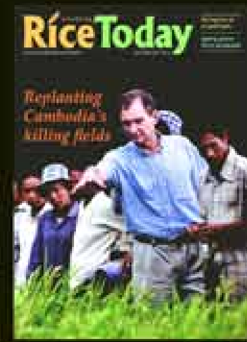
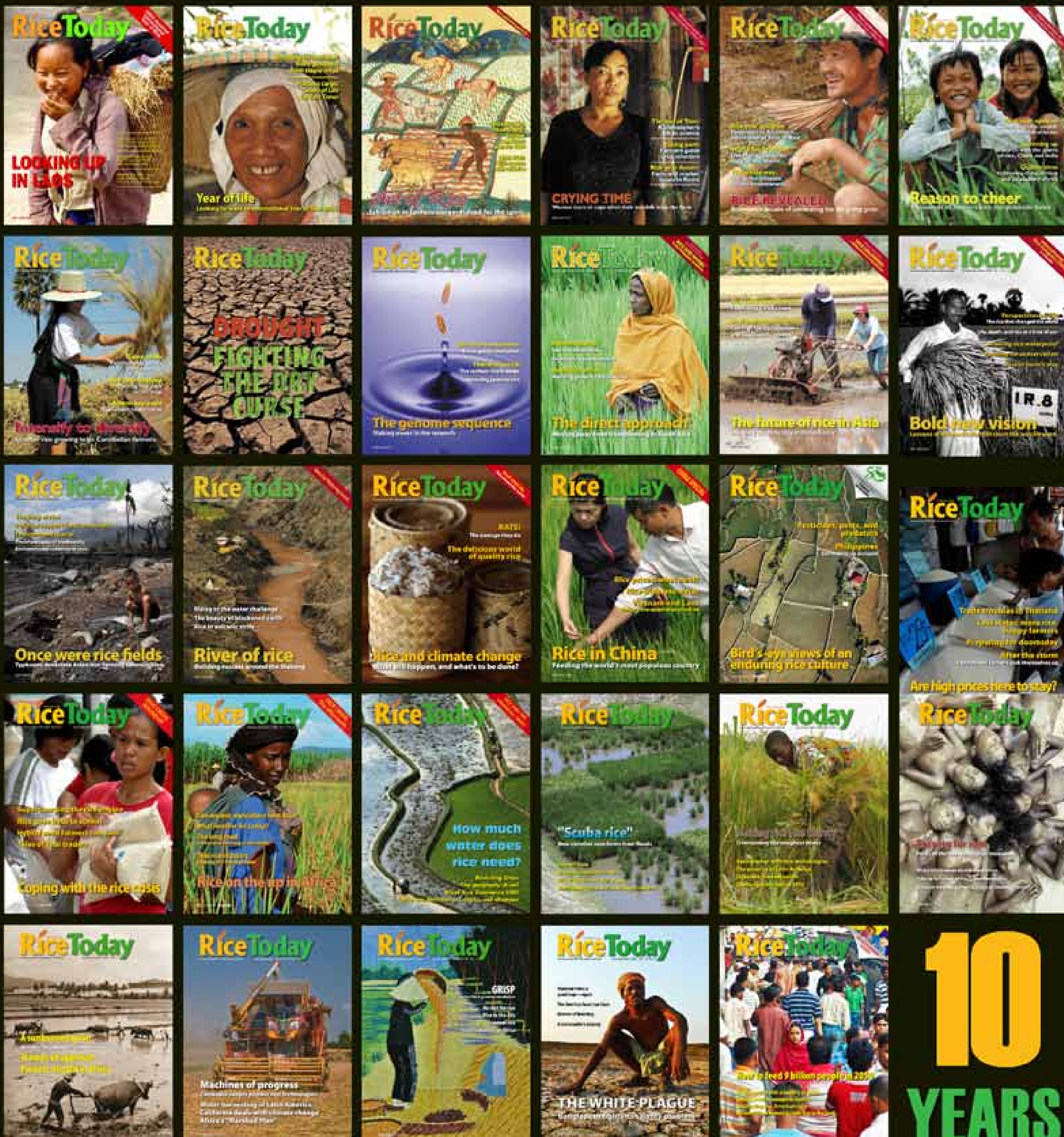
Rice Today

www.irri.org

International Rice Research Institute

January-March 2012, Vol. 11, No. 1



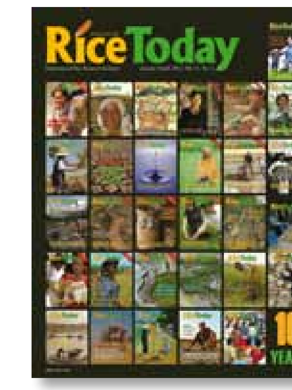


10 YEARS

ISSN 1655-5422

contents

RiceToday Vol. 11, No. 1



Covers within a cover. We are proud that we have made it to 10 years of *Rice Today* magazine and it's all because of our loyal readers like you. To celebrate this historic moment, we created a collage of covers representing a decade of storytelling about everything and anything related to rice. And, from here, as the new banner publication of the Global Rice Science Partnership, we will feature even more articles from various rice research institutes and private organizations and from all corners of the Earth.

Rice Today is published by The Rice Trader Inc. (TRT) in association with the International Rice Research Institute (IRRI).

TRT, for 22 years, has brought subscribers crucial, up-to-the-minute information on rice trade through its weekly publication, *The Rice Trader*. Acknowledged as the only source of confidential information about the rice market, this weekly summary of market data analysis has helped both the leading commercial rice companies and regional government officials make informed decisions, which are critical in today's market.

IRRI is the world's leading international rice research and training center. Based in the Philippines and with offices located in major rice-growing countries, IRRI is an autonomous, nonprofit institution focused on improving the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes, while preserving natural resources. It is one of the 15 nonprofit international research centers supported, in part, by members of the Consultative Group on International Agricultural Research (CGIAR – www.cgiar.org) and a range of other funding agencies.

Responsibility for this publication rests with TRT and IRRI. Designations used in this publication should not be construed as expressing TRT or IRRI policy or opinion on the legal status of any country, territory, city, or area, or its authorities, or the delimitation of its frontiers or boundaries.

Rice Today welcomes comments and suggestions from readers. *Rice Today* assumes no responsibility for loss of or damage to unsolicited submissions, which should be accompanied by sufficient return postage.

The opinions expressed by columnists in *Rice Today* do not necessarily reflect the views of TRT or IRRI.

The Rice Trader Inc.
2707 Notre Dame Blvd., Chico, CA 95928
Web: www.thericetrader.com

International Rice Research Institute
DAPO Box 7777, Metro Manila, Philippines
Web (IRRI): www.irri.org; www.irri.org/ricetoday
Web (Library): http://ricelib.irri.cgiar.org
Web (Rice Knowledge Bank): www.knowledgebank.irri.org

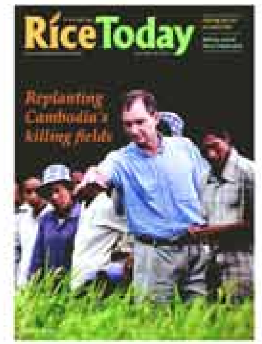
Rice Today editorial
telephone: (+63-2) 580-5600 or (+63-2) 844-3351 to 53, ext 2725; fax: (+63-2) 580-5699 or (+63-2) 845-0606; email: mia.aureus@thericetrader.com, l.reyes@cgiar.org

cover **Juan Lazaro IV**

publisher **Jeremy Zwinger**
associate publisher **Sophie Clayton**
managing editor **V. Subramanian**
editors **Lanie Reyes, Aileen Macalintal**
contributing writers **Gene Hettel, Samarendu Mohanty, Andrew Nelson, Alaric Santiaguel, Lovely Merlicel Quipot, Ma. Lizbeth Baroña, Paula Bianca Ferrer**
Africa editor **Savitri Mohapatra (AfricaRice)**
copy editor **Bill Hardy**
art director **Juan Lazaro IV**
designer and production supervisor **Grant Leceta**
photo editors **Chris Quintana, Isagani Serrano**
circulation **Lourdes Columbres**
Web master **Darell Sison, Alaric Francis Santiaguel**
printer **DHL Global Mail (Singapore) Pte. Ltd.**

RiceToday

A decade of rice storytelling



A popular magazine about rice? Hmmm ... What will you write about after the first issue? That's what I'm told one skeptic asked back in 2001 when IRRI was contemplating the development of a popular magazine devoted solely to rice. Indeed, when IRRI management decided to proceed with the experiment with the first issue of *Rice Today* in April 2002, some apprehension was evident about having enough editorial content to put between the covers on a regular basis.

However, as our award-winning *Rice Today* magazine celebrates its 10th anniversary in 2012, one only has to view this issue's *cover of covers* to see that rice is a multifaceted and vital topic about which interesting and spellbinding news and feature stories can be written. This is true even for a quarterly format in which any single issue now has no less than 48 pages—and sometimes more!

Leafing through the 34 issues published over the last decade, I'm amazed by the diversity of subjects that our legion of writers have covered from all corners of the rice world. Indulge me for a moment as I list just a smattering of some of my favorites:

- Replanting Cambodia's killing fields (2002)
- Sowing peace in South Asia with rice-wheat (2002)
- Interplanting dresses Chinese fields in pinstripes (2003)
- Precious cargo: Seeds of life for East Timor (2003)
- The art of rice: Food for the spirit (2004)
- Crying time: Women learn to cope when their menfolk leave the farm (2004)
- Drought—fighting the dry curse (2005)
- The genome sequence: Making waves in research (2006)
- The direct approach: Moving away from transplanting in South Asia (2006)
- Rice trade liberalization: Examining a tricky issue (2006)
- IR8: The rice that changed the world (2006)
- Rice and climate change: What's to be done? (2007)
- Vietnam and Laos: Making the uplands productive (2007)
- Bird's-eye view of the enduring Ifugao rice culture (2008)
- Coping with the rice crisis (2008)
- IRRI Pioneer Interviews (2008-10)
- How much water does rice need? (2009)
- Scuba rice: New varieties save farms from floods (2009)
- Uganda's rice revolution (2009)
- Praying for rain: Perils of the delayed monsoon (2009)
- Why cold-tolerant rice is needed (2010)
- Pockets of gold in Africa (2010)
- Water harvesting in Latin America (2010)
- Rice in the city (2011)
- The Americas have two faces (2011)
- How to feed 9 billion people in 2050 (2011)

The current issue continues in this fine tradition of storytelling with features about rice in Japan beyond 3.11 (page 20), Ethiopia's millennium crop (page 26), the plight of the rice birds (page 38), and many more.

Of course, rice and the activities that surround it are quite photogenic. We have exploited this aspect since our April 2006 issue with our breathtaking centerfolds. I look forward to this two-page spread in each issue. See the current one on pages 24-25 featuring traditional threshing of rice in Ethiopia using the hooves of trampling oxen.

I also look forward to what have become regular features in each issue in recent years: a two-page map spread (this issue shows rice cropping patterns in Bangladesh on pages 28 and 29) and mouth-watering rice recipes from members of the IRRI community (this issue features soft-centered chocolate pudding using rice flour on page 42).

Since our April 2002 issue, the magazine has grown in distribution and reputation. It has carved out important niches in the publishing world—in traditional hardcopy, on the Web (now upgraded at www.irri.org/ricetoday), and through an email version (sign up by sending a message to info_ricetoday@irri.org). The magazine is now being distributed electronically to 13,000 subscribers including consumers, donors, and partners.

The Rice Trader (TRT), as publisher, and IRRI have now been successfully producing the magazine together for nearly 3 years. This unique partnership has opened up more advertising opportunities to help support the magazine and provide information about private-sector products and services.

In our next issue, we will be announcing the members of an Editorial Board for the magazine, which will reflect the makeup of the Global Rice Science Partnership (GRiSP), the first research program of the new CGIAR (Consultative Group on International Agricultural Research). The diverse mix of persons on the Editorial Board should bring in a plethora of new ideas and keep us abreast of the latest innovations and achievements of the men and women in rice science and trade in Asia, Africa, and the Americas.

Yes, as *Rice Today* enters its second decade, the future looks bright. The printed, Web, and e-*Rice Today* versions of the magazine continue to evolve into a global media presence and resource in an ever-changing world. The production team needs and wants your feedback and ideas. Let the team know what you think! I do regularly.

Robert S. Zeigler
IRRI Director General

10 YEARS

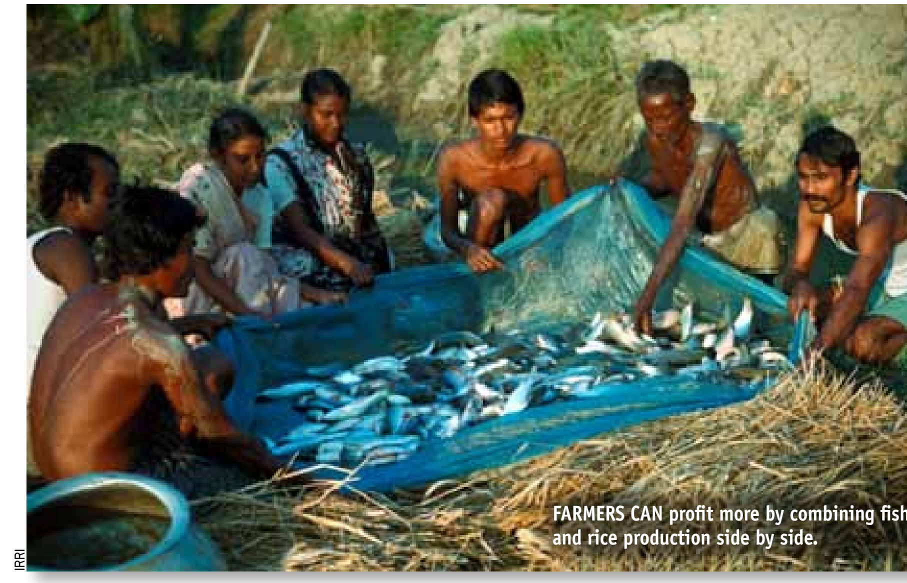
News

Fish and rice flourish together

A traditional farming technique that cultivates rice and fish side by side could help small farmers earn more money from their crops and reduce the impact on the environment, according to a study.

When fish were introduced into flooded paddy fields, farmers were able to grow the same amount of grain as in conventional rice monoculture, but with two-thirds less pesticide and a quarter less fertilizer, according to a 6-year study conducted in China.

This rice-fish co-culture could lessen the environmental impact of agricultural chemicals and help make rice farming more profitable, said the study published in the *Proceedings of the National Academy of Sciences*, USA.



IRRI

FARMERS CAN profit more by combining fish and rice production side by side.

"In areas where land and water are limited for developing both rice and fish production, it is important to conduct rice-fish co-culture," said Dr. Xin Chen, lead author of the study and professor at Zhejiang University in China. She added that the technique should be combined with modern techniques such as irrigation and the use of machinery.

Dr. Zainul Abedin, a farming systems specialist at the International Rice Research Institute in Bangladesh, explained that the practice can generate twice as much income compared with growing just rice.

Source: www.scidev.net

Green: the new color of rice

Rice consumers worldwide can now look forward to eating "green" rice with the launch of an initiative that will set environmentally sustainable and socially responsible standards on rice production management.

The "Sustainable Rice Platform" will elevate rice production to a new level by helping farmers—whether subsistence or market-focused—boost their rice production, keep the environment healthy, facilitate safer working conditions, and generate higher incomes to overcome poverty and improve food security.

The Sustainable Rice Platform will set sustainability targets, develop and promote regional and global standards of best practices for rice production, and support rice farmers to adopt these practices. It will also identify criteria to assess how well the sustainability targets are being met and whether farmers are implementing the practices.

"For example, we will harness our know-how to set standards to better manage insect pests in rice to reduce the unsafe and ineffective use of pesticides, which can damage the environment and the health of farmers," said Dr. Bas Bouman, who will lead the work at the International Rice Research Institute (IRRI)—one of the project partners.

"We can also develop and promote the use of specialized field calculators to determine the environmental footprint of water, carbon, greenhouse gas emissions, or chemical use," he added.

ISAGANI SERRANO

"GREEN" RICE is the target of the new Sustainable Rice Platform that will develop environmentally friendly and socially responsible standards for rice production.

"There are many different sustainable technologies and practices for rice—the world's most important food crop that feeds half the planet," said Mr. James Lomax, from the United Nations Environment Programme (UNEP) that initiated the Sustainable Rice Platform.

"The trouble is, we need a way to deliver and upscale these practices," he added.

The Sustainable Rice Platform initiative was launched on 30 November 2011 at IRRI headquarters in the presence of representatives from IRRI, UNEP, Kellogg Company, Louis Dreyfus Commodities and other companies, and national government agencies from Thailand, Indonesia, Myanmar, Vietnam, Malaysia, and the Philippines.

African PhD students receive Global Rice Science Scholarships

Nine PhD students from Africa have been granted 2011 Global Rice Science Scholarships (GRiSS). They represent one-third of the total number of successful GRiSS candidates selected from around the world through a highly competitive process.

GRiSS was launched in 2011 under the CGIAR Research Program "Global Rice Science Partnership (GRiSP)." The scholarship offers young agricultural scientists the opportunity to be experts in a scientific discipline relating to rice and to have a broader understanding of the global issues that affect rice science for development.

"These young students will be part of the new generation of rice scientists who will strengthen Africa's research capacity," said Papa Abdoulaye Seck, director general, Africa Rice Center (AfricaRice). AfricaRice, one of the architects of GRiSP, leads its activities in Africa.

These awardees from Africa will conduct their doctoral research under the joint supervision of AfricaRice scientists and their respective universities. Representing diverse agricultural disciplines, their thesis topics cover agronomy, plant pathology, entomology, soil and water science, plant breeding, and social science.

Reacting to the news of their selection, the first batch of awardees, who have begun discussing issues related to their research topic with their respective supervisors, expressed their delight and sense of pride.

"It is very encouraging to receive an international scholarship like GRiSS that will allow me to fulfill my dream of becoming an entomologist and teaching in our university," said Carline Santos from Benin, one of the two women awardees in 2011.

Alexander Nimo Wiredu from Ghana and Abibou Niang from Senegal remarked that they felt honored because GRiSS aims to produce world-class scholars.

Mr. Wiredu will investigate the impact of fertilizer subsidy on farm-level rice productivity and food security in northern Ghana, while Mr. Niang will study the factors behind rice yield differences among farmers in selected countries of West Africa, among other things.

Underlining the desperate lack of trained capacity in rice research and development on the continent, Dr. Seck said, "Skills are lacking in all major disciplines relating to rice science, from plant breeding to policy research. This threatens to impede the progress in developing Africa's rice sector."

"Currently, 60–70 graduate students from both African and non-African countries are supervised by AfricaRice researchers across the continent and we hope to increase this number gradually," stated Dr. Marco Wopereis, AfricaRice deputy director general and director of research for development.

R. RAMAN, AFRICARICE (2)

TOP PHOTO: (*Left to right*) GRiSS scholars Omar Ndaw Faye from Senegal and Jasper Mwesigwa Batureine from Uganda visited AfricaRice to discuss their research topics.

CARLINE SANTOS from Benin is one of the two African women who received a GRiSS scholarship.

The AMAF supports GRiSP

The ASEAN Ministers on Agriculture and Forestry (AMAF) voiced their support for the Global Rice Science Partnership (GRiSP) during the 33rd AMAF Meeting, which was held in Jakarta on 6 October 2011 and chaired by H.E. Dr. Suswono, minister of agriculture, Indonesia.

The ministers backed the GRiSP initiative to accelerate rice productivity and production in the region. To overcome the food security crisis that is driven by the challenges of higher food prices, climate change, and bioenergy, strong and close collaboration should be further promoted, according to AMAF's final report.

AMAF directed its senior officials and permanent secretaries to work closely in formulating an appropriate model of cooperation.

The ministers also acknowledged that GRiSP, which is led by the International Rice Research Institute, represents an important expansion and development of 2008's ASEAN Rice Action Plan, as well as the proposal on pilot testing of the ASEAN Rice Trade Forum to be carried out under the Asian Development Bank (ADB) Technical Assistance on food security.

Source: www.aseansec.org/26674.htm

AfricaRice agronomist wins award

Dr. Jonne Rodenburg, from Africa Rice Center, has won the 2011 Japan International Award for Young Agricultural Researchers for spearheading the development of integrated weed management strategies for resource-poor rice farmers in sub-Saharan Africa.

He identified ways to build resistance against parasitic weeds, a number of existing highly resistant and tolerant varieties, and varieties with good weed competitiveness.

Source: www.starafrica.com

Stop insecticide abuse, says IRRI

Vietnam's rice industry leaders advanced a "greener game plan" against brown planthoppers (BPH) in a conference on 16 December 2011.

BPH, unarguably one of the rice farmer's worst fears, not only causes rice plants to wilt and die but also transmits three diseases that stunt rice plants and prevent grain formation.

"We need to seriously rethink our current pest management strategies so we don't just cope with current outbreaks, but prevent and manage them effectively in the long run," said Bas Bouman, head of the Crop and Environmental Sciences Division at the International Rice Research Institute (IRRI) and leader of the Global Rice Science Partnership (GRiSP) program on sustainable production systems.

"At the conference, we engaged policymakers, agricultural scientists, researchers, extension workers, and the private sector that have a direct stake in Vietnam's agricultural industry and can make a positive contribution to a long-term planthopper management strategy," said Dr. Bouman.

Vice Minister Bui Ba Bong of the Ministry of Agriculture and Rural Development (MARD) in Vietnam also expressed the need to manage pesticide distribution and marketing.

At least 32 participants were from China, Indonesia, Laos, Cambodia, Thailand, Vietnam, Singapore, Germany, the Philippines, Malaysia, and Myanmar. Representatives from the Asian Development Bank, Food and Agriculture Organization, and Bayer were also present.

SYLVIA VILLAREAL

IRRI DIRECTOR General Robert Zeigler (*third from right*) stresses the need for a "regulatory mechanism" to control pesticides during a panel discussion with experts from various sectors.

(*From left*) IRRI Senior Scientist Bas Bouman, Professional Translator Quang Huy, PPD Vice Director General Nguyen Huu Huan, FAO Plant Protection Chief Peter Kenmore, Universitas Indonesia Professor Yunita Winarto, Robert Zeigler, CropLife International Manager Keith Jones, and ICAMA Director Wenjun Zhang.

Thailand helps flood-affected farmers

Thailand's Agriculture Ministry has outlined a rehabilitation plan to help flood-affected farmers. The plan includes compensation for rice farmers of 2,222 baht per rai (US$71 per 1,600 m^2).

Apichart Jongskul, secretary-general of the Office of Agricultural Economics, said 1.76 million hectares of rice and crop fields had been affected from Thailand's worst floods since 1942. The disaster has affected 1.13 million farmers.

Source: www.bangkokpost.com

Burundi releases two new rice varieties

Two newly-released varieties, IR77713 and IR79511, are expected to boost food production and meet the rapidly growing demand for rice in Burundi.

Farmers and agricultural stakeholders in Burundi chose the two rice varieties (IR77713 and IR79511) bred by the International Rice Research Institute (IRRI) over the country's locally grown varieties—V14, V18, Watt, and Rukaramu—because they produce more rice and taste and look better.

The new varieties easily gained favor because they are high-yielding and early-maturing. They yield up to 7 tons per hectare, which is 1–1.5 tons more than the locally grown varieties, and they mature 2–3 weeks earlier.

The farmers also ranked IR77713 and IR79511 highest in grain quality of unmilled, milled, and cooked rice. In addition, a sensory test revealed that farmers find IRRI's new varieties tasty.

The new varieties are suitable to be planted in lowland areas of the country (800–900 meters above sea level).


FARMERS WHO participated in the PVS chose IR77713 and IR79511 as the best-looking white rice varieties.

IR77713 and IR79511 bested other varieties as farmers vote in participatory varietal selection (PVS) in Burundi.


IRRI-BURUNDI OFFICE (2)

SELECTED TRAINING COURSES AT IRRI

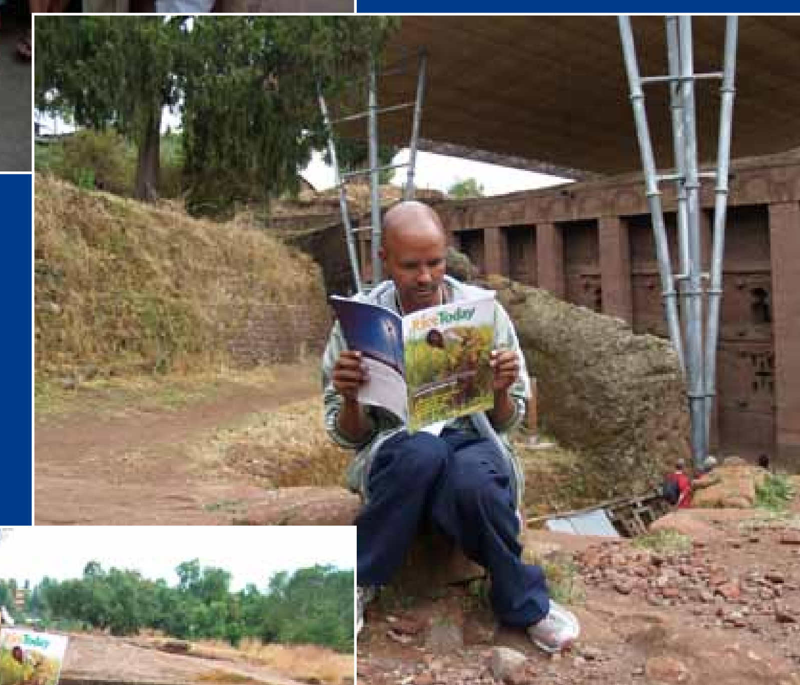
Course	Date	Target participants
SNP Data Analysis	23-27 April	IRRI researchers and scholars
Rice: Research to Production	14 May-1 June	Young scientists (21–35 years old)
Rice Breeding Course	7-22 August	Breeders, agronomists, and research managers
Basic Scientific Writing Workshop	22-26 October	Scientists and researchers

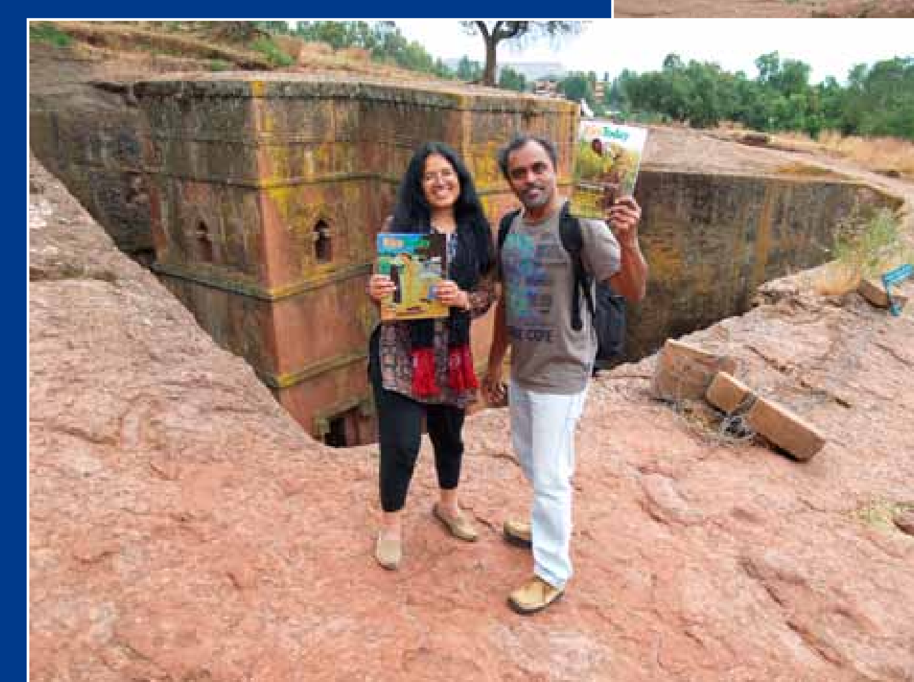
For the complete list and information about the 2012 IRRI Training Courses, visit http://snipurl.com/training_courses_2012.

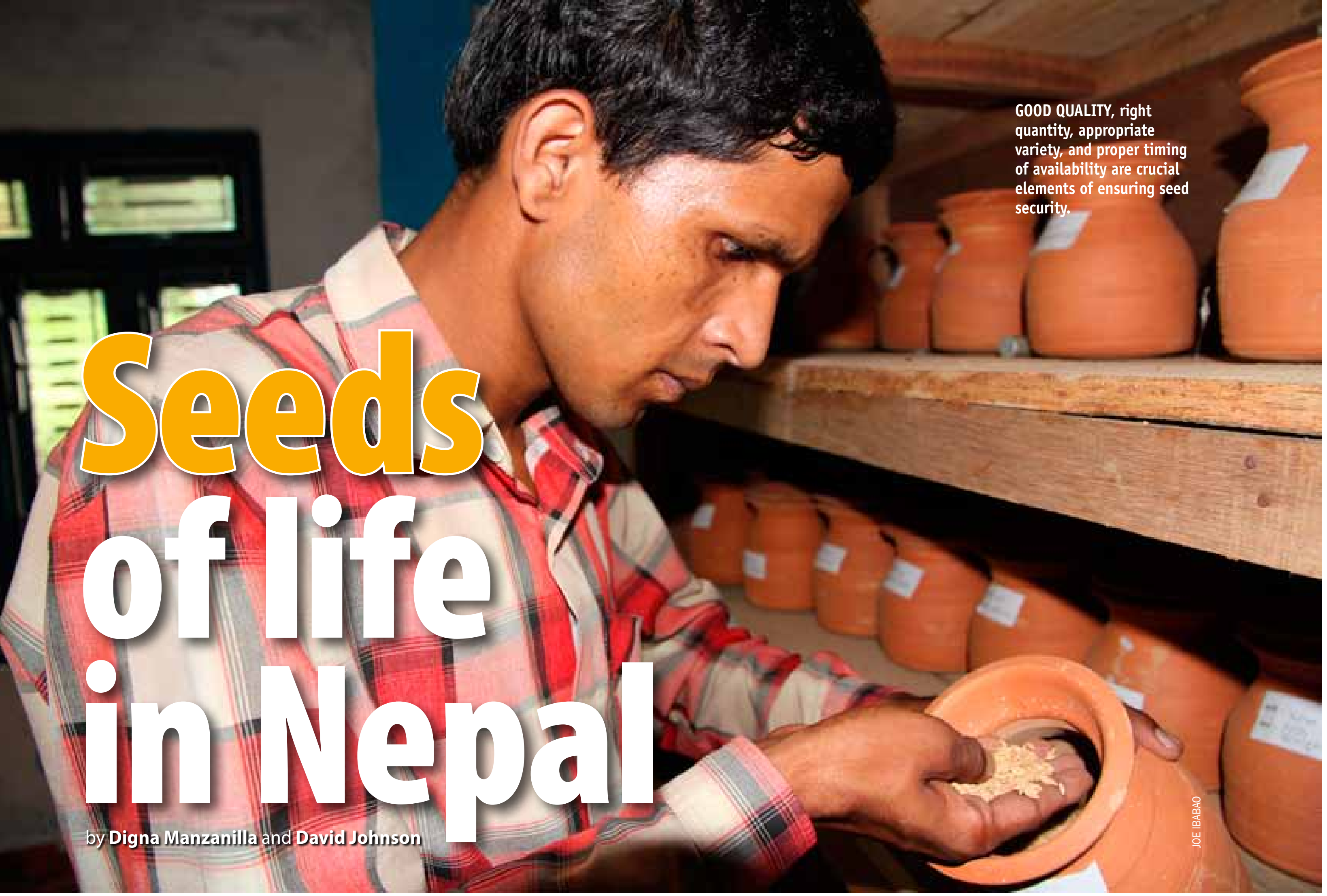
For inquiries, email IRRITraining@cgiar.org, call (63-2) 580-5600 loc 2538/2824/ 2437/2324, or send a fax to (63-2) 580-5699, 891-1292, 845-0606.

Rice Today around the world


RICE AND CHOCOLATES. IRRI secretaries posed with *Rice Today* when they visited the renowned Chocolate Hills of Bohol during the Philippine Association of Secretaries Annual Convention in Tagbilaran City. (*Left to right*) Charisse Piadozo, Lucy Gamel, Zeny Federico, Marlyn Belen, Badet Avance, Minnie Bandian, Lou Herrero, Vangie Gonzales, and Perlie Malabayabas.


ROCK-HEWN. Tour guide Moges Abebe is reading a *Rice Today* magazine near Bet Medhane Alem Church, believed to be the largest monolithic church in the world, in Lalibela, Unesco World Heritage Site, Ethiopia. Lalibela is known around the world for its churches carved from the living rock, which play an important part in the history of rock-cut architecture.


CHURCH RAIDER. AfricaRice communication specialist Savitri Mohapatra and multimedia specialist R. Raman pose and smile with *Rice Today* in front of St. George Church, one of the 11 monolithic churches in Lalibela, Ethiopia. The churches were carved from rock in the early 13th century and have been dubbed an "Eighth Wonder of the World."



GOOD QUALITY, right quantity, appropriate variety, and proper timing of availability are crucial elements of ensuring seed security.

JOE IBABAO

Seeds of life in Nepal

by Digna Manzanilla and David Johnson

Farmers in Nepal are producing enough quality seeds to ensure good harvests and sufficient food on the table

Laxima Adhikari, a farmer in Nepal, used to suffer from an unstable supply of seeds, especially when drought affected her crops. Now, she boasts of bountiful harvests from rice and vegetable crops grown during the winter season. What caused this transformation?

In Nepal, more than 70% of the population depends on rice for livelihood. Half of the cultivated areas are planted with rice, which is grown on 1.48 million hectares, 27% of which are in midhills and mountains, and the rest are in foothills and plains (*terai*).

Although rice is a staple food, the supply of good seeds is limited. The country needs almost 80,000 tons of seed annually but only 9% is supplied by private seed companies and national agencies[1] and these seeds are usually from the farmers' produce. Farmers therefore risk poor harvests because of low-quality seeds, often combined with a lack of inputs and inappropriate crop management practices.

Only 70% of the farming communities usually achieve food security for more than half of the year. If environmental conditions turn unfavorable, only 30% of the communities have enough rice on the table.[2] Ensuring good-quality seeds for a more stable and sustainable supply is therefore a challenge.

A fitting beginning

In 2005, a participatory research project (IFAD-TAG 706) began to tackle food security and environmental sustainability in marginal uplands. It was funded by the International Fund for Agricultural Development (IFAD) in partnership with the Institute of Agriculture and Animal Science (IAAS). The project selected the Sundarbazar Village Development Committee (VDC) in Lamjung District in midhills (900–1,500 meters above sea level) as a key research site.

Farmer field trials, farmer acceptance tests, varietal demonstrations, and minikit programs allowed farmers to test promising rice varieties obtained from IRRI and the National Rice Research Program (NRRP). The farmers were interested in varieties that produce high yield, resist drought, have good cooking and eating quality, tolerate pests and diseases, and command a better price in the market.

Within a short time, four upland rice varieties (Radha-32, Ghaiya-2, IR55435-5, and Pakhejhinuwa) and six for lowland rice (Radha-4, Ram Dhan, Barkhe-3017, Sunaulo sugandha, Barkhe-2024, and NR-1824-21-1-1) were identified as superior to local lines. These were ready for dissemination during the third year of the project in six more villages with similar agroclimatic conditions in Lamjung, Tanahun, and Gorkha districts.

The community has the answer

Word went around that new varieties were available, and requests from farmers came pouring in. What was needed, however, was a viable seed system that could provide a timely and adequate seed supply of good-quality and suitable varieties.

With no private seed companies or a government program to provide the much-needed seeds, the project team embarked on a community-based seed production program to meet this challenge.

The team could not have chosen a better time: the farmers were very receptive to the idea of forming their own seed production system. Years of lack of seed supplies became a driving force for farmers to act together. As a result, the Sundar Seed Cooperative, Ltd., became the first seed producers' group (SPG) in Sundarbazar, Lamjung, in 2007.

"Our dream is to produce enough quality seeds to ensure good harvests and sufficient food on the table," said Krishna Prasad Siluwal, first chairperson of Sundar Seed Cooperative. And, more importantly, the program allows farmers to preserve their time-honored and socioeconomically significant varieties in the villages.

This SPG produced 4 tons of seeds in the first year, 20 tons the following year with about 1,000 farmer-buyers, and 30 tons in the third year. Its members hope to serve at least 3,000 farmers.

As more farmers see the performance of new varieties, demand for seeds increases. Unfortunately, the cooperative can meet only 11% of the total demand for seeds in the villages of Lamjung and neighboring districts.

"We not only hope for ourselves; we also aspire to help other farmers in the same predicament," said Khila Sharma Bagale, Pragati SPG president. "There is unity in poverty, but we are determined to break this cycle and rise, given opportunities."

Capturing the ripple effect

Not long after the IFAD project (TAG 706) finished in 2009, the Consortium for Unfavorable Rice Environments (CURE) continued the work. A good model for development should not end with the project. Lessons learned should be replicated as hundreds of thousands of farmers are in need of good seeds of new and improved stress-tolerant varieties.

GRANT SINGLETON

DR. DAVID Johnson, CURE coordinator, is warmly welcomed by villagers in Nepal.

Stephan Haefele, CURE working group leader for drought-prone rice environments, suggested that new varieties be validated in varying environments. "We are hoping that this [validation] would speed up variety release and wide-scale adoption of farmer-preferred varieties."

So, in 2010, under the auspices of CURE, the project partners formed seven new SPGs in seven villages in Lamjung, Tanahun, and Gorkha districts. In these villages, more and more farmers see the fruits of their labor as they participate in seed production of upland rice, legumes, oilseed crops, and vegetable crops.

In 2010, all seven SPGs and the two cooperatives produced a total of 169 tons of seed (14 tons of upland rice and 155 tons of lowland rice). The Sundar Seed Cooperative is the center for seed production, collection, and distribution. It collected and sold 20% of the farmers' total production.

BISHNU BILAS Adhikari and other field staff members discussing with farmers the importance of seed health management.

BISHNU ADHIKARI

Women not to be outdone

Following the success of the first SPG, the Purkot Seed Producers' Group (now, Pragati SPG) was established in 2008 under the leadership of a progressive farmer, Mrs. Gita Pandey, in Tanahun District. Then, the Harrabot Ladies' Seed Producers' Group was formed in 2010 through the initiative of Laxima Adhikari. She remarked, "When I observed that men were doing well in

1 Sah SN. Rice Research and Development Program in Nepal. Paper presented at the 10th CURE Steering Committee Meeting and Minisymposium on seed systems, 19-21 April 2011, Kathmandu, Nepal.

2 Results of household surveys at the project sites in 2007-08 conducted by the project team. Institute of Agriculture and Animal Science.

their seed production, I was challenged, and thought that what men can do, we can do better.

"Now, we can help our husbands earn income without affecting our household chores since we do farming activities mostly in our own backyard or on nearby farms," she added.

The women saw opportunities in leadership training activities through the project. Since then, they learned to grow other crops and their families can now eat a variety of off-season crops such as cabbage, cauliflower, and leafy vegetables. Millet and maize that used to replace rice on the table are now feeds for livestock and poultry. Beekeeping and goat raising have also been constant sources of additional income.

Varieties for varying markets

The seed producers' groups have been a regular means for CURE to introduce new varieties to the communities. And, participatory varietal selection (PVS) approaches showcased the performance of new varieties and revealed what farmers prefer in a variety.

In Purkot Village, farmers prefer Radha-4, a rainfed lowland rice; Ghaiya-1 and Sukha-2, drought-tolerant upland rice; and Sabitri for irrigated conditions. Rainfed varieties fast becoming popular are Radha-4, Sukha-1, Sukha-2, and Hardinath-1. Farmers also maintain their local traditional varieties such as Pakhejhinuwa and Ratothanter. These traditional varieties are preferred for their resistance to pests and diseases, resilience to changing weather conditions, and values related to their cultural heritage and consumer preferences.

Aside from considering agronomic traits, farmers segment their rice market based on consumer preferences. The "fine grains" have the highest price. These are the fine, aromatic long grains, with good eating quality. However, these usually have low milling recovery (around 65%) and a high percentage of broken grains. The "medium" ones have short and thin grains, whereas the "coarse" grains are "rough on the throat" when swallowed and not as palatable as the first two types. The rough types are also preferred because of their "semi-dwarf" traits, nonlodging, and good grain and straw yields.

Farmers buy seeds for their different land types and toposequence; they want more varieties to choose from for varying agroclimatic, social, and economic reasons. Also, farmers prefer short-duration varieties so they can grow other crops.

Quality seeds have a "savings function." When farmers need cash to pay for their children's school fees, medical needs, and other emergency expenses, they sell their seeds.

Seed security is food security

The availability of good-quality seeds means food security. No seeds, no harvest. This is especially true for communities affected by calamities. The seed producers' groups can provide a security blanket for farmers seeking timely availability of quality seeds.

At first, farmers could not believe that new varieties could improve their low production as they had mostly been producing traditional varieties such as Eakle, Jarnali, Madishe, Mana muri, Jhinuwa, and Mansara. These varieties are low yielding (1.5–2.0 tons per hectare). Usually, a farm household has three small patches for a total of 0.6 hectare. So, a small increase in yield is already considered life-changing.

According to the more than 60 farmers from both Sundar Seed Cooperative, Ltd., and Pragati SPG, they were able to increase their yield by at least 40% when they used improved rice varieties. Most say that they doubled their yields (3.15–5.0 tons per hectare) compared to previous varieties used. Moreover, they now have many varietal options.

These farmers can now eat rice year-round and grow winter vegetables with hopes of overcoming food insecurity. Seed exchanges and information sharing among farmers have improved. Women are more active now than before in farming. Farmers are also expanding rice production to lands that they had abandoned during drought periods.

JOE IBABAO (3)

WOMEN ARE becoming more active in community seed producers' groups and as seed-keepers of popular varieties.

DR. DIGNA Manzanilla, IRRI social scientist, talks with women farmers about their role in the development of a seed producers' group in the community.

A model for improving livelihood

There is no single recipe in forming viable seed producers' groups, but the experience in Nepal provides some guide. Based on a training needs assessment, these farmers are trained in seed production, seed health management, and testing of new varieties in their fields. The training can also be combined with training on vegetable crops, livestock production, and other livelihood programs.

Farmers gain access to foundation seeds so they can produce seeds that are sold to other farmers. The District Agriculture Development Office (DADO) and CURE staff members provide guidance on quality assurance services. But, the whole process depends on a "community guarantee system," which is anchored on trust and on group pressure to ensure adherence to certain "quality standards." This way, the Sundar Seed Cooperative and the Hariyali Seed Cooperative can define the system and conditions in cleaning, drying, tagging, packing, pricing, and labeling their seed produce.

A circle of local champions

Just like in other successful development efforts, local champions empower communities to provide links to local support systems.

Scientists from IAAS, led by Bishnu Bilas Adhikari, assistant professor and agronomist (who serves as a local CURE coordinator), have been a major driving force of the project. "Farmers are becoming more familiar with the program, and are taking on responsibilities themselves, including women as a source of unprecedented support," Prof. Bishnu said.

Prof. Bishnu, together with agricultural economist Hari Krishna Panta, horticulturist Kishor Chandra Dahal, and soil scientist Janma Jaya Gairhe, form a remarkable multidisciplinary team to provide farmers with technical assistance. The team often travels to the sites, usually on their motorbikes to reach even the most remote villages.

Of the nine farmers' groups, four leaders are retired school teachers, whereas others are farmer-volunteers. All have dedicated their time and share a vision to supply affordable and easily accessible seeds to the poor farmers.

(*L-R*) SOIL SCIENTIST Janma Jaya Gairhe, Prof. Bishnu Adhikari, farmer leader Chandra Prasad Pokhrel, cooperative member Sudip Kanta Adhikari, agricultural economist Hari Krishna Panta, and Ms. Sudha Sapkota of the Nepal Agricultural Research Council.

Government support

Mr. Bihod Kumar Shrestha, a DADO extension officer in Tanahun, said, "We are keen on supporting the producers' groups.

"The government provides a seed subsidy at 25% to the farmers' groups for foundation seeds, just enough to pump prime their activities," he added.

"DADO provides training on quality seed production, seed storage, methods to increase yield, controlling pests and diseases, and seed quality control," Mr. Shrestha further explained. Seeds are labeled as "truthful" seeds after evaluation and inspection. Further, DADO selects farmers who become seed inspectors.

To develop the program, each year, DADO will support a farmers' cooperative with Rp60,000 (US$1,100) for its revolving fund and Rp50,000 ($940) for its machinery.

From a single step to a giant leap

CURE aims to expand the geographic coverage of seed producers' groups by targeting new strategic locations in Nepal. New SPG sites will be identified to take advantage of the "ripple effect" of benefits to farmers within a particular geographical reach.

With the increasing number of new stress-tolerant varieties being released in many countries, CURE is working toward bringing its products to the doors of millions of farmers. Farmers in Nepal and in many Asian countries need access to new varieties and technologies, and a community-based seed system that provides a mechanism to link "stress-tolerant seeds" to "food on the table."

Dr. Manzanilla is a social scientist and Dr. Johnson is a senior weed scientist at IRRI. They are both working under CURE as associate coordinator and coordinator, respectively.

Rice breeding brings billions to Southeast Asia

by **Sophie Clayton**

Farmers in Indonesia, Vietnam, and the Philippines benefit by the billion thanks to research

Southeast Asian rice farmers are harvesting an extra US$1.46 billion worth of rice a year as a result of rice breeding by the International Rice Research Institute (IRRI), according to a new Australian report.

Rasja Priatna, a 45-year-old rice farmer from West Java in Indonesia, has been growing rice variety Ciherang for 10 years because he says it produces more grains than the variety his parents were growing before him.

Ciherang is one of hundreds of IRRI rice varieties that were adapted locally and released for farmers such as Mr. Priatna to grow. Ciherang is now the most popular rice variety in Indonesia and currently occupies around 50% of the rice-growing areas in the country.

Thousands of farmers across Southeast Asia have seen similar benefits by growing different IRRI-bred rice varieties with higher yields and other favorable traits. As a result, they produced more rice and have earned higher incomes.

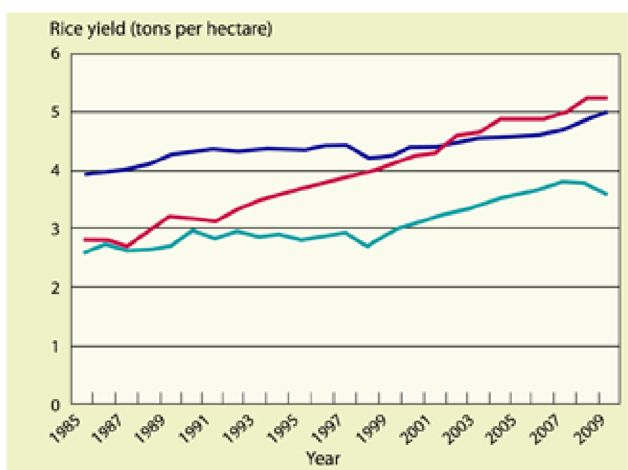
Reporting the impact

A recent report by the Australian Centre for International Agricultural Research (ACIAR) showed that, between 1985 and 2009, improved rice varieties from IRRI increased farmers' returns by US$127 per hectare in southern Vietnam, $76 per hectare in Indonesia, and $52 per hectare in the Philippines. This kind of money makes a big difference not just to the welfare of the farmers, their families, and communities, but to entire nations.

In total, across the three countries assessed—Vietnam, Indonesia, and the Philippines—farmers harvested an extra $1.46 billion worth of rice a year as a result of IRRI's rice breeding.

Dr. Robert Zeigler, director general of IRRI, placed the magnitude of this impact in context: "The annual impact of IRRI's research in these three countries alone exceeded IRRI's total budget since it was founded in 1960," he said.

IRRI's rice breeding work, of course, reaches much further than Southeast Asia. In South Asia, it involves the recent release of drought-tolerant rice in Nepal (see *New rice for Nepal* on page 6 of *Rice Today*, Vol. 10, No. 2) and Bangladesh and across African countries, including the first IRRI rice recently released in Mozambique (see *Mozambique gets new designer rice* on page 6 of *Rice Today*, Vol. 10, No. 3).



	Rice yield increase due to IRRI breeding	Extra money earned per hectare every year (million)	Average total annual value (million)
Vietnam (southern)	9.8%	$127	$610
Indonesia	13.0%	$76	$644
Philippines	6.7%	$52	$204

ACIAR's Impact Assessment Research Program Manager Deborah Templeton said that, apart from improved varieties, other IRRI activities not included in the study are likely to produce further significant benefits.

"Other benefits are improvements in eating quality and resistance to pests and diseases," said Dr. Templeton.

Putting national breeders first

Without explanation, one of the findings of the report looks ominous—it shows that the direct impact of IRRI-bred rice varieties has been declining. But, according to Dr. Zeigler, this is part of the plan. "One of IRRI's primary roles is to support and educate our partners," he said. "By working alongside our national counterparts in research and extension, we help equip national rice breeders with breeding stock and expertise to develop their own rice varieties."

Dr. Bui Ba Bong, Vietnam's vice minister of agriculture and rural development, said, "Today, as Vietnam develops its own lines, IRRI continually provides parental lines for our Vietnamese rice scientists to develop highly suitable varieties for the conditions in Vietnam.

"IRRI has played an important role as Vietnam's partner in rice research and development," he added. "The varieties directly provided by IRRI are of great assistance to the country."

If national partners get better at adapting the improved rice given to them and tailoring it to local conditions, the needs of local farmers and consumers will be better met.

"We will keep delivering high-quality breeding stock with traits of broad interest, such as drought and pest tolerance, across major rice-growing regions," Dr. Zeigler said. "Then our partners can test it locally and incorporate those traits into local varieties and use other technologies we can share with them to make sure the process is as quick and effective as possible."

Dr. Nguyen Thi Lang, head of the Genetics and Plant Breeding Department of the Cuu Long Delta Rice Research Institute, noted how IRRI has been helping to host "numerous training courses and workshops on rice technology transfer systems, for key extension people in Vietnam to expose them to innovative technologies and effective processes of technology transfer to Vietnamese farmers."

One process that helps speed up the delivery of new rice varieties is participatory varietal trials, which involve farmers in selecting potential new varieties early on in their development.

Australia's role in boosting rice yields

As neighbor to the world's rice bowl—Asia—Australia plays an important role in supporting rice research.

On launching the ACIAR report on the impact of IRRI's breeding work, Australian Minister for Foreign Affairs Kevin Rudd said, "Ensuring an ample and affordable supply of Asia's staple crop is critical to reducing poverty and increasing regional stability."

Australia has been a long-term supporter of rice research and development at IRRI and across the whole of Asia. In 2010, the Australian government contributed AUS$15.4 million toward the construction of a new, state-of-the-art Plant Growth Center and upgrades to IRRI's experimental farm in the Philippines.

These new facilities are enhancing IRRI's capacity to increase rice yields against a backdrop of agricultural production pressures and a growing global population.

Engaging farmers early helps prevent rice varieties from being developed that don't meet their needs and may be rejected.

Since 2008, Dr. Jean Du, head of the Bohol Agricultural Promotion Center and one of IRRI's partners in the Philippines, has been testing potential new rice varieties in four provinces of Central Visayas—one of the main regions of the Philippines and an important rice-growing area. Dr. Du has been involving farmers in the trials and he described farmers' adoption of rice varieties tested in this way as "fast."

Getting benefits to farmers quickly

Rapid adoption of new rice varieties is critical to the overall success of any breeding program. One central feature that farmers appreciate is higher yields.

ACIAR reported that IRRI's breeding research between 1985 and 2009 delivered a rice yield increase of up to 13% (in Indonesia) and an average increase of 11.2% across all three countries studied.

"This means farmers are now harvesting more rice per hectare, which not only lifts them out of poverty, but contributes toward the worldwide challenge of feeding the estimated global population of 9 billion people in 2050," said Australian Minister for Foreign Affairs Kevin Rudd upon launching the report in September 2011.

The good news for donors

Based on the ACIAR report findings, Dr. Templeton says that, in very general terms, each dollar invested in rice breeding returns $22 in the form of higher production.

To measure IRRI's contribution to rice yield, the area of each variety grown was calculated in the three countries, its pedigree examined, and this was combined with data on varietal yields. "The value of the additional rice production was based on a representative export price for rice in 2009," Dr. Templeton said. But, one thing is clear: the impact of rice breeding is big, really big.

It is easy to connect higher farmers' incomes with declining poverty. With higher incomes, farmers can afford better food, health care, and education. And, they can afford to invest in more sustainable practices and other businesses, which lead to further economic development.

The Global Rice Science Partnership forecasts that, for every $20 invested in rice research, one person could be lifted out of poverty; not just fed for a day, but elevated into a "virtuous circle" of higher income, investment, and reduced environmental impact—thus breaking intolerable poverty cycles and declining environmental health. (See *Blueprint for a greener revolution* on pages 18-21 of *Rice Today*, Vol. 10, No. 1.)

Mr. Rudd concluded that "IRRI's high return on investment, as found by the ACIAR study, shows how Australians can really make a difference by effectively targeting our aid dollars."

But of course it's not just Australians who can make the investment in rice research—it's anyone.

For more information, see:
The ACIAR full report titled *International Rice Research Institute's contribution to rice varietal yield improvement in South-East Asia* is available as a free download at www.aciar.gov.au.

ANMI fights off a vampire insect

by **Lovely Merlicel G. Quipot**

Scientists from IRRI and RDA developed ANMI, a rice variety that can withstand brown planthopper, South Korea's most destructive insect pest, among other problems

In 2002, the Republic of Korea (South Korea) had four major problems in rice: blast, bacterial blight, cold stress, and brown planthopper (BPH)—the country's most destructive rice insect pest. The job of the International Rice Research Institute (IRRI) was to breed a new rice variety that is tolerant of these problems yet safe to the environment and for consumption.

Summer (mid-June to late August) marks another cropping season in South Korea. It also marks the arrival of BPH, which doesn't survive the winter season. The BPH in South Korea comes from Vietnam and is brought to the country through mainland China, carried by summer winds and typhoons.

A sap-sucking insect

BPH damages rice crops every year in many Asian countries, with estimated annual losses of 2–3 million tons across the region. The pest not only brings viral diseases but also sucks the rice plant to death.

Brown planthoppers pierce the plant stem and suck out the sap, carrying the plant food from the phloem cells, causing the rice plant to dry out, wither, and die.

Serious infestation causes hopper burn in rice fields and often results in complete yield loss. The most recent BPH attack in South Korea was reported in 2009 when 10 counties along the western coastal area of the Korean peninsula were hit at a high density of 20–40 BPH per plant.

An anti-BPH "vaccine" gene

Rice plant resistance is the best strategy to control BPH, not the use of pesticides. So resistance became the focus of IRRI's work in South Korea. Kshirod K. Jena, IRRI senior scientist and plant breeder, started the work on this in 2002.

SYLVIA VILLAREAL

BROWN PLANTHOPPERS travel on the summer winds from Vietnam to Korea, wreaking havoc in rice fields along the way.

The pest has evolved and become virulent to resistance genes that were introduced 15 years ago into rice varieties. Thus, scientists are in constant search for genes that can withstand BPH. In the case of South Korea, a search for the gene that has resistance to the new BPH population is important.

Dr. Jena and his Korean team then discovered a major resistance gene, *Bph18*, in 2005. This discovery is a major breakthrough in rice science because this gene has resistance to the kind of BPH that are swarming and harming rice fields in the country.

"The *Bph18* gene enables rice plants to manufacture a protein that can protect them from BPH attack," Dr. Jena said. A process he calls antibiosis is a defense mechanism in nature that plants use to combat insect predators.

Another breakthrough

The tricky part is that this gene is from an indica rice (IR65482-7-216-1-2), a rice variety that is popular in tropical countries, and not from the japonica rice greatly preferred by the Koreans.

"Japonica rice is well suited to our temperate weather; that is why it is popularly cultivated by farmers," Dr. Yeon-Gyu Kim, director of the Rice Research Division, National Institute of Crop Science, Rural Development Administration (RDA), said. "This variety is readily available to the Korean market and is what our countrymen are used to eating. I can say that the market in Korea looks for round grain, a somewhat sticky rice that fits not only nutritionally but with our eating traditions."

Discovering the gene is a success in itself. But, transferring the *Bph18* gene and the *Bph18* gene alone from indica to japonica is yet another large hurdle to jump.

"Japonica rice has a narrow gene pool so it has a limited reservoir of resistance genes," Dr. Jena related. "Indica rice, on the other hand, has a very wide gene pool." He initially got the germplasm, which he developed with Dr. Gurdev S. Khush, as a Robert S. McNamara fellow of the World Bank by transferring genes from wild rice species. "So, I thought instead of using the same cultivated rice genes for BPH resistance, let me try a new source of resistance," Dr. Jena added.

The Korean government provided Dr. Jena with an elite temperate japonica rice variety to improve using *Bph18*. The government asked him to incorporate the new gene employing DNA marker technology and molecular genotyping in combination with traditional breeding.

Luckily, in 2005, IRRI, in partnership with Japan, completed the rice genome sequence. The vast information from the sequence enabled the team to find the main traits of the new gene, which Dr. Jena identified for BPH resistance. It also helped develop a DNA marker, which will be 100% associated with the BPH resistance trait of the plant. He then introduced *Bph18* to the elite japonica variety Junambyeo.

"That gave me the confidence to introduce that resistance gene from indica to their elite japonica variety," Dr. Jena mused. "We were able to do it in three backcrosses. We made the selection through DNA analysis to make sure that we were introducing only that resistance gene and not any other undesirable traits from indica rice. We were particular to the given order that everything else should be japonica except for the resistance to BPH."

A faster way of breeding

"The progress of the work is fast," said Dr. Jung-Pil Suh, scientist in the Rice Research Division, RDA. "We are very happy. We did three replicated yield trials and the performance of the line in these trials is outstanding. The whole population is uniform with the right panicle size, plant height, good response to fertilizer, and high yield. Most importantly, it has multiple resistance to diseases and BPH."

Thanks to marker-assisted breeding and background genotyping, the usual 10 to 14 years of conventional breeding can now be completed in 6 years. In the case of Korea, it took only 2 years to identify the kind of rice plant [line IR83261BC3-3-3-3-B (SR30071BC3-3-3-B)] that is suited for a local adaptability test. Replicated trials in different regions of the country were done in 3 years.

SUK-MAN KIM

DR. K.K. JENA, IRRI plant breeder (*left*), shows a visitor ANMI rice, which has been infested with BPH in the greenhouse.

In other words, it took Dr. Jena and his Korean team of scientists only 5 years to breed and release a new rice variety, ANMI, which is a Korean word for safe and delicious rice. Officially released in South Korea on 6 December 2010, ANMI is highly resistant to BPH, blast, bacterial blight, and cold stress. This variety is also high yielding, very palatable, and looks glossy with a stickiness that is just right.

Dr. Suh is quick to add, "ANMI will greatly contribute to rice farmers who are engaged in eco-friendly farming. Because this new variety can fight insects, there will be fewer pesticides in the air. Plus, it provides stable cultivation because of its multidisease and multi-insect resistance."

Fulfillment spelled out

"I felt fulfilled with the discovery of the gene and the release of the ANMI rice variety in South Korea," Dr. Jena stated. "That's why I am thankful to IRRI Director General Robert S. Zeigler and my colleagues in both IRRI and Korea. I am confident that ANMI will solve the four major rice problems not only in South Korea but also in other parts of the world. I can say that this is a legacy that I can be proud of and I am sure my colleagues will say the same."

K.K. JENA

DR. N. LANG, head of the Breeding Division, Cuu Long Delta Rice Research Institute (CLRRI) in Vietnam, source of the BPH problem, points at hopper burn—a patch of dead, dried-out rice plants in the field.

Advertorial

A promising new way to grow rice

Center pivot irrigation is a new way to grow rice while conserving water and increasing rice production

Valmont Irrigation, the world leader in manufacturing efficient irrigation equipment for agriculture, has been working closely with growers and researchers to irrigate rice with center pivots. A center pivot is an irrigation machine that uses motorized towers to move a sprinkler-equipped pipeline around a stationary central point. It can apply water or crop inputs to fields ranging from 2 to 235 hectares.

Since the start of the Valmont research project called *Circles for Rice*, **Valley**® center pivots have been used to grow rice on over 30 production fields in Brazil, Pakistan, Ukraine, and the U.S.

Rice growers are welcoming the change to center pivot irrigation because it addresses four of the main drawbacks to flooded rice production: inefficient use of water, high input costs, inability to grow rice on certain soils, and the lack of an additional rotation crop in certain fields.

"The *Circles for Rice* research project evolved primarily with water savings in mind," said Jake LaRue, director of International Product and Project Support at Valmont Irrigation. "Significant savings have been achieved in using center pivots, compared to flood irrigation, saving an average of 45% of applied water."

Valley center pivots are designed to fit a producer's complex farming operation. Farid Noon, a rice farmer from Lahore, Pakistan, began growing rice under mechanized irrigation on his 2.2 hectares with a Valley center pivot in 2009. "I quickly understood the sheer revolution that growing rice on undulating light soils could bring, especially in a country like Pakistan, where rice is grown on hard clay-leveled basins," stated Mr. Noon. He reported 60% water savings over traditional flood irrigation using a Valley center pivot.

Dennis Robison, a U.S. grower, said that he has been growing rice for 35 years. He recently started growing rice on a sandy hill field with 20-foot (6-meter) elevation that could not be flooded or leveled. Using a center pivot, he was able to grow rice on this challenging topography. "The center pivot used about half the water that a flooded field would use," said Mr. Robison.

As global population and hunger continue to grow, increased rice production is imperative. Center pivot irrigation can allow rice production on land where topography had not been conducive to rice production. Growing rice under a center pivot can increase rice production globally and help feed a growing world population.

Valmont Irrigation currently operates seven irrigation manufacturing facilities, located in the U.S., Brazil, China, South Africa, Spain, and the United Arab Emirates. With over 400 dealers worldwide, Valley center pivots and lateral-move machines can be found in more than 90 countries.

To learn more about irrigating rice under a center pivot or linear irrigation system, visit CirclesForRice.com.

For more information, contact
Michelle Stolte **mstolte@valmont.com**

Waking up a GIANT in the global food industry

by **S. Jafar Naqvi**

India is emerging as the frontliner in agriculture and could become the global food basket

The potential of Indian agriculture was central in the talks during India Foodex 2011 and GrainTech India 2011. Themed "Farm-to-Fork," a three-day international conference (9-11 September) was held on the Palace Grounds of Bangalore. It was organized by Media Today Pvt. Ltd.

Counselor of Agriculture of the Netherlands Hank van Duijn inaugurated the event, which was attended by 150 delegates from 18 countries.

(*Top*) THE INTERNATIONAL conference helped forge alliances and joint ventures with the Indian agri-food sector, cooperatives, and new entrepreneurs. (*Bottom left*) The Dutch delegation, under the guidance of Hank van Duijn, cuts the ribbon. (*Right*) The expo saw the presence of a strong contingent of trade delegations such as Food Tech Holland.

Indian agriculture is acknowledged as the emerging food basket in the world. Indian scientists and farmers have achieved great feats in crop production. The Green Revolution and White Revolution[1] are examples that prove that India has the resources, talent, and labor not only to feed its population but also to export food to other countries.

Despite all the progress that India has made on the farm front, many aspects have remained neglected. Low productivity of crops, insufficient storage space, improper distribution channels, inadequate supply chain management, and poor implementation of policies have acted as major constraints. To wake up this "sleeping giant," what is needed is cooperation and synergy among key players such as policymakers, researchers, entrepreneurs, motivators, marketers, and consumers.

At the show

The event also showcased agricultural products from various companies. Examples are steel stock silos and food grain handling systems of Alapala Machine Industries from Turkey; flour-semolina and corn mills, feed mills, and transportation and storage solutions of Uger Makina also from Turkey; automated greenhouse solutions, including heating, cooling, and fertigation systems of Van der Hoeven from the Netherlands; oilseed, pulses, spices, and natural gum of Warka Trading House from Ethiopia; Shami Goat Yiannakis N Antoniades from Cyprus; seaweed organic fertilizers, fodder, and powder of Quingdao Bright Moon Seaweed Group from China; plus other cost-effective solutions to enhance farmers' profitability from Taiwan and Thailand, among other countries. Indian corporate stalwarts were also present such as Jain Irrigation, Reliance, Mahindra, and Greaves.

All about milk

Part of the overall event was DairyTech India 2011, which gathered stakeholders from dairy products, livestock, technology, and allied sectors. They presented and discussed genetic and productivity improvement of dairy animals, better cow's health, dairy technologies, and consumer-driven products, among other topics.

India ranks first in the world in milk production, with an annual output of more than 112 million tons. The value of the dairy in the market is 26 trillion rupees (US$60 billion) and the industry is predicted to grow at 4–5% per year. It is expected to reach $83 billion by 2015. As a major contributor to the food processing industry in India, dairy has the biggest share of the country's agricultural gross domestic product.

However, the dairy industry has not caught the fancy of the younger generation despite opportunities. Most farmers keep animals only for extra income. Others wish to diversify and explore opportunities in this sector.

Southern India has been the major hub for agri- and food-processing activities. That is why farmers are encouraged in the southern states to diversify into dairy and poultry. During the event, many visitors showed interest in venturing into dairy farming. After living a stressful urban and career-oriented life, many wish to go back to their village homes and use their ancestral land for dairying or farming activities.

Mr. S. Jafar Naqvi is the chief coordinator of GrainTech India 2011.

[1] India became the world's largest producer of milk and milk products in the 1970s, and hence, referred to as the White Revolution of India.

Rice in Japan: BEYOND 3.11

by **Jennifer Toews-Shimizu**

PHILIPPE NIBELLE (3)

Japanese farmers and consumers struggle to overcome the lingering effects of the earthquake that struck Fukushima

Japan has long defended and quite successfully managed to maintain sovereignty in its international agricultural trade policies and agreements. Through various threats of sanctions, the high tariffs on foreign rice have kept Japanese farmers self-sustaining. Though self-sufficiency in agricultural products has been on the decline since World War II, the rice industry (except for the rice crisis) has remained at 100%.[1]

However, the effects of the 11 March multifaceted disaster (also known as the Japan 3.11 disaster), which hit the eastern region of Japan, have wreaked havoc on the long- and short-term prospects of the rice industry. The usual 1.84 million-ton rice stockpile (as of October 2010) increased to 2.1 million tons because of the sluggish demand for rice in 2011, according to the Ministry of Agriculture, Forestry, and Fisheries.

[1] Soda, Osamu. Fact about Japan: Japanese Agriculture (International Society for Educational Information. Tokyo, 1993):4.

Products from Fukushima considered safe

On 22 April 2011, Fukushima Governor Yuhei Sato was quoted saying that he would never allow Tokyo Electric Power Co. to operate the Daichi nuclear power plant again. On 11 September, in a message to Japan, Governor Sato said, "All the agricultural, forestry, and fishery products are under strict screening and products over the restriction values are prohibited from being distributed in the market; therefore, I can assure that you can buy and eat any products in the market."

And, a document dated 12 October 2011 by Governor Sato on the official Fukushima Prefecture Web site[2] stated: "The agricultural products provided by Fukushima Prefecture are safe and fresh. I hope everyone will give Fukushima Prefecture full support for our agricultural products."

This statement was followed by a long list of categorized cereal grains (including rice) and vegetable products produced in Fukushima. These products passed the test for consumption and shipment, yet with numerous exceptions listed below each category.

A representative from the prefecture office explained through a phone call that the agricultural products listed had passed inspection for contamination, and mentioned a list of areas from which agricultural products are not allowed to be shipped for consumption. These areas were near the no-entry zone of Fukushima. Other areas were slightly farther away from the no-entry zone, but were labeled as hotspots because of consistent weather patterns, which carry contamination by wind and precipitation. Hence, the prefectural government is stating that, since agricultural product samples (including rice) have been inspected and have passed the 500-Becquerel test, all products shipped from Fukushima are considered safe for human consumption. A Becquerel (Bq) is a unit that is used to measure the rate of nucleus decay per second in radioactive material. In other words, 1 Bq indicates that 1 nucleus is decaying per second. Hence, a more dangerous source will produce a higher Becquerel reading.[3]

Status of Fukushima's rice industry

In a phone interview, Jessica Harvey, a member of the prefectural government office, indicated that since the prefecture was already in financial difficulty before the 3.11 disaster, the state is in no position to offer any assistance to any farmers, rice farmers included. The sale of agricultural products, including rice and *sake* (rice wine), had been a significant source of financial income for the prefecture until now. With the devastation of consumer trust in the products, the representative said that the local rice industry has been virtually destroyed.

The disaster affected three kinds of farmers: those in the 30-km no-entry zone (see map on page 23), those who were dislocated because of the earthquake, and those far-removed from the situation but affected by the radiation concerns, said Mr. Fuji, a representative of the National Federation of Agricultural Cooperative Associations under its rice and wheat division. Keeping that in mind, in a public statement made on 29 October, Minister of Environment Goshi Hosono indicated that the no-entry zone was to be shrunk to a 20-km area in the near future (see map on page 23).

With respect to the actual damage inflicted on Japan's rice industry as a whole, Mr. Fuji put it as a miniscule 1%. With the earthquake, tsunami, and radiation factors, only 100,000 tons of rice were lost in all of the affected prefectures. He said that, of the 23,000 hectares of agricultural land affected, 20,000 hectares were rice production areas.

Mr. Fuji went on to describe the 500-Becquerel limit imposed by the Japanese government and how the agricultural community went on to carry out this safety policy. He indicated that, in all the test samples taken of unpolished genmai rice (the most likely to test positive for radiation because the outer bran layer has not been removed), no figures rose above the 500-Bq limit. However, he went on to say that tested samples that have higher values, such as 480 Bq, would not appear on supermarket shelves. Instead, the local agricultural associations (such as Japan Agriculture) would buy the rice themselves so that farmers would not lose profits. What was then done with the slightly tainted rice was not further explained. Since this interview, a few

[2] www.worldvillage.org/fia/kinkyu_english.php.
[3] Wikipedia.

cases of contaminated rice found in supermarkets have been reported and Fukushima Prefecture was not allowed to sell any rice as of early December. Mr. Fuji stated that this protocol (and other information discussed by him) is outlined in detail on the Ministry of Agriculture, Forestry, and Fisheries Web site (www.maff.go.jp/e/index.html).

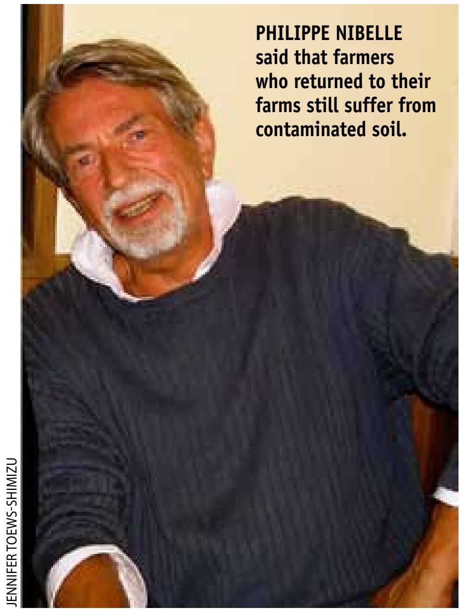
A problem of salt

The most immediate effort by the rice industry, in cooperation with the governments of various levels, is the removal of salt from brine-damaged rice paddies affected by the tsunami. Mr. Fuji said, with no hesitation, that the government is supporting the farmers on a financial and advisory level in this area.

The Ministry of Agriculture, Forestry, and Fisheries has projected that clean-up of agricultural land, reconstruction of paddies, and removal of rubble, debris, and brine will be completed by 2014. The radiation problem, on the other hand, was not an easy question to answer. After a slight pause, he said that nothing has been decided by the government on this issue.

"First of all, the no-entry zone of 30 km poses its own problems, but the topsoil of the surrounding areas is a long-term issue, which no one seems to be addressing yet," he said.

In an interview with Philippe Nibelle of Aizu University, a 9-year resident of Aizu Wakamatsu in Fukushima Prefecture, he indicated that, since the 30-km zone has been recently reduced to 20 km, some farmers have returned to their properties. However, they do not have the finances to remove the top layer of contaminated soil from their fields in order to put in a crop for next year. He said they are not receiving any financial support from the government (either federal or prefectural). Hence, the farmers have not benefited from the reduction of the 30-km no-entry zone. One "topsoil" issue, which seems to have been immediately dealt with, is that of local elementary, junior high, and high schools. These schools have removed the top few centimeters of soil from playgrounds.



JENNIFER TOEWS-SHIMIZU

PHILIPPE NIBELLE said that farmers who returned to their farms still suffer from contaminated soil.

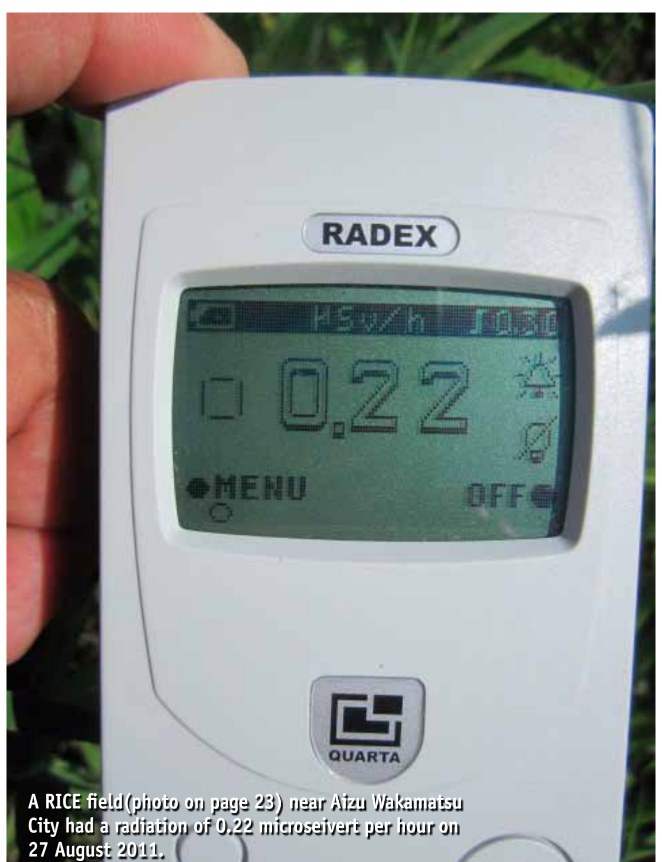
Mr. Fuji further said that concerns about the future capacity for a steady rice supply were paled by the greater concern related to consumer confidence in future Tohoku rice products. Beyond the 30-km no-entry zone, successful rice growth because of effective brine removal in tsunami areas (spring 2011) also points to a productive 2012.

Post-3.11 and rice research

In an interview with a researcher in an Ibaraki Prefecture research institute (just below Fukushima), the future of rice research was in question. Dr. Shigeru Oita of the National Agriculture and Food Research Organization, explained that, since the 3.11 disaster, researchers have turned their attention to developing rice that can withstand saline conditions.

Since many hectares of land have become contaminated with salinity, Dr. Oita said that research is well under way. Japanese researchers are considering rice from India, which is known to tolerate a certain amount of salinity.

However, the problem then faced by the researchers is that of maintaining a flavor and consistency that are acceptable for Japanese cuisine. The challenge of maintaining some essential traits of Japanese rice under harsh conditions will be a long-term project. Contrary to other optimistic reports, Dr. Oita said that some problems need to be overcome before next spring.



A **RICE** field (photo on page 23) near Aizu Wakamatsu City had a radiation of 0.22 microseivert per hour on 27 August 2011.

The reality for the consumer

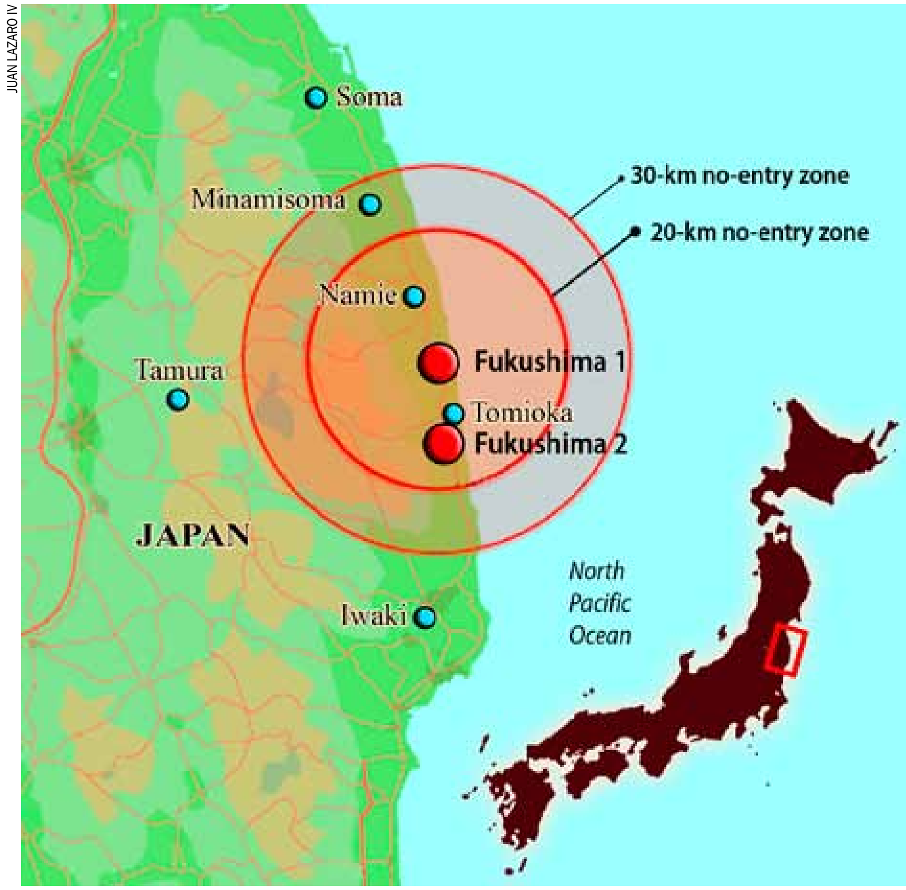
When asked about exports of rice to China, Mr. Fuji noted that, even if mandatory checks for radiation on rice are successfully passed, the Chinese have virtually closed their doors to the import of Japanese rice.

With regard to the future of rice products from Tohoku (the eastern area of Japan), including *sake,* bright prospects are in doubt. For Mr. Fuji, it is a "wait and see" situation. The buying patterns of consumers will need to be verified. Only then will rice producers of Tohoku know the extent of damage from the 3.11 disaster.

The lack of consumer confidence in the safety of rice being in markets became clearer as the 2011 rice crop appeared on supermarket shelves in October. Consumers began storing their own rice supplies from the 2010 crop to put off buying the 2011 crop.

When asked if "2010 rice" was still available, a shopkeeper said with frustration, "Everyone is asking for 2010 rice! I tasted 2011 rice and it is perfectly delicious!"

Megumi, a housewife who agreed to mention only her first name, indicated that she avoided buying rice from the 2011 crop at all. In fact, if 2010 rice were available, she would choose to buy it instead of the usually preferred "new rice." When asked about the 500-Bq policy for agricultural produce, she commented that "the level was too high for human consumption." She also pointed out that rice at a 490 level could have passed the inspection and been sold for consumption even though it is nearly at the unsafe level.



JUAN LAZARO IV

A housewife from Kichijoji District in Tokyo specified that she bought rice produced in Iwate Prefecture, located 255 km north of Fukushima City. She said that she would not buy rice from Fukushima certified to be below 500 Bq because she has a one-year-old child.

One alternative that was being considered for dealing with the unsold government stocks of rice was to reduce or eliminate the importation of maize from the U.S. in late 2011. Since it appears that livestock feed manufacturers import significant amounts of maize from the U.S. every year, feed manufacturers may be encouraged to buy rice from government stockpiles instead.

Generally speaking, since cases of misinformation or withholding of information along with actual cases of contaminated food in supermarkets have become common, many Japanese consumers have become skeptical to the point of turning to foreign food products in their daily shopping needs.

Ms. Toews-Shimizu is a foreign language researcher and primary English teacher at a private school.

JAPANESE RICE farmers within the 30-km no-entry zone are greatly affected.

R.Raman/AfricaRice

Traditionally, rice threshing is done using oxen in many parts of Ethiopia. The oxen trample on rice stalks and the grains are swept and gathered. Farm machines such as mechanical threshers are now being promoted in the country to reduce yield losses and save time.

RICE Ethiopia's millennium crop

by **Savitri Mohapatra**

Rice is now a major livelihood option for farmers in Ethiopia and an important crop for the country's food security

Ethiopia, Africa's oldest independent country and the cradle of an ancient civilization, is fast emerging as one of the big rice-producing countries in sub-Saharan Africa.

"Area rose from 6,000 hectares in 2005 to nearly 222,000 hectares in 2010 and paddy production from 15,460 tons to 887,400 tons," Dr. Tereke Berhe, former regional rice coordinator at Sasakawa Africa Association and current special advisor for rice at the Agriculture Transformation Agency in Ethiopia, said. "At the same time, the number of rice farmers increased from 18,000 to more than 565,000."

RICE HAS become a profitable crop for farmers of Fogera District in northwestern Ethiopia.

R. RAMAN, AFRICARICE (4)

Millennium crop

Although rice has just been recently introduced to Ethiopia, recognizing its importance as a food security crop and a source of income and employment opportunities, the government of Ethiopia has named it the "millennium crop," and has ranked it among the priority commodities of the country.

The national rice research and development strategy (NRRDS) for 2010-19 has been prepared to tackle rice-related progress in rice value chain, postharvest, grain quality, and marketing issues.

According to Dr. Berhe, the rice sector in the country saw a phenomenal growth from 2005 to 2010.

Abundant rice

Until a few years ago, the staple food crops in Ethiopia were maize, wheat, sorghum, and teff—a fine grain unique to the country, which is used for making "injera," a traditional Ethiopian bread.

Rice started to be recognized in the country because of its good productivity, available labor, and vast areas suitable for both rainfed and irrigated systems.

In Ethiopia, about 30 million hectares are suitable for rice, according to the NRRDS. Vertisols, or black clay soils, are abundant in the country and have a high agricultural potential. But, these are difficult to work with, as they are hard when dry and sticky when wet.

"Earlier, farmers used to abandon the waterlogged vertisols in the Fogera plains—a major rice belt in northwestern Ethiopia—during the rainy season," explained Bayuh Belay Abera, national rice research coordinator at Adet Agricultural Research Center in Bahir Dar.

"But now rice serves as a major livelihood option in this area," said Mr. Abera. "When farmers saw that it grows well under waterlogged conditions, they have switched to this crop in the rainy season and have become prosperous since then."

Rice has also become popular because it can be used to make many valuable by-products, such as rice husk, rice bran, and beer. It can also partially or fully replace teff in the making of injera.

Contribution of research

Thanks to active rice R&D activities and with strong support from the Ethiopian government, Sasakawa Global 2000 (SG 2000), and the Japan International Cooperation Agency (JICA), farmers have access to several improved varieties and crop management techniques.

SG 2000 introduced NERICA rice varieties from the Africa Rice Center (AfricaRice). In the last few years, NERICA 1 and NERICA 2 have been officially released for both upland and irrigated ecologies; NERICA 3, NERICA 4, and SUPARICA 1 for upland ecologies; and NERICA 14, NERICA 15, and NERICA 16 for irrigated ecologies.

In addition, various other improved varieties, such as Shebele (IR688059-76-3-3-3-2), Gode-1 (BG-90-2), and Hoden (MTU-1001), have been released for irrigated systems. Among the traditional varieties, farmers continue to grow "X-jigna," which was introduced by the North Koreans for the rainfed lowlands.

However, since much of the arable land in the country is located in mid to high altitudes, cold-tolerant rice varieties are essential for these areas. As part of the IRRI-AfricaRice joint Stress-Tolerant Rice for Africa and South Asia (STRASA) project, researchers are focusing on developing cold-tolerant rice varieties for such regions.

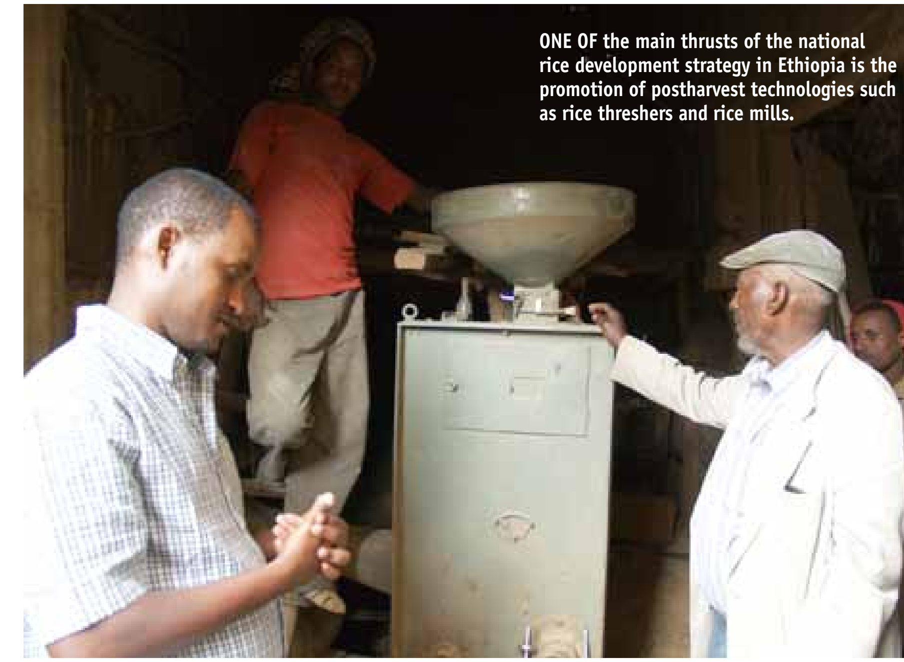
"We have been evaluating varieties for cold tolerance in partnership with the Ethiopian Institute of Agricultural Research and the Amhara Region Agricultural Research Institute," said Dr. Negussie Zenna, an AfricaRice researcher who is closely involved with the STRASA project.

As a result of this work, two cold-tolerant varieties have been selected—FOFIFA 3737 from the Madagascar national program released in 2010 for the irrigated ecology and WAB 189 from AfricaRice released in 2011 for rainfed lowlands. Through participatory varietal selection, farmers confirmed that both varieties have acceptable grain quality.

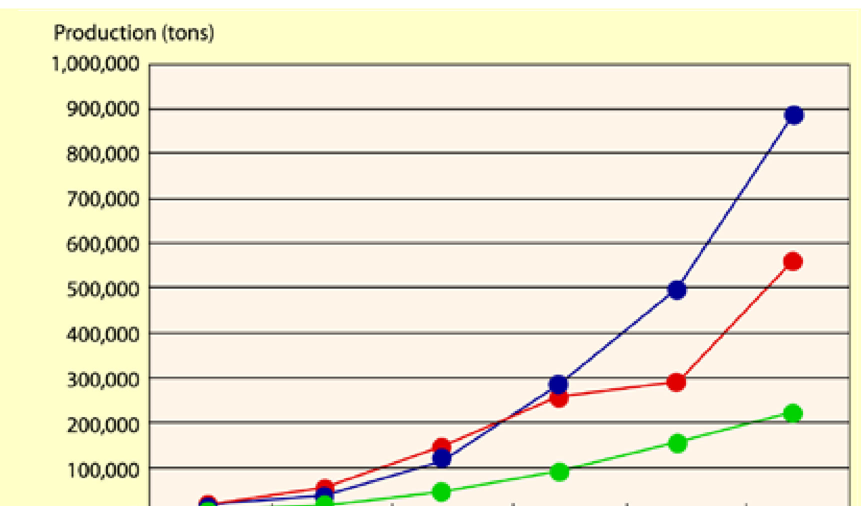
"The farmers showed great interest in WAB 189 because of its earliness, high yield, and good biomass," said Tadesse Lakew, rice breeder at Adet Center.

Dr. Lakew is among the new generation of young African rice scientists who are trained through the AfricaRice Breeding Task Force, which has been launched to build the rice breeding capacity of national partners and stimulate the delivery of improved technologies through strong partnership between international and national rice scientists.

Such partnership will be vital to realizing the Ethiopian government's plan to raise paddy production to about 4 million tons in 2019 and increase rice area to 774,000 hectares.



ONE OF the main thrusts of the national rice development strategy in Ethiopia is the promotion of postharvest technologies such as rice threshers and rice mills.



	2005	2006	2007	2008	2009	2010
Area (ha)	6,000	18,527	49,956	90,448	155,886	221,892
Farmer participants	18,000	53,902	149,868	260,328	285,924	565,442
Production (tons)	15,460	42,825	122,302	285,577	498,332	887,402

Paddy production in Ethiopia, 2005-2010

DR. BAYUH Belay Abera, national rice research coordinator at Adet Agricultural Research Center in Ethiopia, hopes to strengthen R&D partnership with international organizations.

DR. TADESSE Lakew, rice breeder at Adet Agricultural Research Center, shows variety WAB 189, which was released in 2011 for the rainfed lowlands.

Rice cropping patterns in Bangladesh

by **Murali Krishna Gumma, Andrew Nelson, Aileen Maunahan, Prasad S. Thenkabail,** and **Saidul Islam**

Rice is the major staple food crop in Bangladesh. The harvested area covers 11.5 million hectares (because of 2–3 crops per year) or 80% of the cultivated area. Agriculture is the most important sector in Bangladesh's economy. It contributes 19.6% to the gross domestic product (GDP) and provides employment for 63% of the country's population.

The geography of Bangladesh is dominated by the flood plains of the Ganges, Brahmaputra, and Meghna rivers. The variability in the monsoon and winter rainfalls, the immense volume of water from the upstream basins, and the unique coastline mean that the county is particularly prone to drought, flood, salinity, and sea-level changes, often all occurring in the same year. Mapping and monitoring the rice area of Bangladesh provides insight into the complex cropping patterns that are adapted to the environmental and climatic conditions that vary so much each year.

Rice is grown in a complex mosaic of single-, double-, and triple-crop patterns across Bangladesh in the boro, aus, and aman seasons. The boro season spans from November to May when rice is mainly grown under irrigated conditions, covering around 4.70 million hectares, with an average yield of 3.8 tons per hectare. This is followed by the shorter aus season from April to August, in which only 1.11 million hectares of rice are cultivated, mainly under rainfed conditions, with an average yield of 1.9 tons per hectare. The aman rice crop follows the monsoon rains, is mainly rainfed, runs from July to December, and covers 5.65 million hectares, with an average yield of 2.3 tons per hectare.[1]

Remotely sensed images, taken throughout the year, can capture this variation in rice area by season in Bangladesh. The maps here (Fig. 1) are based on observations of the 2009-10 boro season, the 2010-11 aus season, and the 2010-11 aman season. The maps show that boro rice is cultivated in most agricultural areas of the country except the coastal zone due to salinity, the aus crop is mainly in the west and south but is isolated to a few suitable areas during the summer, and the monsoon aman crop is widespread and includes the coastal zone.

The maps also reveal the rice cropping patterns, ranging from single-cropped rice areas, where dry-season salinity and lack of fresh water may limit the possibilities of a second crop, to triple-rice areas, with many permutations in between such as rice-aquaculture or rice-pulse-rice.

In this analysis, we observed that the 11.5 million hectares of rice were cultivated on 8.0 million hectares of land, so the cropping intensity for rice alone is 1.43, but increases to 2.28 when all field crops are considered. Figure 2 shows that rice-other crops and rice-rice-other crops are the dominant rice-based cropping patterns, accounting for 71% of the rice area, with double-cropped rice and the very limited areas of single- and triple-cropped rice completing the picture.

The area planted to rice in Bangladesh varies each season, year after year. A late or early onset of the monsoon affects the extent of the aman crop, a lack of rainfall in summer reduces the extent of the aus crop, but the boro rice area remains almost constant as it depends on groundwater and is not as adversely affected by natural calamities as are the aus and aman crops. Remote sensing is one effective way to monitor these changes and it can also identify longer term trends in rice extent and opportunities for alternative cropping systems.

Dr. Gumma is a postdoctoral fellow and Ms. Maunahan is an assistant scientist in IRRI's Social Sciences Division. Dr. Prasad S. Thenkabail is a research geographer at the U.S. Geological Survey, and Dr. Saidul Islam is a project coordination officer at IRRI-Dhaka, Bangladesh.

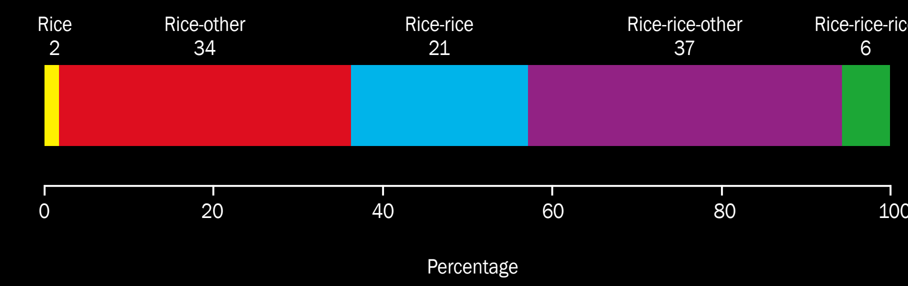


Fig. 2. Percentage area planted to each rice-based cropping pattern.
Note: We do not distinguish the specific season here. For example, rice-other denotes that an area is planted with rice in either the boro, aus, or aman season and the same area is planted with another crop in one of the remaining seasons.

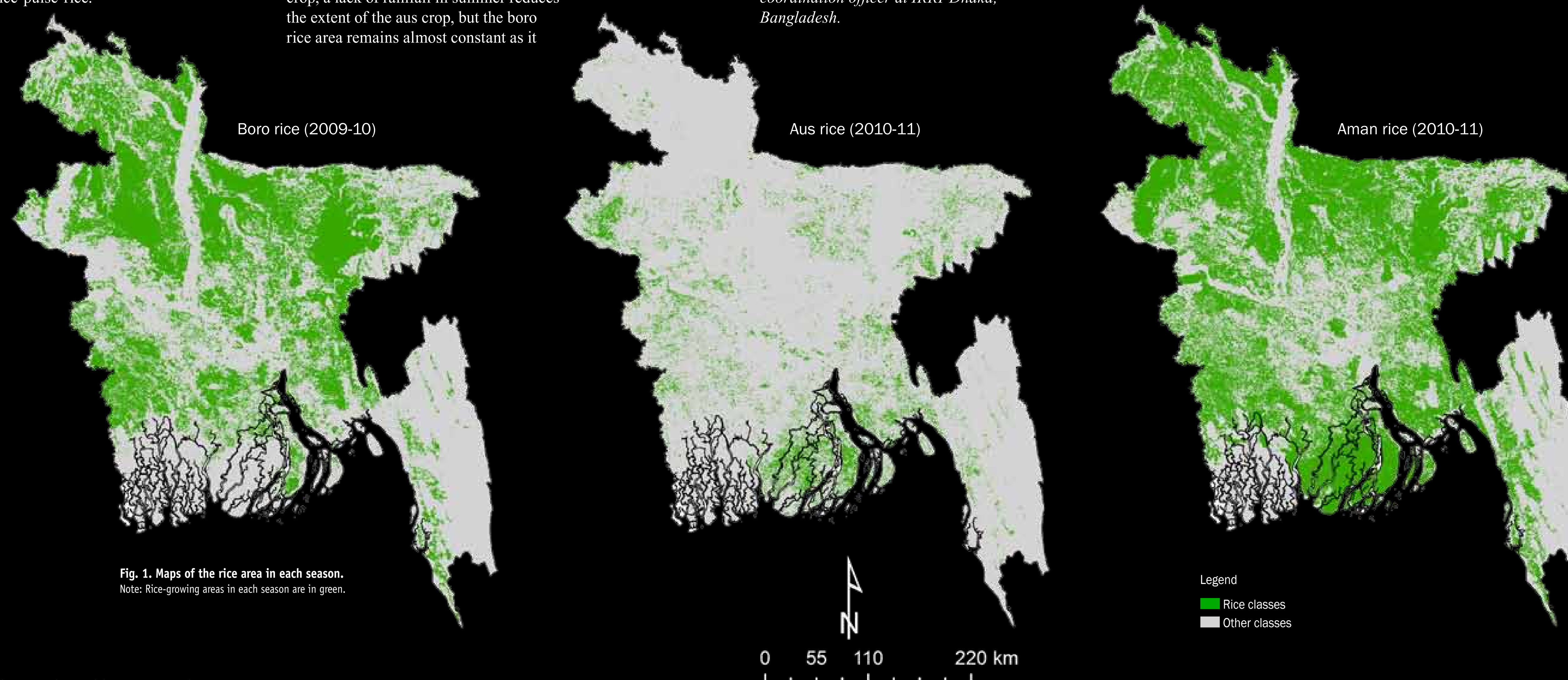


Fig. 1. Maps of the rice area in each season.
Note: Rice-growing areas in each season are in green.

[1] Areas and yields from the Bangladesh Bureau of Statistics for the 2009-10 boro and the 2010-11 aus and aman seasons.

COUNTRY HIGHLIGHT:

IRRI in Bangladesh

Compiled by **Paula Bianca Ferrer**

Surrounded by India, Bangladesh is a country that is as culturally and historically rich. Having an agrarian economy as early as the 13th century, Bangladesh became a chief supplier of agricultural products, such as rice, to Asian traders and beyond during the 18th and 19th centuries, when British traders began exerting economic influence over the Indian subcontinent.

In 1947, East Pakistan was formed from Bengal Province in what was known as the Partition of India under British rule. In 1971, East Pakistan became Bangladesh, but the outcome of the Indo-Pakistan war left the country struggling.

Despite this ordeal, Bangladesh still managed to steadily increase its rice production, which grew from 16 million tons before independence to about 48 million tons in 2009. The introduction of high-yielding varieties, coupled with improved management practices by farmers, allowed farmers to increase their yield per hectare and attain an overall increase in the country's rice production.

Modern rice production technologies gave Bangladesh an impetus to become nearly self-sufficient in rice, despite punishing monsoons and floods. The country now faces other challenges: continuously rising population, decreasing agricultural land, shortages in water and other agricultural resources, and adverse effects of climate change.

IRRI and Bangladesh

Bangladesh's partnership with the International Rice Research Institute (IRRI) started more than 40 years ago. In 1966, the government of then East Pakistan emphasized rice research within the Cereals Section of its Agricultural Laboratory in Tejgaon, Dhaka. Collaborative research to test rice lines from IRRI also began at that time with support from the Ford Foundation. In 1967, the first widely distributed semidwarf rice variety called IR8 was introduced into the country.

In 1970, the Bangladesh Rice Research Institute (BRRI) was established and has worked closely with IRRI ever since. Donors such as the U.S. Agency for International Development (USAID), Asian Development Bank (ADB), the International Development Research Centre of Canada (IDRC), and the Rockefeller Foundation supported initiatives to help Bangladesh in its efforts to overcome rice insufficiency.

Focus was given to improving cultivation practices in cropping patterns; managing water, nutrients, rodents, and insect pests; and farm mechanization, among others.

Modern varieties

The adoption and spread of modern rice varieties, which began in 1967, played a crucial role in advancing and sustaining rice production for subsequent years in Bangladesh. This area of technological progress contributed greatly to the country's efforts in achieving food security despite declining available land and a predominance of small farmers and tenants.

Steady increases in rice production helped the country gain food security despite natural disasters, including major floods in 1987, 1988, and 1998. IRRI's efforts in this area facilitated the development of 55 high-yielding varieties, which include four hybrid rice varieties by BRRI, five high-yielding varieties by the Bangladesh Institute of Nuclear Agriculture (BINA), one each by two Bangladeshi universities, and two flood-tolerant varieties.

Two drought-tolerant varieties are in the process of release. With approximately 4 million hectares of land that perpetually suffer from drought and flooding, Bangladesh seeks to develop stress-tolerant rice varieties to cushion farmers against the impact of climate change.

IRRI works closely with national program scientists through Stress-Tolerant Rice for Africa and South Asia (STRASA), a project that aims for food security during calamities.

Rice-based farming systems

Over the years, many organizations, research institutes, and international nongovernment organizations studied local farming systems across Bangladesh and this included IRRI, which aimed to improve rice-based farming systems or those that integrated other crops and farm elements such as poultry, livestock, and fish with rice.

Funded by the European Commission, the Food Security for Sustainable Households and Livelihoods (FoSHoL) initiative introduced production practices, crop management technologies, integrated farming systems, agroprocessing, and small enterprise development.

Although FoSHoL formally ended in 2009, most of the 2,200 established farmer groups still continue to increase their savings and invest in microcredit platforms. The project empowered the farmers to build on and access their own capital (instead of relying on credit).

The advent of machines

Farm machinery flourished in the country during the 1970s. Low-lift pumps as well as shallow and deep tube wells were extensively developed for irrigation.

IRRI engineers extended their equipment designs and helped manufacturers produce complementary items, or adapt and modify IRRI's designs to their local needs. Local institutions in Bangladesh also pursued agricultural mechanization. This involved initiatives or programs developed by BRRI, the Agricultural Engineering Division of the Bangladesh Agricultural Research Institute (BARI), Bangladesh Agricultural University (BAU), and Bangladesh University of Engineering and Technology (BUET).

Water management

The development of irrigation through deep and shallow tube wells during the 1970s helped fast-track agricultural development. Over time, however, these tube wells, which are also used for irrigating rice, have suffered from severe floods, intrusion of saltwater, or a lack of water recharge.

Together with BRRI and the country's Department of Agricultural Extension, IRRI then introduced alternate wetting and drying (AWD) technology as a water-saving technique, which Bangladeshi farmers described as "an incredible clock for irrigation." It espouses irrigating the field only when needed by observing the level of water inside a plastic tube.

BRRI validated the technology at its seven regional stations covering more than 900 farmers' fields. Records show that yield was higher by around half a ton per hectare and water savings ranged from 15% to 25%. Other private companies and NGOs such as Syngenta, Petrochem, and Practical Action became interested and also tried the technology. This consequently started its large-scale adoption, which involved thousands of farms and farmers.

Bangladesh: fast facts (2009)

Population:	158,570,535[1]
Total land area:	130,168 sq km[1]
Average rice yield:	4.2 tons per ha[2]
Total rice production:	47.7 million tons[2]
Area planted to rice:	11.3 million ha[2]

[1] CIA World Factbook
[2] FAOSTAT

Fertilizers

In collaboration with BRRI and DAE, IRRI introduced the leaf color chart (LCC) to help farmers more accurately estimate the amount of fertilizer to use and reduce wastage. During the boro season of 2010, a number of farmers used LCCs and the country saved 150,000 metric tons of urea fertilizer.

Another innovation by IRRI, "Nutrient Manager," which also makes use of site-specific nutrient management principles, is under development for rice and maize in Bangladesh. This tool will be available in the future via the Internet and a mobile phone.

Rodents and insect pests

In the Chittagong Hill Tracts and other parts of the country, rats were reported to cause farmers severe losses in crops and grains. Rats invade people's homes, bite people, and cause dysentery and fever (see *When rats attack* on pages 44-45 of *Rice Today* Vol. 8, No. 4).

IRRI's Poverty Elimination through Rice Research Assistance (PETRRA) supported community efforts and the adoption of ecologically based rodent management in the area.

Capacity development

Aside from building the scientific expertise of many research and development workers through short-term training, IRRI has helped more than 200 Bangladeshi scholars attain their MS and PhD degrees. This has greatly increased the capacity of Bangladeshi rice researchers and has become an indirect instrument in the development of many improved varieties and management practices. IRRI continues to work with BRRI and other national partners so that capacity development remains an important objective of collaboration.

Challenges ahead

Conserving natural resources and tackling the impact of climate change remain a major challenge for rice research and development in Bangladesh. Improving productivity should also help reduce poverty, improve nutritional status, and bring gender equality. More than 20 initiatives in different areas are being carried out in Bangladesh in partnership with key organizations.

See sources in the online version. www.irri.org/ricetoday.

ISAGANI SERRANO

IRRI HAS been working closely with scientists at the Bangladesh Rice Research Institute since 1970.

IRRI

HAL HANVEY

Golden offspring

by **Teresa Taylor**

Clemson entomologist Merle Shepard develops Charleston Gold, an aromatic and tasty long-grain golden rice

Merle Shepard has been working for 13 years on an unusual "hobby," as he describes the process. It has been a long time coming, and Shepard is excited to reveal the result.

Shepard's pride is a new variety of rice named Charleston Gold. It is an improved aromatic offspring of Carolina Gold, the revered grain that brought Charleston untold wealth during the 18th and 19th centuries (see *Carolina Gold and Carolina White rice: a genetic odyssey* on pages 20-22 of *Rice Today*, Vol. 9, No. 4).

A Clemson University entomologist, Dr. Shepard is in a field of Charleston Gold (see main photo).

Although that large and prosperous economy is gone, rice lives on as an essential and celebrated part of Lowcountry[1] cuisine. Carolina Gold survives as a niche product sold to restaurants, by mail order, and in select grocery stores.

Dr. Shepard is doing his part to preserve the rice's cultural value. At the same time, he and other scientists are creating an opportunity for more profitable rice farming in the future. Charleston Gold is expected to have the needed blessings for larger-scale commercial growing by March 2012.

It piqued my interest

Dr. Shepard is an emeritus professor of entomology who works at the Clemson Coastal Research and Education Center on U.S. Highway 17 in West Ashley, South Carolina.

Enamored with Carolina Gold but in search of a better rice, he started a breeding program in 1998 at the International Rice Research Institute (IRRI) in the Philippines.

He had worked at IRRI for 5 years in the '80s as its head of entomology, following a dozen years teaching at Clemson. He came back to the Clemson system in 1988. "When I got to Charleston, realizing this was one of the biggest rice-growing areas in the States at one time, it immediately piqued my interest," Dr. Shepard says.

Dr. Shepard wanted to know whether rice could be developed with the best characteristics of Carolina Gold—long grain, delicious taste, aroma, and its striking golden hulls—combined with the genetic strength of a modern-day rice, one that resists diseases and other plights.

Gurdev Khush, former head of IRRI's Plant Breeding and Genetics Division and winner of the World Food Prize in 1996, made the first cross (see inset photo). It was between Carolina Gold and IR64, a long-grain rice widely grown in Asia with a shorter stature and "lodging" resistance.

Lodging is an often fatal condition seen in older, tall-growing rice varieties. It happens during heavy winds and hard rains.

"The plants just lie down, like a big animal lying down in the middle of the field," says Dr. Shepard.

"Charleston Gold's grain is longer and more slender than its Carolina Gold parent and it cooks dry and flaky," Dr. Shepard says. He indicated that lodging, in addition to the loss of slave labor, was another reason for the demise of the Lowcountry's rice industry. A series of weather events following the Civil War caused the rice to lodge, "so the yields were almost nothing.

"IR64, developed by Dr. Khush, also has some other advantages," Dr. Shepard adds. "This variety doubles or quadruples the yield of the old Asian varieties. And it tastes pretty darn good."

Dr. Khush went on to make a second cross at the Institute, and then began the process of selection, successive years of test crops and identifying the strongest plants in each generation.

Looking for Gold

Dr. Shepard received his first packets of rice seed from the Philippines in 2001. He started growing them out the next year and winnowed the original 25 family lines to 12, then 4.

By 2005, "We tentatively saw one that popped out above all the rest. We were already calling it Charleston Gold, although it was not really a named variety."

Within the next few years, the chosen rice underwent further evaluation by Anna McClung, a rice breeder and researcher in Texas. McClung did the "finishing"—making sure the new breed, true to type, was not producing rogue plants.

Charleston Gold also was grown in different places, in part to determine its hardiness against fungal diseases under different growing conditions. According to Dr. Shepard, it proved to have excellent broad-spectrum disease resistance.

"This is particularly important in organic production because you don't have to treat these diseases with any chemicals," he said. "Charleston Gold is perfectly fitted to an organic market."

Organics are growing about 20% a year, Dr. Shepard points out. "More and more people are going for organic stuff. I think there is a huge place for things like these grains."

A wonderful rice

Glenn Roberts of Anson Mills in Columbia and president of the Carolina Gold Rice Foundation also sees a bright future for the new rice.

He says Charleston Gold has the right characteristics to become a significant part of the market. Dubbed an "artisanal grain guru," Mr. Roberts works with organic grain growers in several states. He sells his products worldwide, including to more than 2,000 chefs in the United States.

He has already sold about 40,000 pounds (20,000 kg) of Charleston Gold this year, and says demand is growing every month.

"It's a wonderful rice," Mr. Roberts says. "I like the nuances."

Specifically, he thinks the rice ages well, with changes in flavor and texture that make it even more elegant and floral with time. He also says Charleston Gold is a good reflector of its terroir. "I love the idea that you can taste the ground and the water in the rice." But, "This does not take away from Carolina Gold," he points out. "It just increases the rice market and brings more attention to Charleston."

Brooke Byrd of Carolina Plantation Rice in Darlington, which is also growing Charleston Gold, says Lowcountry consumers can expect to see the new rice in coming months in specialty shops, Whole Foods Market, and in select Piggly Wiggly and Harris Teeter stores. Both Anson Mills and Carolina Plantation Rice are selling it online.

Shepard says he didn't receive outside funding or grants to specifically pursue the development of Charleston Gold. Dr. Khush and Dr. McClung also joined in purely out of personal interest, he says.

"It was just something we had an intense desire to do and we made it happen."

Ms. Taylor is the food editor of The Post and Courier *in Charleston, South Carolina, U.S.A.*

Edited version reprinted with permission from The Post and Courier.

See related video at http://snipurl.com/charleston_gold.

[1] Lowcountry is a region in South Carolina, U.S.

India's 2010-11 bumper crop and low export price soften the impact of historic flooding in the Mekong Delta and of the Thai rice mortgage program

STRIKING A BALANCE

The 3rd World Rice Conference feature

by Aileen Macalintal

A. AMIRA Foods (India) President Karan Chanana. *B.* Rice Exporters Association (Thailand) President Korbsook Iamsuri. *C.* NFA (Philippines) Administrator Angelito T. Banayo. *D.* TRT CEO Jeremy Zwinger with Myanmar delegates, winner of 2011 Rice Tasting contest. *E.* Over 500 participants attended the 3-day event. *F.* Rice grain exhibits. *G.* Delegates from around the world.

India's export machine emerged as the talk of the town in Ho Chi Minh City during The Rice Trader's (TRT) 3rd World Rice Conference, because of the country's re-entry into nonbasmati rice exports with prices almost half of those of the biggest rice exporter, Thailand. Clearly, policy and climate change still make price watching more unpredictable than ever.

More than 500 rice traders, experts, policymakers, and other key players in the market from all over the world participated in the three-day conference (19-21 October) held at the Sheraton Saigon Hotel in Vietnam.

Talks of the trade: the import side

Setting the mood for the conference, TRT President and CEO Jeremy Zwinger gave a general overview of the global rice trade: India's back-to-back news of lifting the export ban in September and its notably low prices; the Thai flooding, which delayed the impact of the government's rice-buying program; and the risks in planting rice compared with planting other crops, thanks to climate change and the shifting global supply/demand equation. According to Mr. Zwinger, these "game changers" caused the market to be volatile and it will continue to be volatile.

Vice Minister Bui Ba Bong of Vietnam's Ministry of Agriculture and Rural Development shared a positive outlook on Vietnam's rice exports despite the flooding of rice paddies in the Mekong Delta and India's competitive prices that challenge the country's market share.

Administrator Angelito T. Banayo of the National Food Authority (NFA) reported that the Philippines significantly lowered purchases in 2011 on its way to rice self-sufficiency: the 2007-08 imports of 2.552 million tons went down to 1.843 million tons in 2008-09, up in 2009-10 to 2.352 million tons, and then dramatically down to 860,000 tons in 2011.

When asked about possible deals with countries other than Vietnam—its major exporter— Administrator Banayo said that NFA is open to such deals. "Our population has been growing fast and our rice production has not been able to cope with the consumption," he said. He backed this up with the country's annual per capita consumption of rice, which is 119 kg, multiplied by millions of rice consumers. Furthermore, recent blows from typhoons account for an average production loss of 477.8 thousand tons.

Bangladesh and Indonesia showed a striking resemblance in their country reports in terms of growing population and increasing demand. Rice production in Bangladesh is currently 32.6 million tons for a highly dense population of 150 million, according to Iladi Dad Khan of the Ministry of Food and Disaster Management, Bangladesh. Indonesia, on the other hand, has more than 240 million people and its rice production in 2011 was 42.70 million tons, which was below the target.

President Director Sutarto Alimoeso of Perum Bulog, the world's current top importer, emphasized, "We don't want to disrupt the market." Thus, he pointed out that Bulog is working on a price stabilization policy.

The export side

On the export side, Korbsook Iamsuri, Rice Exporters Association president in Thailand, shared that the country is facing three "new things," which dominated the market in 2011. These are new leadership in the government after the elections; the severe flooding, which was dubbed "the most severe deluge in decades"; and tough competition with India. Ms. Iamsuri reported that, under the pledging program, the Thai government plans to buy unlimited grain and release stock at a higher cost, but under "superstrict supervision."

President of Amira Foods (India) Karan Chanana observed that traders constantly remark on India's low prices, and Pakistan is following this trend. Analysts see this plunge in rice prices as an advantage as it offset what could have been a surge in prices brought about by the Thai pledging scheme. India's prices were seen as an equalizer that came at the right time.

Why could India afford to pull prices down? According to Mr. Chanana, it is the increase in rice production area. India's 2010-11 bumper crop reached 99 million tons, which is already its annual production, and it has a value of 1 trillion rupees (US$19.4 million).

Mr. Chanana explained that the rice industry forms the economic backbone of India because rice gives jobs to 70% of the country's labor force. Basmati, which literally means "*an aroma that pleases the senses,*" is grown once a year in India and Pakistan only. A trade that is being dominated by India, basmati contributed to the steady increase in Indian exports from 1999 to 2010. He added that 95% of India's exports are shipped to Saudi Arabia, the Middle East, and the United Arab Emirates. India's rice accounts for almost a quarter of global rice production at 21.5%.

The global rice market and food security

IRRI economist Samarendu Mohanty reported that the IMF Food Price Index, which was on an upward slope from 2001 to 2011, reached its peak from 2008 to 2011. Unfortunately, parallel to this is the increasing number of hungry people.

Dr. Mohanty focused on the effect of current events on global food security, that is, the "tug of war in the global rice market." He said that the rice price was pulled up by typhoons in Asia together with the Thai mortgage policy, and now it is pushed down as India resumes its exports of nonbasmati rice and its good 2011 crop. He further said that India's re-entry can actually "bring the global rice market to its knees" as it "nullified" the impacts of Thai policy.

Focusing on the Thai rice mortgage program, Dr. Mohanty commented that Thai taxpayers carry the burden since rice is expensive in the domestic market (which could have a weak infrastructure). Dr. Mohanty mentioned that, to meet world demand, 116 million tons of rice are needed by 2035 amidst the scenario of a slowdown in rice yield growth in the last decade.

Lastly, Dr. Mohanty emphasized the role of IRRI in outreach and training programs, research, and benchmarking of price. He said that the hurdles to food security are high government interventions, the lack of grading standards, and the absence or lack of a robust cash market. He recommends four ways to secure rice in the future: (1) revamp productivity growth (target: 1.0–1.5% per year), (2) allow rice to move across borders, (3) devise a mechanism for price discovery and price risk management, and (4) implement domestic market and policy reforms (organized retailing and direct income support to farmers).

Best-tasting rice

Another highlight of the event was the annual Rice Tasting Contest, now in its third year. It was judged by Chef Michael Cross, winner of the Lord of Rice Chef Contest in 2011. The Myanmar Rice Industry Association won the *World's Best Rice* 2011 with its entry, Myanmar Pearl Pawsan specialty rice.

The Myanmar Rice Industry Association and International Rice Producers were neck and neck in the contest but Myanmar pulled ahead with 14 out of 15 points.

This is the first time that Thai rice did not win this contest. International Rice Producers placed second with Thai Jasmine rice, Riso Gallo from Italy placed third with its Venere Black Rice variety, Xian Na Lan from China came in fourth with its entry of Hom Mali rice, and fifth place went to Genesis Grains with Premium Calrose rice from California.

“Train us”

Story and photos by **Ma. Lizbeth J. Baroña**

A Filipino farmer’s desire to be taught brought rice-growing best practices to his farming community

Back in 2006, a farmer in the town of Victoria in the Philippine province of Laguna asked his local government to assist him in sending a message to the International Rice Research Institute (IRRI): “Train us.”

Soon after, Mr. Casiano Estrella Jr. and his fellow farmers in his municipality went through the Cyber-Village Project—a coaching of farmers on how to get important farming information from an Internet-based portal of rice technologies called the “Pinoy Rice Knowledge Bank” (Pinoy-RKB).

Pinoy-RKB

The project, now in its second phase, started in 2006 and has reached about 3,500 farmers in 12 municipalities across the country. IRRI is working closely with the Philippine government, through the Philippine Rice Research Institute (PhilRice), in carrying out the project.

The Pinoy-RKB is a country-specific off-shoot of the Rice Knowledge Bank, which shares information about best practices, as well as updated technologies for all stages of rice production, with farmers (see *Banking on our rice knowledge* on pages 36-37 of *Rice Today* Vol. 8, No. 3).

On a rainy morning in August 2011, a second group of rice farmers from Victoria was about to get the same training as their fellow farmers did 5 years back. The local farmers’ enthusiasm could be traced to one man: Casiano Estrella Jr., or Mang Jun, as he prefers to be called.

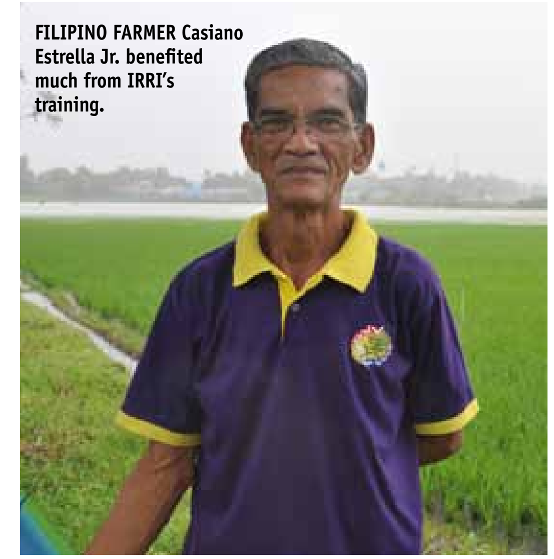
A community man

Mang Jun is a high school graduate who never stopped learning. His thirst to learn was fueled by another passion: serving his community.

A young Jun landed his first job as an assistant to community projects at the University of the Philippines Los Baños (UPLB), located a few kilometers north of Victoria. He went on to work for UPLB’s sister campus in Manila as a clerk. His stint with UPLB, however, stirred his heart for the community, something that never really left him. So, he left his job at UP Manila, and returned to Victoria.

He took his desire of serving his community further by running for municipal councilor as an independent candidate in 1995, and won. During this time, Mang Jun established ties with the municipal agriculture system, which proved helpful for him several years after he embarked on rice farming.

“I ran again in the following election for a second term, but I lost,” Mang Jun said. “That was the time when I decided to become a rice farmer.”



FILIPINO FARMER Casiano Estrella Jr. benefited much from IRRI’s training.

Banca-Banca

To aid in his early years as a rice farmer, Mang Jun applied for membership in a local rice farmers' group named Banca-Banca Multi-Purpose Cooperative.

“I wanted to avail of the credit privilege to start up my farm,” he said. But as Mang Jun would realize soon, he had established himself as a community leader well enough that, in 2003, not only was he accepted into the cooperative, but was voted to lead the organization.

Train them

As a leader, Mang Jun looked to educating his fellow farmers as a way to tackle the problems on their farms.

“I’d long heard about IRRI when I was still with UPLB, and that it is located right in our backyard,” he recalls. It was during one of his municipal government-sponsored tours to the Institute that Mang Jun recalls a “light bulb” moment.

“I heard during one of my field trips to IRRI that they were conducting a project called ‘cyber-village,’” he said. After understanding that the project targets different municipalities across the country to introduce rice technologies through the IRRI Rice Knowledge Bank, Mang Jun wanted his fellow rice farmers in Victoria to have such training.

“I asked for the help of our local municipal agriculturist and provincial officials to facilitate Victoria’s rice farmers’ training,” he said.

Farmers’ learning hub

“We have a center in our community where we have reading materials and a computer that allow us to access the Rice Knowledge Bank,” Mang Jun said. “Before, we could not even identify a disease properly so we sprayed pesticides anytime we wanted.

“Because of the training we had, and the constant checking with the RKB, we now know that you should not just spray anytime you want to because there are insects in the field that actually help fight pests,” he added.

Mang Jun said that, after their training, they became aware of integrated pest management (IPM), and promptly practiced it. They soon realized that IPM was not only good for the farm’s health, but it also kept their overhead costs lower than before (see also *Managing pests with nature* on page 46).

Now, they can balance what they heard from the pesticide agents who used to visit them with what they know about best practices in pest management.

Due credit

Perhaps the clearest indication of change that Mang Jun observed in his community is that his fellow rice farmers can now be trusted by their cooperative’s credit system with bigger loans.

“Before we applied these technologies on our rice farms, our credit program in the cooperative lended only about Php18,000 (about US$400) per crop to a farmer for fear that he might not be able to pay it back,” he said. “But now, after improving the ways they manage their rice, their yields have increased over the years, and so the average credit that our cooperative now gives to farmer-members increased to between Php30,000 and 50,000 ($1,300–$2,100).”

Changed

“We have always been committed to helping the Philippines’ rice-growing sector,” said Mr. Julian Lapitan, head of IRRI’s National Programs Relations. “We are happy to see a positive response to our efforts in communicating good rice-growing practices to Filipino farmers.”

As I said my goodbyes to Mang Jun, he joined the rest of his fellow farmers and Victoria municipal extension staff, who at the time were inside a local Internet cafe, receiving tutorials from IRRI and PhilRice staff on how to use the newly launched technology on managing the application of nutrients on their rice farms.[1]

“Things have really changed around here,” he smiled.

FARMERS CONSTANTLY visit the Rice Knowledge Bank Web site to learn more about rice farming.

[1] http://snipurl.com/fertilizer-tips.

Plight of the rice birds

by **Greg Howell**

Do we want a world where Java has lost its sparrow?

Rice is life for nearly 3.5 billion people around the globe, especially in Asia, but, before people came to dominate the Asian landscape, many organisms had evolved to exploit this nutritious group of swamp grasses. Today, we call these other rice-consuming organisms pests and diseases as they compete with us and our growing population for the fixed resources of the Earth. One particular group that farmers target are the granivorous or seed-eating birds, and, although some less specialized birds such as sparrows are faring well in this fight, many of the grass finches[1] (Estrillidae), once considered pests, are rapidly declining.

Information on how to reduce the damage caused by birds to rice production is available from the International Rice Research Institute (IRRI) and government agencies but precious little information exists on preserving the avian diversity of cultivated rice ecosystems, especially when the opportunity cost might just be a farmer's next meal. Advocated bird control measures range from passive and active scaring methods (using visual and sonic cues) to active trapping and brutal extermination such as stamping on the netted birds as is promoted in Sabah, Malaysia.

The most specialized rice eater of all the granivorous birds is the Java sparrow or Java rice bird, known scientifically as *Padda oryzivora,* which literally means "rice eater of the field." In the Philippines, this bird is also known as *mayang costa*. The Java sparrow is the largest of the estrillid finches. Its huge red beak is uniquely adapted to dehull even mature rice—a trick that is beyond the ability of most other finches. Hence, it has become an unwelcome competitor for cultivated rice crops.

It is believed that, before the advent of rice cultivation, these birds lived in the savanna and woodland surrounding swamps dominated by wild rice species in Java and Bali, Indonesia. As rice cultivation developed, the Java sparrow also spread out along with it.

This unwitting partnership between humans, their rice, and the Java sparrow worked well until the human population grew and the increase in rice cultivation started to encroach on the birds' natural habitat: the ecotone[2] between the rice paddy where the birds fed and the trees and structures where they nested. Now, Java sparrows are in danger of becoming extinct in Indonesia. Although the species may now be arguably regarded as valuable in Indonesia, the Java sparrow is still considered a feral pest in Christmas Island, Hawaii, Fiji, and the Philippines. In many places where these birds now live, they have been relentlessly hunted not just because they are considered as rice pests but also because of their desirability as caged birds.

JAVA SPARROWS can be bred in captivity.

ISAGANI SERRANO

Ironically, Java sparrows are one of the easiest species to breed in captivity. However, economic circumstances and poor regulatory control in Indonesia favor the movement of the remaining wild birds from the fields to a life of barren captivity as most owners are keepers rather than breeders of birds. The closely related Timor sparrow (*P. fuscata*) is even more threatened by these processes and the genetic integrity of the few captive populations held outside the Indonesian archipelago is threatened by hybridization with the Java sparrow by careless avicultural practitioners.

With few exceptions, grass finches are all adapted to eat grass seeds although some species supplement the diet of their hatchlings with insects during the breeding season. Reproductive success in estrillid finches largely depends on the grasses they feed upon. In rice and other grasses, all the protein that will ever be stored by the grain is translocated into it during the first week after pollination while the endosperm is liquid. This protein-rich milk is what sustains most estrillid nestlings in the wild, but, to have a continuous supply requires a diversified landscape containing a mosaic of genotypes at different stages of growth. Unfortunately for the birds, modern agricultural practices seek to shorten the period until maturity and to synchronize grain filling not just within a plant or a single crop but across the landscape.

SEGFREDO SERRANO (2)

For millennia, the landscape across Asia was a mixture of rice paddies, primary and secondary forest, isolated villages, and urban centers. This suited many granivorous birds. The lack of temporal and spatial continuity between crops isolated the birds, and also helped contain outbreaks of plant diseases and pests.

After World War II, modern agricultural techniques were introduced. Productivity went up, and the barriers that separated rice paddies started to disappear, creating the present agroecological landscape. These changes have not only shrunk the food supply for the specialized granivorous birds but have also reduced the available nesting sites since none of the granivorous birds actually nest in the rice fields. They do, however, need close access to rice fields and other seeding grasses in order to raise their young.

Weeds constitute an alternative seed source within a rice crop and, in fact, many estrillids, particularly the munias (*Lonchura* spp.), prefer barnyard grass (*Echinochloa* sp.) over rice. Of course, no farmer would want to waste space, water, fertilizer, and insect control measures, or other resources, to grow food for birds when those resources could be used to grow more food for the family or for trade, so weeds are removed or minimized within a crop.

ARTIFICIAL NESTING boxes were incorporated in the restoration of the Prambanan Temple in Java.

DWINITA WIKAN UTAMI

As the human population increases, the number of commensal species that exploit the anthropogenic landscape has decreased but there are some winners. The Eurasian tree sparrow, in particular, has adapted well in this competitive environment. The protein requirements of nestling sparrows do not depend on immature milk-seed, but rather on insects that abound in a well-functioning paddy. Most estrillids nest in trees or shrubs but a few, such as the *Padda* spp., are cavity nesters. They use natural tree hollows and rock crevices or, in developed landscapes, they opt for roof cavities and other spaces within buildings. This habit places them in direct competition with the worst of their avian competitors, the Eurasian tree sparrow. Increasing affluence too can have a direct effect as buildings are repaired and construction standards are introduced, which reduce the available nesting opportunities for cavity-nesting birds.

So, what hope is there for the Java sparrow? It may be endangered in its home in Indonesia, but it is secure where it has established feral populations and also in captivity. Diminishing nesting opportunities can be overcome by providing artificial nesting boxes as was demonstrated during the restoration of the Prambanan Temple in Java. Increasing affluence in Indonesia has brought about not just a larger population that wants to keep birds, but a more educated population that wants to preserve them in their native habitat—and this should drive the political will to enforce regulatory controls on trade in endangered species. Ecotourism and bird watching bring millions of dollars of foreign revenue to Indonesia each year. Visiting Java would not be complete without seeing the Java sparrow. The future of the Java sparrow and every species lies with the collective responsibility of humanity to control its own population and its impact so that Earth remains a diverse, healthy, and resilient place for all its inhabitants.

Dr. Howell was an Australian research scientist working in IRRI's Plant Breeding, Genetics, and Biotechnology Division. He came to IRRI in 2004 along with his wife, Melissa Fitzgerald, who headed the Grain Quality and Nutrition Center at IRRI. He worked part-time on research about time of day of flowering in rice as a possible avoidance mechanism for reducing heat-induced sterility during flowering. Dr. Howell and his family returned to Australia in December 2011, where he hopes to keep and breed finches once more, including the Java sparrow.

[1] Any of several small finch-like birds found from Africa across Asia and into Australasia.
[2] A transition area between two adjacent but different patches of landscape, such as forest and grassland.

Sowing the seeds of rice science

by **Imelda R. Molina, Randolph Barker, Gelia T. Castillo, Pamela Castanar,** and **Noel Magor**

IRRI's 50 years of providing training played a critical role in building research and extension capacity in global rice science

Over the last 3 years, a study has been conducted to document past IRRI training activities, assess the impact of IRRI training, and ask the question, "Where do we go from here?" This article summarizes the results of this study.

Valuing training activities

The Green Revolution has been associated with the development of high-yielding or modern rice varieties. However, the rapid and successful spread of the high-yielding varieties has been largely because of IRRI's training program. Over the past half century, the training program has sown the seeds of rice science in every corner of the rice-growing world. Close to 12,000 rice scientists and extension workers have found their way to Los Baños, Laguna, where the IRRI Philippine headquarters is located.

From the start, IRRI management has recognized the need for training in both research and extension activities to achieve sustained increases in rice production. However, obtaining enough financial support for training has often been difficult. This has been particularly true in recent years, just when rapid changes in science and technology emphasize the need for a strong training and capacity-building program. In some countries, national agricultural research and extension systems (NARES) staff now have a dearth of agricultural scientists to replace senior scientists who have reached retirement age and are not being replaced. In short, *training has been undervalued.*

A study of IRRI training activities

As of December 2010, a total of 11,599 trainees had benefited from the courses offered by IRRI, 10,031 in nondegree training and 1,568 in MS/PhD degree programs. The study examined, among other things, trends over time from 1962 to 2010 (see Fig.), which show an increase in female participants.

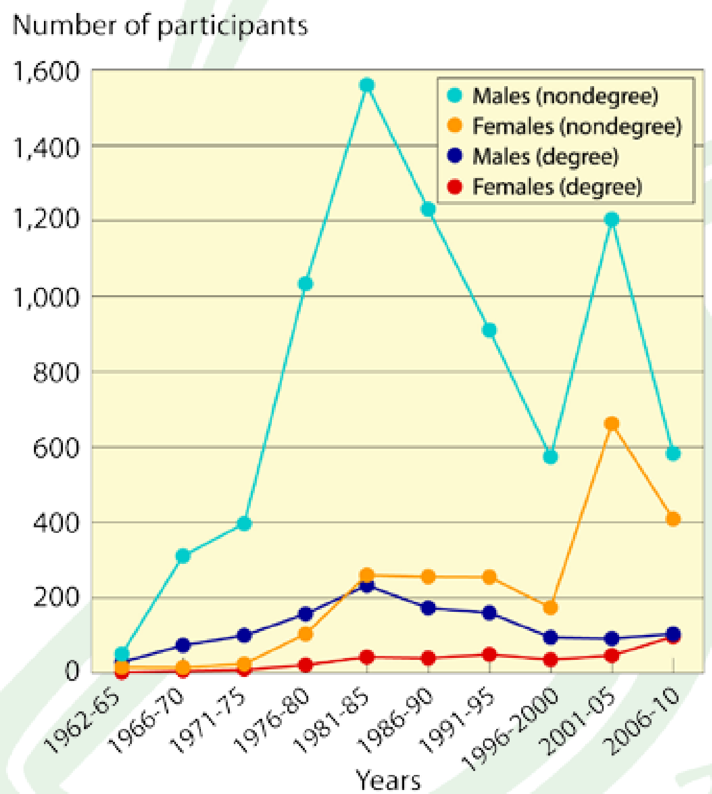


Fig. Distribution of IRRI training participants by type of courses and by gender (1962-2010).

Nondegree training

From the 1960s to '80s, 6-month and 2-week training courses focused on rice production. (See historic pictures of the early training program participants and staff members on page 41.) The 2-week rice production training courses were offered to IRRI staff members and Peace Corps volunteers. For some time, cropping systems and water management were of interest, too. Now, the short courses, usually 2–3 weeks, reflect a shift of interest, priorities of individual programs or scientists, and availability of funding. As a result, a set of training activities is much more diverse. Ideally, training activities should complement IRRI research priorities.

Degree training

Over time, scholars in crop management and agronomy have become fewer and those in socioeconomics sharply decreased. But, scholars increased in areas such as plant breeding, genetics, genomics, and molecular biology. This trend is evident in universities in both developed and developing countries. This reflects that interest in traditional agricultural sciences has declined.

What the alumni say

When we surveyed 50 IRRI degree scholars (mostly alumni from the University of the Philippines Los Baños), all of them felt that the training program enhanced their capacity to contribute to research and development "at home."

When asked to rank NARES research capacity and the demand for IRRI training, many of our alumni would like to continue a relationship with IRRI through further training and research opportunities.

Four of IRRI's outstanding alumni, Jikun Huang of China, Jose Hernandez of the Philippines, Tin Htut of Myanmar, and Phan Hieu Hien of Vietnam, were recognized during IRRI's 50th anniversary celebration in Hanoi in November 2010 for their significant contributions in advancing the Institute's mission to reduce poverty and hunger, improve the health and welfare of rice farmers and consumers, and ensure protection of the rice-growing environment (see *2010 outstanding IRRI alumni* on pages 36-37 of *Rice Today*, Vol. 9, No. 4). We asked an outstanding alumni awardee, Jikun Huang, director and professor of the Center for Chinese Agricultural Policy, Chinese Academy of Sciences, to explain briefly how IRRI training has affected his career.

Dr. Huang says:

"The time I spent in IRRI as a PhD scholar and postdoctoral fellow was one of the most important experiences in my life. My training at IRRI has significantly influenced the way I work in at least three areas after I returned to China in 1992. First, I always followed what I learned at IRRI on how to prioritize policy issues for research, which is critical for decision making in developing countries, including China. Second, my IRRI experience has led me to decide in dedicating my entire research efforts to empirically based policy studies, which have helped me not only in publishing papers in academic journals, but more importantly in contributing to national policy making. Lastly, I learned the value of keeping the spirit of teamwork and engaging in multidisciplinary research that provided me opportunities to contribute to research in other fields using my knowledge in economics and policy."

Impact of IRRI training

Reports were prepared on the impact of IRRI training in seven countries: Bangladesh (1964-2010), Cambodia (1987-2010), India (1964-2010), Laos (1993-2007), Myanmar (1989-2000), the Philippines (1963 to present), and Vietnam (1963-2010). Aside from NARES, a major beneficiary of the training programs has been IRRI itself in its research undertakings.

IRRI's research and training programs have no doubt played a critical role in building the research capacity of many NARES in Asia. Several studies point to IRRI's substantial contribution to the development of rice science and rice-related knowledge and technology and its dissemination and also to the establishment of a fully functional rice research system in NARES. In almost 50 years, IRRI has helped develop a well-trained cadre of research scientists and managers who are now providing scientific and management leadership in many agricultural research systems.

Where do we go from here?

Developing the IRRI training program database of various programs has taken considerable time. Now, it is a relatively easy task to continue and broaden the database on trainees.

Also, now would seem to be a good time to maintain stronger contacts with former IRRI scholars. This would include consulting with our outstanding alumni on their future needs. The alumni could assist IRRI, its donors, and NARES in planning future training and capacity-building activities. Also, IRRI should recognize and award outstanding alumni from time to time as it did in Hanoi in 2010.

It cannot be overemphasized that training has been the lifeblood of IRRI. Almost 12,000 scientists from IRRI and NARES have benefited from their IRRI training. IRRI management is prepared to continue to invest considerable resources in the training and development of the staff and NARES partners.

Source:
Molina IR, Castillo GT, Castanar P, Magor N, Barker R. 2011. Sowing the seeds of rice science: Achievements and future directions for training at IRRI. Monograph. IRRI, Philippines (forthcoming).

Dr. Molina is an associate scientist in IRRI's Social Sciences Division (SSD) and Ms. Castanar is a former professional service contract employee in SSD. Dr. Barker is a former SSD head and emeritus professor at Cornell University, Dr. Castillo is an IRRI consultant, and Dr. Magor is head of the Training Center at IRRI.

The authors are grateful to Training Center (TC) staff members Priscilla Comia, Ma. Socorro Arboleda, and Anilyn Maningas for giving us access to the TC-OSA (Office of Scholars' Affairs) database.

What's cooking?

CHRIS QUINTANA (2)

Soft-centered chocolate pudding using rice flour

Chocolate puddings are great for dinner parties. This recipe can be prepared between courses. The ingredients are fairly simple since it's basically a soufflé mix. The rice flour in the recipe acts as binder, so adding too much flour would make it too heavy. Rice flour is being used to create foods that require starch because of growing allergy problems worldwide tied to the use of wheat flour. Since this pudding is similar to a soufflé, it's better to overcook it and lose the soft center than to take it out too early and have it collapse.

My own sense of fulfillment comes from being able to make something truly magnificent and present it to friends. Even if you don't grow or prepare every ingredient every single time, an intimate knowledge on how it is done enriches my appreciation—way beyond anything that is presented fait accompli *in a restaurant or place where I first encountered a food that I particularly like.*

by **Greg Howell**

Ingredients

- 100 grams butter (3.5 oz)
- 200 grams dark chocolate (7 oz)
- 140 grams granulated sugar (approximately 1 cup)
- 4 eggs
- 40 grams rice flour (approximately 1/3 cup)
- vanilla paste or essence to taste

Directions

1. Butter and flour six 200-milliliter (3/4 cup) darioles (small round molds).
2. Melt chocolate and butter together and mix thoroughly until glossy. Take care that the chocolate only just melts as it can split and, if it is too hot when added to the egg mixture, can partially cook the mixture before it is incorporated.
3. Separate the whites from the egg yolks and beat the whites with an electric mixer on high until foam forms.
4. Continue to beat as you gradually add the sugar.
5. When you can no longer feel the sugar granules, add the yolks and continue to beat them until incorporated.
6. With a whisk, add the chocolate mix and a teaspoon of vanilla paste.
7. Lastly, whisk in the rice flour.
8. Spoon or pour the mixture into the prepared darioles until they are ¾ filled.
9. Bake in a preheated oven at 180 °C (350 °F) for 10 to 15 minutes.
10. Turn off the oven and let the puddings sit for at least 10 minutes before serving.
11. To serve, run a knife between the outer edge of the pudding and the mold, then turn it out onto your serving plate.
12. Dust with confectioner's sugar and serve with vanilla ice cream or fresh whipped cream.

Serves 6.

Watch Dr. Howell demonstrate how to prepare this dish in a 7-minute video on YouTube at http://snipurl.com/pudding_rice and see a short note about him in his article *Plight of the rice birds* on pages 38-39.

Hidden Treasure*

Truths about 2012

"To see what's in front of one's nose is a constant struggle," said George Orwell. This implies a political attitude that can be observed in some countries in the face of a crisis. What comes to mind are the perennial problems of poverty, food scarcity, and financial debt crises. The first two are typical problems of poor countries, while the third is mostly confined to rich countries or those with complex economies. Rich or poor, though, one can feel the inability to deal with truth at the worst of times as clear for all to see, together with history's tendency to repeat inconvenient truths (such as debt problems).

Indeed, recognizing the presence of these issues right in front of us is a struggle and a skill, if not a gift that we have yet to receive. Common sense tells us that ignoring or pretending that problems do not exist does not stop them from existing. In fact, ignoring them only makes things worse. I have always been telling my staff and family, "If you don't own your problems and emotions in a tough situation, those problems and emotions will own you."

At the onset of 2012, a refreshing resolution would be to see the truth that stares us in the face, and deal with it. Scarcity in varying forms is the single truth that we constantly need to confront this year, so that we stretch our limited resources and maximize happiness within a limited time. Since rice feeds half of the world, it is one crop that we don't want to be scarce because we don't want half of the globe to go hungry.

The Food and Agriculture Organization (FAO) forecast global rice trade to be down to 33.8 million tons in 2012 from 34.3 million tons in 2011. According to the FAO Rice Market Monitor (November 2011, vol. XIV, issue no. 4), international rice trade was at "an all-time high" as it went up by 1 million tons because of the increase in Asian demand for rice imports. In 2012, this may not be the case because of the low import demand from Asia, following the decline in Thai exports and Asia's high domestic stocks (particularly in India). I see this New Year in a positive light, though, and feel that rice trade will be put in balance by promising imports from India, Pakistan, and Myanmar, back to back with demand from China, Southeast Asia, Africa, and the Middle East.

From a rice trader's perspective, scarcity will be a problem if we underestimate the needs of our growing population, ignore the drastic effects of climate change, undervalue rice production in a backdrop that includes the production of other grains, fail to distribute rice surpluses, and fail to take advantage of the benefits of rice research and development. Also, one needs to realize the value of rice trade, of how important it is in compensating for the lack of supplies in certain areas.

Divisions throughout the world, in the philosophy that governs society, in finances, in available resources, and in terms of food and availability, are yet another truth that one cannot ignore. The truth is that the number of hungry on the globe is much greater than what many in the political realm want to admit, because to admit this means to dedicate efforts for a solution, but this is not the case; hence, reluctance to accept the reality.

The intellectual divide is further widened in a world that is hampered by increasingly limited opportunities for success. While computers help bridge the gap, not everyone in the world has access to electricity.

Another great divide is motivation. The truth is that certain nations do not want to work at a pace of efficiency that comes naturally to other nations, and yet these nations want to have the same amount of benefits compared to what has been painstakingly built over many years of exhaustive effort. This is a reality that so few want to talk about as it reveals a lack of responsibility. Frankly, any entitlement-based society is not good because it reduces efficiency and clouds the natural truth that rewards should largely go to those who created growth in the first place. The world is beset with many problems and the key lies in being truthful about problems, as this opens doors to solutions.

So, my prayer as 2012 starts is that it will be a year of wise reflection in which our hearts open to the truth.

Jeremy Zwinger

Jeremy Zwinger
Publisher

* The opinions expressed here are those of the author and do not necessarily reflect the views of the International Rice Research Institute.

ODISHA: THE FUTURE GRANARY OF INDIA

by **Sam Mohanty, Satya R. Das,** and **Murali Gumma**

The poor Indian state of Odisha has to overcome first the human-made constraints to high yield and the challenges of climate change to become India's future granary

Odisha, formerly known as Orissa prior to 5 November 2011, is one of the poorest states in India, with more than 45% of the population below the poverty line—the highest in the country.[1] More than half of its population of 42 million suffers from chronic energy deficiency, almost half (48%) of the women have a nutritional deficiency, and two-thirds of the children have some form of anemia.

Odisha is an agrarian state with agriculture and allied sectors contributing to nearly 22% of the state gross domestic product in 2009-10. Nearly 70% of the total workforce is directly or indirectly employed by this sector. Despite its importance in the state economy, agricultural production still depends on the mercy of the rain god. More than half of the 9 million hectares of total cropped area in 2008-09 depended on monsoon.

Rice is the major crop grown in the 15.5 million-hectare state, accounting for nearly half of the total cropped area and more than 90% of the total cereal area, and is also a major staple food for a majority of the population. Besides its importance as a major staple, rice is also deeply engraved in the rich Oriya tradition and culture, in which various festivals can be traced back to different growing phases of rice.

Odisha's rice production

Despite its economic, strategic, and cultural importance, rice productivity in Odisha is one of the lowest in the country. The state remained untouched by the effects of the Green Revolution for three decades since the mid-1960s, with paddy yield hovering around 1.5 tons per hectare. This has resulted in a decline in its share in the country's rice production from more than 11% in the pre-high-yielding-variety period to less than 8% in recent years.

However, in the past 15 years, the rapid increase in yield growth saw paddy yield increasing from 1.5 tons per hectare in the mid-1990s to more than 2.5 tons per hectare now. Despite this, average paddy yield in the state is still well below the national average of more than 3 tons per hectare.

In the last four decades, rice area in the state has been stagnant at 4.5 million hectares, with production growth completely dependent on yield growth. More than 90% of the total rice is grown in the kharif season, accounting for two-thirds of the total kharif cropped area. The plateau terrain of the state, with yellow laterite and lateritic soils, is low in organic matter and NPK, accounting for 60% of the state's rice area. The remaining 40% of rice is grown in the coastal belt with alluvial soil, which is generally fertile but low in nitrogen and phosphorus.

The slower yield growth of paddy in the state could be explained by the lack of proper infrastructure, including irrigation facilities, input availability, output marketing, transportation, and storage; socioeconomic conditions of the farmers; and the size of landholdings.

The following six problems need to be overcome:

1. Dependence on the whim of nature and no irrigation for about 60% of the total rice crop make intensive agriculture difficult. A majority of rice-growing areas that depend on rain are in the western belt, whereas surface- and groundwater-irrigated rice is predominantly limited to the eastern coastal belt (Fig. 1).
2. Fertilizer application was only 10 kilograms per hectare on an NPK basis until the early 1990s (Fig. 2). It has increased to about 60 kilograms in recent years but remains well below the all-India average of nearly 100 kilograms. With this increase, the use of urea is still excessive.
3. The small landholding size (half of rural households own less than a hectare) and continuous fragmentation make it difficult for farmers to adopt modern rice production technologies.
4. Inadequate rural credit, coupled with poor economic conditions of small and marginal farmers, which account for 80% of total farmers and 50% of total landholdings, is also responsible for low input use and low adoption of capital-intensive technologies.
5. The poor seed replacement rate of less than 10%, with more than half of the farmers using their own 10- to 15-year-old seeds, also contributes to lower yield in many parts of the state.
6. A lack of marketing facilities for paddy and the absence of government procurement in many parts of the state add to farmers' misery and contribute to low input use and the use of non-capital-intensive technologies.

Apart from these human-made constraints, delays in sowing and loss of crops due to the frequently extreme weather also result in more variations in paddy yield on a year-to-year basis. The state has been plagued by one or multiple stresses in most of the years in the last four decades. So far, in the last four decades, 55 high-yielding varieties have been released in the state. But none of these varieties are suitable for harsh ecosystems such as flood-prone semi-deep water, drought-prone upland with severe weed problems, and coastal saline areas.

Ways to move forward

Since two-thirds of the total rice area is not irrigated, priority should be given to improving productivity in rainfed systems. The diverse ecosystems under which rice is grown within the rainfed system make it difficult to prescribe a blanket technology package for the entire region and careful evaluation is needed to develop a customized technology package for each ecosystem. For example, the technology package for the rainfed upland rice production system (15% of rice area) should tackle the problems of weed growth and recurrent drought. Similarly, in the rainfed lowland system that accounts for nearly half of the total rice area in the state, the development and use of rice varieties tolerant of submergence and stagnant flooding should be a top priority.

National and international agricultural research organizations have many ongoing initiatives to improve productivity in the unfavorable regions of the state. For example, IRRI has introduced many stress-tolerant varieties in Odisha through the STRASA (Stress-Tolerant Rice for Africa and South Asia) project in recent years. It is working closely with research institutions, the state agriculture department, Orissa State Seed Corporation, National Seed Corporation, several small seed growers, and NGOs for the dissemination of submergence-tolerant varieties (Swarna-Sub1, IR64-Sub1) and a drought-tolerant one (Sahbhagi dhan) in the state. Odisha was the first state to release flood-tolerant variety Swarna-Sub1 in India. Although salinity-tolerant variety IR720946 has not been released in the state, its performance in some parts of the state has been encouraging so far. Similarly, the Indian government is addressing some of these challenges through its National Food Security Mission (NFSM) and is focused on increasing production through quality seed, integrated nutrient management, and integrated pest management.

There is also plenty of scope to improve paddy yield in the irrigated ecosystem from the current 3–3.5 tons per hectare through improved varieties, better water management practices, and balanced fertilizer application.

Imbalanced fertilizer application is a major concern for both rainfed and irrigated ecosystems throughout the state and has resulted in lower yield growth due to depletion of soil fertility, higher incidence of pests and diseases, and other nutrient deficiencies. The NFSM is trying to tackle some of these emerging issues by introducing resource-conserving production practices such as balanced fertilizer application but more needs to be done to get paddy yield to 4–5 tons per hectare. The delivery and adoption of these technologies could be significantly accelerated through the increased use of ICT (information and communication technology) tools. For example, IRRI in collaboration with its national partners has recently introduced site-specific nutrient management (SSNM) in the Philippines through mobile phone technology, in which farmers can dial a toll-free number and answer simple questions related to their rice field and production practices by pressing a number on the keypad of their phones and receiving an SMS message with a fertilizer recommendation customized to their field.

The successful adoption of stress-tolerant varieties and improved production practices, which will expand rice production in the state, will likely reduce crop losses and increase farmers' income, leading to small-scale mechanization and crop intensification.

However, both the state and central governments should be proactive in formulating an appropriate policy structure and improving credit facilities and other supply chain problems to speed up modernization in the future granary of India.

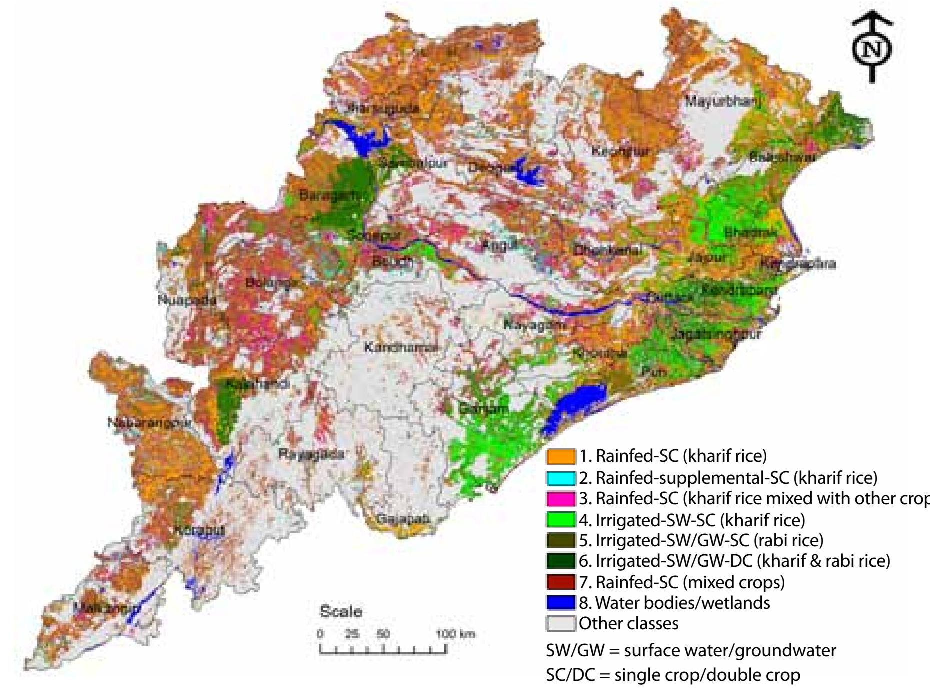


Fig. 1. Rice-growing areas in Odisha (2010-11).

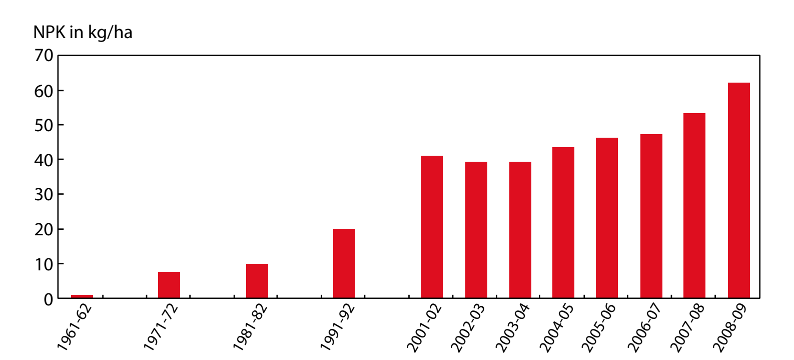


Fig. 2. Fertilizer consumption in Odisha.
Source: Orissa Agriculture Statistics, 2008-09.

Acknowledgment
We would like to thank Dr. Achim Dobermann for his valuable suggestions and Dr. Umesh Singh for providing information related to STRASA activities in Odisha.

Dr. Das is a professor in the Department of Plant Breeding and Genetics at the Orissa University of Agriculture and Technology while Dr. Gumma is a postdoctoral fellow in the Social Sciences Division at IRRI.

See Dr. Mohanty's blog at http://snipurl.com/mohanty_blog.

[1] National Sample Survey, 2004-05.

Managing pests with nature

by K.L. Heong

Pests should be critically re-assessed and proven guilty before insecticide use is contemplated. This was my conclusion in 1994 with the late Professor Michael Way in an extensive review of the role of biodiversity in rice pest management.[1] This landmark publication paved the way to sustainable pest management by enhancing biodiversity and ecosystem services.

Hundreds of arthropod species in rice ecosystems have various ecological functions such as herbivory (feeding on rice plants), predation, parasitization, pollination, decomposition, and nutrient cycling. Herbivores are often labeled as "pests" because they feed on rice plants. Out of more than 100 species, less than 10 species can cause yield loss (if they occur in sufficiently large numbers). Predators and parasitoids that attack them, however, keep them from increasing in number. This intricate food web of relationships among rice plants, pests, and the rich biodiversity of natural enemy species constantly strives toward equilibrium to prevent abnormal developments in pest species.

Engineering the ecology

Ecological engineering is an approach to restore or enhance biodiversity of both floral and faunal species, in the rice landscape, so that resources in the form of shelter and food for the natural enemies are enhanced. It is "the design of human society with its natural environment for the benefit of both."

Saving the habitats

In most rice landscapes, bunds and nonrice habitats occupy a substantial proportion. Some are populated with fruit trees and shrubs, or grown with vegetables. But, farmers often treat these areas as wastelands and spray them with herbicides, mistakenly thinking that they harbor pests.

Most of the key pests of rice are monophagous (restricted to rice). They just move from rice patch to rice patch. These nonrice habitats provide refuge, food, and homes for natural enemies of rice pests.

In the Philippines and Thailand, rice bunds with the perennial *Brachiaria* grasses are home to two species of crickets that are ferocious predators of pest eggs laid on leaves. These foragers are nocturnal. They move into rice fields in search of food at night and return to their grassy homes come daytime. Many spider species also depend on these grassy habitats.

Flowers vs. pests

Aside from conserving natural habitats, ecological engineering can augment biodiversity by planting nectar-rich flowers on bunds. These flowers provide nectar for bees and other species that pollinate fruit crops in rice landscapes. The nectar is also food to many hymenopteran parasitoids, especially those that regulate rice pest species, such as planthoppers, leafhoppers, stem borers, and leaf folders.

In Vietnam, ecological engineering fields, which have bunds enriched with nectar-rich flowers, had significantly higher parasitism and predation of planthopper eggs that are deeply embedded into the rice tissues. Without using insecticides, farmers from these villages are harvesting similar or higher yields but with a substantial increase in profits from less insecticide use. Something similar was observed in hybrid rice fields in Jin Hua, China.

No to insecticides

Use insecticide only when absolutely necessary and as a last resort. This is an all-important tenet of ecological engineering. Insecticides are, by design, *biocides*. Organisms that are more likely to be killed in an insecticide-sprayed field are those that have a small size, soft body, and high mobility. Ironically, pest species tend to be larger and less mobile and are thus less vulnerable to the sprays.

In addition, because farmers' sprayers often function poorly, most spray droplets land on the water, affecting everything in it. Since rice is an ephemeral habitat, all species that live in it are migrants, both pests and natural enemies. At the early crop stages, pests and natural enemy species move in and inhabit it. Bunds with flowers that serve as homes of natural enemies become the sources of predators such as spiders and crickets. These predators feed on the initial inhabitants, the detritivores (organisms that feed on organic waste), such as midges and flies in the rice aquatic system before the pests arrive. Also in the aquatic system are predators such as microvelids—insects that serve as "sharks" for the invading pests.

Challenges in ecological engineering

Predators and parasitoids of pest species are important regulators of pest populations. However, insecticides used during early-season spray routines are highly toxic, which destroys predators and parasitoids. Thus, pests are left unregulated and can develop exponentially into damaging proportions.

Rice fields are naturally and richly endowed with predator and parasitoid biodiversity that can be enhanced by planting flowers nearby. But, the challenge is to motivate millions of farmers to adopt these concepts, stop their routine spraying, and enrich rice-field bunds with nectar-rich flowers.

Parasitization is not an easy concept for farmers to grasp and parasitoids are too tiny to be observed. One approach is to use bees as an indicator species for farmers to observe. Bees and parasitoids belong to the insect order hymenoptera, which have rather similar characteristics. Farmers can be motivated to observe and conserve "bees and their relatives" and refrain from spraying insecticides harmful to them.

Lastly, ethics in marketing insecticides need to be improved and conform to the FAO Code of Conduct on the distribution and correct use of pesticides in ads and promotions. In many rice-producing countries, pesticides are still being sold as fast-moving consumer goods, which lead to their overuse and misuse.

Dr. Heong is an insect ecologist at IRRI.

For a video on this topic, go to http://youtu.be/vsDlYnk8b8U

[1] Way MJ, Heong KL. 1994. The role of biodiversity in the dynamics and management of insect pests of tropical irrigated rice: a review. Bull. Entomol. Res. 84:567-587.


BAYER
Arize®
Increasing rice yields,
enriching lives
Better Rice Better Life
Bayer CropScience