Resilience Solutions for the Rice Sector in the Philippines

The Philippines, with its more than 7,000 islands, home to over 100 million people, it is often described as Asia’s ‘typhoon mat.’ The Philippines is an agricultural country, with a fast-growing population, where over a quarter of the labour force is engaged in agriculture-related activities. Rice is the national staple and a political crop, representing a major source of income for millions of farmers. Climate change is a major threat to Philippine rice production, modelling scenarios predict a 45% decrease in the supply of domestic production by 2021. Climate change adds another layer of vulnerability to poor and small farmers that must face both market and climate-related challenges.
Rice is a staple food of about 80% of the population and represents almost 23% of the total consumption of poor households and 10% of non-poor. The contribution of the rice sector to GDP is 0.7%, although its production contributes about 38% to the total value of agricultural production.

**Key sector stakeholders**

**Direct actors:** Farmers, landowners, extension workers, input suppliers, providers of irrigation services, dryers, millers, storage owners, traders, providers of logistics services, wholesalers, retailers, farmers associations, consumers, manufacturers and government.

**Indirect actors:** Research centres - International Rice Research Institute (IRRI) and the Philippine Rice Research Institute (PhilRice), National Meteorological Agency -PAGASA, Ministry of Agriculture, Municipal agricultural office, financial institutions (banks and microfinance institutions), Department of Trade and National Food Authority.

**Main challenges in the sector**

- With an average annual income of USD 2,000, farmers continue to be among the poorest in the Philippines. The main challenges include limited land ownership, failure of land reform programs, lack of access to modern and appropriate technologies, know-how, machinery, and technology, limited access to credit and financing, post-production facilities and markets; and indiscriminate and illegal importation of rice and other commodities.

- The geology of the Philippines limits the productivity of the country compared to larger connected rice areas of countries like Thailand.

- For many years, the Philippines’ policy to ensure rice reserves for three months and to secure stock in times of calamity or low production has resulted in the Philippines being a net importer of rice.

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**Value chain of the rice sector in the Philippines**

The value chain builds on five main processes from pre-production to consumption. Each process involves specific activities, which are conducted by direct actors and engage identified indirect actors.

**Value chain of rice sector in the Philippines**

<table>
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<th>Process</th>
<th>Pre-production</th>
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<td>Processing, grading, storing and handling</td>
<td>Sorting, packaging, marketing</td>
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<td>Direct actors</td>
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<td>Dryers, mills &amp; storage owners</td>
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<td>Consumers, manufacturers &amp; government</td>
<td></td>
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<tr>
<td>Indirect actors</td>
<td>Philippine Rice Genetically Improved Rice Authority (PhilRice-GIRI)</td>
<td>Ministry of Agriculture</td>
<td>National Food Authority</td>
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**BRPM analysis**

Each process of the value chain was assessed in order to identify the climate risks associated to each phase and the resilience options and tools available to address these risks and achieve specific resilience outcomes. The BRPM analysis of the pre-production, production and post-production processes is presented below.

**BRPM Analysis - Rice value chain The Philippines**

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|---|---|---|---| |
| Process | Phase I Pre-production | Phase II Production | Phase III Post-production |
| Risk | None | Drought, flooding, heat spell, El-Niño, extreme weather, wind, pests and crop diseases | Rainfall, flooding, cold spell, heat waves, pests |
| Main actors | Producers | Producers | Producers |
| Options | Information on climate-resilient seeds & appropriate initiatives | Weather forecast services, decision support systems, early warning systems, financial products (credit & insurance) | Tools for agrometeorological services, Rainfall, flooding, extreme weather, winds, pests, crop diseases |
| Tools | Decision Support Systems: Rice Crop Manager App | Efficient irrigation design & implementation, Water management, Risk-sharing or transfer schemes, Improved advisories services | Drones & satellite imagery for flood and soil salinity monitoring |

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**Normal environmental conditions for production**

- Rice grows in temperatures above 18ºC, average temperature in the Philippines is at least 23 ºC. It is also grown in mountainous areas where climate is cooler (up to 1,300 m).  
- Rice grows in areas requiring 10 mm of water daily, with a minimum temperature of 18ºC and a maximum temperature of 32ºC.  
- Rice grows almost all year round, making it a very versatile crop.

**Changes in the weather that could affect production and the value chain operations**

- Climate-related stress around flowering time affects plant recovery.  
- Climate change brings about changes in temperature and rainfall patterns.  
- Climate change is expected to affect rice production with rising temperatures and changing precipitation patterns.  
- Changes in rainfall, either in the form of strong rains or continuous period of no rain, affect directly rice production, largely through impacts on water availability.  
- Relative humidity and wind speed affect rain-fed rice as they induce pests and diseases that multiply in the crop canopy.  
- Flooding also affects production by destroying the harvestable goods or by decreasing the transportation of products from farm to market.  
- Typhoons have a significant impact on the productivity, with an average of 20 typhoons that hit the rice crop during the reproductive stage, the yield is expected to decline.

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**Sector facts**

- **Total production:** 19.07 million tonnes
- **Total area of production:** 4.8 million hectares, representing 35% of agricultural land.
- **Number, size and types of producers:** 2.4 million farmers, of which an estimated 62% self-finances production activities. Most farmers are poor (~1.4 ha) and old (~57 years).
- **Average yield:** 3.9 tonnes per hectare

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**Rice**

- Rice can be grown in the Philippines all year round. At most, it is possible to grow three consecutive rice crops in a year. During the wet season (January-June), rice naturally requires a consistent supply of water. During the dry season (July-November), rice may be grown under rain-fed or irrigated conditions. At the year’s last quarter is the typhoon season, harvesting is recommended to take place before October.
Resilience Solutions

Leading resilience solutions: Identified resilience solutions in the rice sector in the Philippines vary from services and technologies addressing water-related challenges, to seed development of varieties that are less vulnerable to CC impacts, and financing and risk management solutions, among other. The leading resilience solutions identified are communal irrigation systems and seed development.

1. Communal irrigation systems

Description: Adequate and regular supply of water are key in rice production. Irrigation is critical in maintaining rice yields and sustaining current production levels in a changing climate; it is particularly important in the early growth stages, to meet the moisture levels required for appropriate plant development. Moreover, with adequate levels of water and moisture, chemical inputs can be properly implemented in production. Consequently, productivity in irrigated rice fields is 1-4% higher than in rain-fed non-irrigated areas. Depending on the region, the production areas that are irrigated range between 50-90%. There are two separate irrigation systems: national irrigation systems (NIS) and communal irrigation system (CIS). The NIS is managed by the National Irrigation Authority (NIA) and the CIS is managed by the communal irrigation authorities.

Market opportunities: Analysis indicates that the rice gap may be reduced by expanding irrigation facilities in areas where irrigation is limited. Current irrigation facilities are challenged by inefficient design and maintenance. Improvement in design, capacity building, and investment are required. In the present structure, only 11% of irrigation is provided by private organizations. Although public-private partnerships (PPPs) are being considered, no operating model has yet been identified or explored.

2. Seed development

Description: New varieties of rice seeds are essential regardless of changing environmental conditions. With genetic enhancement, local rice varieties are able to better tolerate adverse conditions without compromising yield potential. For example, rice plants normally can only stay flooded for three days, with flood-resistant seeds, rice plants could withstand two more weeks of being flooded. The potential to increase rice yield by 15-20% over inbred varieties in the face of climate challenges may help address food security concerns.

Climate-smart seed varieties under development by Philippian institutions (IRRI & PhilRice) include improved varieties that are resilient against floods, drought, saltiness, and heat (still under research).

Resilience contribution: With climate-smart seeds, rice crops could potentially be less vulnerable to floods, droughts and heat waves. Consequently, the financial profitability of rice producers could be sustainable, despite the impacts of CC.

Market opportunities: The development of new seed varieties must consider various aspects, from cost and implementation, to how farmers respond to new seeds. Seed development requires intensive research capital, which drives up its cost, and limits the scale of commercialization and level of uptake. Consequently, development and production still have a weak institutional base. Policy support and sustainable financing mechanisms are highly necessary for large-scale uptake.

Main challenges related to resilience solutions

- Institutional arrangements: The participation of the private sector in irrigation investments in the rice sector can be increased through PPPs. This would require new institutional arrangements that ensure the profitability of the PPPs and incentivize private sector actors, clarity of contractual arrangements, addressing specific problems in rice production, and structures to enhance financial viability and mechanisms dealing with policy interference.

- Policy and governance: Appropriate policies and governance structures can further encourage a more active participation of the private sector in climate adaptation. Land ownership remains a critical issue in the sector, and those farmers that do own land lack the necessary economies of scale to make investments viable, practical or affordable. Policies addressing land ownership and financial constraints can boost the participation of the private sector and facilitate the uptake of adaptation and resilience solutions.

- Knowledge and lessons learned: One of the PMCR findings relates to the crucial role of the private sector in the development of climate-smart rice seeds. However, lessons learned from the roll-out of the hybrid seeds failed program in the early 2000s, should be considered.

- Appreciation of risks and changing conditions: The understanding of CC and its associated risks must be deepened into all processes in the value chain. At the plantation level, most farmers base their decisions on instinct or past experience, instead of using weather data to establish a climate-based crop calendar. As a result, farmers get “confused” as to when to sow their crops, and once a season is delayed, the following cropping rotation is also affected. Additionally, crop insurance has been highlighted as a promising area where the private sector can assist farmers in minimizing the risks involved in rice production.

Quotes

“Private sector actors are aware about climate change and need for resilience in the agriculture sector; they even suggested projects for government such as weather stations and rainwater harvesting system... Farmers are aware of climate change—e.g., they say, “We are getting confused already, we don’t know when is the right time to start planting...” Weather data and prediction are improving but farmers still get confused as to when to prepare their fields and start planting.” - PhilRice Munoz, Nueva Ecija