Energy, Agriculture and Food Security

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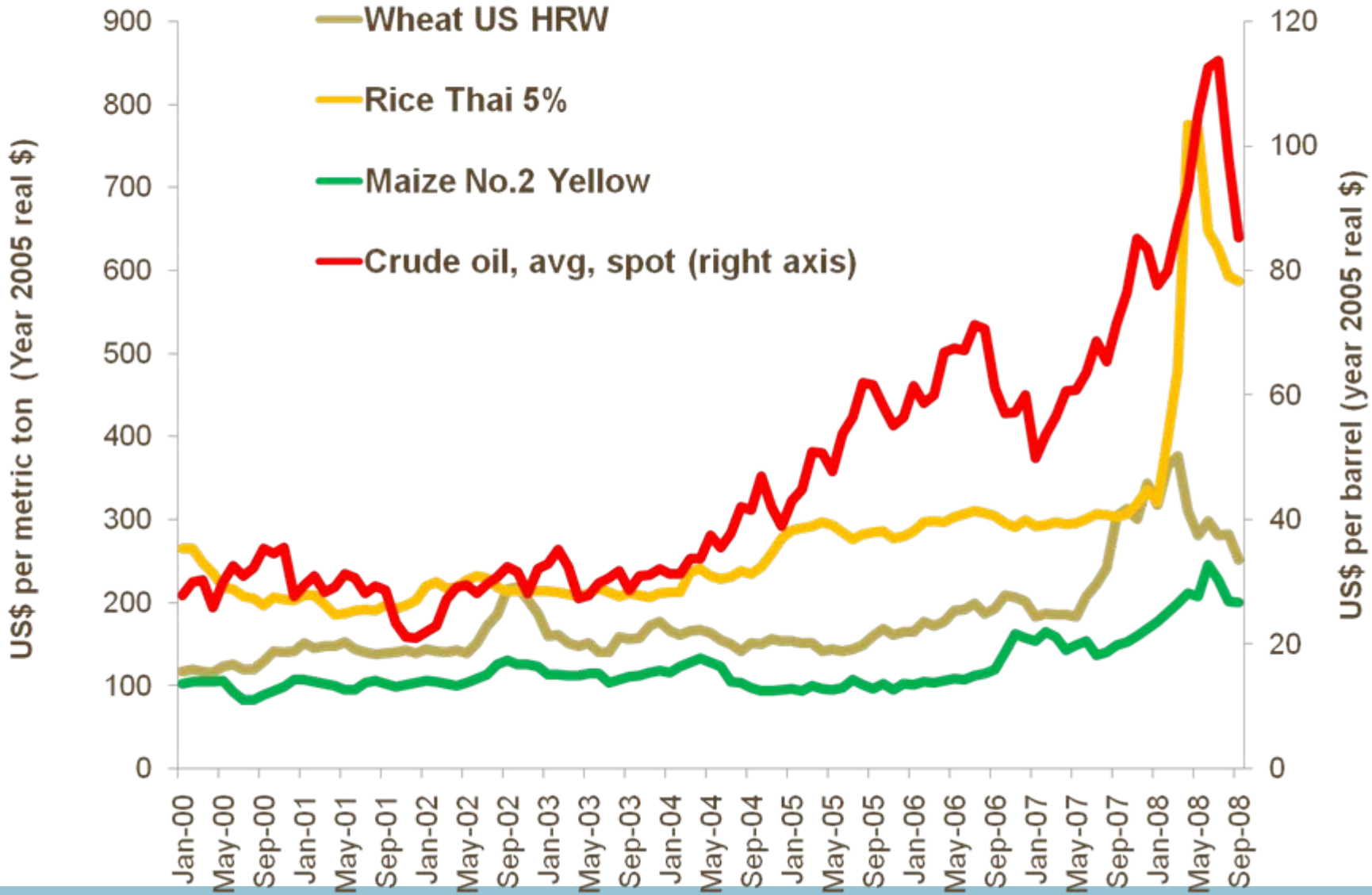
BILL & MELINDA GATES *foundation*

Energy, Agriculture and Food Security

Energy , agriculture & food security are linked by the following trends:

- **Intensification and the structural transformation of the agriculture sector**
- **Rising urban middle class demand for food diversity, convenience and quality – supermarkets & food imports**
- **Declining importance of biomass as fuel**
- **Potential expansion of bio-fuel production**

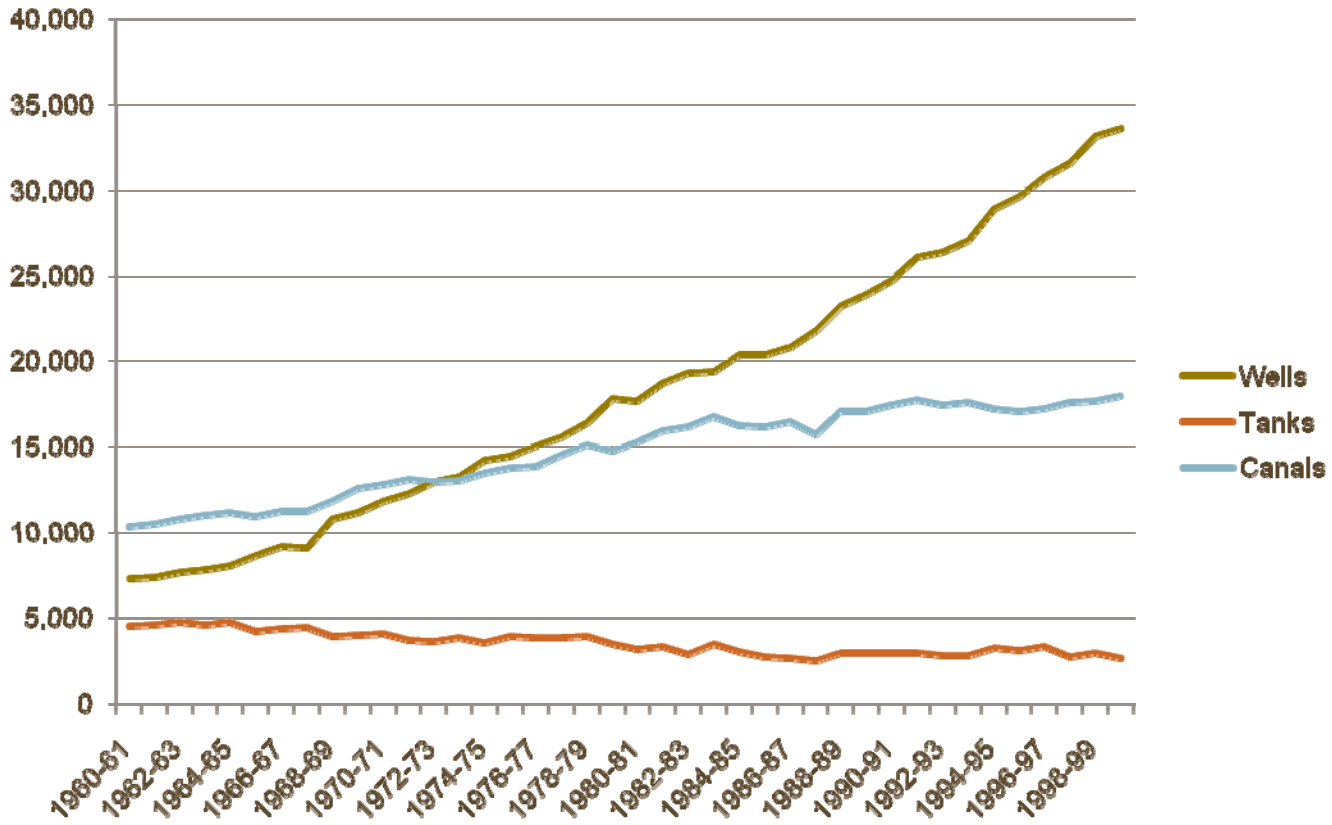
Trends in Food and Oil Prices



Source: Data from WB 2008

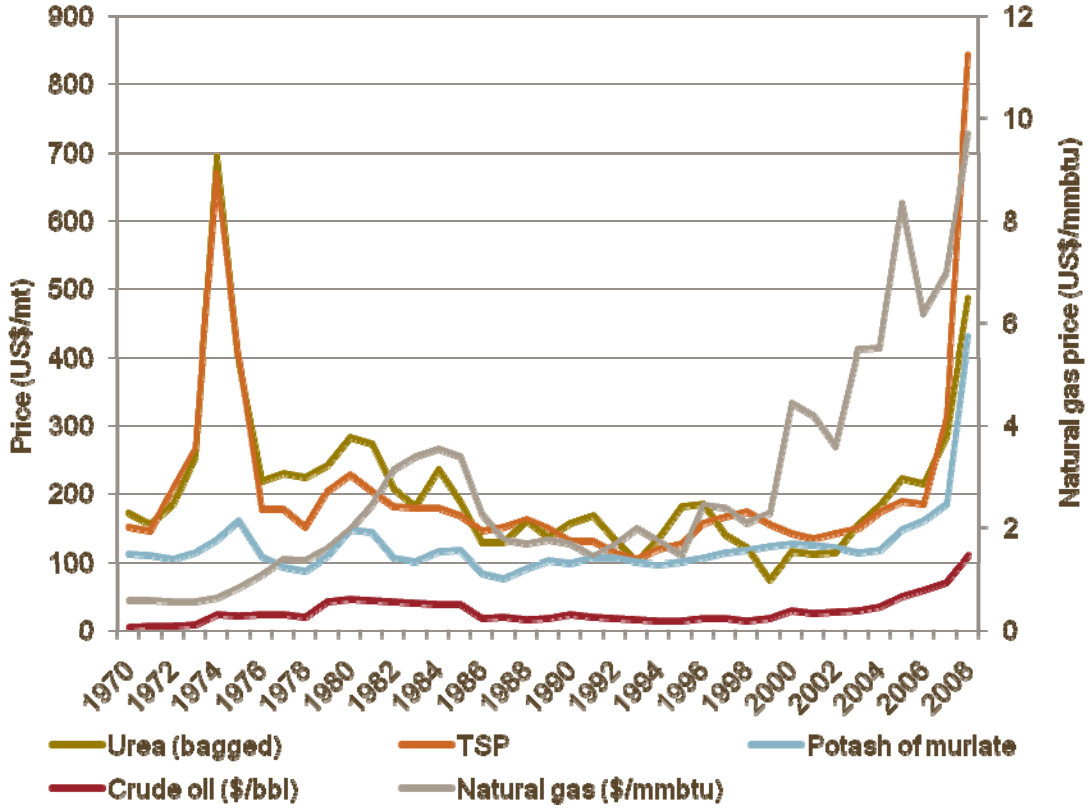
Intensification & the structural transformation of the agriculture

- Rising population densities and improved market access leads to the intensification of smallholder agriculture systems– rising energy requirements per hectare
- Declining share of agriculture in GDP is associated with rising opportunity cost of labor and mechanization and fertilizer use
- Demand for post harvest processing, storage and quality rise with economic development



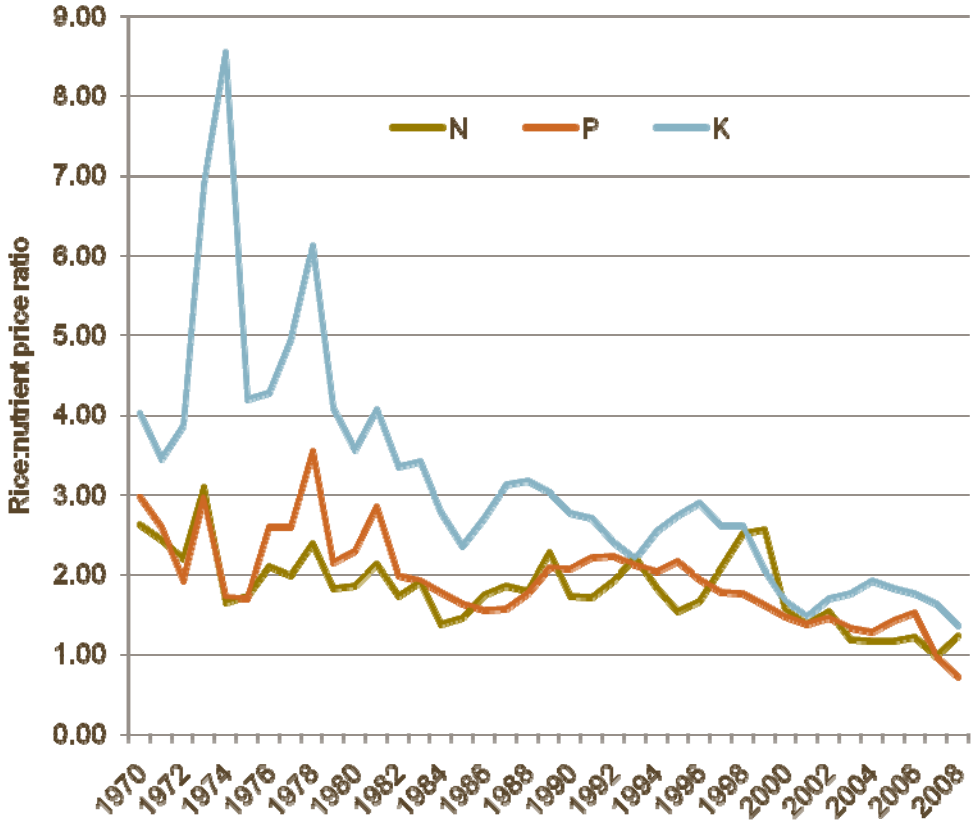
India irrigated area by type of irrigation (000 ha)

Source: Ministry of Agriculture, http://agricoop.nic.in/statistics/sump2.htm

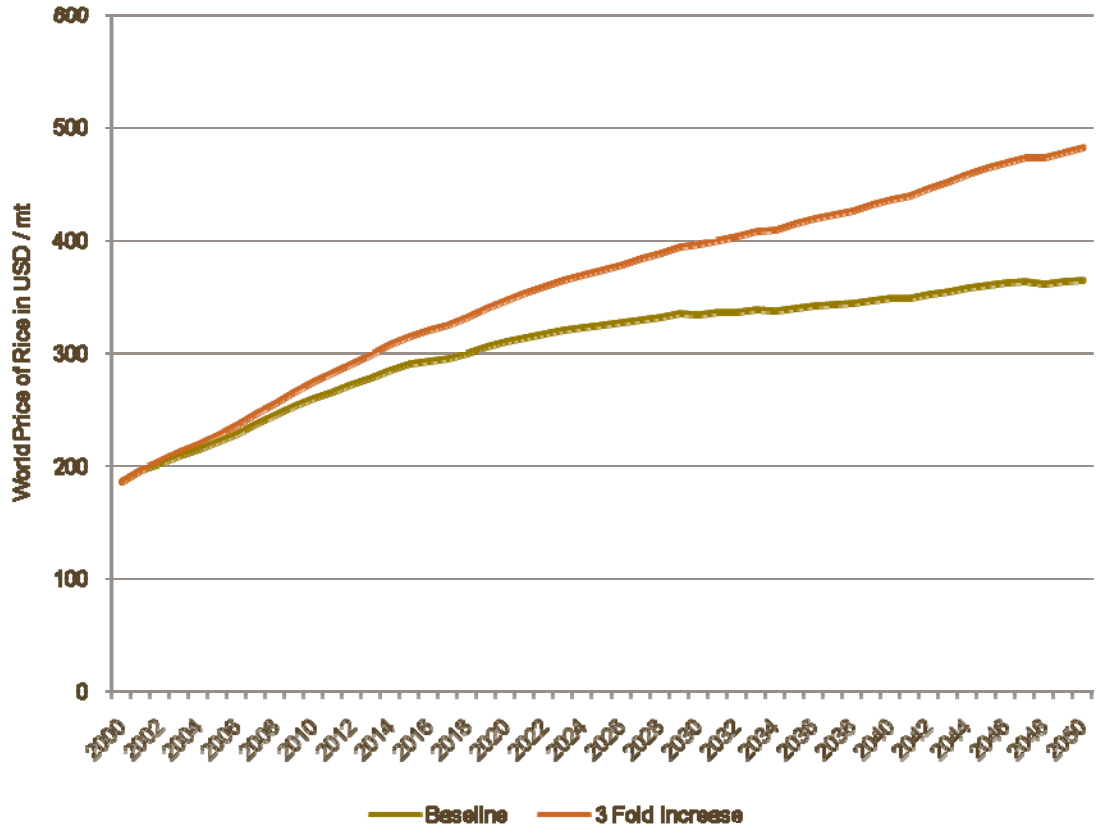


Trend of fertilizer and oil price since 1970

Source: World Bank 2008



Rice to fertilizer price ratio trend (1970-2008)



World Price of Rice under Baseline and a 3-Fold Fertilizer Price Increase Scenario

Source: IFPRI/IMPACT Model Projections

From Traditional to Modernizing to Industrialized Food Systems

Consumption:

- *Traditional* – Rising caloric intake, diversification
- *Modernizing* – Diet diversification, shift to processed foods
- *Industrialized* – Higher value & processed foods

Retail:

- *Traditional* – Small scale, wet markets
- *Modernizing* – Spread of supermarkets (limited for FFV)
- *Industrialized* – Widespread supermarkets

Processing:

- *Traditional* – Limited processing sector
- *Modernizing* – Employment and value addition from processing
- *Industrialized* – Large processing sector, domestic and export

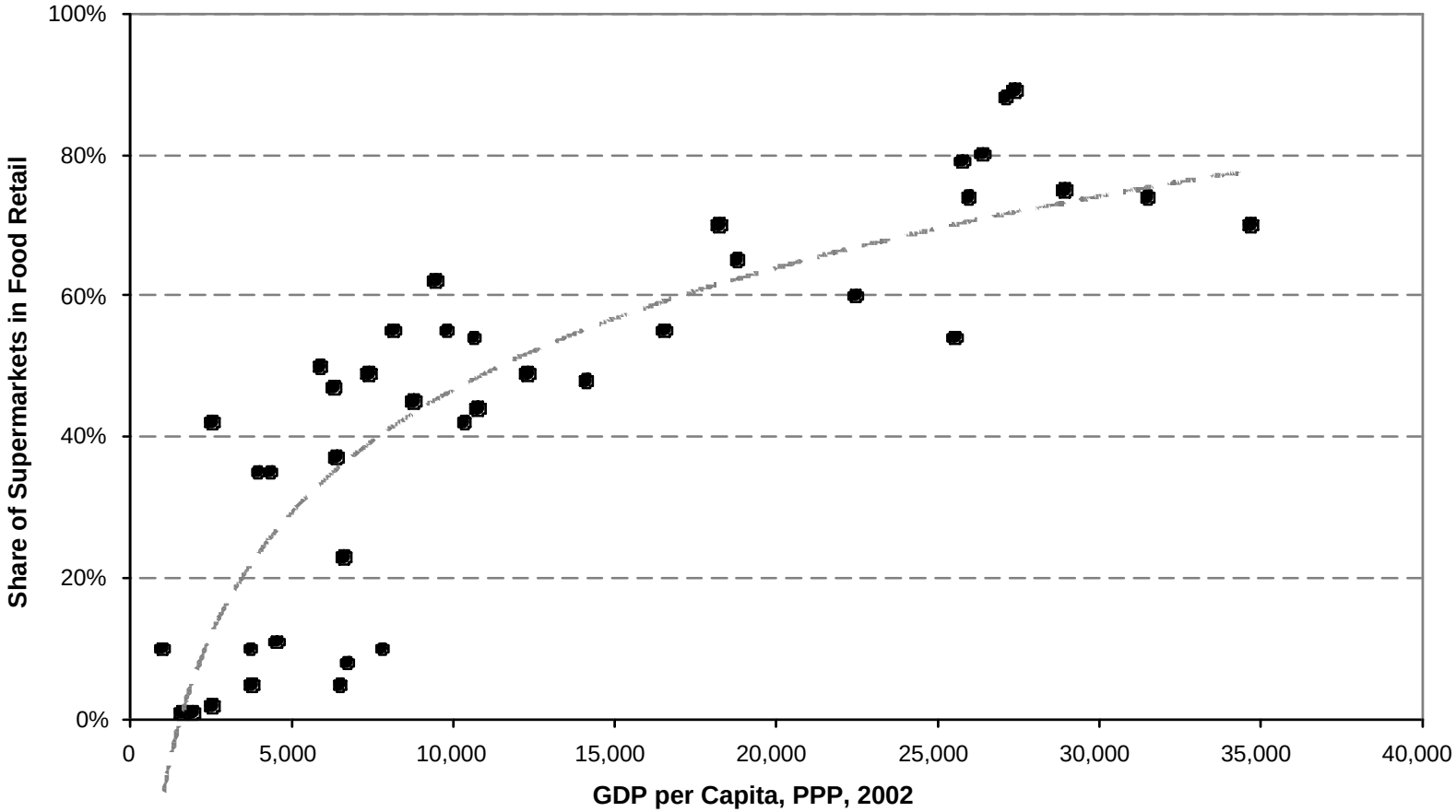
Wholesale:

- *Traditional* – Trad. wholesale, retailers bypass traditional system (exports)
- *Modernizing* – Trad. and specialized wholesalers, some retailer bypassing
- *Industrialized* – Specialized wholesalers, private distribution centers

Dietary transition in Asia: an overview

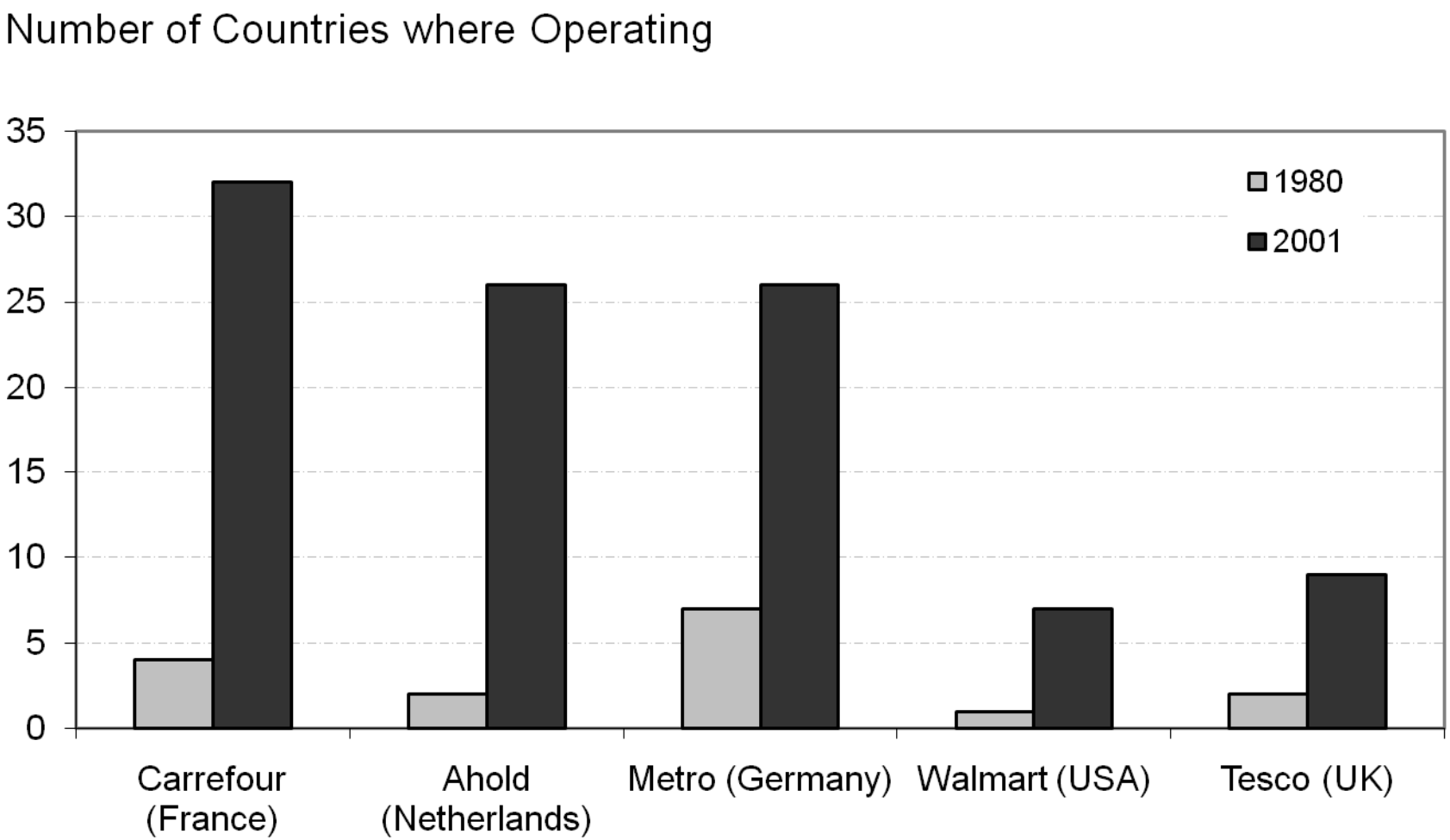
- Reduced consumption of rice
- Increased consumption of wheat and wheat based products
- Rise in high protein and energy dense diets
- Increased consumption of temperate zone products
- Rising popularity of convenience food and beverages

Rising GDP per capita is associated with a larger share of supermarkets in food retail



Source: data from Traill (2006) and World Bank World Development Indicators (2006)

Global expansion of transnational supermarkets, 1980-2001



Source: UK food group

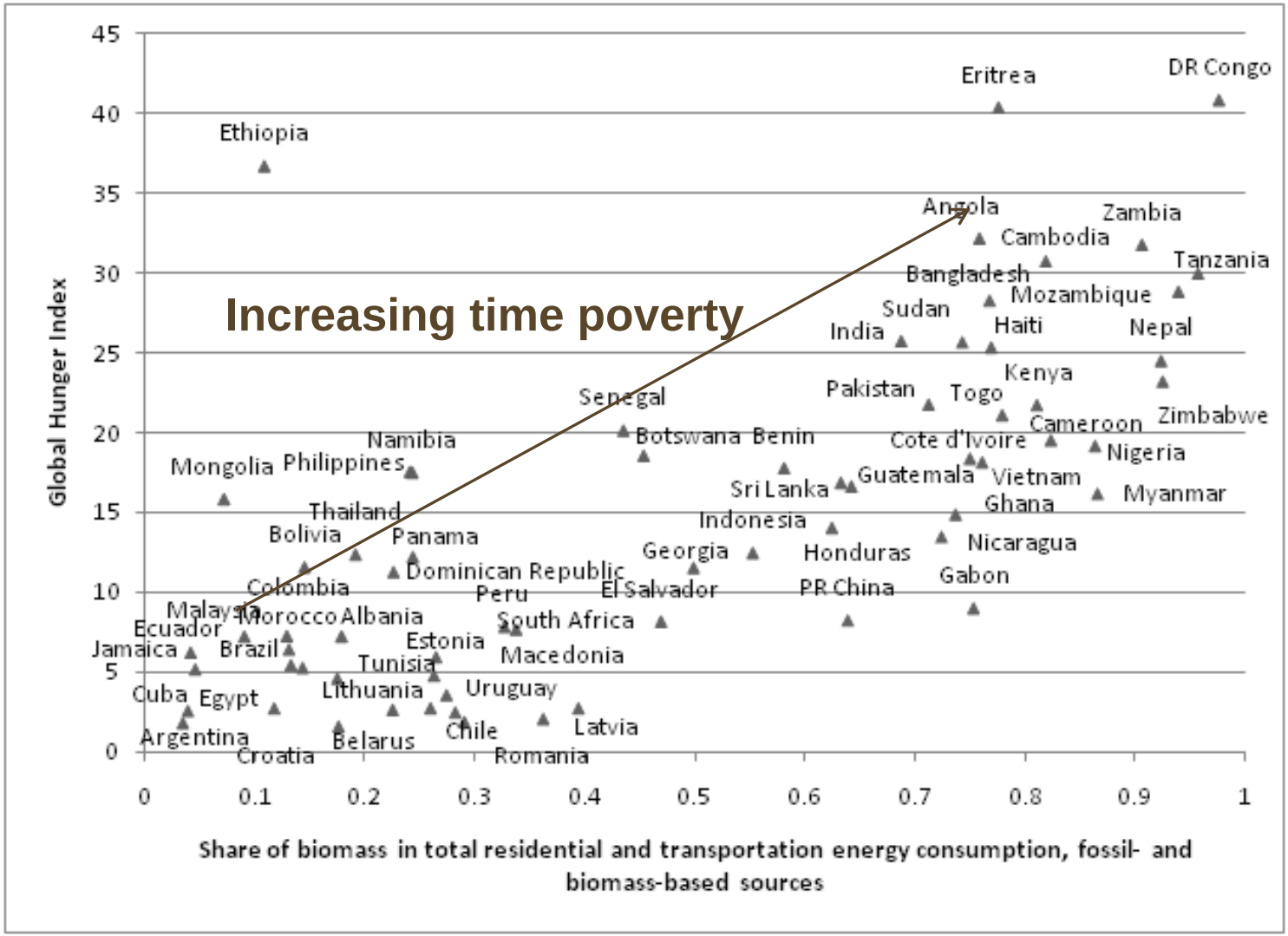
Reliance on biomass for energy

- **Fuel wood, manure and other combustible residues are the most significant source of energy in many developing countries—over 90 percent of total primary energy supply for DR Congo, Tanzania, and Ethiopia (IEA 2005)**

- **The gender dimensions are clear:**
  - **The collection biomass major time burden for women**
  - **Burning firewood indoors factor in female and infant mortality**

Courtesy of Mark Rosegrant (IFPRI)

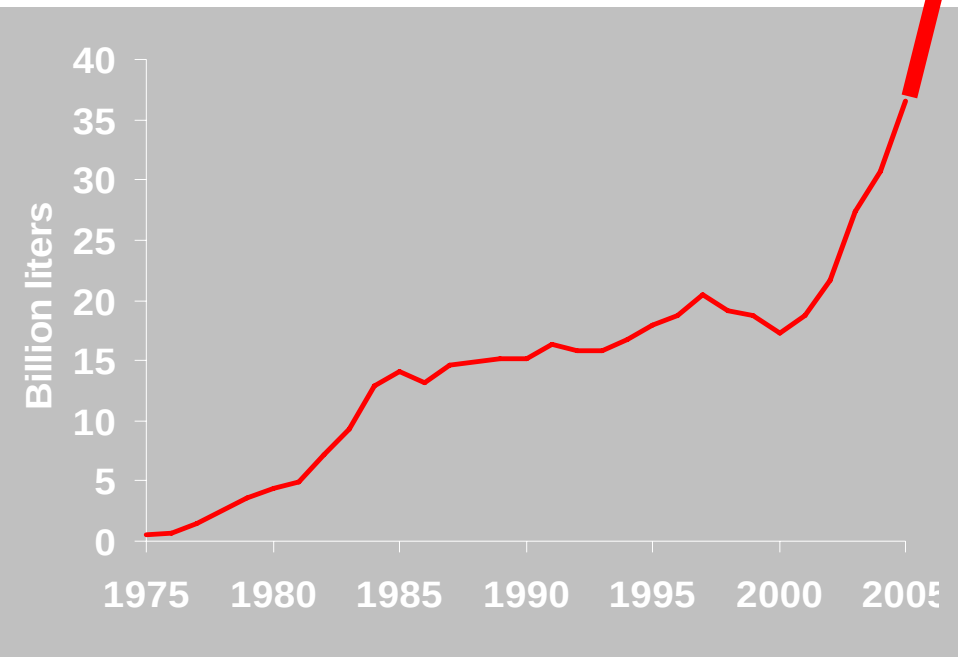
Hunger and use of biomass as energy

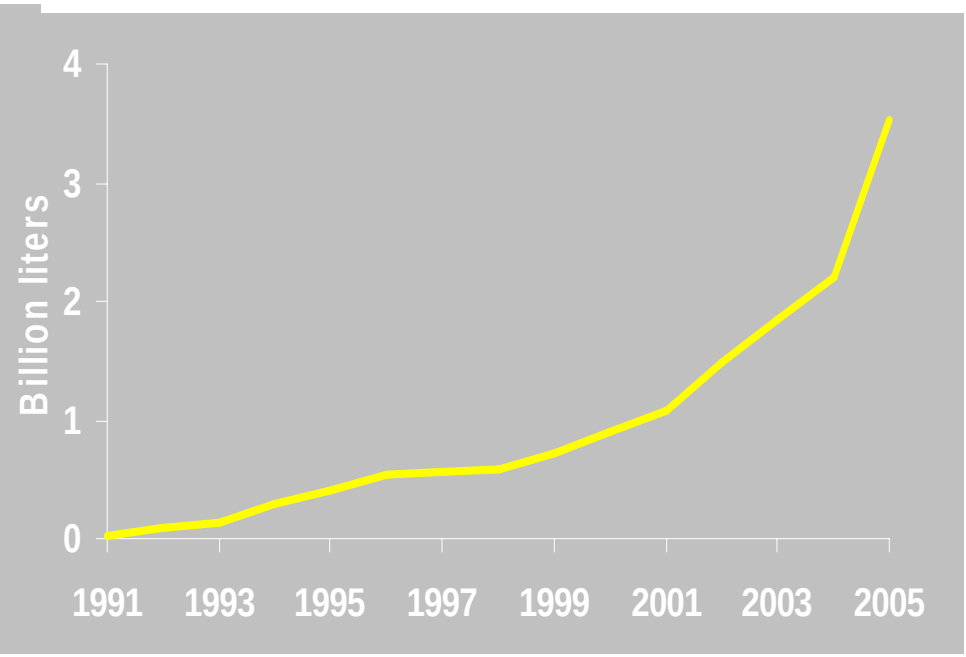


Courtesy of Mark Rosegrant (IFPRI)

The biofuels boom

World ethanol and bio-diesel production, 1975-2005





Ethanol > 90% of biofuel production; Brazil and US are 90% of the ethanol market

Biodiesel: EU accounts for 90% of production

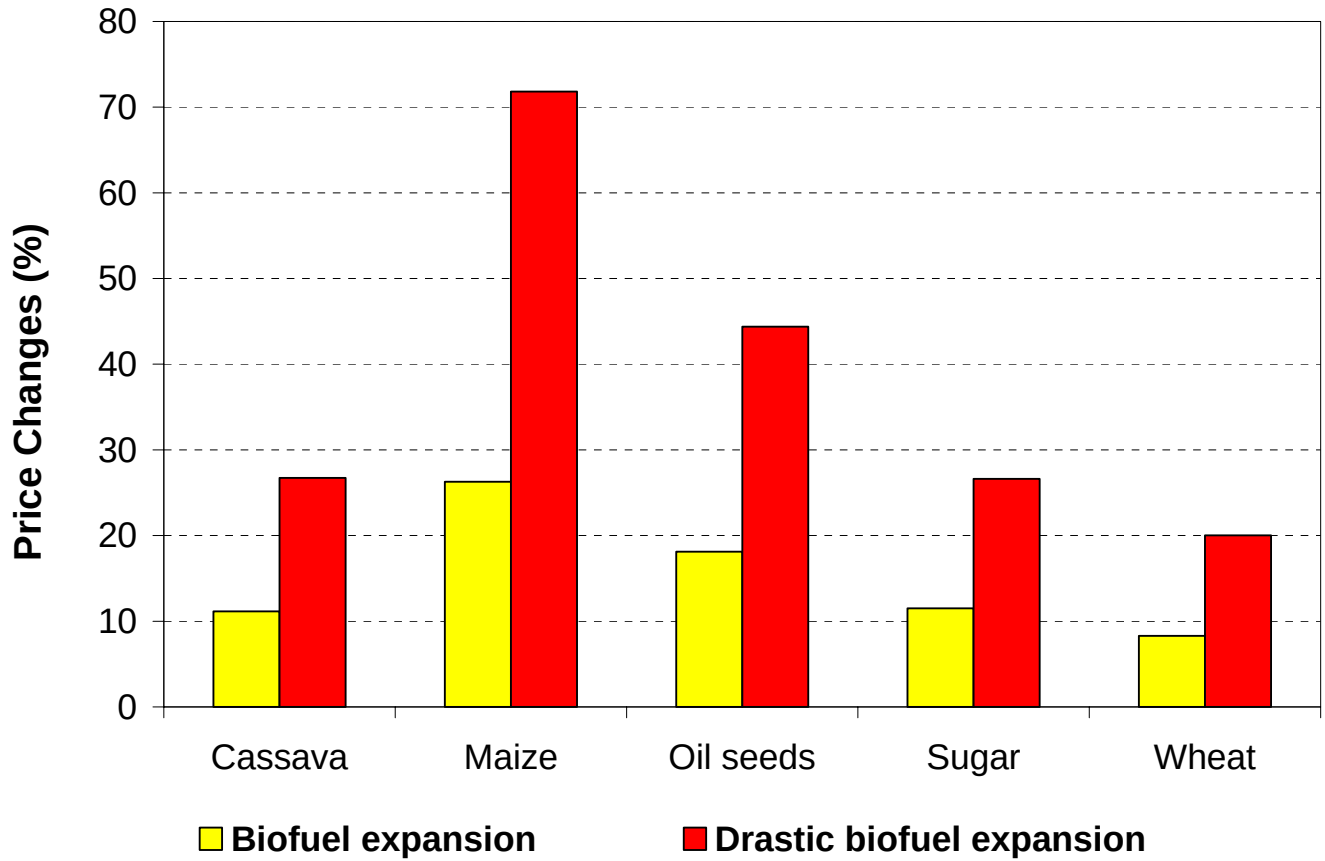
Source: Worldwatch Institute 2006

Biofuel Impacts on Prices?

Source	Estimate	Commodity	Time period
World Bank (April 2008)	75 %	global food index	January 2002 – February 2008
IMF (2008?)	70 %	corn	?
	40 %	soybeans	?
IFPRI (May 2008)	39 %	corn	2000 – 2007
	21-22 %	rice & wheat	2000 – 2007
OECD-FAO (May 2008)	42 %	coarse grains	2008 – 2017
	34 %	vegetable oils	2008 – 2017
	24 %	wheat	2008 – 2017
Collins (June 2008)	25-60 %	corn	2006 – 2008
	23-35 %	US retail food	2006 – 2008
Glauber (June 2008)	23-31 %	commodities	April 2007 – April 2008
	10 %	global food index	April 2007 – April 2008
	4-5 %	US retail food	January – April 2008
CEA (May 2008)	35 %	corn	March 2007 – March 2008
	3 %	global food index	March 2007 – March 2008

Source: FAO 2008

Changes in world prices of feedstock crops and sugar by 2020 under two scenarios compared to the baseline levels (%)



Source: IFPRI IMPACT projections

Energy, Agriculture & Food Security: the way forward

- Continue focusing on staple crop productivity growth reduces the food-fuel trade-off
- Seek technology & policy options for enhancing input use efficiency
- Exploit opportunities for reducing non-renewable energy use (example. Conservation tillage)
- Invest in novel (de-centralized) renewable energy technologies– small scale solar systems; bio-fuel from biomass
- Identify options for energy savings across the value-chain from the farm to the supermarket.

Thank You