

Global Food Security

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SSERC CPD Event

12th February 2014



Food Security

“Food security is the sustainable production of sufficient amounts of high quality, safe food required to underpin health and wellbeing of human populations world-wide”



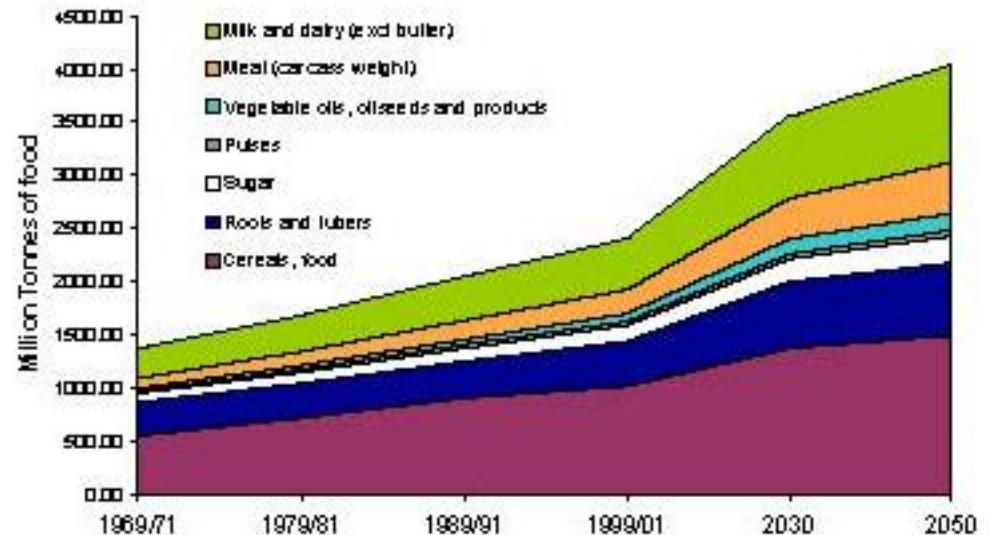
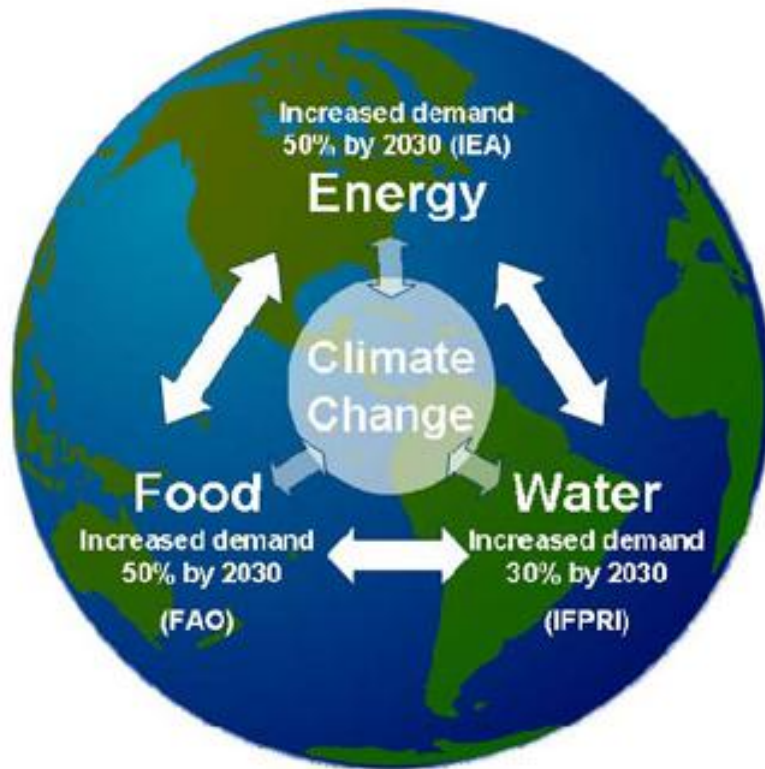
Food Is A Political Issue...

‘... because the UK is a developed economy, we are able to access the food we need on the global market.’ Margaret Beckett, March 2006

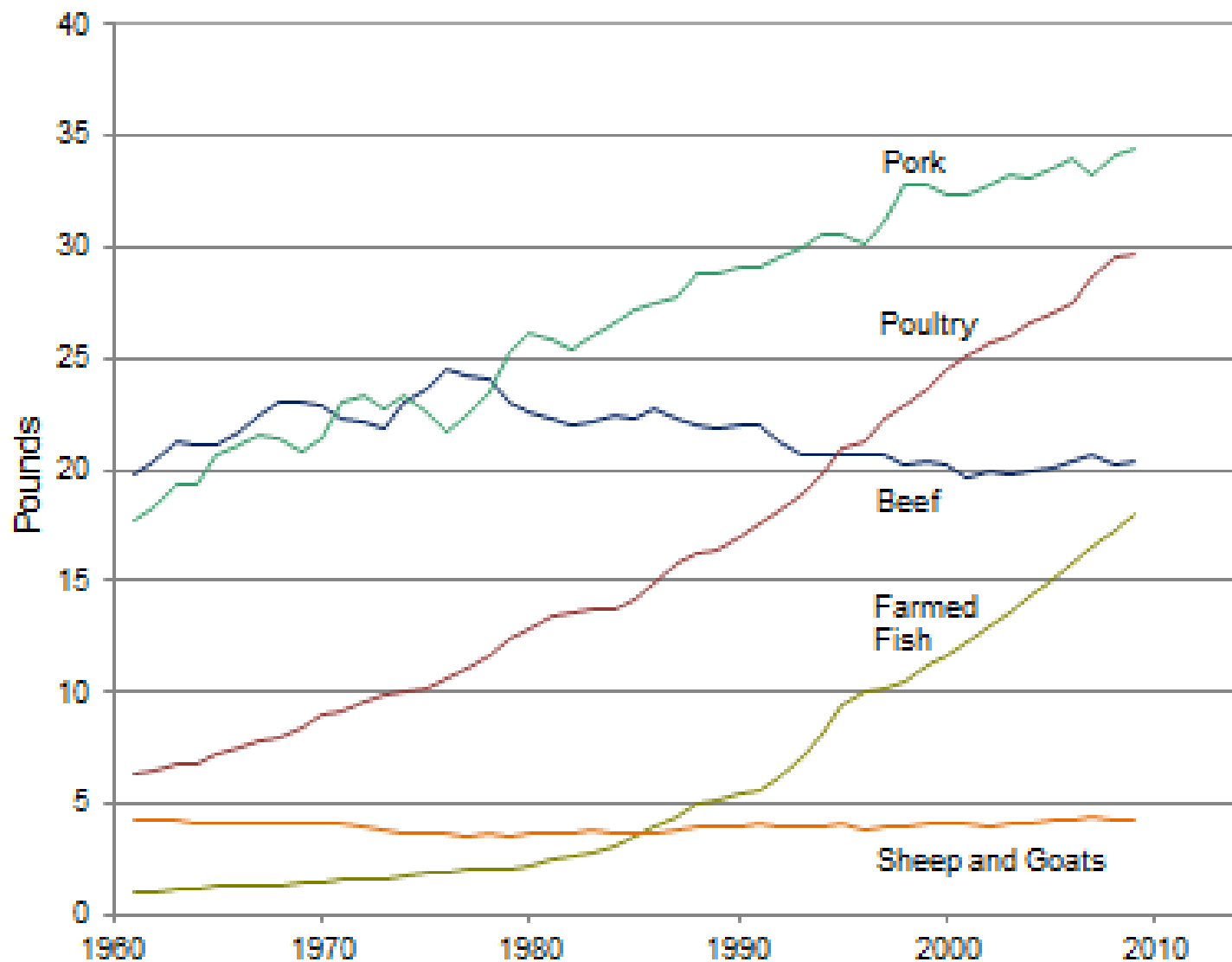
“Defra's joined-up thinking recognises the fragility of UK food production”. Prime Minister, 2010

Food, Energy, Water and Climate Change: The Perfect Storm

7 Billion People by 2030; 9 Billion People by 2050



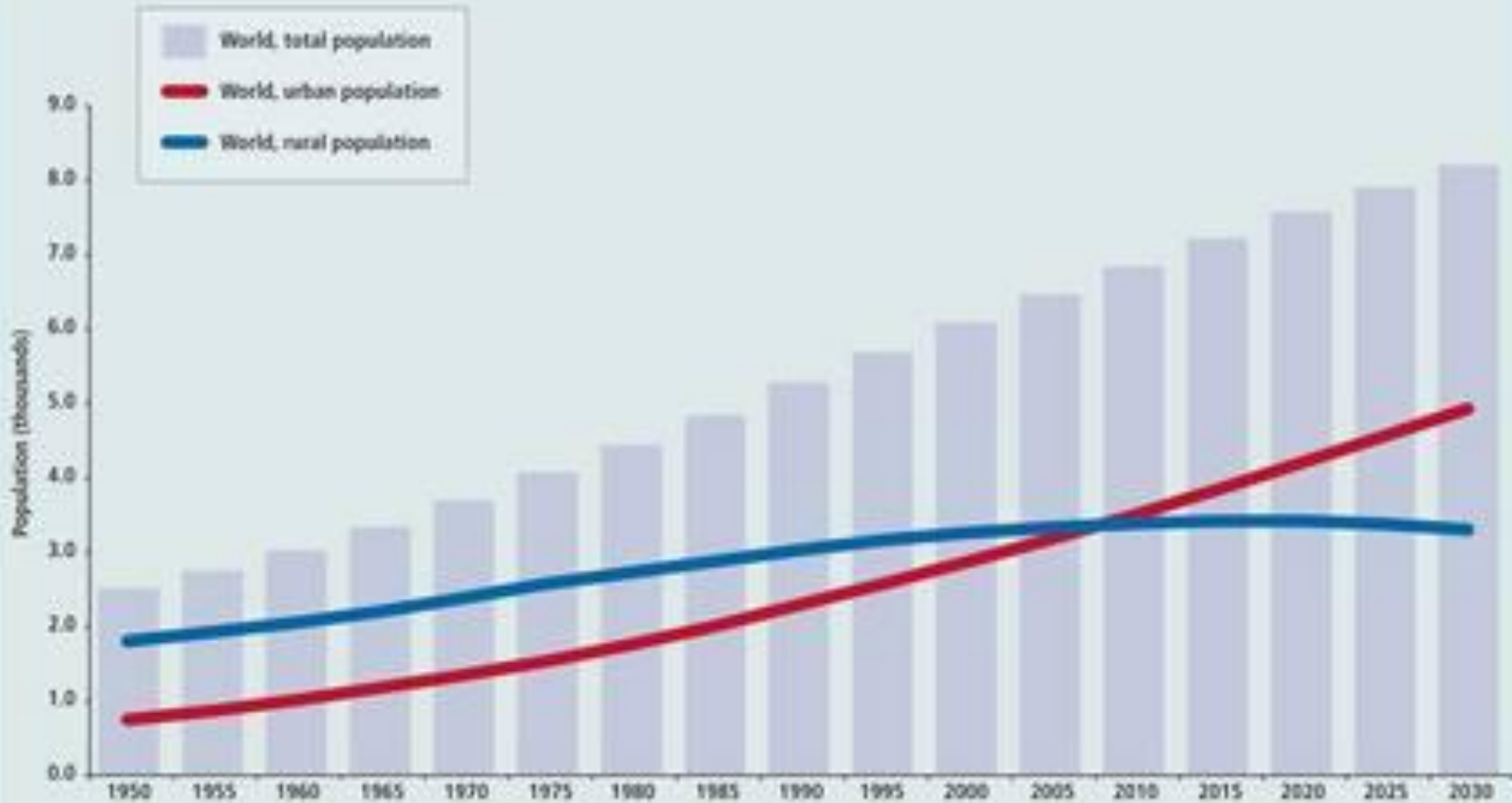
World Animal Protein Production Per Person, 1961-2009



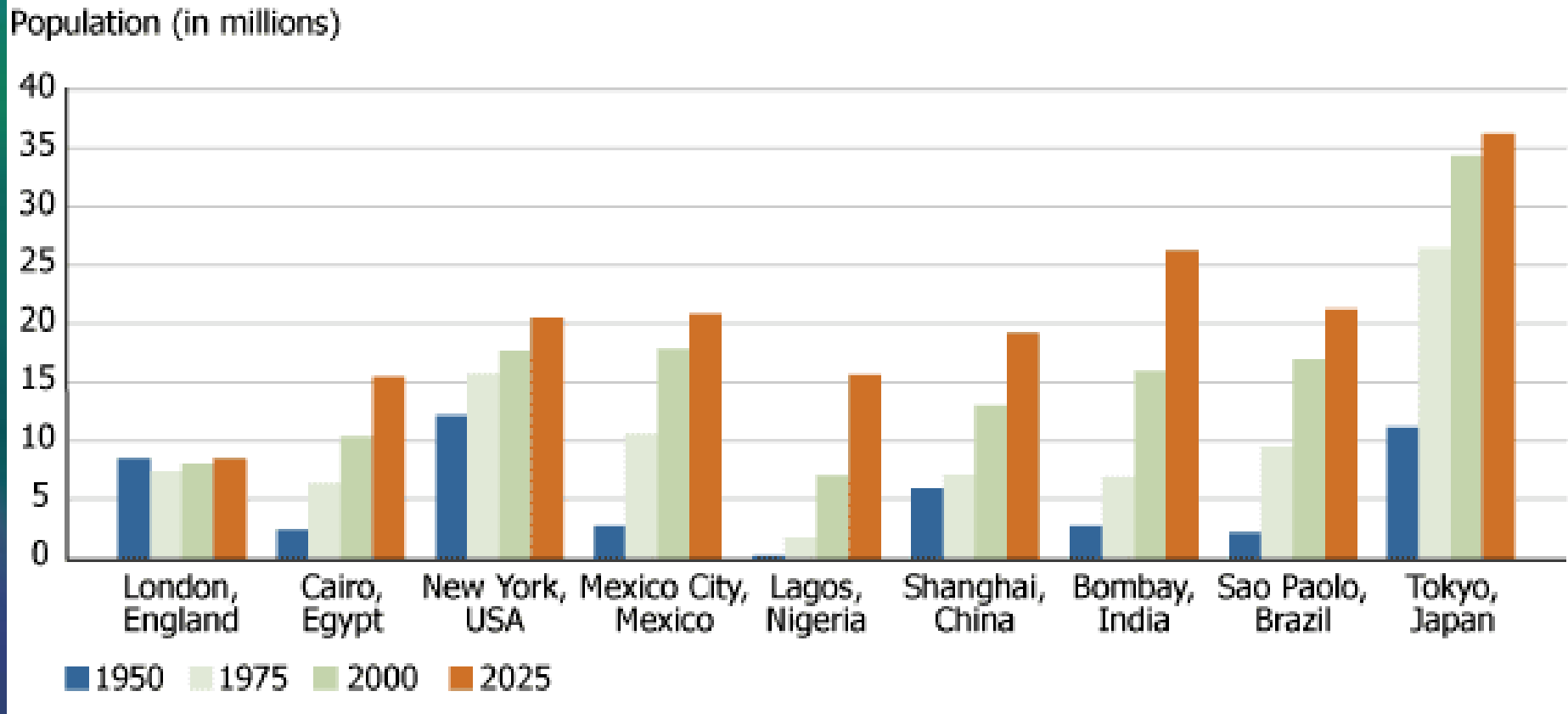
Source: EPI from FAO; UNPop

Urban v Rural Dwelling

The urban and rural population of the world, 1950-2030

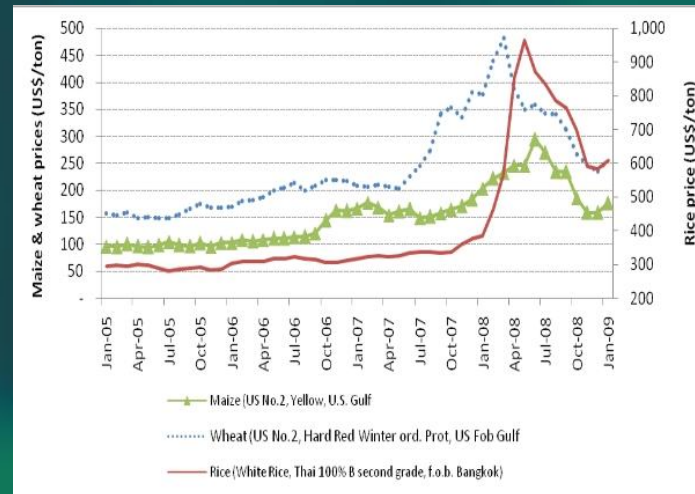


Global Megacities

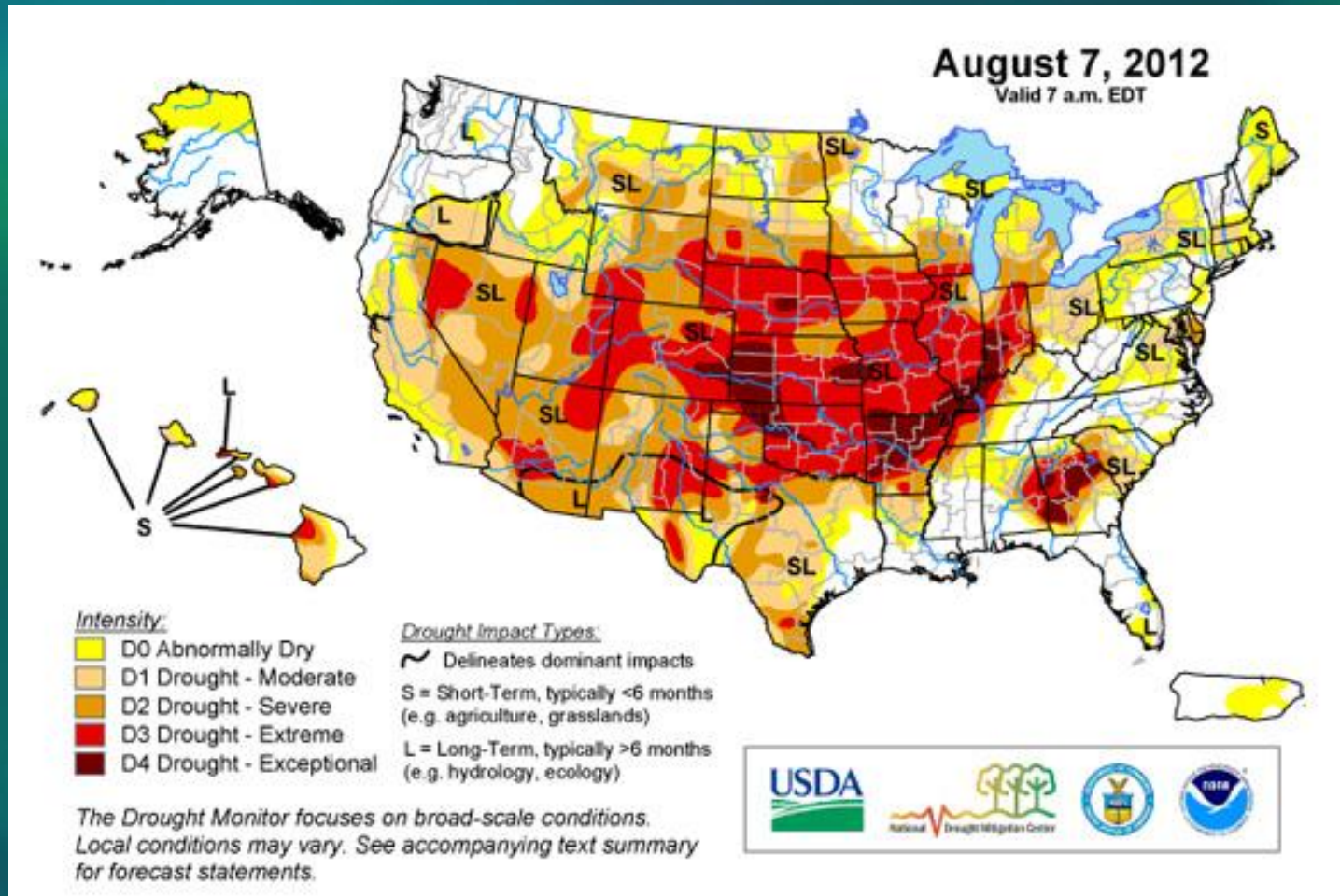


United Nations, World Urbanisation Projects: The 2007 Revision

Food Riots, 2008



USA Drought, 2012



Global Warming Estimates

Permafrost Thaws



Glaciers Melt



Drought Increases



Fire Increases



Pests Expand



Diseases Increase



Flooding Increases



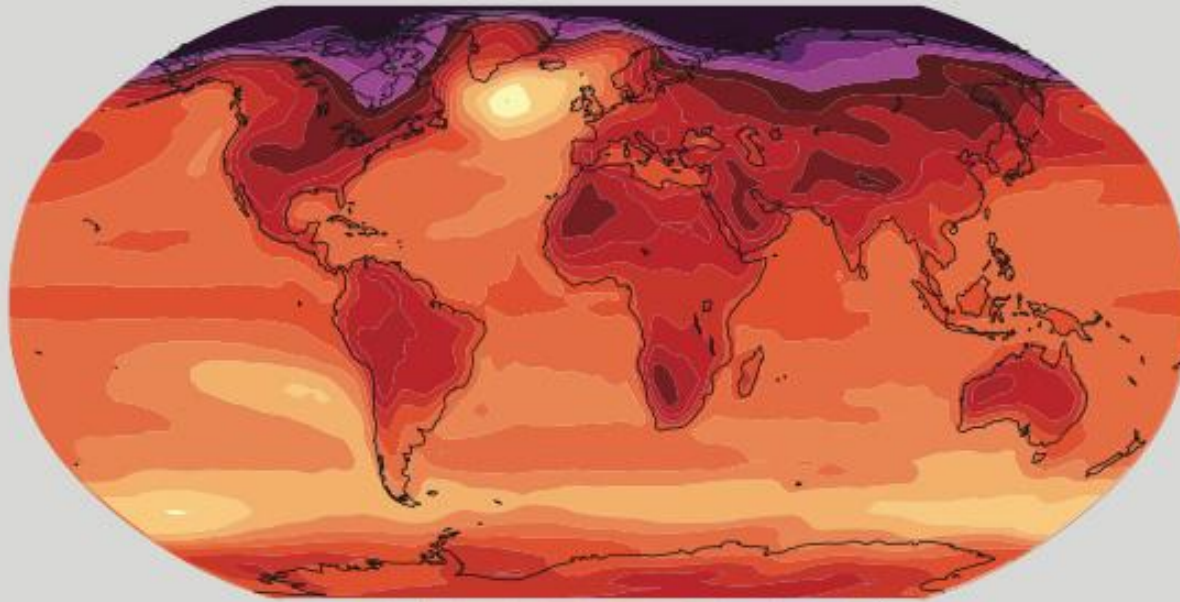
Sea Level Rises



Snow Cover Declines



Forests Change



0 1 2 3 4 5 6 7 (°C)



Storms Intensify



Ecosystems Shift



Species Decline



Agriculture Changes

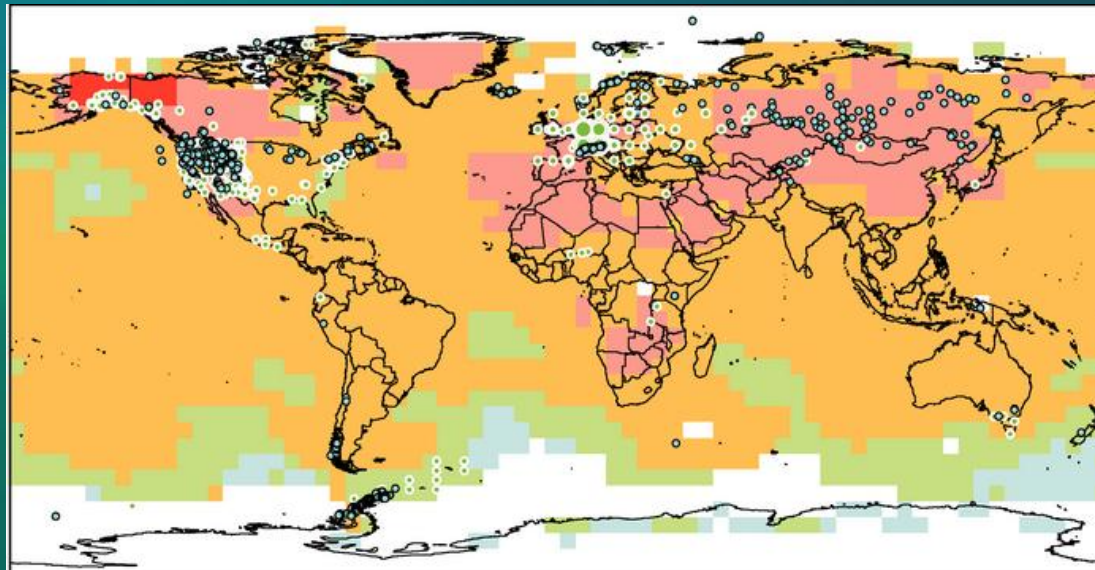


Refugees Increase



Famine Spreads

Global Temperature Changes

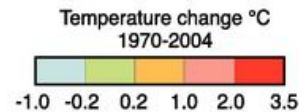


NAM		LA		EUR ^{28,115}		AFR		AS		ANZ		PR*		TER ^{28,586}		MFW**		GLO ^{28,671}	
355	455	53	5	119	28,115	5	2	106	8	6	0	120	24	764	28,586	1	85	765	28,671
94%	92%	98%	100%	94%	89%	100%	100%	96%	100%	100%	-	91%	100%	94%	90%	100%	99%	94%	90%

Observed data series

- Physical systems (snow, ice and frozen ground; hydrology; coastal processes)
- Biological systems (terrestrial, marine, and freshwater)

Europe ***	
○	1-30
○	31-100
○	101-800
○	801-1,200
○	1,201-7,500



Physical Biological

Physical	Biological
Number of significant observed changes	Number of significant observed changes
Percentage of significant changes consistent with warming	Percentage of significant changes consistent with warming

1970-2004
IPCC (2007)

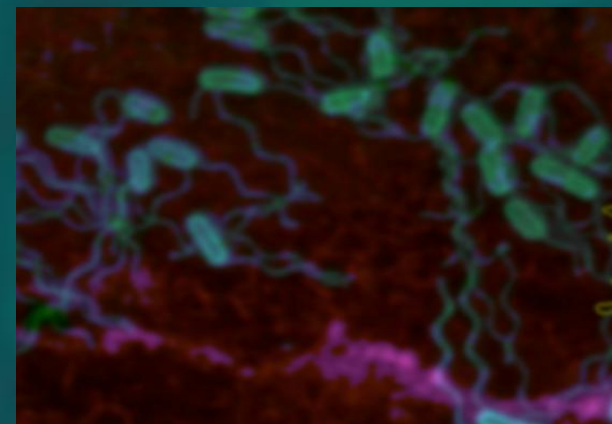
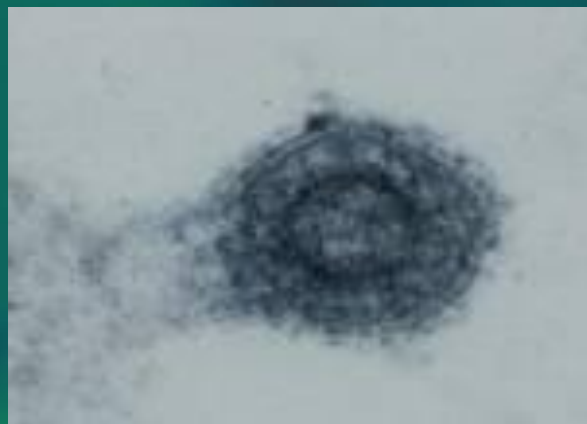
* Polar regions include also observed changes in marine and freshwater biological systems.

** Marine and freshwater includes observed changes at sites and large areas in oceans, small islands and continents. Locations of large-area marine changes are not shown on the map.

*** Circles in Europe represent 1 to 7,500 data series.

Climate Change

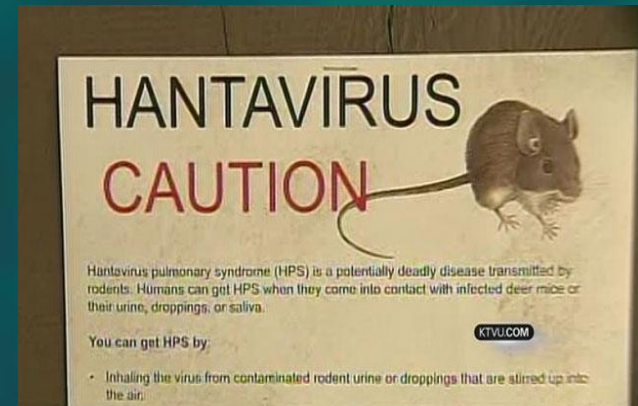
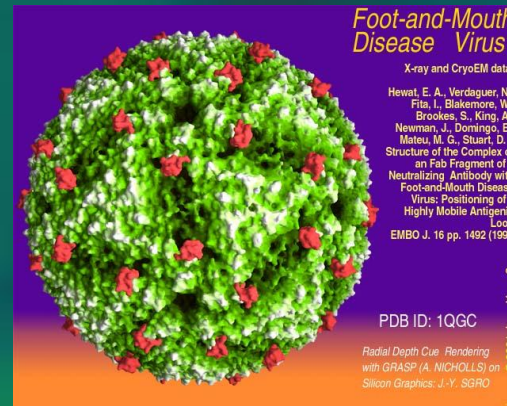
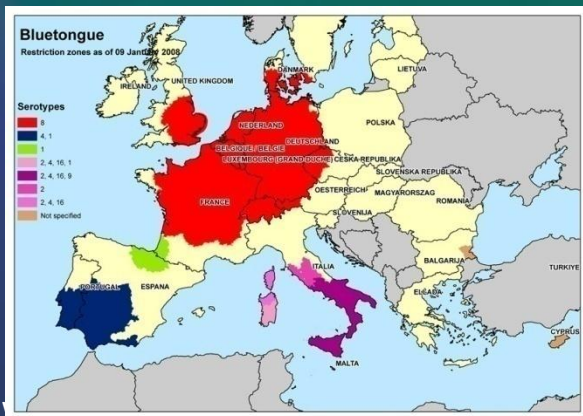
- Intergovernmental Panel on Climate Change (www.ipcc.ch)
- 20% greenhouse effect due to agriculture
 - 50% CH₄, 70% N₂O, 5% CO₂
- Mitigation
 - 21% reduction in CH₄ attributable to improved management of ruminants
 - feed, genetics, reproduction
 - Reducing impact of endemic (production) diseases



Climate Change

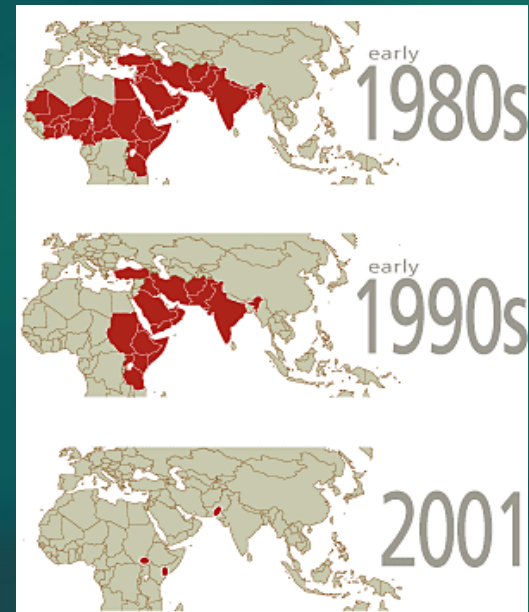
- **Adaptation**

- Emerging and re-emerging pathogens - especially viruses
- Zoonoses increase
- Cross-species transmission
- Changed disease patterns
- **Reducing the impact of emerging and exotic disease**



Infectious Disease Impact

Eradication of Rinderpest (Cattle Plague) by vaccination
has yielded
net savings to Africa of \$1 Billion/year



Courtesy: Mark Stevens, Roslin Institute

Bill and Melinda Gates Foundation and DFID GALVmed

Cattle (especially dairy), Small Ruminants, Chickens
Livestock Health, Livestock Genetics and Reproduction,
Postharvest and Markets

Disease	Cattle	Small Ruminants	Poultry
Endoparasites	X	X	X
Peste des Petits Ruminants (PPR)		X	
Contagious Bovine Pleuropneumonia (CBPP)	X		
Ectoparasites	X	X	X
Trypanosomes	X	X	
Contagious Caprine Pleuropneumonia (CCPP)		X	
Newcastle Disease			X
Goat Pox and Sheep Pox		X	
Rift Valley Fever (RVF)	X	X	
East Coast Fever	X		

“Global Grand Challenges Agenda”

- Millennium Development Goals
 - Eradicate extreme poverty and hunger
 - Ensure environmental sustainability
 - Develop a global partnership for development
- The Foresight Project on Global Food and Farming Futures
- Global Food Security Programme Strategic Plan, 2011-2016
- UK Cross-Government Strategy for Food Research and Innovation
- The CGIAR Climate Change, Agriculture and Food Security (CCAFS) Commission on Sustainable Agriculture and Climate Change
- The Foundation for Science and Technology debates on the theme of "Achieving food security in the face of climate change”

“Global Grand Challenges Agenda”

- “Sustainable Intensification”
 - More food, fewer inputs, less waste
 - Optimal use of natural resources, especially land
 - Exploitation of technologies (old and new)
- Biological Efficiency is the answer

Sustainable Intensification

- Livestock
 - Reduced mortality (death, especially neonatal)
 - Reduced morbidity (endemic/production diseases)
 - Improved reproductive performance
 - Improved/balanced nutrition
 - Increased kg output/input (growth rate/feed conversion ratio/killing out %)
- Crops
 - New varieties and systems
 - More yield from fewer inputs, including use of land
 - GM and new technologies
- Land-use
 - Farming
 - Forestry
 - Integrated systems
 - Biodiversity
 - Public access

Waste – Developed Countries



100kgs per person per year lost at consumption stage

Gustavson et al, 2011. Global Food Losses and Food Waste, FAO.

Waste – Developing Countries



Losses during production, storage or transport

The Moredun Foundation

- Global Issues
 - Food Security
 - Climate Change
 - Animal Health and Welfare



- Local Issues
 - Policies and Policymakers
 - Communities
 - Environment



Biologically Efficient Farm Animals



Vaccines



Diagnostic Tests



Disease Control
Programmes

Endemic (Production) Diseases

Vaccines



“Prevention is Better than Cure”

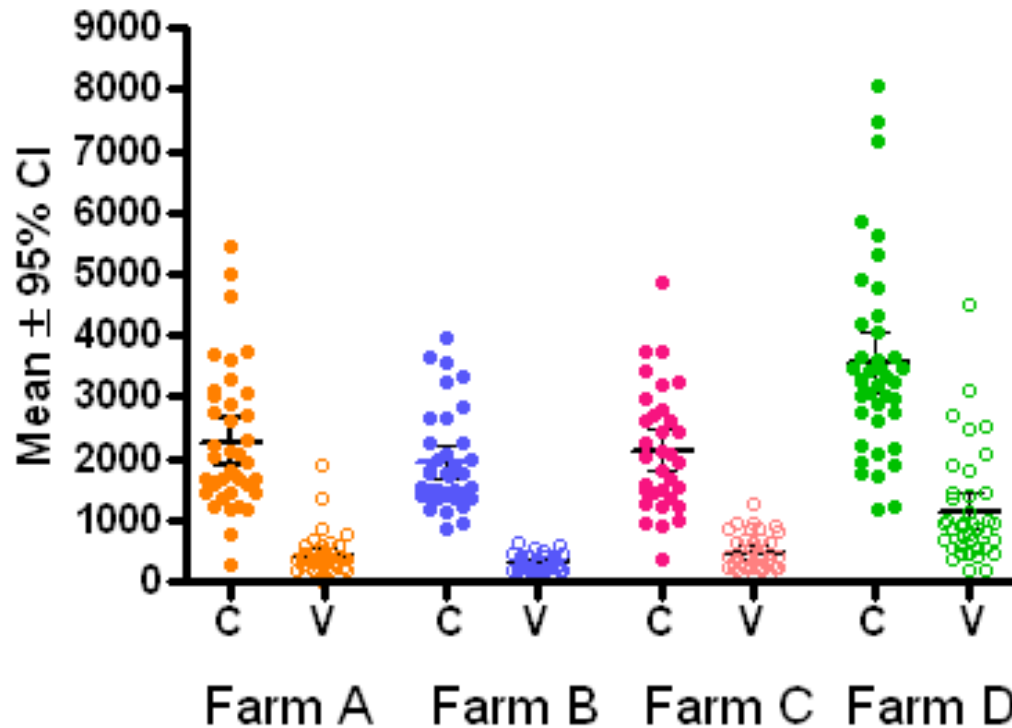
Barber's Pole (*Haemonchus contortus*)



Haemonchus contortus

Australian Sheep Trials

Effect of vaccine on *Haemonchus* egg output on four NSW farms from early Nov 2011 to late April 2012



Dr W. David Smith



MoreDun

Diagnostic Tests

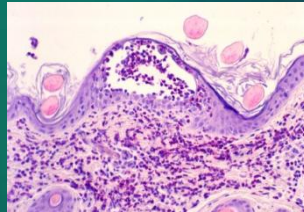
“Find it fast and deal with disease”

Sheep Scab



Diagnostic Test for Sheep Scab

Psoroptes ovis



Dr. Alistair Nisbet,
Dr John Huntley,
Dr Stew Burgess

Clinical Disease

Subclinical Disease?





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Disease Control Programmes

“Manage livestock for efficiency and sustainability”

Targeted Selective Treatment;



Targeted Selective Treatment

Anthelmintic resistant nematodes widespread

- Threaten sustainability of livestock farming

Dr Andy Greer, NZ
Dr Fiona Kenyon
Dr Dave Bartley
Dr Frank Jackson

Part-flock approaches (targeted selective treatment, TST) suggested to slow development of resistance

- Instead of whole-flock treatments
- Fewer worms exposed to treatment

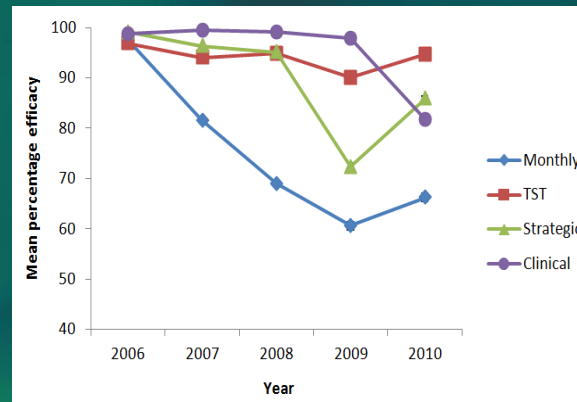
Idea has been tested and proven successful:

Anaemia – blood feeding worms



www.moredun.org.uk

Maintain efficacy of wormers



Weight gain



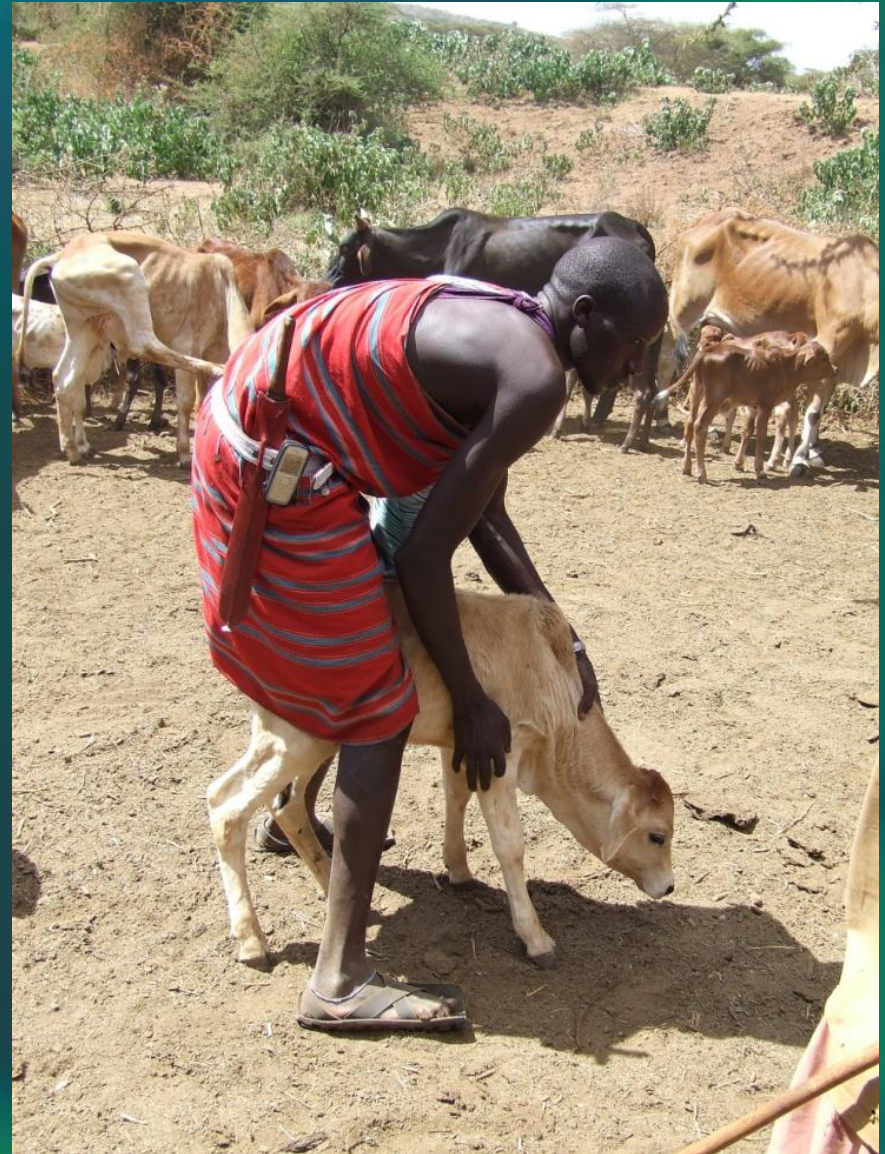
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Scotland and Global Food Security

Scotland – small country; big impact

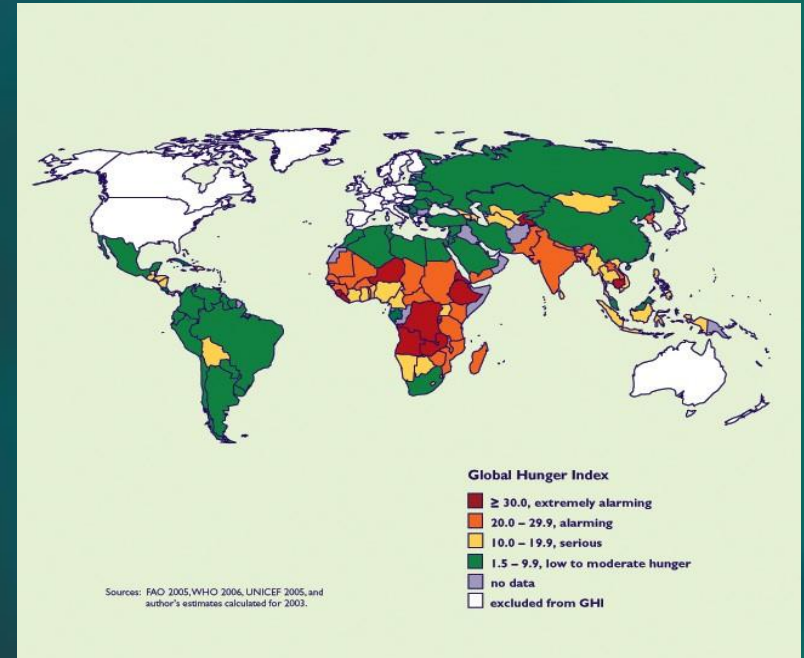


Sir John Beddington and
Sir Robert Watson, May 2012
“What is needed for global food
security is **Technology** and **Rural
Development**”.



Issues Not Covered

- World trade in commodities – WTO; GATT
- Conflicts/bioterrorism
- Soils
- Crops for biofuels
- CAP Reform – greening agenda
- Socio-economics
- Obesity, lifestyle, vegetarianism
- Water
- Genetic modification
- Political agendas – G8/G20



Feeding the 9 Billion?

- Yes, we can
- 70% more food overall (FAO, Bruinsma, 2009).
- 100% more in developing countries (FAO, Bruinsma, 2009).
- Science, Engineering, Technology

Acknowledgements

Moredun Staff

Scientific and Farming Collaborators –
national and international

Scottish Government

QMS

Eblex

Defra

BBSRC

Commercial companies

