The Green Revolution Forty Years Later: Lessons Learned and Unfinished Business

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Views expressed in this presentation are personal.
Green Revolution Impacts on Crop Improvement

- **Production**
  - Cereal output in developing countries has grown 2.8 percent annually for three decades

- **Productivity**
  - Yields, not area, were responsible for growth
  - TFP grew along with yields
Long run commodity price decline has had a positive impact on food security and poverty reduction.

Real prices for commodity group

Index (1991–92 = 100)

- Cereals
- Oilcrops
- Meat
- Dairy
- Sugar
- Horticulture
- Tropical beverages
- Raw materials

Year: 1961 to 2002
Without the Green Revolution

- Food production would have been 20% lower in the year 2000;
- Food imports to developing countries would be almost 30% higher;
- Calorie consumption per capita would be 13-14% lower;
- Child malnutrition would be up by 6-8%.

Evenson & Rosegrant (2003)
India: Green Revolution & Rural Poverty

GREEN REVOLUTION PERIOD

60%

40%

1965

1985

20%
Small holder productivity growth triggered overall rural growth and rural transformation
The Green Revolution was Public Sector Driven

- International & national public sector played a crucial role in making it happen
- Global Green Revolution networks enabled technology access by developing countries and yielded substantial benefits
**Evidence on Factors Contributing to Productivity Growth**

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<tbody>
<tr>
<td>Policies /institutions</td>
<td>Macro/sectoral/legal/political reforms</td>
<td>30%</td>
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<td>32%</td>
<td>30%</td>
<td>15%</td>
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<tr>
<td><strong>Infrastructure</strong></td>
<td>Rural Roads</td>
<td>15%</td>
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<td>10%</td>
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<td>Irrigation</td>
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<td>8%</td>
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<td>7%</td>
<td>5%</td>
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<td>Electricity, health/education, telecomm</td>
<td>15%</td>
<td>20%</td>
<td>30%</td>
<td>15%</td>
<td>11%</td>
<td>25%</td>
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<tr>
<td><strong>Inputs Delivery</strong></td>
<td>Fertilizer, pesticide, seed, machinery, etc</td>
<td>10%</td>
<td>2%</td>
<td>7%</td>
<td>20%</td>
<td>6%</td>
<td>2%</td>
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<td></td>
<td>Ag. credit/insurance (subsidies for start-up or lending)</td>
<td>5%</td>
<td>8%</td>
<td>3%</td>
<td>5%</td>
<td>2%</td>
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<td><strong>Research/extension</strong></td>
<td>Ag. Research/Natural resources mgmt (NRM)</td>
<td>10%</td>
<td>10%</td>
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<td>Ag. Extension/NRM</td>
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Where did the Green Revolution Work?

- Where demand for intensification was high – high population densities and good market infrastructure
- On favorable production environments that were amenable to further intensification
- For the primary food grains – rice, wheat, maize
And where it did not work?

- Low demand conditions
- Marginal production environments
- “Orphan” staple food crops, especially those with little research backlog (e.g. cassava)
- Sub-Saharan Africa – largely bypassed by the Green Revolution
A Mixed Record on Equity Impacts

- Farm size effects
- Labor market impacts
- Gender differences in sharing benefits
- Favorable vs. unfavorable environments
Limits to Green Revolution Lead Growth

- Technology was important but only with enabling policies, institutions, & infrastructure investments
- The Green Revolution strategy worked for a few crops & very discrete production environments
- Poverty & food insecurity persisted despite the GR success
- Unintended consequences undermined the gains that were made
Increased use of fertilizers, pesticides, and water

Source: Tilman et al (2001)
Effects on Water and Soils

- Agriculture is the most consumptive human use of fresh water. This affects both the quantity and quality of water resources.

- Direct and indirect negative effects have been well documented, these include:
  - Declining water tables
  - Drainage of wetlands;
  - Nutrient loading of surface water and groundwater;
  - Salinization and waterlogging of soils;
  - Agrochemical contamination;
  - Siltation of rivers
Crop and Resource Management Technologies: Can we achieve scale?

- Few examples of wide spread, cross country use of non-breeding technologies
- Technologies for sustainable use of inputs (e.g., water use efficiency) have had limited success
- Knowledge-intensive practices (such as IPM) have not scaled up well
- We need a new paradigm for addressing sustainable crop & resource management
Challenges for Asia

- Sustaining staple crop productivity gains while diversifying into high value agriculture
- Maintaining competitiveness of cereal crops in an era of globalization
- Dealing with the re-organization of production systems—towards scale economies
- Addressing inter-regional disparities in productivity & income growth
Challenges for Africa

- Low and inelastic demand conditions
- Heterogeneous farming systems and staple crops
- Low levels of agricultural R&D
- Under investment in enabling environment
- Poor incentives for enhancing productivity
Over-riding Considerations

- The stickiness of Green Revolution era policies, especially input subsidies
- The shifting locus of agricultural R&D from the public to the private sector
- Climate change threats to overall productivity growth & to increased incidence of extreme events
The challenge for future Green Revolutions: Reaching beyond the low hanging fruit