

# THE GLOBAL FOOD SYSTEM & GLOBAL INEQUALITY: CHALLENGES & RESPONSES

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# CIRCULATED READING

Pretty, J. et al (2010)  
The top 100 questions  
of importance to the  
future of global  
agriculture

Chapter 4: Environment  
and Food

ENVIRONMENT AND FOOD  
Colin Sage

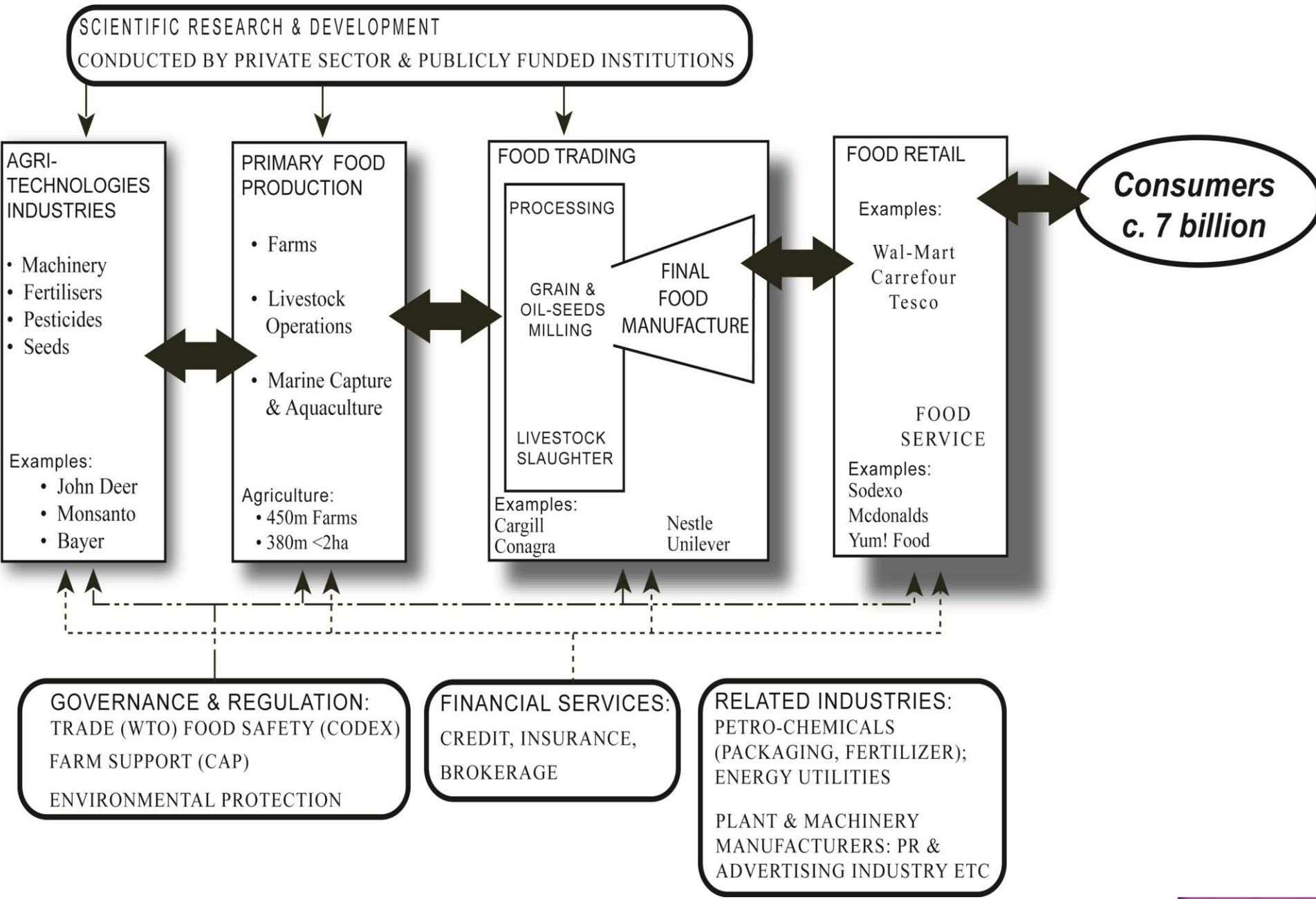


Introductions to environment series  
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# OBJECTIVES

- Events since 2007-08 have sharpened concern around global food security & raised important questions about the food system
- Food prices have risen by c.40% over past year
- OECD-FAO report: food prices look set to rise by up to 30% by 2010 as agricultural growth slows
- But face new challenges: climate change, water depletion, peak oil & complex interactions
- Need for a fundamental reappraisal of the global food system

Fig. 2.1



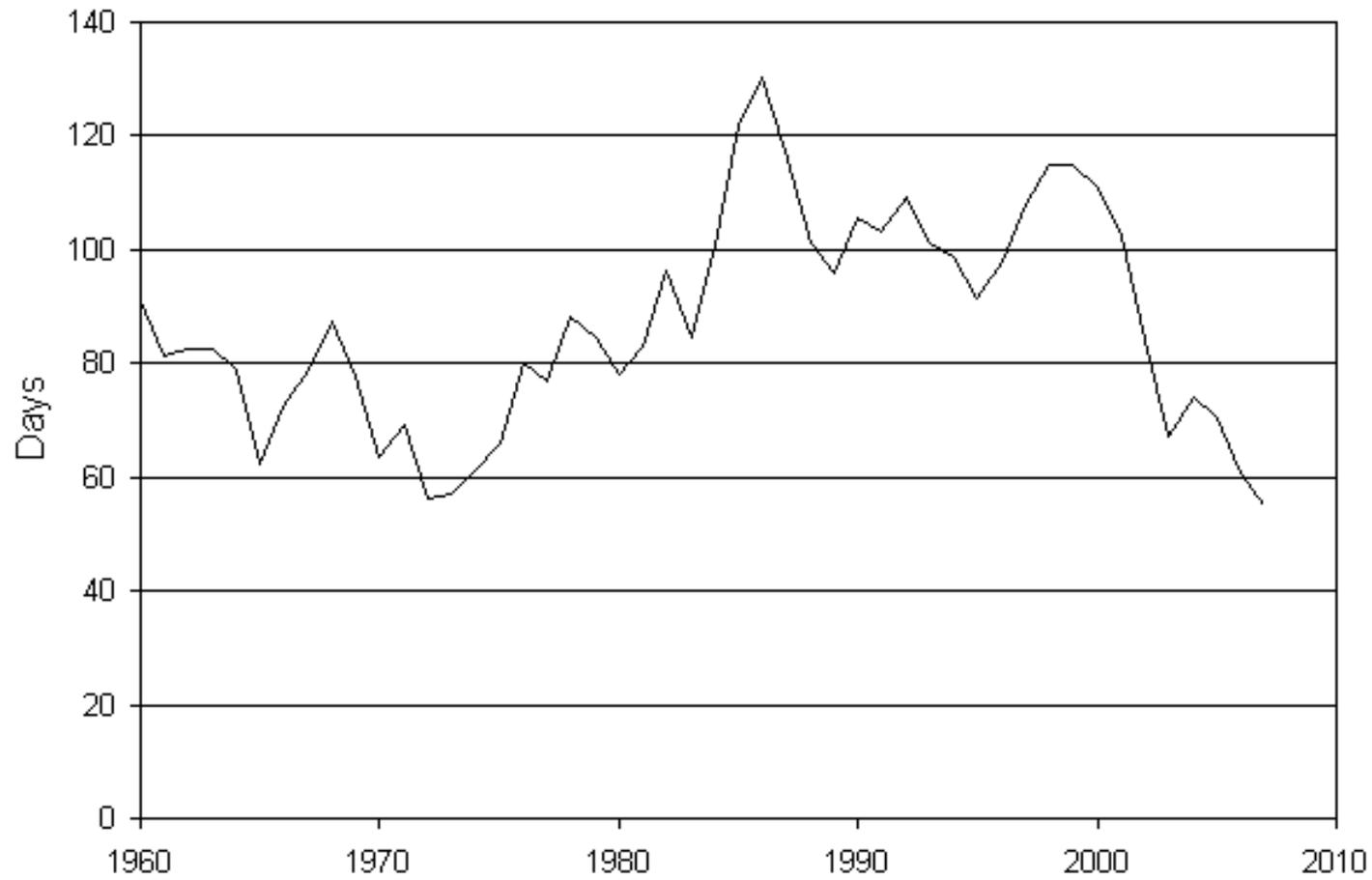
# THE 'SUCCESS' OF THE FOOD SYSTEM

“(W)orld population has doubled while the available calories per head increased by 25 percent. Worldwide, households now spend less income on their daily food than ever before, in the order of 10-15 percent in the OECD countries, as compared to over 40 percent in the middle of the last century. Even if many developing countries still spend much higher but declining percentages, the diversity, quality and safety of food have improved nearly universally and stand at a historic high” (Fresco 2009: 2).

# SOME OF ITS SHORTCOMINGS

- ◉ An estimated one billion people in the world are experiencing hunger and malnutrition because of their lack of entitlements to access food
- ◉ Over one billion people in the world are overweight or obese and susceptible to diet-related diseases
- ◉ Externalities: what we pay for food fails to account for the loss of ecological services, the depletion of resources, impairment of earth system processes, and the costs for human health and well-being
- ◉ The nature of demand is outstripping capacity to increase supply: do we need to rethink patterns of consumption?

## World Grain Stocks as Days of Consumption, 1960-2007



Source: USDA

# CONTESTING PARADIGMS?

- ◉ Discourse of ‘doubling’ food production to meet the needs of a global population of 9b by 2050.
- *Productivism*: Business As Usual with a biotech magic bullet (‘Gene Revolution’)?
- ◉ Sustainable intensification: utilising best agro-ecological methods and local knowledge to devise a more differentiated approach
- Building local food security, reducing vulnerability enhancing resilience

# RETHINKING SCIENTIFIC & TECHNOLOGICAL NORMS IN DEVELOPMENT

- IAASTD (2009): Despite S&T achievements in agricultural productivity, “we have been less attentive to some of the unintended social & environmental consequences”
- Need for “new policy options for food & livelihood security under increasingly constrained environmental conditions”
- “BAU is no longer an option”: need to rethink the role of AKST in achieving development goals

International Assessment of Agricultural Knowledge, Science & Technology for Development (IAASTD) 2009 Executive Summary

# FOOD SYSTEM AND FOOD SECURITY

- ◉ Not just about producing enough basic staples
- ◉ Nor about diversification into high protein foods
- ◉ But about availability, access and the capacity to utilise appropriate & sufficient food
- ◉ During past decade more children have died from diarrhoea caused by drinking polluted water than people killed in all armed conflict since 1945.
- ◉ Clean water, freedom from disease, micronutrients
- ◉ Access to affordable food: entitlement relations (Sen)

# QUESTION

- Is the prevailing architecture of the world food system fit for purpose?
- Trading patterns reflecting comparative advantage uninformed by actual resource endowments
  - 3 of top 10 food exporters are water scarce countries
  - Kenya's success in HMFV exports amidst widespread food insecurity (Ethiopia too)
  - Rising food prices, low food stocks & competing uses for grain and arable land
- Challenge of global environmental change makes it imperative to rethink BAU practice

# THE MEATIFICATION OF THE HUMAN DIET

- ◉ Animal products have moved from the periphery to the centre of food consumption (location on the plate)
- ◉ Since 1950 population >2x; meat consumption 5x
- ◉ Remain persistent inequalities in levels of consumption but also dramatic changes (1980-2002, kg/cap):
  - High income countries 79 → 94
  - Middle income countries 22 → 46
  - Low income countries 7 → 9
- ◉ Meat a key feature of the nutrition transition in MICs

# CLIMATE CHANGE

- ⊙ Anthropogenic emissions of GHGs → warming
- ⊙ Atmospheric concentration CO<sub>2</sub> & safe limits:  
450ppmv = >+2°C?
- ⊙ Agri-food production: a major contributor to CC; will be significantly affected by it; role in mitigation
  - LCA: 31% of GWP of all products & services in EU-15
  - Livestock: contribute 18% of global warming (CH<sub>4</sub>, N<sub>2</sub>O)
- ⊙ Temperature, rainfall, pests / disease, extreme events
- ⊙ C sequestration through better soil management

# WINNERS & LOSERS IN A WARMING WORLD

- ⊙ High latitudes: medium-term benefits?
  - Russia summer 2010
- ⊙ Low latitudes (tropics):
  - 3b people, many earning <\$2/day & depend on ag
- ⊙ Recent CGIAR/ILRI study (June 3<sup>rd</sup>):
  - Decline in length of growing period (Mexico - SE Asia)
  - Decrease in N of reliable crop-growing days (India)
  - High temperature stress (>30°C) (E & S Africa)
  - Increase variability of rainfall (frequency, intensity)

# CLIMATE CHANGE & FOOD SECURITY

- ◉ Such scenarios suggest that:
- ◉ Growing crops becomes too risky to pursue as a livelihood strategy across large parts of the global tropics
- ◉ So how will people cope? Become environmental refugees & seek to cross Mediterranean in increasing numbers?
- ◉ Unlikely that food surplus generating regions (Americas, Europe, Australia) will balance deficits in tropics
- ◉ Currently UNWFP barely feeding 10% of malnourished
- ◉ Food security not simply an outcome of biophysical changes: reflects a host of responses / non-responses to challenge

# FRESHWATER

- ◉ 97% of water on Earth in oceans
- ◉ Much of 3% of freshwater locked up in ice caps & glaciers
- ◉ 1.5 b people lack clean water
- ◉ 71% of water used by agriculture
- ◉ Irrigated agriculture occupies 18% of farmland but produces 40% of crop output: hydraulic imperative
- ◉ Embedded in food: virtual water
- ◉ But international trade in food does not reflect available water resources.

# WORLD ECONOMIC FORUM REPORT



## WATER SECURITY

THE WATER-FOOD-ENERGY-CLIMATE NEXUS



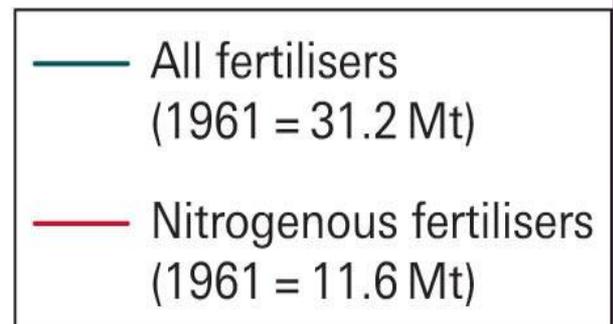
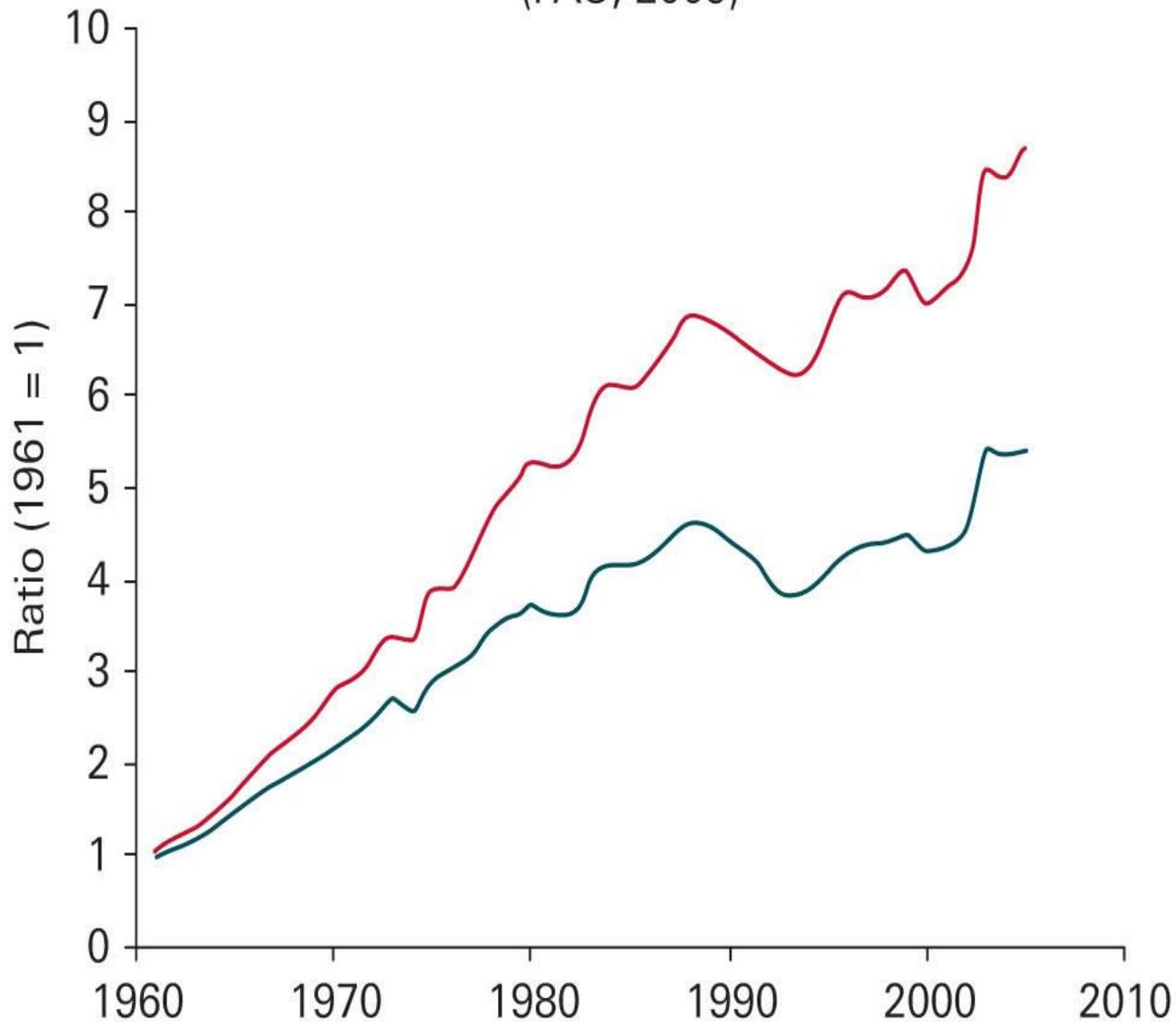
*The World Economic Forum Water Initiative*

- “if ‘BAU’ water management practices continue for another 2 decades, large parts of the world will face a serious structural threat to economic growth, human wellbeing & national security.” (p.xxii)
- Breaking humid zone thinking across all sectors, incl energy generation

# FOOD & ENERGY SECURITY

- One of the key challenges for food security in decades ahead posed by issue of 'Peak Oil' (chapter 4)
- Global food system rests upon cheap energy for: agri-inputs, machinery, processing, distribution.
- Chemical fertilisers (NPK). Argued that responsible for up to half of world's food supply (Smil).
- Synthesis of atmospheric N into urea uses natural gas.
- As oil prices rise so have fertiliser prices: 2-3x in 2008 alone
- This has huge consequences for food production

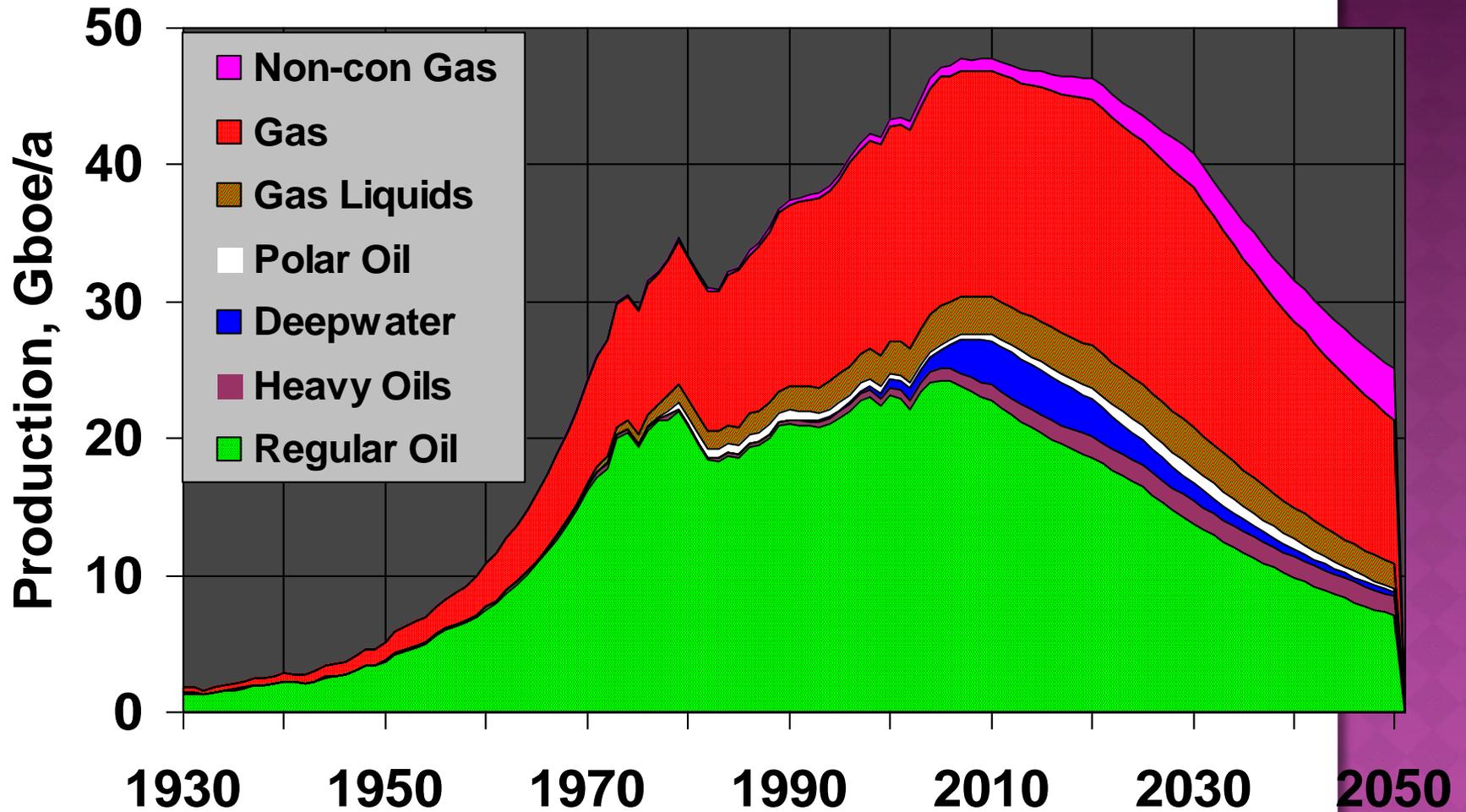
World fertiliser consumption (1961–2005)  
(FAO, 2009)



# ENERGY PRICES SET TO RISE FURTHER

- ◉ Peak oil: point of maximum production rate for a well, country, globally (Hubbert)
- ◉ As land-based giant fields producing sweet crude decline, necessary to move to non-conventional sources: off-shore, smaller, deeper water, difficult terrain (arctic), low quality crude (tar sands)
- ◉ Energy returns on energy invested (EROEI) lower
- ◉ Environmental impacts (including accidents) greater
- ◉ Shale gas hydraulic fracturing in Pennsylvania

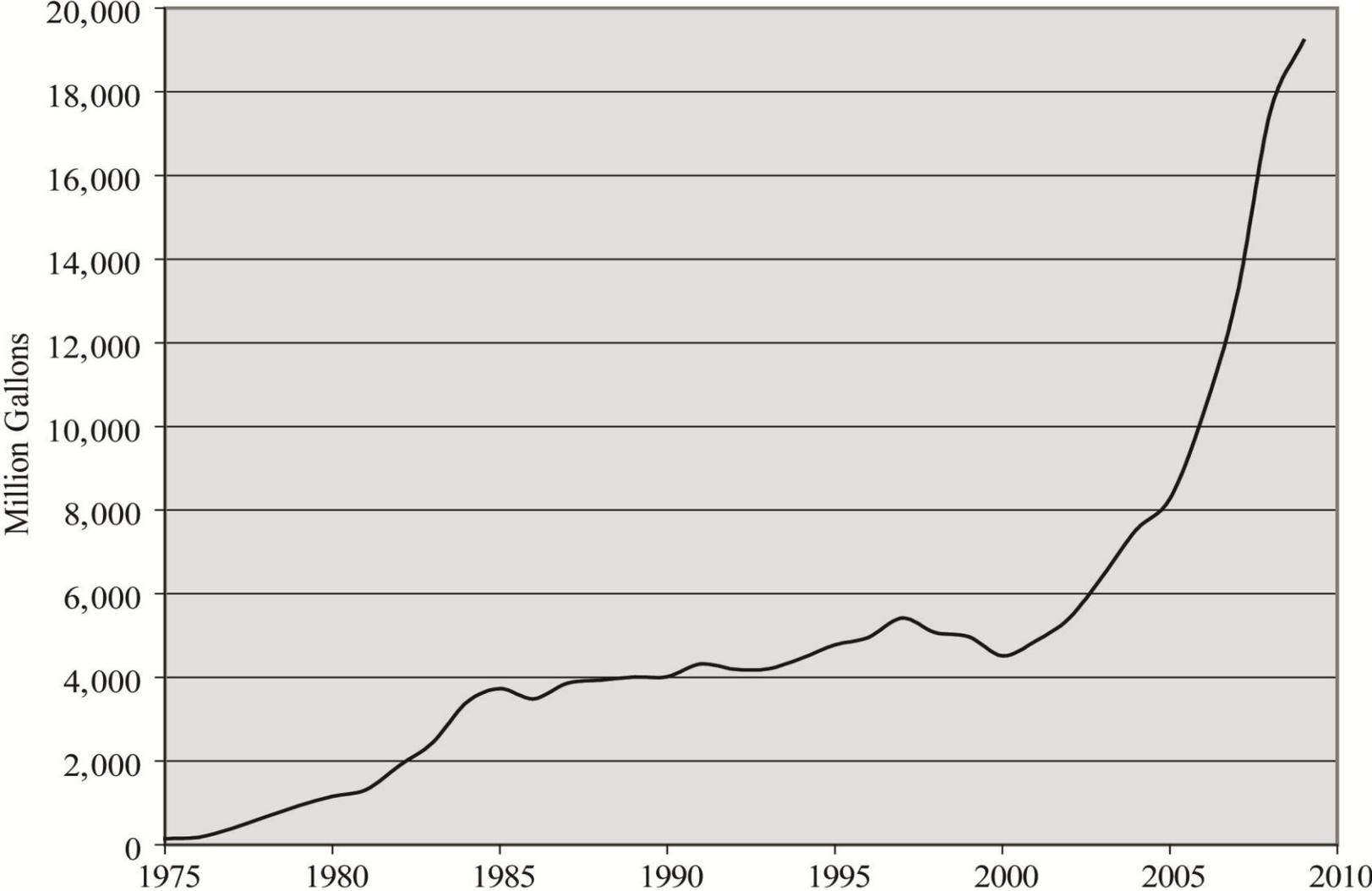
# PEAK OIL



# AGRICULTURAL BIOFUELS

- ◉ Brazil's success with ethanol from sugar cane as part substitute for gasoline made it attractive model
- ◉ US expansion of refinery capacity: corn as feedstock
- ◉ Has been heralded as 'carbon neutral' mobility. Yet:
- ◉ EROEI much lower for corn; without federal subsidies would be financially marginal if oil < \$90/b
- ◉ LCA challenges any carbon savings from ethanol (corn requires extensive N fertilisation)
- ◉ Utilising arable land to grow fuel for mobility rather than food for hungry people
- ◉ EU: has driven biodiesel sector with targets: but has resulted in controversial conversion of forest to palm oil

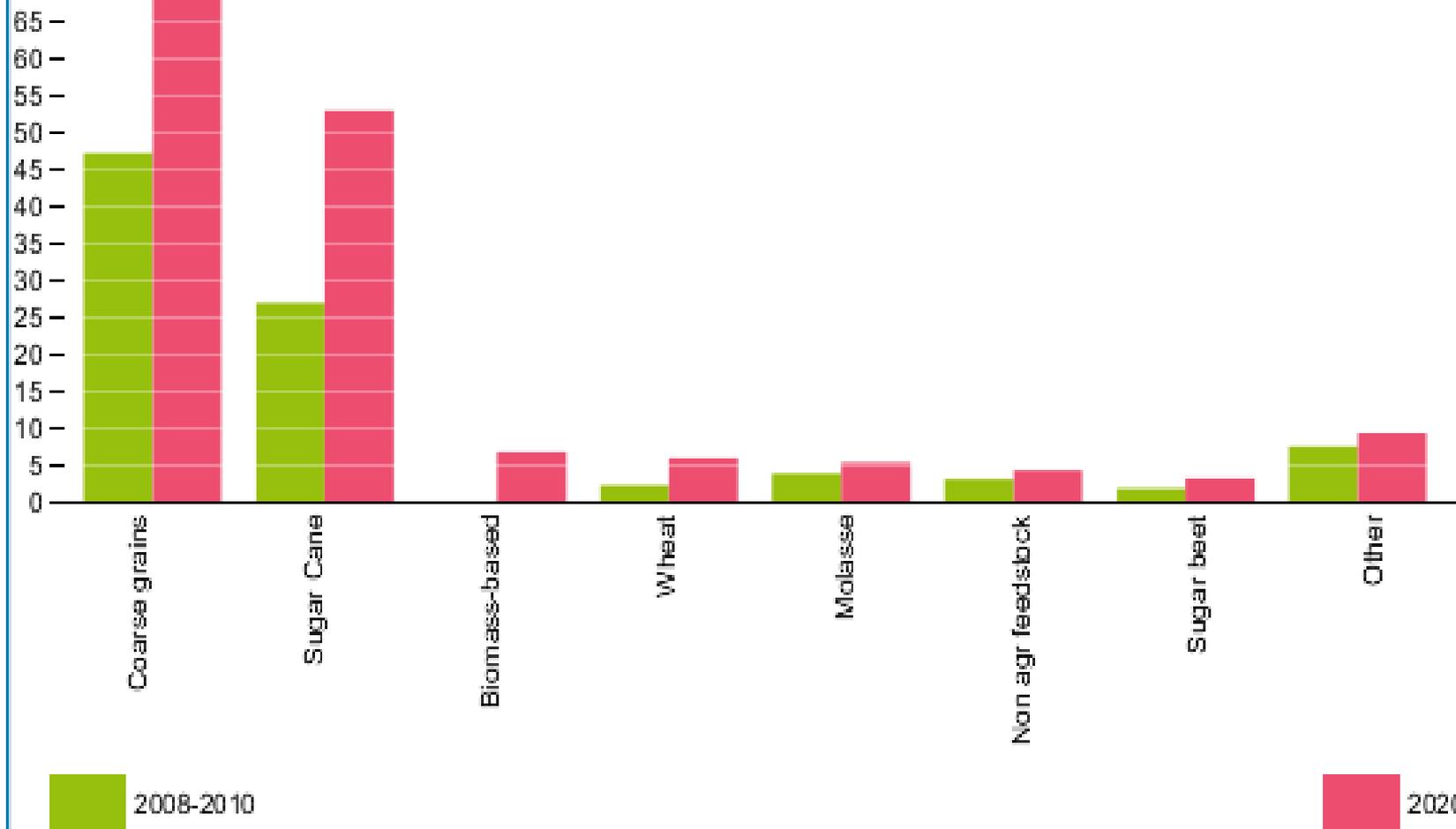
Fig 4.7 World annual fuel ethanol production 1975-2009





## Ethanol production by feedstocks used

Billion litres



Source: OECD and FAO

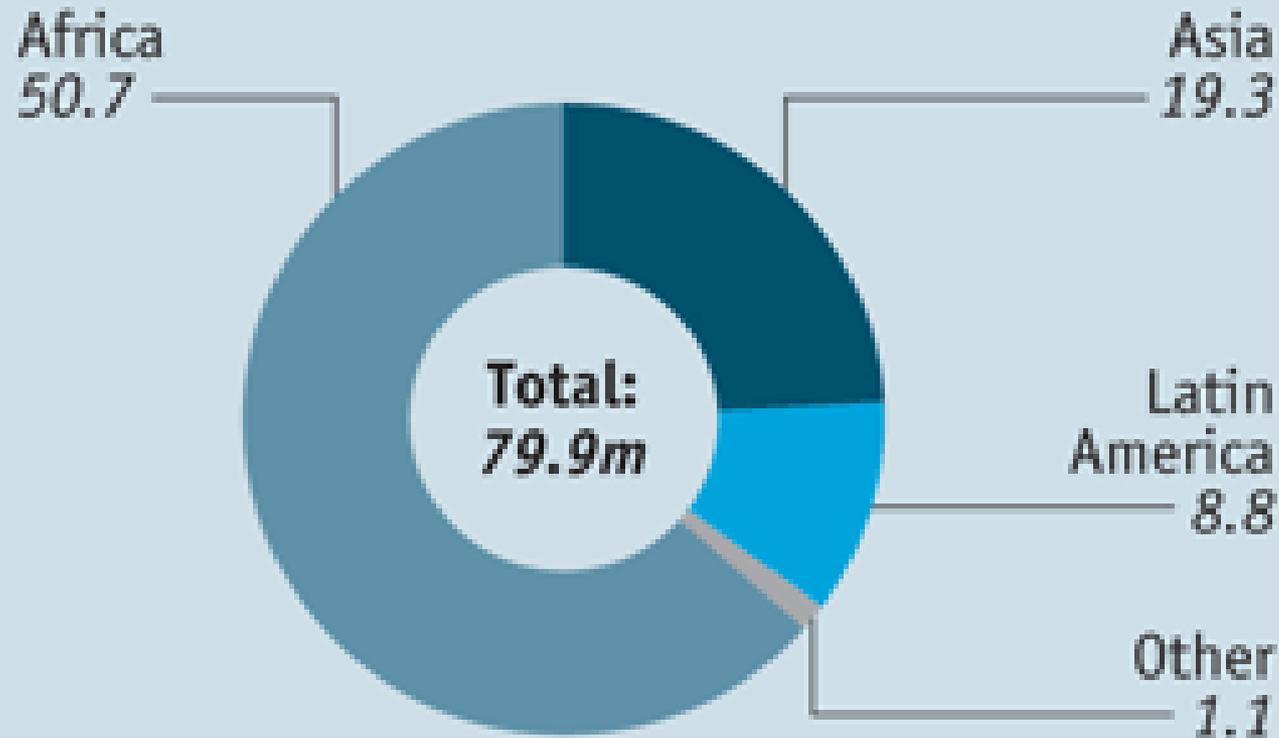
# THE SCRAMBLE FOR LAND

- One of the features following the 2007-08 rise in food prices was leasing of land overseas.
- Investments seemed to be aimed at strategic long-term security rather than short-term profit.  
Included:
  - Korean conglomerate, Daewoo, attempt to lease 1.3mha in Madagascar (40% of its arable land) for biofuel & food. Protests led to fall of government.
  - China, Gulf States, S. Arabia & India have leased land; Saudi negotiating 70% of Senegal's rice-growing area
  - Japan has 3x more land abroad than it has at home
  - Is as much a grab for water as it is for land

# Go Africa

Total area of reported land deals\*, 2001-11

Hectares, m



Source: Oxfam, CIRAD, CDE at University of Bern, International Land Coalition

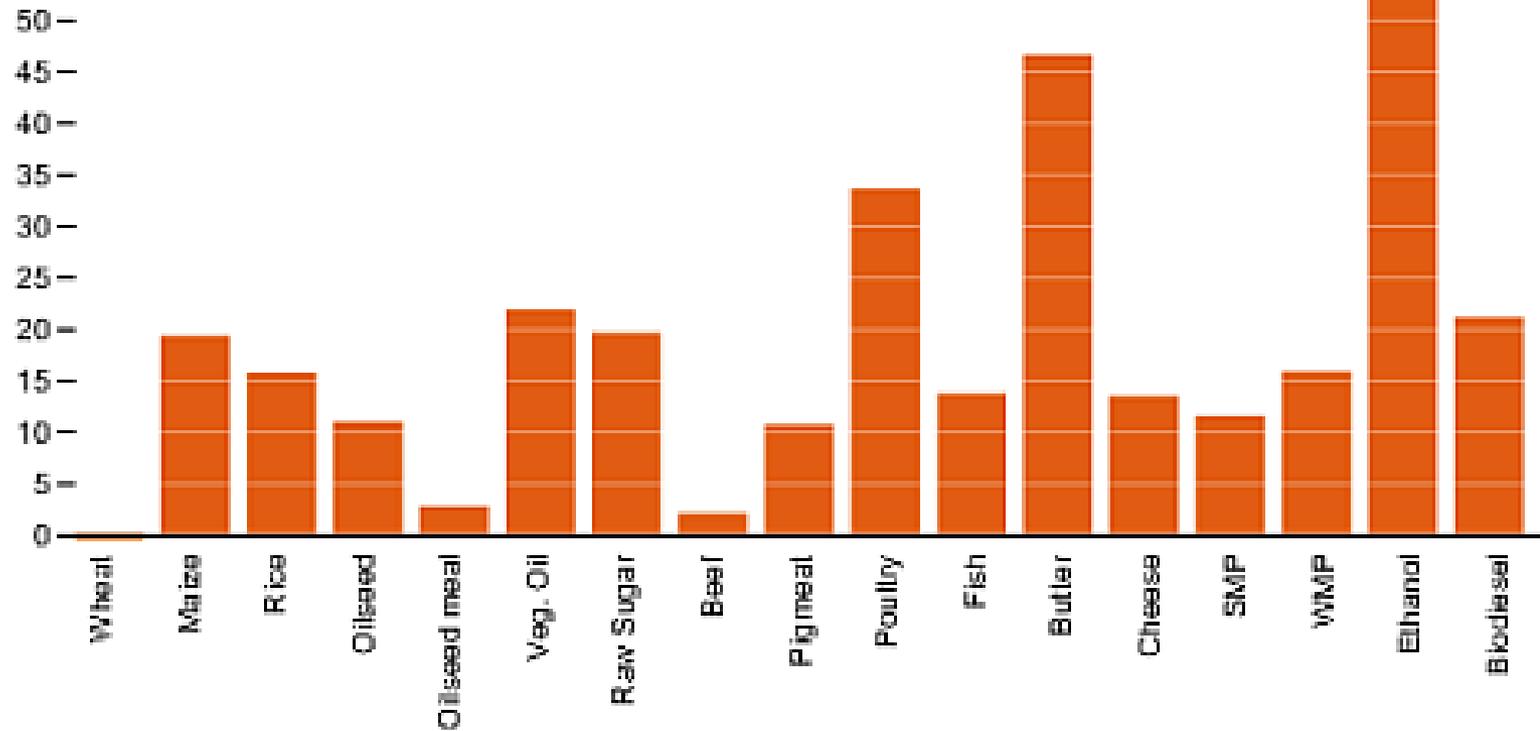
\* Preliminary estimate

# REVIEW

- Significant challenges for global food system:
  - Climate change; freshwater; energy security
- Yet effort by the rich world to secure their own medium-term advantage
- Problem in relying on the market to ensure food & nutritional security for the poor
- Expected increase in food prices of 30% to 2020
  - Not helped by speculation on commodity markets
- What are the implications for political stability?



## Price changes in real terms, % (2011-20 compared to 2001-10)



Source: OECD and FAO

# CONSUMPTION TRENDS

- ◉ *Meatification* of the human diet - worldwide.
- ◉ Nutrition transition in MIC: Inc energy density of diets
- ◉ Resulting in rising levels of overweight/obesity & diet related diseases (diabetes, CVD, cancer) in the South.
- ◉ Intensive livestock systems have huge demand for feed
  - 1/3 of world grain production + 85% soybean
  - Worldwide soya occupies area size of Egypt
- ◉ Food waste: scandalous level of discard in food chain
  - Contract farming grade outs; food service discard
  - UK: 25% of all food purchased by weight thrown away

# RESPONSES: THE WAY FORWARD

- **Global food system requires serious reform:**
  - Must avoid knee-jerk pursuit of productivism as 'solution'
  - Sustainable intensification offers better route to ensure food security for the most vulnerable & mitigation options
  - Work to ensure that N health problems are not replicated through the globalisation of dietary norms
  - Food must be made affordable to those who spend >50% of income on food needs: need for public policy innovation
  - Creating a new economic morality around the global food system, which ensures the human right to food informed by social justice & environmental sustainability.