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The Global Rice Market in the Context of Climate Change

C.S.C. Sekhar
Professor, Institute of Economic Growth
Delhi University, Delhi, India
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csekar@iegindia.org
Objectives

• Overview of world rice market with main focus on Asian countries
• Review of existing evidence on climate change impacts on rice
• Discussion of current policy framework in Asia
• Trade and stocking policies needed to adapt to climate change impact
RICE: OVERVIEW...

Production (ERS-USDA)

- China: 29.8%
- India: 22.8%
- Indonesia: 7.7%
- Bangladesh: 6.9%
- Vietnam: 5.9%
- Thailand: 4.2%
- Burma: 2.6%
- Philippines: 2.3%
- Brazil: 1.7%
- Japan: 1.6%
- Pakistan: 1.4%
- United States: 1.2%
- Cambodia: 1.0%
- Egypt: 0.8%
- Korea, South: 0.8%

Consumption

- China: 29.9%
- India: 20.5%
- Indonesia: 7.8%
- Bangladesh: 4.7%
- Vietnam: 2.4%
- Burma: 1.8%
- Japan: 1.0%
- Korea, South: 0.9%
- Egypt: 0.8%
- Nepal: 0.8%
- European Union: 0.8%
RICE: OVERVIEW ...

**Exports**

- India: 26.7%
- Thailand: 22.6%
- Vietnam: 13.6%
- Pakistan: 9.3%
- United States: 7.6%
- Burma: 4.5%
- Cambodia: 2.8%
- China: 2.0%
- Uruguay: 2.0%
- Brazil: 1.6%
- Paraguay: 1.1%
- Argentina: 1.0%
- Guyana: 1.0%
- Australia: 0.8%
- European Union: 0.6%

**Imports**

- China: 12.4%
- Nigeria: 5.2%
- European Union: 4.5%
- Philippines: 4.2%
- Cote d'Ivoire: 3.5%
- Bangladesh: 3.5%
- Saudi Arabia: 3.4%
- Iran: 3.1%
- Senegal: 2.5%
- Iraq: 2.5%
- South Africa: 2.2%
- Malaysia: 2.1%
- United Arab Emirates: 1.9%
- Mexico: 1.9%
- United States: 1.8%
RICE: OVERVIEW ...

World Rice Stocks

- China: 60.7%
- India: 16.8%
- Thailand: 3.7%
- Indonesia: 2.9%
- Philippines: 1.7%
- Japan: 1.7%
- Korea, South: 1.1%
- Vietnam: 1.1%
- Egypt: 1.0%
- European Union: 0.9%
- Bangladesh: 0.8%
- Pakistan: 0.8%
- United States: 0.7%
- Sri Lanka: 0.5%
- Brazil: 0.5%
RICE: OVERVIEW

- Rice is basic staple diet for about one-half of the world's population
- Asia accounts for more than 80 percent of global rice production and 75 percent of global consumption, and 70 percent of exports (FAOSTAT, 2017).
- Only 8 percent of world rice production is traded annually
- Bulk of the rice production occurs in the monsoon land of Asia, stretching from Pakistan to Japan. All these countries are major consumers of rice
- China and India are the major countries in the world rice market with a cumulative share of more than 50% of world production and consumption.
- Other major producers/consumers are Indonesia, Bangladesh, Vietnam and Thailand.
RICE: OVERVIEW ...

• Major exporters – India, Viet Nam, Thailand, Pakistan and USA. Except India, all other exporters have large exportable surplus (cons/prod ratio is way below 1)
• Major importers – China, Indonesia, Philippines, Bangladesh, Japan and Nigeria.
• Except China and Japan, all other countries have intensified domestic production recently (cons/prod ratios have declined sharply).
• China appears to import mainly to augment stocks
• As per WTO IDB Database, all three major exporters – India, Thailand and Vietnam - maintain high import tariffs (40%-70%)
• Major importers – China, Philippines, South Korea and Malaysia - also maintain high import tariffs (40%-513%)
• Declining cons/prod ratios and high tariffs show increasing emphasis on domestic production by both exporting and importing countries.
The two common outcomes of climate change relevant for agriculture are increase in CO$_2$ concentration and increase in temperature.

In general, an increase in CO$_2$ level is found to increase yields while increases in temperature reduced yields.

On an average, rice production in the Asian region may decline by 3.8% due to climate change in the next century. Declines in yield are predicted for Thailand, Bangladesh, southern China and western India, while increases are predicted for Indonesia, Malaysia, and Taiwan and parts of India and China (Matthewqab et al. 1997).

Probability of a production decrease (PPD) is high in the 2020s for all SRES scenarios (Special Report on Emissions Scenarios) – (Masutomi et al. 2004). This suggests that it is necessary to take immediate adaptation measures.

Indonesia, Philippines, Thailand, and Viet Nam - Under the most pessimistic scenario without adaptation or technical improvements, rice yield potential, overall, is likely to decline about 50% by 2100 (ADB 2009)
CLIMATE CHANGE AND ITS IMPACT ON RICE ...

• Regions and months in Asia where temperatures are already approaching critical levels for rice are Pakistan and Northern India (Oct.), Southern India (April, Aug.), Eastern India and Bangladesh (March-June), Myanmar/Thailand/Laos/Cambodia (March-June), Vietnam (April/Aug.), Philippines (April/June), Indonesia (Aug.) and China (July/Aug) - - Wassman et al. (2009).

• First hotspot in Asia: The mega-deltas in Vietnam, Myanmar and Bangladesh - improvements in resilience to flooding and salinity are crucial for increasing, or even maintaining, the yield levels

• Second hotspot in Asia: Indo-Gangetic Plains (IGP)- developing cultivars tolerant to heat, drought, flood and salinity stress; improving water management; resource-conserving technologies; crop diversification; pest management
## CLIMATE CHANGE AND ITS IMPACT ON RICE …

<table>
<thead>
<tr>
<th>Country</th>
<th>Climate risk for rice</th>
<th>Type of adaptation/mitigation measures needed</th>
</tr>
</thead>
</table>
| Bangladesh | 1) **Tropical storms and saline intrusion** (up to 8 km by 2030) resulting from sea level rise  
| China | 1) **Changes in rainfall patterns and increases in the frequencies of droughts and floods; sea level rise, storm surges, glacial and/or permanent frost melt; and heat waves**  
2) **Yield without CO2 fertilization for rainfed and irrigated regions to decline** by -13% and -9% respectively in 2020 | Insurance policies and increased public investment in research; changing cropping patterns; increasing investment in irrigation infrastructure; using water saving technologies |
## CLIMATE CHANGE AND ITS IMPACT ON RICE …

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| India   | 1) Punjab and Haryana: **High temperature-induced sterility**; abrupt temperature rise in rabi season; declining soil organic matter; rising salinity; increased pests and diseases and, **shortage of irrigation water**  
2) Uttar Pradesh and Western Bihar: **Excess rain during maturity of rice**  
3) Eastern Bihar and West Bengal: **widespread flooding; frequent droughts in some pockets**; rain and storms during maturity of rice; increased pests and diseases and, **shortage of irrigation water** | Developing reliable weather forecasts and crop insurance models; irrigation facilities; developing heat-tolerant, flood-resistant, salt and alkali-tolerant rice cultivars; water-saving technologies such as laser land levelling, direct seeded rice, no-till rice etc; improved pest management techniques; crop diversification and harnessing the indigenous technical knowledge of farmers.. |
## CLIMATE CHANGE AND ITS IMPACT ON RICE …

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<tbody>
<tr>
<td>Indonesia</td>
<td>increase in the probability of a 30-day delay in monsoon onset in 2050; a substantial decrease in precipitation up to 75% in the dry season (July–September), adverse effect on food security; rise in domestic prices for paddy and rice; food inflation</td>
<td>Increased investments in water storage, early warning systems, crop diversification and drought-tolerant crops; increased public agricultural research investments and enhancing awareness of both government agencies and farmers</td>
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</tbody>
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### CLIMATE CHANGE AND ITS IMPACT ON RICE …

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<th>Country</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Philippines</td>
<td>Climate change estimated to cost the Philippine economy approximately PHP 26 billion yearly by 2050,</td>
<td>Development of rice technologies appropriate for local conditions and stress and drought tolerant varieties; irrigation development with focus on restoration of traditional systems rather than constructing new large-scale irrigation systems, and promotion of privately owned shallow tube wells; redesigning and overhauling of the top-down rice extension programs to a more decentralized system; alternate wetting and drying’ (AWD) technology</td>
</tr>
<tr>
<td>Thailand</td>
<td>Temperature increase, rainfall below normal and serious droughts over the years; Saline intrusion from the sea.</td>
<td>Development of drought and salinity tolerant varieties of rice; early warning systems;</td>
</tr>
<tr>
<td>Country</td>
<td>Climate risk for rice</td>
<td>Type of adaptation/mitigation measures needed</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Japan</td>
<td>Increase in extreme weather events such as droughts, floods, storms as well as increase in their intensities; drastic increase in hot days exceeding 30°C during summer; increasing sterility and adverse effect on quality of the grain</td>
<td>Genetically modified (GM) crops that introduce a new heat-tolerant trait; advanced transplanting and the adoption of later-maturing cultivars may help to exploit advantage of elevated CO2</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Strong association between climate conditions in Vietnam and El Niño and La Niña occurring every two to seven years; 63 provinces continue to be affected by El Niño-induced drought since 2014,</td>
<td>Monoculture farming of rice in Central Highlands could be replaced with diversified cropping systems; drought-tolerant varieties; early warning systems; geographical information system (GIS) for analyzing climate risks at a more disaggregated level</td>
</tr>
</tbody>
</table>
## COUNTRY POLICIES

<table>
<thead>
<tr>
<th>Country</th>
<th>Support price or other measures</th>
<th>Input subsidies</th>
<th>Public stocking</th>
<th>Subsidized food distribution</th>
<th>Canalization of trade</th>
<th>Free exports</th>
<th>Free imports</th>
<th>Latest applied tariff</th>
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<td>×</td>
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<tr>
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<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
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</tr>
<tr>
<td>Vietnam</td>
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<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>40</td>
</tr>
</tbody>
</table>
WORLD RICE CRISIS 2008

• When world rice price started rising, rice exporting countries withheld their exports and reduced supply in the world market.

• Importing countries scrambled to build their stocks at the same time.

• These simultaneous shifts – leftward shift of the export supply curve and the rightward shift of the import demand curve – led to a huge increase in rice price in May 2008.

• When exports normalized (except by India), prices also stabilized immediately.
• More inward looking policies by major countries
• Increase in emphasis on domestic production and stock building
• If all the countries adopt stock-building policies, price rise in international market will be much sharper even for small supply shocks.
• Widespread adoption of stockpiling practices could therefore have an opposite effect to their intended outcomes, and could actually aggravate volatility in food supply and price.
POLICIES NEEDED TO ADDRESS CLIMATE CHANGE

Climate change impacts manifest mainly two ways of – gradual yield declines and sudden floods and storms

Thus, a two-pronged strategy is needed

Gradual yield declines:

- Investment in R&D
- development of rice varieties tolerant to heat-stress, drought, flood and salinity
- knowledge sharing among countries
- irrigation development;
- alternate wetting and drying’ (AWD) technology
- improved GIS systems for analyzing climate risks at a more disaggregated level
POLICIES NEEDED TO ADDRESS CLIMATE CHANGE

Sudden floods and storms

• Reliable early warning systems and information sharing
• judicious mix of the stocks-trade-import financing instruments on the following lines
  • Build regional physical reserves with contributions from major countries (on the lines of APTERR)
  • Encourage countries to reduce export restrictions and import barriers
  • Create facility to finance commercial grain imports
  • Release grains from reserves after the country has exhausted the options of drawing down its own stocks and making use of the financing facility for commercial imports.
  • Emergency release during humanitarian crises
Thank you and Suggestions.....

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