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Biofuels, Food Prices and Food Security

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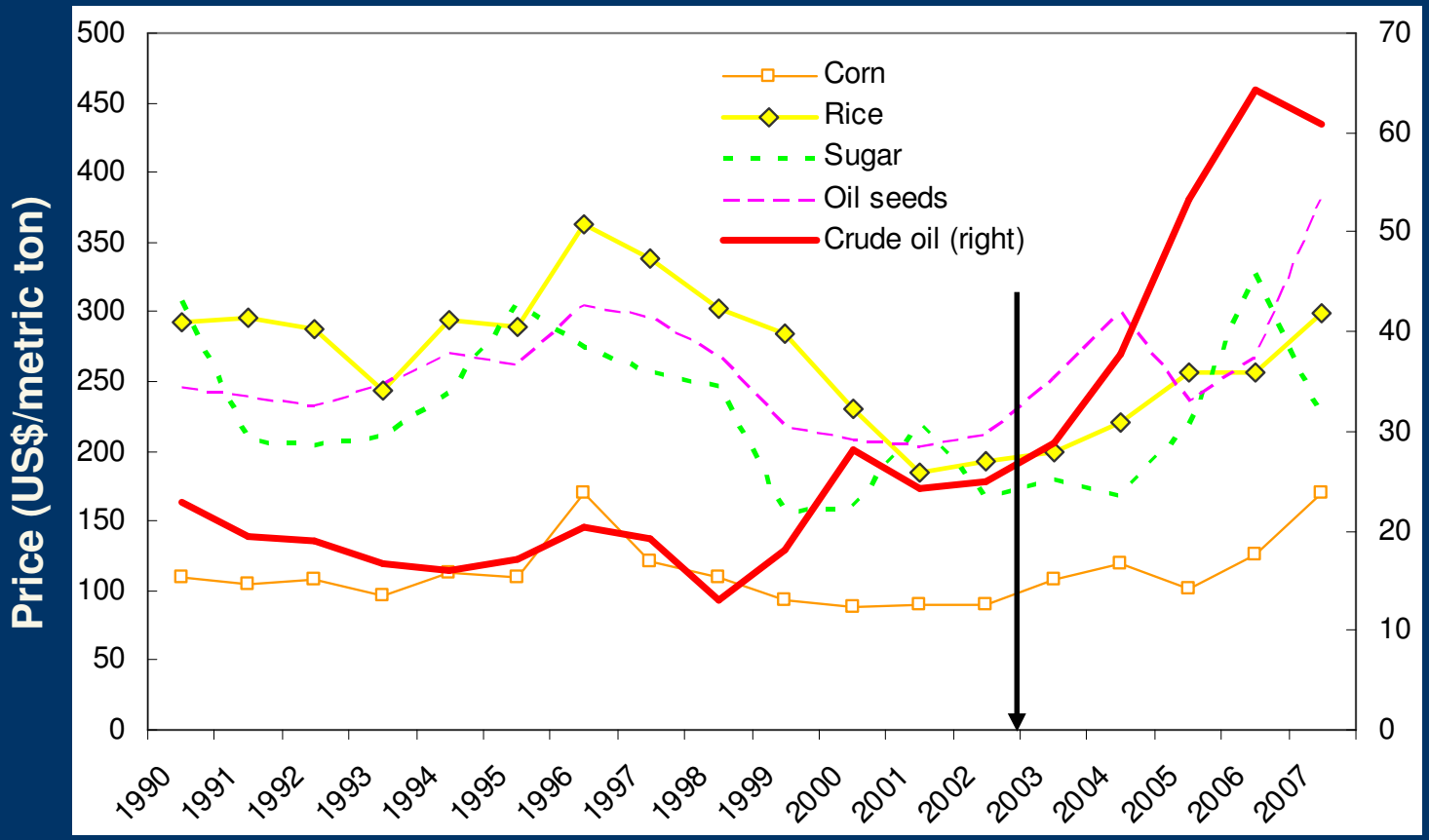
Growing Concern over Rising Food Prices

Global pressures on food prices and food supplies is causing new concerns for many over threats to welfare and food security

- Causes are diverse – varying from climate, pest & disease outbreaks
- The connection with biofuels (esp. ethanol from maize in US) is coming under scrutiny
- While upward food prices is good news for producers, there are many poor consumers who stand to lose

World prices of selected commodities, 1990-2007



Rapid increase in oil price since late 1990s and major agricultural commodities

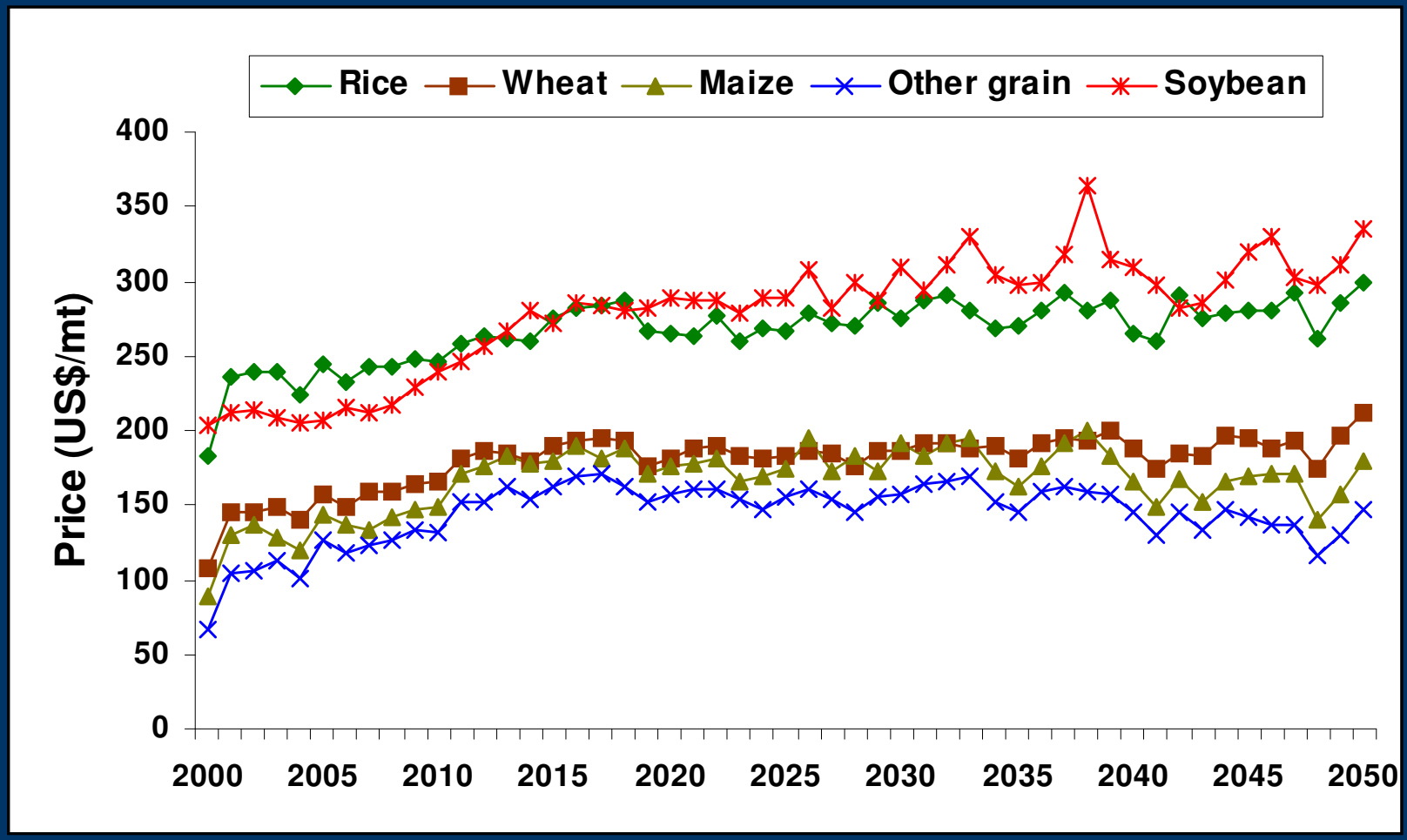
Sources:

Corn, rice, sugar, and oilseeds for 1990–2005 - OECD 2005; 2006-07 – WB 2007

Crude oil - IMF 2007

Real world food prices projected to rise 30-50 percent beyond current high levels

Cereals



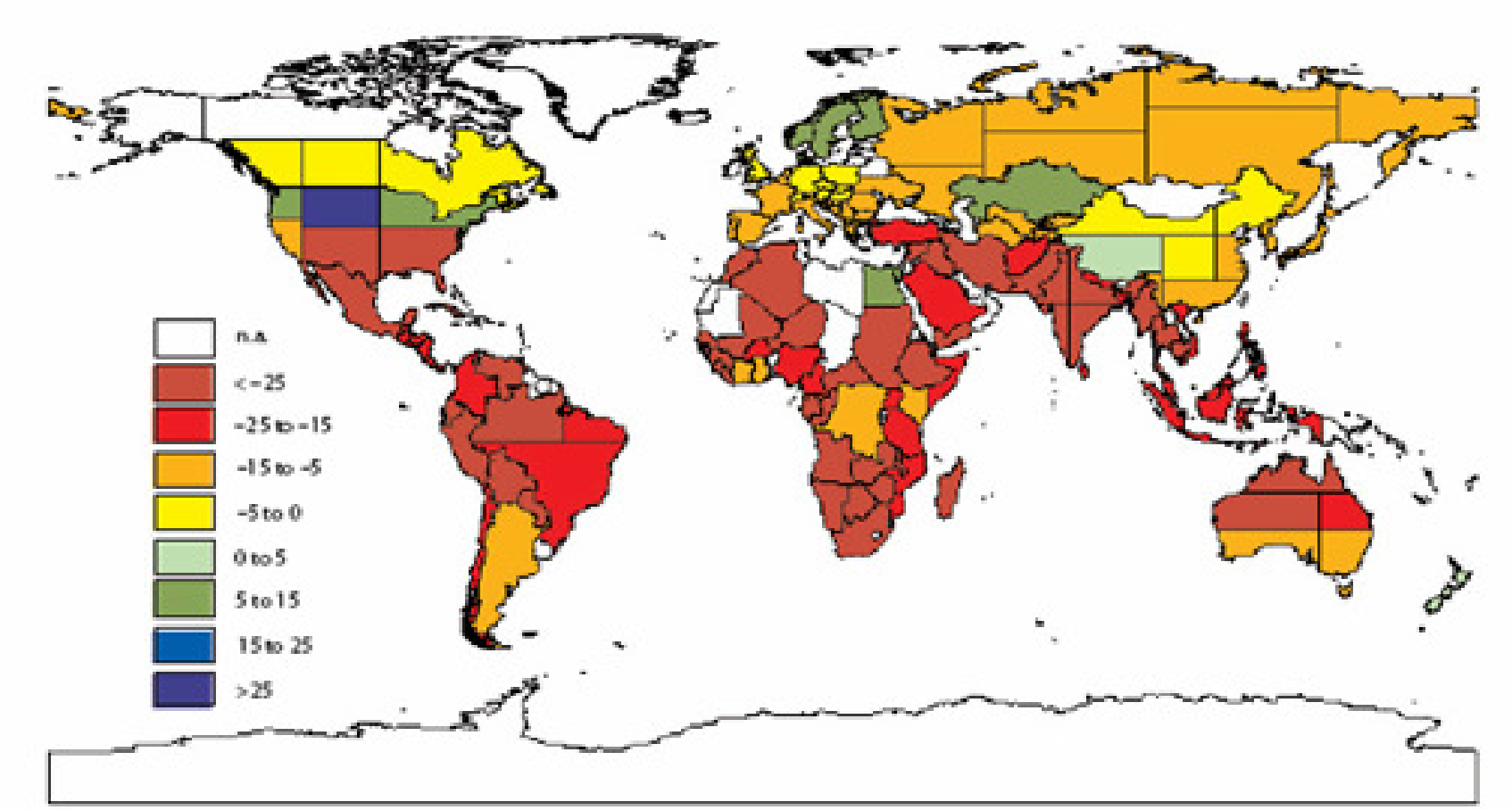
Current Trends

- Price increases driven by both demand and supply factors
- Population growth and economic growth – Asia post-1999 recovery and strong growth in Africa
- Biofuel demand - competes with land and water resources used for food
- Continued rapid growth in livestock demand and feed demand

Current Trends

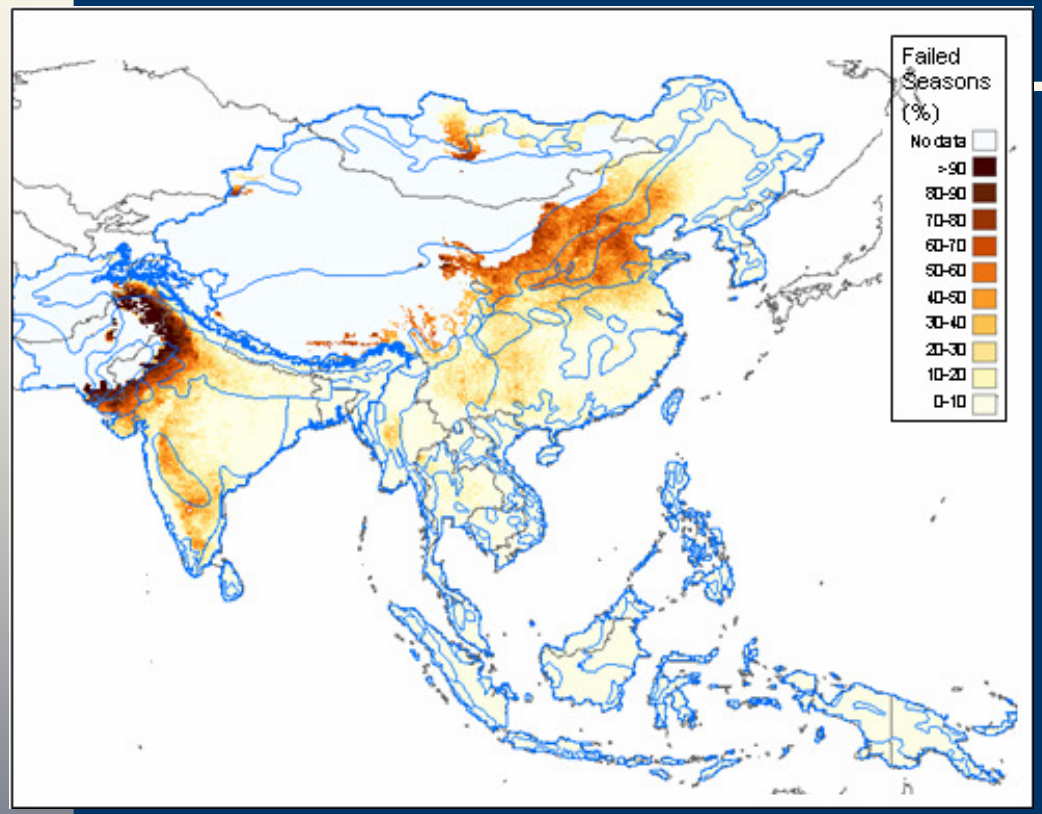
- Growing resource scarcity, particularly of water – increasing uses in non-ag sectors
- High commodity prices create investment and income opportunities but threaten poorer, vulnerable consumers
- Resource competition and environmental degradation require new focus on integration of growth and sustainability policy

Climate change will reduce production growth in many of the poorest countries and regions



Percent change in agricultural production due to climate change, 2080
Source: Cline 2007

Water Scarcity and Drought Stresses in Asia



Proportion of failed growing seasons for rainfed cultivation, 100 year weather simulation

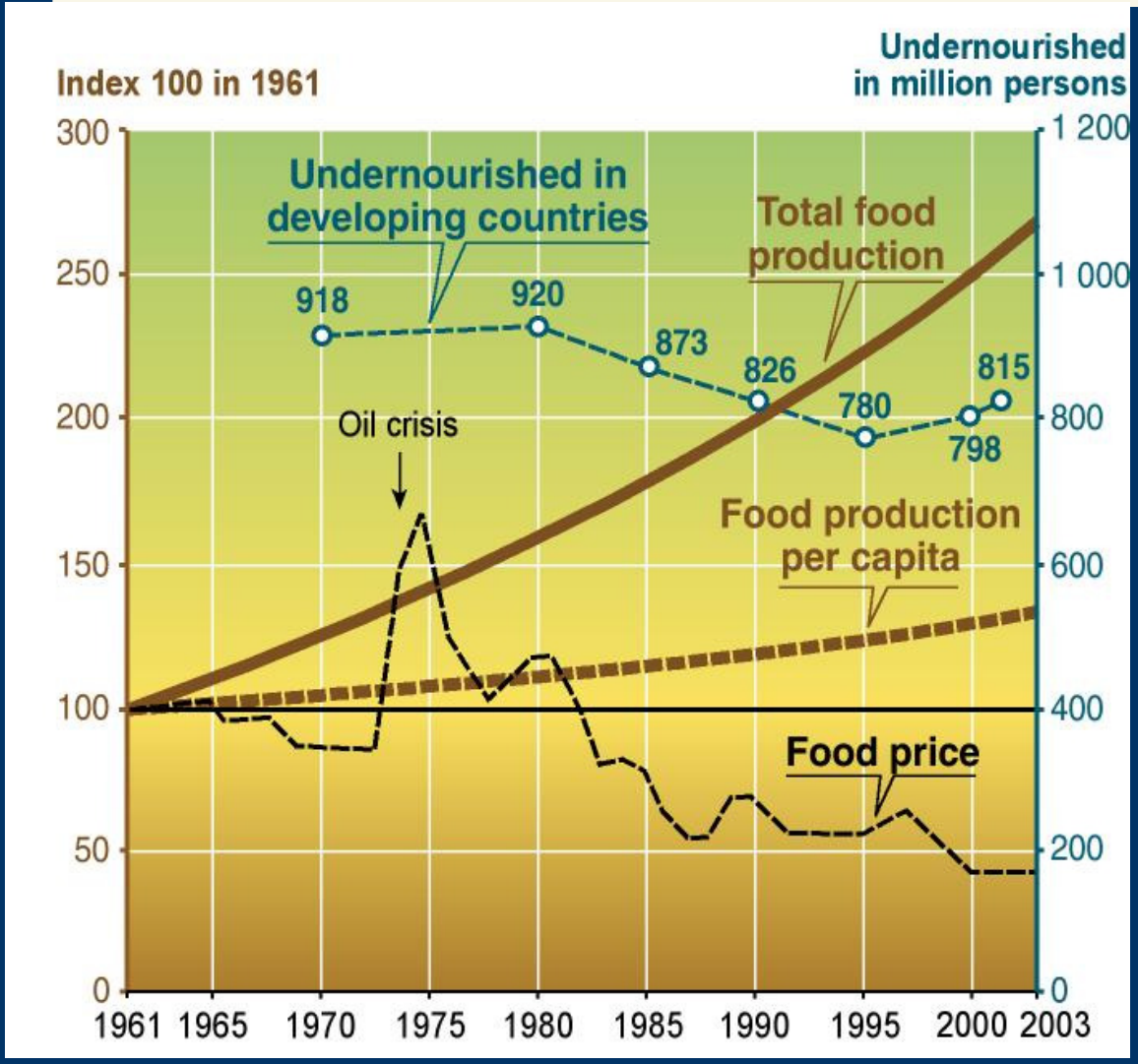
Source: Hyman et al. forthcoming

Note: The figure illustrates 100 year weather simulation based on historic data analysis

- **Drought**
  - lowers average expected yields
  - exacerbates other production uncertainties, reducing technology adoption of the poorest farmers

Drought impacts need to be mitigated by investments in irrigation

Food Production and Price Trends



What lies ahead? →

Source: from Wood and Ehui (Chapter 8 "Food". Millennium Ecosystem Assessment 2005)

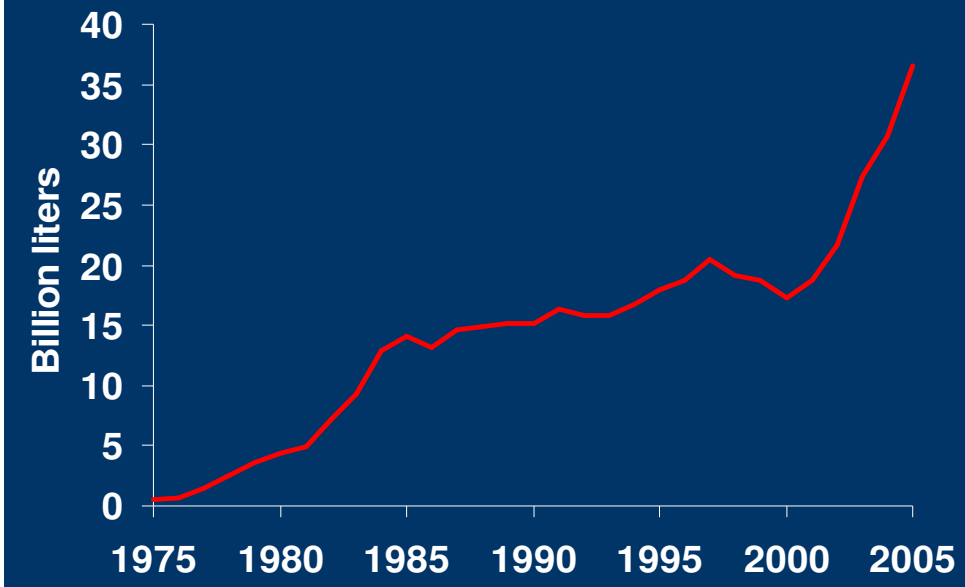
Looking at Various "Drivers" Behind Global Trends in Food Prices

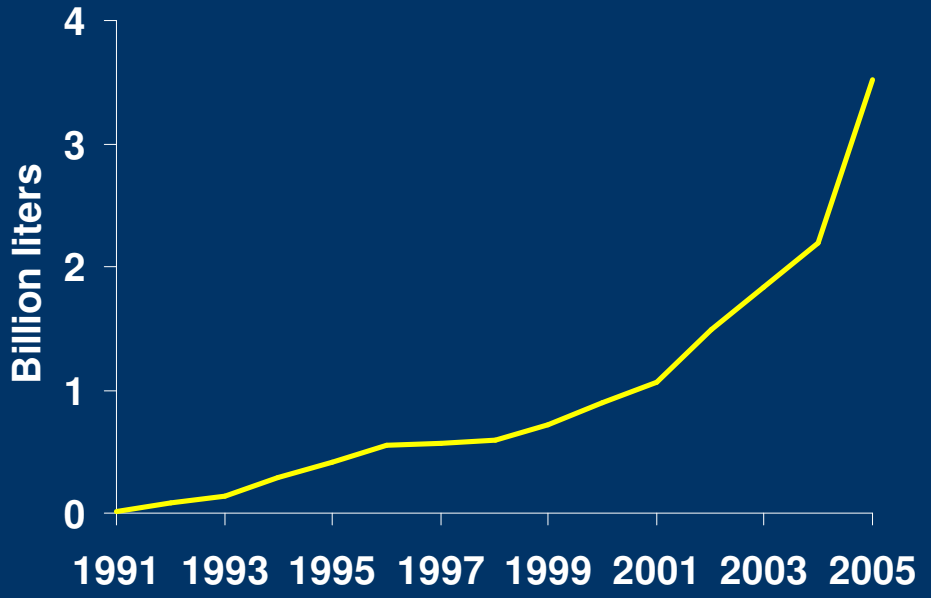
Need to draw attention to the numerous factors that underpin changing conditions in global food markets

- Socio-economic drivers – rising incomes and demands for meat (and the necessary feed grains to supply it)
- Environmental drivers – increasing variability in climate facing agriculture
- Policy drivers – blending requirements for biofuels and renewable energy initiatives

The biofuels boom

World ethanol and bio-diesel production, 1975-2005





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

Biodiesel: EU accounts for 90% of production

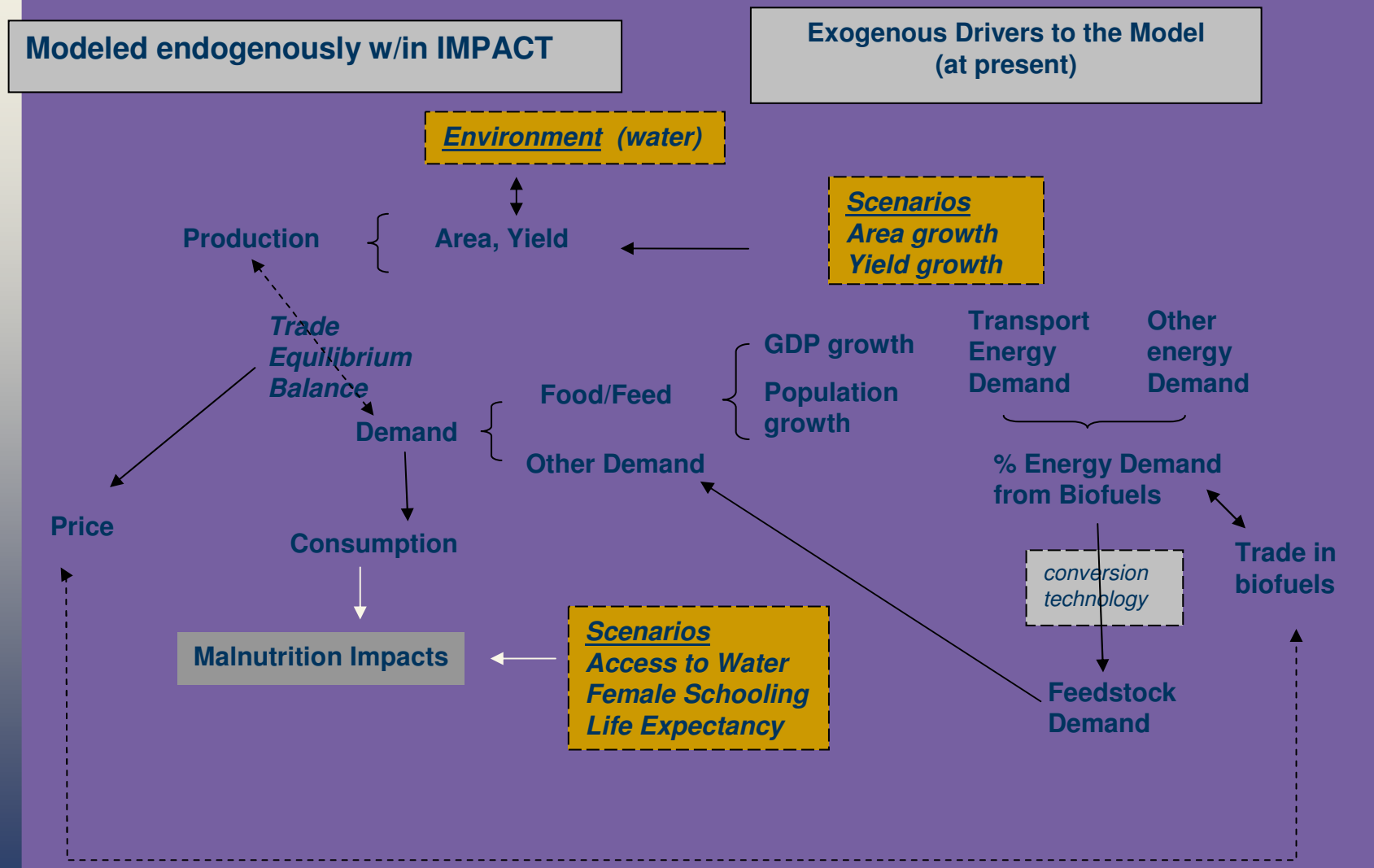
Source: Worldwatch Institute 2006

Bringing out the policy dimension in how to address these issues

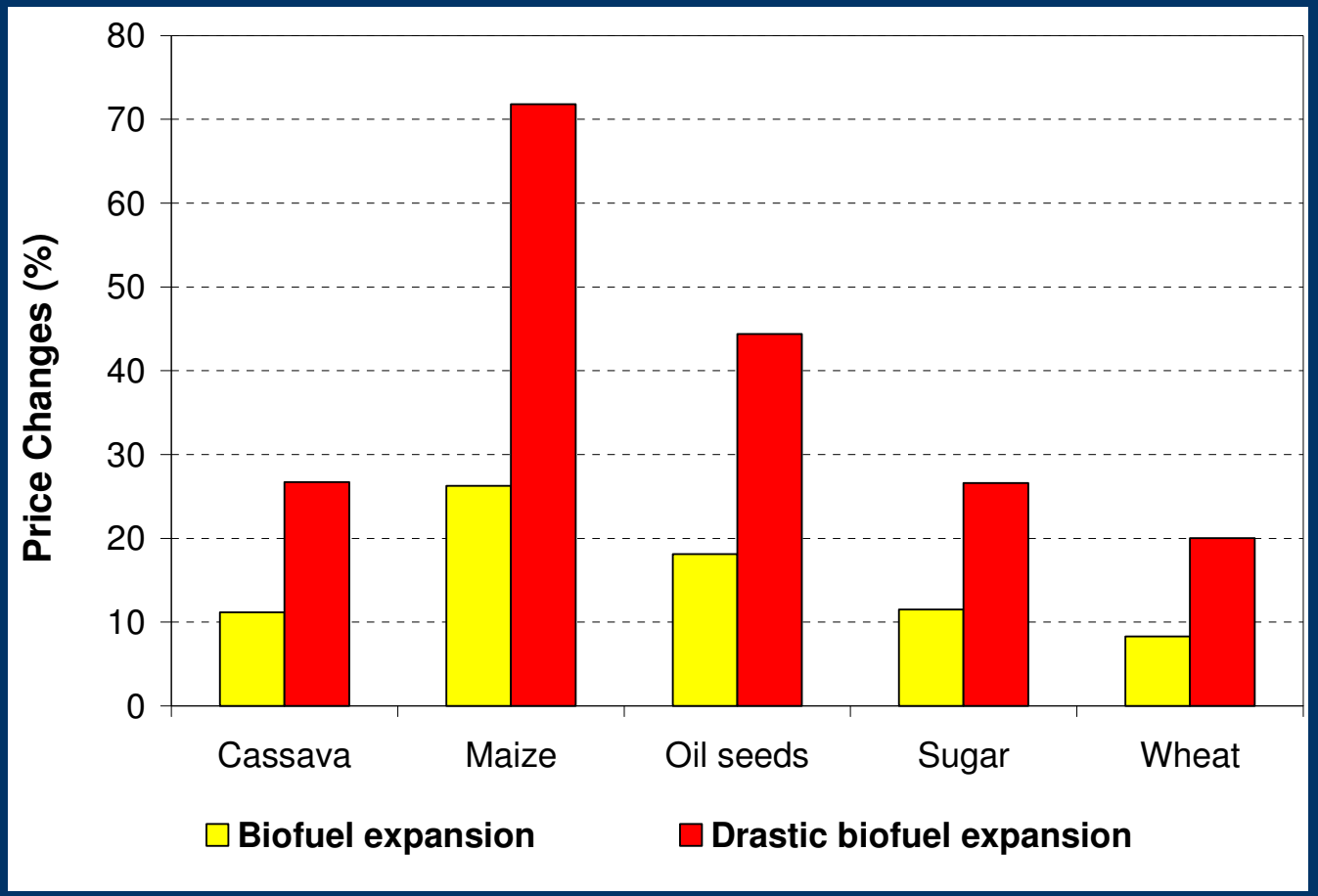
While most of the CGIAR is focused on the science of biofuel production and feedstock improvement – IFPRI looks to the policy side

- Social Protection issues – how to protect those most vulnerable to impacts
- Appropriate policy interventions – the blunt instrument of price controls versus targeted interventions
- Balancing maintaining producer incentives with reducing vulnerability of consumers

Modified Framework for Biofuels

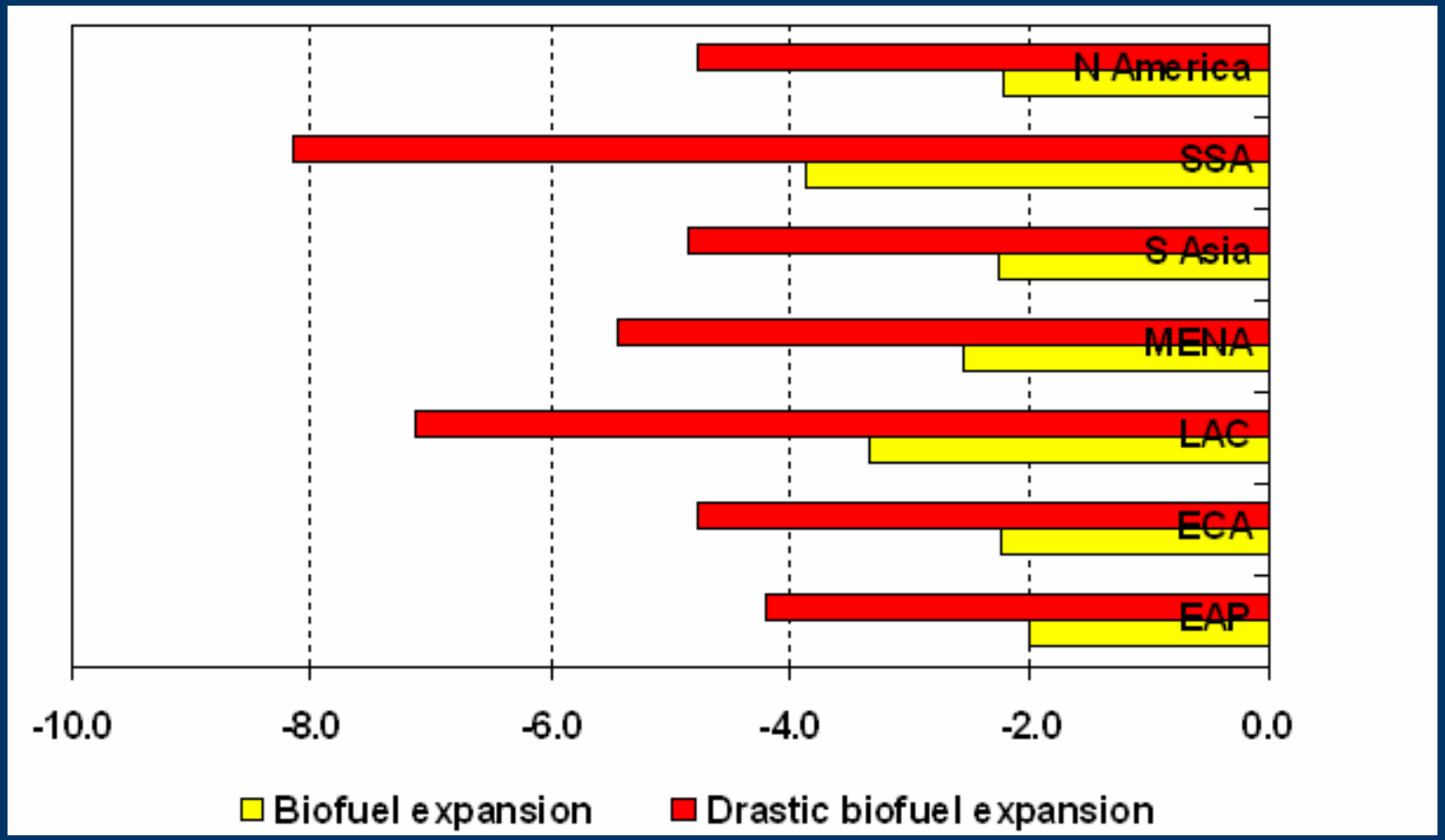


Changes in world prices of feedstock crops and sugar by 2020 under two scenarios compared to the baseline levels (%)



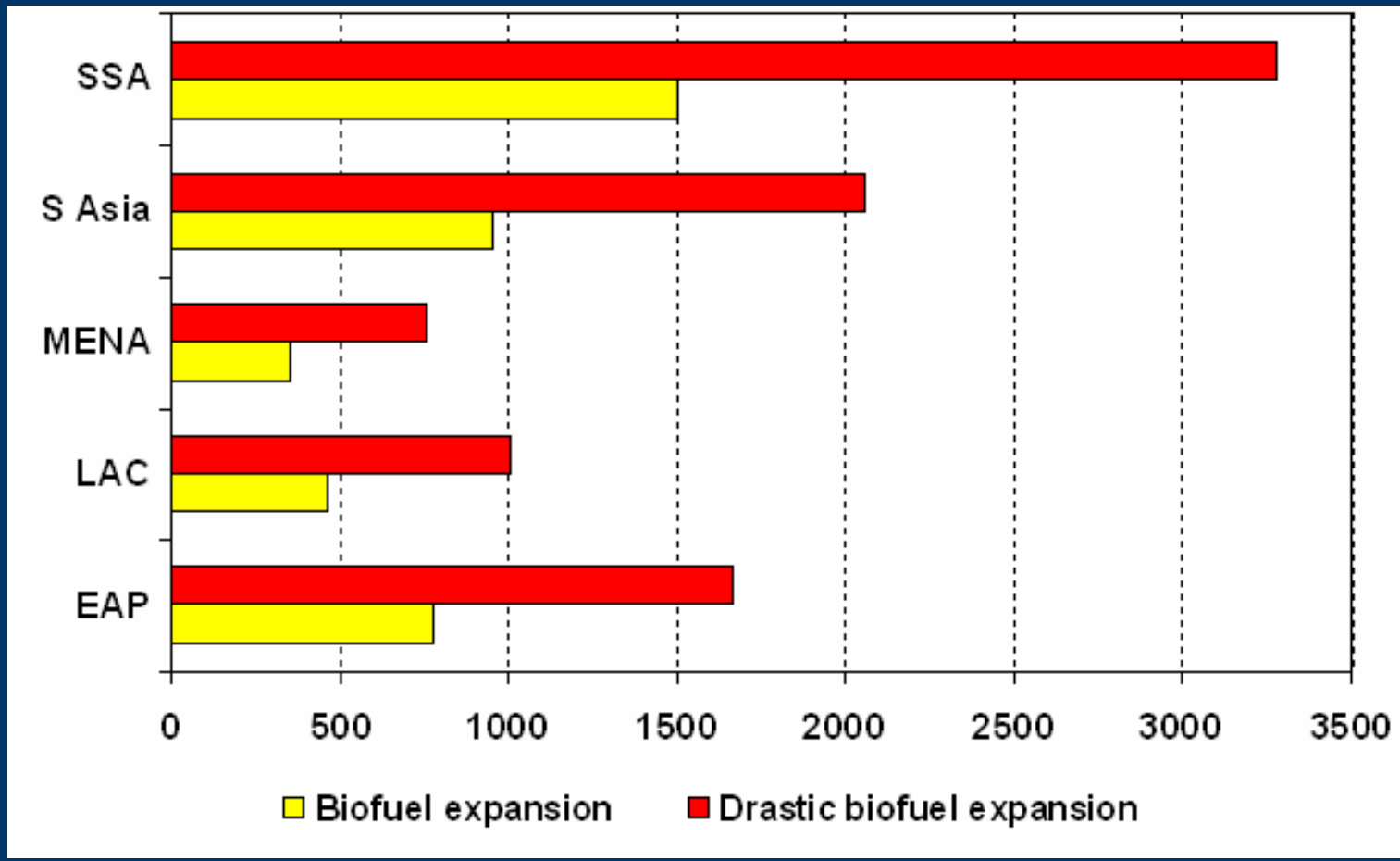
Source: IFPRI IMPACT projections

Changes in calorie availability by 2020 under two scenarios compared to the baseline levels (%)



Source: IFPRI IMPACT projections

Changes in number of malnourished pre-school children by 2020 under two scenarios compared to the baseline levels (%)



Source: IFPRI IMPACT projections

But we can't just look at average impacts

Price-effects for Bangladesh five-person household living on one dollar-a-day per person

Spend…their 5 $

3.00 *$* on food

.50 $ on energy

1.50 $ on nonfood

>a 20 percent increase in food and energy prices requires them to *cut 70 cents* of their expenditures.

Cuts will be made most in food expenditures:

>reduced diet quality, and

>increased micronutrient malnutrition

Food & Energy Expenditure Shares (for $1/day poor)

Country/year	Rural	Urban
Ethiopia, 1999		
Food	69.5	63.8
Energy	10.4	7.7
Bangladesh, 2000		
Food	65.6	60.1
Energy	9.3	9.4
Guatemala, 2000		
Food	50.5	47.6
Energy	1.3	1.3
Tajikistan, 2003		
Food	70.7	73.7
Energy	4.9	4.2

source: Ahmed *et al.*, 2007 (cited in von Braun, 2007)

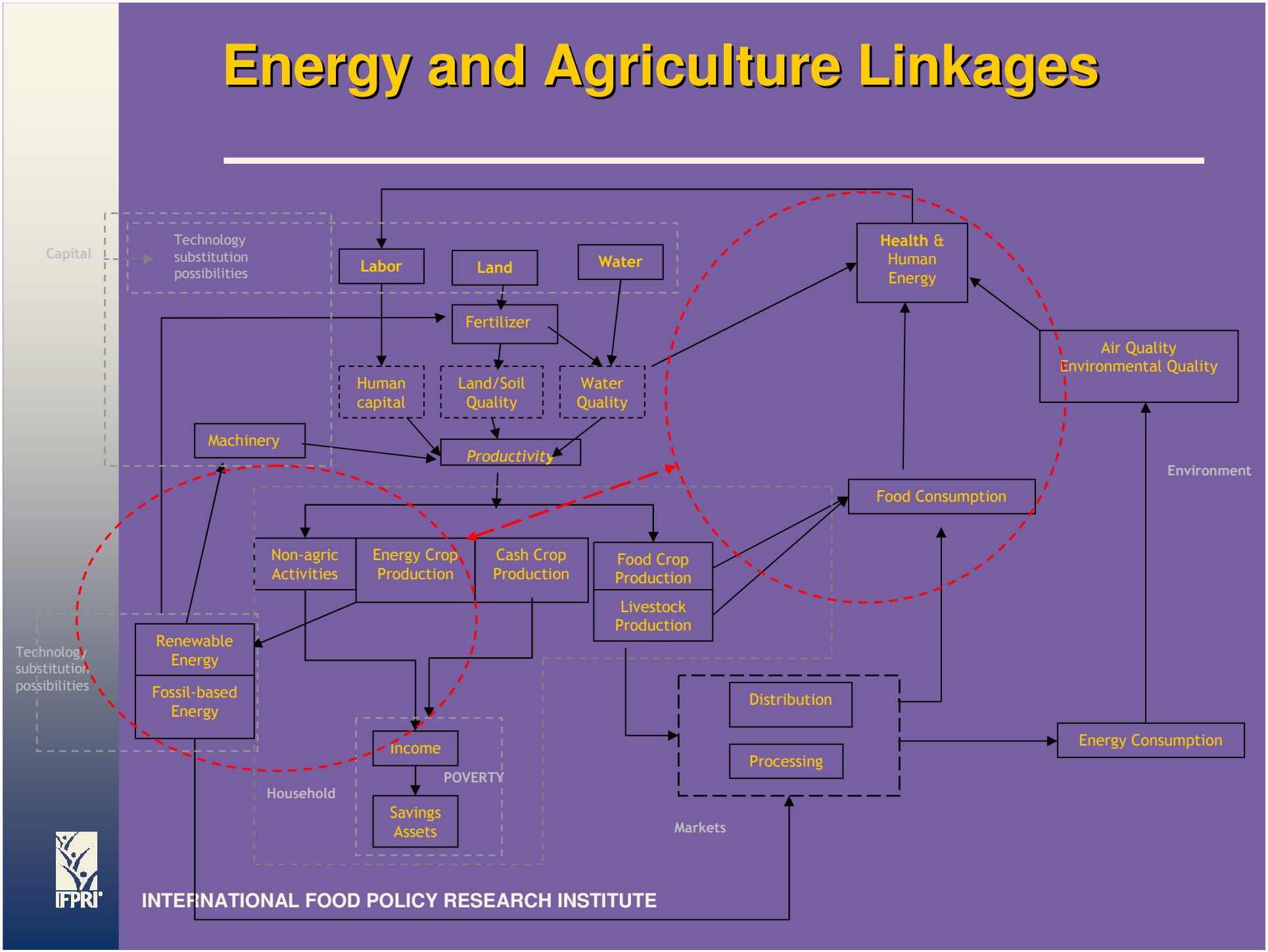
Important Bio-Physical Constraints

- While some crops may be more favourable from the perspective of profitability, they may encounter binding environmental constraints such as water (e.g. sugarcane in India, maize in Northern China)
- Extensive use of crop residues by 2nd generation technology would threaten sustainability of crop land resources
- Even where water might be available, there might also be constraints on available land for expansion (e.g. Southern China)
- A more detailed look at land-use is necessary in order to project trade-offs between alternative uses into the future
- Need to add account for water balance, as well

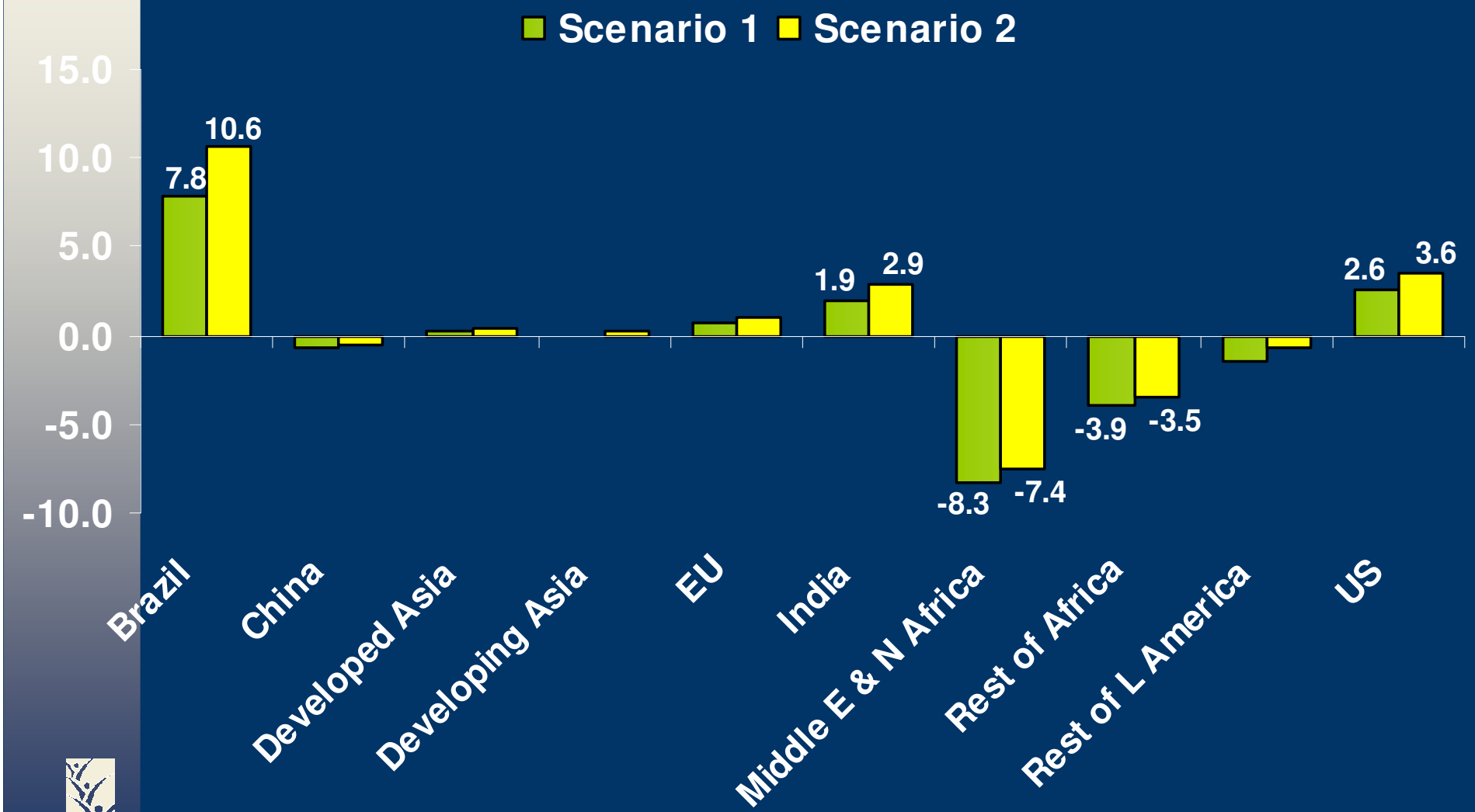
Other key linkages to make

- Must link scenarios for GDP growth to those for energy demand – CGE models are good for this
- Need to represent substitution possibilities for both technology, feedstock and even energy sources
- The role of markets in bioethanol also needs to be explored – embodies an important aspect of economic response
- Linkages to factor markets in agriculture (fertilizer price is also tied to fossil fuel prices)
- Role of biofuel in GHG mitigation is also important – although we are more focused on adaptation side of CC rather than the mitigation aspects, at the moment

Energy and Agriculture Linkages



Change in agric. value added by 2020: scenarios compared with baseline (%)



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Source: MIRAGE

Overall Messages from Analysis

- There will be a "food-versus-fuel" trade-off if:
  - Innovations and technology investments in crop productivity are slow
  - Reliance is placed solely on conventional feedstock conversion technologies to meet future blending requirements (or displacement) of fossil fuels with biofuels
- This situation could change considerably
  - With increased investments in technologies for biofuel conversion and crop productivity
- Biofuels increase value-added to agricultural land, and can provide boost to ag labor as well – but equity issues will arise

Important Issues for IFPRI/FAO

- Production processes for high-value liquid biofuels that can generate widespread benefits
  - Need to design production systems that will integrate rural households into the value chain
  - Allow for on-farm addition of value, rather than just extracting raw biomass
  - 'First generation' processes for producing biofuels compared with emerging ligno-cellulosic technologies? Should some countries wait?
- Solid biofuels – better, cleaner sources of energy for the poor (health/gender implications)
- Broad-based investment in agricultural research and rural infrastructure

Factors that Affect Impacts on the Poor

- While our level of analysis was very macro-level, there are some key points which should be taken into consideration when gauging impacts on the poor
- The nature of production systems
  - National policies tend to favor large-scale operations over small-scale producers
  - If land distribution is highly un-even (LAC) there might be little gained by small-holders
- Liquid fuels versus Solid fuels
  - Differentiate between liquid fuels (for transport) used by higher-income households and solid fuels (heating, cooking, lighting) for poorer households

Concluding Thoughts (1)

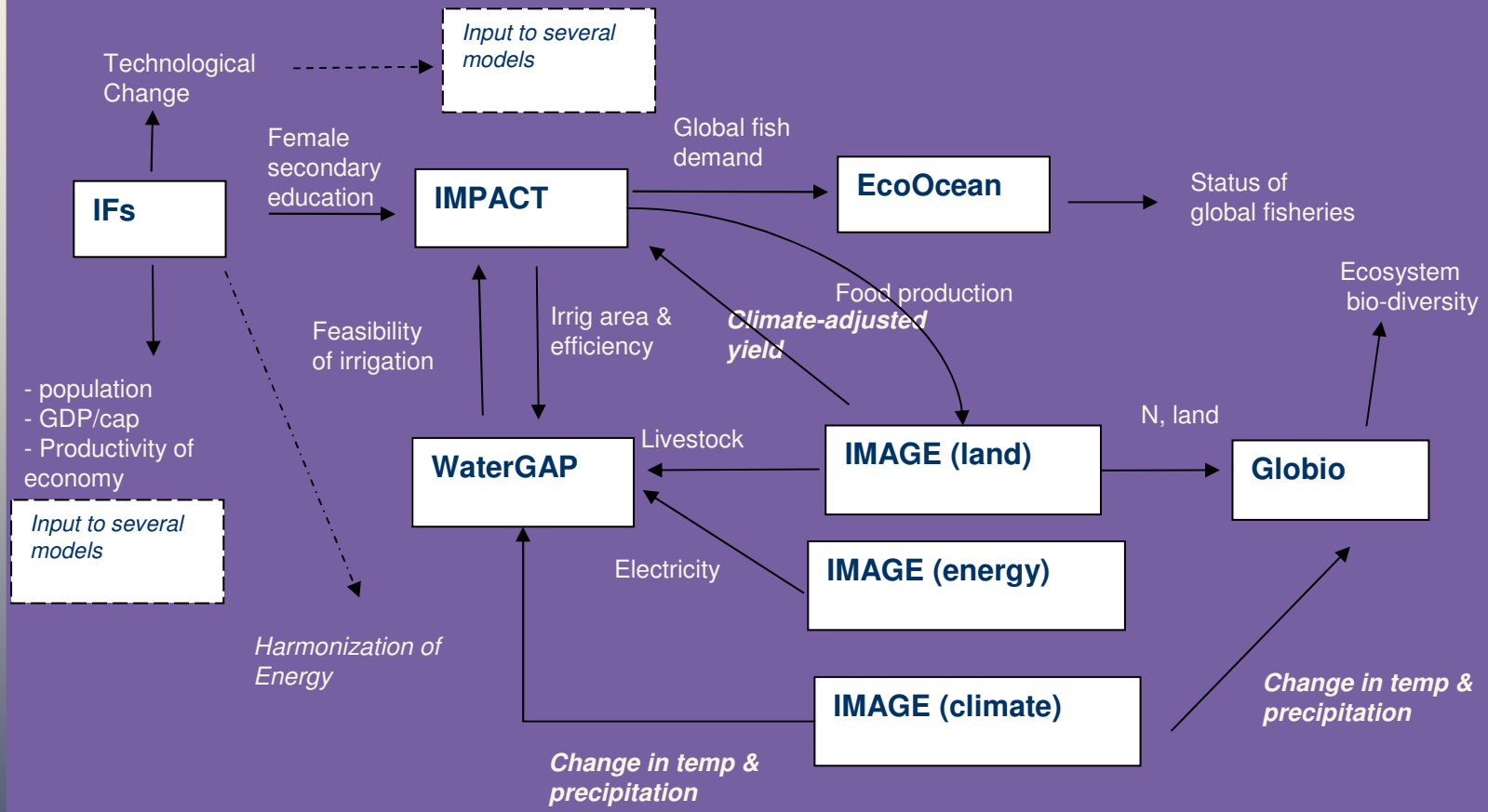
- Impacts of global biofuel development and growth on rural poor can be mixed and farming system-specific – both positive and negative – needs careful assessment
- Need better typologies to understand where there will be a 'crowding-out' effect – and where there's room for complementarities and synergy
- Need better assessment tools that bring out other details of the food system and can link to micro-level data to understand welfare impacts
- Strengthening food systems to enhance their resilience to global environmental change will also go a long ways towards improving their compatability with bioenergy systems

Concluding Thoughts (2)

- There is a "duality" involved when thinking about the functioning of food systems and biofuel/bioenergy systems
  - Improving production, processing, storage, distribution and marketing will do as much for food security outcomes as it will for improving viability/efficiency of bio-energy systems
  - Many of the issues that make global environmental and economic change a challenge for food systems will also be a challenge to bio-energy systems
  - Solving one problem may help to solve the other problem, which is the essence of duality….

Thank You!

Linkages in Multi-Model Assessment: GEO-4



Highly Disaggregated Platform For Evaluating Complex Change