Science and Technology Policies for Agricultural Productivity and Growth in Developing Countries

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Outline

1. **Big Picture of Scenarios: Scientific and technological advancements and markets**
2. **Impact of scientific and technological advancements**
3. **Policy for impact-oriented research**

Ag. Science & Technology Policy for Growth and Poverty Reduction

Strengthening the science systems for …

- Productivity
- Competitiveness

Complementary policies

- Need for market opportunities / free trade
- Access to information
- Transparent legal and institutional framework

Outlook: New Risks and New Opportunities

Progressive Policy Actions Scenario:

- New Focus on Agricultural Growth and Rural Development

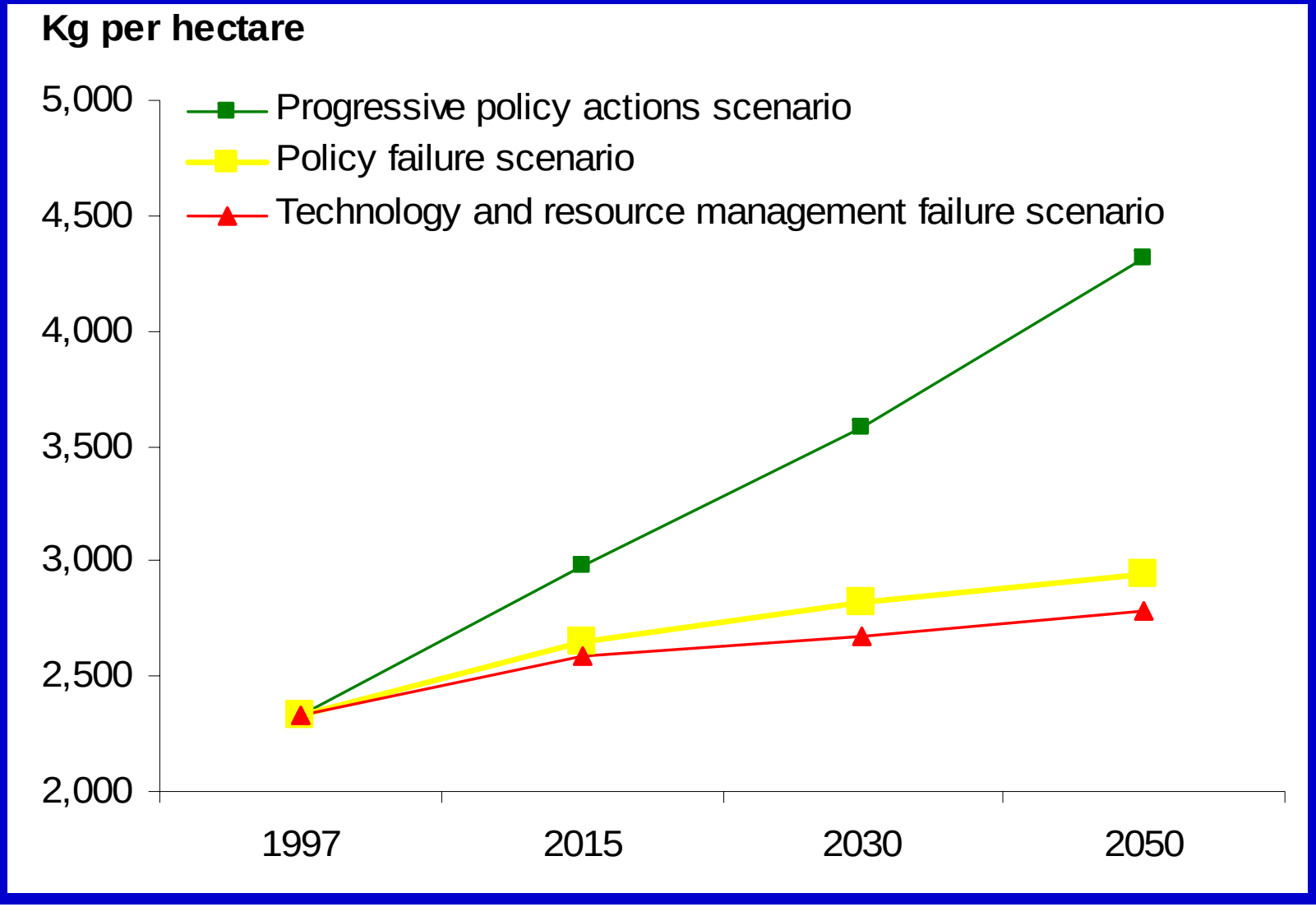
Policy Failure Scenario:

- Trade and Political Conflict, rise in protectionism worldwide

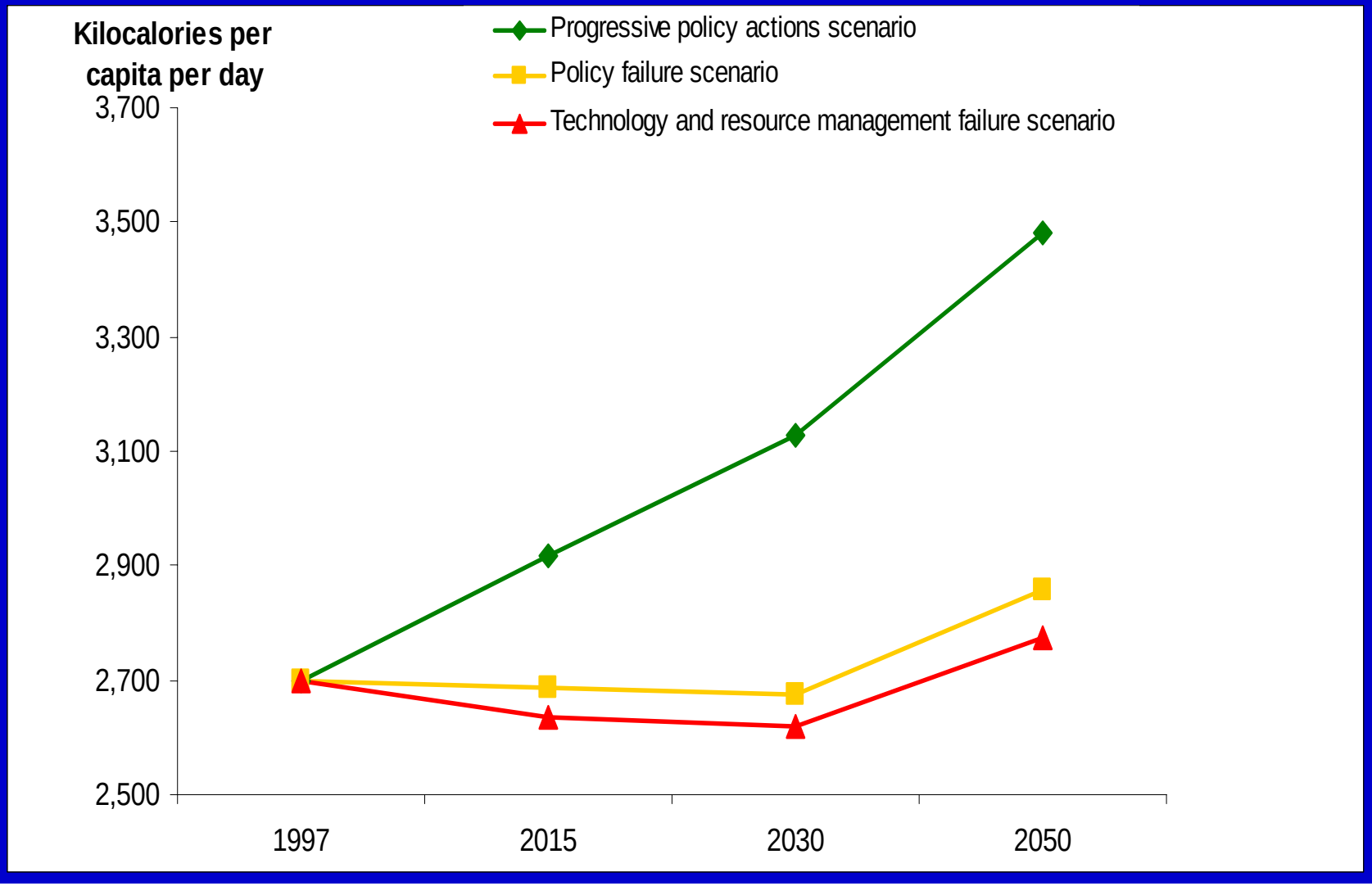
Technology and Resource Management Failure Scenario:

- Adverse technology/natural resource interactions

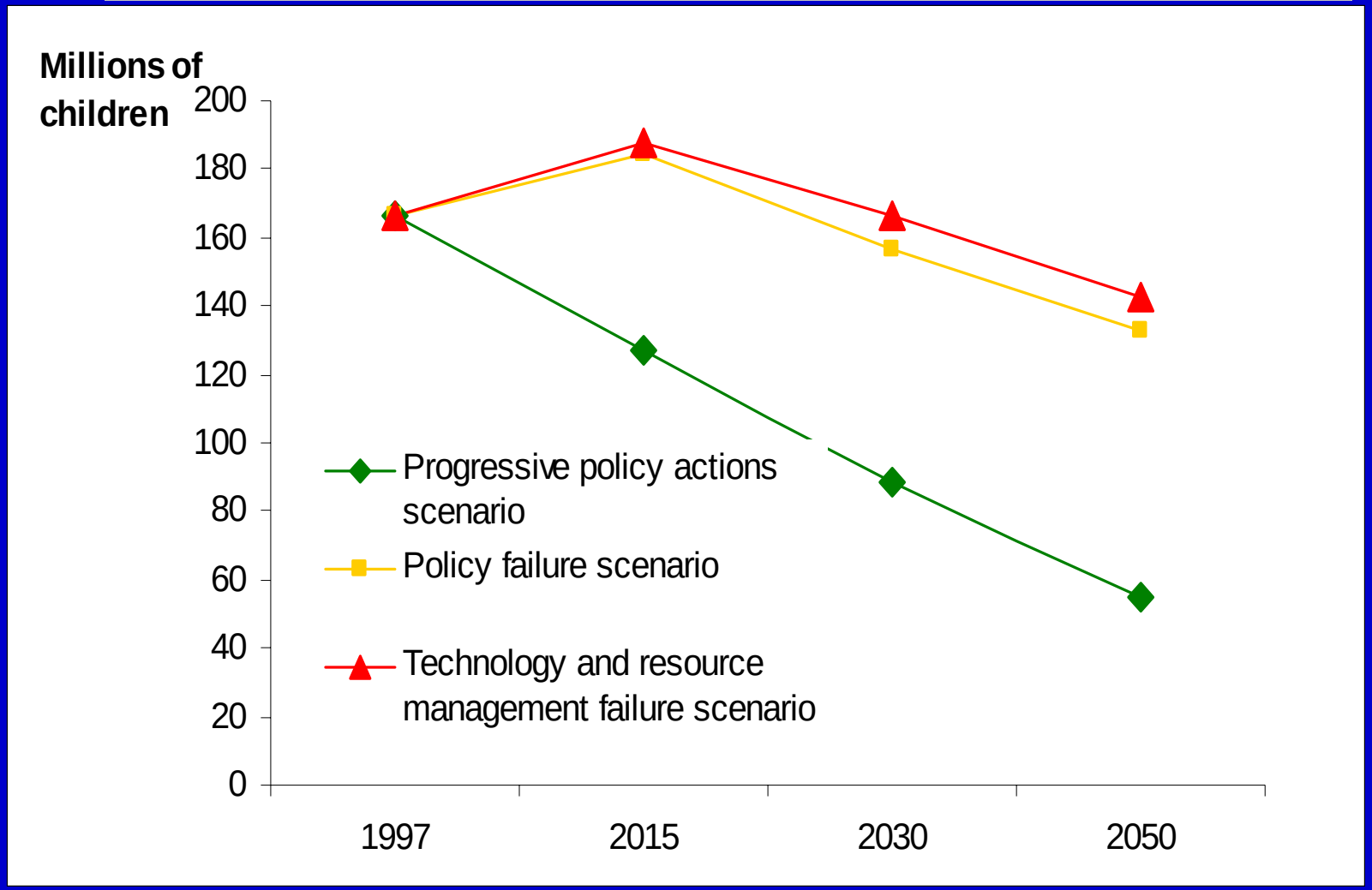
Projected cereal yields in developing countries: IFPRI scenarios



Projected daily calorie consumption in developing countries: IFPRI scenarios



Projected child undernourishment in developing countries: IFPRI scenarios



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Technology for whom in Developing Countries?

Focus on

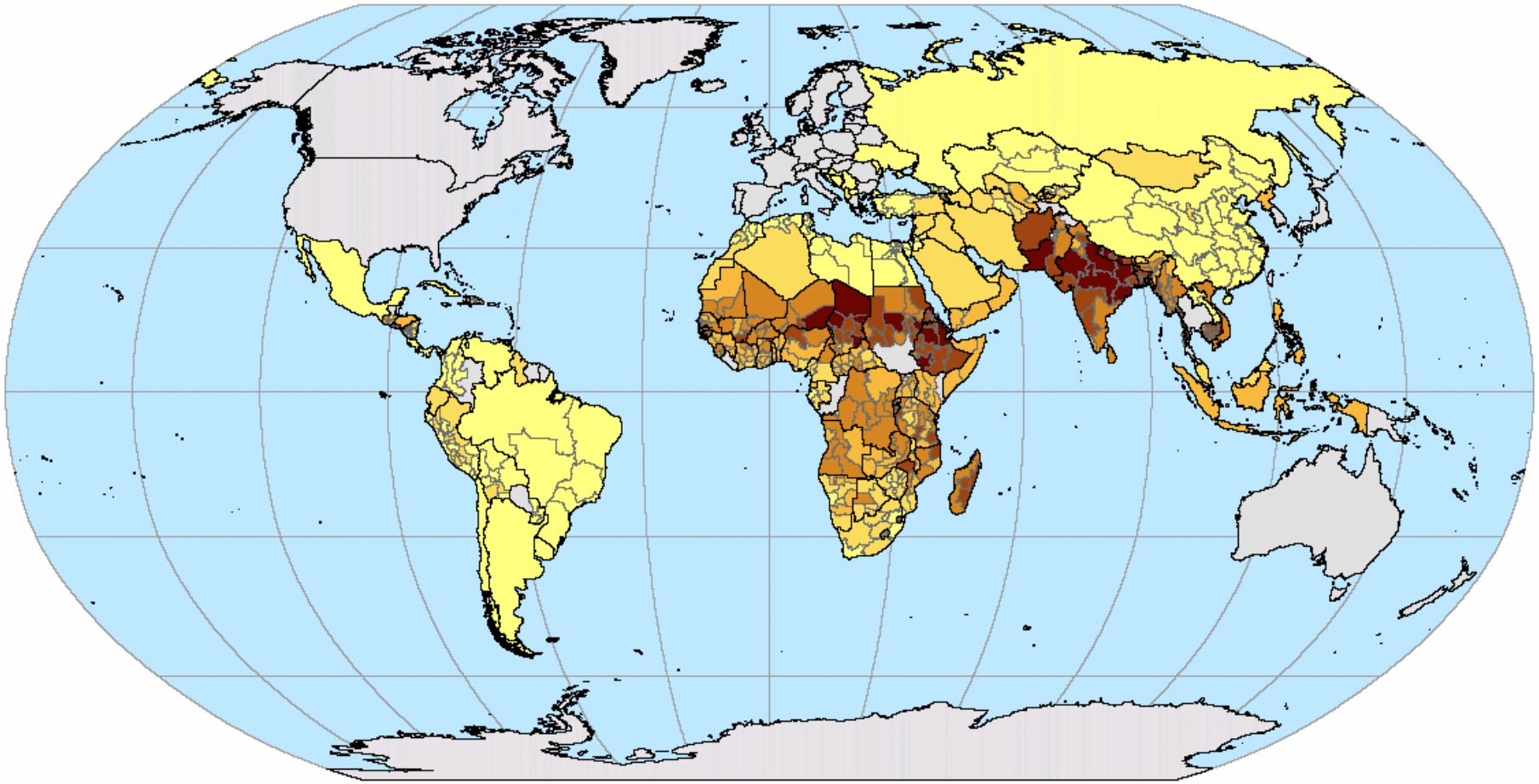
- **the ca. 350 million small farms and**
- **on the poor in rural areas**

Farm Size by World Regions

World Region	Average Farm Size (ha)
Africa	1.6
Asia	1.6
Latin America and Caribbean	(67.0)
Europe	27.0
North America	121.0

Source: Calculated from various sources, incl. FAO World Agricultural Census

Prevalence of Child Malnutrition



Robinson Projection

Percent of children underweight

- less than 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- more than 50
- no data
- national borders

Children are defined as underweight if their weight-for-age z-scores are more than two standard deviations (2 SD) below the median of the NCHS/CDC/WHO International Reference Population.

Data Coverage	Count-ries	Data units	Avg. units/ country	% of world Population	% of non-OECD Population
National data only	43	43	1.0	16	18
Subnational data	74	639	8.6	65	78
Total	117	682	5.8	81	96

Sources: UNICEF, Demographic and Health Surveys (DHS), National Human Development Reports (nHDR), African Nutrition Database Initiative (ANDI). Data for 96% of countries are from 1995 or later. All data are from 1990 or later.

CIESIN Columbia University

What technologies and science?

- **Information and Communications Technologies**
- **Agricultural Research, incl. Biotech**

…and the promising linkages between the two

Information and Communications Technologies

Gains of a "pervasive" technology:

- **time and cost savings;**
- **more and better information, leading to better decisions;**
- **greater efficiency, productivity, and diversity;**
- **lower input costs;**
- **higher output prices; and expanded market reach.**

Information and Communications Technologies in Rural Areas

Poor alternatives to the phone:

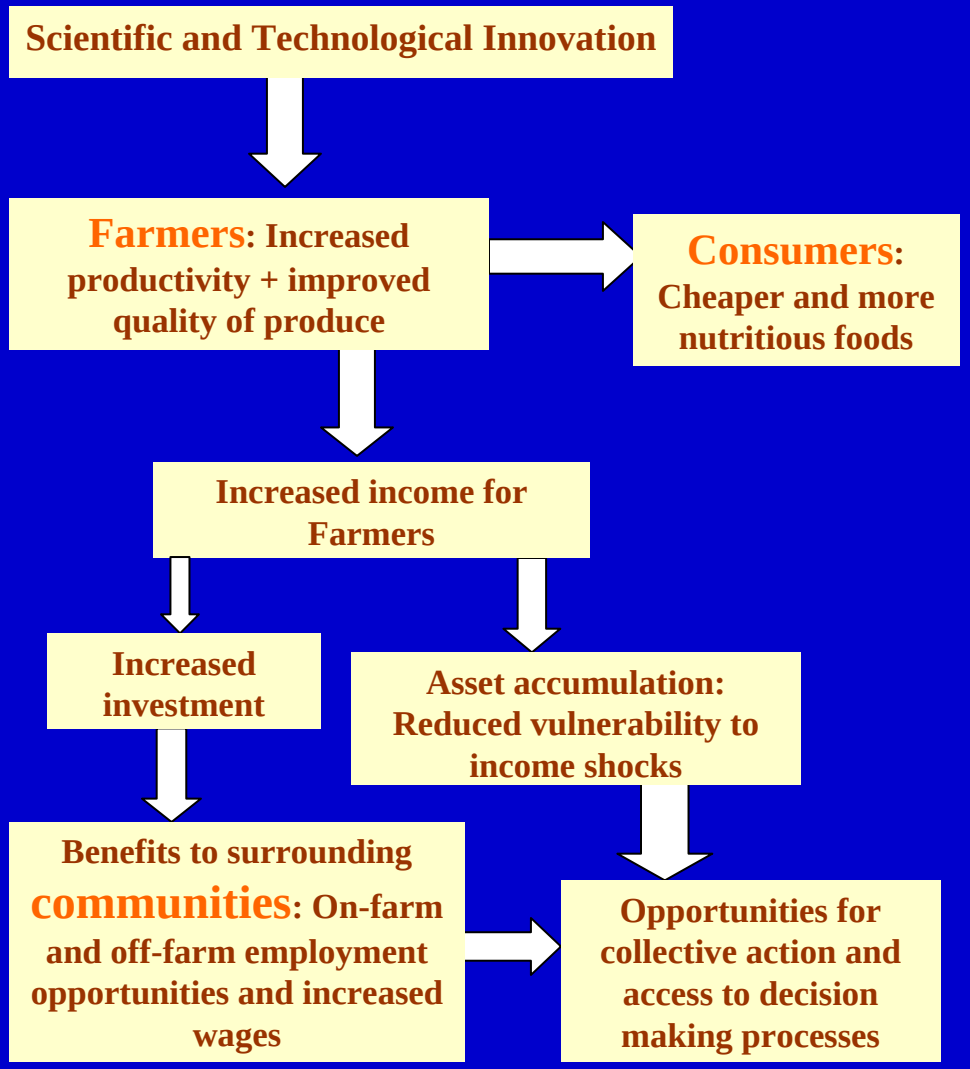
- **Bangladesh: 64% send a person**
- **Peru: 43 % send a person**

What is communication for ? (Bangladesh)

31% business, 11% health, 10 % employment

India: internet based market information for farmers and traders

Rationale for investments in Agricultural research



Science and Technology impacts on poverty reduction and economic growth in China (S. Fang, IFPRI)

Investments in	Average for all regions (Yuan per Yuan expenditure)
Ag. R&D	**9.59**
Roads	8.83
Education	8.68
Telephone	6.98
Irrigation	1.88
Electricity	1.28
Returns to Rural GDP from investments, 1997	

Investments in	Average from all regions (number of poor reduced per 10,000 Yuan expenditure)
Education	8.8
R&D	**6.79**
Roads	3.22
Electricity	2.27
Telephone	2.21
Irrigation	1.33
Poverty loan	1.13
Returns to poverty reduction from investments, 1997	

Science and Technology impacts on poverty reduction and economic growth in India (S. Fang, IFPRI)

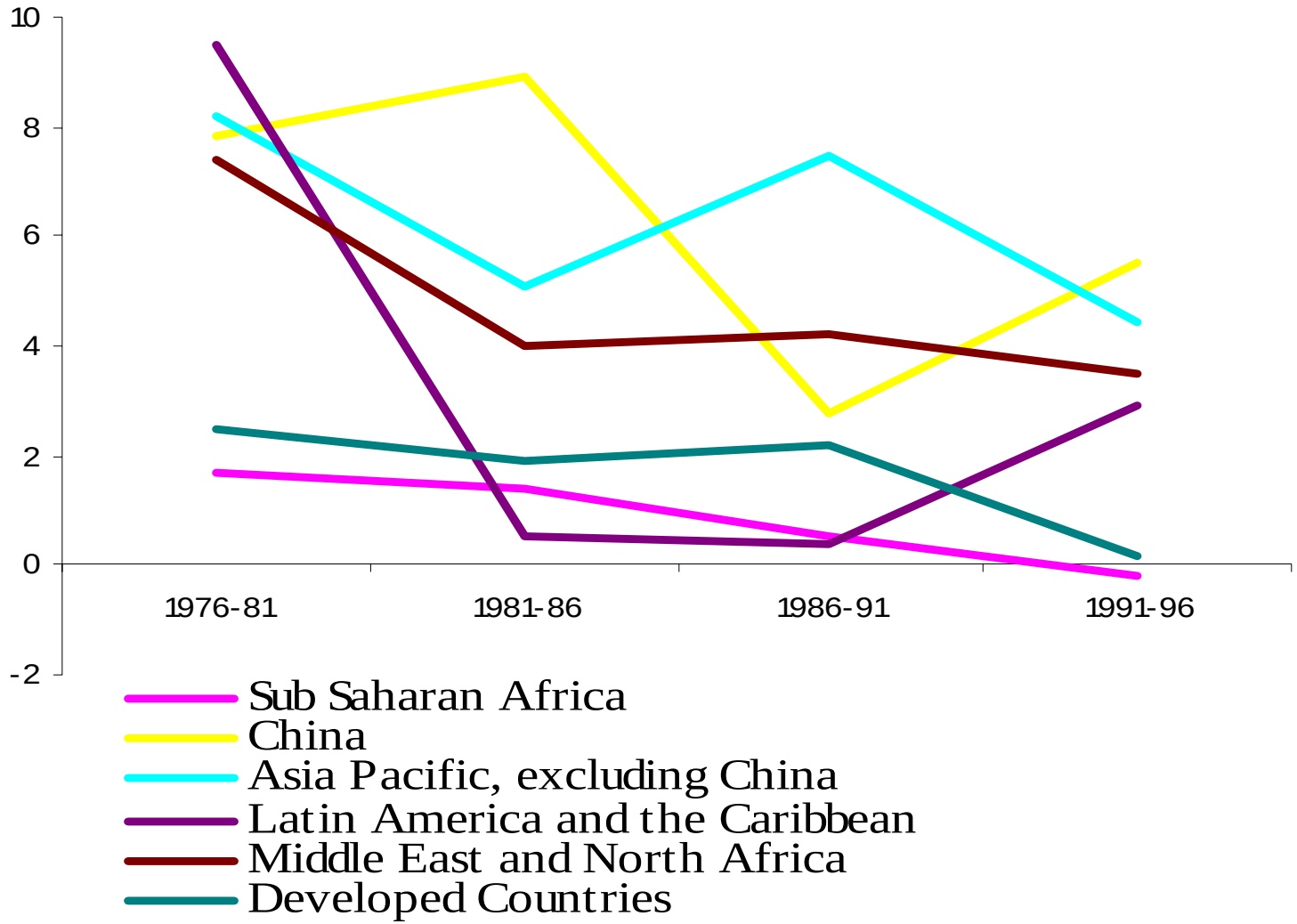
Investments in	Urban poor	Rural poor
Ag. R&D	**72.11**	**84.5**
Rural roads	28.39	123.8
Rural education	7.43	41
Irrigation	7.31	9.7
Rural development	5.87	25.5
soil and water conservation	5.15	22.6
rural health	4.55	17.8
Rural electricity	1.44	3.8

Number of urban and rural poor reduced per million Rs, 1995

Research systems trends

- slowdown of funding for public Ag. Research
- Mixed picture in the developing world (China, Brazil, Africa,…)
- Continued key role of the CGIAR
- Increased involvement of private sector in agr. Research

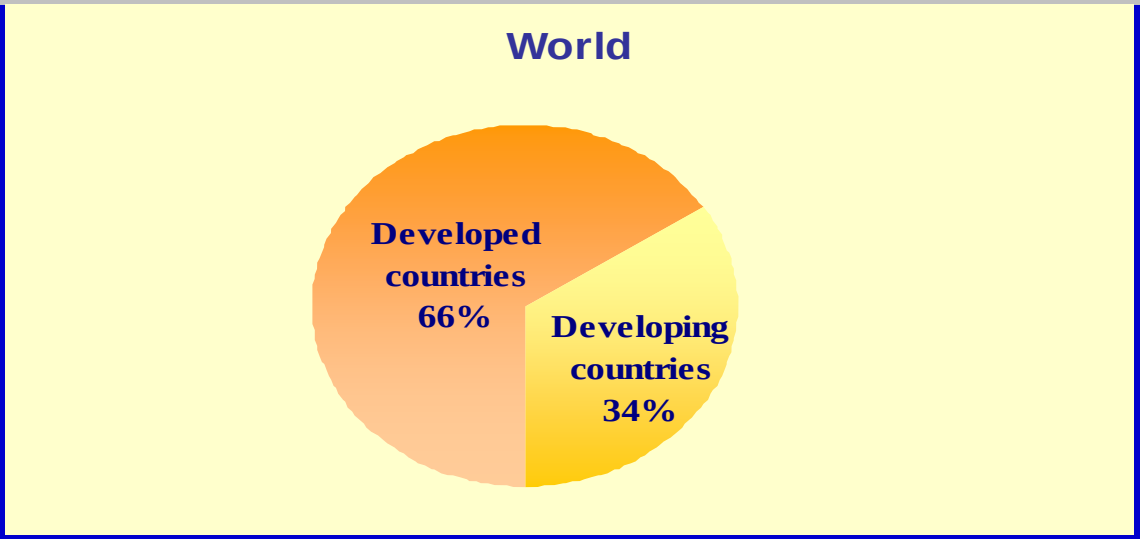
Research trends: slowdown in growth rates

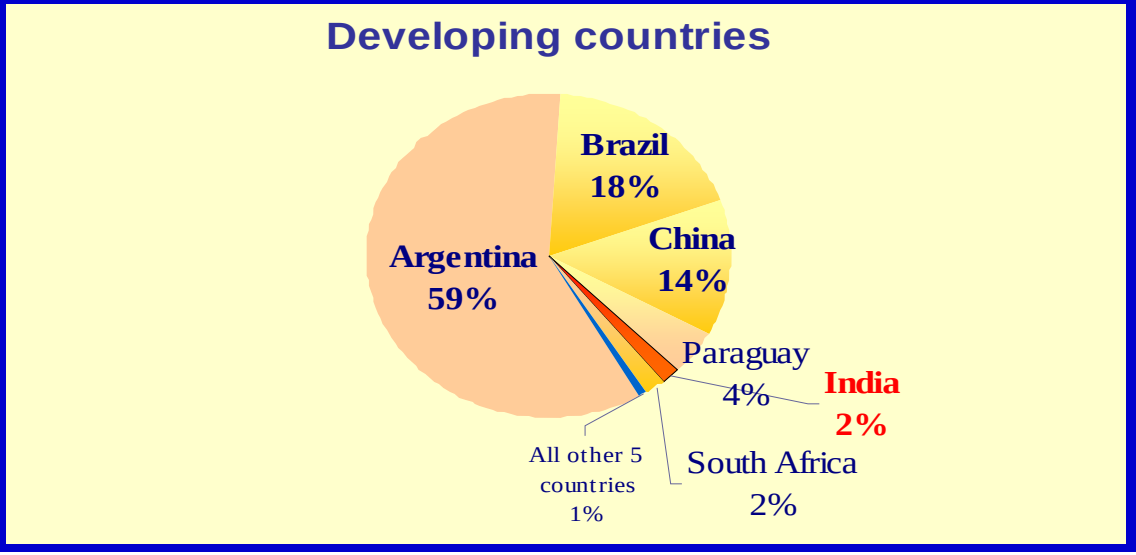


Current research trends: Area planted to GM crops in 2004

81 million hectares worldwide

500,000 hectares in India





Biotechnologies in Progress

Serving poor consumers and producers

- *Drought Tolerance*
- *Salinity Tolerance*
- *Nitrogen Use Efficiency*
- *Micronutrient Fortification (HarvestPlus)*

Needed:

- **Incentives for public – private partnerships**
- **regulatory frameworks**

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Science Policy Problems in LDCs

- Lack of science policy in developing countries
- Under-valued agric. Science in developing countries
- Complexity of science related institutions (IPR)
- Lack of capacity (researchers, organizations)

Making ag. research more pro-poor

a. Intellectual Property Rights - Challenges:

- Insuring freedom to operate of researchers in the future in an increasingly proprietary research environment
- Balancing plant breeders' intellectual property rights with the rights of poor farmers to save, reuse and exchange seeds

Making ag. research more pro-poor

b. Biosafety: Challenges Following Cartagena Protocol

- Harmonizing biosafety regulations with systems for food safety, seed and phytosanitary regulation, importation, and other relevant laws or regulations;
- Devising regulatory procedures that minimize entry barriers without compromising environmental and human health safeguards;

Making ag. research more pro-poor

- **Investment in capacities**
  - Higher education (universities with distant learning)
  - Strengthening national and regional systems
  - Legal and regulatory environment that secures property rights and enforces contracts
- **Rural information and market infrastructure to improve access to markets, credit, inputs**

1. Investing in human resources
2. Improving access to productive resources
3. Improving markets, infrastructure, and institutions
4. Expanding research, knowledge, and technology
5. Improving natural resource management
6. Supporting sound trade and macroeconomic policies
7. Promoting good governance and ending conflicts

Research and Technology: an essential part of the bigger development agenda