

The background of the slide features a composite image. In the center, a human hand is shown from the palm side, cupping a small, transparent globe of the Earth. The globe shows the continents in white and the oceans in blue. The hand is rendered in a realistic, slightly blurred style. The background is a vibrant mix of green and blue, with abstract, flowing lines and a grid-like pattern, suggesting a digital or scientific theme. The overall composition is dynamic and visually striking.

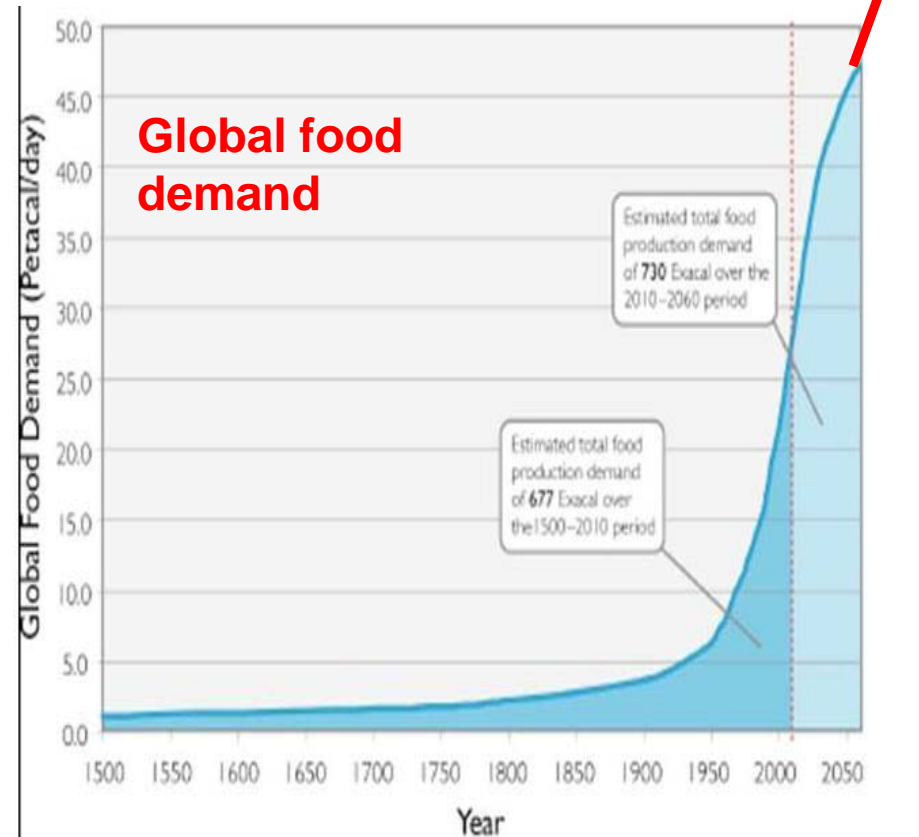
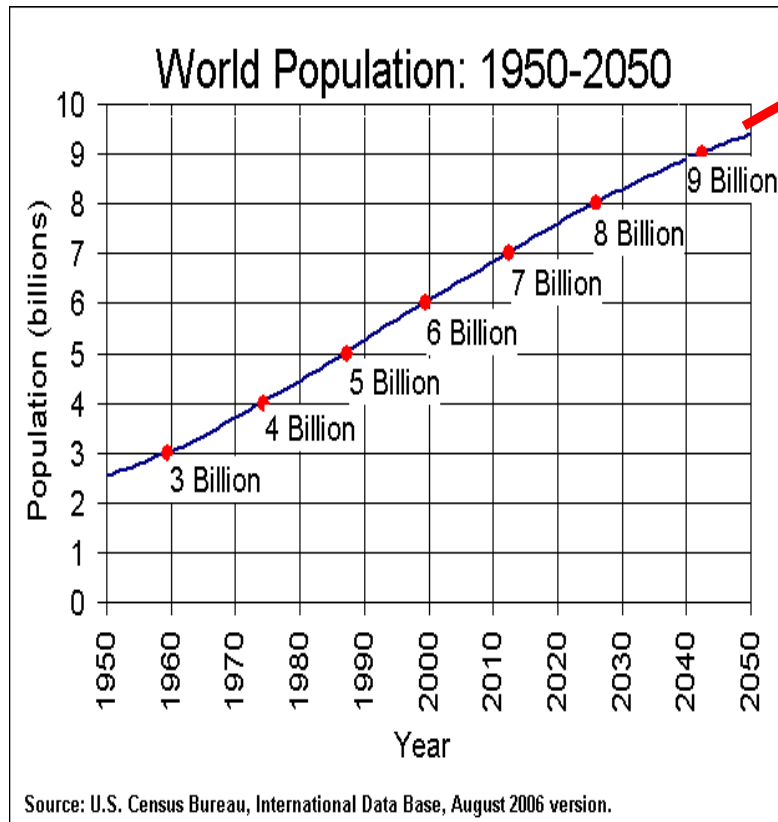
# **The Coming Famine:**

**risks and opportunities for global food security**

Julian Cribb FTSE  
Manjimup, WA  
May 5, 2011



# Rising demand





# Demand + Constraints

## DEMAND:

Population >11.4  
billion by mid 2060s

600 petacalories/day

Total food demand:  
+100-130%

## CONSTRAINTS:

‘Peak water’

‘Peak land’

‘Peak oil’

‘Peak P’

‘Peak fish’

R&D drought

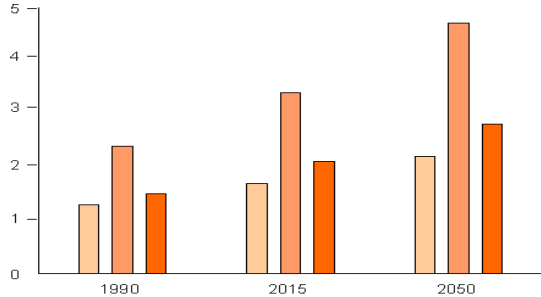
Climate extinction





# Peak Water

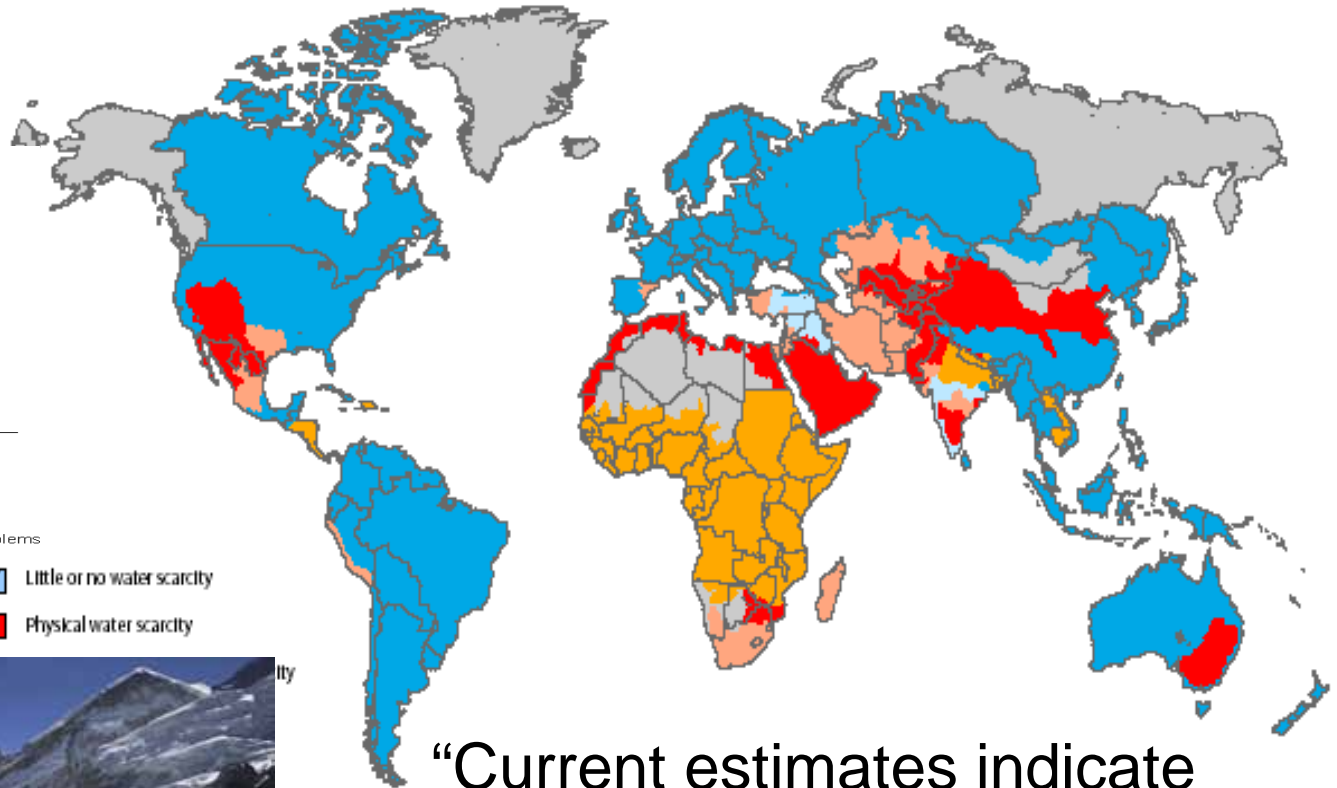
(population in billions)



Numbers of people with:

- no water availability problems
- few to moderate water availability problems
- moderately severe to severe water availability problems

Little or no water scarcity  
Physical water scarcity

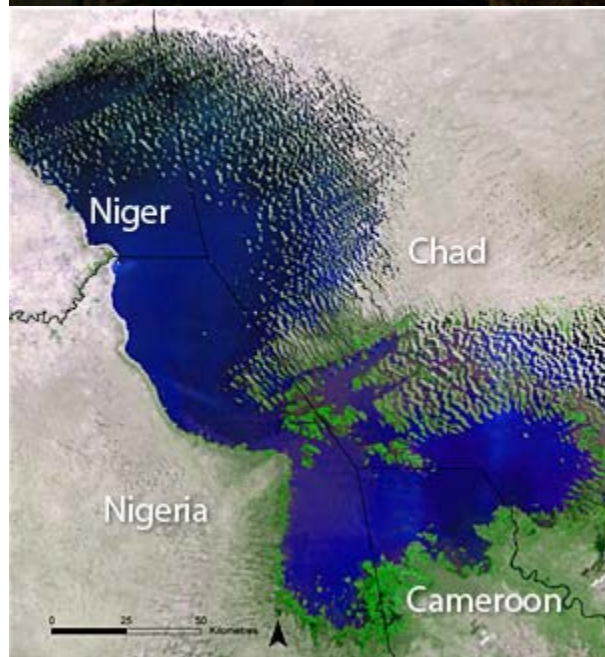


“Current estimates indicate that we will not have enough water to feed ourselves in 25 years time...”

– Colin Chartres, IWMI .



# Vanishing lakes, rivers & aquifers



Murray mouth ▲  
◀ Lake Chad





## A thirsty race...

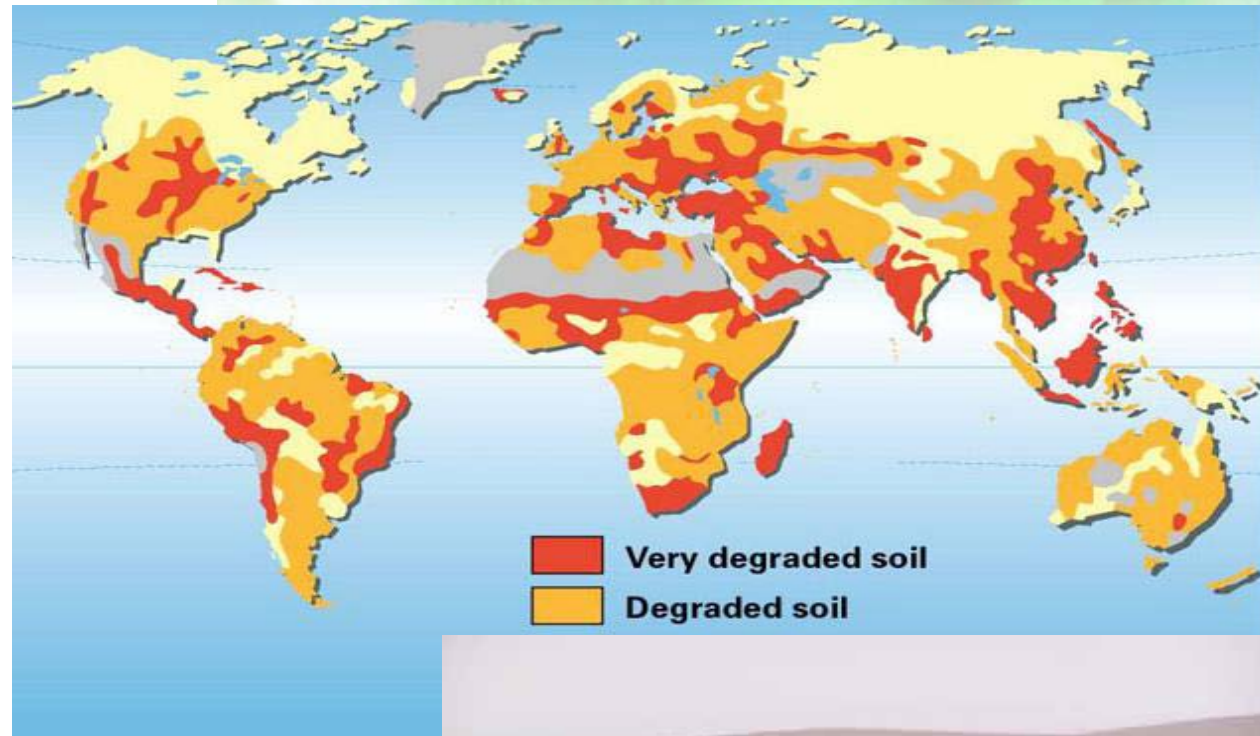
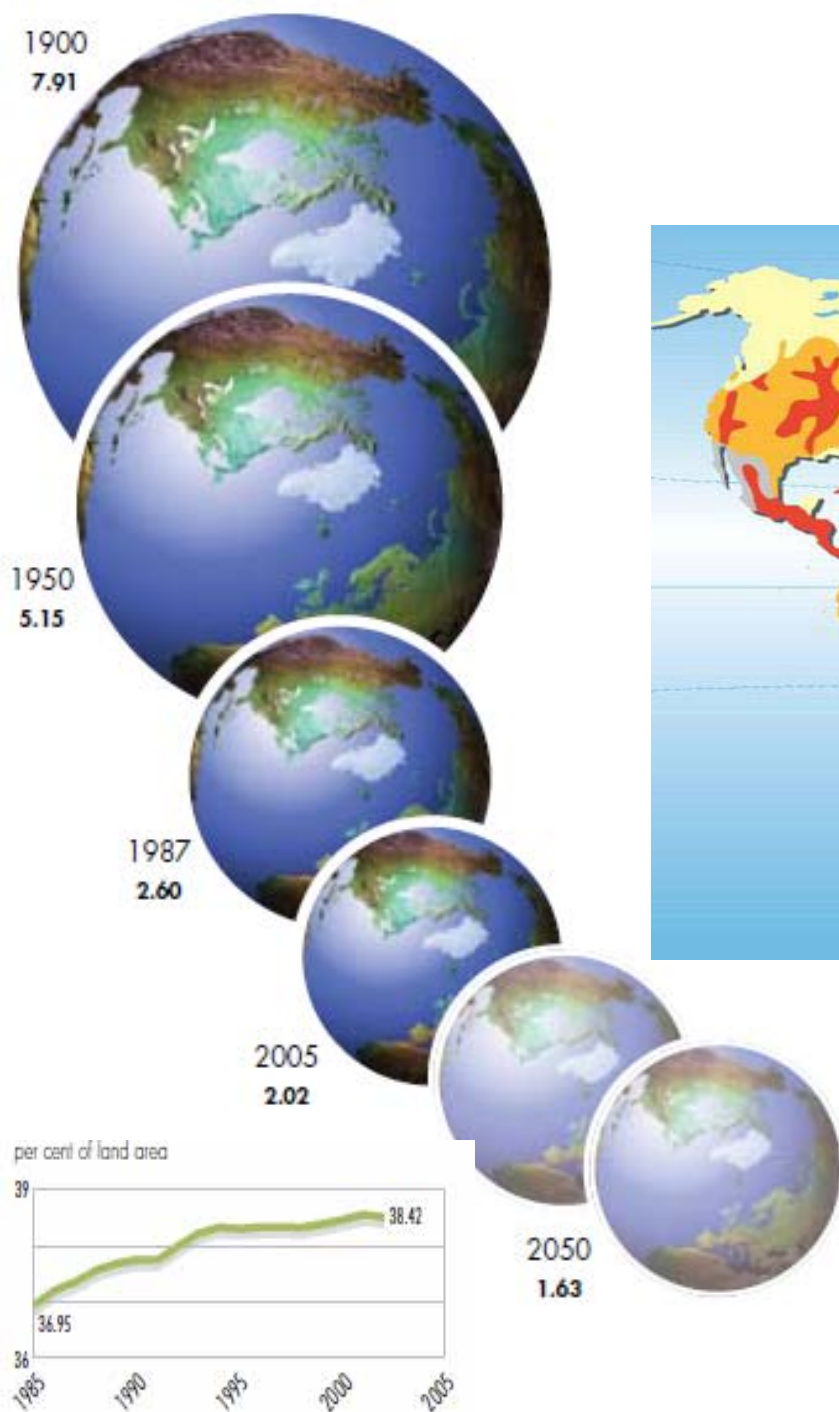
Total human water use:  
7450 cubic kilometres

Average person uses  
1240 tonnes/years



Food	Litres to grow
Slice of bread	40 litres
Tomato	13
Cup of coffee	140
Glass of milk	200
Egg	135
Glass of wine	120
Kilo of grain	1500
Cotton T-shirt	4000
Kilo of chicken	6000
Kilo of beef	15000

# Peak Land







# Megacities: mega-risks



By 2030...

	Population (in millions)
Jakarta	37
Tokyo-Yokohama	36
Manila	36
Mumbai	30
Delhi	30
New York	20

By 2050...

7.7 billion living in cities  
occupying land area = China

Will use:

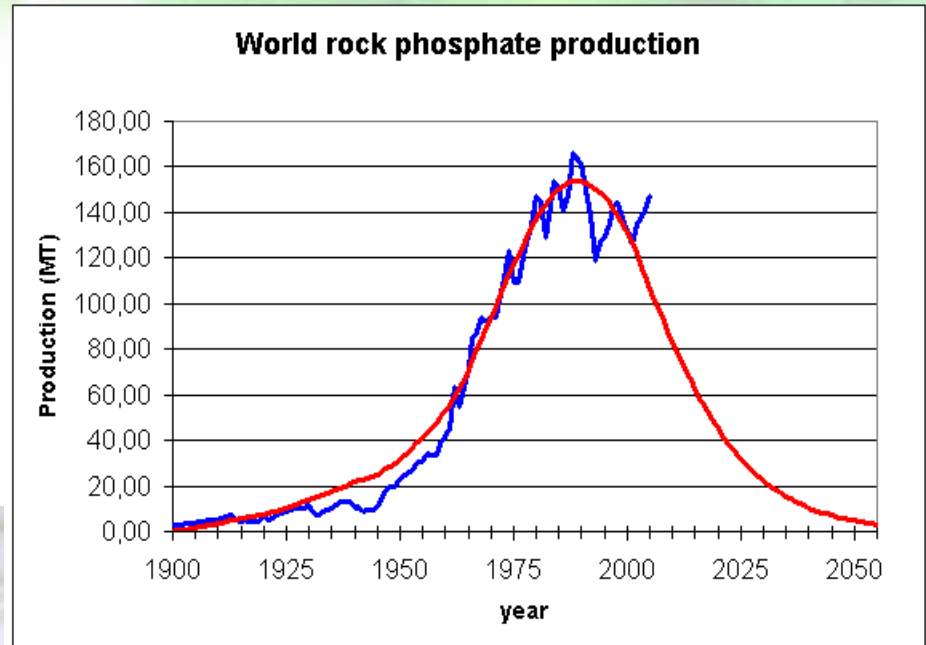
2800 cu kms water  
3 bn tonnes of P



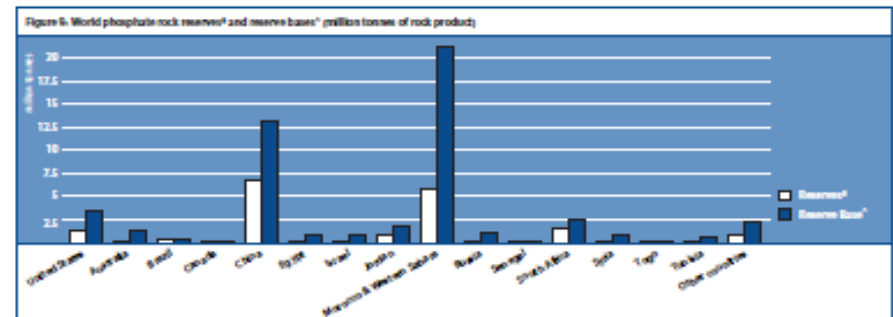
# Nutrient crisis



**Nutrient  
pollution**



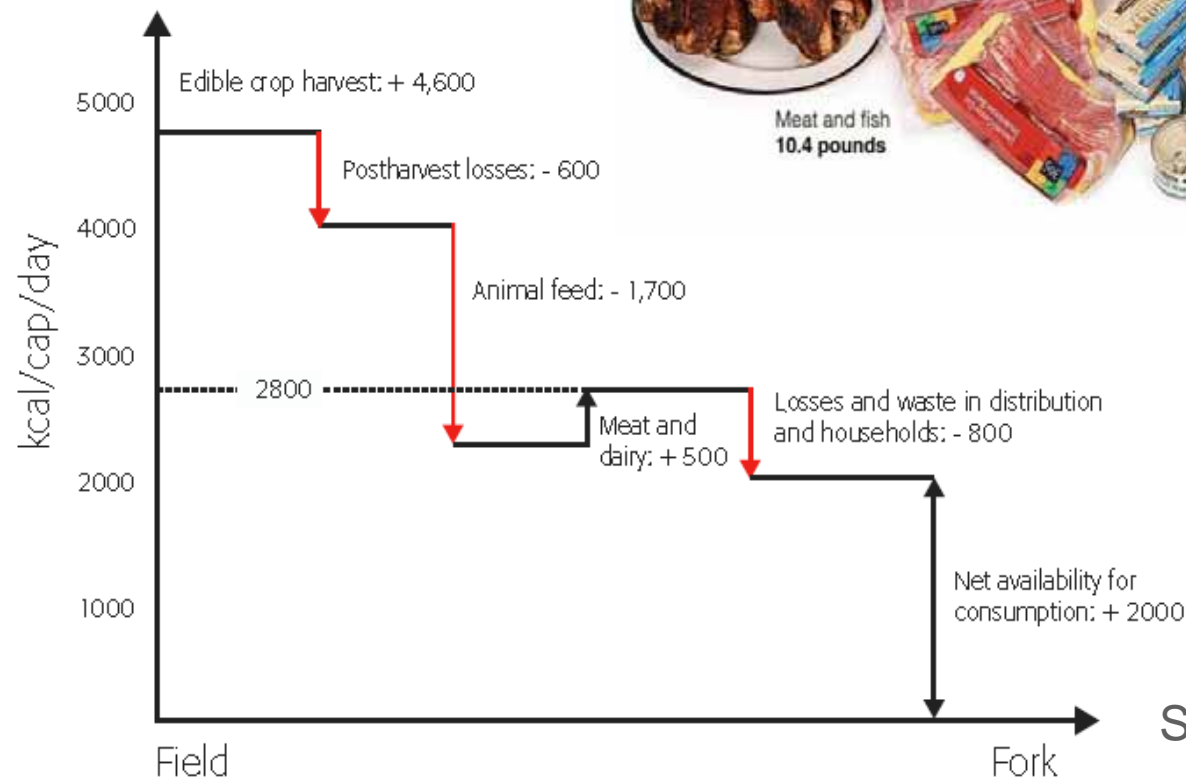
**Peak phosphorus ▲**



**▲ World reserves**



# The Great Waste



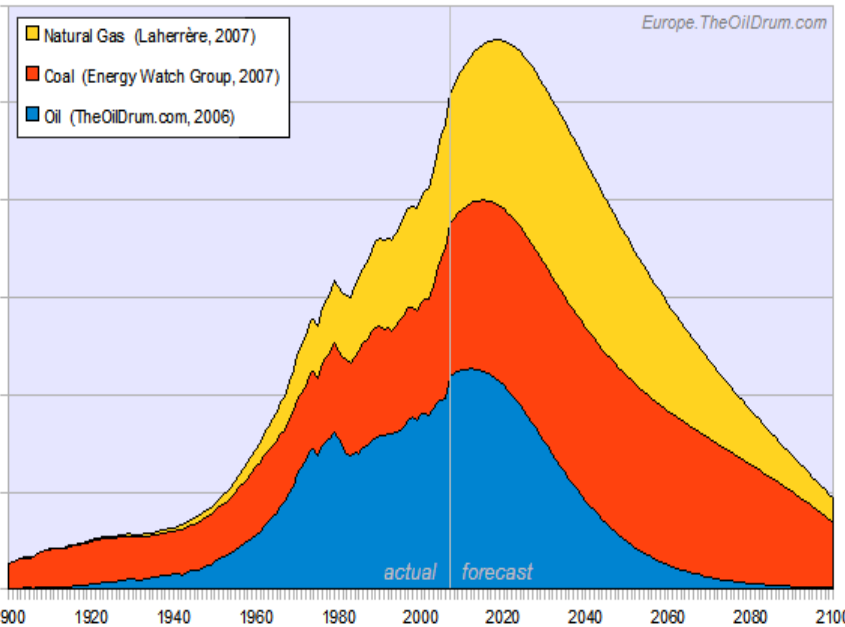
▲ Food wasted by avg. family in a month. (USDA)

SIWI 2008



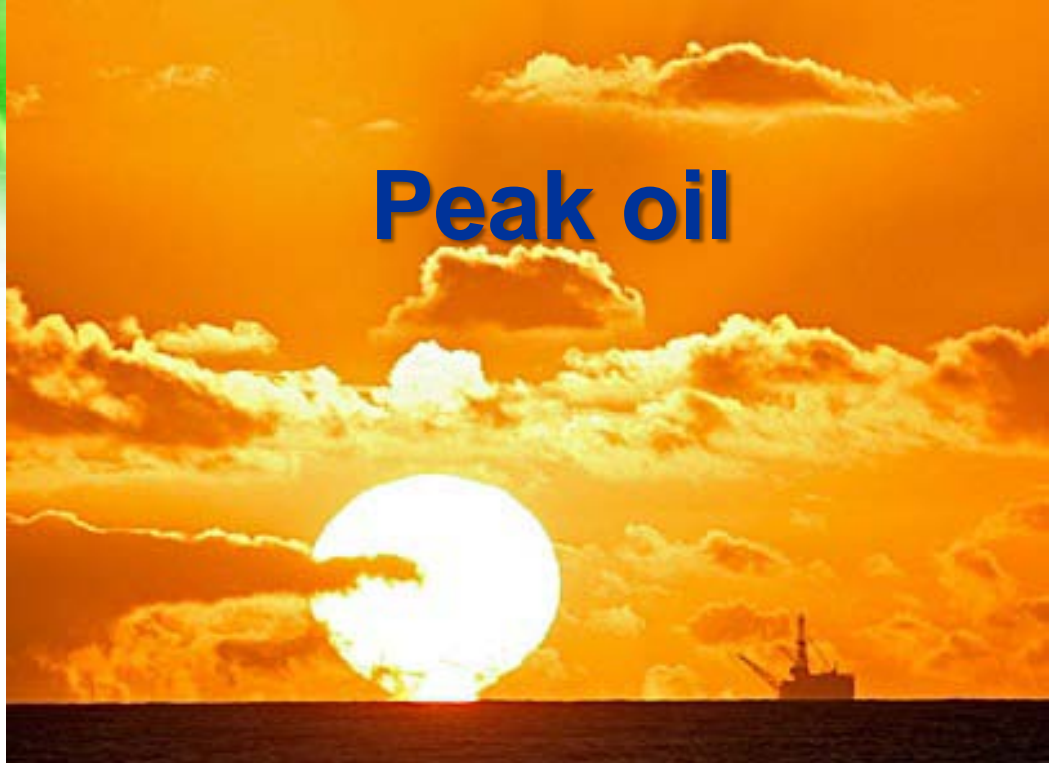
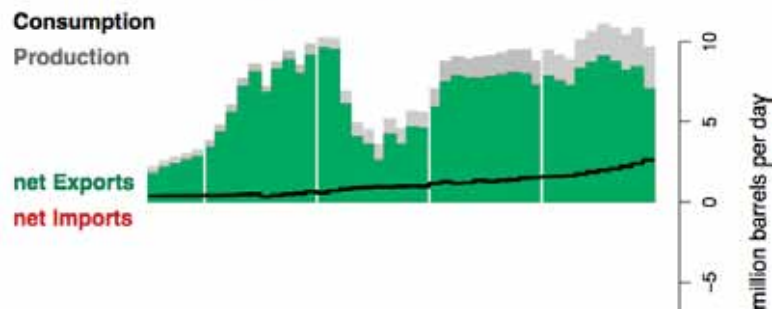


Conventional Fossil Fuels



### Saudi Arabia : Oil

2009 exports decreased by 16. %



## Peak oil



Algae farming



# Floundering fisheries



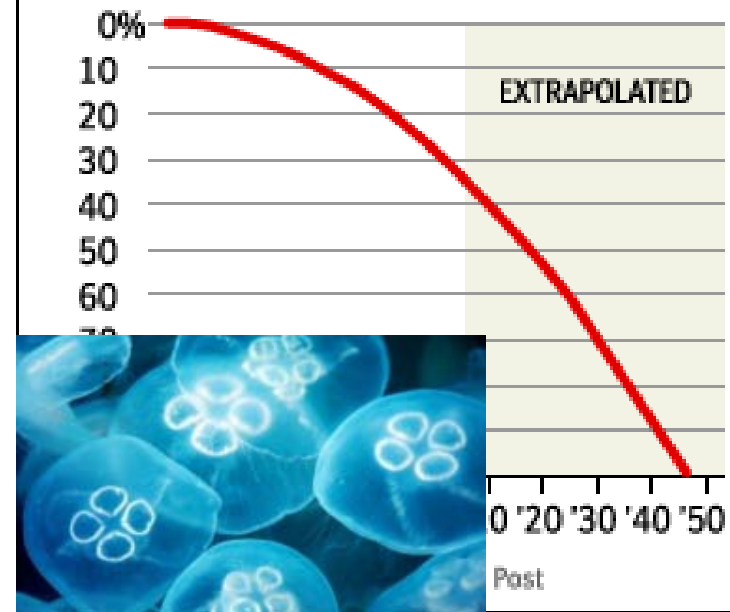
**“The maximum wild capture fishery potential from the world’s oceans has probably been reached .”**

- FAO

## Fisheries' Downfall

If current fishing trends continue, all of the commercial fisheries will have collapsed by 2050, according to a peer-reviewed study.

### Percentage of fisheries collapsed

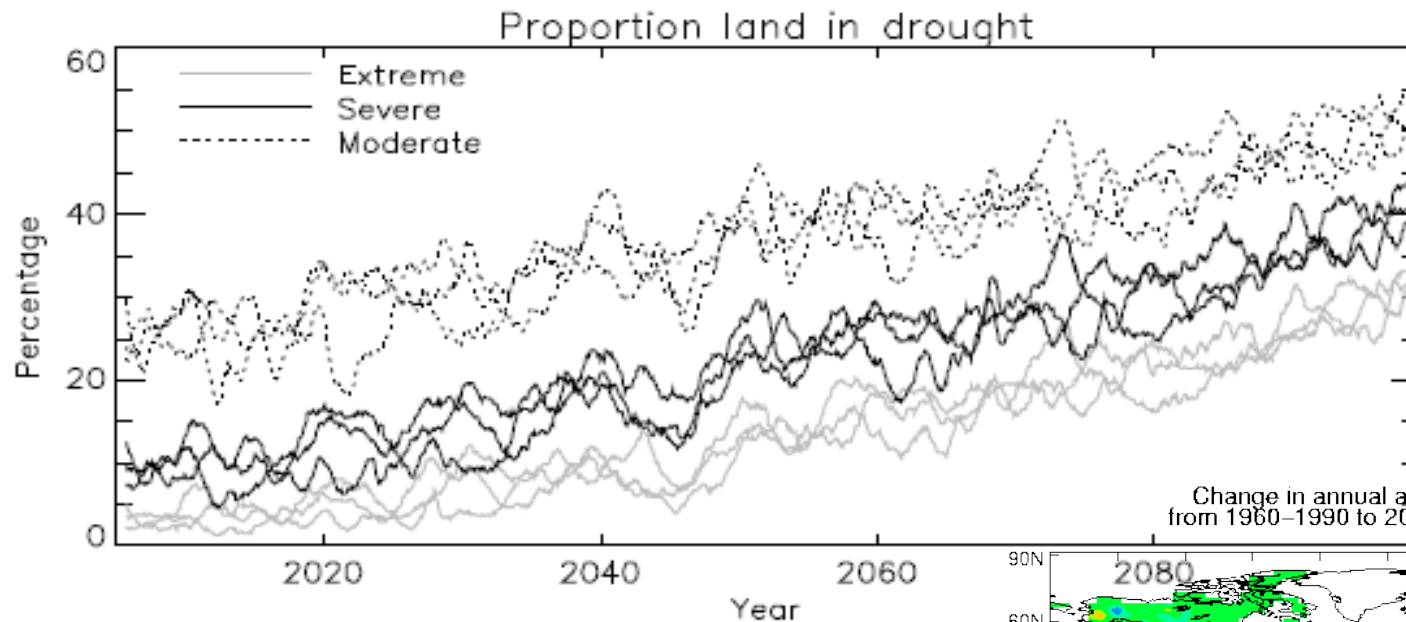




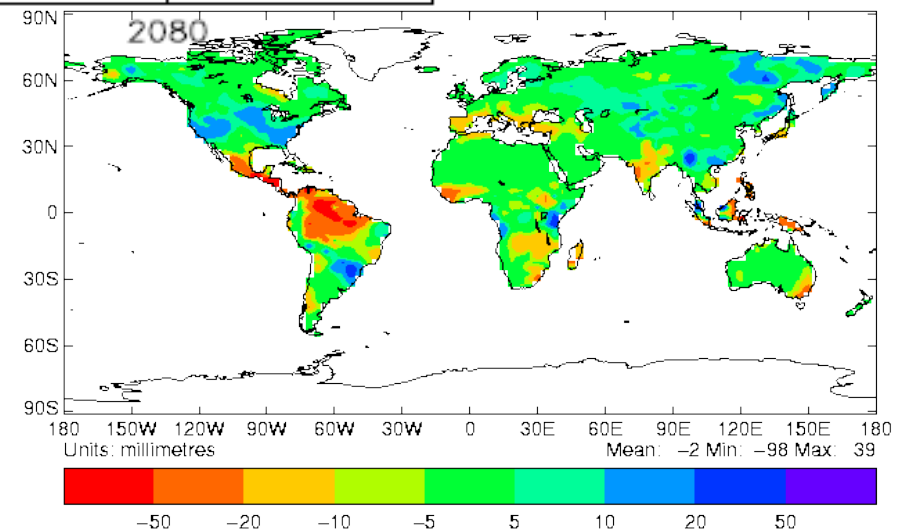


# Climate instability

More floods



Change in annual average soil moisture content from 1960–1990 to 2070–2100 from HadCM2 IS92a



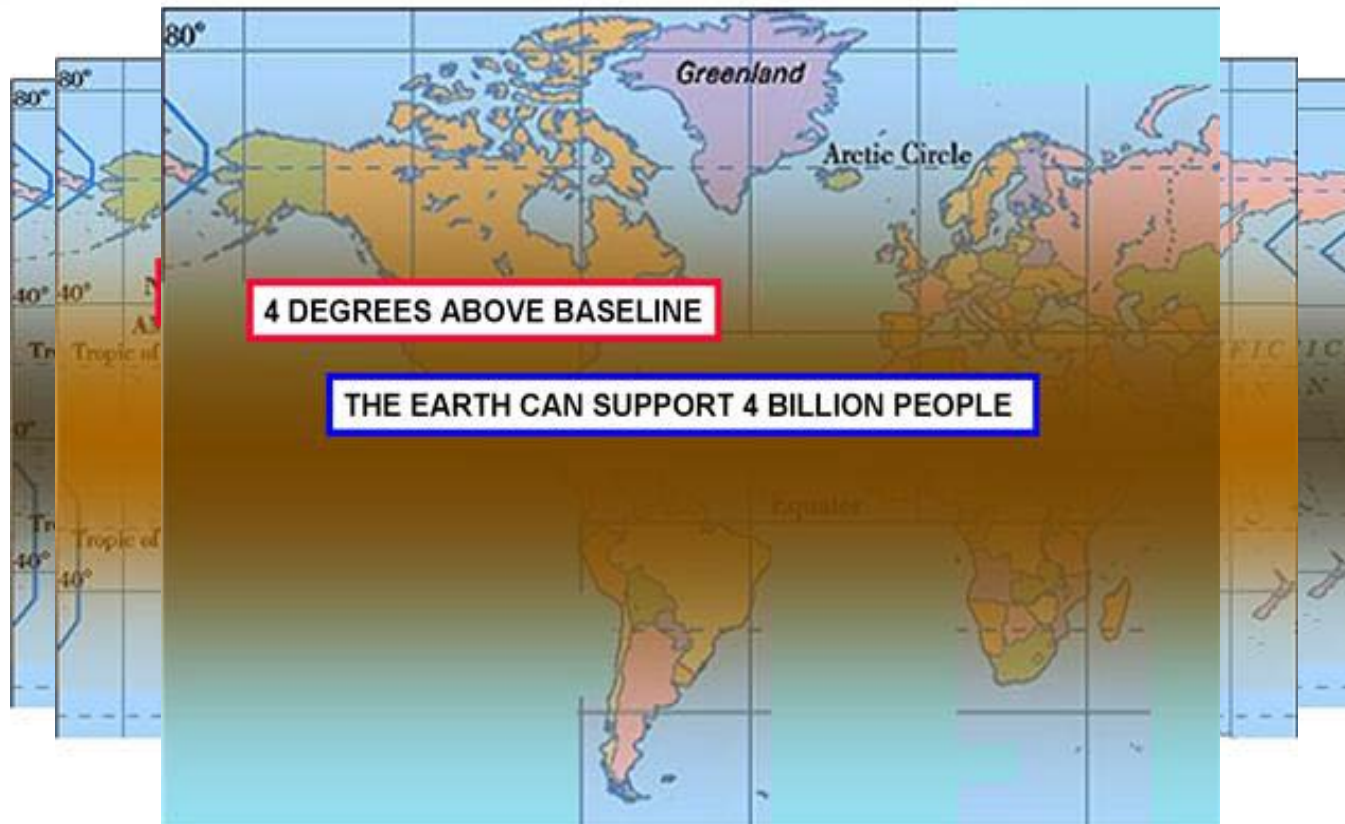
▲ 4x more drought

Global soil moisture forecast ►

**Scientific consensus:  
25% less food**



# Climate impact on food ?



Source: Dr James Martin, 21<sup>st</sup> Century School, Oxford: Commonwealth Lecture 2010





## The farmers' challenge

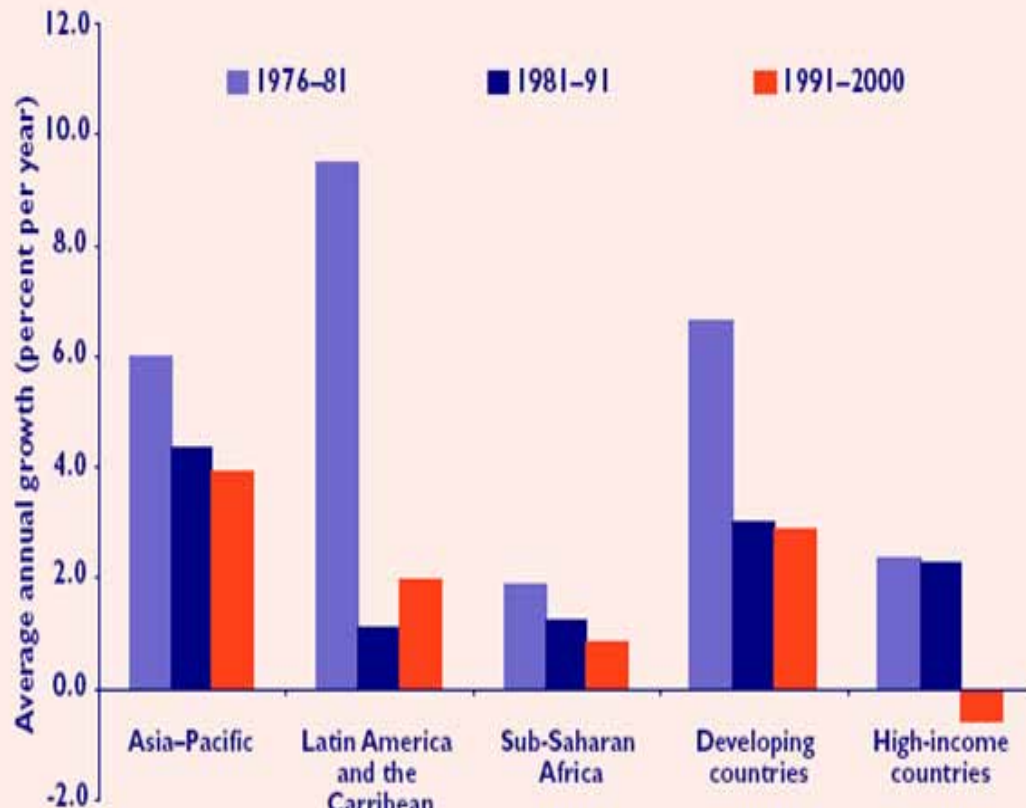
**Double** global food output with:

- **half** the present fresh water
- far **less** land
- **no** fossil fuels (eventually)
- **scarce** and very **costly** fertilisers
- **less** technology
- more **drought** & climatic variability.

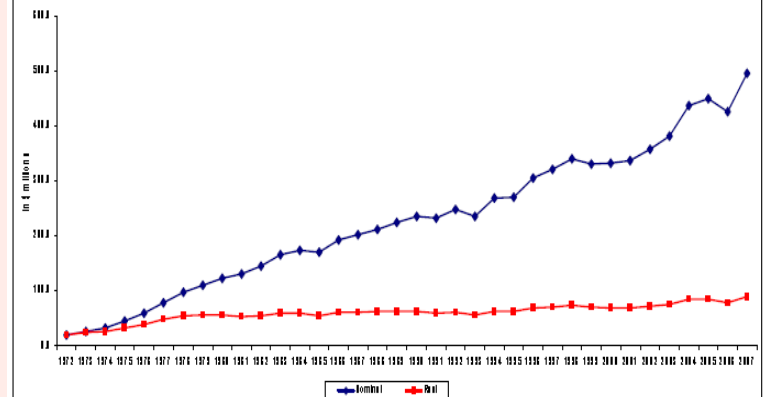


# Knowledge drought

Figure 1 Public agricultural R&D spending trends

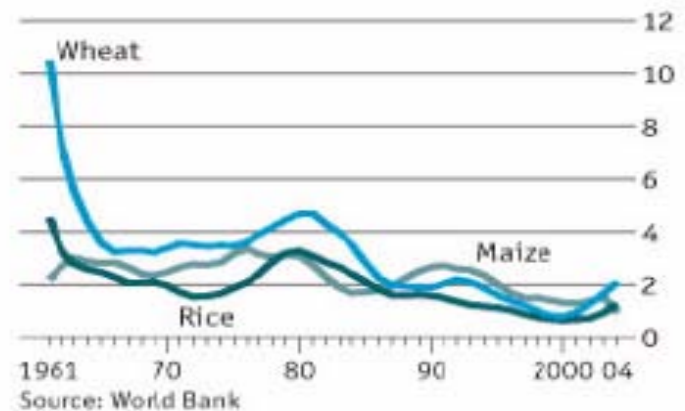


CGIAR Total Funding Trends



## Diminishing returns

Crop yields in developing countries  
Annual average growth rate, %

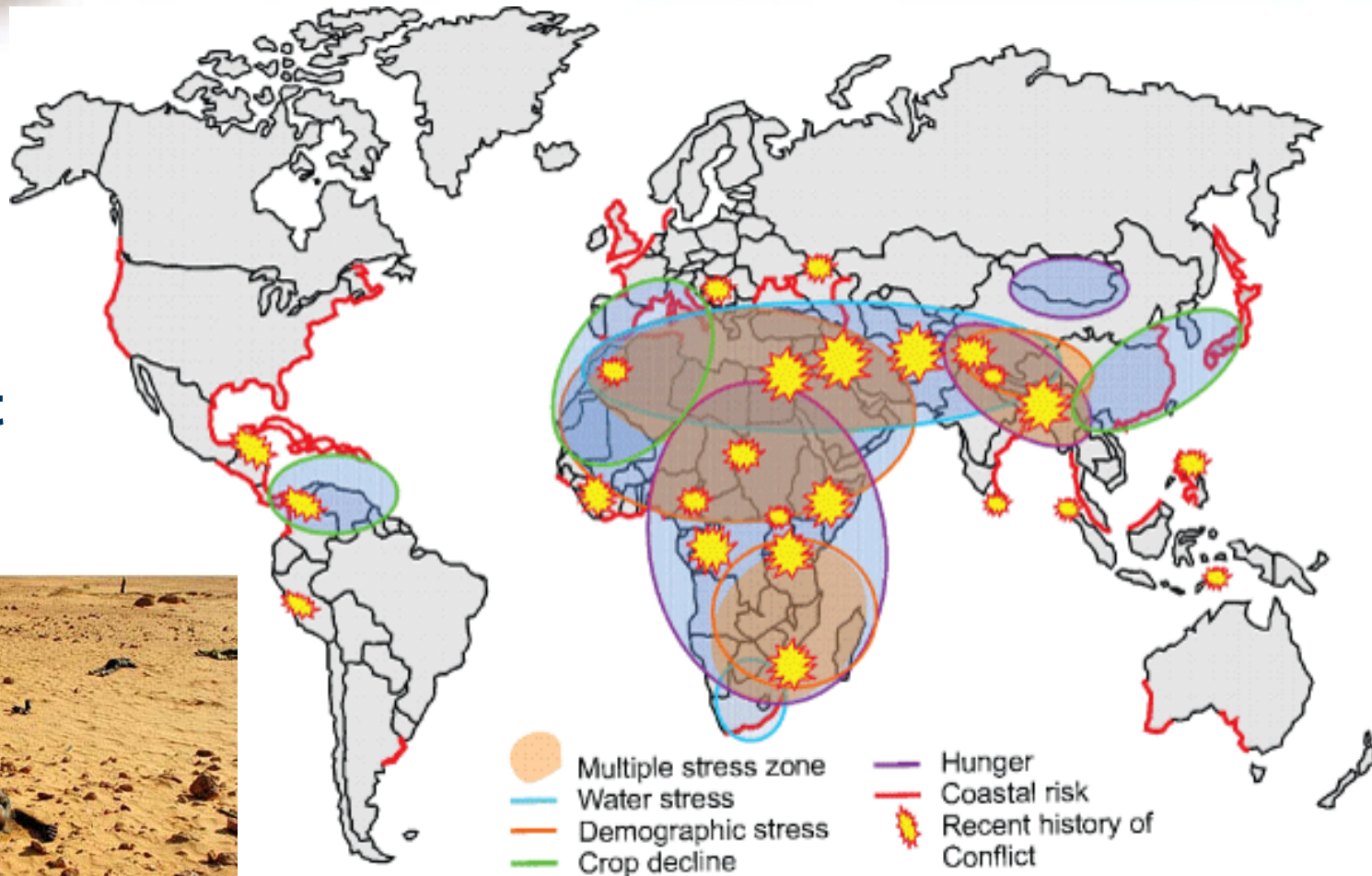






# Future conflicts

**UK Ministry  
of Defence  
threat  
assessment  
2008**





# Soaring food prices



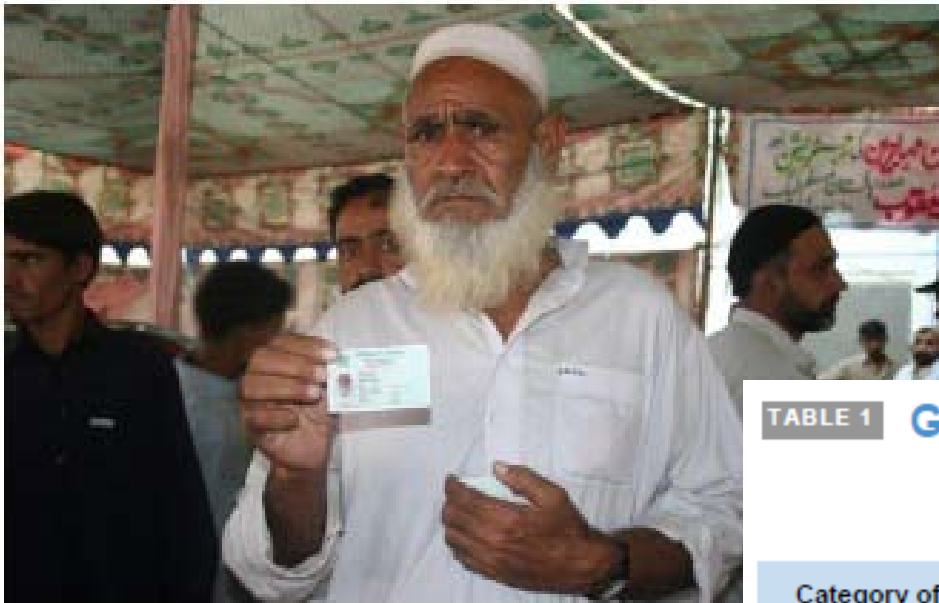
Egypt's riots  
began with food  
price protests







# Rising tide



**Refugees: 50m +**

**Migrants: 200m +**

**TABLE 1** Global forced displacement | 2008-2009 \*

Category of displaced population	2008 (in mln)		2009 (in mln)	
	Total	Protected/ assisted by UNHCR	Total	Protected/ assisted by UNHCR
Refugees under UNHCR mandate	10.5	10.5	10.4	10.4
Refugees under UNRWA mandate	4.7	—	4.8	—
<b>Total number of refugees</b>	<b>15.2</b>	<b>10.5</b>	<b>15.2</b>	<b>10.4</b>
Asylum-seekers (pending cases)	0.8	0.2	1.0	0.2
Conflict-generated IDPs	26.0	14.4	27.1	15.6
<b>Total number of refugees, asylum-seekers and IDPs</b>	<b>42.0</b>	<b>25.1</b>	<b>43.3</b>	<b>26.2</b>



## **Solutions 1: reinvent food, recycle**

- **Double** ag R&D to \$80bn globally a year
- **Invest** \$80bn to share the knowledge among 1.8 billion farmers
- **Reinvent** farming systems to use less land, water, energy, nutrients, pesticides
- **End waste**: recycle all organic waste and water into new food & resource industries
- **Educate** people to respect and value food.



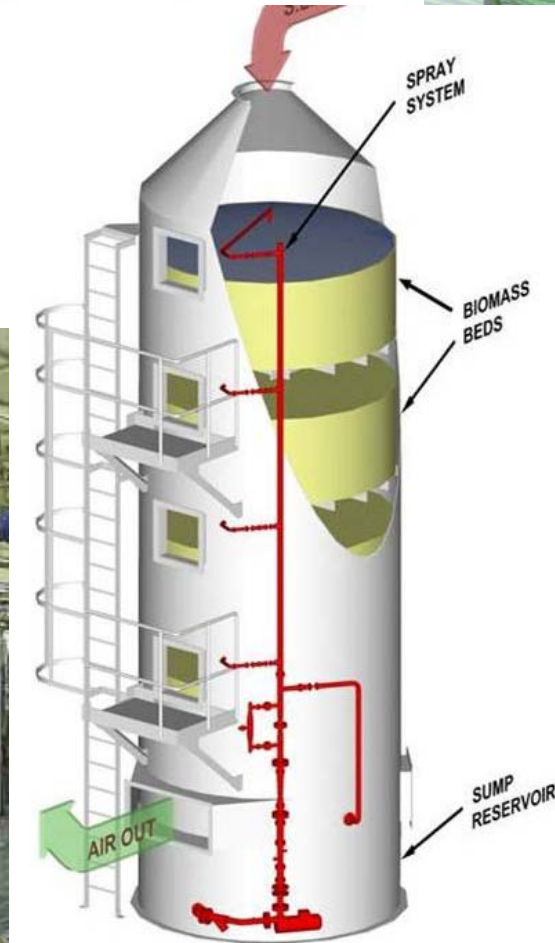
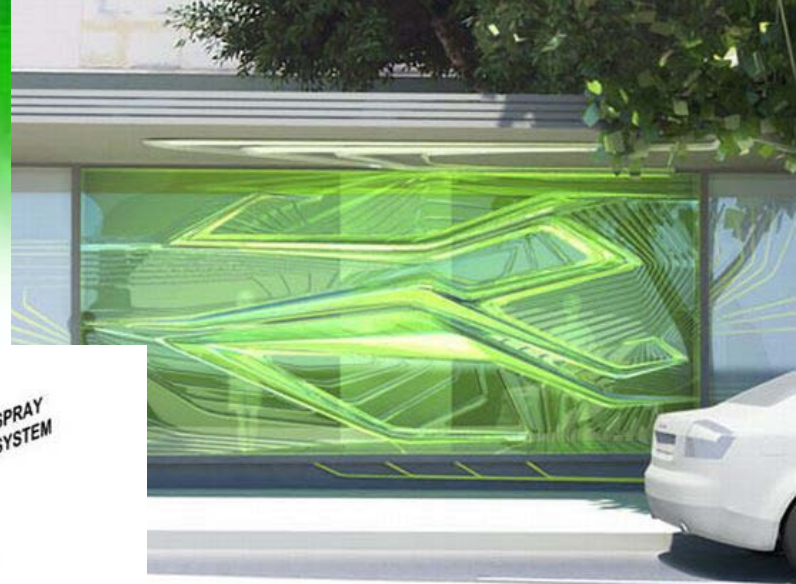


# Solutions: Vegies in the sky





# Solutions: Biocultures







# Solutions: 23,000 new crops







**Revegetate, recarbonise, rehydrate**







## Solutions: A Food Year

- A **Food Year** in every junior school on the planet
- Teach new respect for food: how to eat for health *and* sustainability



OR  
?





## **Solutions: pay more for food**

- Today's globalised food prices
  - Signal farmers to grow less
  - Destroy land, water and climate
  - Prompt colossal waste of food
  - Promote over-nutrition & kill consumers
  - Increase poverty and hunger
  - Undermine global food security
  - Destroy rural communities and ag research
- **Food prices must increase**
- **Barriers to food trade must be abolished**





## Australia's role...

- **Lead** in low-input farming systems
- **Lead** in urban recycling and novel food production systems
- **Value** farmers and pay them fairly
- **Share** our farm knowledge globally
- Teach consumers to **respect** food
- Recognise sustainable food research is **defence spending.**



**Thank you**

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