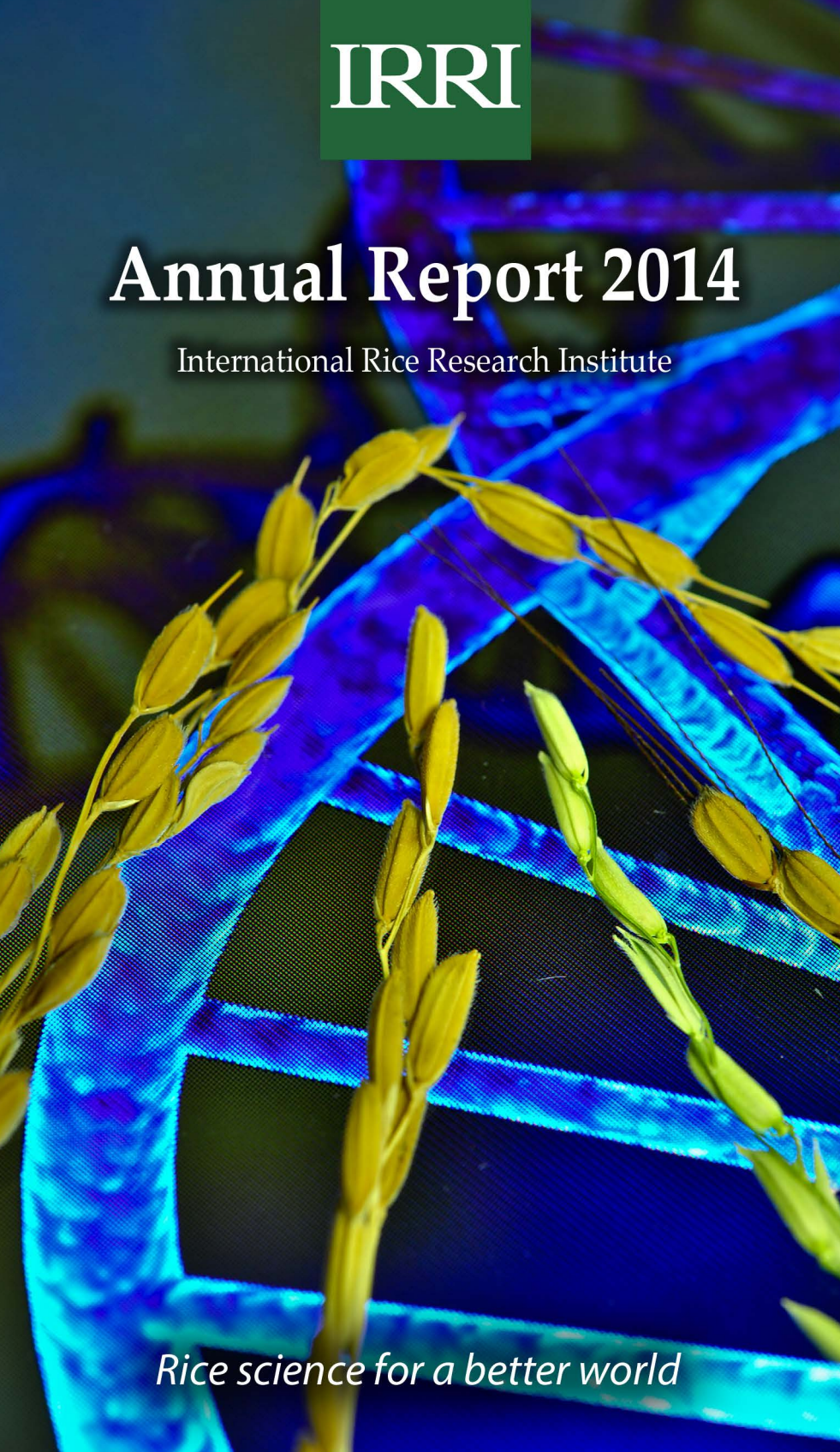


IRRI

Annual Report 2014

International Rice Research Institute

Rice science for a better world

Director general's message

The second Green Revolution is underway!

Establishing a new and relevant breeding factory, deciphering the information found in 3,000 sequenced rice genomes, marketing a country's unique indigenous "heirloom" rice varieties to the outside world, distributing climate-smart rice to reduce Asian farmers' risks, and celebrating 150 consecutive knowledge-filled cropping seasons right here at headquarters. All of this "exciting stuff" and much, much more marked yet another banner year for IRRI.

You "on the go" stakeholders—with maybe only a few minutes to give our work some notice—can read all about it, summarized in this annual brochure for quick reference in bite-sized chunks. You can find the details and backstories packaged on our website. Just float your mobile device over a relevant QR code or go to www.irri.org/annualreport/2014.

Without doubt, both the popular and academic media were aware of our "exciting stuff" during 2014. We engaged in a heartening media blitz throughout the year to relay our important messages—be it, among others, *National Geographic, The Economist, The Wall Street Journal*, Channel NewsAsia, PBS NewsHour, and Radio Australia on the popular side or *GigaScience* and Springer International Publishing on the academic side.

Often in this extremely positive media exposure, as the Channel NewsAsia graphic here shows, I was the one in the limelight—but only as the Institute's champion representing the hundreds of staff members doing such wonderful work. In those interviews, I tried to crystallize some critical issues for our clients, supporters, and the general public.

For example, in the Channel NewsAsia interview, I pointed out that, "climate change and the effects of increasing greenhouse gas in the atmosphere will change and make more challenging rice production scenarios in the future. Rising sea levels and rising temperatures are indeed a reality."

In *The Economist* coverage, I lauded the flood-tolerant Sub1 rice varieties as the first of a new generation of seeds that are kick-starting a second Green Revolution (GR2.0). "If all goes well," I said, "over the next few years, plants that tolerate drought, salinity, and extreme heat will revolutionize the cultivation of mankind's most important source of calories. But that will depend on the technology working as promised and, in particular, on public policies that support GR2.0. Neither is guaranteed."

These are messages that we need to get out to garner more support for the important research that IRRI scientists are conducting in consort with our colleagues in the Global Rice Science Partnership (GRiSP), which by the way completed a fourth successful year in its first 5-year phase in 2014. With less than one year left in my tenure as director general, this is one responsibility that I will truly miss.

Over the last 10 years, I have thoroughly enjoyed being IRRI's chief messenger—in both good times (like the unveiling in 2006 of our comprehensive 2007-15 strategic plan, *Bringing Hope, Improving Lives*) and the not-so-good (the 2008 rice price crisis comes to mind). Through it all, the unprecedented progress that I have witnessed has been gratifying, energizing, and humbling.

As IRRI's eighth director general, I cannot overstate how proud I am to have been a part of the Institute's family and all of the "exciting stuff" that interlaces its impactful legacy.

Robert S. Zeigler

Milestones

2014 was packed with significant events and activities

- In February, Dr. Matthew Morell became IRRI's seventh deputy director general for research, bringing a wealth of leadership experience in research and in establishing public-private partnerships.
- IRRI celebrated International Women's Day in March, highlighting the important role of women in all areas of agricultural science.

- Phase 3 of the Stress-Tolerant Rice for Africa and South Asia (STRASA) project was launched in New Delhi in May. With this phase, STRASA, a flagship project of IRRI, GRiSP, and the Bill & Melinda Gates Foundation, has been extended an additional 5 years.
- In May, The World Economic Forum on East Asia launched the Grow Asia Initiative with IRRI as a founding collaborator. Director General Bob Zeigler, during a televised plenary on Agricultural Transformation in East Asia, called on governments and the private sector to join hands to ensure that farming families share in the benefits of economic growth.
- In September, IRRI called on the ASEAN Ministers of Agriculture and Forestry to nurture a new generation of rice scientists and extension professionals during a series of high-level meetings in Myanmar.
- In October, the secretaries of agriculture of India, Bangladesh, and Nepal signed an agreement to fast track the release of any rice variety undergoing proper evaluation protocols in any one of their countries. Acting rapidly on this revolutionary and courageous agreement, in February 2015, India directly released four rice varieties from Bangladesh and two from Nepal for similar agroecologies in India. This agreement will not only fast track varietal releases, but also bring huge savings of time and resources to the three countries.
- In late October, the far-ranging scientific program of the 4th International Rice Congress (IRC2014) had something for everyone in the rice sector, including the latest advances in rice research and technologies already coming out of the second Green Revolution.

- In November, in Beijing, Chinese Vice Minister Li Jiayang and Dr. Zeigler exchanged views on strengthening science and technology cooperation between China and the Institute.
- Also in November, Vietnam's Ministry of Agriculture and Rural Development and IRRI jointly crafted a national strategy designed to make rice production in the country an even larger engine of inclusive economic growth. This raised the decades-long partnership between Vietnam and IRRI, which started in 1963, to an even higher level.

For more 2014 milestones and links to the details, go to www.irri.org/AnnualReport/2014; for milestones across 55 years of IRRI's rich history, go to www.irri.org/about-us/our-history.

Research highlights

A remarkable scientific feat: 3,000 Rice Genomes Project

Since the first sequencing of a rice genome in 2004, an additional 3,000 genomes have now been sequenced. In 2014, the sequence data derived from this project (3K RGP)—a collaboration of BGI (in Shenzhen, China), the Chinese Academy of Agricultural Sciences, and IRRI—were made publicly available to rice researchers across the globe on World Hunger Day (28 May).

3K RGP has unleashed the true power of rice genetic resources. Traditional rice varieties encompass a huge range of potentially valuable genes, which can be used to develop superior varieties for farmers to take part in the uphill battle of feeding an ever-increasing world population (estimated to reach 9.6 billion by 2050). The genes linked to valuable traits can help breeders enhance global food security by creating new rice varieties. These varieties will have improved yield potential, higher nutritional quality, better ability to grow in problem soils, and improved resistance to pests and diseases. They will also be more tolerant of stresses, such as flooding, salinity, and drought, which will be inevitable with future climate change.

However, the benefits of the sequence information coming out of 3K RGP will be realized only when each gene is mapped to a specific trait. Without this additional knowledge, it's like having a phone directory full of numbers but no names attributed to them. GRiSP has initiated the Global Rice Phenotyping Network to bring together an international community of rice scientists in a joint effort to advance the measurement of the physical and biochemical traits of a rice plant and then link them to genes that breeders can use.

IRRI's new breeding factory

Not much has changed in plant breeding over the last 50 years. The methods used today in Asia are generally the same as the ones used in the 1960s and 70s. More disturbing, the rate of yield increase or genetic gain for irrigated varieties is less than 1% per year. With so many challenges brought on by climate change and a growing population, plant breeding needs a reboot. So, IRRI is restructuring its entire breeding operations. Transforming Rice Breeding, a project funded by the Bill & Melinda Gates Foundation, is one important component of the Institute's new breeding factory, which is focusing on irrigated rice. IRRI is aiming to double the rate of genetic gains—the increase in crop performance that is achieved through genetic improvement programs per unit time of breeding—or even make it higher.

A never-ending season for the LTCCE

IRRI's Long-Term Continuous Cropping Experiment (LTCCE) marked its150th rice cropping season, making it one of the longest running agricultural experiments in the world—and perhaps the most exciting. In 1962, the LTCCE (then called the Maximum Yield Experiment) was created to sustain high annual rice yield from a unit area of land using an optimum mix of rice varieties and cultural practices. With diminishing water and land resources, and the threat of climate change, the LTCCE now provides a benchmark for sustainable rice production against which the productivity, sustainability, and profitability of rice production systems can be assessed. The best ones could be the next set of gold standards for growing rice in a world that has become quite different from just a few decades ago.

Green Revolutions 2.0 & 3.0: no farmer left behind

For various reasons, many farmers who are among the poorest of the poor did not benefit fully from the first Green Revolution (GR1.0) in rice. But in the next revolutions in the series—GR2.0 already under way and GR3.0 to follow—no farmer will be left behind. On the frontlines of GR2.0, researchers are already incorporating stress tolerance into new rice varieties. Several million of the world's poorest farmers have access to one of the first new technologies of GR2.0—flood-tolerant rice. It is envisioned that GR3.0 will phase in sometime around 2030, when farmers begin planting yield-plateau-busting C_4 and nitrogen-fixing rice varieties and consumers start finding broad-based nutritious rice in the marketplace.

Myanmar: Sowing their choices

IRRI, in partnership with the Myanmar government and nongovernment organizations, has launched the Livelihood and Food Security Trust Fund Project. It is introducing participatory varietal selection (PVS) to farmers in Labutta, Bogale, and Mawlamyinegyun townships. The project is training farmers in preference analysis and giving them the opportunity to see, touch, smell, and even taste new rice varieties grown at PVS trial plots. More importantly, they have the power to choose the ones they want, instead of relying on the few varieties introduced by seed companies and government agencies. The benefits of PVS trials have spread to neighboring villages along the coastal areas of the Ayeyarwaddy Delta in Myanmar. Food security and livelihood of farmers have been improved through higher-yielding and stress-tolerant rice varieties of their choice.

Research highlights (continued)

Philippines: Women moving mountains for heirloom rice

Mary Hensley and Vicky Garcia, respectively, started Eighth Wonder, Inc. and RICE, Inc. to bring indigenous heirloom rice from the Cordillera Region in the Philippines to the outside world. This helps provide sustainable livelihood to farmers in one of the most marginal rice ecosystems in the country. Now, they are joining forces with the Heirloom Rice Project, funded by the Philippine Department of Agriculture and led by IRRI, to widen their initial marketing success and bring heirloom rice production to the attention of the national government for developing industry policies and standards.

Southeast Asia: The bubble that dries

Many Southeast Asian farmers rely on drying their rice crop using the sun. It is cheap and environment-friendly but unfortunately laborious and unreliable. Sun drying can reduce the quality of the grains and increase postharvest losses by around 20% or even more. One alternative is a low-cost dryer, developed through IRRI's partnership with a private company, made primarily of sturdy polyethylene plastic material. It is called the solar bubble dryer—"solar" because of the ambient temperature that provides heat from the sun for the dryer, and "bubble" because of the dome-like shape of the polyethylene plastic roof when set up. This low-maintenance, hassle-free, and portable dryer also uses materials that are locally available, making it economical to build, an important aspect that could encourage intended users— small farmers, in this case—to adopt the technology.

India: Creating an oasis with climate-smart rice

In eastern Uttar Pradesh, where rice production is predominantly rainfed, growing rice is so risky that farmers take a gamble every cropping season. When luck is on their side, during a year with ample rainfall, the farmers are blessed with enough food to sustain their families till the next cropping season. But, when drought strikes, the price of crop failure means losing all their investments— labor, seed, and inputs—and long, lean, hungry months ahead. The variety, Sahbhagi dhan, developed by IRRI and the Central Soil Salinity Research Institute, and disseminated by the STRASA project, is helping farmers cope with the harsh environment. It is also empowering women who are the backbone of India's agricultural workforce and play a vital role in the day-to-day maintenance of their rice farms.

Research highlights (continued)

Getting ready for climate change: More than seeds

Climate-smart rice varieties, developed at IRRI and multiplied and distributed under the STRASA project, are now accessible to some 10 million farmers in South Asia and Africa and are already creating a major impact, improving many lives. In addition to the new seeds of climate-smart rice, farmers in a flood-prone village in India are also learning about better seedbed management, proper use of fertilizer, and other technologies through illustrated brochures. The technologies are further improving the productivity of flood-prone and salt-affected rainfed lowland areas in South Asia, making rice production stable, and increasing the income of poor farmers.

Africa: The rice sector transformation continues

Rice consumption in sub-Saharan Africa is increasing faster than any other staple in the region, being driven by rapid economic growth and urbanization. IRRI's work is focused on unlocking the potential of the rice industry in East and Southern Africa (ESA) where production conditions can directly benefit from Asian technologies.

In 2014, the ESA breeding team developed populations for different ecosystems: 47 for irrigated areas, 20 for the rainfed lowlands, and 18 for high-elevation environments. Also in 2014, three new varieties were released in Uganda and, in Burundi, 90% of the 5,000-hectare irrigated scheme in the Imbo Plain were planted with IRRI varieties.

IRRI conducted rice production training for 2,250 farmers in Burundi (including 400 ex-combatant women) and 390 farmers in Mozambique. Eighteen Tanzanian women farmers and extension workers and 18 Kenyan technicians and researchers received training in seed production and dissemination. In 2014, to support varietal development, IRRI completed the construction of plant pathology, molecular biology, and grain quality laboratories at the regional hub headquarters in Burundi.

During Breeders' Week at headquarters, IRRI's ESA breeding team (from left)— Joseph Bigirimana (Burundi), Alexis Ndayiragije (Mozambique), and Rosemary Murori (Tanzania and Kenya) are briefed on the function of the Institute's new Rapid Generation Advance (RGA) facility by RGA technicians Joseph Beredo and Rhulyx Mendoza.

IRRI's 2014 media blitz

To get its message out, IRRI's presence in both the popular and academic media was striking. More than 130 scientific articles appeared in 100 journals, many direct open access. And not since the 2008 rice price crisis was IRRI positively featured in the major popular media so regularly.

30 April: Photo of Bangladeshi rice farmers whom IRRI works with appeared on the *National Geographic* Web site.

10 May: IRRI was featured in an important article in *The Economist* about a bigger rice bowl coming from the second Green Revolution.

22 May: During the World Economic Forum for East Asia, broadcast by Channel NewsAsia, Dr. Zeigler talked about Agricultural Transformation in East Asia.

28 May: The Chinese Academy of Agricultural Sciences, BGI, and IRRI published in *GigaScience* an article on the sequencing of 3,000 rice genomes.

7 June: A chapter by Dr. Zeigler, *Biofortification: Vitamin A deficiency and the case for Golden Rice*, appeared in the Springer book, *Plant Biotechnology: Experience and Future Prospects*.

30 August: Dr. Zeigler appeared on Radio Australia's First Bite Program to participate in the GMO-Golden Rice debate.

16 September: IRRI was featured prominently in the October issue of *National Geographic* magazine in an article on the next Green Revolution.

17 September: As the debate intensified over Golden Rice in the Philippines, IRRI was featured on the PBS NewsHour in the USA.

25 September: During a Brookings Institution discussion on eliminating hunger by 2030, Dr. Zeigler said that immediate changes in rice production practices are necessary to offset volatile climates, limited water supply, and diminishing agricultural land.

6 November: Dr. Zeigler appeared on a segment of Channel NewsAsia's public affairs program, *Insight*, entitled *The Hungry Planet*.

21 November: Dr. Zeigler was featured in a *Wall Street Journal* op-ed piece in which he discussed a second Green Revolution and championed Golden Rice, which could save millions of children from blindness and death.

Robert Zeigler (right) was interviewed by Tamal Mukherjee, senior producer, English current affairs, Channel NewsAsia, in IRRI's media room during the 4th International Rice Congress in Bangkok in October.

HR: Meeting IRRI needs worldwide

Our Human Resources team is responsible for the development and delivery of initiatives to retain employees as well as attract and recruit new talent to the Institute. IRRI's national and international staff members now exceed 1,400 personnel worldwide. We have 1,266 nationally recruited staff and 163 globally recruited staff in 14 locations in Asia and Africa.

IRRI's workplace thrives on diversity. Our employment policies provide equal opportunities for all, regardless of age, gender, ethnicity, social background, religion, or disability. We have 40 nationalities working to support IRRI's global mission. We are particularly proud to be an employer that values gender equality: 40% of all our staff worldwide and 47% of our HQ nationally recruited staff are women.

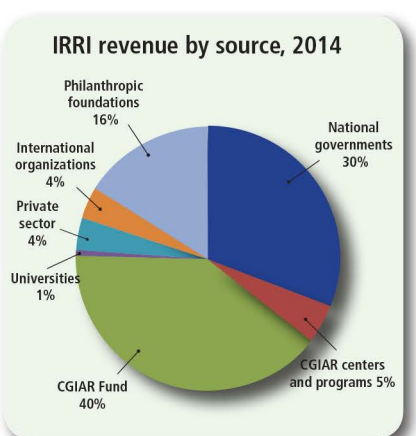
In 2014, we continued to strengthen our client- and service-oriented structure to ensure a productive and engaging work environment, through revision of IRRI's HR policies and practices. We also introduced technical developments such as an electronic job application system. Furthermore, IRRI continues to demonstrate the importance of training and development in strengthening the skills of staff and is implementing a comprehensive leadership program.

IRRI continued to offer important work-life balance activities, including organizing sporting events and health and wellness activities and providing additional facilities such as the soccer field, tennis courts, and the recently refurbished gym.

Financial support

IRRI's total revenue for 2014 was USD 99.19 million.

Donor investment is fundamental to achieving our goals and, in 2014, major donor groups included CGIAR Fund (USD 38.88 million), national governments (USD 30.16 million), philanthropic foundations (USD 15.73 million), CGIAR centers and programs (USD 4.67 million), private sector (USD 4.01 million), international organizations (USD 3.84 million), and universities (USD 0.63 million). For detailed information, refer to IRRI's audited financial statements at http://irri.org/AnnualReport/2014.



Training: Innovative people, technologies, and ideas

The overall objective of IRRI's Training Unit is to enhance the technical capacity of the next generation of scientists. It also aims to strengthen their organizations and groups that will implement innovative technologies and ideas crucial in achieving sustained increases in rice production and improving farmers' productivity.

In 2014, IRRI headquarters hosted 310 scholars (165 males, 145 females) from 37 countries. Short training courses and workshops for farmers, technicians, and others conducted across the globe were attended by 23,605 persons. Significant training activities included the following.

- IRRI and PhilRice completed the south-south training program for Africans in extension and research with funding from JICA. A total of 142 persons (35% female) were trained over the last 4 years.
- The catalytic role of training farmers through partners covered a total of 20,382 (29% female) participants.
- Rice Technology Transfer Systems focused on developing an appreciation of the rural development program in Korea and enhancing the skill set needed by modern rural extension agents.
- The Lee Foundation Rice Scholarship Program granted 19 PhD scholarships (11 males, 8 females) for students from Bangladesh, India, Indonesia, Myanmar, Nepal, Philippines,Thailand, and Vietnam.
- The Rice Research to Production Course got the participants' feet wet in the rice paddies as they learned how rice is connected to the international community.
- The Rice Industry Agriculture Services Training Course was piloted for developing a generation of professional extension agents with the first batch of trainees coming from the Indonesian private sector.

Under the JICA-Africa Training Program, the final of 9 courses offered over 4 years focused on rice production and research techniques for African research technicians with 15 participants from Benin, Burkina Faso, Congo, Côte d'Ivoire, Guinea, Kenya, Mali, Tanzania, and Togo.

On the cover: In May, 3,000 rice genomes with their genes and DNA sequences were made publicly available. See the research highlights for details.

IRRI is a member of the CGIAR Consortium

www.irri.org/AnnualReport/2014

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