

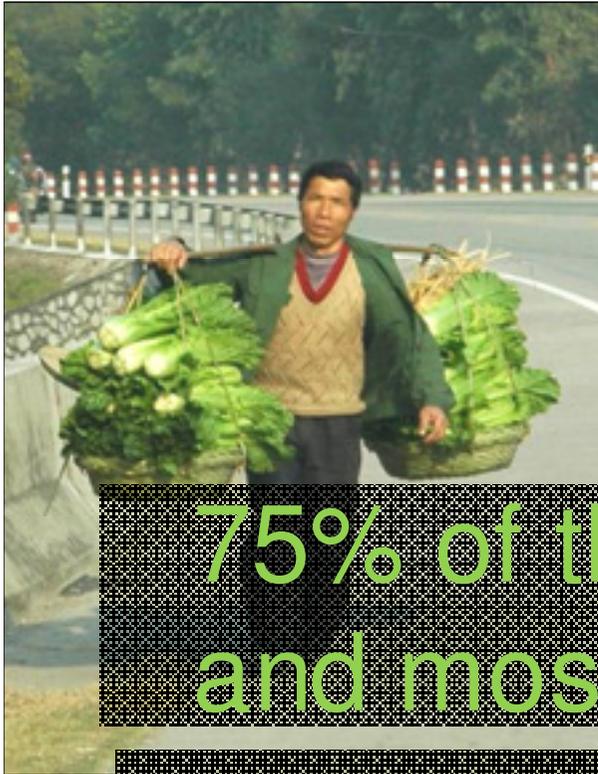
# *“The Future of Agriculture”*

**The World Development Report - 2008**

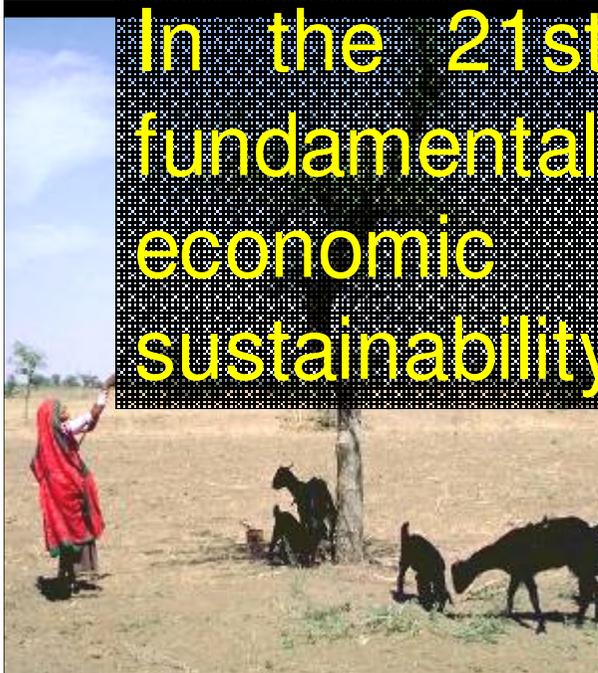


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Agriculture & Rural Development (ARD)  
The World Bank, Washington, DC.  
[efernandes@worldbank.org](mailto:efernandes@worldbank.org)

Zaragoza, June 16, 2008

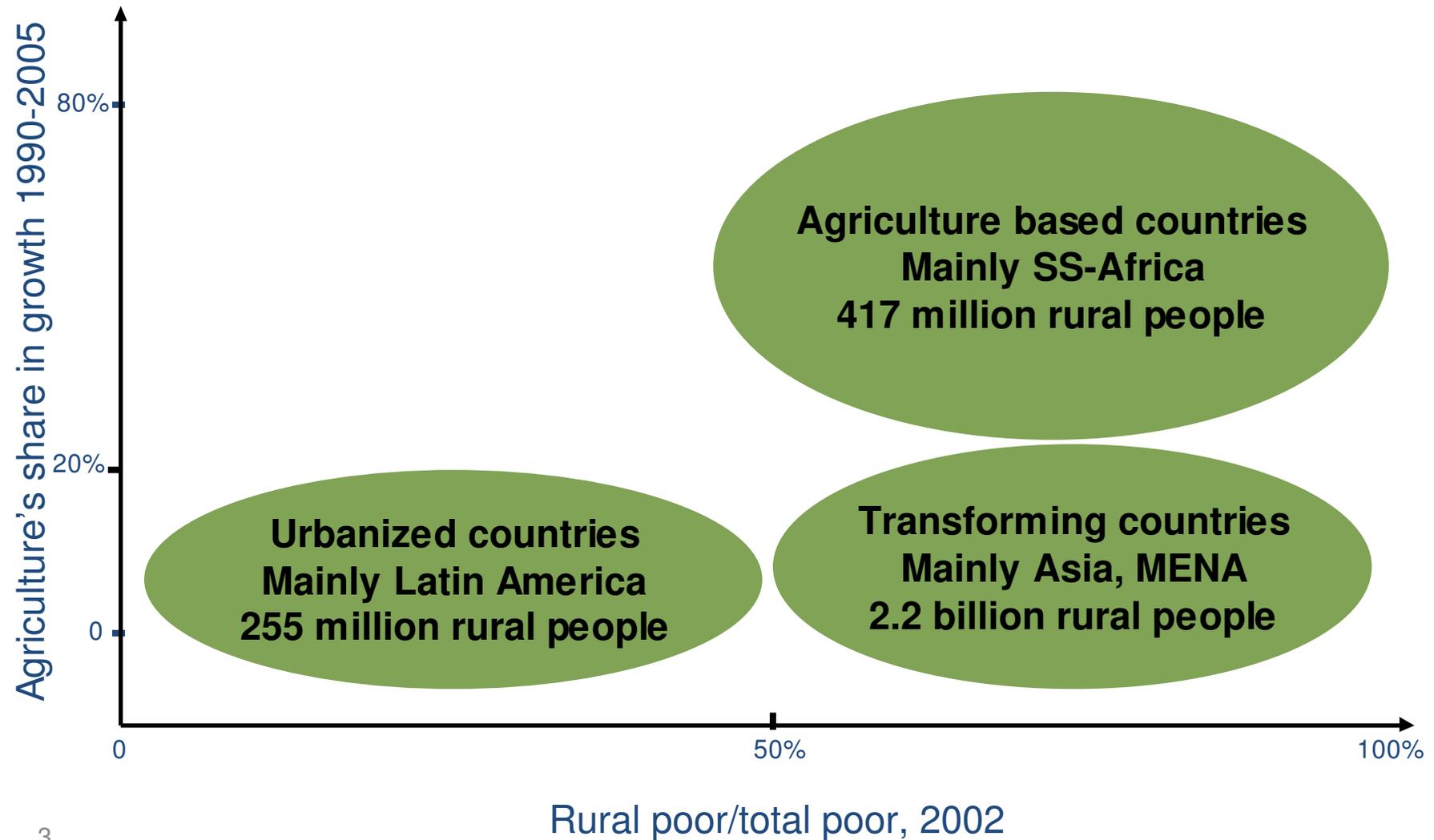


75% of the world's poor are rural and most are involved in farming



In the 21st century, agriculture remains fundamental for poverty reduction, economic growth and environmental sustainability

# WDR 2008 described the three worlds of agriculture



# Agriculture for development has three basic functions

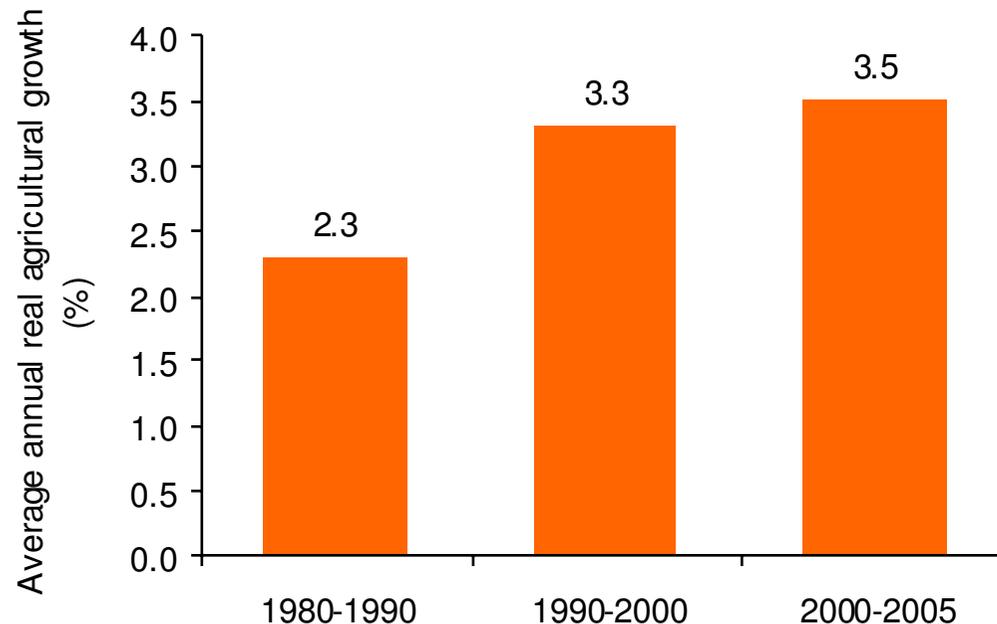
1. Major driver of growth in countries where agriculture generates significant share of GDP
2. Source of food security and livelihoods (especially for poor and in rural areas)
3. Integrate risk management & resilience to climate change via better natural resource management

# 1. A driver of overall economic growth

## Success stories: China, India, Vietnam

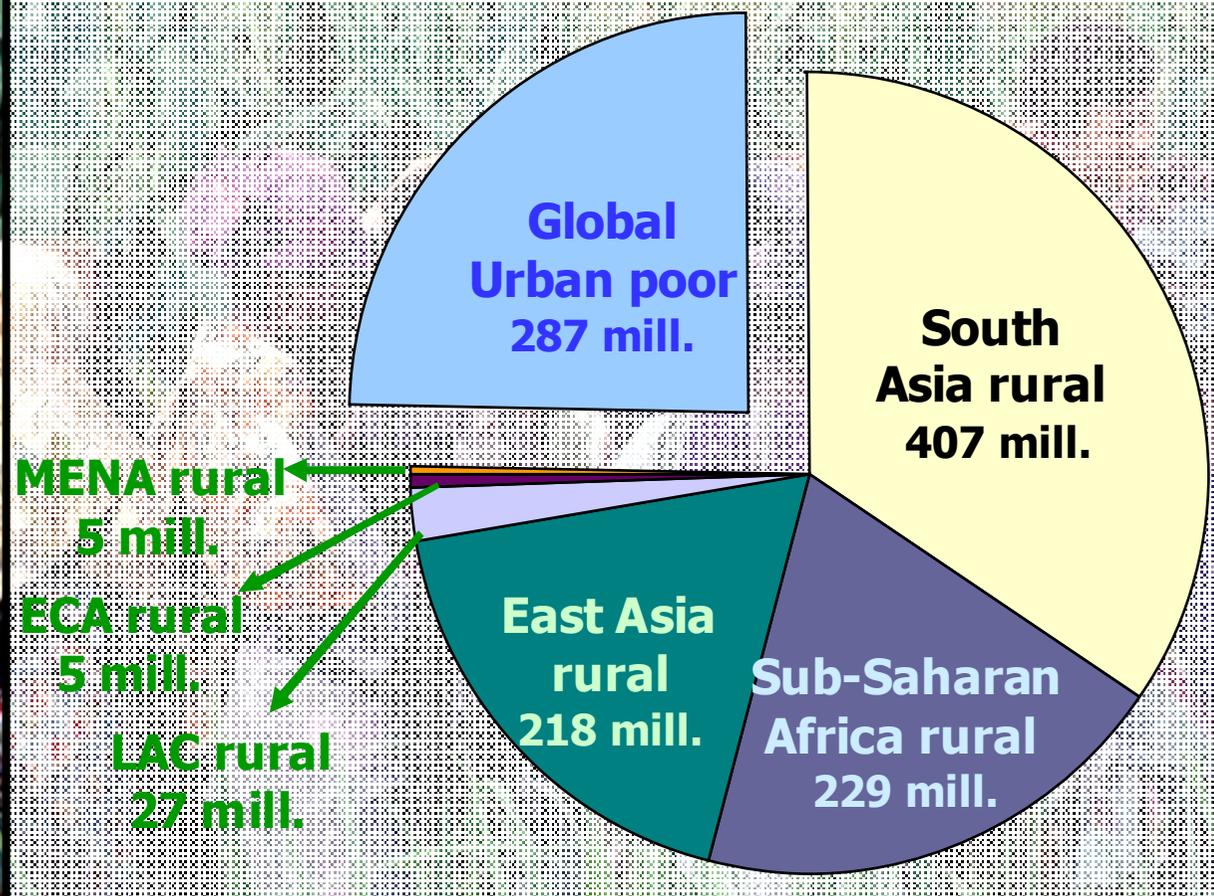
- Large contributor to GDP and changes in GDP
- Affordable food
- Employment at competitive wages
- Comparative advantage in trade
- Strong vertical and horizontal growth linkages

## Accelerating agricultural growth in Africa



## 2. A source of livelihoods and food security (availability, access, nutrition)

Global extreme poverty 2002, \$1.08 a day



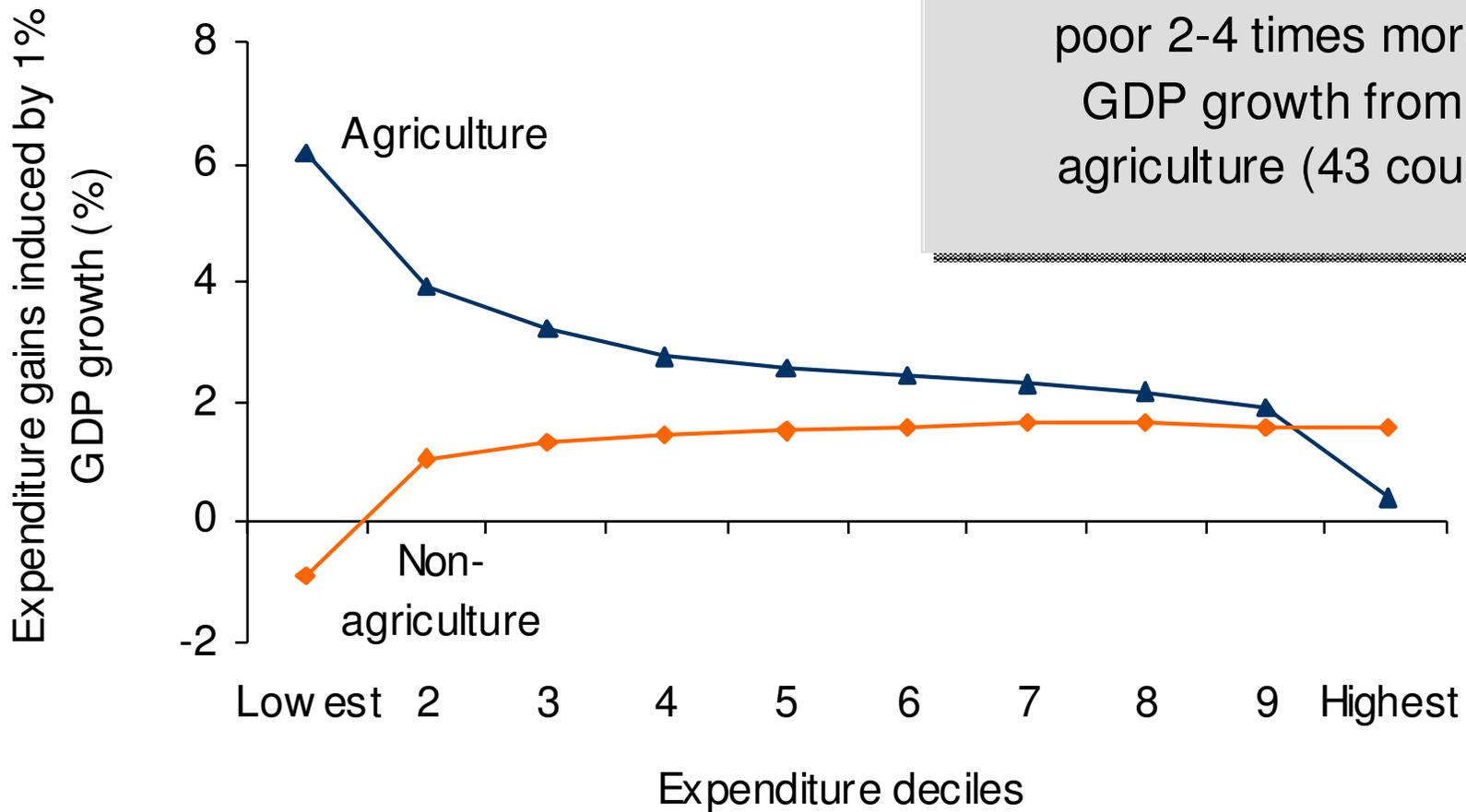
2.5 billion people depend directly on agriculture

800 m smallholders

75% of poor are rural and the majority will be rural to about 2040

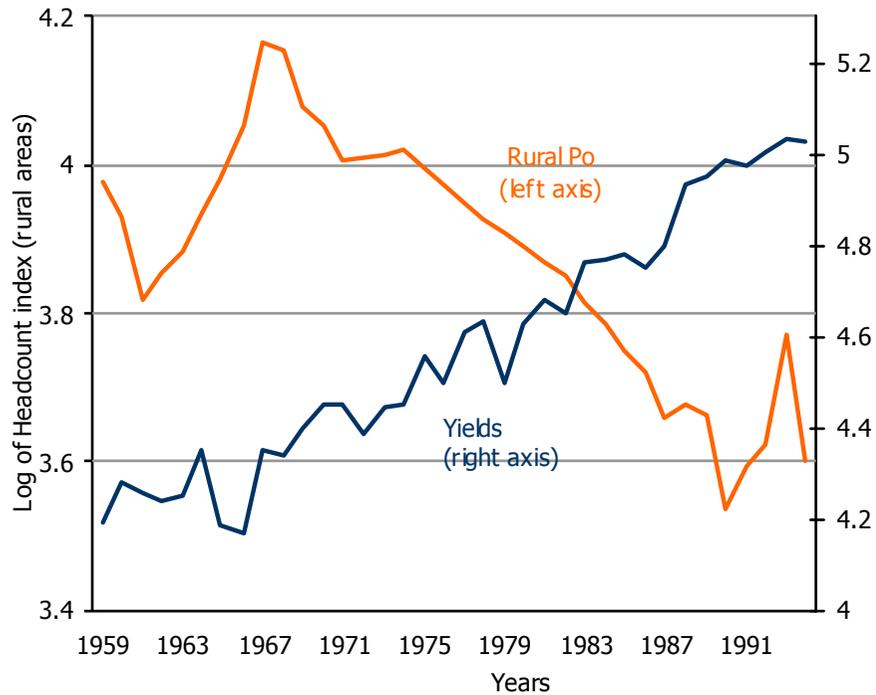
# Growth from agriculture is especially effective for poverty reduction, and in rural areas

GDP growth from agriculture benefits the income of the poor 2-4 times more than GDP growth from non-agriculture (43 countries)

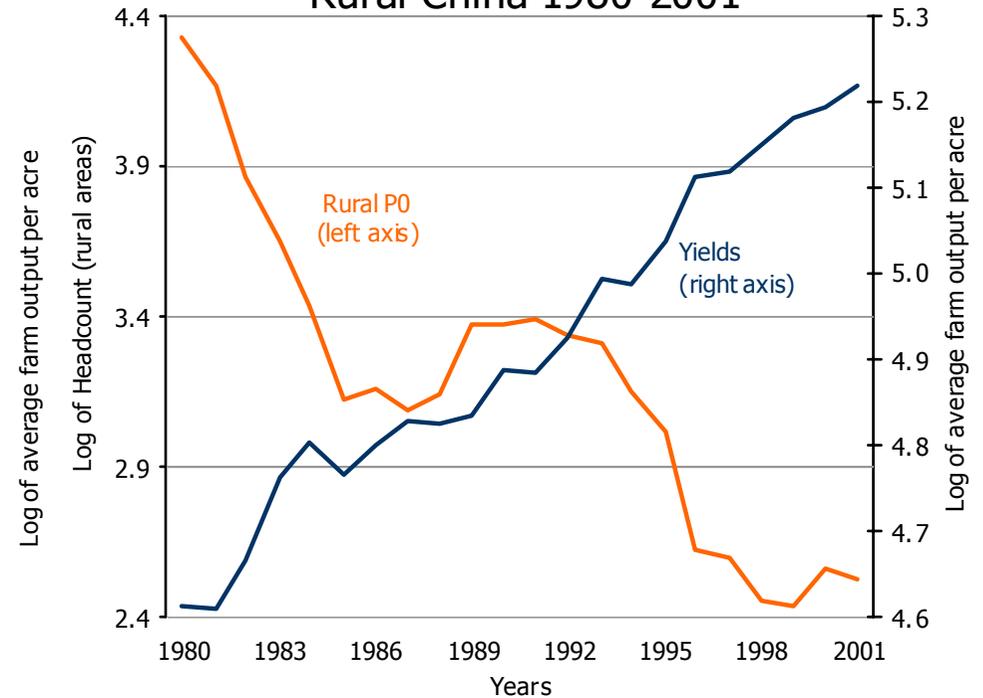


# Agricultural productivity growth has driven poverty reduction in Asia

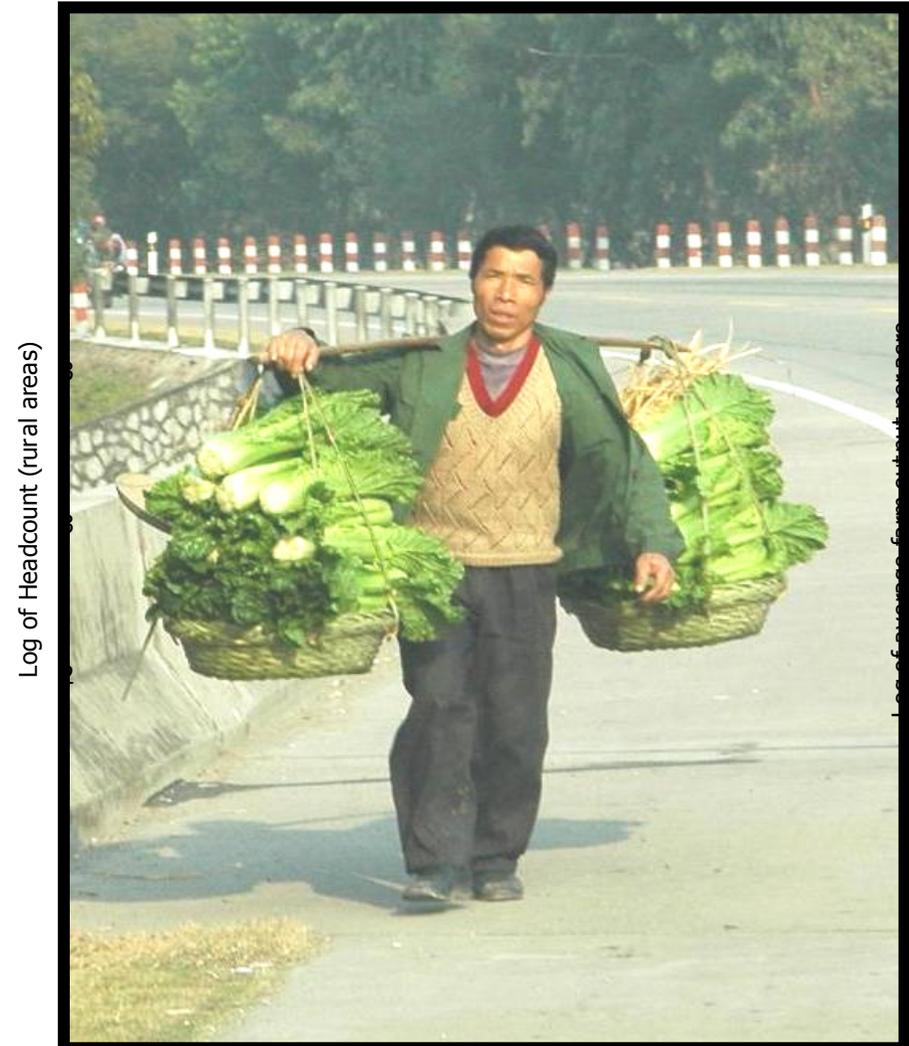
Headcount index and average farm yields  
Rural India 1959-1994



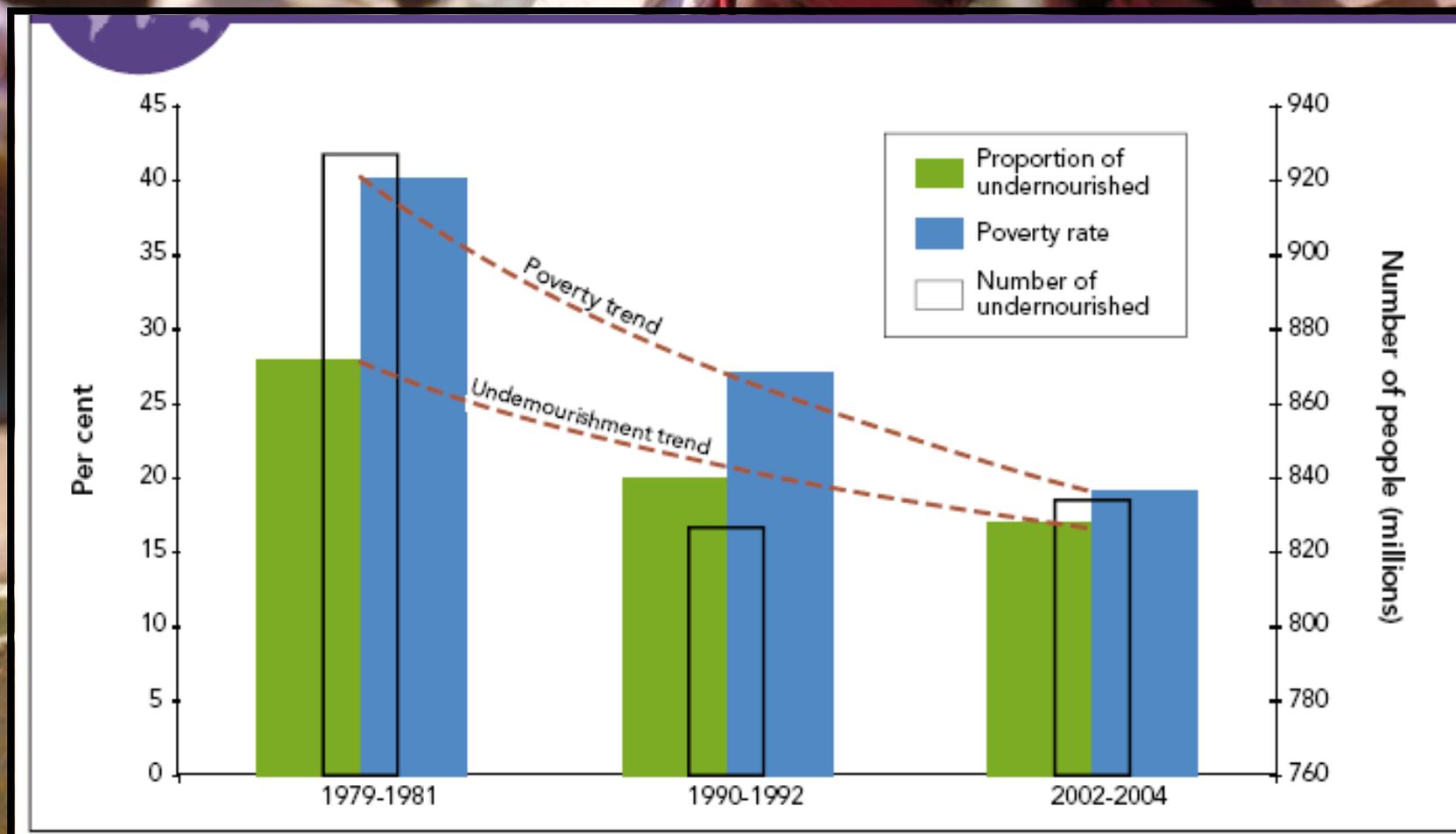
Headcount index and average farm yields  
Rural China 1980-2001



# Agricultural productivity growth has driven poverty reduction in Asia



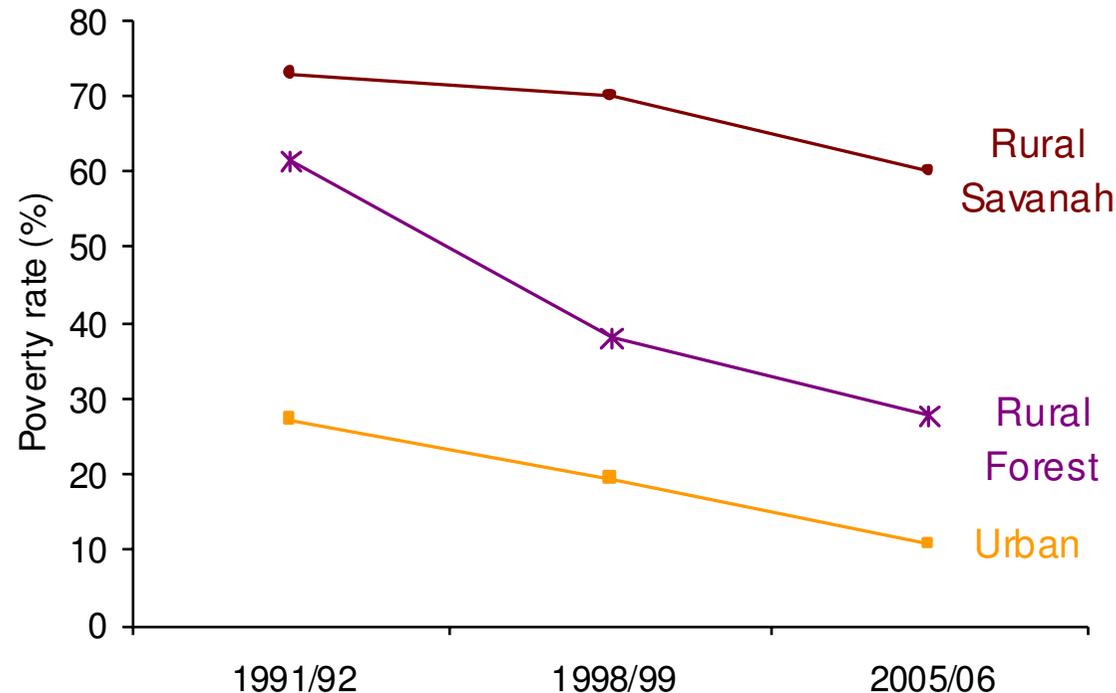
# Lowers poverty while reducing undernourishment



Source: Poverty rates - Ravallion, Chen and Poore (2002); und - FAO (2006)

Note: Dotted lines are logarithmic trends in poverty and undernourishment rates.

# Ghana – a story of poverty reduction



- ❑ Rural poverty halved with increased agricultural productivity, higher cocoa prices, reduced food prices, and income diversification

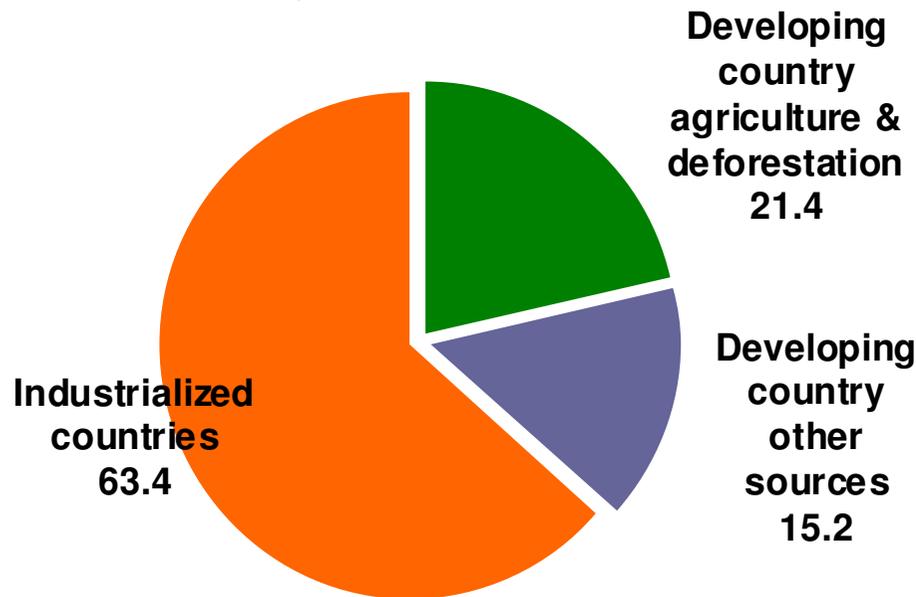
# 3. Better natural resource management for lower risk and higher resilience

## Important user of natural resources:

- 80% of fresh water resources
- 40% of land area
- 21+ % of greenhouse gas emissions

**Many Opportunities:**  
Sustainable farming systems and environmental services (conservation farming, agroforestry, agrobioengineered landscapes for climate resilience)

**Contributions to greenhouse gas emissions**





# Improved opportunities

- **Technological innovations**

- Intensification technologies such as improved and resilient varieties, conservation farming, precision farming, intensive management – e.g. NERICA rice, Bt cotton
- ICT in production, financial management, marketing
- Value addition through changes in product or process

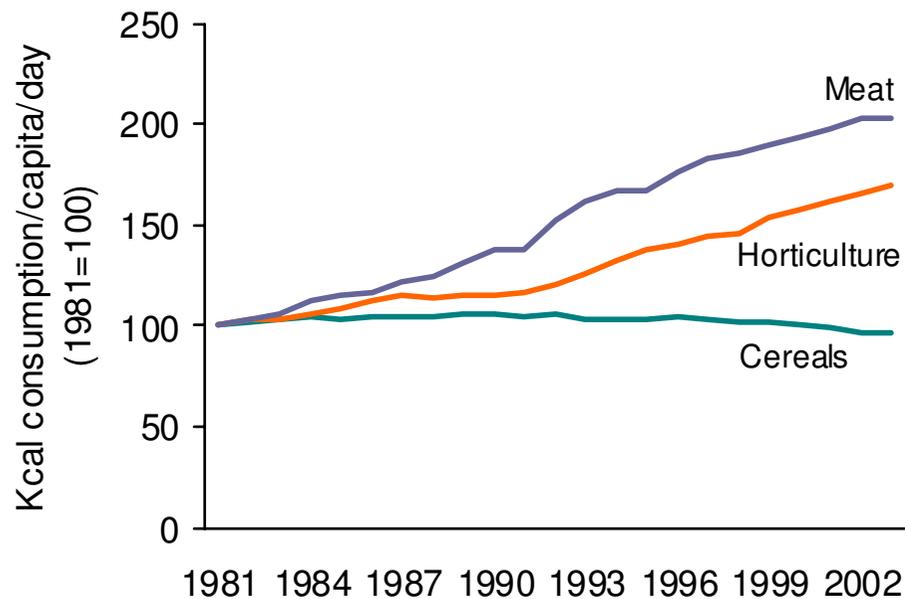
- **Institutional innovations** (many at early stages)

- Stronger producer organizations and industry/trade associations
- Weather and price risk insurance (Malawi)
- Partnerships (public-private, private–community)
  - For infrastructure improvement
  - For rural financial services
  - For agricultural extension
  - For input supply
  - For market access

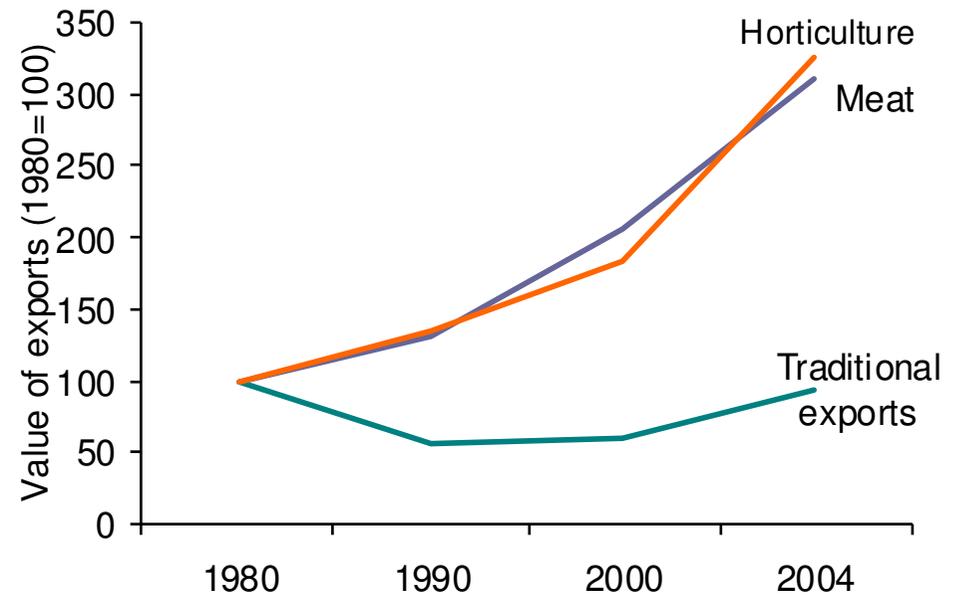
# Improved opportunities

Changing diets – a new agriculture of high value products and non-traditional exports

Developing country consumption



Developing country exports



# Improved Opportunities

New demand for value-added, differentiated products in emerging end-markets and more prosperous countries



# Improved Opportunities

New demand for value-added, differentiated products in emerging end-markets and more prosperous countries

## Box I. Emerging Functional Foods from Developing Countries

- **Brazil:** Manufacturers in Japan and the U.S. obtain plant-based physiologically active ingredients such as antioxidant compounds from acai-berry, guarana, and yacon.
- **Kenya:** There is a potential to develop the camel milk sector for the domestic market and to respond to the demand from South America. Camel milk has medicinal properties, especially in management of diseases such as diabetes, high blood pressure, heart disease, allergies, and peptic ulcers. Camel milk can be found in a number of supermarkets in Nairobi.
- **Peru:** Purple corn, yacon, maca, and cat's claw are exported to Japan and the U.S. The export value of just two plants, purple corn and yacon, grew at an average annual rate of 467 percent and 335 percent, respectively, from 1998 to 2002. Dozens of companies are involved in export.

Source: EMBRAPA; BioTrade Peru 2004; Gitonga 2006; Authors.

# Improved Opportunities

New demand for value-added, differentiated products in emerging end-markets and more prosperous countries



Functional Food	Benefit to Health and Well-being
Oats (beta-glucan)	Heart health
Eggs with increased omega-3 content achieved by altered chicken feed	Heart health
Margarine fortified with plant sterols	Improved cholesterol levels
Fermentation with specific bacteria to yield bioactive peptides	Lowers blood pressure
Chewing gum sweetened with xylitol instead of sugar	Helps prevent dental caries
Golden rice	Pro-vitamin A
Orange-fleshed sweetpotato	Pro-vitamin A



# Improved Opportunities

New demand for value-added, differentiated products in emerging end-markets and more prosperous countries

## Box 2. Small but Growing Functional Food Market in Developing Countries

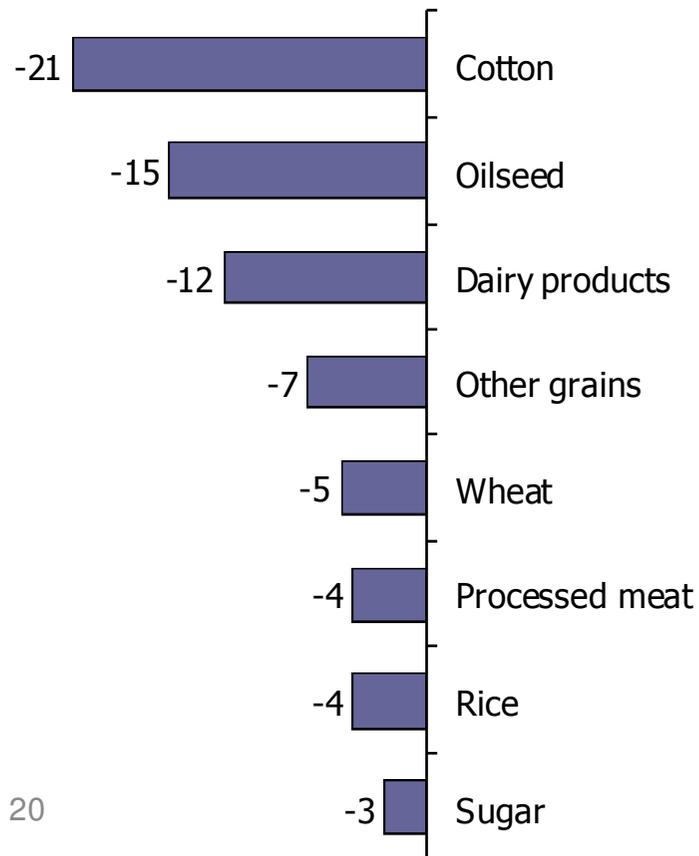
- **China:** The total functional foods market is approximately US\$6 billion per year, which is expected to double by 2010.
- **India:** With its strong tradition of eating healthy foods, India ranks among the top ten nations in buying functional foods and the market size is expected to nearly double in the next five years.
- **Brazil:** The sector is relatively young, growing rapidly and has significant room for further growth. Sales value is projected to reach US\$1.9 billion by 2009, which translates into a growth rate of 29 percent per capita spending on functional foods during this period.
- **Peru:** The sector for health foods, in general, is still in early stages, but has potential for growth because of rich biodiversity in roots and tubers containing diverse sugars and carbohydrates, which can respond to the demand for low-fat and sugar-free products.
- **Russia:** The value of functional foods market was estimated at US\$75 million in 2004, with an annual growth of 20 percent expected. The dairy industry took the lead in the functional foods movement and the largest growth is expected in this sector.

*Source: Sun 2006; Ismail 2006; Benkouider 2005; Gutierrez 2004; Drujinina 2005; Spiridovitch 2005.*

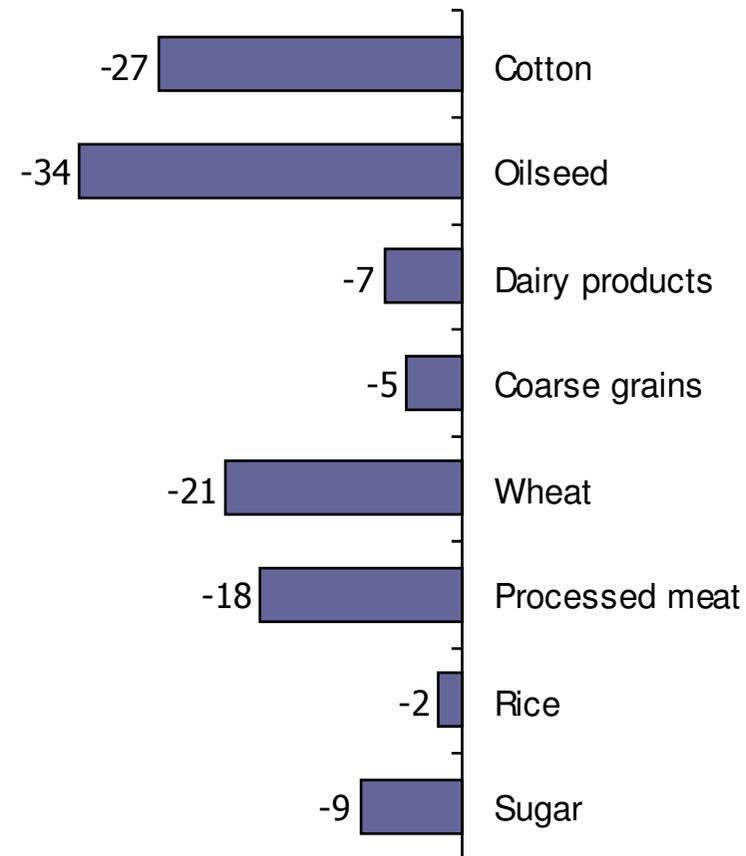
# But major challenges remain

## Global trade distortions are still pervasive

**Real international commodity prices have been suppressed by current global trade policies** (% of price)



**Trade share losses to developing countries due to current global trade policies** (% point loss to developing country trade shares)



# Recent increase in food prices

- May have already pushed 100 million people into poverty over the last two years.
- The doubling of food prices could set back the fight against poverty by 7 years.
- For more than 2 billion people, high food prices are now a matter of daily struggle, sacrifice, and even survival.

# The stakes are high

- Rising food prices risk losing recent gains in reducing malnutrition. Malnutrition threatens this -- and future -- generations.
- Already hunger and malnutrition are the underlying causes of death of over 3.5 million children every year.
- Not a temporary phenomenon – high food prices are expected to stay high in the medium term (above 2004 levels through to 2015).

# Why have food prices risen?

## Main drivers of food price inflation

### Fundamentals -Supply and Demand

#### INCREASING DEMAND:

Sustained **food demand from emerging markets**, especially demand for protein and fresh fruits and vegetables – e.g., Russia, China and India

**Diet changes**, from grain to more diversified diet, meats and dairy with higher derived demand for grains and oilseeds

**Biofuel mandates** => demand shift, particularly in the United States (corn-based ethanol), and Europe (rapeseed for biodiesel), Argentina (soybeans for biodiesel)

Agricultural commodity prices  
S&P/GSCI



Source: Thomson Datastream

# Why have food prices risen?

## Main drivers of food price inflation

**Fundamentals**  
**-Supply and Demand**

### DECREASING SUPPLY:

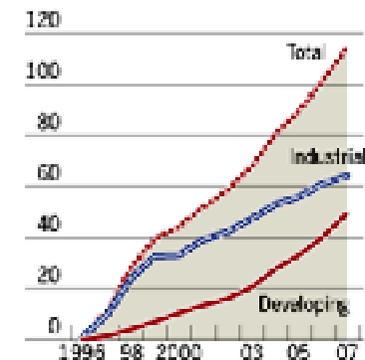
Very **low stock to use ratio** for grains due to:

**Shortfalls in grain production** due to droughts in Australia, Canada, Eastern Europe

**Disappearance of intervention stocks** in USA and EU due to policy reforms

**Competition from biofuels**

**Global area of biotech crops**  
Hectares (m)



Source: ISAAA

# Why have food prices risen?

## Main drivers of food price inflation

### Fundamentals -Supply and Demand

#### **INCREASING PRODUCTION COSTS**

Increasing costs of energy, fertilizer and other commodity dependent agricultural inputs

#### **DECLINING DOLLAR**

Declining dollar drives up prices of all commodities, including agro-commodities.

#### **SPECULATION AND INFLATION HEDGE**

Inflow of funds causes commodities to diverge from trading on their fundamentals

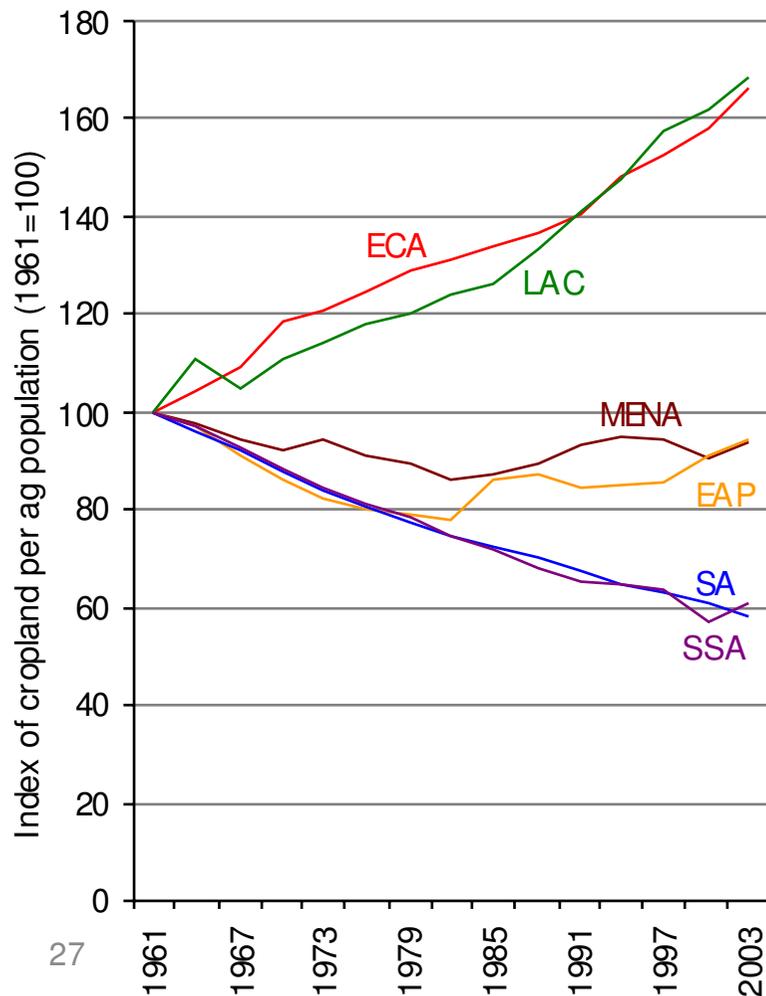
# Major policy messages

- Avoid short-term responses to short-term food insecurity that have difficult longer-term implications
- Short-run instruments affect income distribution (by definition), and may create rents that require planning exit strategies in advance
- Short-run instruments that work well in one situation may not in another, depending on:
  - institutions, capacity
  - governance requirements
  - size of country and history of trade, etc.
- **Promote new opportunities for longer-term agricultural growth**

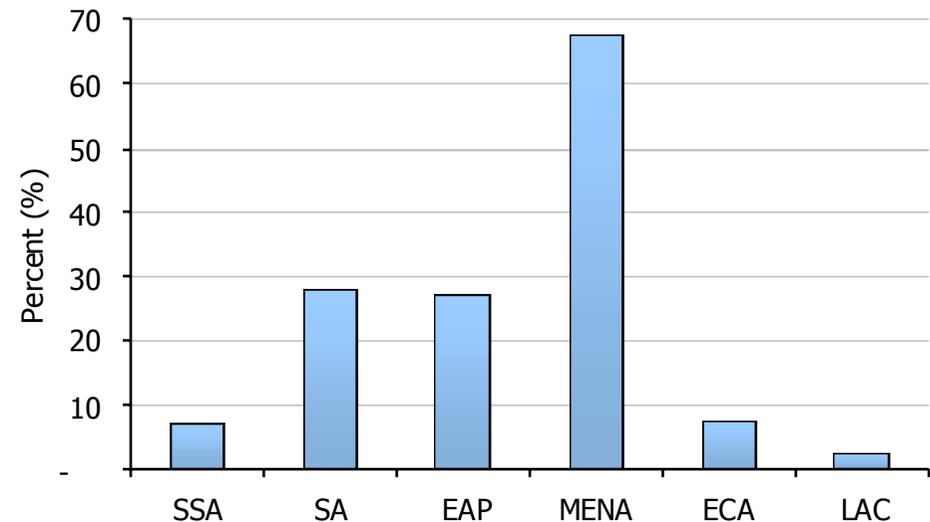
# Challenges

## Increasing land and water constraints

**Cropland per capita of agricultural population**



**% of population in absolute water scarcity**



# Challenges

Increasing land and water constraints

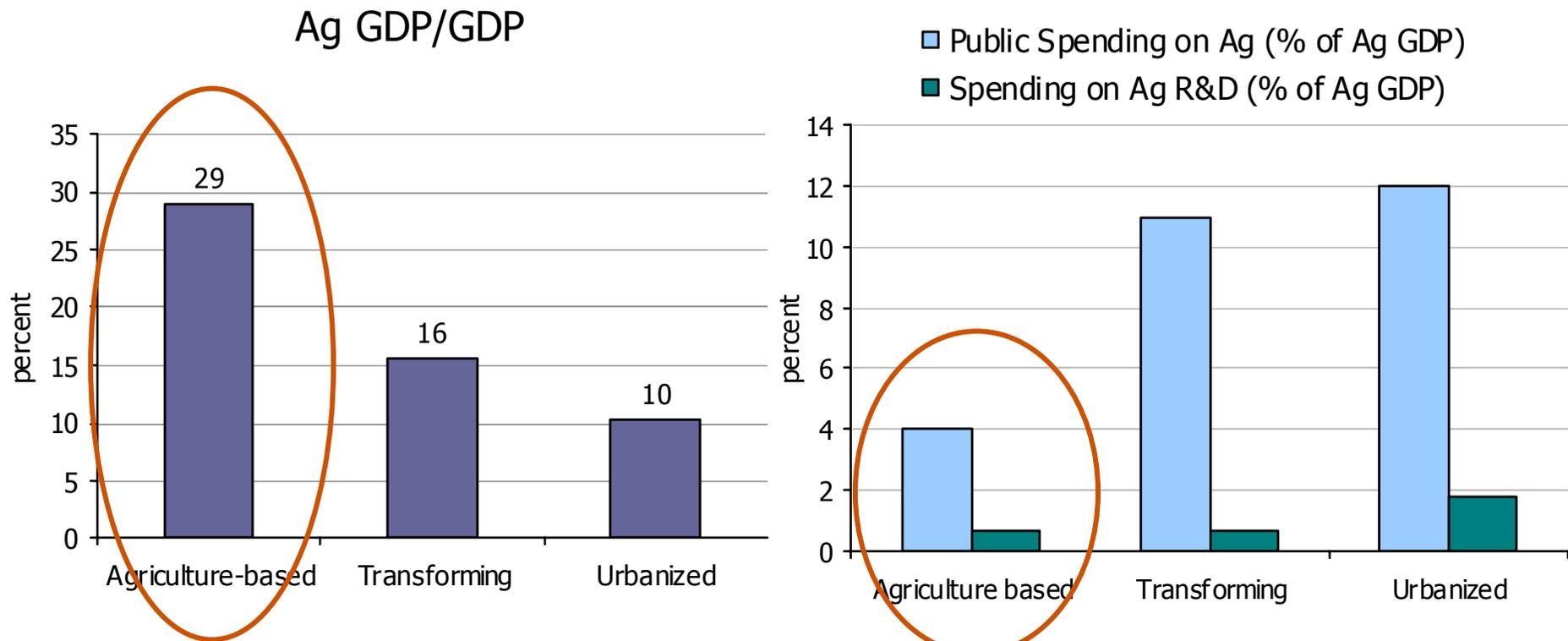


# Challenges

- **Making growth pro-poor**
  - Connecting smallholders to most profitable markets, whether old or new
  - Improving assets of the poor, especially women
  - Scaling up to achieve aggregate impact
- **Implementation bottlenecks**
  - Underinvestment in core public goods
  - Weaknesses in governance (new state roles, coordination, decentralization)

# Challenges

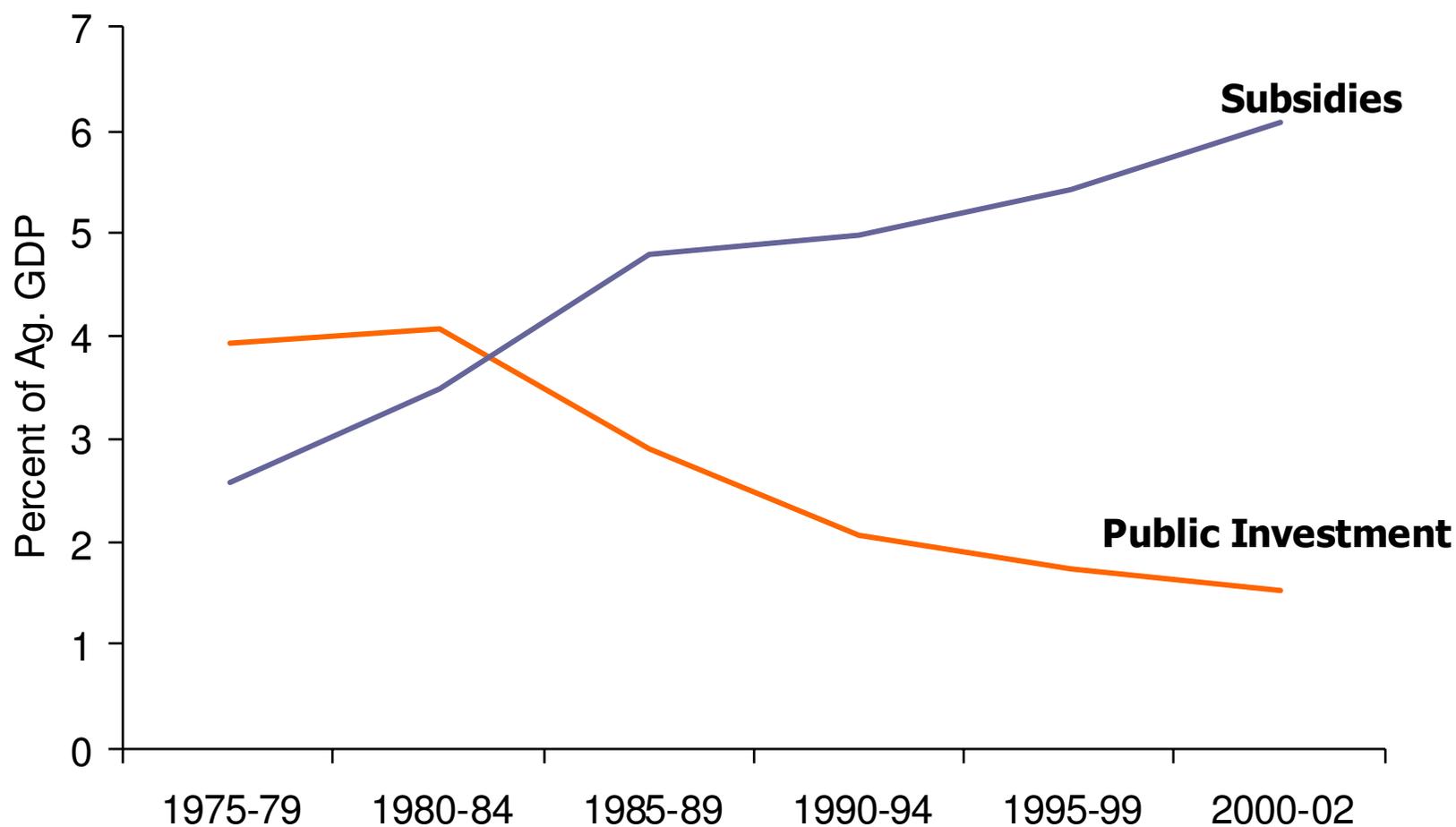
Agricultural-based countries spend too little on agriculture (and R&D)



But quality of existing spending often poor

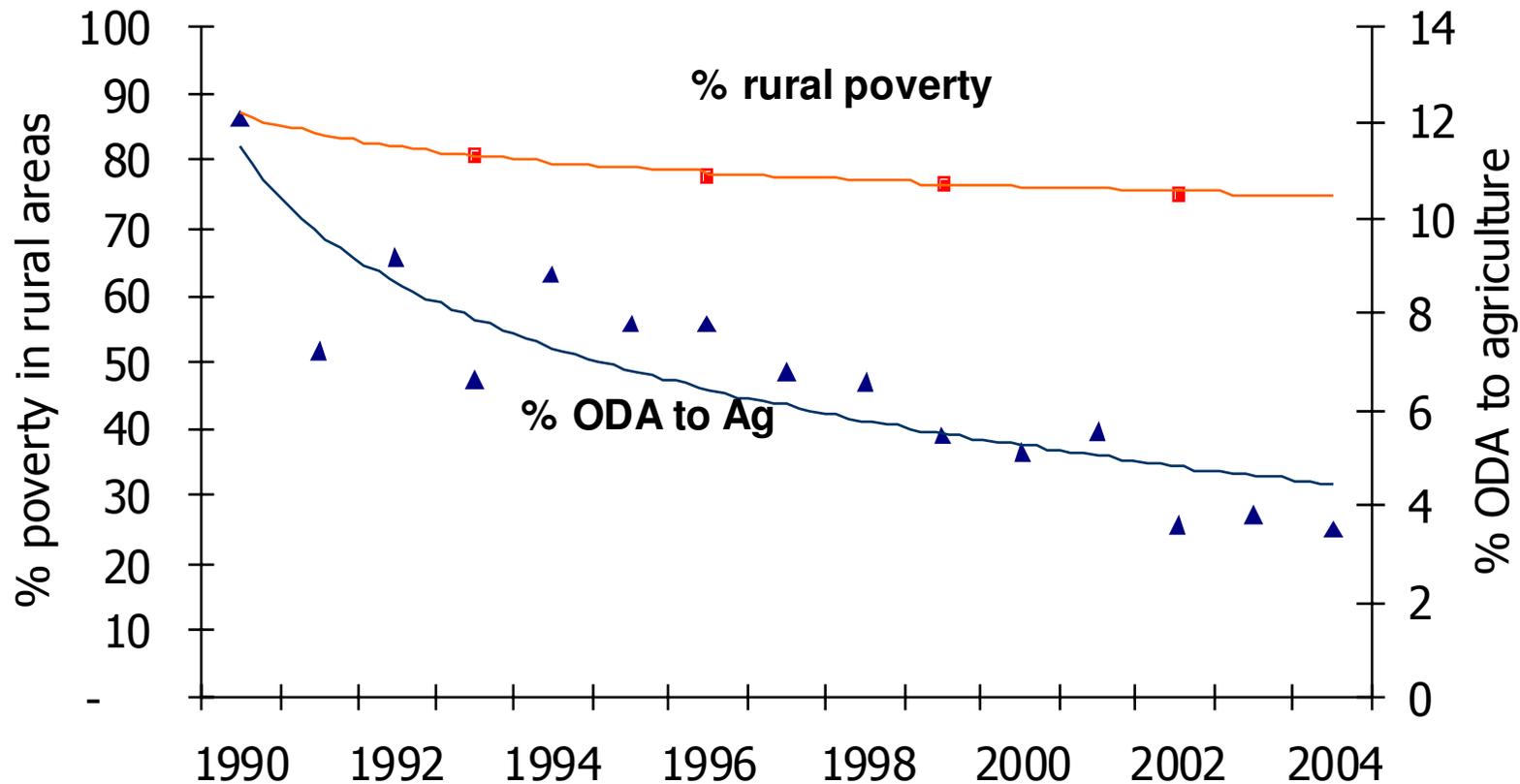
# Challenges

“Misinvestment” is also pervasive



# Challenges

Donor support to agriculture also declined despite Millennium Development Goal of halving poverty



# Donor support to agriculture 1980-2005

## Early 1980s

Official development  
assistance (ODA): 17%

**World Bank lending: 30%**

## Early 1990s

Official development  
assistance (ODA): 12%

**World Bank lending: 15%**

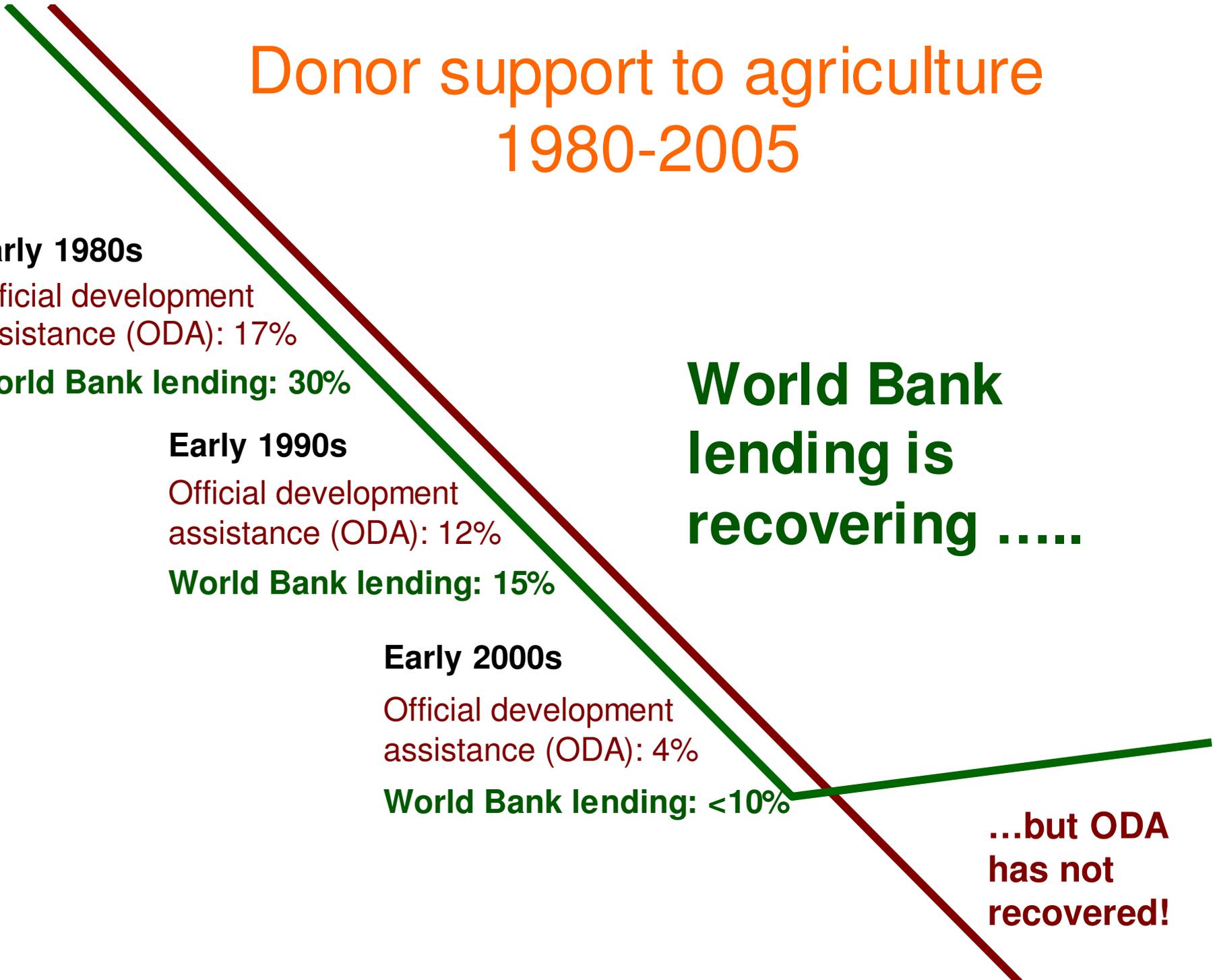
## Early 2000s

Official development  
assistance (ODA): 4%

**World Bank lending: <10%**

**World Bank  
lending is  
recovering .....**

**...but ODA  
has not  
recovered!**



# Challenges

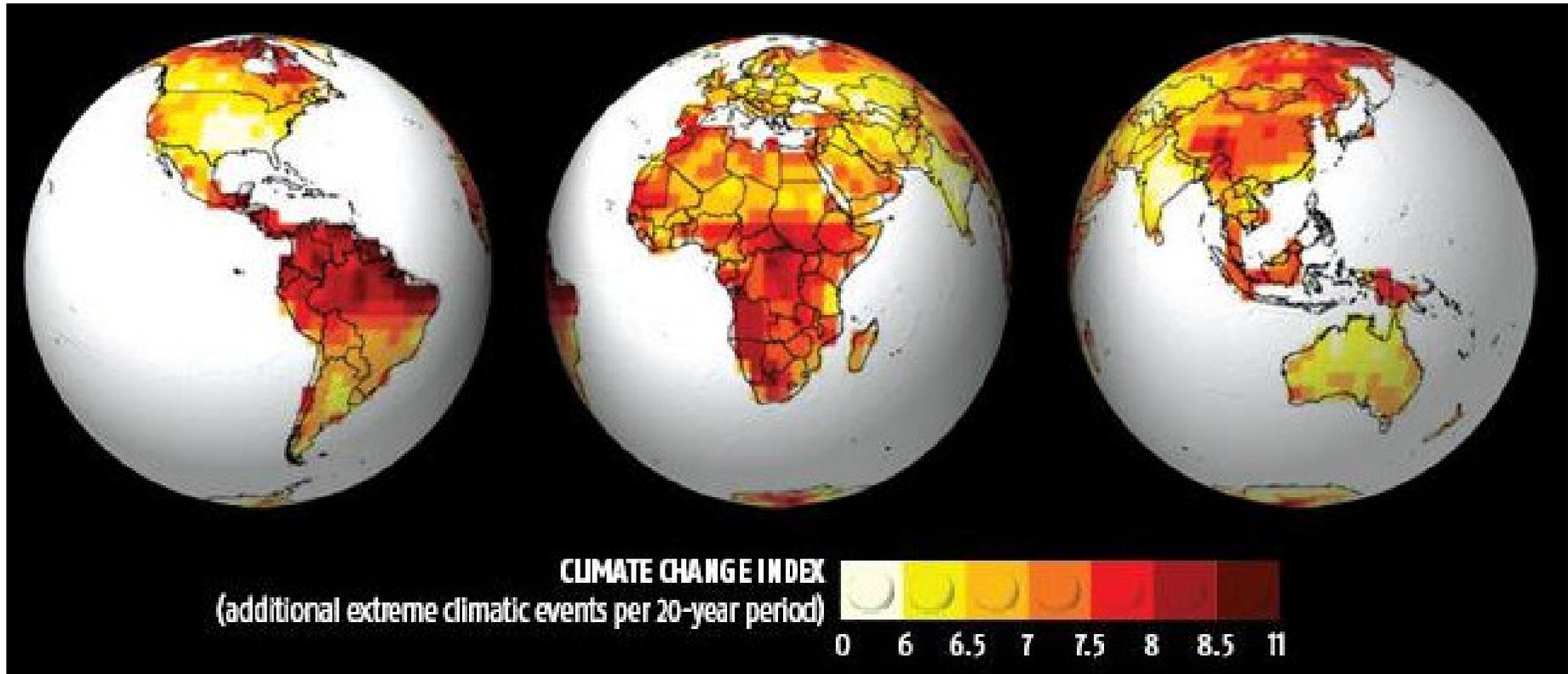
## Improving governance to implement agriculture-for-development agendas

- **Double weakness of governance as a hurdle**
  - State weakest in poor countries
  - Capacity weak in agriculture vs other sectors
- **Improving governance at national and global levels**
  - National and local: cross-sectoral coordination, capacity of MinAg, decentralization
  - Global--coordinate for complex and inter-related issues (trade restrictions, climate change, animal diseases, biodiversity, standards)

# Major Challenge - Agriculture & Climate Change



# Increase in frequency of extreme events likely



Baettig, Wild, and Imboden (2007) A climate change index: Where climate change may be most prominent in the 21st century. *GEOPHYSICAL RESEARCH LETTERS*, VOL. 34.

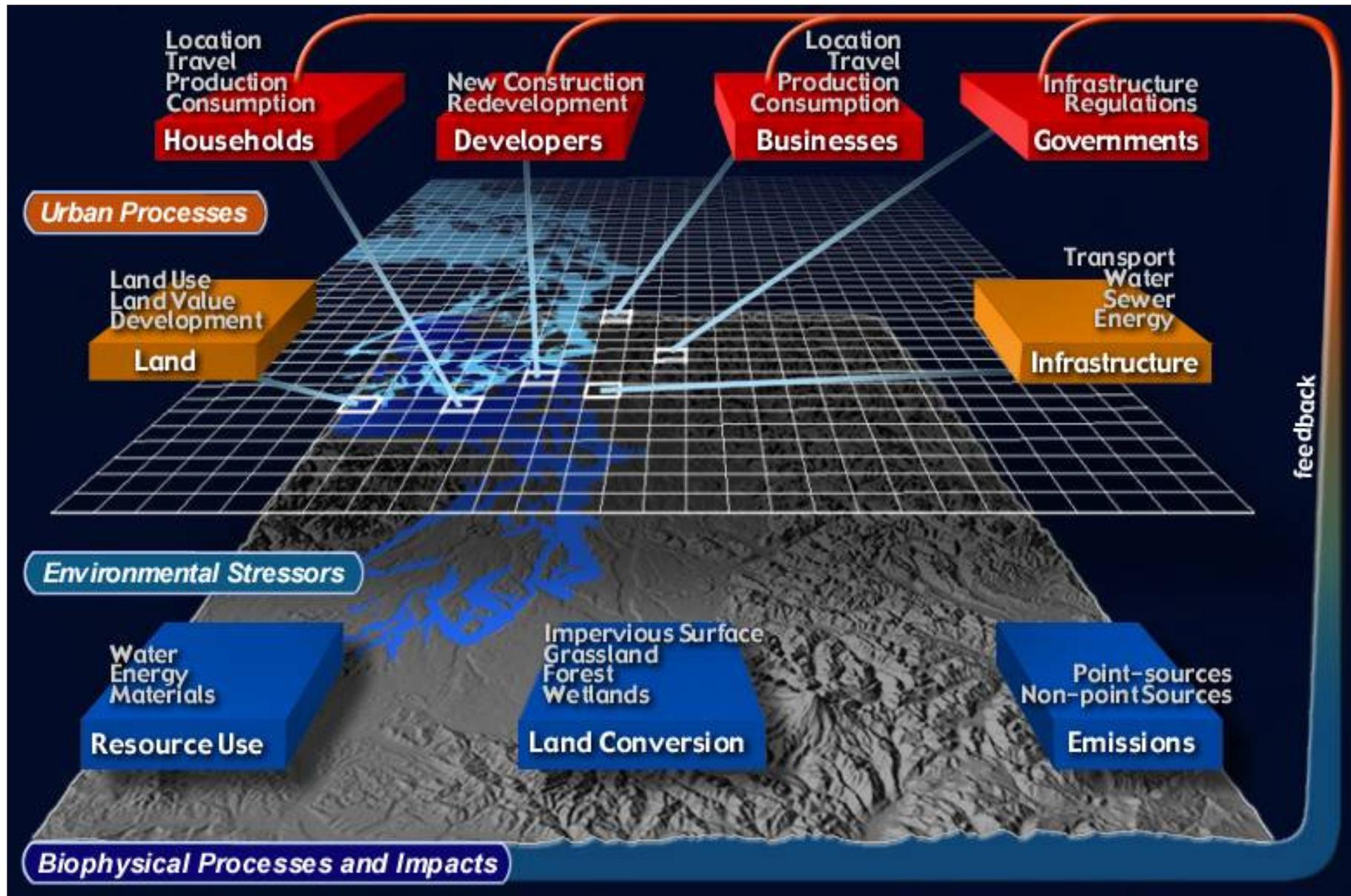
# Projected climate change impacts on agriculture

- Reduction in crop yields and agriculture productivity
- Increased incidence of pest attacks
- Limit the availability of water
- Exacerbation of drought periods
- Reduction in soil fertility
- Lower livestock productivity and higher production cost
- Lower availability of human resource and lower labor productivity

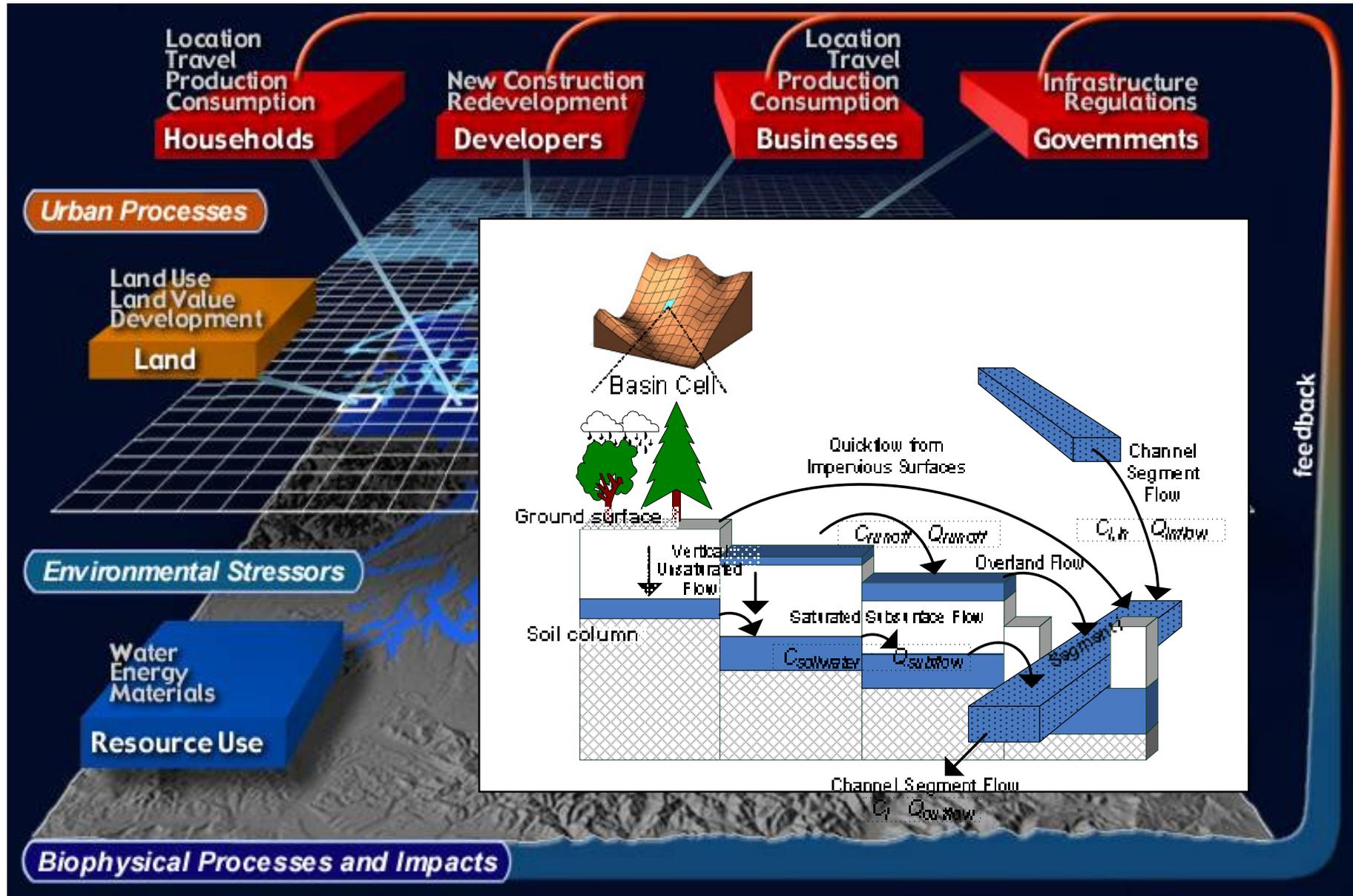
# Much adaptation = good development

- Promoting growth and diversification
- Investing in research and development, education and health
- Creating markets in water and environmental services (carbon, biodiversity, hydrology)
- Improving international trade system
- Enhancing resilience to disasters and improving disaster management
- Promoting risk management and risk-sharing, including social safety nets

# Create a Dynamic Hydrology Analysis Framework



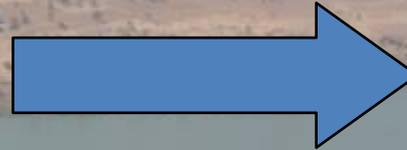
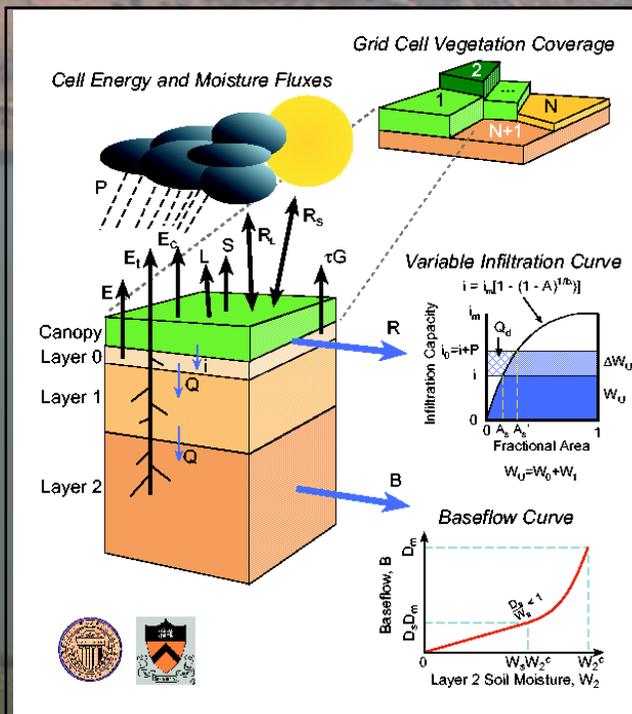
# Create a Dynamic Hydrology Analysis Framework



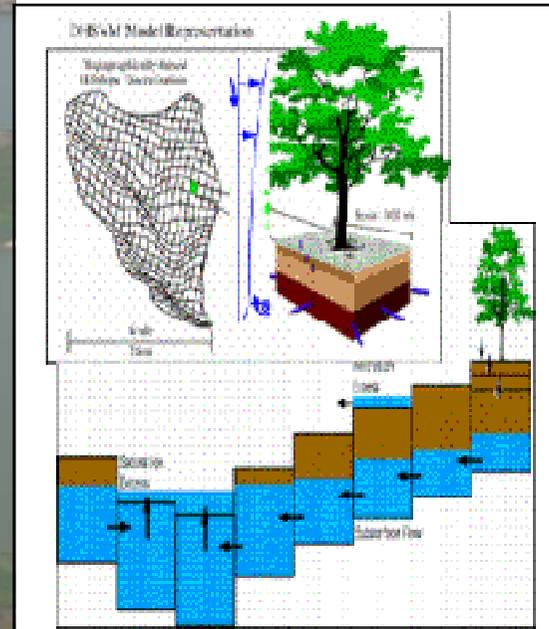
# Create a Dynamic Hydrology Analysis Framework

## DISTRIBUTION OF WATER ACROSS BASINS

### VIC (Variable Infiltration Capacity)



### DHSVM (Distributed Hydrology Soil Vegetation Model) (150m)



\*extensive literature in international peer-review

## Action steps

- Build adaptive capacity through appropriate management of year to year climate variability.
- Recognize that year to year climate variability is superimposed on a slowly evolving background climate, and present observed and forecast information in such a way that longer term trends can be disentangled from shorter term variability.
- Provide appropriate information on near term climate change associated with both on-going trends and decadal scale fluctuations.

# Climate Change Opportunity – financial flows for mitigation

- Comparative financial flows:
  - Annual ODA: \$100 billion
  - Annual FDI in developing countries: \$150 billion
  - Annual GDI in developing countries: \$1500 billion
  - Incremental annual investment required for adaptation to climate risk (World Bank): \$40 billion
- Potential annual cost of emission reductions in developing country : \$150-250 billion
  - Could be transformed into beneficial income flows through cap-and-trade scheme and carbon trading

## Pro-poor climate mitigation policy

- Thus, climate change policy, if designed appropriately, can generate income for small farmers and investment flows for rural communities
- Requires effective integration from global governance of carbon trading, to sectoral and micro-level design of markets and contracts, and investment in community management

# What remains to be done?

Agriculture remains fundamental for development!!

1. Accelerate **smallholder productivity increases for agricultural growth** and **food security** in Africa
2. Follow a **comprehensive approach to reduce sectoral disparities** and poverty in transforming countries of Asia
3. Enhance **sustainability and environmental services** from agriculture & market mechanisms for PES
4. Pursue **multiple pathways out of poverty**: smallholder farming, labor market, RNFE, migration
5. **Improve the quality of governance** in agriculture at local, national, and global levels.

# World Development Report 2007

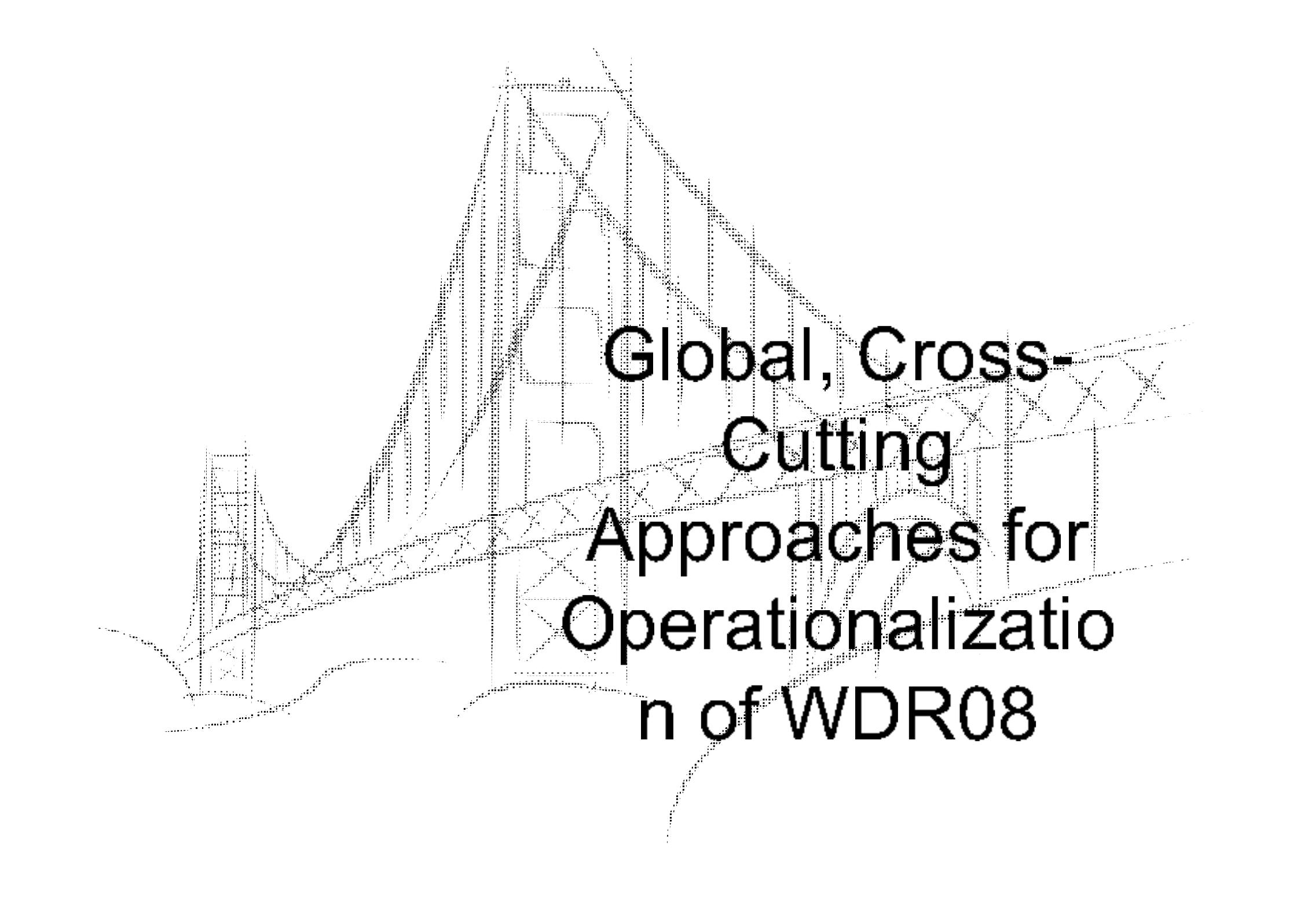
## Key recommendations

- **Doha must progress –**
  - Progress on eliminating anti-poor policies such as cotton subsidies
  - Supporting policies for smallholder trade supply response
  - Protection of food staples costly and often inequitable
  - **Subsidies can be used** BUT with attention to market development and equity
- **GMOs have unrealized potential for the poor and especially in the face of climate change –** but with attention to bio-safety
- **IPRs** must be tailored to country and commodity specifics—with attention to humanitarian access
- **Biofuels will be important**
  - Improve efficiency and address tradeoffs--food prices, the environment, and opportunity cost of subsidies
- **Climate change requires urgent attention**
  - Urgency of funding mitigation and adaptation for poor countries
  - Extend carbon financing to provide agricultural incentives (agro-forestry, avoided deforestation)

Thank you!



Extras



**Global, Cross-  
Cutting  
Approaches for  
Operationalization  
of WDR08**

# Internal Dissemination

- **A joint effort by Regions and SDN/ARD**
- Multiple topical workshops through Rural Policies Thematic Group (**linking Regions and SDN/ARD**)
- Five video conferences to country offices **led by Regions with SDN/ARD support**
- Focused regional retreats—**e.g. Oct. 07 for AFR...**
- 13 operational briefs by SDN and Regions **on selected WDR08 topics (plus 8 DEC/ARD policy briefs)**
- SDN/ARD Intranet site **for WDR08 Operationalization (<http://rural>)**
- **Bank-wide sessions at “SDN Week”**

# External Dissemination/Outreach

- Led by DEC, **supported by SDN/ARD**
- Usual WDR materials plus 8 Policy Briefs **written by DEC, published by SDN/ARD**
- “Road show” of WDR team **after launch—missions to more than 35 countries**
- Country **Conferences**
- Development Marketplace FY09 **focused on Operationalization of WDR08 ideas, led by SDN/ARD (planning in progress)**
- **SDN/ARD is preparing** selected teaching materials (**clickable map of “three worlds”, glossary of terms for non-specialists, etc.**)

# Advancing the Global Agenda in WDR08 in Partnership

- Boosting agricultural productivity **through research in the CGIAR**
- NRM governance (**Global Forest Partnership, PROFISH, etc.**)
- Climate change (**Clean Energy, Forest Carbon, GEF adaptation work**)
- Biodiversity (**GEF, Critical Ecosystem Partnership Fund, Agrobiodiversity – CGIAR, Communities, Conservation & Markets**)
- Animal disease threats (**with OIE, and lesson learning from HPAI with UN System**)
- Aid-for-Trade (**with WTO/Standards and Trade Development Facility, civil society, and private sector groups**)

# Special Attention to Mitigation and Adaptation to Climate Risks in Agriculture

- Increasing awareness among client countries
  - Strengthen demand for mitigation, adaptation and climate risk support in agricultural and rural projects
  - Enhance consideration in CASs of vulnerability, mitigation, and adaptation in agriculture
- Operationalization highlights
  - Due diligence in assessing climate risks
  - Screening tool for mitigation & adaptation in project design
  - WBG is actively implementing GEF adaptation grants; Biocarbon Fund pioneering prototype market instruments
  - Reducing vulnerability via insurance
  - Supporting Ag (crop, fish, livestock) and NRM research for mitigation & adaptation
  - Reducing Emissions from Deforestation (REDD), Forest Carbon Partnership Facility (FCPF), Forest Law Enforcement & Governance (FLEG), Reducing land degradation via SLM.

# Regional/Global Cross-Sectoral AAA Addressing the WDR 2008 Agenda

- Agricultural Source Book updates (Investment, Land, Gender)
- Spatial analysis of linkages between infrastructure investment and agriculture productivity (AFR AICD/SDN Spatial Team)
- Cross-country analysis of rural-urban transformation (rural-urban linkages, economic role of rural towns, non-farm rural activity)
- Analytical and Learning Program on Peri-Urban areas
- Establishing a bridge between lessons from WDR 2008 and preparation of WDR 2009

# Supporting the Regions (Requests)

- Diffusion of good practice in WDR08 themes, **from both other Regions and outside the Bank, for specialized activities in agric. and RD including: irrigation, other rural infrastructure, rural energy and transport, ag technology, NRM, value chains, aid-for-trade, finance, and policy**
- Supporting strategic planning: **e.g. irrigation business plan in AFR, or series of SDN supported Ag Public Expenditure Reviews in Regions in collaboration with them and DfID**
- Help improve understanding of the needs of rural **people, especially farmers, across units, sectors, and levels in the Bank**
- Assist with resource mobilization and partnership network **development better linking regions to global public goods agenda**

# Periodic Assessment of Progress

- Through SDN Task Force on Operationalization of WDR08
  - Participation from all SDN Anchor Units the Regions, DEC and IFC
- Terms of Reference:
  - **Review** current Regional/Anchor FY08/09 work programs, using the WDR 2008 as a tool
  - **Identify** possible changes in the FY08/09 work programs that might emerge from that review
  - **Aggregate** insights from ongoing prep of Regional action plans to discern trends, identify opportunities for synergy