Agriculture and Structural Transformation: General Patterns and Implications for Food Security in Asia and the Pacific

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The Three Transformations

• Structural Transformation
• Agricultural Transformation
• Dietary Transformation

• ...each driven by deep and basic global forces, as well as highly specific local factors
The structural transformation in historical perspective
Figure 1. The structural transformation in 86 countries, 1965-2000
Raising Agricultural Productivity

The basic *cause and effect* of the structural transformation is rising productivity of agricultural labor. There are three basic ways to raise labor productivity in agriculture:

- Use new technology to produce more output for a given amount of labor.
- Let agricultural workers migrate to other occupations, without lowering output, thus sharing the output with fewer rural people (the classic Lewis model of development).
- Through higher prices for agricultural output (make it worth more in real economic terms, which may well be happening in the current economic era, but is a reversal of historical trends).
Global Land and Labor Productivity Patterns, 1961-2009

Sources: Pardey (2011)
The 20th Century decline in food prices

Grillis & Yang Global Agricultural Price Index (Updated)
Adjusted for Inflation by the U.S. GDP Price Deflator

-1.0% per year

-1.6% per year
Mechanisms for affecting agricultural productivity

- Macro economic policy  
  - (about 1/3 of the story)

- Trade policy  
  - (about 1/6 of the story)

- Sectoral policy (including rural investments and infrastructure)  
  - (about ¼ of the story ???)

- Farm-level activities (including extension and rural education)  
  - (about ¼ of the story ???)
Three Rice Revolutions

• ... in demand for rice
• ... in supply of rice
• ... in marketing of rice
• Market economies are driven by demand, so start with what is happening to rice demand.
## The Changing Role of Rice in Food Consumption in Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Calories</th>
<th>Calories from Rice</th>
<th>Rice as % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>1805</td>
<td>656</td>
<td>36.3</td>
</tr>
<tr>
<td>1970</td>
<td>2069</td>
<td>790</td>
<td>38.2</td>
</tr>
<tr>
<td>1980</td>
<td>2200</td>
<td>797</td>
<td>36.2</td>
</tr>
<tr>
<td>1990</td>
<td>2443</td>
<td>848</td>
<td>34.7</td>
</tr>
<tr>
<td>2000</td>
<td>2606</td>
<td>803</td>
<td>30.8</td>
</tr>
<tr>
<td>2007</td>
<td>2668</td>
<td>783</td>
<td>29.3</td>
</tr>
</tbody>
</table>

### Average Annual % Increase/(Decrease)

<table>
<thead>
<tr>
<th>Period</th>
<th>Total Calories</th>
<th>Calories from Rice</th>
<th>Rice as % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961-70</td>
<td>1.53</td>
<td>2.09</td>
<td>0.57</td>
</tr>
<tr>
<td>1961-90</td>
<td>1.05</td>
<td>0.89</td>
<td>(0.25)</td>
</tr>
<tr>
<td>1970-07</td>
<td>0.69</td>
<td>(0.03)</td>
<td>(0.71)</td>
</tr>
<tr>
<td>1990-07</td>
<td>0.52</td>
<td>(0.47)</td>
<td>(1.00)</td>
</tr>
</tbody>
</table>

*Source: Data from FAO Food Balance Sheets.*

“Calories” are daily per capita energy available.
Rice consumption declines with per capita income increases

Global Engel Curve for Rice

log Consumption per capita

log GDP per capita

bandwidth = .8
Figure 2. Annualized percentage change in rice consumption by quintile and location, Indonesia, India, and Bangladesh.

R refers to rural quintiles, U to urban quintiles. Period over which changes are calculated are 1967-2006 for Indonesia, 1983-2005 for India and 1983-2005 for Bangladesh.
Figure 3. Alternative projections of world rice consumption at different rates of economic growth and rural to urban migration, with real rice price constant at its 2007 level.
Implications for the role of rice in Asia’s food security:

Rice is increasingly the food of the poor. This has significant implications for poverty if countries use “high” rice prices as a mechanism to guarantee “macro” food security and a high level of self-sufficiency in rice.
Implications (2)

The share of rice in caloric (energy) intake is falling rapidly.
   a. Asia now has a strongly negative income elasticity of demand for rice.
   b. Rapid rural to urban migration lowers per capita rice consumption quite sharply.
   c. Better connected food systems mean that rural households can be less self-sufficient in food production and consumption, especially rice.
   d. On average, Asia obtained about 40 percent of calories from rice in the early 1970s, at the peak impact of the Green Revolution, and that share is now below 30 percent and falling.
   e. The budget share spent on rice is falling even faster. Now only 10 percent of the food budget goes to rice (on average—it is higher for the poor), so 90 percent of the food budget is spent on other commodities and value added from processing and convenience.
Implications (3)

Following the changing patterns of rice consumption, the share of rice in agricultural output and in the overall economy is also falling rapidly.

<table>
<thead>
<tr>
<th>Region</th>
<th>Share of rice in GDP Early 1960s</th>
<th>Share of rice in GDP Late 2000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia</td>
<td>6.8 %</td>
<td>1.0 %</td>
</tr>
<tr>
<td>South Asia</td>
<td>8.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>14.5</td>
<td>3.8</td>
</tr>
</tbody>
</table>
# Modernizing Food Supply Chains: The Impact on Rice Distribution

<table>
<thead>
<tr>
<th></th>
<th><strong>Rice Economy</strong></th>
<th><strong>Non-Rice Commodities</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(starchy staples)</td>
<td>(Fruits and vegetables, meat/dairy, processed foods, wheat)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Farm inputs/supplies</strong></th>
<th>Smaller area possible</th>
<th>More value/hectare, but what role for small farmers (what “assets” do they need to stay in?)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Higher yields, stress tolerance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consumer quality</td>
<td></td>
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</tbody>
</table>

| **Farm Production (management and knowledge)** | Very knowledge-intensive for good management practices; Access to inputs by farm size | Knowledge intensive; can there be effective extension for new technologies? Role of farm assets |

| **Procurement/logistics and Wholesalers** | Less rural consumption as workers leave; more transportation and storage; greater production instability with climate change | High transaction costs of dealing with small farmers; issues of quality control and product traceability |

<table>
<thead>
<tr>
<th><strong>Processing and value added</strong></th>
<th>Milling technology</th>
<th>Large share of consumer food expenditure is spent in this box</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How to add value; branding?</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th><strong>Retail/consumer welfare and health dimensions</strong></th>
<th>Supermarkets as suppliers of rice? Increased price stability through private actions? Problems of access by the poor?</th>
<th>Modern supply chains are funneling consumer demand back up the system. The food system is less supply driven</th>
</tr>
</thead>
</table>
Challenges Ahead...

- Implications for food security of changing value chains
  - Increasing role of large-scale private sector in farming, processing and retail
  - Understanding the rice marketing system: Micro data from farm gate to retail
  - Feed inputs and livestock/aquaculture systems
  - Food quality, safety and traceability: Whose responsibility?
Challenges (2)...

• Rapidly falling demand for rice not far off...
• Continued push to expand rice production...
• Fear of the rice market in major importing countries, with accelerated self-sufficiency campaigns
• A thin and unstable rice market, with lower prices for “commodity” rice
Lessons for the Region

• Even when successful, all three transformations—structural, agricultural and dietary, can be painful for participants

• And yet they are the ONLY sustainable pathway out of poverty

• Good government policies can speed the transitions and mitigate the pain (mind the GAP)

• Growth with equity and stability is KEY
Conclusions

• Things we have not talked about
  – 1. Impact of climate change
  – 2. Will trade agreements change the playing field? Philippines & Indonesia
  – 3. Will rice escape the bio-fuel connection? If not, what will drive a connection between rice and petroleum? Wheat, corn, financial markets?