
- 1 key motif – “Value”



# Defra food R&D Programme – covers farm to consumer

- **Food security** – understand trade offs and benefits
- **Food chain resilience** – disruption and risks to the supply chain; supports UK Food Security Risk Assessment
- **Sustainable consumption and production** – supporting a low carbon food chain, understand supply chain and consumer behaviours, practices, confidence in food; sustainable diets; future trends and impacts
- **Innovation**– collaborative R&D - supports growth and competitiveness in food and drink sector, increased resource efficiency , waste reduction; raw material quality

# Defra food R&D Programme – covers farm to consumer (cont)

We have commissioned two pieces of research as a result of evidence gaps identified in the UK Food Security Assessment.:

- The resilience of the food supply chain in the event of disruption to energy supply, and;
- the flexibility of food supply chains in the event of disruption to sea ports

# Conclusions

- Food availability needs double in the next 25-50 years to alleviate hunger and poverty
- Global food security is achievable but business-as-usual policies, practices and technologies will not work
- Climate change poses challenges to the agricultural sector – reducing GHG emissions and adapting to climate change
- Managing our soils and water is critical for increasing productivity in a sustainably manner
- Innovation along the whole food chain, involving all relevant stakeholders, is critical
- Science and technology is critical – the risks and benefits of all technologies must be evaluated