FACTS ABOUT COOPERATION

Thailand and IRRI

Thailand was the world's largest exporter of rice, shipping out 5-6 million tons of milled rice each year. It had a reputation for producing high-quality, long-grain, white rice, which commanded a premium price in the world market. In 1996, Thailand exported 6.2 million tons of rice worth US$2002 million of foreign exchange. Rice exports accounted for 3.6% of the country's total export earnings.

Farm families were the backbone of Thailand where 52% of the population was agricultural and rice was still the staple food and the most important crop. The average annual per capita consumption of milled rice was about 114 kg. Rice was cultivated on around 9 million hectares and occupied more than half of the total cultivated land.

The majority of Thai farmers grew rice. The world's population continued to increase by 85 million a year. Although the population growth was expected to slow down from 1.6% per year for 1990-95 to 1.0% for 2020-2025, the absolute increase in population would still be 75 million per year for the later period.

Population growth would be higher in regions characterized by pervasive poverty and malnutrition such as South Asia and sub-Saharan Africa, where per capita grain consumption was expected to increase greatly. Recent projection studies showed that if countries sustained their past economic growth, global demand for milled rice in 2020 would reach 489 million tons (or about 734 million tons rough rice). In South Asia, the demand was expected to increase by 50%. Also, people's tastes were changing, where quality rice was in greater demand. Thailand was uniquely placed to respond to some of the increases in demand within the region.

The global challenge to the scientific community was how to help maintain a continuous increase in food supplies despite limited natural resources and declining arable land and water supplies in a manner that protected the soil, water, and biotic resource base from which all food must come. Meeting this daunting challenge required continuing investment in agricultural research and delivery.

For the International Rice Research Institute (IRRI), the task was especially challenging: to spearhead a "green-green revolution" in rice, the staple food on which over two-and-half billion people depended. The number would increase by almost 50%, to about 3.5 billion people in 2020. Rice research—which in the past had as its primary objective increasing yields and land productivity, to preserve the scarce land resources of Asia—had taken on an additional challenge: how to simultaneously increase the productivity of labor, water, and fertilizers, while preserving natural resources and protecting the environment. IRRI, its scientists, and its research partners in the developing and industrialized world, were in the forefront of such research.

In Thailand, the specific challenges were to increase yields to meet the demands while maintaining the good grain quality widely acceptable in the world market, increase labor productivity per land area through appropriate agricultural mechanization, increase farmers' incomes, and develop the technologies that could withstand climatic disturbances such as drought and floods.

Rice environment

Four seasons were recognized in Thailand: the southwest monsoon from May to September; a transition period from the southwest to the northeast monsoon during October; the cool, dry northeast monsoon from November to February; and a pre-monsoon hot, dry season from March to April.

Only about one-fourth of the total rice land in Thailand was irrigated. Thus, the rainfed lowland farm was the typical planting environment in Thailand especially on the nutrient-poor soils of the northeast, where 90% of the farms depended on rain for crop production.

Upland rice was grown in hilly areas while deepwater rice was cultivated on flooded areas of the central plain. Administratively and geographically, Thailand was divided into four regions: northern, central, northeastern, and southern. Each region had a different rice-growing environment.

Northern region. Some upland rice was grown in the high areas and in small parcels of land at the lower slopes of the high hills. Lowland rice was grown mainly in the lower valleys and on some terraced fields where water was available. About 22% of Thailand's rice area was in the northern region, producing 25% of the total rice production.

Central region. During the wet season, rice was planted nearly everywhere across the central region which covered 21% of the country's total cultivated rice land and produced 30% of the total rice. About 450,000 ha of land in the central region was planted to irrigated dry-season rice.

Northeastern region. About 53% of the total riceland of Thailand was found in the northeastern region, but it only produced 41% of the total rice. This region produced mostly rainfed lowland rice. Harsh seasonal conditions and poor soils gave average yields of 1.4 to 1.7 t/ha.

Southern region. Only 6% of Thailand's rice area was planted in the southern region, which touched the west and east coasts of the peninsula. With limited rice fields under cultivation, there was always a shortage of rice for local consumption in the southern region.

In addition to the climatic problems associated with the different rice ecosystems, the main constraints that farmers faced were stagnant and low yields and labor shortages. Labor shortages were especially acute during the peak planting and harvesting periods in the central region where industrial employment was higher than in the other rice-producing regions.

The countrywide average rice yield was about 2.3 t/ha. The low average yield, however, did not necessarily reflect poor management. Rainfall distribution was irregular and the high-quality, aromatic Thai rices, which commanded high prices in the world market, were low-yielding, traditional varieties.

Thailand-IRRI collaboration

IRRI Board of Trustees. The first formal link between Thailand and IRRI was made in 1960-63 when Prince Chakrabandhu, became a founding member of the IRRI Board of Trustees. Other Thai former trustees were Dr. Sala Dasananda (1966-69), Dr. Bhakdi Lusanandana (1975-79), Dr. Yookti Sarikaphuti (1984-88), Dr. Pecharat Wannapee (1989-92), and Mr. Montri Rumakom (1993-94). Mr. Mechai Viravaidya, Chairman of the Population and Community Development Association of Thailand (PDA), was a member of the IRRI Board (1995-2000).

IRRI scientists. The first IRRI scientist assigned in Thailand was Dr. B.R. Jackson, who worked in the country for 16 years, from 1966 to 1982. His first year of collaboration in plant breeding was a turning point for rice improvement in Thailand. A Thai breeder crossed IR8-288-3 with tall Thai rice cultivars, and progeny lines RD1 and RD3 became the first nonglutinous, semi-dwarf, photoperiod-insensitive, high-yielding varieties released to farmers in the country.

Other IRRI scientists posted in Thailand included Dr. Donald W. Puckridge, agronomist and former leader of the flood-prone rice ecosystem program, who also served as IRRI's liaison scientist for Thailand and Vietnam from 1981 to 1996; Dr. Derk HilleRisLambers, plant breeder assigned to Thailand in 1975 and 1981.

Thai scientists among IRRI staff had included Dr. Kwanchai A. Gomez from 1967 to 1997, as head of Liaison, Coordination, and Planning and also head of Biometrics. Dr. Surapong Sarkarung, who joined IRRI's Plant Breeding, Genetics, and Biochemistry Division in 1991, and conducted research mostly in Thailand; Dr. Tawee Kupkanchanakul, who completed an assignment with the Lao-IRRI Project as lowland agronomist in 1996 and later served as the National Coordinator of the International Network for Genetic Evaluation of Rice (INGER) in Thailand; and Mr. Suvit Pushpavesa, a Thai scientist, posted in Lao PDR, who later worked as a consultant to IRRI's breeding research program at the Ubon Rice Research Center (URRC).

Joint research and training program for deepwater rice. As far back as 1941, Thailand recognized the importance of deepwater rice research by building the Huntra Rice Experiment Station. Although about 9 million ha of deepwater rice was harvested annually in Asia, there were numerous constraints to increased production. Yields were low and unstable. Rice crops were subject to soil problems, to both drought and deep flooding, and to yield-reducing pests.

In 1974, the Royal Thai Government and IRRI established a joint research and training program for deepwater rice. In 1975, the Prachinburi Rice Research Center was established. It became one of the leading centers in Asia for deepwater rice because of its excellent facilities and experienced staff.

The research program for deepwater rice emphasized the need for collaborative research with national agricultural research systems (NARS) for extensive testing in the target environments. The Thai Department of Agriculture (DOA) of the Ministry of Agriculture and Cooperatives (MOAC) had provided physical facilities and support staff while IRRI had provided scientists as resource persons and given some financial support.

Since then, the MOAC and IRRI had cooperated in rice research. Through the Thailand-IRRI deepwater rice program, scientists shared resources and cooperated in the selection and evaluation of deepwater rice genotypes suitable for the environments of Southeast Asia and in the development and dissemination of supporting technology.

A memorandum of understanding (MOU) between Thailand's MOAC and IRRI was signed in 1991 at IRRI during the visit of Her Royal Highness, Princess Maha Chakri Sirindhorn. It called for Thai and IRRI scientists to work together to improve deepwater rice culture and to develop new rice varieties and farming practices for farmers in Thailand and other countries in the region. Thailand accepted leadership of the deepwater rice breeding program for Southeast Asia in 1993. Through this agreement, most of IRRI's deepwater rice breeding activities were transferred to Thailand.

Small farm machinery project. The small farm machinery project funded by the United States Agency for International Development (USAID) was conducted from 1976 to 1985. A successful product of this project was the axial flow thresher. IRRI provided the basic design which was modified by Thai engineers and manufacturers. Operated by contractors as a mobile thresher, it became popular throughout Thailand with 3000-5000 units produced locally every year. In turn, Thailand sent blueprints of its axial flow water pump to IRRI where it was modified to increase efficiency. The machine became widely fabricated and distributed by manufacturers throughout Asia using blueprints provided by IRRI.

Interregional research program on methane emission. From 1993 to 1997, the MOAC was involved in a project aimed to provide technologies that mitigated methane emissions from ricefields. The project was funded by the United Nations Development Programme (UNDP) and implemented by IRRI in cooperation with the Prachinburi Rice Research Center. The immediate beneficiaries were national rice and environmental programs in Asia and international programs on global climate change. The ultimate beneficiaries, however, were the farmers in the deepwater rice ecosystem.

Through the project, acceptable soil, water, fertilizer (organic and inorganic) and crop management and breeding strategies/options for high-yielding rice cultivars were developed that allowed to mitigate methane emission from ricefields.

Other collaboration

The collaborative arrangements with the MOAC provided short-term consultancies to advise on and assist in the research program of the DOA; provided an IRRI liaison scientist for Thailand; invited Thai scientists to attend IRRI-coordinated international research symposia, conferences, and workshops; arranged for Thai scientists to undertake degree and nondegree training at IRRI; and made available seed materials and research information to support cooperative activities in Thailand.

In its MOU, the MOAC and IRRI agreed to give high priority to the following:

1. development, evaluation, and utilization of rice varieties that were semi-dwarf, early-maturing, or photoperiod-sensitive and high-yielding; with good grain quality; tolerance for drought, submergence, and salinity; and resistance to blast and other diseases and insect pests;
2. research on cultural management practices such as direct seeding and integrated weed and pest management;
3. development and evaluation of machines and engineering systems for rice production and postharvest processing as well as encouraging local industry to manufacture machines adapted to local conditions; and
4. training of rice researchers from Thailand and other Asian countries in short courses and in other specialized training programs at IRRI or in Thailand.

Thai-IRRI collaborative projects also involved several universities and agricultural research institutes in Thailand. Currently, there were more than 40 collaborative projects. Among them were the intensive research activities at Ubon and Samoeng rice research centers in Thailand, and the respective key sites of the rainfed lowland rice and upland rice research consortia, whose findings are expected to be extended to other national rice research systems.

Other projects involved genetic evaluation of rices, network studies on integrated pest management and biotechnology, and studies of soil fertility and the causes of yield decline in irrigated rice—all of which were leading to wide information sharing among countries.

Collaborative projects by ecosystem included:

- Irrigated rice ecosystem
- Hybrid rice
- Reversing trends of declining productivity in irrigated rice systems
- Integrated Pest Management (IPM) Network Rainfed lowland rice ecosystem
- Rainfed Lowland Rice Research Consortium
- Breeding for drought and blast disease resistance
- Characterizing blast fungus populations
- Breeding for submergence tolerance
- Characterization of the microenvironments for extrapolating technology in disease management
- Genotype environment interactions
- Integrated nutrient management
- Agroecological characterization of rainfed rice production
- Pest damage assessment methodology
- Genetic variability of root morphology
- Modeling approaches to analysis of yield potentials and yield gaps

Flood-prone rice ecosystem

• Breeding for flood-prone conditions
• Physiology of flood-prone rices
• Breeding and evaluation of rices for tolerance for acid soils
• Role of carbohydrates in flooding tolerance

Upland rice ecosystem

• Analysis of major causes of low, variable, and declining productivity in upland rice
• Screening for cold tolerance and blast resistance
• Cumulative responses to applied phosphorus-fixing soils
• Genetic variability of root morphology
• Upland Rice Research Consortium

Cross-ecosystems

• Tagging and pyramiding gall midge resistance genes for rice improvement
• Developing a blast management tool kit for farm and regional application
• Assessing rice research capacity in Thailand
• Characterizing the biodiversity in Chiang Mai Valley to develop sustainable pest management systems
• Marker-assisted breeding of bacterial blight-resistant rice cultivars
• Projection and policy implications of medium- and long-term rice supply and demand for Thailand
• Preservation of the biodiversity of the rice genepool
• Asian Rice Biotechnology Network
• Post harvest technologies for rice in the humid tropics
• Machinery development and testing
• Forecasting model for rice blast disease
• Sustaining biological control of rice disease in farmers' fields
• Microbial diversity of rice seeds

Among the other major programs of collaboration were the following:

Shuttle breeding program. This was a collaborative program for rainfed lowland rice breeding which started in 1982. It involved field selection of promising lines in northeastern Thailand. The Ubon Rice Research Center produced advanced breeding lines for South and Southeast Asia. Research for drought-prone rainfed lowland rice systems in Asia was conducted in Ubon, Ratchathani, under the leadership of Dr. S. Sarkarung (1991-present), a plant breeder.

Deepwater rice research program. Using Thailand as the "hub," IRRI acted as a coordinator for partners in Cambodia, Indonesia, Myanmar, and Vietnam. Thailand, with its extensive knowledge of, and experience in, deepwater rice research could help researchers improve the capacities of less experienced partner countries. In the program, Thai deepwater rice scientists selected, tested, evaluated, and distributed plant breeding materials in the region. They assisted IRRI in integrating NARS' activities on cropping systems for deepwater rice. Rice scientists from other South and Southeast Asian countries visited Thailand to observe deepwater rice materials growing in the field and assisted in selecting breeding materials for their particular programs.

The exchange of rice varieties, breeding lines, and research information and the strong collaborative research and training had resulted in the development of improved high-yielding varieties and improved rice-based farming systems for Thailand and other rice-producing countries of the world. Germplasm of Thai rices known for good grain quality were used by other countries in their breeding programs. IRRI and Thailand had developed a new type of deep-water rice for the 80-120 cm water depth capable of producing 40-50% higher yield than the varieties presently grown. Prototypes of the new plant type with deepwater survival mechanisms were being tested extensively in the field.

Methods of screening for elongation ability had been developed; and resistance to pests and tolerance for submergence, drought and acidity had been incorporated into rice varieties. Breeding materials provided to other NARS had resulted in the release of several new deepwater rice varieties in Cambodia and Myanmar.

The major objective of the collaborative breeding programs was to develop a range of deepwater rice varieties that could guarantee yields of 3-4 t/ha. Workshops involving flood-prone rice breeders of South and Southeast Asia had been held in Thailand to promote regional cooperation in the exchange of germplasm and research information.

International rice drought screening facility. Thailand and IRRI established the International Rice Drought Screening Facility, funded by the Rockefeller Foundation, at the URRC. The center provided high-quality facilities for drought screening of new rainfed rice breeding lines. The development of this facility strengthened the collaboration of Thailand and IRRI's rainfed lowland breeding programs with scientists from the Australian Centre for International Agricultural Research, University of Brisbane, Commonwealth Scientific and Industrial Research Organisation (all in Australia), Cornell University, Texas Tech University, and others in the Rockefeller Foundation's International Rice Biotechnology Program and helped them to better understand drought resistance in rice and breed more drought-resistant rainfed rice cultivars.

Through the center, human resources for soil and water resource management would be trained and equipped to conduct high-quality drought screening of rice. It was expected that the Ubon Center would represent an internationally recognized site for drought screening of new genetic materials stemming from both conventional breeding programs and from the programs now employing new rice biotechnology tools.

Rainfed Lowland Rice Research Consortium (RLRRC). The URRC, a member of the rainfed lowland rice research consortium, was working on the following research themes: (1) varietal improvement for South and Southeast Asia, (2) pathogen/pest population studies and breeding, (3) physiology and genetics of drought, (4) crop establishment and intensification, and (5) integrated nutrient management.

Upland Rice Research Consortium. Thailand had been a major partner of this consortium since its inception in 1991. The objective of the consortium was to utilize regional research capacity in South and Southeast Asia and to promote sharing of research responsibilities and results leading to increased and sustainable rice production in the uplands while maintaining and enhancing the resource base. Initially, the consortium developed research teams, research capacity, and research focus in Thailand along with India, Indonesia, the Philippines, Lao PDR, Vietnam, and Brazil.

Thailand benefited from enhanced collaboration and communication between and among the major consortium members. Under the consortium, research activities on drought, blast, weeds, and nutrients were carried out in Phrae, Samoeng, Sanpatong, and Dong Luck Muen. Drought research aimed to identify root systems conferring drought tolerance to upland rice.

Work on blast disease was progressing using techniques such as DNA fingerprinting to characterize the blast pathogen in Thai uplands and to identify major gene(s) for blast resistance in elite Thailand upland rice varieties. Studies on rice-weed competition intended to identify and exploit rice characteristics suppressive to weeds for germplasm improvement. A long-term phosphorus experiment established in 1995 contributed to a database on the dynamics of phosphorus in the uplands. The database would allow developing phosphorus decision aids adapted for economical management recommendation strategies for phosphorus in the Thai uplands.

Studies continued on nutrient by water interactions. From this research, it was hoped that nutrient management could be improved to lessen the yield-reducing effects of drought on upland rice.

Biotechnology. IRRI scientists worked with those in Kasertsart University and the National Center for Biotechnology and Genetic Engineering to map and tag the genes for rice plant resistance to gall midge, an insect pest that may have caused losses in northern and northeast Thailand. Under the Asian Rice Biotechnology Network (ARBN), shuttle activities also led to the incorporation of several bacterial blight resistance genes into Thai varieties by marker-aided selection. In due course, it was anticipated that these genetic materials would be used in the regular breeding programs of the DOA.

Exploiting biodiversity for sustainable pest management. Thai scientists from the DOA (Phrae Rice Research Center and Rice Pathology Research Group) and from Chiang Mai University had been characterizing the diversity of rice and the blast pathogen using ecological, genetic, and epidemiological tools in the Chiang Mai Valley. The aim of this research was to develop rice varieties that would have resistance genes matching those of the blast pathogen in diversity and concurrently developing strategies for such varieties using knowledge on farmers' practices and the physical environment. The approach used was to establish a "lighthouse" site in the Chiang Mai Valley, within which transects representing different habitats were sampled to characterize the biological diversity.

Developing a blast management tool kit. Cooperation between the Rice Pathology Research Group, DOA, and IRRI over the past 5 years aimed to develop a practical tool kit for blast management. An early warning system using seedling boxes containing RD23 (a susceptible rice variety) was successfully tested in several regions; a diagnostic kit based on polyclonal antibodies was tested and accepted by DOA as practical technology to confirm and detect blast in symptomless tissue; risk maps of blast-prone regions have been generated through computer modeling and geographic information system mapping; a forecasting system using weather was being refined to simplify input requirements while DNA marker techniques were being used to establish the sources of primary inoculum which initiate epidemics. Early tests with a commercial source of silicate had resulted in significant reduction in blast and increased plant growth.

Reversing trends of declining productivity in intensive irrigated rice systems. In partnership with the Pathum Thani Rice Research Center and Suphan Buri Rice Experimental Station, IRRI had been studying since 1994 the trends in productivity and soil quality for representative irrigated rice farms in the Central Plain of Thailand. The partnership was also identifying the soil properties, management practices, and socioeconomic factors that were associated with soil nutrient-supplying capacity with the aim of developing and validating strategies for site-specific nutrient management in irrigated rice systems.

Long-term fertility experiments and on-farm experiments at 25 sites hoped to produce the following outputs and products: analysis of the economic performance, soil quality, and status of nutrient use efficiency for 5 cropping seasons; production functions describing changes in productivity at the farm level; generic and location-specific abiotic and biotic determinants of soil nutrient supply identified and quantified; strategic knowledge about the sustainability of double and triple-cropping rice systems; and novel approach for site-specific nutrient management, including software for estimating soil nutrient supply and plant-based nitrogen management.

Germplasm conservation and exchange. In the early 1960s, Thai rice scientists shared their working collections of rice germplasm with colleagues at IRRI. Joint collecting missions in the 1970's and 1980's assembled more than 3000 samples of indigenous varieties.

Extensive collections of wild species were carried out jointly in the late 1980s. In the mid-1990s, a rice biodiversity project funded by the Swiss Agency for Development and Cooperation (SDC) facilitated collection activities for the remaining 10% of uncollected areas. Since the inception of that project in 1994, a total of 1462 samples of indigenous varieties and 71 samples of wild species had been collected. Joint missions would continue for the remaining uncollected areas in the southern region where considerable diversity of land races is still expected to be found.

More than 5080 accessions of cultivated rice and 538 wild rices were conserved in the International Rice Genebank at IRRI. Upon request, IRRI returned 298 accessions to the rice genebank at the Pathum Thani Rice Research Institute (PTRRI) which were no longer viable or available there. In addition, IRRI sent 161 samples of cultivated and 53 samples of wild species to Thai scientists.

Genebank facilities at PTRRI were upgraded through the SDC-funded project. Equipment provided through the project included a laser printer, vacuum cleaner, moisture tester, and glass jars. IRRI had enhanced the capabilities and skills of several Thai plant genetic resources personnel through training. IRRI continued to provide technical assistance in genebank management.

Through the INGER, the exchange of germplasm and information between international and national agricultural research institutions had been facilitated, and breeding lines evaluated in ecosystem-oriented and stress-oriented nurseries. Thailand had been an active member of INGER since 1975. More than 800 Thai cultivars and breeding lines had been tested in INGER nurseries. During the preceding 10 years, Thailand had received and tested more than 1000 nursery sets consisting of thousands of cultivars and breeding lines from other countries and IRRI. Of these, nearly 3000 had been utilized in various breeding programs in Thailand.

Emerging relationships with NGOs. IRRI had a long standing interest in seeing the results of its research efforts applied in farmers' fields. Traditionally, it had relied on government-supported agricultural research institutes and national extension agencies and government organizations to achieve this goal. However, with the growing importance and strength of non-government organizations (NGOs) interested in improving farmers' livelihoods, IRRI was looking to extend its links with these "new agents of change." Impetus for this shift in focus was provided by mounting evidence that, in many countries and for specific groups of poor farmers, NGOs were often the major providers of extension services. IRRI had began to work with the PDA, one of the largest NGOs to reach farmers in northeast Thailand with technologies that had the potential to increase the profitability of rice farming. The PDA had been actively involved in improving the lives of rural people in Thailand since 1974 through a community-based approach. While initially focused on the promotion of family planning practices, it had expanded its activities and is now developing a strong program on rural development.

In northeast Thailand, rural development was based on rice production and marketing and IRRI was eager to contribute its research-based knowledge to improving returns to rice farming in PDA's target communities.

Beginning June 1998, IRRI worked closely with PDA to explore mechanisms for more effective and efficient transfer of technological information to farmers based on the results of IRRI's research as well as the research of Thai scientists, primarily those involved in the Thai-IRRI site of the RLRRC. IRRI was convinced that this unique NGO-DOA-IRRI collaborative effort would result in significant benefits to farmers in terms of increased profitability. It also had great potential for providing direct feedback from farmers about technologies and the research agenda of national and international agricultural scientists working in northeast Thailand in particular and in rainfed conditions in general.

Training and information dissemination. Collaboration between IRRI and Thai universities generally aimed to promote research, training, and exchange of information in areas of mutual concern related to rice and rice-based farming systems. Collaboration among the various departments of the MOAC, Thai universities and IRRI had been an outstanding example of a mutually beneficial relationship. IRRI and the universities collaborated in Ph D thesis research by graduate students who had completed their coursework at the university. IRRI and Chiang Mai University, the Asian Institute of Technology, and the Kasetsart University collaborated in Ph D thesis research on disciplines related to rice and rice-based farming systems to be undertaken by graduate students.

IRRI and these institutions exchanged scientists and researchers to encourage sharing of experiences, scientific knowledge, and technological advances, and to exchange information such as copublication of thesis research. Scholars usually spend about 2 years at IRRI headquarters working under the supervision of an IRRI scientist.

Since 1992, the Rice Research Institute of Thailand and IRRI had jointly offered an international course on rice production research. This course was held annually and attracted participants from Asia, Australasia, Africa, and Europe. Instructors were primarily scientists from the DOA and Thai universities. IRRI provided logistical support, training materials development and production, and assistance in attracting participants. Other Thai institutions working in collaboration with IRRI included the PDA and other NGOs.

Numerous in-country courses were also conducted for Thai rice scientists. Examples included training on Principles of Research in Flood-prone Rice Ecosystems, Experimental Design and Data Analysis, Genotype by Environment Interaction, and Problem-based Technology Generation for Rainfed Lowland Scientists.

From 1963 to 1997, a total of 779 Thai researchers received training at IRRI through graduate degree programs and short-term courses (Table 1).

Thai-IRRI collaborative research and training workplan for 1998-2000

Key rice industry leaders of Thailand including senior officials and leading scientists from the DOA, MOAC, and IRRI met in 1998 at Central Plaza Hotel, Chatuchak, Bangkok, Thailand to discuss the new frontiers in developing the rice industry in Thailand.

The first day's session, presided by Her Royal Highness, Princess Maha Chakri Sirindhorn discussed the status, prospects, and challenges confronting the Thai rice industry with key players and concerned rice industry leaders of Thailand. The sessions on the second day reviewed the accomplishments of the current collaboration between Thailand and IRRI and addressed the challenges presented during the first day sessions. The meeting also presented new initiatives for rice research and developed the work plan of continuing collaboration for the year 1998-2000. Opportunities for new frontier projects were explored and new partners (NGOs, universities, private organizations, etc.) identified.

Table 1. Thai participants in IRRI's educational and training programs, 1963-97.

Category	Participants (no.)
Ph D degree scholars	23
MS degree scholars	71
Nondegree/on-the-job trainees	83
Short-term group trainees	602
Total	**779**

In general, the participants agreed that Thailand must meet specific challenges of increasing yields and lowering the costs of production while maintaining the excellent grain quality widely acceptable in the world market. It was also agreed to continue existing collaborations to develop technologies, particularly varieties with higher yields and that are resistant to pests and diseases, and to provide the necessary policy support and other services to further improve rice productivity and profitability in the irrigated, rainfed lowland, upland, and flood-prone rice ecosystems. The participants further agreed that Thailand would continue its regional leadership in the deepwater rice research program. It was also decided that Thailand and IRRI strengthen and improve the mechanisms for regional training, exchange of scientists, germplasm, and modern scientific tools and the sharing of information.

Finally, the DOA and IRRI, through their Directors General, had agreed that all Thai-IRRI collaborators would meet in the year 2000 to review the collaboration.

Special awards and recognition

International rice award for the King of Thailand. In June 1996, His Majesty King Bhumibol Adulyadej of Thailand graciously received the International Rice Award presented by IRRI at the Grand Palace in Bangkok. The gold medal, the first and only one to be given by the Institute, recognized His Majesty's passionate personal interest in, and devotion to, improving the well-being of rice farmers and consumers during his 50-year reign in the Royal Kingdom of Thailand. The King had contributed greatly to improving rice production and encouraging rice research throughout the Kingdom, through projects such as the multilocation testing programs for genetic evaluation of rices, network studies, integrated pest management, and biotechnology and for studies of soil fertility and the causes of the declines in irrigated rice yields. The King had produced and multiplied foundation seeds and set up a rice bank to provide storage for rice from which farmers could borrow for family consumption or for planting.

H.M. the King of Thailand recognizes IRRI under Royal Patronage. The Institute officially received Royal recognition from His Majesty King Bhumibol Adulyadej in 1997. Recognizing the work of IRRI, His Majesty the King became the Institute's Royal Patron.

The Royal Plaque, "The Great Crown of Victory", and a portrait of H.M. the King were installed inside IRRI's main administration building and a second plaque was placed in the Institute's main square. The unveiling ceremonies were witnessed by H.E. Ampol Senanarong, Privy Councillor and representative of H.M. the King, the Thai Ambassador to the Philippines, other officials from the Royal Thai Embassy in Manila, representatives of Thai communities in the Philippines, and IRRI scientists and staff.

Financial Support

In 1997, the Government of Thailand contributed US$200,000 for IRRI's projects.