and hand weeding, which were done exclusively by female family members, women had to take on tasks formerly done by men, such as cleaning dikes, irrigating fields, applying chemical fertilizers, and hauling and packing paddy. Women have also assumed managerial roles (including supervision of hired laborers) and their decision-making authority in rice production (such as choosing which varieties to plant) has also increased. We identified appropriate and available strategies and technologies to help solve the labor constraints of female-headed households. These include short-duration rice varieties that can escape drought and floods, can enable farmers to grow nonrice crops after rice, and reduce weed infestation; direct seeding using plastic drum seeders to reduce drudgery and labor costs of transplanting and weeding; mechanical implements for row seeding; the use of leaf color charts for proper timing of N application; and water-conserving techniques such as mulching. Improved nursery management and crop establishment strategies—such as seedling age, spacing and timing of transplanting in the dry season, and use of *Sesbania* green manure and pressmud to restore soil health in sodic soil areas—are also important options.

Project leader

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9

PROJECT 9

Consortium for Unfavorable Rice Environments (CURE)

Low and unstable yields are a feature of rice farming in rainfed unfavorable environments, which are also characterized by poverty and high population density in both rural and urban areas. Difficult conditions and heavy reliance on unpredictable rains have meant that, in the past, farmers continued to grow mostly traditional varieties or used few inputs when they adopted modern varieties. Hence, productivity gains have been incremental and small. It is essential, if we are to meet the challenge posed by unfavorable ecosystems, to develop a well-structured strategic research approach to address key constraints. The Consortium for Unfavorable Rice Environments (CURE) offers a strong framework within which researchers, extension workers, policymakers, and farmers can tackle key problems.

Increasing and stabilizing rice productivity in unfavorable rice environments will help reduce risk in rice cultivation for risk-averse subsistence farmers, and improve household food security and livelihood without harming the environment or depleting the available natural resources. Throughout the highly diverse unfavorable environments, our strategy involves on-site work with our partners in the national agricultural research and extension systems (NARES) and a multidisciplinary approach to technology development and dissemination.

CURE fosters cooperation in research and development between

NARES and IRRI, who jointly identify strategic problems through collaborative research at NARES sites. CURE was created in 2002 following the restructuring and consolidation of the Rainfed Lowland Rice Research Consortium and the Upland Rice Research Consortium into a single entity. NARES membership in the consortium involves 10 countries: Bangladesh, Cambodia, India, Indonesia, Lao PDR, Myanmar, Nepal, the Philippines, Thailand, and Vietnam. The research activities are described in projects 7 and 8.

Working groups' progress

The fourth annual meeting of the CURE Steering Committee, held on Lombok Island, Indonesia, on 24-27 May 2005, reviewed progress reports given by its six working groups. The Steering Committee appraised working groups' progress, approved 2005 work plans, and made strategic decisions regarding future research in rainfed ecosystems. The required technical reports detailing the progress of CURE's six working groups concerning rainfed ecosystems at the nine key sites in six countries were given in the 2004 year-end and 2005 mid-year reports submitted to the Asian Development Bank on 1 February 2005 and 8 August 2005.

Drought-prone lowlands. CURE research confirmed that Thai fragrant rice variety KDML105 and its derivatives are highly tolerant of late-season drought. This is a rare documented confirmation of a highly drought-tolerant genotype adapted to the environment.

Submergence-prone lowlands. The Sub1 gene associated with submergence tolerance has been incorporated in to the popular variety Swarna for further testing on-station and on-farm (see projects 2 and 7). This advance has significantly shortened the breeding cycle from the normal 6–10 years to just 2 years.

Salt-affected environments. Scientists tested nursery and crop establishment methods that make seedlings more able to withstand the stresses of saline environments. These treatments have resulted in more vigorous seedlings that produced a higher grain yield at harvest.

Shifting rotational upland systems. Promising rice varieties for upland conditions have been identified through participatory varietal selection trials and seeds are being multiplied for distribution to farmers. These include varieties for short fallows and for intensively cropped rice-based upland systems.

Drought-prone plateau uplands. Central Rainfed Upland Rice Research Station (India) scientists received IRRISTAT (a computer program for data management and basic statistical analysis of experimental data) training at IRRI's Philippine headquarters. The training advanced participants' skills in interpreting data, selecting stable genotypes, identifying technological components across locations, and formulating a future work plan.

Intensive uplands with long growing season. Seed mixtures were shown to be more effective than row interplanting practices for reducing yield loss from disease in the endemic neck blast area of Lampung, Indonesia.

Special workshop

During its fourth annual meeting, CURE held a special workshop, *Progress in crop improvement research since 1991*, which reviewed crop improvement strategies of NARES partners and documented progress made over the past two decades. Thirteen scientists from six countries presented papers on progress in rice breeding for rainfed ecosystems in drought-prone, deepwater/*boro* (dry season), submergence-prone, tidal wetlands/problem soils, and upland areas of South and Southeast Asia and China, and identified future breeding strategies and priorities for CURE.

Project leader

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