Agriculture and climate change
With a focus on Southeast Asia and Rice

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Overview

1. Systems view of climate risk
2. Agriculture systems trends in Southeast Asia
3. Climate risks and agriculture
4. Issues for climate action
5. Ways forward – Addressing climate change in rice landscapes
Climate Risks: A systems view

- Risk of climate-related impacts results from the interaction of climate-related hazards with the vulnerability and exposure of human and natural systems.

- Mitigation and adaptation activities are socio-economic processes that influence both drivers and impacts of climate change.

**Figure** - Schematic of the interaction among the physical climate system, exposure, and vulnerability producing risk.

*Illustrative Example*
Systems view of climate and food security

- **Systematic view** shapes thinking at FAO on climate change and food security
- **Food security** is impacted by both climate change **drivers and impacts**
- Action to address near and long-onset impacts from climate change to **enhance resilience essential**
- Action to **address emissions** – in any sector – will **lessen risks** and strengthen food security over time

**Figure** - Links between climate change and food security

*Illustrative Example*

**Source**: FAO, 2016
System Trends in Asia

Food security and Nutrition

• Significant **reduction** in undernourishment

• Achieved through **income growth** and improved availability and access of food

• **Higher** per capita **consumption** of livestock products, fish, fruits and vegetables

• These **trends will intensify** into the future to match new demand

**Figure** - Changes in consumption in Southeast Asia

*Food expenditure shares (%)*

*Source: OECD-FAO Agricultural Outlook 2017-2026*
System Trends in Asia

Food security and Nutrition

- Poor nutrition & micronutrient deficiencies persist
- Obesity & diabetes are growing problems
- Future, food security and nutrition strategies need to focus more on the quality of food consumption (e.g. micronutrients) than on quantity
- Farmers have the potential to increase their incomes by growing non-rice crops, which are often more profitable

Figure - Share of children under 5 stunted: then and now

http://data.unicef.org/nutrition/malnutrition.html
System Trends in Asia

Figure - Agricultural production in Southeast Asia

Commodity shares of gross production value in constant 2004-2006 international dollars, 1963 to 2013

Source: OECD-FAO Agricultural Outlook 2017-2026
System Trends in Asia

Agricultural and Rural Livelihoods

Figure - Agricultural and fisheries sectors share of employment and GDP in Southeast Asia

Source: OECD-FAO Agricultural Outlook 2017-2026.
System Trends in Asia

Livelihoods

- Farm sizes are decreasing on average, but policies are emerging to aggregate small farms
- Farmers will need to diversify income sources for their incomes to keep up with other sectors
- Urbanization is intensifying; particularly in small and medium sized towns
- Urban centers are not just consumers but can be key actors in the food value chain and investors in rural areas

Figure - Projected urban and rural populations: Asia and the Pacific
Billions of people

System Trends in Asia
Agricultural production and post harvest

- **Productivity growth** in agricultural systems has started to **flatten and decline** in some countries.
- **Mechanization** is spreading in nearly all countries in the region.
- Integration of **ICT & other technology** has potential to enhance farm productivity.
- But, **current public R&D investments** are **not sufficient** to drive reversal of decline in productivity growth.

**Figure** – Production growth in Southeast Asia
*Decadal annual compound growth rates (%) 1960-2014*

Source: OECD-FAO Agricultural Outlook 2017-2026
System Trends in Asia

Global value chains

- ASEAN farmers are comparatively well integrated into global commodity value chains in oils, livestock, and grains; particularly rice
- Intra-regional GVC participation is higher in Southeast Asia than anywhere else in the world
- Extra-regional participation also high
- Procurement practices in global value chains, if oriented towards sustainability, may be able to positively influence production practices on-farm

**Figure** – ASEAN and world GVC participation Forward Linkages in Global Value Chains

*Source: OECD-FAO Agricultural Outlook 2017-2026*
System Trends in Asia

**Agroecosystems**

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<th>Economic-institutional capacity</th>
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By 2050 in HE-3 and HE-4:
- 60% population, 60% GDP
- 80% of Asia’s population and GDP

Currently in HE-4:
- 44% population, 20% of GDP
- 65% of Asia’s population

- Significant **yield increases** necessary to meet demand
- **Resource scarcity** and **degradation** is expected to intensify
- **Trade** in commodities based on **consumer preferences in urban areas** key **driver of natural resource depletion**

Figure - Water Security: Hydro-Economic Conditions, Present to 2050

*Interim research by Water futures and solutions initiative - IIASA*

Source: Cosgrove et al, 2015; Wiberg, 2016
System Trends in Asia

Agricultural Policy Environment

- Enabling environment for agriculture differs considerably across the region
- Efforts to strengthen R&D, farmers access to finance, agricultural & rural infrastructure and environmental standards could bring benefits in terms of productivity and sustainability in the region

Figure – Areas to improve enabling environment
Ag Growth Enabling Index normalised scores for each country relative to sample average

Source: OECD-FAO Agricultural Outlook 2017-2026
Climate Change and Agriculture

**Impacts**

- **Projected impacts** of climate change on yield are significant
- OECD estimates rice **yields** could be 16% and 17% **lower** for non-irrigated and irrigated rice on average with climate change
- **Prices** projected to be **over 50% higher** by 2050

**Figure** - Percentage change in rice yields in 2050 compared with situation of no climate change

*OECD estimates based on IFPRI IMPACT model (Hadley-Dssat-Agrip climate change scenario)*

Adaptation is important

Action required

- Smallholder agriculture particularly vulnerable to climate change risks and impacts
- Rural women and marginal groups are the most vulnerable
- Adaptation is already happening in farmer fields
- Effective strategies such as improved crop varieties and agronomy require further research & extension support

Figure - Percentage yield change as a function of temperature for rice in tropical regions
For local mean temperature changes up to five degrees

Source: Challinor et al 2014
Tackling emissions

Action required

- 70% of the technical mitigation potential in agriculture occurs in tropical developing countries
- Ability to quantify GHG emissions & mitigation in these countries is limited
- Gains can be made with more efficient production and lower intensity of emissions
  - Investments in yield improvements
  - Resource-use efficiency
  - Reduction of on-farm losses
- Wide application necessary for desired impact

Figure – Emissions from agriculture, forestry and other land-uses and AFOLU emissions in total regional emissions Share, 1990-2014

Issues for climate action

The Paris Agreement

• **NDC key planning document** for future climate change action

• **Rules-based system** implies need for **standardized approaches**

• Countries ability to access support may be related to ability to **demonstrate ambition** and **articulate needs**

**Figure** – Relationship between NDCs and other UNFCC planning mechanisms

*Illustrative Example*

Adapted from: GIZ, 2015
Issues for climate action

In the agriculture sectors

- Under the Paris Agreement countries in Asia have signaled Agriculture (crops, livestock, forestry, fisheries and aquaculture) as a key concern
- Challenges include:
  - Scaling-up
  - Transparency
  - Finance
  - Ambition
Issues for climate action

Ambition

• Despite its significance Paris will not be enough

• By 2030 the emissions gap to keep us on 2 degree pathway could be as much as 15-17 GtCO₂e

• More if 1.5 degrees is our goal

• Ambition presents opportunities and challenges for agriculture

Figure – Emissions gaps between current pledges and temperature goals

GHG emissions, GtCO₂e per year

Source: CAT, 2016
Countries have identified key areas of common technical focus including resilient and, in some cases, climate-smart or low emission crop production.

Advancing agriculture priorities for agriculture requires increased coordination with UNFCCC focal points and negotiators.

ASEAN collaboration through AMAF common position is a good example of using the NDCs to coordinate for action.

Figure – NDC Priority Actions by Sector in Southeast Asia

Source: FAORAP, 2016
Issues for climate action

**Finance**

- **Most** climate finance comes from **private** sources.
- **Innovative finance** products are **emerging** that could address funding gaps in agriculture and land-use.
- **Aimed** at reducing risk – from both impacts and drivers.
- **Data** crucial.

**Figure** - Climate Finance Contributions by source– 2015 Share, USD millions

**Source:** CPI, 2016
Value of a landscape approach

For tackling climate change risks to rice and agriculture in Southeast Asia

- Landscape approaches recognize that the root causes of problems may not be site-specific
- By their nature they combine natural resource management with environmental and livelihood considerations as well as broader societal trends
- In this way they are consistent with a systems view of climate change risks
- Encourage early assessment of trade-offs and innovation in applying solutions
Possible ways forward

Addressing climate change risks and opportunities in rice landscapes

1. Improve understanding of broader context for agriculture in the region and systematic threats from climate change

2. Enhance crop and landscape specific research and development programmes

3. Strengthen public and hybrid extension services

4. Enhance systems for field level data collection, monitoring and reporting

5. Explore ways generate value from sustainable and climate-smart product value chains
Thank You

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