

What Will It Take To Feed the World Sustainably?

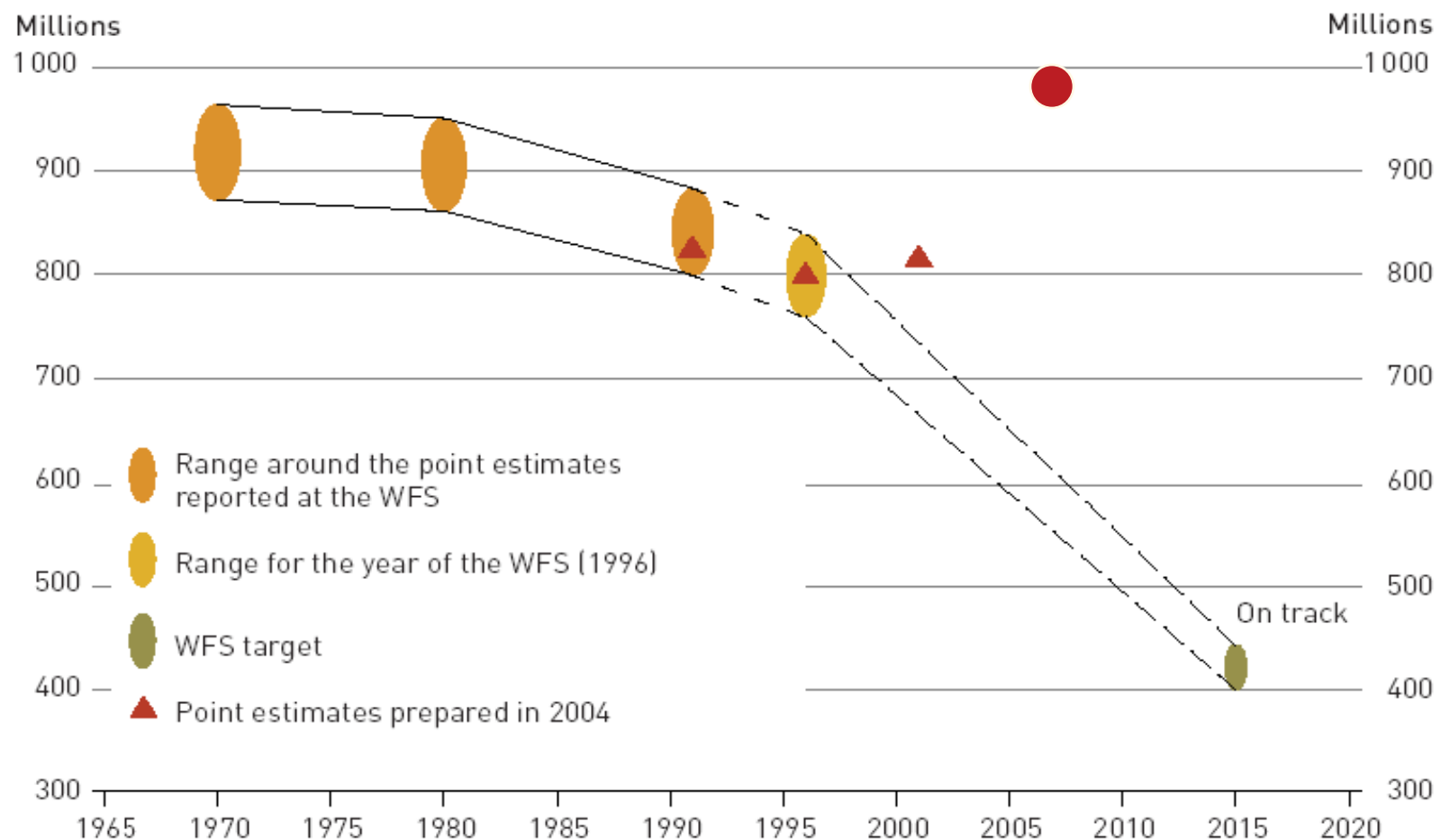


Roz Naylor, Stanford University, October 2008





Number of undernourished in the developing world: observed and projected ranges compared with the World Food Summit target

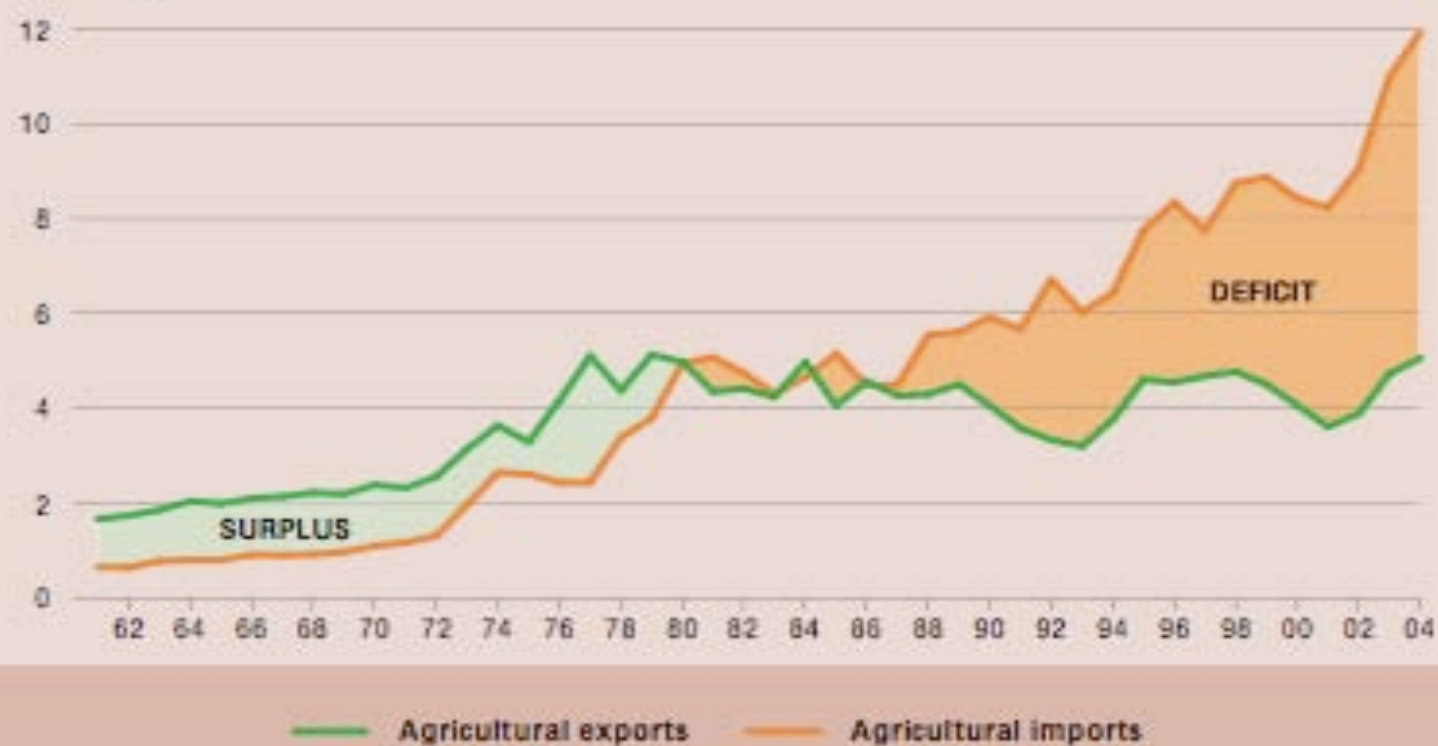


Source: FAO

FIGURE 27

Agricultural trade balance of least-developed countries

Billion US\$



Source: FAO.

Challenges for 21st Century

- Reduce global hunger (food security)
- Meet world food demand with sustainable agricultural practices
- Food safety

Population Growth

	2000	2025	2050
China	1,270	1,450	1,410
India	1,050	1,450	1,660
Less Developed Countries	4,930	6,752	7,946
WORLD TOTAL	6,120	8,010	9,190

Source: UN Population Division Population Database (2006 Revision)
<http://esa.un.org/unpp/index.asp>



Population Growth

	2000	2025	2050
China (millions)	1,270	1,450	1,410
India	1,050	1,450	1,660
Less Developed Countries	4,930	6,752	7,946
WORLD TOTAL	6,120	8,010	9,190

Source: UN Population Division Population Database (2006 Revision)
<http://esa.un.org/unpp/index.asp>



Income Growth

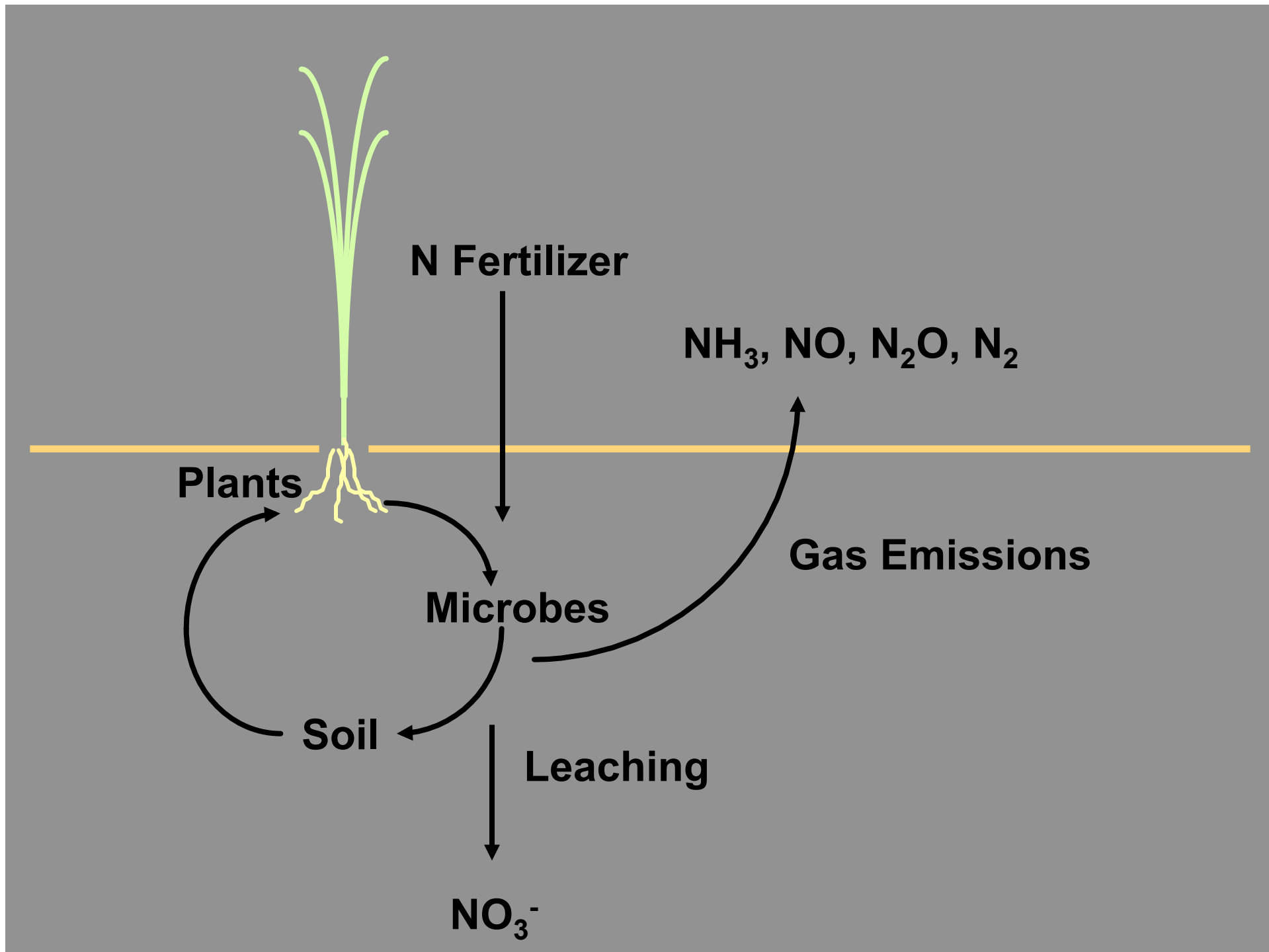




Green Revolution



- New plant architecture & shorter maturity length
- Fertilizer and water inputs
- Disease/pest resistance
- Improved animal breeds
- Information technology





“Poets -- and city folks -- love to romanticize agriculture, portraying it as some sort of idyllic state of harmony between humankind and nature. How far this is from the truth! Since Neolithic man domesticated the major crop and animal species some 10-12 millennia ago, agriculture has been a struggle between the forces of natural biodiversity and the need to produce food under increasingly intensive production systems.”

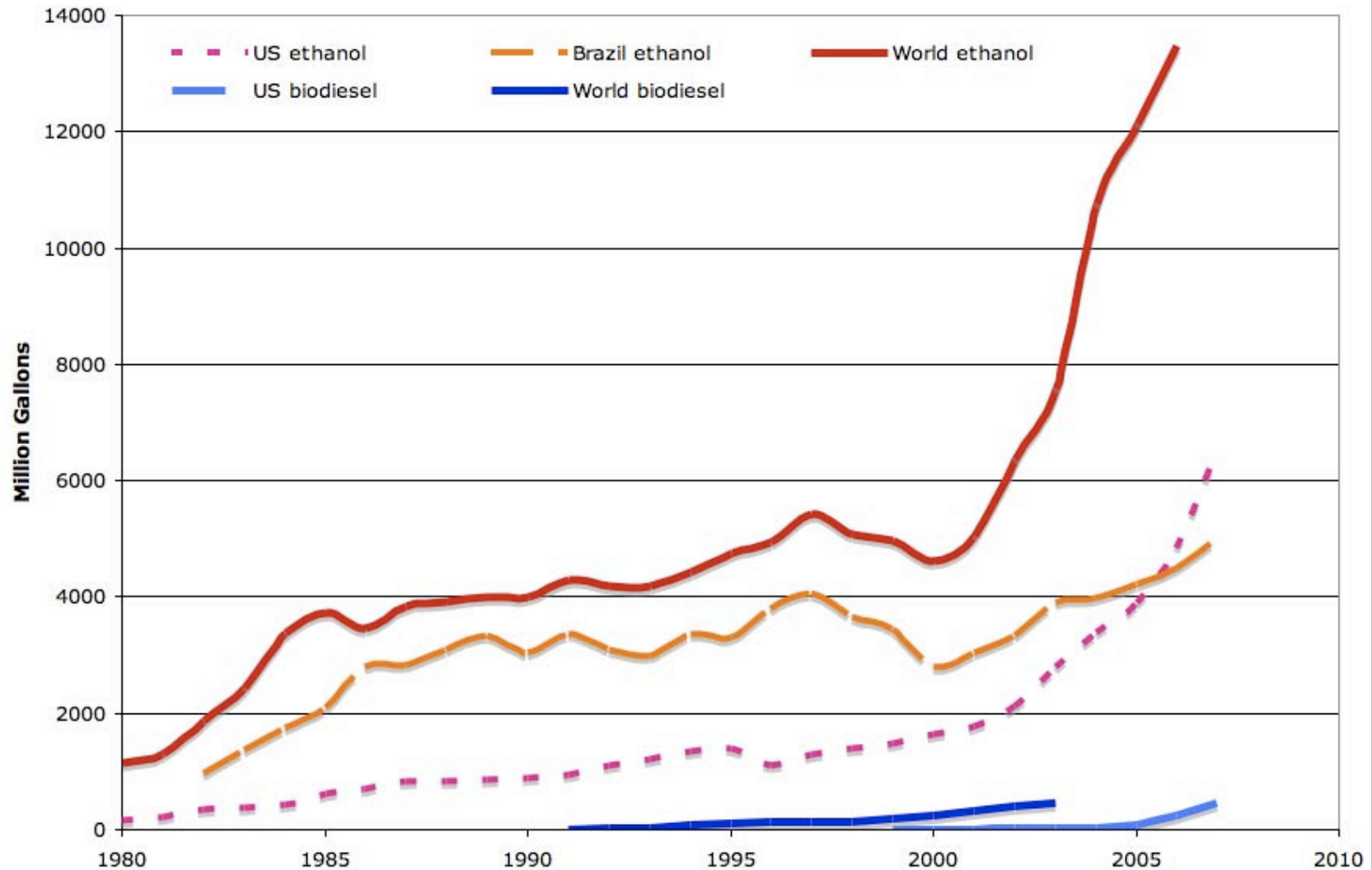
-- Norman Borlaug (2002)



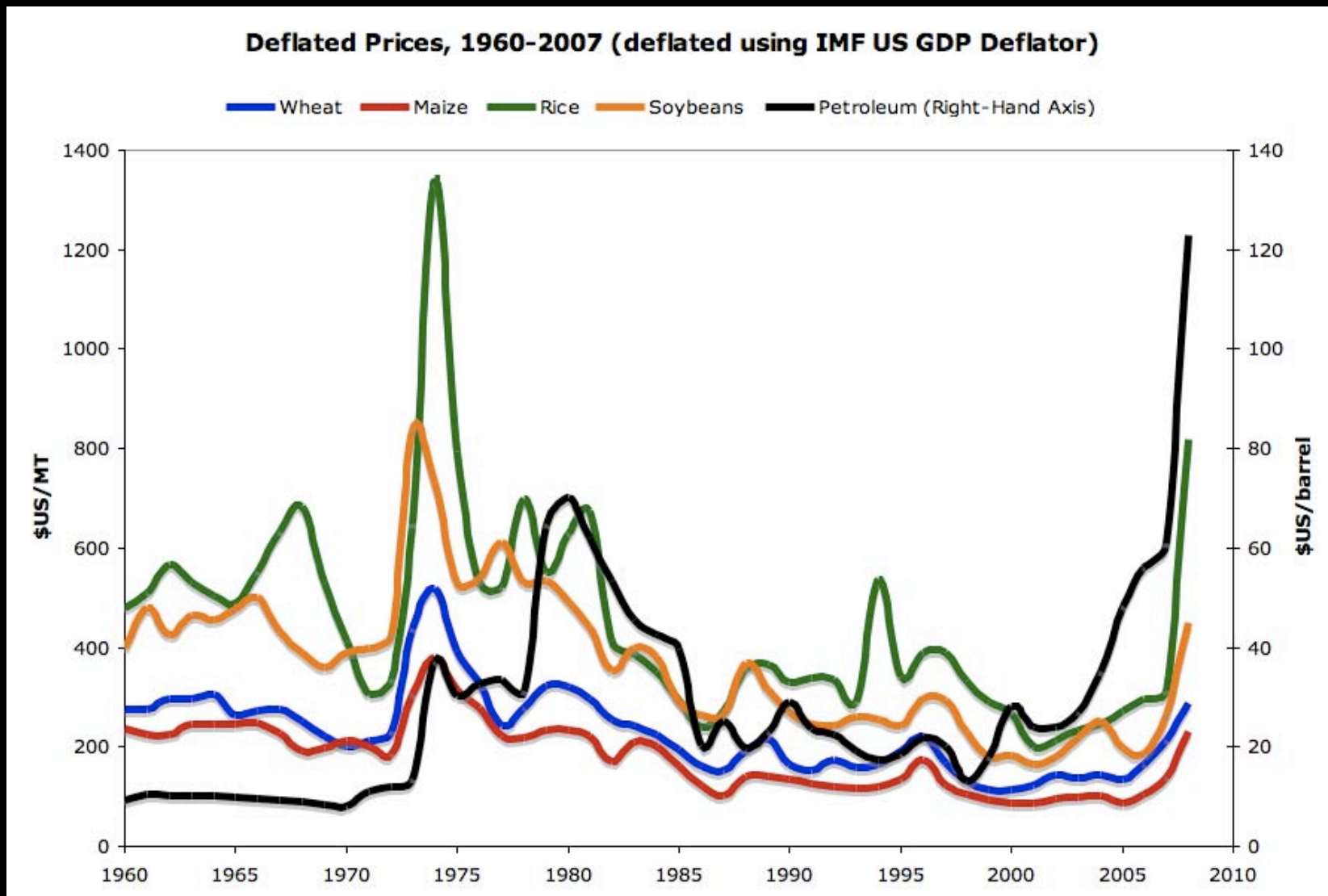


Biofuels Production, 1980-2007

Sources: www.biodiesel.org, www.ethanolrfa.org,
http://www.earth-policy.org/Updates/2005/Update49_data.htm



Energy and Commodity Prices 1960-Present

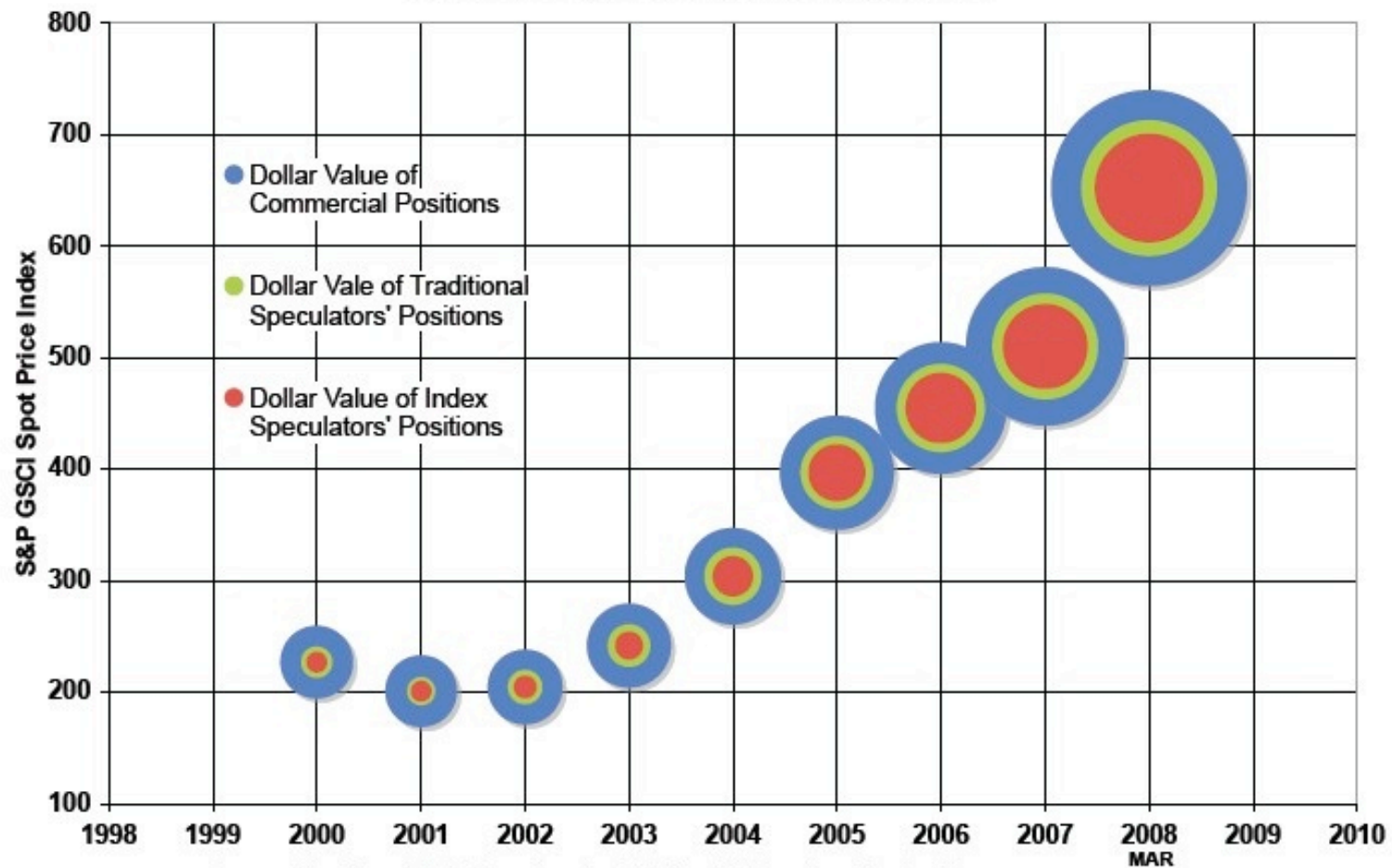


Turmoil in Global Food Markets

Question: Are biofuels the culprit?

- Tight markets: shock the system
- Policy mandates
- Substitution (crops, end uses)
- Speculation

Commodity Futures Market Size

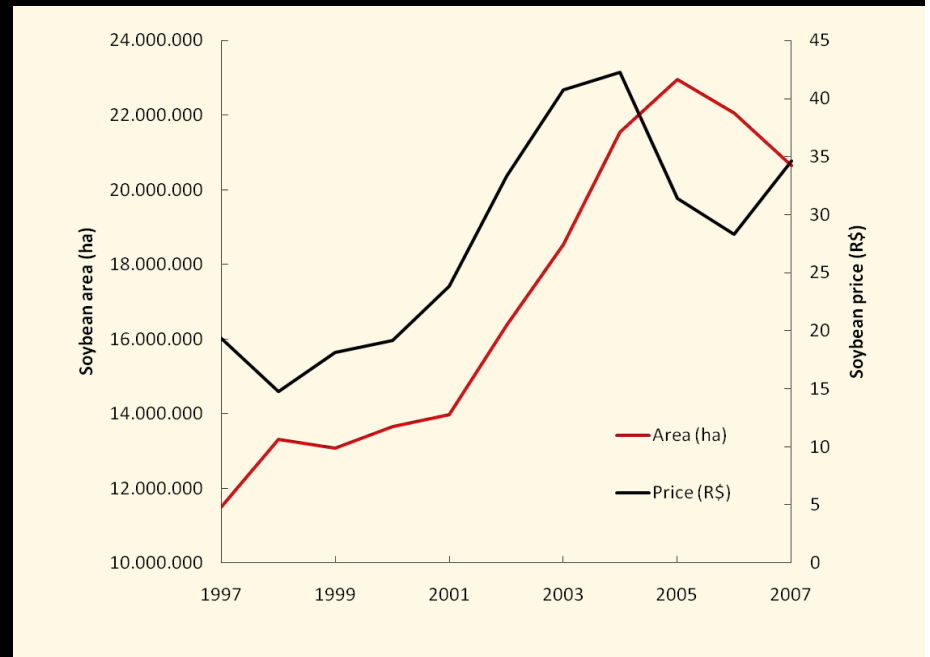


Source: Bloomberg, CFTC Commitments of Traders CIT Supplement, calculations

Soybean Growth in Brazil



photo by Leomar José Mess
Novo Tempo Press



Source: Luiz Martinelli

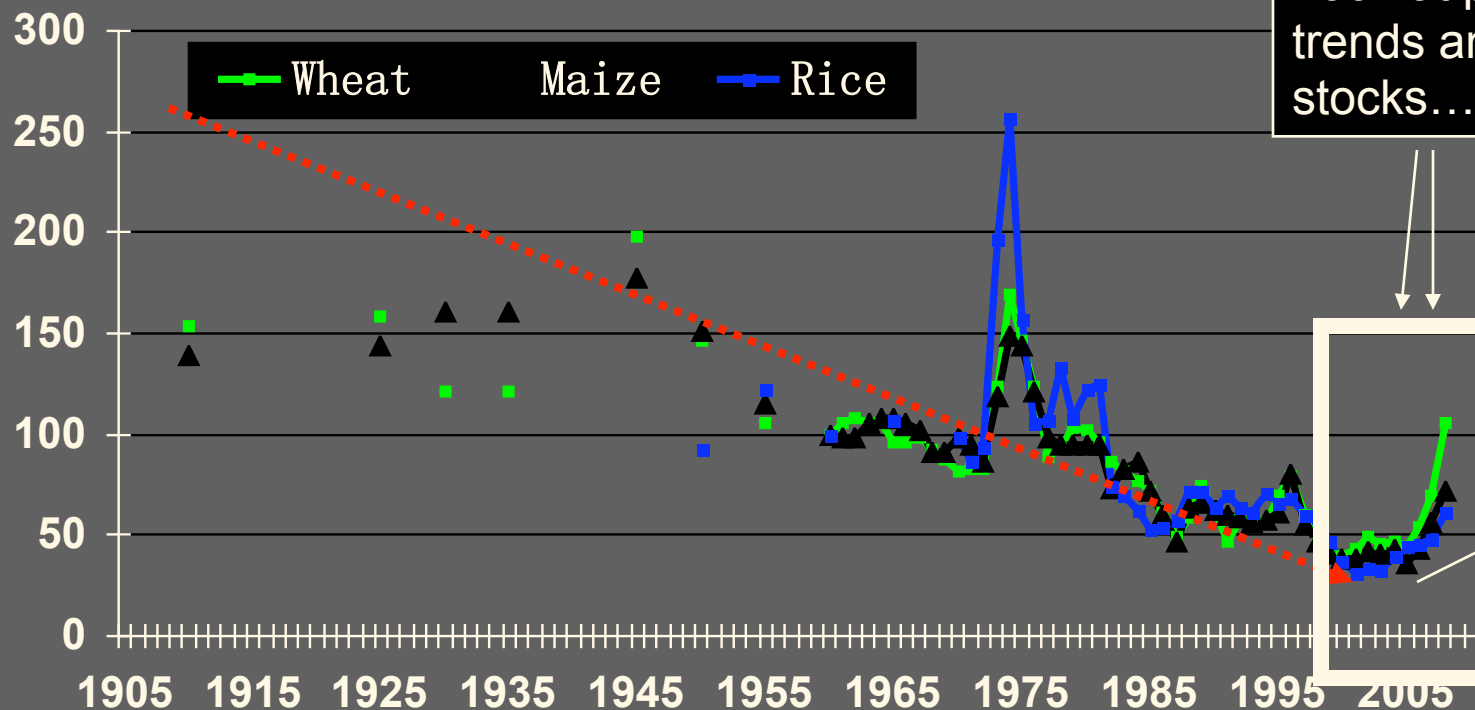






The nature of the current price rise appears to be different

real global cereal price index
(All prices = 100 in 1960)



Look at production trends and cereal stocks....

Look at futures in 2010



Wheat Rust in East Africa and Asia



Ug99 in Kenya

(www.sciencedaily.com - David Mowbray, CIMMYT)



Wheat harvest in India

(www.daylife.com)

- 1999: First appeared in Uganda
- Spread to Ethiopia, Kenya, Sudan
- 2007-2008: more virulent strain discovered in Yemen and Iran
- Based on wind patterns, expected to move east into India, Pakistan, neighboring countries - this region produces 25% of global wheat crop
- Yield losses as high as 71% observed in experiments
- 80% of wheat varieties grown in Asia and E Africa are susceptible, including rust-resistant varieties developed by CIMMYT
- India's response: ban rice exports

Going Hungry

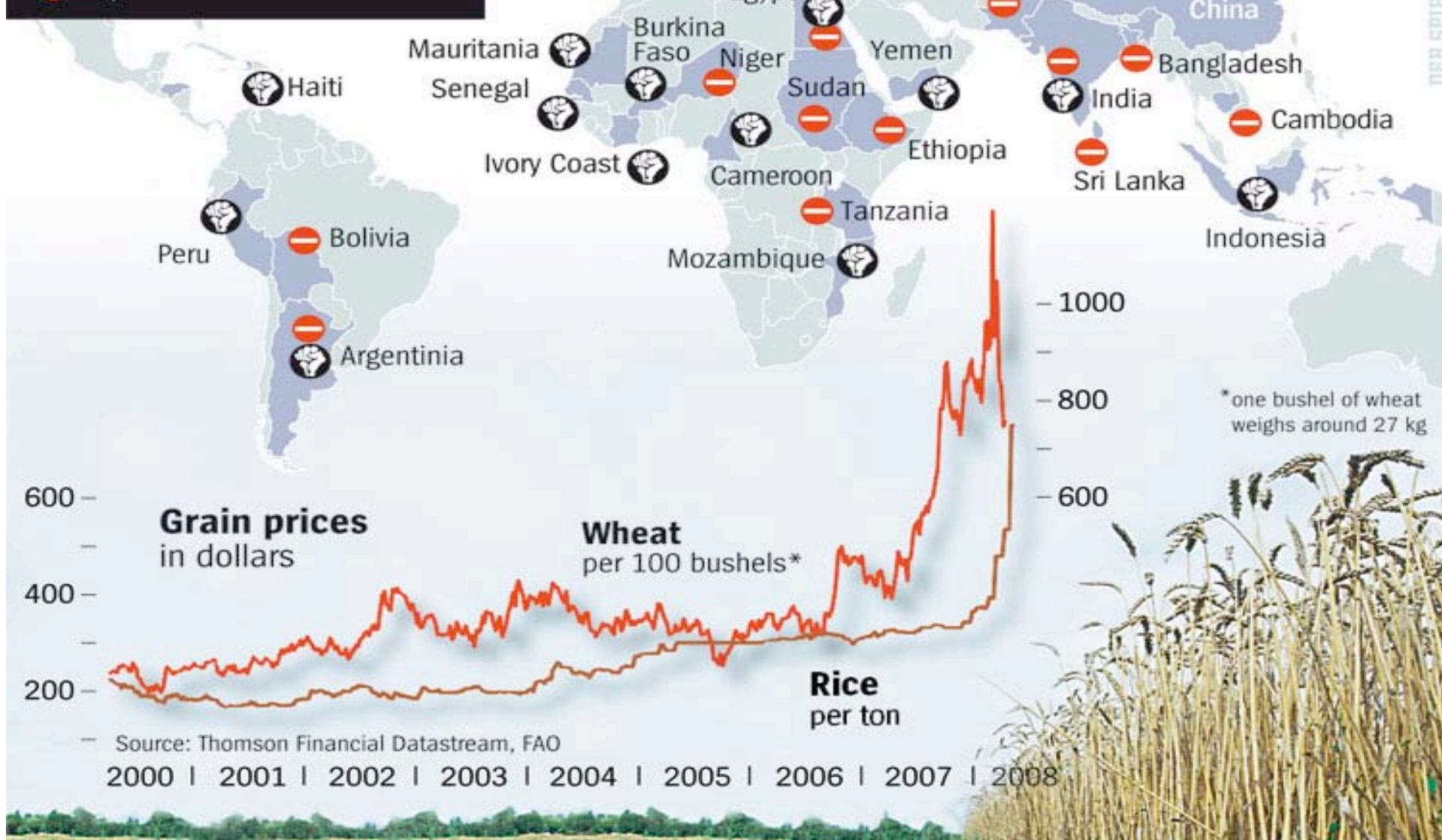
Consequences of the food crisis



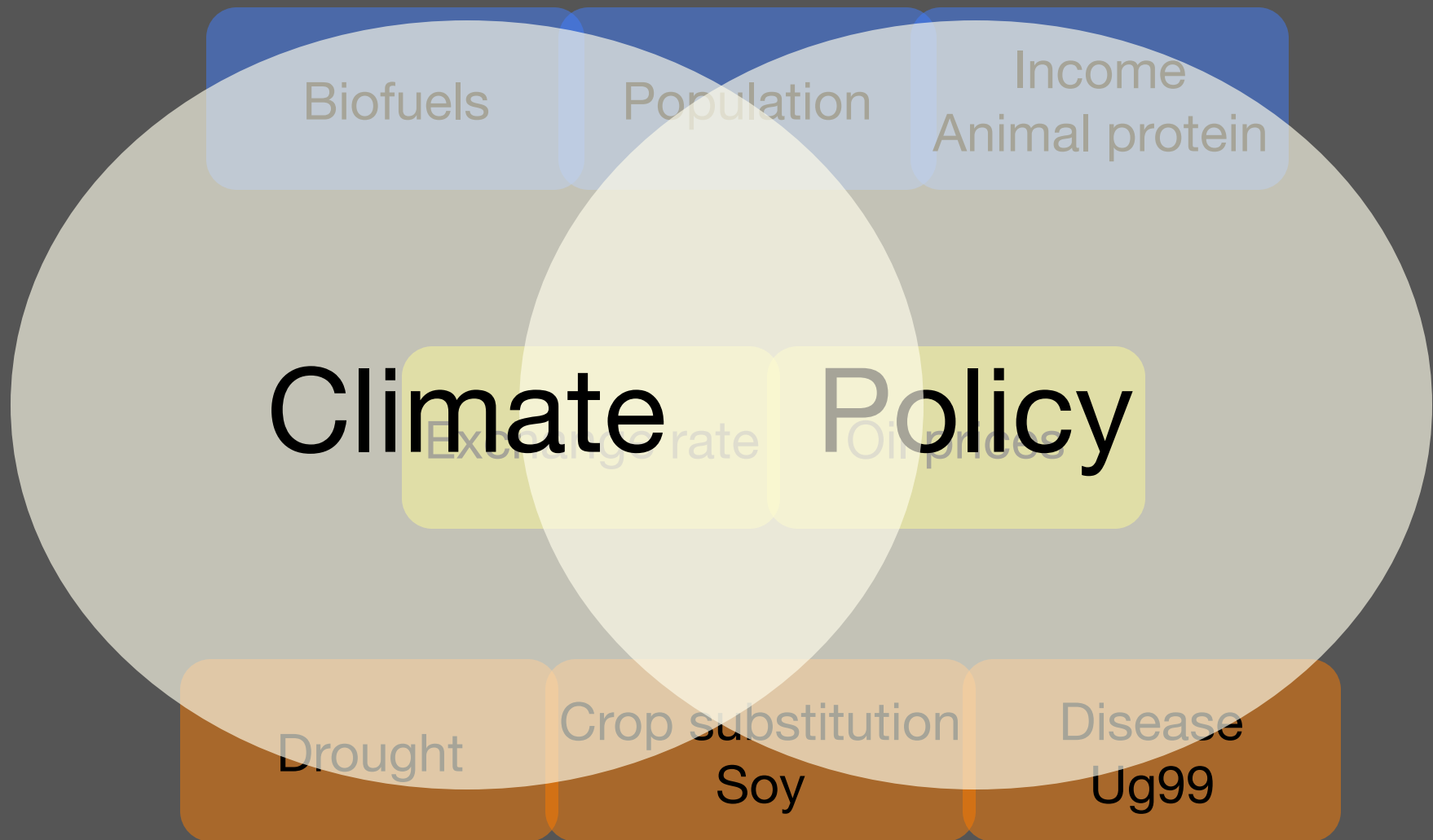
Unrest/protests



Export ban/restrictions



Turmoil in global food markets



Turmoil in Global Food Markets

“What we are witnessing is not a natural disaster, a silent tsunami or a perfect storm..
The food crisis is a man-made catastrophe
And as such, must be fixed by people.”
--Robert Zoellick, The World Bank

What Will It Take?



- Management
- Technology
- Agricultural Investments
- Policy
- Consumer behavior

Resilience

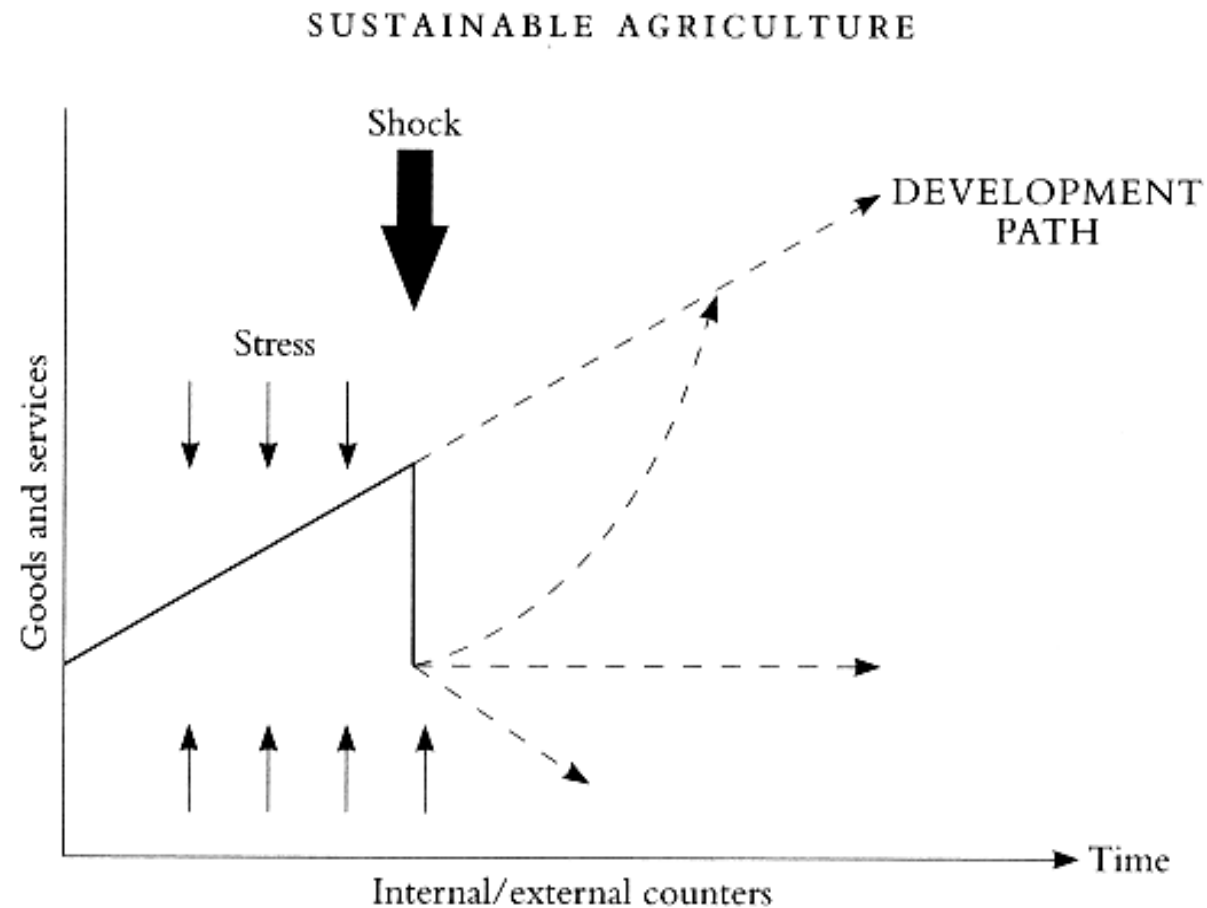


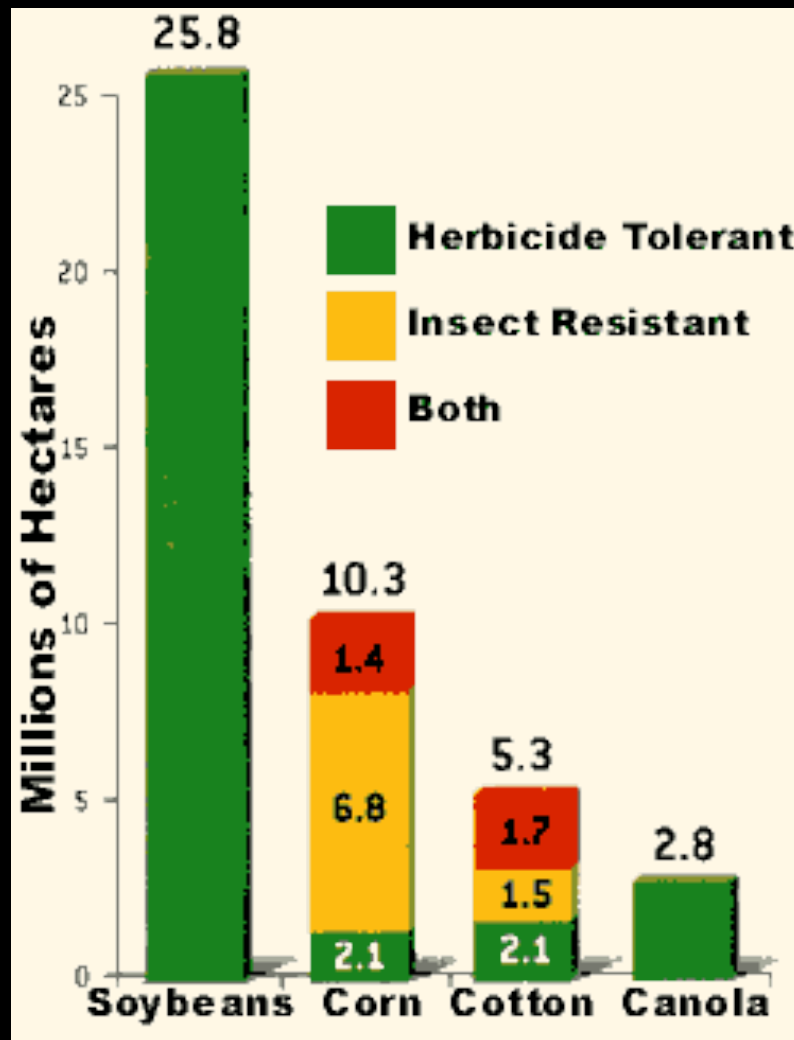
Figure 9.3 The dynamics of agricultural sustainability



Cargill: Soy Trade in Brazil



Technology: Gene Stacking



U.S. Farm Bill (May 2008)

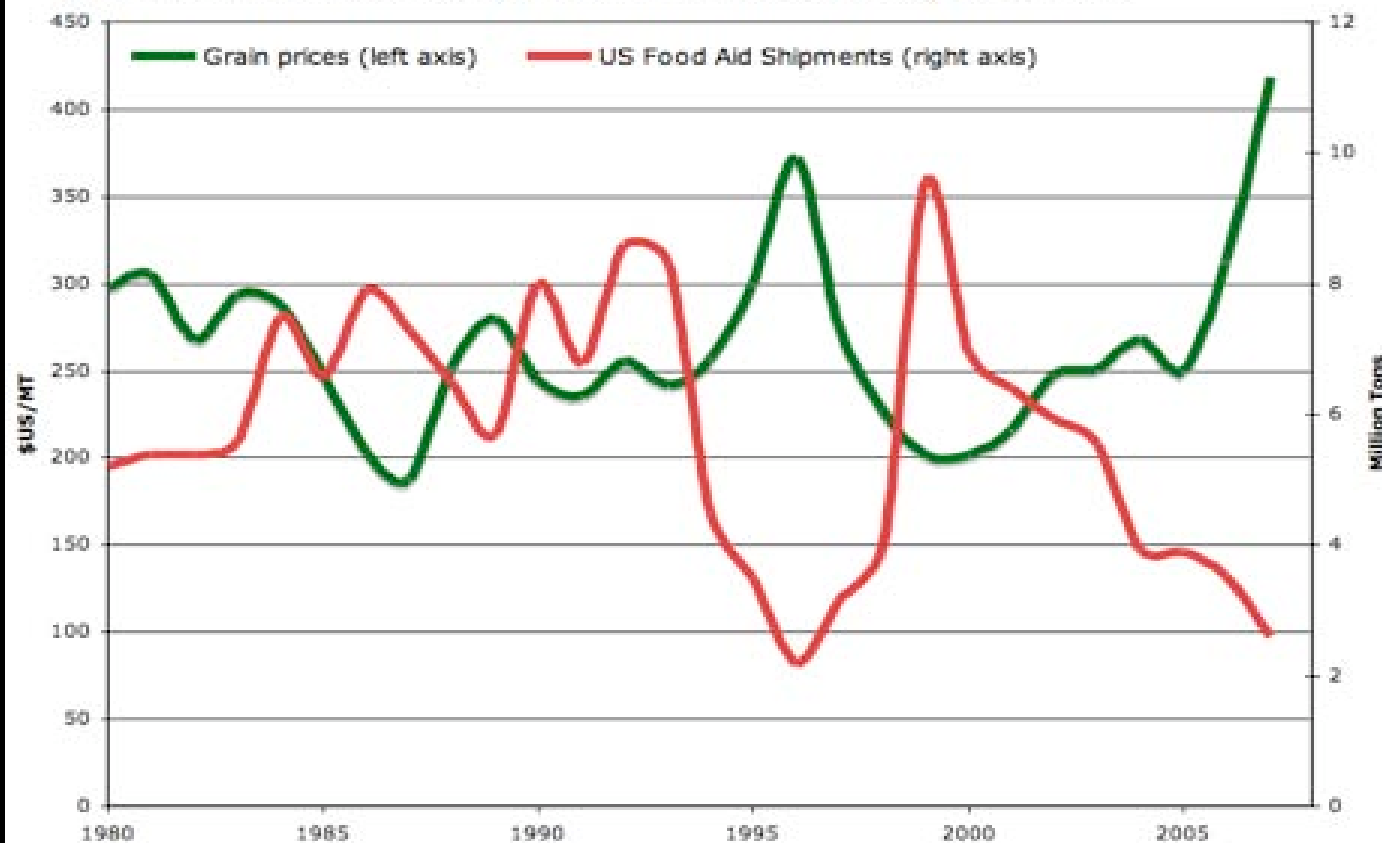
\$288 Billion over 5 years



- Liquidity (loan rate)
- Stability (target, direct pay)
- Income enhancement
- Food security, safety net
- Conservation
- Protecting special interests
- Getting elected
- Complying with WTO and other agreements

U.S. Ag Investments and Food Aid

Fig. 2: US Food Aid Shipments and Grain Prices, 1980-2007



SOURCES:

Food Aid: 1980-1996: FAO; 1997-2006: globalpolicy.org; 2007: USDA
Grains Prices: average annual wheat+maize price, International Monetary Fund

Biofuels Policies

- 2008 Farm Bill, CRP:
 - Priority given to enrollment of
while fields that qualify to
produce perennial biomass
crops for cellulosic energy
production
- Appropriation for
Conservation
- EU Biofuels
Sustainability Criteria



Consumer Choices



- Meat consumption (not if, but how much?)
- Sustainable products
- Organic products
- Origin of product

