Japan and IRRI

Japan and IRRI have been partners since the institute's establishment in 1960. Ever since, Japan has provided leadership expertise by having a representative on the IRRI Board of Trustees. The government of Japan has been one of IRRI's most generous financial supporters, having given around USD 217 million between 1971 and 2015. In 1992, one of IRRI's research buildings was named after Dr. Kenzo Hemmi, an outstanding Japanese agriculturist. The Japanese government contributed USD 1.9 million to its construction. Japan also provided financial support for the construction of the Nyle C. Brady Laboratory, which houses the International Rice Genebank.

Over the years, Japan has shared with IRRI both knowledge and human resources, especially scientists. Forty-eight trainees and 112 scholars from Japan worked at IRRI between 1962 and 2015. These include 21 PhD and 16 MSc students, 49 on-the-job trainees, 12 interns, and 14 fellows.

Since 1984, Japanese scientists have been assigned by the Japan International Research Center for Agricultural Sciences (JIRCAS) to work on collaborative projects at IRRI headquarters under a special contribution of the Japanese government through the Ministry of Agriculture, Forestry, and Fisheries. This resulted in the identification of genes that are resistant to various races of bacterial leaf blight disease, establishment of direct seeding technology, and a clearer understanding of the genetic mechanism for control of rice tungro. JIRCAS, alongside IRRI and four other research institutions, is a strategic founding partner of the Global Rice Science Partnership.

Ongoing research activities

Climate change

- CCARA and CCADS-RR. *Climate Change Adaptation in Rainfed Rice Areas* (CCARA) aims to maximize rainfed rice production through efficient natural resource management based on seasonal climate predictions in Southeast Asia. The project developed WeRise, a decision-support system that provides farmers with crucial weather and rainfall distribution information during the crop-growing season. WeRise has been pilot-tested in Indonesia and Lao PDR, providing training to 114 extensionists and researchers. It has also developed seven rice lines for yield potential and seven lines for early-morning flowering. The second phase of CCARA, *Climate change adaptation through the development of a decision-support tool to guide rainfed rice* (CCADS-RR), aims to develop a WeRise-based integrated decision-support system in Southeast Asia. The system will enable

Completed research activities and key achievements

- **Impact of local climatic conditions on rice spikelet fertility and grain quality in the hot and vulnerable regions of India.** JIRCAS and IRRI scientists evaluated the effect of weather conditions on rice grain quality and spikelet sterility under field conditions in India to develop early-morning flowering rice, which can avoid heat-induced spikelet sterility. The project identified heat-sensitive popular varieties to develop EMF rice through future molecular breeding.

- **Implementation plans to disseminate submergence-tolerant varieties and associated new production practices in Southeast Asia.** The project helped farmers reduce losses in production and income caused by typhoons and flooding through (1) GIS and remote-sensing courses; (2) the development of a response plan to reduce the impact of submergence on rice production and farmer livelihood; (3) on-station and on-farm evaluation of submergence-tolerant rice varieties; and (4) training of NARES partners on rice and marker-assisted breeding, management and analysis of socioeconomic data, and participatory varietal selection, among others.

rainfed rice farmers to increase production by up to 50%. It also aims to evaluate this system for improvement of rainfed rice production in sub-Saharan Africa.

- MIRSA and MIRSA 2. *Greenhouse gas mitigation in irrigated rice systems in Asia* (MIRSA) assessed the feasibility of greenhouse gas mitigation through water-saving techniques in irrigated rice production. It determined different rates of methane gas emissions during a cropping season and established a standard protocol for measuring greenhouse gas emissions in rice systems. To familiarize farmers with alternate wetting and drying (AWD) technologies, extension activities such as field visits, seminars, and workshops were done. *Technology development for circulatory food production systems responsive to climate change* (MIRSA 2) is the ongoing second phase of the project. MIRSA 2 aims to develop an improved rice cropping system in Southeast Asia with AWD. The goal is to craft implementation guidelines on techniques to reduce greenhouse gas emissions from irrigated paddy fields and set up an information infrastructure to share findings of participating members.

Breeding and crop improvement

- Development of drought-tolerant crops for developing countries. The project evaluates transgenics of known stress-response genes for their role in affecting yield under drought. Work at IRRI focuses on drought in lowland rice conditions using the variety IR64. In collaboration with JIRCAS, the International Center for Tropical Agriculture, and the International Maize and Wheat Improvement Center, 10 genes have been evaluated for yield under drought in field and screenhouse studies on rice and wheat. In lowland rice studies at IRRI, some transgenics related to multiple traits showed a significant effect on yield. The most promising line was identified and is being crossed with an IRRI drought-tolerant variety in an effort to increase its yield under drought.
- Wonder rice initiative for food security and health. This joint IRRI-Nagoya University-Japan International Cooperation Agency (JICA) research project aims to develop new rice varieties for Africa and Asia that are high yielding, resistant to biotic stresses, and tolerant of abiotic stresses that adversely affect rice production in both regions. Currently in its third year, the project has used nine Asian and seven African elite varieties with inherent adaptation to different rice ecosystems in the two continents. Seven rice cultivars are being used as genetic donors for high yield and resistance to blast and bacterial blight. More than 200 advanced generation backcross lines, derived from different cross combinations between the selected recurrent and donor parents, have been developed. Pyramiding genes for yield and resistance to biotic stresses using rice lines developed under the project has been started.
- Introduction and use of the genetic resources produced by Japan-IRRI collaborative research. Breeding materials developed under the project are transferred to JIRCAS in Japan and evaluated under local environments. Selected elite lines with high yield potential and heat tolerance will be used for the development of Japanese rice varieties.

Capacity-building programs

- From 2011 to 2014, JICA, IRRI, and the Philippine Rice Research Institute conducted the season-long rice-farming extension program for Africa. Established with the Coalition for African Rice Development (CARD), the program aims to strengthen human resources in rice production in Africa. Under the training component, IRRI trained 63 extension agronomists from 14 CARD countries and 13 participants from the Philippines, 38 young researchers from 20 CARD countries, and 41 research technicians from 21 CARD countries. In 2016-19, JICA and IRRI will conduct Phase 2 of the program and offer three courses annually on building capacity for improving the rice seed sector in Africa.
- In partnership with Kyushu University, IRRI will conduct a rice production and research course for the university's undergraduate and graduate students.

International Rice Research Institute (IRRI)

The International Rice Research Institute (IRRI) is the world's premier research organization dedicated to reducing poverty and hunger through rice science; improving the health and welfare of rice farmers and consumers; and protecting the rice-growing environment for future generations. IRRI is an independent, nonprofit research and educational institute founded in 1960 by the Ford and Rockefeller foundations, with support from the Philippine government. The institute, headquartered in Los Baños, Philippines, has offices in 15 rice-growing countries in Asia and Africa, and about 1,180 staff members of some 40 nationalities.

Working with in-country partners, IRRI develops advanced rice varieties that yield more grain and better withstand pests and disease as well as flooding, drought, and other destructive effects of climate change. More than half of the rice area in Asia is planted to IRRI-bred varieties or their progenies. The institute develops new and improved methods and technologies that enable farmers to manage their farms profitably and sustainably, and recommends rice varieties and agricultural practices suitable to particular farm conditions as well as consumer preferences. IRRI assists national agricultural research and extension systems in formulating and implementing country rice sector strategies.

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August 2016