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

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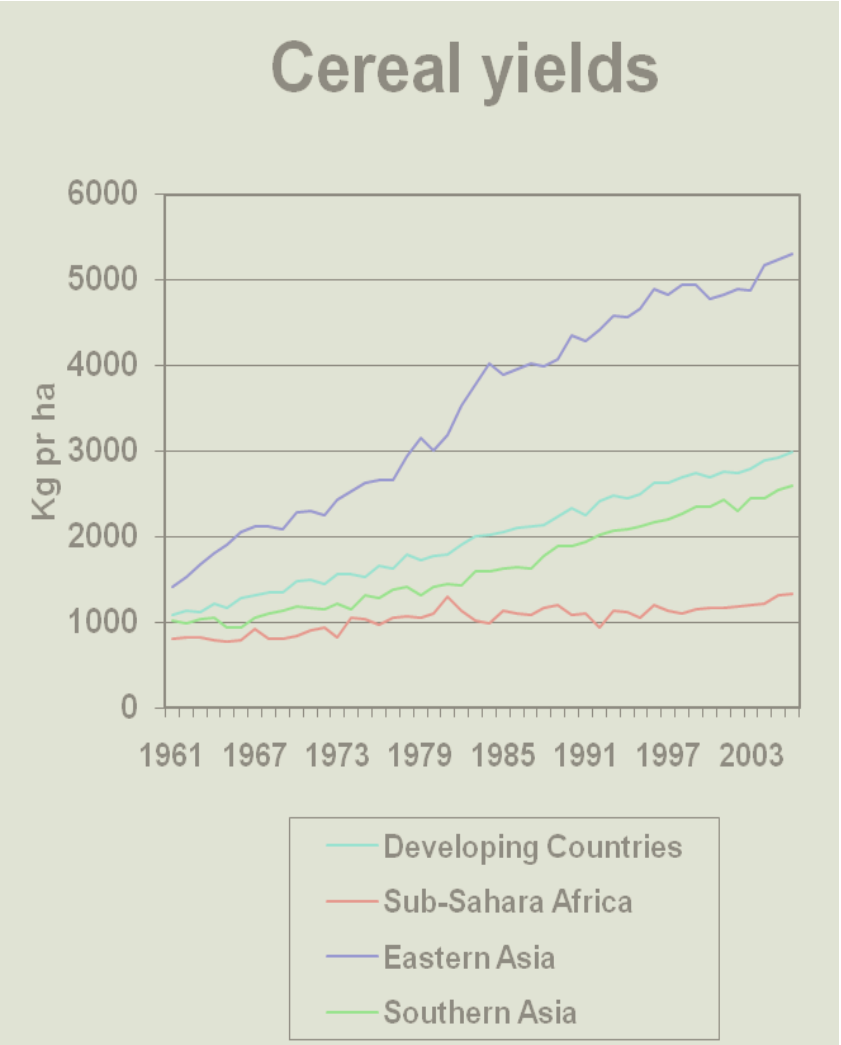
Views expressed in this presentation are personal.

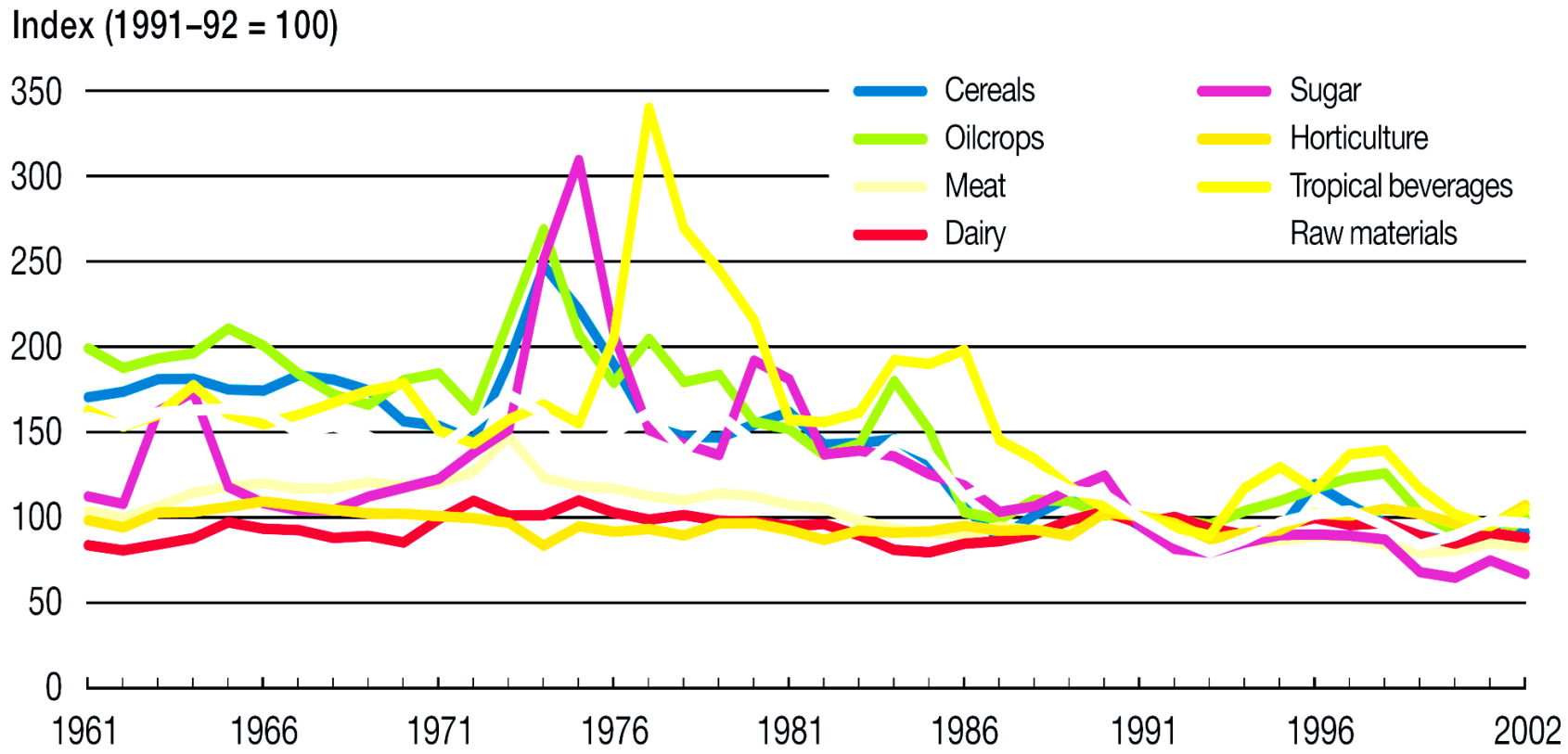
Green Revolution Impacts on Crop Improvement

- **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

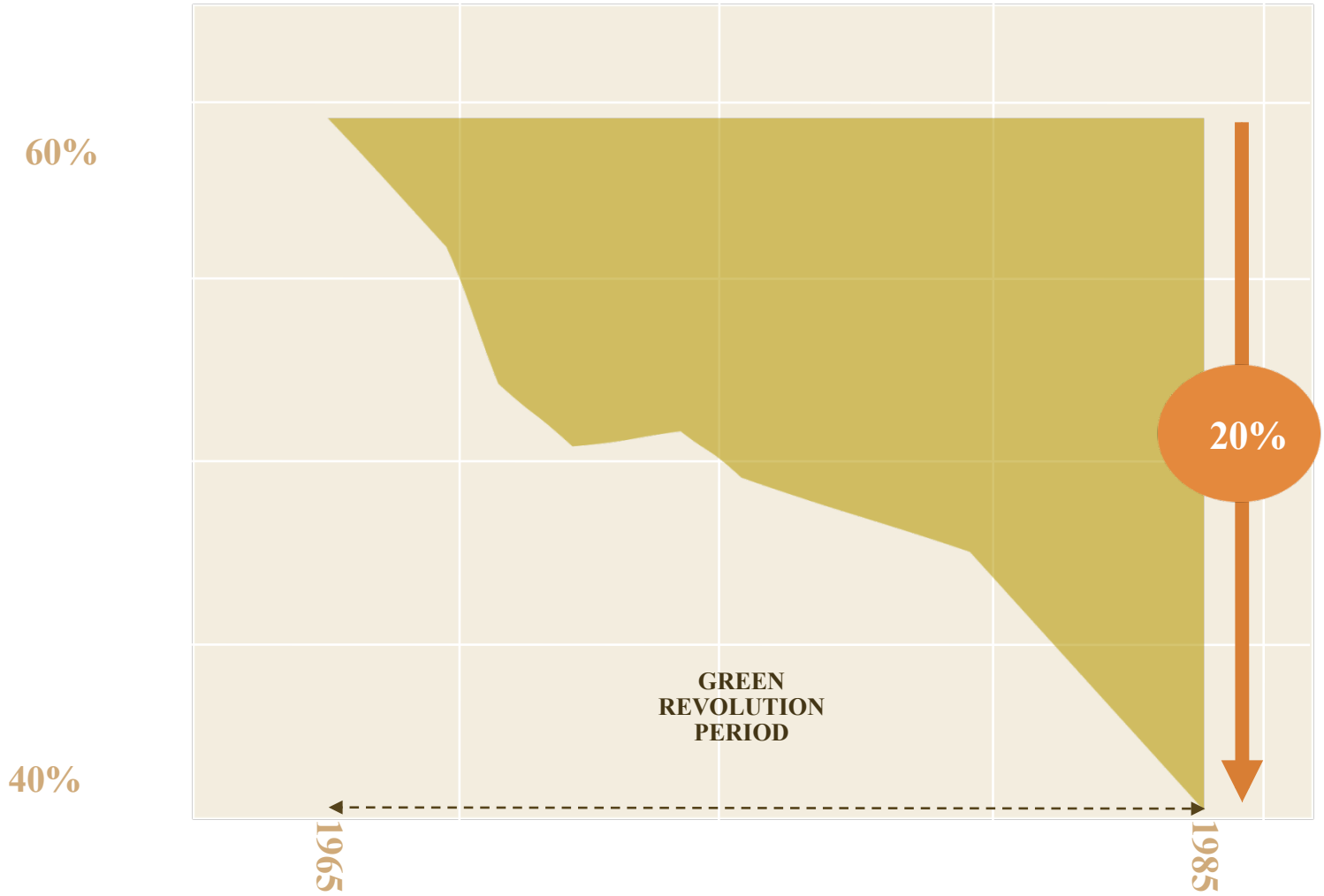


Without the Green Revolution

- 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



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

Factors affecting agricultural growth	Components	Taiwan (1950-1960)	China (1978-1990)	Indonesia (1976-1993)	South Korea (1970-1979)	India (1982-1994)	Vietnam (1990-1999)
Policies /institutions	Macro/sectoral/ legal/political reforms	30%	30%	32%	30%	15%	25%
Infrastructure	Rural Roads	15%	15%	10%	10%	30%	20%
	Irrigation	10%	10%	8%	8%	7%	5%
	Electricity, health/ education, telecomm	15%	20%	30%	15%	11%	25%
Inputs Delivery	Fertilizer, pesticide, seed, machinery, etc	10%	2%	7%	20%	6%	2%
	Ag. credit/insurance (subsidies for start-up or lending)	5%	8%	3%	5%	2%	8%
Research/ extension	Ag. Research/Natural resources mgmt (NRM)	10%	10%	10%	2%	20%	10%
	Ag. Extension/NRM	5%	5%	--	10%	9%	5%
All factors	Total	100%	100%	100%	100%	100%	100%

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 (eg. cassava)
- Sub-Saharan Africa – largely bypassed by the Green Revolution

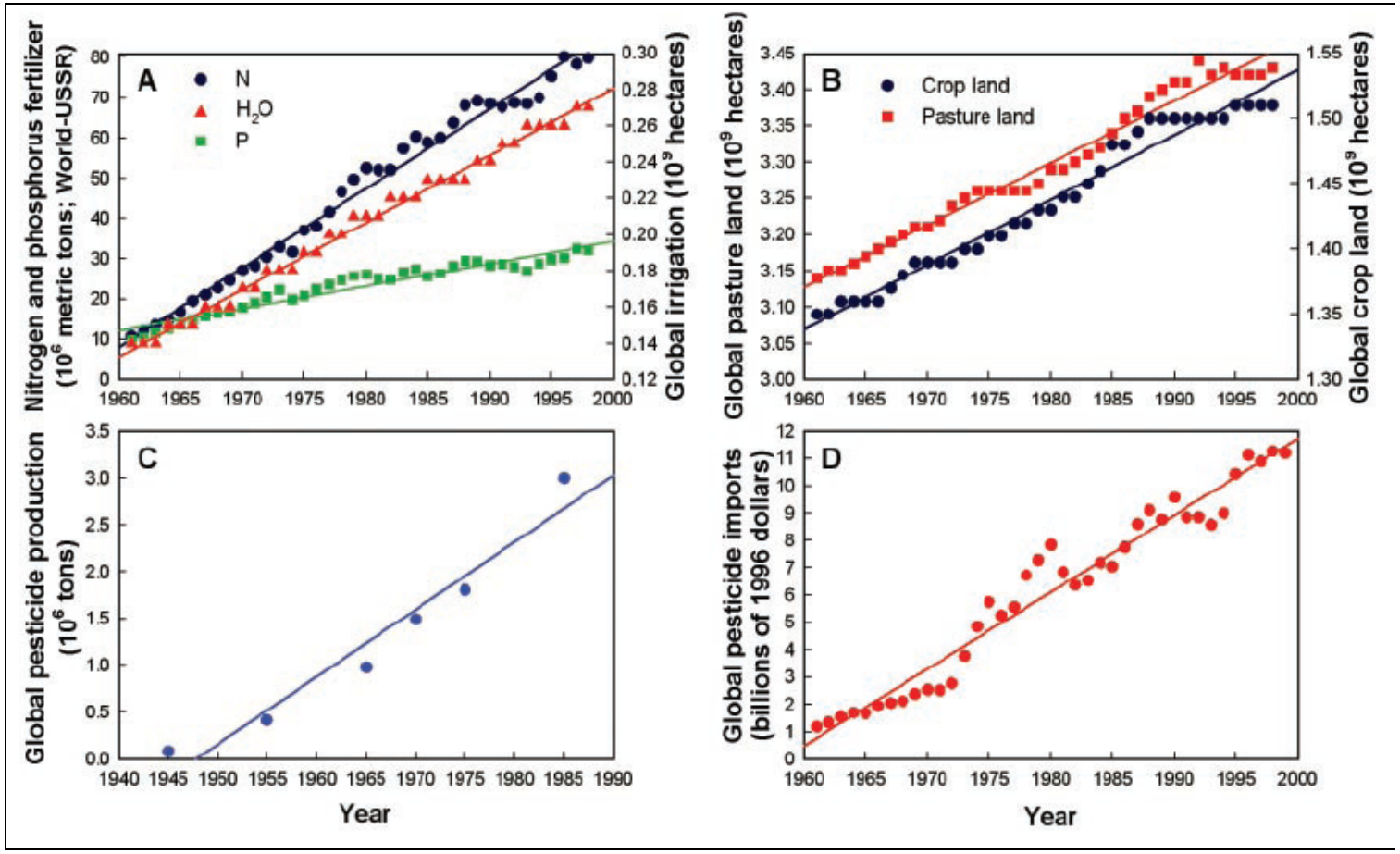
A Mixed Record on Equity Impacts

- 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

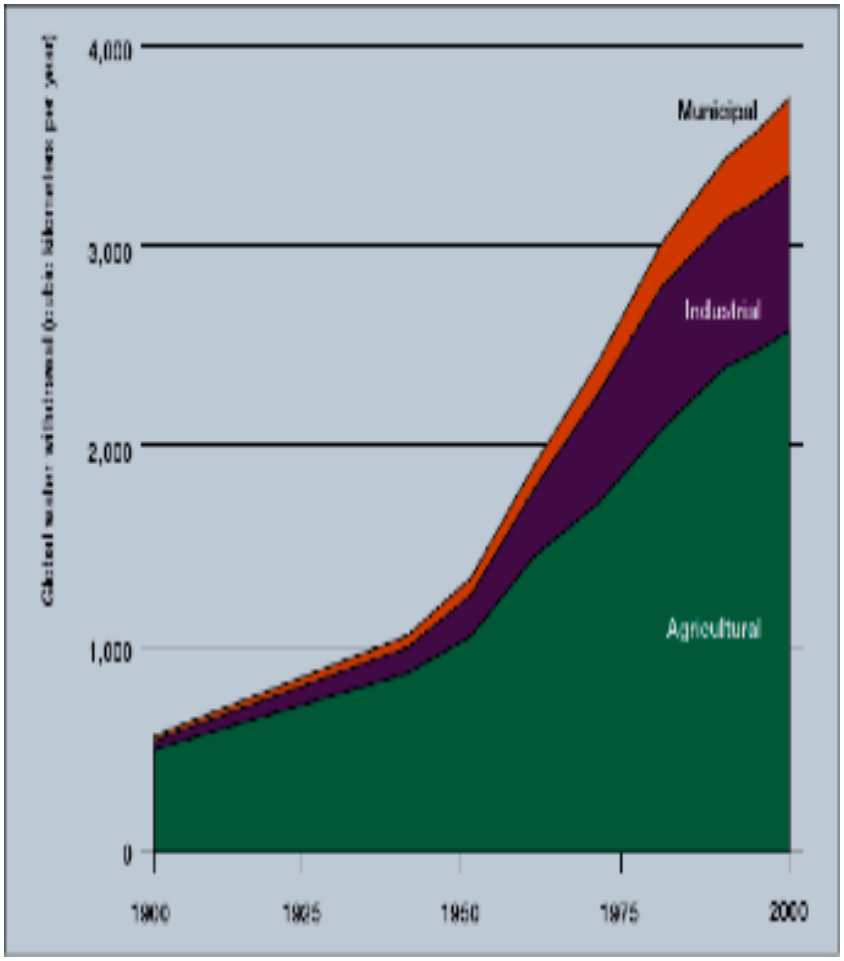
Increased use of fertilizers, pesticides, and water



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 (eg., 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