



GOING BEYOND RICE

TRANSITIONING TOWARD EQUITABLE, PROFITABLE, AND ENVIRONMENTALLY SOUND RICE AGRI-FOOD SYSTEMS

INTRODUCTION

The contribution of IRRI to SDG2 – ending hunger and malnutrition – in Southeast Asia is an essential and, at the same time, a challenging task. For decades the number of hungry people had been declining, but this isn't true anymore. Over 820 million¹ people globally are undernourished. While there are differences among countries, Southeast Asia is still home to 61 million² undernourished people, 9% of its population. Over 33 million (5.2% of the region's population) are severely food insecure, typically running out of food, and at worst, go a day (or days) without eating. The prevalence of stunting in children under five years of age stands at 25% while the percentage of overweight children increased from 3.2% in 2000 to 7.7% in 2018.

Achieving SDG2 by 2030 requires the region to work collaboratively to address complex and interrelated challenges such as climate change, urbanization, biodiversity loss, water scarcity, poverty, food safety and nutrition, and social inequity. Climate change affects agriculture and food systems adversely due to irregular weather patterns, floods, drought, or natural disasters. Urbanization often means less labor for agriculture in rural

areas and changing demands on diets. Coupled with the declining role of agriculture in the region's economy, an increasing number of youths opt for a more recognised career in the cities. The contribution of agriculture to the region's GDP³ is 10.3% compared to 33% for services and manufacturing. The future of agriculture will need to respond to all these changes.

Agriculture – including the rice-based systems – is facing tremendous pressure to be more productive in a landscape where land has been degraded, water and chemical pesticides have been overused, and biodiversity has been lost. Poverty and social inequality exacerbate the situation. While the region has been hailed for its success in reducing poverty, the number of people living under the national poverty line is still high in some countries, e.g. Lao PDR (23.4%), Myanmar (24.8%) and Philippines (21.6%). While social and gender inequality remains an issue, the needs of these groups should not be overlooked.

The recent COVID-19⁴ pandemic has exposed the vulnerability of our food systems and agriculture as a whole. While the impact on the prices of rice, fish,

1 <http://www.fao.org/state-of-food-security-nutrition>

2 <http://www.fao.org/documents/card/en/c/ca7062en/>

3 <https://www.aseanstats.org/publication/asean-key-figures-2019/>

4 <https://www.irri.org/news-and-events/news/policy-brief-safeguarding-food-systems-southeast-asia-amid-covid-19>

vegetable, and other agricultural products has not been extreme, there is a strong indication that logistical challenges due to various forms of restrictions can cause disruptions in the production and supply chains. It is inevitable that there would be long term impacts of COVID-19 on food security due to foreseen economic recession.

Within this dynamic landscape and challenges, IRRI in Southeast Asia will invest in rice agri-food research taking a landscape perspective and considering the interconnectedness of various systems, e.g., agriculture, land, water, biodiversity, logistics and markets.

IRRI has 17 country offices worldwide, with six in Southeast Asia



THE RICE SECTOR IN SOUTHEAST ASIA AT A GLANCE

Rice is the single most important staple in the region as it provides 50% of calorie intake for its population. The region's rice areas comprise 48 million ha or almost 30% of the world rice harvest. It produced 220 million tons of rice in 2018. Rice exporting countries include Cambodia, Myanmar, Thailand, and Vietnam; and Vietnam and Thailand are among the top three rice exporting countries in the world. Rice importing countries include Malaysia, the Philippines, and Indonesia. In the last couple of years, Indonesia has produced sufficient rice but is still importing for its reserve. In most years, Lao PDR is self-sufficient.

The total irrigated and rainfed systems are approximately equal in size. Irrigated areas provide much of the region's exports, such as in Vietnam, and are critical to a regional surplus. Rainfed regions of Thailand, Myanmar, Indonesia, and Lao PDR are of particular importance from a national food security perspective and strategic importance for higher-value production with the fragrant, heirloom, and other premium products. While relatively small in terms of the regional area, upland rice is the basis of cropping in the 10 million ha of the upland cropping systems and critical to household food security and livelihoods of rural communities in countries such as Lao PDR.



2018 International Rice Congress in Marina Bay Sands, Singapore

Particular environments share similarities across countries. For example, salinity is a key constraint in many coastal areas throughout the region and with large areas affected in the Mekong and Ayeyarwady deltas. Similarly, submergence prone areas are widespread in the flood-plains of the Ayeyarwady (Myanmar), Chao Phraya (Thailand), Mekong (Vietnam), Tonle Sap (Cambodia) and in Kalimantan and Sumatra (Indonesia). Sea level rise could further affect the productivity of these major rice-growing regions.

The role played by the private sector in rice systems of Southeast Asia varies considerably. In most areas, the private sector is involved in input supply, machinery provision, and value addition within the supply chain. Hybrid rice seed supply, (<5% of total rice area), is dominated by the private sector and leading regional and global companies. Several smaller companies are working with governments in promoting initiatives in the rice sector. As rice is a staple for most Southeast Asians, the private sector has a key role in IRRI's partnerships for innovation and improved rice systems in the region.



Dr. Chanthakone Boualaphanh and Dr. Phetmanyeng Xangsayasane, Lao rice scientists and breeders



IRRI secures the endorsement of ASEAN Member States for ASEAN RiceNet during the 41st ASEAN Minister of Agriculture and Forestry Meeting in Brunei Darussalam in 2019

KEY IMPACTS OF IRRI IN SEA

- Filipino rice farmers are earning an **additional US\$ 52** annually using IRRI-bred rice varieties.
- Indonesia's average annual value of gains from IRRI is equivalent to or more than **US\$ 76/ha** across the average rice area.
- The annual value of the gains from IRRI is equivalent to **US\$ 127/ha** or more across the average rice area in Southern Vietnam.
- As a result of food shortages in the late 1970s, many Cambodian farmers were forced to eat their rice seed and traditional varieties were lost. In the 1980s, IRRI reintroduced more than **750 traditional Cambodian rice varieties** into the country.
- In the 1970s, Thailand had 9 million hectares of deepwater rice land. To stabilize yield from these unfavorable areas, Thailand and IRRI established a joint research and training facility for deepwater rice, the **Prachinburi Rice Research Center**, now one of Asia's leading deepwater rice research centers.
- To date, **74 IRRI improved rice varieties** have been developed, released and promoted in Myanmar. These IRRI improved varieties are being used by approximately 40-50% of all smallholder rice farmers in Myanmar.
- With support from IRRI in research, improved rice varieties, and crop management, total rice production in Lao PDR increased from 1.5 million tons in 1990 to more than 2 million tons in 1999, at which time the country **achieved rice self-sufficiency**. In 2019 rice production reached 3.5 million tons.

INVESTING FOR IMPACT

IRRI's vision for the region is to achieve SDG2 by 2030. This means that undernutrition, micronutrient deficiencies, and obesity will have been successfully addressed. The interim impact that IRRI strives to achieve by 2025 through this strategy is to increase the sustainability of rice-based agri-food systems through innovation and technology adoption that provide sufficient nutritious rice to the populations of Southeast Asia while preserving the landscape biodiversity and providing better income to the farmers, women, and youth.

Building on IRRI's 60 years of experience, the following five programs will be implemented in collaboration with governments, research institutions, universities, private sector, development partners, and other key stakeholders. A key aspect of IRRI's future intervention is a strengthened collaboration with ASEAN and ASEAN Plus Three.

Bill Gates' 2015 visit to the IRRI Headquarters in Los Banos, Philippines



PROGRAM 1: Climate change mitigation & adaptation

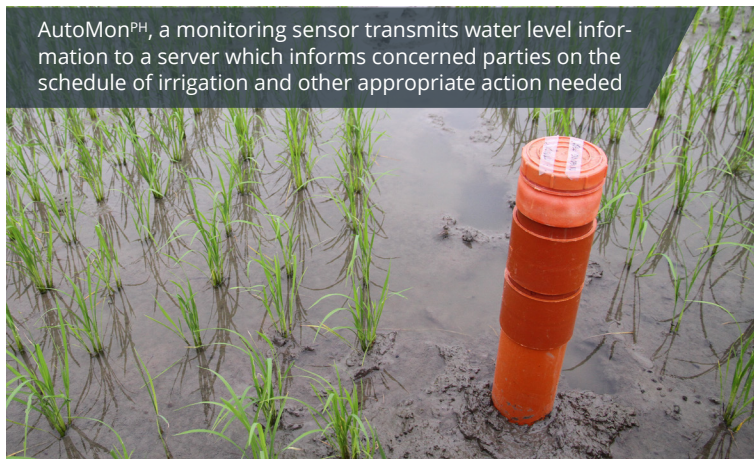


Southeast Asia is affected by climate change, as there are more frequent observed incidents of severe weather irregularities. Drought has been an issue in many parts of the region, including in the Mekong river basin⁵. Current water-use projections foresee further pressure on many Southeast Asian countries' water resources. Floods also increasingly pose challenges to agriculture, and salinity intrusion threatens, especially the highly-productive delta regions. Straw burning, puddled cultivation, and excessive use of water in rice farming contribute to greenhouse gas emission.

IRRI will continue to work on both climate change mitigation and adaptation at the landscape level. Building resilience of rice agri-food systems to various climatic shocks and crises like COVID-19 is a core component of this regional program. IRRI will support governments to strengthen policies and institutions related to climate change. It will reinforce initiatives on developing and disseminating climate-smart rice varieties and crop management practices that can help rice production be more resilient to environmental shocks. IRRI will strengthen its breeding programs in the region that have targeted climate-smart rice varieties that can cope with abiotic stresses - drought, salinity, submergence, and screening of materials for high temperature. Gendered trait preferences will be considered while determining breeding priorities and the dissemination of varieties. IRRI's collaboration with ASEAN through ASEAN RiceNet, ASEAN Fall Armyworm, ASEAN Plus Three Emergency Rice Reserve (APTERR) and other relevant initiatives through SOM-AMAF will be an important element of this program. Further, in areas such as the Mekong Delta, IRRI deploying its sustainable intensification program by working with partners to develop practices to help reduce greenhouse gas emissions from the rice farming landscapes through the promotion of water-saving technologies such as direct-seeded rice (DSR) and alternate wetting and drying (AWD).

⁵ <https://www.nationalgeographic.com/environment/2019/07/mekong-river-lowest-levels-100-years-food-shortages/>

AutoMon^{PH}, a monitoring sensor transmits water level information to a server which informs concerned parties on the schedule of irrigation and other appropriate action needed



PROGRAM 2: Food security & nutrition



As food security and nutrition remain a crucial challenge for the region as described above, IRRI will further consolidate its program under this theme. As staple food for many of the world's poor, rice can be a convenient delivery vehicle for micronutrients that can prevent 'hidden hunger' and stunting in children. Food safety is an important element of this program. IRRI is developing rice varieties biofortified with vitamin A, zinc, and iron. Similarly, research continues on low glycemic index rice, which can become part of a healthier diet for people who have, or are prone to, diabetes. To meet the increasing demand for rice, IRRI will promote the adoption and utilization of high-yielding varieties in the region. IRRI will strengthen initiatives that focus on variety release and seed systems to accelerate deployment and increase farmers' access to and use of quality seeds and seed markets of recommended climate-resilient varieties. It is also vital to address losses in the post-harvest value chain by upgrading various technologies, e.g., drying and storage. Mechanization and post-harvest for rice-based production systems are also important but technology adoption and land consolidation will need attention. With partners across Southeast Asia, IRRI is developing near-real time information systems to deliver to government data on planted rice areas, yield prediction and loss, as well as options with farmers to reduce the yield gaps, which are on average two-thirds of a farms' potential agronomic yield. Additionally, IRRI will work with governments through policy advocacy to prevent further loss of productive agricultural lands due to urbanization or other development through policy.

IRRI and its national research partners have developed Golden Rice to complement existing interventions to address vitamin A deficiency (VAD). As a commodity, it is estimated to hit the Philippine markets by 2023 or later



PROGRAM 3: Reducing environmental footprints



Agriculture, including rice farming, has significant environmental and climate footprints. Supporting countries' national determined contribution (NDCs) and the Paris Agreement on climate change, future rice agri-food systems need to be tweaked to better integrate and preserve vital ecosystem services, lower pollution, and address climate change. IRRI is developing ecological approaches to management and resource-conserving technologies to support further intensification and diversification of rice systems. IRRI is developing market-driven and environmentally sustainable options with farmers to reduce the yield gaps. IRRI will promote the transition to environmentally sustainable rice-based agri-food systems for food and nutritional security. Expansion of well-designed management practices and diversified cropping systems for optimum yield and long-term environmental sustainability will be necessary, including addressing the issues of transboundary pests.

The program will strengthen the crop and resource management practices to improve resource use efficiencies, e.g., water and chemical fertilizer, including through the introduction or strengthening of market mechanisms (water pricing), policy and market incentives, or precision farming technologies. Water-saving technologies and efficient use of water in rice farming will be expanded. Gender equity considerations in sustainable intensification will be central. Through the Sustainable Rice Platform (SRP), IRRI has also developed a series of indicators to assess the sustainability of farm practices. Burning of crop residues is not only posing health risks to rural as well as urban communities; it is also a waste of resources. IRRI aims to expand its research on sustainable rice straw management options and scale-out practices that reduce burning and offer additional income opportunities. IRRI will promote biodiversity conservation in support of CBD Convention and enhance the quality of the rice landscape by working across sectors to restore ecological functions and rehabilitate degraded ecosystems as part of income-generating activities of increasingly diversified and resilient rice-based farming systems. Payment for ecosystem services by end-users and beneficiaries (consumers or taxpayers) will be a tool that can promote landscape conservation and restoration.

Mechanized rice straw collection using balers helps address the problem of labor shortage and enables easier removal of harvested rice straw from the field for feedstock or mushroom production



PROGRAM 4: Value chains & improved income



Large number of farmers and rural population still live in poverty. It is ironic that with an abundance of natural resources, they remain the group that enjoy the least economic return from farming. Most of the margin accrues in value addition and downstream value chains. Therefore, securing and increasing the income of farmers will be an essential focus of IRRI, through e.g. development of insurance products to protect income against natural disasters or more diversified cropping systems. Rice-based agri-food systems in the region need to diversify their production systems from their sole focus on rice, which will be insufficient to reduce poverty in the long run. In certain areas, driven by evolving demand and changing consumption patterns, farmers will specialize in highly productive and high-quality rice production.

In contrast, in other areas, farmers will diversify towards higher-value crops. In some areas, farmers will diversify towards, e.g. rice-fish systems or agroforestry. Rice-based diets are already expanding away from rice, and the challenge will be to develop nutrition-sensitive value chains that respond to this demand. Further, building on the SRP, IRRI will promote the development of sustainable and profitable rice value chains. Additionally, IRRI will continue to support capacity development of extension workers and farmers on best agricultural management practices and technologies using a participatory platform - this will enhance knowledge and skills and farmer empowerment at the community level resulting in farmers improved decision making and control in technology choices, markets, relevant agricultural policies, and their agroecosystems.



Rice vendor in the Philippines

PROGRAM 5: Women and youth in rice Agri-Food Systems (AFS)



Women play an essential role in agriculture, food security, and landscape management. However, these roles are often overlooked. They also tend to have less control of decision-making within households and communities, lack access to land, credit, markets, and extension advisory services and get paid less, resulting in low productivity and incomes. In terms of youth, many of them are no longer looking at agriculture as their first choice of career. IRRI, using rice-based systems as an entry point, will design and test solutions based on systematic analyses of the context, challenges and opportunities. Systematic analyses will be conducted on implications of structural and rice AFS transformations in various settings for gender equality and youth engagement; impacts of mechanization on women's labor, incomes, and health; gendered impacts of climate change in rice AFS and CSA and, implications for risk management; unpaid care work and role of women in water management to inform gender-responsive strategies for diversification and intensification will be undertaken. Research will be done to establish the profitability of rice value chain at different nodes in different contexts; design and testing of innovative land tenure and financial models targeting youth; public-private partnerships; creation of an ecosystem of collaboration amongst urban and rural youth to capitalize on urbanization and digital revolution and; generating evidence to understand pathways for engagement and empowerment of youth will be core components of the agenda. Capacity building will be an integral part of this effort. Support to women and youth with vocational training and certification programs could help farmers become more independent and connect to national and international markets. At the same time, IRRI will be supporting the development of enabling conditions, e.g., policies, incentive systems based on evidence, for their increased participation and empowerment. We will support the development and integration of digital agriculture decision support tools in the rice agri-food systems.

Participatory action research with farmers in Prey Veng Province, Cambodia



Different types of rice from IRRI's International Rice Genebank

INVESTMENT REQUIREMENT

IRRI in Southeast Asia currently has existing projects and activities for the major part of the regional programs mentioned. They will be scaled up.

Several research areas that would require significant additional investment in the region include climate change, rice breeding, seed systems and product management, diversification of rice agri-food systems for better income, technologies and innovation, and regional program 5 – women and youth in rice AFS – as this program is relatively new.

IRRI welcomes any interest from partners to invest in this regional strategy.

IRRI is a training ground for scholars and researchers at the Masters, PhD, and Post Doctoral levels



PARTNERSHIPS AND SYNERGIES

IRRI will work collaboratively with other CGIAR Centers under the umbrella of One CGIAR, which will allow IRRI to address common challenges at a landscape level. Further, IRRI has taken the lead in multinational organizations like the Council for Partnership on Rice Research in Asia (CORRA), to create multi-sectoral consortia for private sector partners like the Hybrid Rice Development Consortium (HRDC) and the Direct Seeded Rice Consortium (DSRC).

Key development agencies such as FAO, UNEP, IFAD, UN Women, YPARD, UNDP, ADB, World Bank, BMZ, ACIAR, SDC, etc. will be IRRI's important partners. IRRI will also continue to strengthen its collaboration with ASEAN.

To implement the strategy effectively, IRRI will work closely with governments, e.g., through NARES, as IRRI responds to their priorities and needs. IRRI and national governments have developed joint country plans in most countries in the region, which will be the basis of national-level interventions.

Additionally, IRRI will seek support and collaboration from research organizations and universities, private sector, farmer associations, youth and women groups/networks, and other key stakeholders to find solutions for current and looming challenges in the rice agri-food systems. One area that IRRI would like to expand is South-South Cooperation, not only within the region but also transferring knowledge and technologies to and from other regions.



"Protecting my health and protecting the environment for the next generation are two of the most important changes for me," Mr. Nhat, a rice farmer in An Giang Province in Vietnam, said after attending an SRP training

Field test of seed caster drone that can be adapted for broadcast seeding or input delivery



RISKS AND SENSITIVITIES

There are uncertainties concerning donor priorities due to COVID-19. Our assessment in the region suggests that many donors are shifting their priorities to the health sector and away from agriculture research, at least in the short term.

Similar trends may also be true for many governments. If this trend persists, there is a need for IRRI to explore new funding opportunities and expand their funding options, e.g., private sector, crowdfunding, emerging donors, South-South Cooperation, etc.

IRRI's ability to deliver this strategy effectively will depend on strengthening its regional/country capacity by decentralizing technical expertise and resources. In view of this, IRRI will continue its ongoing policy on regionalization.

In the coming years, we may be confronted with challenges such as geopolitical tensions, increased migrations, possibility of new pandemics, or major disasters that can influence our ability to deliver the above programs.

The flexibility and adaptability of the programs mentioned would be required.



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ABOUT US

IRRI aims to abolish poverty and hunger by improving the livelihoods and nutrition of people who depend on rice-based agri-food systems. In doing so, IRRI's work protects the health of farmers, consumers, and the environmental sustainability of rice farming in the world challenged by climate change. IRRI's work promotes the empowerment of women and supports opportunities for youth in an equitable agri-food system.

CGIAR is a global research partnership of 15 organizations for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources. The 15 CGIAR Research Centers are independent, non-profit research organizations, conducting innovative research. Home to more than 8,000 scientists, researchers, technicians, and staff, CGIAR research works to create a better future for the world's poor. As the world's largest global agricultural innovation network, CGIAR brings evidence to policy makers, innovation to partners, and new tools to harness the economic, environmental and nutritional power of agriculture.