# PROJECT 6

# Irrigated Rice Research Consortium

An estimated 2.2 billion Asian rice farmers and consumers depend on the productivity of irrigated rice systems for their livelihoods and/or food security. Three-quarters of all rice is produced with irrigation, making the irrigated rice agricultural ecosystem—which produces the most food to feed the most people—the most important in Asia. Despite the enormous importance of rice, however, many farmers who grow it remain poor.

The Irrigated Rice Research Consortium (IRRC) provides a framework for partnership that combines IRRI and national agricultural research and extension systems (NARES) and that facilitates and strengthens NARES research and technology delivery. The IRRC is active in nine Asian countries that grow irrigated rice and includes on its steering committee policymakers, senior scientists, and communication specialists from Bangladesh, China, India, Indonesia, Myanmar, the Philippines, and Vietnam. The IRRC also seeks partnerships with nongovernmental organizations and the private sector to identify and help implement solutions to farmers' problems.

In 2005, phase III of the IRRC began, and will continue until 2008. The IRRC is organized in workgroups composed of interdisciplinary teams of research and extension workers within each of the sites at which the consortium operates. The workgroups are based on national research priorities and specific activities designed to solve farmers' problems of production in the irrigated and favorable rainfed rice ecosystem. Each activity has high anticipated impact for the collaborating site at which it is undertaken and, most importantly, for the region. The workgroups—Productivity and Sustainability, Water Saving, Postproduction (postharvest), and Labor Productivity—are linked to an overarching Impact Workgroup, which provides farmer participatory appraisals, facilitates outreach programs, and monitors and evaluates the adoption and impact of improved technologies.

**Output: Regional and NARES-driven multidisciplinary research and extension partnerships strengthened and new technologies for irrigated rice adopted**

In 2005, the IRRC consolidated its research-extension partnerships and continued work to ensure the relevance of NARES research. Some key achievements in 2005 included the recruitment of an IRRC coordinator of Phase III (2005-08), the establishment of a new Steering Committee for Phase III, and an increase in the resources and efforts for training NARES partners. IRRI

hosted a meeting of the IRRC Steering Committee in September 2005 to review progress in 2005 and plans of workgroup activities for 2006. Substantial research activities under the IRRC workgroups have progressed in nine countries, with new research activities begun in Myanmar. In 2005, the IRRC conducted 24 workshops, presented 40 conference papers, and produced 18 scientific publications.

The new IRRC structure and NARES partnerships are now in place and poised to provide an international platform and effective mechanism, both of which will allow the research-extension partnership to promote the use of sustainable, benefit-enhancing technologies in irrigated rice-based systems.

The IRRC will take several important steps in the near future, including recruitment of a social scientist, exploration of opportunities for strengthening involvement in Lao PDR and Myanmar, and development of a communication plan, including documentation and promotion of success stories that highlight technologies positioned for impact.

The IRRC developed a framework in 2005 for integrating the most appropriate crop and resource management technologies to meet location-specific needs and opportunities among consortium partners in the major rice-growing countries of Asia. These include

- *Myanmar.* An in-country outreach program (ICOP), launched in Octo ber 2005 with the Myanma Agricul ture Service.
- *Vietnam.* Meetings held in October to discuss a Vietnam ICOP. Support is strong for scaling up site-specific nutrient management, crop establishment technologies, water man agement, and extension and training activities on rice grain-drying systems for NARES and private indus try partners.
- *China.* A national IRRC workshop was held in October 2005, with par ticipants showing strong interest in scaling up the delivery of tech nologies developed from collab orative research on nutrient and pest management.
- *Philippines.* Information on water-saving technologies was synthesized and evaluated, and a national work shop on progress and plans for aero bic rice was conducted.
- *India.* The IRRC helped scale up di rect-seeding options for farmers in the states of Uttaranchal, Uttar Pradesh, and Bihar.

We have made strong progress toward placing NARES and industry partners in position to scale up the delivery of technologies in China, Myanmar, the Philippines, and Vietnam.

In several countries in 2005, the Postproduction Workgroup evaluated a cheaply produced moisture meter and simple grain quality kit, and began a study of the effect of hermetically sealed bags (the "superbag" developed at IRRI) and other hermetically sealed systems on grain and seed quality. We continued to compile and analyze data on the monthly market prices of milled grain in different regions of several countries and we evaluated rice mills in Indonesia and Vietnam. In Vietnam, we oversaw the adaptation of a rice hull furnace with improved feeding for use with commercial rice dryers and we trained staff from Nong Lam University and

researchers from Bac Lieu Province on laser leveling.

The Productivity and Sustainability Workgroup further established research and local extension partnerships in several countries, including a crop residue management project in China and a study of potassium needs for high yield in the rice-wheat belt of northern India. Site-specific nutrient management underwent further promotion in China, Myanmar, the Philippines, and Vietnam. We established an active partnership with the Center for Chinese Agricultural Policy for farmer participatory and policy research and with China Agricultural University in other national initiatives. In Indonesia, the IRRC provided about 40,000 new four-panel leaf color charts (used by farmers to easily determine the nitrogen needs of their rice plants) for distribution and, at a June 2005 workshop, built consensus on nutrient management and research, and private sector and extension partnerships. Leaf color charts were also provided for distribution by NARES in Myanmar, the Philippines, and Vietnam. In central Vietnam, we completed two seasons of farmer participatory research in 2005, determining that yields could be increased by 0.5 ton per hectare or more with the addition of zinc to sandy loam soil, and that potassium and phosphorus deficiencies existed across different soil types. In northern Vietnam, the IRRC collaborated with the Danish International Development Agency to establish training of trainers and farmer field schools in integrated nutrient management.

The Water Saving Workgroup synthesized and evaluated information on water-saving technologies, ultimately contributing to the *Comprehensive Assessment of Water Management in Agriculture* (see Project 5). In the 2005 wet and dry seasons, experiments were conducted at four locations in the Philippines on water-saving technologies with emphasis on aerobic rice. Also in the Philippines, we conducted an ongoing assessment of farmers' adoption of alternate wetting and drying (dry season) and aerobic rice (wet season) in Central Luzon, and developed water-saving extension materials (posters, leaflets, brochures, and a flip chart) in both English and Tagalog. These were distributed to NARES partners, extension workers, and farmers. In China, we conducted water-saving experiments with emphasis on aerobic rice.

The Labor Productivity Workgroup tested direct-seeding options and compiled information for decision frameworks for crop establishment and weed management in Bangladesh and India. Sources of information availability for Bangladeshi and Indian rice farmers are being assessed and information gaps identified. In India, Indonesia, and the Philippines, we analyzed shifts in weed species as influenced by different weed management practices. In 2005, research began in Indonesia on yield losses due to weeds and management options in southern Sumatra. In Myanmar, we developed a poster for weed identification. In Malaysia, information was drafted for a publication on "weedy rice" and we began evaluating integrated weed control measures for weedy rice. The distribution of weedy rice infestation in China's Liaoning and Jilin provinces was determined in an initial survey and we evaluated integrated weed control measures in Zhejiang Province. Studies on the distribution of the weed Cyperus rotundus and its adaptation to lowland rice in the Philippines were undertaken with the University of the Philippines Los Baños.

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Program 3

# Improving productivity and livelihood for fragile environments

Rice farmers working in environments that are unfavorable for high levels of production—infertile uplands, rainfed lowlands subject to frequent droughts and submergence, and deepwater and coastal areas that suffer from flooding, strong winds, salinity, and other soil-related problems—suffer from low farm income and high incidence of poverty. Further, more than 700 million of Asia's poor depend on rice grown in these environments, receiving 50–80% of their calories from cereal alone. As well as accounting for more than half of the land used to grow rice, fragile ecosystems are home to the majority of Asia's rural poor.

Farmers in these fragile ecosystems tend to be resource-poor and, given the environmental perils they face, unwilling to invest adequately in inputs such as fertilizer. The resultant yields they achieve are thus low, averaging less than 2 tons per hectare compared with more than 5.5 tons per hectare in favorable irrigated lowlands. But, if farmers are to adopt them, new, higher-yielding varieties—which must be tolerant of drought, submergence, and problem soils—must also be comparable in quality with traditional varieties if farmers are to adopt them. Such varieties, along with appropriate and efficient crop management practices, will help reduce the risk in rice cultivation that contributes to socioeconomic inequity and will help increase both yield and farm income.

Recent advances in molecular biology for tagging and characterizing genes and their transfer to other species have increased the chance of successfully developing high-yielding rice varieties suitable for unfavorable ecosystems. The diverse nature and wide geographical spread of these environments make it essential that this research be carried out in partnership with national agricultural research and extension systems (NARES) and draw on local scientific expertise and farmers' indigenous knowledge. IRRI coordinates the Consortium for Unfavorable Rice Environments (CURE, Project 9) to develop and implement the research agenda to tackle problems in unfavorable rice environments. The consortium emphasizes the development and delivery of technologies and knowledge to farmers, and works with them to adapt these technologies to specific needs, conditions, and livelihood strategies.

The research and related activities are grouped into three projects, on genetic enhancement, natural resource management, and the activities of CURE. Project 8, which focuses on natural resource management, now also incorporates the former Project 11: *Enhancing ecological sustainability and improving livelihoods through ecoregional approaches to integrated natural resource management*, which aims to improve rural livelihoods by enhancing the sustainability of supporting ecosystems.

## PROJECT 7

# Genetic enhancement for improving productivity and human health in fragile environments

Improving rice production in unfavorable cropping areas that rely on rainfall can lead to important gains in food security, human nutrition, poverty reduction, and environmental protection. Most modern rice varieties developed for irrigated systems in more favorable environments tend to perform poorly under rainfed conditions, resulting in low and unstable yields and poor profitability. For these reasons, it is crucial that we develop rice varieties that are tailored for unfavorable ecosystems. Such varieties should combine high and stable yields and consumer-preferred grain type with traits such as enhanced seedling vigor; greater resistance to drought stress through improved tolerance, avoidance, or escape; heightened tolerance of submergence; improved ability to grow in soils that have toxic levels of salt, iron, or aluminum or are deficient in phosphorus or zinc; and strengthened resistance to pests and diseases, especially the blast fungus. Development of these types of varieties is the goal of Project 7.

Although improved, more reliable yields will offer more calories, there is also potential to improve the