IRRI

2017
Annual Report

Responding to Changes

Contents

Charting a bold new course

Bringing people together to serve a dynamic global rice sector

The much anticipated launch of our new Strategic Plan in May 2017 set us up for a hectic, but very rewarding year of achievements and substantial change for IRRI.

Crafted to align with the UN Sustainable Development Goals, IRRI's Strategic Plan reinforces a results-oriented approach to our work that will foster increased collaboration across the organization, our partner networks, and with our funders. Ultimately, it will guide us in achieving the substantial goals we have set, responding to our partners' changing needs, accelerating impact for our stakeholders, and being bold, proactive, and agile in a dynamic global rice sector.

This strategic plan is built on 57 years of successfully serving the global rice sector. It is only because of the vision, talent, fortitude, and perseverance of the scientists and supporters before us that IRRI is able to look into the future with a high level of confidence in our ability to work closely with partners to solve some of the world's most pressing issues in food and nutritional security.

In the first year of implementation of the strategic plan, we have seen the plan and its implementation spark critical conversations with partners and stakeholders on the path ahead, providing further insights and momentum to take us further on our journey.

With our new direction, I think it is fitting that we have chosen to highlight some examples that represent our work in this annual report. While there are a myriad of stories to share with you, we have selected some of the high-points to feature in this report. There were also a few accomplishments that particularly motivated me.

Recently, a group of IRRI researchers spent some time in Nueva Ecija and Isabela, two top rice-producing provinces in the Philippines, talking with lowland farmers. In their survey, they asked farmers to identify the "most important change" that they felt had come about since they began working with IRRI and learning about quality seeds and rice cultivation technologies. Through this survey method we learned that over 90% of respondents said that their rice yields markedly increased, while 80% directly attributed the improvement in their quality of life to these enhanced farming practices and innovations. Perhaps most significantly, the water-saving feature of IRRI's alternate wetting and drying (AWD) practice dramatically reduced the competition for water between farmers. This, in turn, has strengthened community relations and fostered better farming cooperation. It has encouraged farmers to coach each other and share their knowledge and experiences within formal and informal peer-to-peer networks. For me, this shows that our work not only impacts individual lives, but also brings people together in support of the common good.

Another notable accomplishment is the publication record of our scientists. During 2017, IRRI scientists reported their research in 238 refereed scientific journal articles, including publication in journals such as *Plant, Cell and Environment; Field Crops Research*; *PLoS One*; *Crop Science*, *Plant Physiology*; *Scientific Reports*; and *Phytopathology*. The stories in this annual report humanize some of these technical reports and also illustrate how IRRI's work is directly benefiting our national partners and rice farmers on the ground.

Speaking of national partners, certainly a key thrust of the new strategic plan is a firm commitment to greater regionalization. This includes embedding global expertise locally so that IRRI researchers are able to work more closely with our national partners and respond to emerging challenges and needs.

The establishment of the IRRI South Asia Regional Centre in Varanasi, India is a prime example of this commitment. Funded by the Indian government, the Centre marks a major milestone in IRRI's decades-long partnership, which will now be augmented with a modern state-of-the-art facility providing high-quality research, training, and service provisions to stakeholders across South Asia and Africa.

Further supporting our regional commitments, IRRI also named new Regional Representatives this year in each of our regions of focus; Dr. Nafees Meah for South Asia, Dr. David Johnson for Southeast Asia, and Dr. Abdel Ismail for Africa.

This year, IRRI also focused on establishing new ways to create and accelerate impact for our stakeholders – another key thrust of the strategic plan. For example, we launched IRRI Education in the first part of 2017. Benefitting from the legacy of the IRRI Training Centre, this new platform enhances the institute's human capacity building program with a comprehensive suite of courses that capitalize on IRRI's expertise in rice research, agriculture extension, and leadership development for the rice sector.

As Mr. Takehiko Nakao, President of the Asian Development Bank, stated at the IRRI Education launch, "Agriculture is now at a crossroads. With increased population, threats of climate change, and growing demand for nutritious food, the agricultural sector needs more rapid transformation and to make use of the best available knowledge and technology. This means investment in human capacity building must increase together with science and technology. This makes IRRI Education very timely."

Finally, IRRI Tech Transfer has also seen significant success this year. With a primary mandate to expand the adaptation of research, technologies, and intellectual assets in order to accelerate impact for poor farmers around the world, it has brokered over 25 partnership agreements with governments, industry, and the private sector, leveraging their expertise and infrastructure to reach stakeholders all across the globe. It also recently established the Direct Seeded Rice Consortium (DSRC), a multi-sectoral partnership that aims to further develop and disseminate a more sustainable method of rice farming that will help conserve resources and protect the environment.

There is much, much more beyond what I have just described. So, whether you are perusing our printed annual report or are currently online, take a few minutes to get the full stories by reading about these and other intriguing tales about our three goals to innovate, catalyze, and transform lives in the global rice sector.

Before I close, let me share a milestone in IRRI's work with nutritionally-enhanced rice through a recent agreement with the Bill & Melinda Gates Foundation. The agreement, signed late in the year, will continue the foundation's funding support for the next phase of the project *Healthier Rice, Nutritionally Enhanced Rice* with a USD 18 million investment over the next five years. Its scope includes the development of high-yield rice varieties bio-fortified with β-carotene (Vitamin A), iron, and zinc, as well as facilitating the deployment of Golden Rice, and regulatory applications for high Iron and Zinc rice. UNICEF recently estimated that Vitamin A deficiency puts 140 million children at risk of illness or death.[1]

We are incredibly grateful for the continued support of all of our funders. It is only as a result of their strong belief in the work we do in Research for Development that we can continue to develop and adapt innovative research and contribute to solving these significant global issues. We are particularly delighted with the rise of a new crop of investors in IRRI's research. This year the Indian national and state governments as well as the Philippines government have emerged as our 3rd and 5th largest donors, respectively. The recognition by developing nations of the importance of investing in research for development in the rice growing world is critically important. Beyond these multi-year government commitments, it is further exemplified by the support that IRRI received from sixteen member countries in the Asia-Pacific Region for the regional Rice Action Agenda. The proposal was endorsed by Agriculture delegates at the 20th Annual Meeting of the Council for Partnership on Rice Research in Asia (CORRA),

As we move forward to 2018 with our new plan and structure now in place, we are running at full speed. It's time to come together and focus on doing great research, delivering fantastic outcomes, and seeing our work transform people's lives across the globe.

I invite you to join us!

Matthew Morell
Director General

> Our work not only impacts individual lives, but also brings people together in support of the common good.

[1] https://news.un.org/en/story/2018/05/1008782

IRRI BY THE NUMBERS

USD63,954,000
Total revenue

82
New research projects

129,590
Total varieties in IRRI Genebank

77
Cooperation agreements signed

98
Graduate students learned at IRRI research centers

49,362
Farmers participated in field demonstrations and trainings

318
Researchers participated in courses, in the classroom and in the field

753
National media mentions and media articles

272
Peer-reviewed publications

Innovate

Be the linchpin of scientific innovation and thought leadership, solving complex problems with deep research

With the world's growing population, the increasing demand for rice, and the rapidly changing landscape, IRRI is continuously innovating to create a more productive, secure, and sustainable rice sector. Our position as the premier organization for rice science allows us to predict future needs, propel research, build partnerships, and develop new technologies, practices, and policies to serve our stakeholders in the rice sector.

Aside from developing disease-resistant rice varieties, scientists at IRRI are also working on a novel and promising new approach to combat bacterial blight – using rice genome editing to 'starve' the pathogen by blocking its access to the plant's nutrients.

IRRI partnered with the Philippine government to launch a community-based water management project centered on the IRRI-developed AutoMonPH - an automated IoT tool that monitors water levels and alerts farmers and stakeholders through SMS.

Based on the NAMAs from the Bali Action Plan, IRRI collaborated with the Thai government and other partners to implement a greenhouse gas mitigation project tailored for Thailand's rice sector, utilizing IRRI's best practices and innovations like AWD technology and the SRP Standards.

To accelerate the impact of our work, IRRI TechTransfer will lead in the positive engagement with the private and public sectors to support the discovery, development, and dissemination of high-value products and services.

Rice breeders employs recent advances in the CRISPR-Cas gene-editing system, which would provide unprecedented control and precision in creating targeted changes in the rice genome.

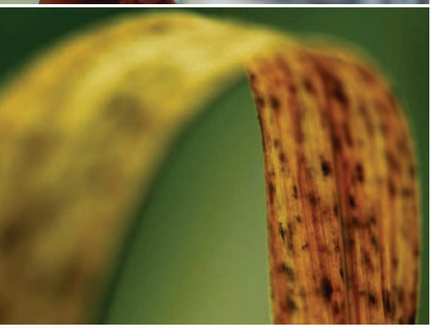
Finally, IRRI hails the completion of the genome sequencing of seven wild rice varieties, an initiative that started at IRRI in 2003, as a major breakthrough with the potential to further develop climate-smart rice varieties with the ability to adapt to different environmental conditions.

IRRI believes that innovations in rice science are game changers, ensuring that the global rice sector can timely and appropriately respond to the rapidly changing needs of the entire rice value chain.

Pursuing medium to long-term innovations through advanced genetic technologies such as novel durable disease resistance mechanisms

Starving the foes: new ways to protect rice against diseases

Scientists are looking at an innovative approach and a potential strategy to make rice resistant against pathogens that have "learned" to bypass the plant's "immune system."



Rice farmers struggle against a ruthless adversary every monsoon season. Whether it is in Odisha in India, Central Java in Indonesia, or Mindanao in the Philippines, bacterial blight outbreaks are a common enemy during the rainy season. In irrigated environments, bacterial blight can easily spread across large cultivated areas, causing high economic losses.

Major genes for resistance called Xa genes (e.g., Xa4, xa5, Xa21), have been developed and used in rice breeding programs. As early as 1980s, the widespread use of Xa genes provided an important level of protection to many rice mega-varieties, enabling them to succeed in favorable environments across Asia.

The enemy adapted to resistant rice varieties

As any other harmful bacteria or pathogens, the invading organism that causes bacterial blight needs to steal nutrients from the host plant to survive. However, obtaining these nutrients is not an easy task since plants have a natural protection system that detects and destroys intruders inside and outside the plant. This is the plant immune system and most of the rice Xa genes that we know are part of it. The pathogens need to deactivate the protection layer to feed. But, not all pathogens are the same. Some have developed the ability to disable a particular Xa gene and spread.

Starving the enemy

Since some pathogens have "learned" to bypass the "immune system," scientists are exploring new strategies to protect rice plants. One way of reducing the infection is by blocking the pathogen's access to nutrients to starve the pathogen, leaving it with no source of energy needed for growth. As far as we know, the pathogens do not have the means to deal with nutrient restrictions.

This is an innovative approach and a potential strategy to elevate disease resistance in crops. To validate this concept, several scientists at the International Rice Research Institute (IRRI) are using genome editing techniques to target plant nutrient-related genes and induce starvation in the bacteria at the onset of the disease. The scientists have found that making minimal changes at the DNA level is enough to block the nutrient flow and reduce bacterial growth without affecting yield.

Moving into the breeding program

For the past two years, IRRI scientists have been looking for natural variations that mimic the so-called starvation phenotype. Interestingly, they have found two landraces among thousands of rice accessions that naturally block nutrient flow toward the infection. These plants carry small variations in nutrient-related genes, which are enough to limit the growth of a broad population of bacterial blight pathogens.

Breeders at IRRI have started to move these novel genes into elite accessions, expecting to achieve durable resistance. This strategy represents our best chance to substantially reduce bacterial blight epidemics.

Addressing the food-energy-water nexus

WateRice: New joint Philippine-IRRI water project kicks off

The project's goal is to improve water use efficiency through ICT tools that can improve farmers' decisions on water and weed management.

With the goal to achieve a rice-secure Philippines, the Philippine Department of Agriculture (DA) is working with the International Rice Research Institute (IRRI) on various initiatives and interventions to improve the country's rice productivity, the latest involving water use efficiency.

Under the national rice program, the Philippine Rice Research Institute (PhilRice) and IRRI are undertaking a joint scientific effort to improve water use efficiency in the country's irrigation systems. With financial support from the Bureau of Agricultural Research of the Department of Agriculture (DA-BAR), IRRI and PhilRice have launched the project, Water-efficient and risk mitigation technologies for enhancing rice production in irrigated and rainfed environments (WateRice).

The Waterice Project's goal is to improve water use efficiency through ICT tools that can improve farmers' decisions on water and weed management. Further, it recommends best management practices and mechanization in both irrigated and rainfed environments.

The project also launched the IRRI-developed irrigation management decision tool called AutoMonPH. The tool will provide opportunities for real-time field monitoring of an irrigation system.

The project will also focus on mechanization, best management practices for rainfed and weed management to improve water use efficiency. It will be initially implemented in Regions 1, 2, 3, 6, and 12 of the Philippines.

Rice-growing countries in Asia are moving toward the development and implementation of concrete mitigation programs to reduce the environmental footprint of the rice sector.

Although many countries are moving toward the implementation of concrete mitigation programs, there is a clear underrepresentation of the agricultural sector, especially in the rice-growing countries of Asia.

One possible mechanism to reach scale in implementing mitigation technologies is through Nationally Appropriate Mitigation Actions (NAMAs), one of the agreed outcomes from the Bali Action Plan concluded at the Conference of the Parties 18 in Doha, Qatar, in 2012.

NAMAs refer to any initiatives by developing countries, through government agencies such as agriculture ministries, to reduce greenhouse gas (GHG) emissions. These can be policies directed at transformational change within an economic sector or actions across sectors for a broader national focus. NAMAs are supported and enabled by technology, financing, and capacity building aimed at reducing emissions relative to projected emissions in 2020 without these policies.

The need for a Rice NAMA

Globally, agriculture contributes 10–12% of GHG emissions. But, emissions are higher in most Southeast Asian countries because of rice production. Although climate change affects rice production, rice production could play a role in curtailing global warming; hence, the significance of NAMAs for rice production.

The International Rice Research Institute (IRRI) developed a NAMA prototype for Thailand's rice sector with the Thai Rice Department, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Sustainable Rice Platform (SRP), and other public- and private-sector partners. IRRI assessed the GHG emission savings under different mitigation scenarios and provided technical backstopping on the implementation of alternate wetting and drying (AWD) technology in combination with laser land leveling and other crop management options.

The Thai Rice NAMA prototype focused on applying AWD and the SRP standards. It considered the more technical options of crop management as a means to maximize the mitigation effect. IRRI tapped into its Postharvest and Mechanization Unit to ensure inclusion of technical expertise on laser leveling, straw management, and fertilizer spreading.

Other mitigation initiatives

The IRRI project on Mitigation options to reduce methane emissions in paddy rice provides technical support and guidance to policymakers in Vietnam and Bangladesh for implementing GHG mitigation technologies. Funded by the CCAC with support from the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS), this project aims to provide the foundation for future NAMA or NAMA-like projects for the rice sector.

The CCAC Paddy Rice project focuses on the outscaling of AWD technology in Vietnam and Bangladesh through support from national plans with geo-spatial information.

On the other hand, IRRI-developed AWD technology addresses the twin problems of adaptation and mitigation through efficient water management. It enables farmers to save on irrigation water by up to 30% and reduces methane emissions by 30–70% without yield loss.

Recognizing the well-established benefits of using AWD, two consortia in Vietnam and Bangladesh and their respective agriculture ministries developed a work plan with IRRI for scaling out AWD in rice. National partners in both countries are strongly engaged in developing region-specific strategies for scaling out mitigation options in rice production. IRRI also leads in the development of solutions for country-specific local problems and bottlenecks.

To facilitate information sharing, IRRI set up an online knowledge hub, where information on an array of mitigation technologies and practices can be accessed.

Moving forward

IRRI intends to establish a Rice NAMA Clearing House in its Vietnam office. In June 2017, an initial Stakeholder Workshop on climate change policies was held in Hanoi.

The Clearing House will serve as a one-stop information platform for technical advice and collaborative engagement on NAMA-related programs and projects in Asia.

IRRI also offers trainings of experts on climate change mitigations. The training will feature various mitigation technologies and practices in Asia and GHG calculation tools. This would be vital for rice-growing countries in formulating and implementing their rice NAMAs.

A Filipino farmer is set to use an AWD pipe in his rice field. AWD enables farmers to save on irrigation water by up to 30% and reduces methane emissions by 30–70% without yield loss. (Photo by Isagani Serrano, IRRI)

Investing in climate mitigation for the rice sector and rallying partners and supporters to invest in the same

Climate change action plans for rice farming: from concepts to implementation

Working closely with individual governments, agriculture research and extension partners, and the private sector to provide information tailored to their specific needs on terms consistent with IRRI's commitment to CGIAR policies on open access and the use of intellectual assets

IRRI establishes milestone intellectual property policy

IRRI's intellectual property and commercialization policy ensures "Impact Acceleration" for the benefit of small farmers, by enabling private sector dissemination channels which complement established impact pathways via public sectors in developing countries.

IRRI Board of Trustees approved the Intellectual Property and Commercialization (IP&CC) Policy at its meeting in Myanmar from October 9th to 11th, 2017. The approval of the new policy is a milestone that ensures full alignment of IRRI's intellectual property activities with its new Strategic Plan and the CGIAR Intellectual Assets policy, and provides full compliance with the Institute's commitments to treaties and stakeholders.

IRRI's intellectual property and commercialization policy ensures "Impact Acceleration" for the benefit of small farmers, by enabling private sector dissemination channels which complement established impact pathways via public sector partners in developing countries. The policy also ensures IRRI obtains "Freedom to Operate"on 3rd party key and emerging technologies, so as to conduct its research work efficiently, at science's cutting edge.

The new IP policy is consistent with, and builds on, the CGIAR Principles on the Management of Intellectual Assets, the CGIAR Open Access and Data Management Policy, and IRRI's obligations under the International Treaty on Plant Genetic Resources for Food and Agriculture. It also takes into account IRRI's commitment towards donors.

The policy also spells out provision in relation to: (1) governance and oversight of IRRI's intellectual property and commercialization activities; (2) protection of intellectual property; (3) licensing and commercialization; and (4) public-private partnerships.

To develop public-private partnerships, a new department called IRRI Tech Transfer was established. The department will draw on intellectual assests developed by IRRI to engage positively with the private sectors and support the discovery, development, and dissemination of high-value products and services.

Maximizing impact of unique traits and germplasm

'Wild' genes open up opportunities for healthier, climate-smart rice

The completed sequencing of the seven wild rice varieties is a significant progress to drive further genome evolution and domestication.

The genome sequencing of seven wild rice varieties has finally been completed. This breakthrough is expected to provide opportunities for breeders worldwide in developing better rice varieties that will respond to the changing needs of the farmers and the consumers.

This discovery is outlined in the article "Genomes of 13 domesticated and wild rice relatives highlight genetic conservation, turnover and innovation across the genus Oryza" published by Nature Genetics. The study details the generation of seven wild and two cultivated genomes (IR8 and N22). The IR8, popularly known as "miracle rice," was developed by rice scientists from the International Rice Research Institute (IRRI). IR8 was one of the rice varieties that ushered in the Green Revolution in Asia during the 1960s and prevented worldwide starvation and famine.

The completed sequencing of the seven wild rice varieties is a significant progress to drive further genome evolution and domestication. Because wild relatives of rice are adapted to different biogeographic ranges and can tolerate many biotic and abiotic stresses, they continue to be an important reservoir for crop improvement.

This discovery further opens the doors for rice breeders to harness genes from the wild relatives of rice, allowing further improvement of crops with traits that are preferred by farmers and consumers. The research results could significantly improve the rice breeding scenario, allowing shorter periods for genetic discovery and varietal improvements that would normally take years to develop. It will also help IRRI in its goal of ensuring global food and nutrition security through sustainable rice production.

This scientific breakthrough was a product of close collaborative research work with multiple institutes across the globe throughout the years. It all started in 2003 when Dr. Rod Wing and Dr. Scott Jackson, a professor, GRE Eminent Scholar, and Director of the Center for Applied Genetic Technologies at the University of Georgia, initiated a collaboration with Dr. Darshan Brar, former IRRI plant breeder and Head of the Plant Breeding and Genetics Division during a visit to IRRI Headquarters in Los Baños, Philippines. Having isolated DNA for a number of wild species, Drs. Wing and Jackson took the samples back to their laboratories to produce the genome libraries used for sequencing.

Developing the capacity to incorporate high-value traits into successive new generations of rice using new molecular breeding techniques

CRISPR-Cas system: Revolutionizing the genetic blueprint of rice

Recent advances with the CRISPR system—the world's most promising gene-editing tool—could increase the speed of rice breeding.

One of the most discussed scientific events in today's world is the discovery and application of the clustered regularly interspaced short palindromic repeats (CRISPR) system in genome editing. CRISPR is simply a specialized bacterial immune system that scientists have modified into a tool for eliminating or manipulating the set of genetic instructions in animals, plants, and even humans. This tool is easy to use and is cheap, which adds more value for this technology for rice scientists working on eliminating or modifying unwanted traits and inserting new traits to improve the crop's yield, resistance to diseases, and ability to thrive under harsh environmental conditions.

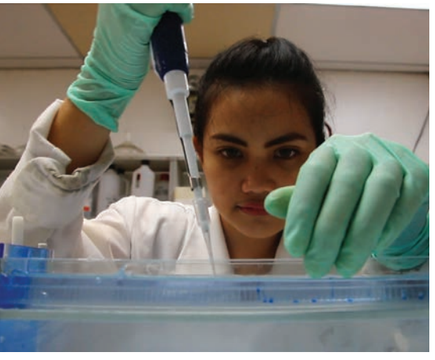
The CRISPR system has two components: a guide-RNA (gRNA) and a nuclease (Cas9/Cpf1). The gRNA carries the nuclease to target a certain location in a genome. After the gRNA reaches the target location, the nuclease attached to it can cut the genome at a desired location. This genome-editing process could be used to generate mutations arising from the cell's attempt to repair itself or introduce a piece of a new gene fragment into the cell.

The CRISPR system is highly versatile in its approach and applicability. With subtle changes in its general makeup, the CRISPR system can be directed to perform a variety of functions related to genome studies other than cutting and splicing DNA and removing and inserting genes.

CRISPR and the rice challenge

Although genome editing in rice was already being practiced using other technologies, the CRISPR-Cas system provided unprecedented control and precision in creating targeted mutations in the rice genome. The CRISPR method could induce mutations with a very high efficiency. The focus soon shifted to the application of the CRISPR tool for the betterment of the rice crop as research moved toward the applied aspect of genome editing. In this regard, significant strides have been made toward improving rice and its traits.

Another enzyme alternative to Cas9 has been identified and has been successfully applied as an additional editing tool for rice. Known as Cpf1, it enables scientists to target locations in the rice genome inaccessible to Cas9, thus expanding the available targeting potential.



The CRISPR system was first used by the molecular editing team of the C4 Rice Project in early 2017. The team used Cas9 and Cpf1 to edit the OsEPFL9 gene, which determines stomatal formation and patterning, and creates a mutation that causes OsEPFL9 to lose its functions. Both Cas9 and Cpf1 were successfully used to edit the gene in question and create mutants. Further research in this area is ongoing and would be helpful in rolling out rice varieties with a stronger ability to survive droughts because of the more efficient use of the water stored inside the plants.

Other research activities at IRRI are also using CRISPR to manipulate other traits in rice to develop varieties that can withstand environmental stresses and pests and diseases, contain higher nutrients, and produce better grain quality. The system is also useful in developing double-haploid rice, which provides greater breeding efficiency.

Create and support a network of catalytic agents to drive widespread adoption of high-level innovations and technologies

Working across rice-growing countries, IRRI endeavors to integrate rice industry innovations into the local rice value chain through partnerships, education, and technology to maximize impact and produce substantive benefits for rice farmers, producers, and consumers.

With 'hidden hunger' or micronutrient malnutrition as one of the major UN Sustainable Development Goals, IRRI has been leading the way in developing healthier rice varieties biofortified with key micronutrients like zinc, iron, and Vitamin A.

Developed by IRRI with the Philippine Department of Agriculture, the satellite-based rice crop monitoring project Philippine Rice Information System (PRISM) will help farmers and policymakers make better decisions through accurate and timely data, recently showcased when the system mapped calamity flooding in Mindanao.

In Odisha, IRRI is helping set up "Evidence Hubs" - district-level centers to help farmers and stakeholders provide feedback and be better informed of the seed value chain in their areas, and particularly to offer a platform for women to participate in decision-making and new technologies.

IRRI recently launched its IRRI Education, a progressive teaching facility that offers multi-disciplinary courses from foundational skills to executive and leadership training.

At the 50th anniversary of ASEAN, IRRI and its partners recognized fifteen leading farmers and scientists from across the region through the Rice Science and Technology Ambassadors Award, recognizing their contribution to agriculture research and impact to smallholder farmers.

To collectively address food security, research heads pledged support to IRRI's ASEAN+3 Rice Breeding and Genetics Initiative during the Council for Partnership on Rice Research in Asia (CORRA) meeting. The initiative seeks to ensure rice availability and affordability among the council's member nations.

Lastly, IRRI partnered with India to establish the IRRI South Asia Regional Centre (ISARC) in Varanasi, a fully-equipped modern facility that will support research collaborations, training, and service provisions for institutions, scientists, and other stakeholders in South Asia and Africa.

For IRRI, adoption of best practices, technologies, and innovations across the global rice industry is essential for improving resiliency against future challenges and ensuring food security.

Developing the capacity to incorporate high-value traits into successive new generations of rice using new molecular breeding techniques

Improving health and nutrition through rice science

Opportunities exist to improve the nutritional content of rice varieties to solve the micronutrient-deficiency problem affecting more than two billion people, mostly in rice-consuming Asian countries.

"More than two billion people in the world are malnourished and most of them live in rice-consuming Asian countries," said Dr. Mallikarjuna Swamy, head of IRRI's Healthier Rice Breeding. He also added that huge opportunities exist to improve the nutritional content of rice varieties to solve the micronutrient-deficiency problem. Scientists at IRRI and its partners are working together to bring solutions such as the high-zinc rice varieties that have been released in the Philippines and Bangladesh.

Micronutrient deficiency, also called hidden hunger, is a major nutrition problem affecting more than two billion people worldwide, especially in Asian countries, where rice is the major staple food. This is because most of the popular rice varieties grown and eaten by billions of people lack a sufficient amount of minerals and vitamins. Health problems from deficiencies in iron, zinc, and vitamin A are highly evident in Asian populations. Children and pregnant and lactating women are especially vulnerable to malnutrition.

The United Nations has identified overcoming the problem of micronutrient malnutrition as one of the major sustainable development goals to be achieved by 2035. For a major problem like this, science is essential. IRRI, being the leading research center for the development of rice varieties, has helped solve many problems through scientific interventions. Our project aims to develop more nutritious rice varieties as part of a bigger strategy for counteracting global hidden hunger.

How important is dietary zinc?

Zinc is needed for the body's immune system to properly work. Zinc deficiency causes stunting, diarrhea, reduced immunity, and poor cognitive development. IRRI is focusing on developing rice varieties with a higher content of zinc than the popular varieties. IRRI uses conventional breeding methods, transferring the trait from new high-zinc donor lines that we have identified.

IRRI has already released a high-zinc variety in the Philippines and three varieties in Bangladesh in collaboration with our partners, the Philippine Rice Research Institute (PhilRice), and Bangladesh Rice Research Institute.

Using information communication technology (ICT) innovations such as remote-sensing technology, geographic information systems (GIS), and high resolution satellite images to monitor and evaluate agricultural systems

PRISM in perspective

Information has the power to help policymakers make better decisions.

Information is power and, when in the hands of policymakers, better decisions can be made. It is especially important for a country like the Philippines which experiences an average of about 20 typhoons a year.

In January 2017, the Philippine Rice Information System (PRISM) was tasked with assessing the extent of damage due to flooding and torrential rains that hammered Davao City in Mindanao in the southern part of the Philippines.

"We received a request from the DA for an assessment of flooded rice areas in Davao," said PRISM project leader Alice Laborte. "We mapped all the flooded areas—not just the rice areas—in Davao and other parts of Mindanao where many locations were placed under a state of calamity.

"The beauty of this technology, which makes use of satellite imagery, is that we can quickly provide an assessment and estimate the extent of damage over a large area," Dr. Laborte added. "One needs also to consider that when there's a calamity such as this, mobility for government workers is limited, and accurate and timely assessments of damage are particularly challenging."

System in shape

PRISM is an online system that consolidates and presents accurate, timely, and location-specific information on the status of rice crops. This includes rice area estimates, planting dates, yield estimates, and crop health assessments. PRISM provides vital information that can support the DA in strategic and policy decision making, technology deployment, disaster preparedness, and rapid response to emergency situations during natural calamities.

The project was able to map the rice areas in the entire country with an accuracy of more than 85%. It provides a quicker turnaround time for estimating rice areas.

"PRISM can estimate rice area and yield at the municipal level, so the data are more specific than official statistics. It can also generate more granular map – even at the barangay level (the smallest local government unit in the Philippines). However, we need accurate barangay maps to release reliable estimates at this level," shared Dr. Laborte.

Agricultural extension workers undergo crop health training for the expansion of the coverage of PRISM monitoring fields

Ready to go

The PRISM Project will be turned over to the DA through the Philippine Rice Research Institute (PhilRice) to ensure the continued operation of its system.

"We have been working hand in hand with PhilRice during the research project phase of PRISM," said Dr. Laborte. "PhilRice has been beefing up its infrastructure and setting up a separate PRISM unit with dedicated staff."

PRISM also significantly invested in building the capacity of their regional partners. Last year, the DA regional field officers participated in several training courses, including research data management, GIS, and crop health. Meanwhile, local government units joined a crop health training activity.

"We are seeing a growing interest in PRISM products and we would like planners and policymakers to use the information generated by PRISM when and where needed to make informed decisions," she further shared.

"Besides assessing damages caused by flooding and drought, we receive other queries from the DA on whether we can estimate irrigated and rainfed rice areas, and also map other crops, such as maize and other high-value crops, across the country," said Dr. Laborte. "We have to build the system incrementally. Now that we have developed and gained confidence in our estimates for rice area, we can explore protocols for mapping other areas as a next step."

Agricultural field officers undergo training in basic geographic information system, which enables the visualization of rice area and yield, gps-based field observations, and other data generated by PRISM.

Primed with a new purpose

Farmers, on average, lose about 37% of their rice crop to pests and diseases annually. In severe cases, pests and diseases can even wipe out crops completely, leaving farmers with nothing.

Following on the success of the PRISM Project, the Philippine DA wants to further tap IRRI to assess damage caused by pests and diseases on rice. The Pest and Disease Risk Identification and Management (PRIME) project focuses on pests and diseases such as blast, bacterial blight, rice tungro disease and its vector green leafhopper, brown planthopper, and rats, which cause major losses in the Philippines. Like PRISM, PRIME is funded by the DA-Bureau of Agricultural Research."

PRIME will build on the existing platform of PRISM and will integrate field-based pest surveillance and information derived from satellite and drone images to identify risk factors of pest and disease outbreaks, map potential outbreak risks, and identify appropriate management strategies and tactics to reduce crop losses. It is expected to enhance the DA's ability to reduce yield losses due to pests and diseases through better management and targeting of risk areas.

Information generated from both projects will boost the rice-based monitoring system of the Philippine Department of Agriculture.

Dr. Laborte says PRISM can provide an accurate and timely estimate of damages over a large area when making assessments on the ground.

Working with the public and private sector to realize additional high-value markets such as meeting urban consumer's requirements for rice products that are convenient, high quality, nutritious, and affordable

"Evidence Hubs" help increase use of improved rice varieties in Odisha

Participants at an Evidence Hub in Puri District evaluating rice varieties (Photo: IRRI India)

In Odisha, growing rice is a challenge. Environmental stress is the most important yield-limiting factor. Around 1.1, 1.3, and 0.15 million hectares of rice areas in Odisha are prone to flooding, drought, and soil salinity, respectively. Other factors include low seed and varietal replacement, non-availability of quality seed in rainfed areas, knowledge gaps, to name a few.

In partnership with the State Government of Odisha, IRRI established Evidence Hubs. The hubs are organized at district levels to involve different stakeholders of the seed value chain in evaluating released rice varieties and those in the breeding pipeline.

Evidence Hubs emphasize the relationships among the various stakeholders to facilitate the process of varietal selection of the most preferred rice varieties in the region. Through the Evidence Hubs, men and women farmers, extension officers, seed dealers, seed producers, seed certification officers, millers, scientists and government officials discuss the traits and characteristics of their preferred rice varieties.

Feedback generated from these hubs is important for breeders in developing product profiles for new rice breeding lines for different ecologies. Additionally, the hubs provide evidence-based facts to guide policymakers in formulating strategies for varietal preferences, selection, and replacement and seed production. Evidence Hubs will also give farmers proofs of the advantages of replacing older varieties with new ones. By encouraging the adoption of the most suitable varieties, the farmers gain more yield and income.

Evidence Hubs also provide a platform for women to participate, evaluate, and analyze new technologies and decision-making. IRRI works closely with women Self Help Groups (SHGs) that play an important role in many farming-related decisions including varietal selection and adoption.

Creating awareness about new varieties through social contacts helps speed up the adoption of new varieties through the informal seed system. Through SHGs, IRRI promotes women leadership in the seed sector where they are trained to become seed producers by linking them with the formal seed system. This way women groups are gradually transformed into business enterprises that generate income, ensures local seed security, and contributes to varietal replacement.

Evidence Hubs bring together men and women farmers, extension officers, seed dealers, seed producers, seed certification officers, millers, scientists, and government officials to discuss the traits and characteristics of their preferred rice varieties.





Providing a customer-focused and demand-driven suite of educational programs that capitalize on IRRI's expertise in rice research, agricultural extension, and rice sector policy

Going beyond yield: IRRI Education to build human capacity in farming

IRRI Education aims to provide knowledge and skills to everyone in the agricultural sector through a demand-driven business model that allows for customizable programs specific to the niche needs of its clients.

The International Rice Research Institute (IRRI) launched its capacity building initiative, IRRI Education, on April 2017. The launch was attended by Asian Development Bank President Takehiko Nakao and several senior management and Board members of ADB. They joined members of the International Rice Research Institute's Board of Trustees (BOT) and senior management in a show of support to IRRI Education's mission.

"Agriculture is now at a crossroads," said President Nakao. "With increased population, threats of climate change, and growing demand for nutritious food, the agricultural sector needs more rapid transformation and to make use of the best available knowledge and technology. This means investment in human capacity building must increase together with science and technology. This makes IRRI Education very timely. We congratulate IRRI for the initiative.

IRRI Director General Matthew Morell spoke about the multi-faceted nature of capacity development that will be necessary for the agri-food systems of the future.

"Our goal is that, through IRRI Education, we will move beyond providing foundational knowledge and skills through to executive and leadership education. We have the ability to assist those already in the agri-food sector by providing an understanding of the more complex requirements that a more mature rice sector will demand," Morell said.

"Agriculture today has changed. Through our successes, we are able to be less obsessed just with high yields to ward off mass starvation. Rather, we deal with the complexities of adapting and mitigating the effects of climate change, addressing food and nutrition security in an urbanizing world and ensuring an equitable and sustainable global rice sector," he added.

Since 1964, more than 15,000 students have benefitted from training at IRRI, including 66 alumni from 11 developing countries supported through the ADB Scholarship Program that started in 1988. Many of these alumni have become leaders—agriculture ministers, scientists, thought leaders—within their national agricultural research and extension systems.

IRRI Education builds on that training foundation. It aims to provide knowledge and skills to everyone in the agricultural sector through a demand-driven business model that allows for customizable programs specific to the niche needs of its clients.

IRRI Education will provide key programs designed specifically for individuals and professionals working in the agricultural sector. It will offer the following:

- Science Courses which offer training and research tools and techniques for emerging scientists, from Basic Experimental Design to Research Proposal Writing;
- Technology Transfer Courses which will provide technical knowledge transfer through on-site, hands-on training programs for students, researchers, NARES, and the private sector; and
- Leadership Courses which will teach advanced management skills, strategic planning, and policy creation and implementation in the context of agricultural research and development.

IRRI also partners with ministries of agriculture, NARES, and private companies to assess capacity building needs and create more focused training programs for its intended clientele.

From left: Temina Lalani-Shariff (IRRI Communications Head), Jim Godfrey (IRRI BOT Chairperson), Matthew Morell (IRRI Director General), Takehiko Nakao (ADB President), and Peter Brothers (IRRI Education Head) (Photo: IRRI)

Working with IRRI and NARES scientists to make their scientific knowledge and expertise more widely accessible

ASEAN 50th Anniversary Celebration recognizes rice farmers and scientists

The farmers' and scientists' hardwork and commitment to increasing rice productivity in their respective countries have significantly contributed to a more food-secure region and a revitalized rice sector for Southeast Asia.

The Association of Southeast Asian Nations (ASEAN) and IRRI recognized and awarded 15 leading farmers and scientists from across Southeast Asia for their valuable contribution to rice farming and agriculture research, especially where they have helped smallholder farmers in the region achieve food sufficiency and increase food production and security.

Dubbed as ASEAN Rice Science and Technology Ambassadors Award, the recognition pays tribute to the hard work and commitment of various individuals in increasing rice productivity, significantly contributing to a more food-secure region and a revitalized rice sector for Southeast Asia. It also recognized the impact of the continuous work of Southeast Asian national governments and the International Rice Research Institute (IRRI) in developing, adopting, and promoting new and improved rice technologies and approaches that have benefited millions of rice farmers and consumers.

The ASEAN Rice Science and Technology Ambassadors Award was an initiative led by the Philippine Department of Agriculture, in cooperation with the International Rice Research Institute (IRRI) and the Philippine Department of Foreign Affairs. It was sponsored by China through the ASEAN-China Cooperation Fund.


MR. SIHONG KHOTTAVONG
Outstanding Rice Farmer – Lao PDR


DR. ASFALIZA RAMLI
Outstanding Rice Scientist – Malaysia


MR. JAAFAR BIN ZAKARIA
Outstanding Rice Farmer – Malaysia


DR. SAILILA E. ABDULA
Outstanding Rice Scientist – Philippines


DR. YIN ZHONGCHAO
Outstanding Rice Scientist – Singapore


MR. BUNMEE SURAKHOT
Outstanding Rice Farmer – Thailand


DR. OUK MAKARA
Outstanding Rice Scientist – Cambodia


DR. SATOTO
Outstanding Rice Scientist – Indonesia


DR. PHETMANYSENG XANGSAYASANE
Outstanding Rice Scientist – Lao PDR


MR. U THAN MYINT
Outstanding Rice Farmer – Myanmar


MS. MYINT YI
Outstanding Rice Scientist – Myanmar


MR. NEMENCIO J. CONCEPCION
Outstanding Rice Farmer – Philippines


DR. JIRAPONG JAIRIN
Outstanding Rice Scientist – Thailand


DR. TRAN THI CUC HOA
Outstanding Rice Scientist – Vietnam


MR. PHAN THIEN KHANH
Outstanding Rice Farmer – Vietnam

Tailoring engagements with NARES partners to account for varying needs, rice sector opportunities, and the changing political landscape in specific countries and regions

CORRA members pledge strong support for solutions to regional food security

The ASEAN+3 Rice Breeding and Genetics Initiative aims to improve the genetic resources of rice varieties available to member countries, increase yield, and assist national breeding programs.

In September 2017, agriculture research heads from 14 Asian countries supported the ASEAN+3 Rice Breeding and Genetics Initiative - a long-term regional investment and collaboration initiative in rice breeding aimed to address regional food security and national rice sector strategies.

In this year's meeting of the Council for Partnership on Rice Research in Asia (CORRA), the research heads signed a declaration of support to endorse this regional platform to their respective Ministries of Agriculture for further deliberation.

Despite the progress of some Asian nations in their respective agricultural sectors, food crisis remains a looming threat. If viable solutions are not found by 2030, the food supply of 560 million people in the region would be adversely affected.

The ASEAN+3 Rice Breeding and Genetics Initiative aims to improve the genetic resources of rice varieties available to member countries, increase yield, and assist national breeding programs. Through this initiative, member countries could advance a bilateral or multilateral partnership; underpinning the future of their respective rice industries through co-development and co-investment in key regional rice resources.

The People's Republic of China through the China National Rice Research Institute hosted this year's annual gathering of leaders. CORRA is composed of representatives of national agricultural research and/or extension systems (NARES) from sixteen member countries in Asia including Bangladesh, Cambodia, China, India, Indonesia, Japan, South Korea, Laos PDR, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam. The council acts as an advisory board and provides a platform for partnership and collaboration among its members.

India, IRRI partnership to boost South Asia's rice sector

The IRRI South Asia Regional Center will further bolster India-IRRI partnership to ensure food and nutrition security and capacity development in the South Asian region.

The Memorandum of Agreement for the establishment of the IRRI South Asia Regional Center (ISARC) was signed by IRRI Director General Matthew Morell (left) and DAC&FW Secretary S.K. Pattanayak (right). With them is Minister Radha Mohan Singh (Agriculture and Farmers Welfare).

The government of India and the International Rice Research Institute (IRRI) further bolsters their partnership to ensure food and nutrition security and capacity development in the South Asian region.

A Memorandum of Agreement was signed on August 2 in Krishi Bhawan, New Delhi, by IRRI Director General Matthew Morell and Hon. Secretary S.K. Pattanayak of the Indian Department of Agriculture, Cooperation and Farmers Welfare. The MOA signing precedes the July 12 approval of the Union Cabinet, which is chaired by Prime Minister Shri Narendra Modi, for the establishment of the IRRI South Asia Regional Center (ISARC) at Varanasi, Uttar Pradesh.

"While IRRI has historically helped India to meet its overall food security needs through the green revolution high-yielding rice varieties such as IR8, the challenge now is to deliver increased livelihoods for farmers through increasing the value of rice, and increasing the well-being of farmers and consumers through enhanced nutrition outcomes. This agreement opens up more exciting collaborative activities in developing higher-yielding and more nutritious rice varieties that also meet the eating preferences of consumers," said Dr. Morell.

"It is important that new and improved rice varieties also possess superior grain quality that add value through meeting domestic and export market expectations to further improve the lives of farmers who rely on rice for their livelihood and sustenance," he added.

In an official statement by the Indian Press Information Bureau, ISARC will be the first international center in eastern India. The center will drive initiatives that focus holistically on the rice value chain in the country.

ISARC will be managed by IRRI and is designed to provide a regional facility that supports research collaboration, training, and service provision to institutions, scientists, and other stakeholders from India and other South Asian and African nations. The center will house a modern and sophisticated research facility that aims to develop higher-yielding and more nutritious rice varieties that also meet the eating preferences of consumers.

Specifically, it will offer the following products and services:

- Center for Excellence in Rice Value Addition (CERVA)
  - Research toward the production of state-of-the-art grain quality
  - Further improvement of nutritional quality, biofortification, postharvest loss and processing, rice value chains, understanding heavy metal contamination, and production of new varieties that meet market demand and expectation
- Broader programs of capacity development
  - Short courses on rice-based agri-food systems
  - Scholarships and internships
  - IRRI Education products provided to the private sector, NARES partners in India, international students from SAARC and Sub-Saharan Africa, and state and national government officials
- Broader programs of research and development
  - Center for phenotyping excellence
  - Agronomy research on systems intensification and optimization
  - Developing and delivering climate-resilient and stress-tolerant rice varieties
  - Intensifying cereal cropping systems to invigorate economic activities across many regions

ISARC is designed to provide a regional facility that supports research collaboration, training, and service provision to institutions, scientists, and other stakeholders from India and other South Asian and African nations.

Transform

Engaging global actors to inform policies and establish standards and benchmarks that transform how food is cultivated, produced, and marketed in rice-based agri-food systems

IRRI recognizes that transformation of the rice sector cannot be accomplished by one research organization alone. This is why IRRI is investing significantly on forming alliances with key actors in the rice sector across countries, borders, and sectors of society.

IRRI partnered with global multinational company BASF to establish the Direct Seeded Rice Consortium (DSRC), a multi-sectoral organization that promotes and advances a more sustainable system of rice cultivation.

To address production loss due to improper storage and management of harvested grains, IRRI collaborated with American company GrainPro to bring to market Ultra Hermetic Storage, a postharvest technology product that was recently introduced to farmers in Vietnam.

IRRI-backed 'Evidence Hubs' in Odisha are empowering Women Self-Help Groups (SHGs) to take the lead in agricultural innovations, training them not just in skills and capacity building but also on varietal preference, climate-smart rice, and seed entrepreneurship.

The Resilient Rice Field Laboratory will develop new, high-yielding, stress-tolerant rice varieties that are well-suited and well-adopted by farmers across South Asia.

With funding from the Japan International Cooperation Agency (JICA), IRRI and PhilRice recently gave a specialized training course to 19 participants from seven African countries on rice seed production and extension methods, promoting best practices and the use of quality seeds among African farmers.

Brokered by IRRI, the regional seed policy agreement now has nine member countries across South and Southeast Asia, allowing faster and more expansive sharing of new and better seeds to reach the hands of farmers.

Bangladesh partners with IRRI to help the country's rice sector cope with the drastic effects of climate change and degradation of natural resources.

Finally, the Sustainable Rice Platform (SRP), established by IRRI and UN Environment, is ramping up its activities by developing trainings, strategies, and workshops to promote adoption of sustainable standards by smallholder farmers and other rice value chain actors.

Through the delivery of successful policy interventions and institutional capacity-building programs, IRRI hopes to advocate the development of equitable and sustainable rice sectors around the world.

Facilitating the diversification of rice-based farming toward higher-value commodities to increase income and overall farm stability and minimize risk

IRRI and BASF team up to promote direct-seeded rice in Asia

Direct seeding is a more efficient and cheaper method of growing rice; it requires less resources and emits less greenhouse gases.

The International Rice Research Institute (IRRI) and BASF signed three agreements, paving the way for wider dissemination and adoption of direct-seeded rice (DSR) tools and technologies. Through this partnership, the two organizations will establish a multi-stakeholder DSR Consortium and further research on the use of non-genetically modified, herbicide-tolerant rice.

Under optimal conditions, direct seeding is considered a more efficient and cheaper method of growing rice than manual rice transplantation. It requires less resources such as labor and water, and it emits less greenhouse gases compared with other rice growing methods.

Although direct seeding is widely practiced in the United States and South America, challenges such as higher yield losses due to weed infestation have limited its wide-scale adoption in Asia.

The new research consortium aims to:

- develop robust mechanized dry- and wet-DSR systems,
- investigate solutions to manage weeds, and
- formulate agronomic practices suited for DSR farms in Asia.

Furthermore, the consortium will enable IRRI to develop DSR technologies and test rice varieties suitable to Asian environmental conditions. Membership is open to the public and private sectors, research organizations, NGOs, and farmer groups.

The partnership will also advance research on non-genetically modified, herbicide-tolerant rice to safely control weed infestation in DSR systems. Once these varieties are introduced to the market, a third-party organization will assess their impact on rice productivity, profitability, and ecological sustainability.

Defining and implementing a vigorous agenda in postharvest technologies, to empower farmers in their dealings with traders and millers

IRRI, GrainPro introduce advanced hermetic rice storage tech in Vietnam

Proper rice storage helps preserve its high quality while reducing its negative effects on the environment.

In Vietnam, it is crucial that rice producers and traders learn more about effective rice storage techniques to preserve rice quality and increase its market value. One significant challenge among Vietnam farmers is proper rice storage and management to maintain its prime condition. Mismanagement of storage can lead to grain quality deterioration and rice loss due to birds, rodents, and other animals.

Proper rice storage helps preserve its high quality while reducing its negative effects on the environment. It also enables farmers to gain a bigger profit margin.

To build awareness on effective and sustainable rice storage techniques, GrainPro and the International Rice Research Institute (IRRI) introduced the Ultra Hermetic Storage technology to Vietnam's government agencies, NGOs, and private sector representatives from big rice producers in the country.

Hermetic storage is an IRRI-developed postharvest technology that is being used in many countries for the past 20 years. Because of the air-tight enclosure, it can reduce loss and preserve grain quality. It can also be operated without power, and does not require pesticides for fumigation.

Promoting this postharvest technology among Vietnam's rice farmers can allow them to store rice that are of export quality. But to make this possible, the Ultra Hermetic Storage technology must be disseminated broadly.

The Swarna Laxmi SHG is aiming to make quality seeds of preferred rice varieties locally available to farmers through seed entrepreneurship. (Photo: IRRI India)

Improving access to technologies, finance and extension services for women

Women's groups lead agricultural innovations in Odisha

Women Self-Help Groups (SHGs) in Odisha are being tapped to lead agricultural innovations, including varietal selection and the adoption of climate-smart rice.

Women farmers are often less productive than men because they have limited access to technology and information. However, they have an enormous potential to make significant contributions to improving agricultural productivity and reducing hunger and malnutrition with proper training. In fact, SHGs can be change agents by creating awareness, disseminating knowledge and seeds of new varieties, and by participating in the decision making on technology use.

Through the Evidence Hubs, the International Rice Research Institute (IRRI) is utilizing women SHGs to empower their members through the provision of knowledge, skills and capacity building, self-motivation, and learning that can lead to achieving desirable adoption levels of climate-resilient rice varieties. Evidence Hubs facilitate the process of varietal selection of preferred rice varieties in the region by engaging the different stakeholders of the seed value chain in evaluating available as well as unreleased rice varieties.

In 2017, 894 women farmers participated in IRRI's evaluation of new and old rice varieties under an Odisha project. These participatory trials are proving to be important in the adoption of new varieties among women groups. In addition, 1,166 women farmers are planting the new varieties in demonstration plots to accelerate varietal adoption and replacement.

In Gananathpur Village in Kalahandi District, the Maa Thakurani SHG, 17 members of the SHG evaluated 19 rice varieties on a demonstration field monitored by IRRI and the State Department of Agriculture. The group selected the best varieties and exhibited their potential to become viable enterprises. The Swarna Laxmi SHG in Deogarh District has taken 0.2 hectares as a demonstration site of for 16 new rice varieties.

IRRI also provide training for building the capacity of SHGs on quality seed production and storage practices. The production of quality rice seeds will help increase their annual income as these command higher prices than grains.

SHGs aims to make quality seeds of preferred rice varieties locally available to farmers through seed entrepreneurship. The women farmers are being trained in various seed system innovations and seed varietal preference process. This strategy has been successfully translated into practice as a significant number of women farmers are now growing foundation seeds and maintaining the quality to produce certified seeds.

Through this intervention, IRRI has created a cluster of 90 members from 10 SHGs in Akhadepada Village in the Nimapada Block of the Puri District. IRRI assisted in registering the cluster as "Seed Producer Group" at the district level by providing the foundation seeds to enable it to produce certified seeds. The institute also linked the group with a seed corporation so it can be a part of the formal seed system.

These approaches help create sustainable agriculture livelihood opportunities for women, improve their skills and capabilities, and enhance their managerial capabilities by way of wealth creation and its management.

Members of the Maa Thakurani SHG in Gananathpur Village in Kalahandi District select the best rice varieties and show their potential to become viable enterprises. (Photo: IRRI India)

Driving national economic self-determination through policies and investment that provide positive outcomes

Prime Minister Narendra Modi furthers innovation for the Indian rice sector

The Resilient Rice Field Laboratory will develop new, high-yielding, stress-tolerant rice varieties that are well-suited and well-adopted by farmers across the region.

Prime Minister Narendra Modi inaugurated the Resilient Rice Field Laboratory at the International Rice Research Institute (IRRI). The facility forms part of a three-prong approach to developing new, high-yielding, stress-tolerant rice varieties that are well-suited and well-adopted by farmers across the region.

Primary scientific research conducted in the Field Laboratory to develop stress-tolerant rice varieties is then transferred to IRRI's Centre of Excellence at the IRRI South Asia Regional Centre in Varanasi, Uttar Pradesh for further localized testing.

"The Varanasi Centre would help increase farmers' income by enhancing and supporting rice productivity, reducing cost of production, value addition, diversification, and enhancement of farmers' skills," said Prime Minister Modi.

From the IRRI South Asia Research Centre in Varanasi, a broad technology adoption network enables IRRI and its local partner, the Indian Centre for Agriculture Research to bring these innovations to farmers groups. This ensures innovations are tailored to farmers' needs and quickly adopted--creating a responsive, real-time laboratory dedicated to the development of high quality, profitable rice varieties for those in need.

"India's demonstrated leadership in agriculture and agricultural science in the region is a real benefit to farmers not only in India but also across SAARC, ASEAN and Sub-Saharan Africa in mitigating the risk of climate change for rice farmers," said Dr. Matthew Morell, Director General of the International Rice Research Institute, "The establishment of research facilities and Centres of Excellence such as this one and the one in Varanasi is a testament to the Indian government's commitment to South-South collaboration as a key mechanism for meeting food security needs and improving the livelihoods and welfare of farmers--the farmers who play a critical role in transforming the global rice sector into an efficient, highly-productive economic driver of the region."

Providing business and technological assistance to countries in Eastern and Southern Africa to invest in domestic rice production

PhilRice, IRRI host training to help improve productivity of African rice farmers

IRRI and Philrice hosted a training for seven (7) African countries on knowledge and skills in rice seed production.

IRRI and the Philippine Rice Research Institute (PhilRice) had partnered to host a training program designed to provide participants with knowledge and skills in rice seed production and the promotion of quality seeds among African farmers.

Participants went through a specialized course on rice seed production and extension method. The course covered land and seedling preparation, planting, field problem diagnosis, harvesting, and postharvest practices. Extension methods and technology transfer strategies promoting the use of quality seeds will also be a key component of the program. The PhilRice's Central Experiment Station in Nueva Ecija and IRRI Headquarters in Laguna served as the participants' training ground.

There were 19 participants from Ethiopia, Ghana, Kenya, Mozambique, Sierra Leone, Tanzania, and Uganda attending the eight-week course. Many of the participants were selected based on the work they do in their respective countries' agricultural research institutions and public extension programs. Others represented non-government organizations, universities, and the private sector. In addition, ten participants from the Philippine Department of Agriculture were also in attendance.

The training program is one of the activities under the Extension Capacity Development for Rice Food Security in Africa Project, which is funded by the Japan International Cooperation Agency. This project stands alongside the rice value chain improvement initiatives of different members of the Coalition of African Rice Development, and aims to contribute to the fulfillment of the respective national rice development strategies of its member countries.

Actively seeking opportunities to inform policy formulation and appropriations processes that cut across sectors or constituencies in order to cultivate an enabling environment for rice sector

Agreement on multi-country seed-sharing reached

The seed policy is timely and critical to build a strong regional cooperation within Southeast Asia and across both South and Southeast Asian regions.

Two more countries have joined a regional seed policy agreement that speeds up the distribution of modern rice varieties across nations in South and Southeast Asia. This agreement was formalized during a meeting of agriculture ministers and representatives of nine countries, titled "Seeds without Borders: Regional cooperation for seed-sharing," held last June 9-10 at Siem Reap, Cambodia.

Organized by the International Rice Research Institute (IRRI), the meeting brought together government and policy leaders from Cambodia, India, Bangladesh, Nepal, Myanmar, Sri Lanka, Thailand, Laos, and Vietnam for a multi-country dialogue on collaborative ways to improve farmer and consumer welfare through innovative agricultural technologies.

Originally signed by India, Bangladesh, and Nepal in 2014, the regional seed sharing agreement has now expanded to include Sri Lanka and the Kingdom of Cambodia. Further, the agreement expanded to include other crops, in addition to rice.

"The workshop on seed policy is timely and critical to initiate the discussion and to build a strong regional cooperation within Southeast Asia and across both South and Southeast Asian regions," said H.E. Veng Sakhon, Cambodian Minister for Agriculture, Forestry and Fisheries (MAFF). "It provides an effective platform for us to see how we can reciprocally benefit from South Asia's experiences and information."

"What we have seen here today is an example of how effective national leadership and vision can lead us to a future where nations are connected by seeds without borders," said Dr. Matthew Morell, IRRI Director General. "Agro-ecological zones and the effects of climate change don't stop at borders, so the availability of high-quality seeds shouldn't either."

He went on to say, "making a variety of agricultural crops available across borders is a major step forward for farmers and national agricultural systems. The extension of this agreement to include other crops means signatory countries gain an added benefit from the high degree of cooperation that we have already achieved by working together on rice for so many years."

Making a variety of agricultural crops available across borders is a major step forward for farmers and national agricultural systems.

Modern rice varieties such as climate-resilient varieties that withstand drought or salinity, help vulnerable farmers establish a secure food supply for their families as well as added income that they can invest in their own future.

Standard regulatory systems for new rice varieties require multi-season testing to ensure performance, pest and disease resistance and consumption quality. While these processes are important for quality assurance, the process is typically conducted independently by each country. As such, a variety released in one country is still required to go through a similar vetting process in a neighboring country, increasing the time to market these new rice varieties.

This seed-sharing agreement enables new and better seeds to reach the hands and fields of farmers more rapidly by establishing common parameters for varietal release.

As part of the workshop, participants identified a need to establish clarity on intellectual property rights, improved quarantine and seed certification standards, better engagement with the private sector, and expansion to other agricultural food crops to move the regional seed agreement forward further still.

Sh. Shobhana K. Pattanayak, Secretary of the agricultural department under India's Ministry of Agriculture and Farmers Welfare, believes that having more nations join the agreement for sharing seeds is a good demonstration of regional cooperation that other parts of the world can emulate. Equally, Dr. Morell stated that IRRI remains committed to working with country partners to usher in economic and social growth as well as regional and global food security.

The workshop also included a signing ceremony of a Memorandum of Understanding between the Government of Nepal and IRRI. More than a renewal of a former agreement, the MOU reaffirms a strengthened commitment to continue working together, deepening the two parties' relations and allowing for a larger operational presence in the country.

"Nepal has always kept IRRI in high regard due to IRRI's continuous support for our rice research and development," stated Dr. Suroj Pokhrel, Secretary of the agricultural and development ministry of Nepal.

Following from this workshop, IRRI will continue to actively engage with the signatory countries to move forward on the identified areas of development for the agreement.

Driving national economic self-determination through policies and investment that provide positive outcomes

Bangladesh Agriculture Minister hopes for new era of collaboration for rice sector

In partnership with IRRI, Bangladesh rice sector aims to cope with the drastic effects of climate change and degradation of natural resources through the institute's advanced agricultural technologies and innovative farming approaches.

Enhancing practical farmer knowledge, climate change mitigation strategies, and improving farm productivity for the Bangladesh rice sector were the focus of the visit of Bangladesh Agriculture Minister H.E. Begum Matia Chowdhury to IRRI headquarters. The said visit was part of the minister's efforts to help the Bangladesh rice sector cope with the drastic effects of climate change and degradation of natural resources through the institute's advanced agricultural technologies and innovative farming approaches.

"The purposeful investment in agricultural research and development is a high priority of the Bangladesh government to achieve sustainable and inclusive development. We hope that IRRI will continue to provide the technical support we need through collaborative programs for our vision of a food- and nutrition-secure future," said Minister Chowdhury.

The past several years showed an improvement in rice production in Bangladesh. However, in 2017, three episodes of severe flash floods have ravaged large agricultural areas of the country, particularly in the northern districts. At least 8 million people and around 8,000 hectares of paddy have been affected, leading to food shortage and hiked prices over the past few months.

IRRI Director General Matthew Morell said that the institute will continue to work with the Bangladesh government to ensure collaborative and responsive programs for the rice sector are in place to meet the current and future needs of the country's rice industry, particularly for the vulnerable farmers and consumers.

"IRRI is deliberately strengthening our presence in the South Asian region by closely working with our partners in determining how IRRI's research initiatives can best fit with the priorities of the government," added Dr. Morell.

Engaging beyond the agricultural sector with the development organizations, government agencies, and investors to advise and tailor solutions to specific issues

UN Environment and IRRI join hands to drive climate-smart sustainable rice

Innovative partnerships are needed to transform the global rice sector towards a low-carbon, sustainable future, and contribute to the 2030 Agenda and the UN Sustainable Development Goals.

In October 2017, a Memorandum of Understanding was signed by the two institutions to strengthen collaborative initiatives focusing on climate-smart sustainable best practices in rice production, with a particular focus on meeting the needs of rice farmers in developing countries.

Collaboration began in 2008 when the two institutions established the Sustainable Rice Platform as a multi-stakeholder initiative, bringing together governments, private sector actors, research and grass-roots organization to address the many challenges facing the rice sector. The alliance was officially launched in 2011 and now counts 80 institutional members around the world, linking together research, production, policymaking, trade and consumption to enhance sustainability throughout rice value chains.

Speaking at the opening of the First Global Sustainable Rice Conference and Exhibition held at the UN Conference Centre in Bangkok, Dr Matthew K Morell, IRRI's Director General, commented: "We are proud to strengthen our broad-ranging partnership with UN Environment to work together on our shared goals. Given the many challenges the global rice sector faces as we look ahead over the next 25 years, major transformation will be needed in order to meet the needs of a fast-growing global population in a sustainable way."

Under the agreement, the two institutions will work to enhance sustainable rice-based production and food systems through awareness raising, capacity development, knowledge exchange, and evidence-based analyses for policy support, as well as adoption of the new Sustainable Rice Platform Standard on Sustainable Rice Cultivation.

"We need to increase the adoption of climate-smart sustainable technologies to small-scale rice farmers around the world, and this partnership, as well as working with the private sector, will help in that job," said Erik Solheim, head of UN Environment. "This work goes beyond just putting food on plates. It's about boosting sustainable production, and therefore giving farmers and consumers a better deal. It's about delivering on our global goals, and taking concrete climate action."

The MOU was signed during the first Global Sustainable Rice Conference and Exhibition held in Bangkok which gathered around 300 global rice stakeholders from 30 countries to discuss challenges facing the global rice sector, and to propose innovative collaborative approaches to enhance sustainability in the sector.

HIGHLIGHTS

CIAT, FLAR, and IRRI: stepping up joint efforts to globally bolster sustainable rice production

IRRI partnered with the International Center for Tropical Agriculture (CIAT) and the Latin American Fund for Irrigated Rice (FLAR) to improve quality seed production and ensure delivery of quality seeds to farmers and national seed systems around the globe.

FAO and IRRI: stepping up joint efforts to globally bolster sustainable rice production

FAO and IRRI have agreed to cooperate more closely to support sustainable rice production in developing countries to improve food security and livelihoods while safeguarding natural resources.

UNEP and IRRI: partnership to drive climate-smart sustainable rice

UNEP and IRRI signed a new agreement to reinforce their long-standing collaboration to promote innovative environment-friendly technologies for rice production in developing countries.

France: climate-smart solutions for rice growers

In September 2017, IRRI presented its portfolio of projects on scientific and environmentally efficient strategies to address the effects of climate change during the Philippine-France Forum on Agriculture.

Iran: a rice research and training hub for Central and West Asia

IRRI signed a Memorandum of Agreement (MOA) accepting the role of lead capacity development provider of rice research and training facility in Central and West Asian countries.

India: establishing a hub of research excellence in South Asia

In December 2017, Secretary of Indian Department of Agriculture S.K. Pattanayak, met with IRRI to signify support for the upcoming launch of the IRRI South Asia Regional Centre (ISARC), the first international center in eastern India to drive initiatives focused on improving the rice value chain in the region.

China: towards big data for rice farming

The China Agricultural University (CAU) signed an agreement with the International Rice Research Institute (IRRI) renewing a partnership to boost research, training, and knowledge and technologies exchange between the two institutions.

Namibia: building ties to boost rice production

Although corn is Namibia's primary food staple, the government is keen on expanding rice production to improve its food security.

In January 2017, delegation from Namibia explored collaboration by learning about IRRI's high impact research activities, particularly on drought.

Myanmar: rice as the pulse of life

A partnership between researchers and smallholder farmers in lower Myanmar is improving agricultural profitability and productivity through rice-rice and rice-pulse cropping systems.

Sri Lanka: better rice research and development

IRRI signed a Host Country Agreement with Sri Lanka to further the country's programs and initiatives on rice breeding, water management, farm mechanization and capacity building.

Lao PDR: expanding partnership to increase food and nutrition security

The government of the Lao People's Democratic Republic and the International Rice Research Institute (IRRI) have entered into an agreement that strengthens their partnership in research and expands IRRI's role in increasing the country's food and nutrition security.

Philippines: joint program to push rice productivity

The Philippines works closely with IRRI toward a continuous and fruitful collaboration to help our rice farmers meet their production targets and also address their production gaps.

Cambodia: strategies for increasing country's rice production

Cambodia works with IRRI to considerably increase its annual production in the next 10 years. The partnership will focus on the seed systems and varieties that can adapt to drought, flooding, and other stresses caused by climate change, use of remote sensing technologies for improved rice monitoring, and developing integrated pest management approaches.

Thailand: deeper collaboration for stronger regional food security

Thailand continues to explore ways of deepening its ongoing collaboration with IRRI. In January 2017, H.E. Mr. Thanatip Upatising, the Ambassador of Thailand to the Philippines visited the institute's headquarters to exchange information and see what can be done for the benefit of IRRI and member countries.

AWARDS & ACCOLADES

IRRI receives Conviron Green Leaf Award for rice science tech investments

In recognition of its efforts to develop technologies that provide solutions to the challenges facing the rice sector, the International Rice Research Institute (IRRI) received the 2017 Conviron Green Leaf Award.

Conviron praised IRRI for its significant investments in new technology that drives discovery and progress in plant science and agricultural production. IRRI has a unique capacity to bring together lead researchers from all over the world, create programs, and develop rice production technologies that are communicated from the scientists down to the farmers. IRRI also has an expert and driven workforce that enables transformative rice research innovations.

Outstanding Research Award for biofortified indica rice study

IRRI's Genetic Transformation Laboratory, headed by Dr. Inez Slamet-Loedin, was recognized at the Regional Science and Technology Week (RSTW) for its work on iron- and zinc-enriched indica rice. The study is regarded as a breakthrough in the battle against micronutrient deficiency.

Titled "Biofortified Indica Rice Attains Iron and Zinc Nutrition Dietary Targets in the Field," the paper garnered the Outstanding Research and Development Award for the Research Category from the Los Baños Science Community Foundation, Inc.'s (LBSCFI), Philippine Agriculture and Resource Research Foundation, Inc. (PARRFI). The study successfully verified the proof of concept on attaining Fe/Zn nutritional targets under flooded field conditions. Genetically engineered rice has raised the levels of iron (up to 15 micrograms) and zinc (up to 45.7 micrograms). Generally, polished rice grains contain only around 2 micrograms of iron and 16 micrograms of zinc.

IRRI scientist wins 2017 Japan International Award for Young Agricultural Researchers

The project Climate-ready rice: Optimizing transpiration to protect rice yields under abiotic stresses, led by the University of Sheffield in collaboration with Kasetsart University in Bangkok and the International Rice Research Institute (IRRI), has been shortlisted in the 2017 Newton Prize. The Prize is part of the Newton Fund initiative and supports exceptional research and innovation in partner countries in Asia, where production of better rice varieties have social and economic importance.

This international collaborative project aims to enhance the heat and drought tolerance of rice plants while decreasing water loss and increasing water-use efficiency. In turn, this will make the crop survive and produce yield even in dry conditions. The success of this project would benefit farmers and improve food security in Asia.

Climate-smart rice project shortlisted in 2017 Newton Prize

The project Climate-ready rice: Optimizing transpiration to protect rice yields under abiotic stresses, led by the University of Sheffield in collaboration with Kasetsart University in Bangkok and the International Rice Research Institute (IRRI), has been shortlisted in the 2017 Newton Prize. The Prize is part of the Newton Fund initiative and supports exceptional research and innovation in partner countries in Asia, where production of better rice varieties have social and economic importance.

This international collaborative project aims to enhance the heat and drought tolerance of rice plants while decreasing water loss and increasing water-use efficiency. In turn, this will make the crop survive and produce yield even in dry conditions. The success of this project would benefit farmers and improve food security in Asia.

Dr. Kshirod Jena & Dr. Rakesh Singh
Fellow National Academy of Agriculture Science, India

Dr. Ruaraidh Sackville Hamilton
Recognized by the International Treaty of Plant Genetic Resources for Food and Agriculture

Dr. Uma Shankar Singh
Krishak Samriddhi Aayog Commission of Uttar Pradesh

AWARDS & ACCOLADES

WINNING SCIENCE:
Meet the awardees of the first IRRI Seed Grant Scheme

The International Rice Research Institute (IRRI) delivers through research excellence. The IRRI Seed Grant Scheme was launched in early 2017 to foster innovative collaborative research among young scientists. Following a competitive peer-review process, six research teams were awarded USD 15,000 each to undertake cross-disciplinary and innovative research in a span of nine (9) months. Meet the principal scientists and the stories behind their winning proposals.

Nitika Sandhu: Transforming rice production to improve the livelihood of farmers

Dr. Sandhu aims to transform rice production systems to help poor farmers struggling to cope in a changing world. She has formed a collaborative research team with experts in plant breeding, soil chemistry, and growing rice in unfavorable environments. The team examines issues associated with variable seedling sowing depth and its effect on nutrient uptake in relation to water content. Their research aims to identify rice varieties and develop management practices that lead to high rates of germination and emergence and better crop establishment under direct seeding. The ultimate goal of their research is to increase the yield and profitability of farmers through the adoption of mechanized direct seeding.

Van Hung Nguyen: A schedule for harvesting success

Dr. Nguyen and his research team aim to develop a system called EasyHarvest. This will optimize the scheduling of combine harvester services so that the needs of farmers can be matched to the availability of contractors and equipment. By combining predictions of harvesting times and the availability of combines, the harvesting requirements of farmers can be efficiently managed. This system also offers the potential to monitor and forecast the dates for harvesting rice, allowing farmers to plan well in advance. EasyHarvest could cut postharvest losses by 3% and farmers' costs by as much as 10%. It could also help reduce the environmental footprint of harvesting by using machinery more efficiently and effectively.

Harold Glenn Valera: Empowering rice farmers with information technology

Dr. Valera aims to empower rice farmers in the Philippines by increasing their access to information technology such as the Rice Crop Manager (RCM), a decision-support tool developed to help farmers increase their yield and profitability by providing them with tailored crop management advice.

Through surveys, Dr. Valera aims to evaluate the behavior of men and women farmers toward the information provided by RCM. He will assess differences in perception and understanding of the information it provides and how these affect implementation of its recommendations. By bringing together experts in social science, information and communication technology, and agriculture, this research will highlight the effectiveness of agricultural extension: the ability of scientific research and knowledge to educate farmers. The outcomes will be a series of recommendations that will enhance the dissemination of ICT tools such as Rice Crop Manager.

Dmytro Chebotarov: Software tools to accelerate rice breeding

Dr. Chebotarov aims to develop a software tool that will help scientists and breeders deliver the next generation of rice varieties. The genome of a rice plant is a unique sequence of genetic code that acts as a blueprint or set of instructions that controls every aspect of the plant.

Dr. Chebotarov and his team aim to develop a software tool called MAPPA. This will enable scientists to maximize the value of their data while minimizing the cost of sequencing. MAPPA will exploit the information from the variants measured by ensuring that these are well-distributed within the genome while being informative. Apart from saving scientists money, the real value of the tool is in increasing the amount of information available to scientists and breeders, which, in turn, will increase the speed and efficiency of introducing agriculturally desirable traits into new rice varieties—and benefit rice farmers and consumers alike.

Hsiang-Chun Lin: Using lessons from the past to drive the future of rice breeding

Dr Lin aims to further harness the potential of chloroplasts and mitochondria. Because of the important role these structures play, a variation in the genetic code between rice varieties could lead to major differences in important agricultural traits that affect growth, biomass production, and yield. In a unique collaboration between bioinformaticians and biologists, Dr. Lin's research aims to compare the DNA of 3,000 rice varieties and identify variations called single nucleotide polymorphisms (SNPs). This information will enable her team to understand the diverse function of rice and understand the evolution and history of rice domestication, which will help to identify lines that can be used to breed new varieties with improved agronomic traits. It will also help scientists understand the evolution and history of rice domestication, information that will inform the breeding process.

Nikolaos Tsakirpaloglou: Safeguarding the future of rice nutritional quality

Dr. Tsakirpaloglou aims to safeguard the nutritional quality of future rice varieties to help fight malnutrition.

Working with scientists from the C4 Rice Group, Dr. Tsakirpaloglou research aims to evaluate the performance of biofortified lines under future climate conditions. The results will enable the selection of appropriate geographical zones to ensure the maximum impact of biofortified lines in the coming decades. It will also call for the development of new strategies to mitigate micronutrient deficiency in a world experiencing extreme changes in climate.

Experiencing UNLEASH

By using the innovative mindset of young people and partner talents with leading companies, research institutions, foundations, non-profits, and investors, UNLEASH aspires to provide next generation solutions for the SDGs.

In August 2017, 1000 talents from 129 countries gathered in Denmark to develop solutions for the Sustainable Development Goals. These talents developed 197 solutions to make the world a better place.

Among them are Rochie Cuevas and Nitika Sandhu of IRRI.

"UNLEASH gave me an opportunity to see IRRI's guiding principles in action, albeit from outside the Institute. After all, UNLEASH is also all about creating a global impact that benefits the people and planet." - Rochie Cuevas

"I learned that being in a team means being bold, proactive and agile. It is also important to communicate well so your ideas will deliver the impact that you hope for. UNLEASH experience taught us how to engage donors, investors, and the audience. We were encouraged to think out of the box and look beyond conventional solutions to create a water-sufficient, sustainable world." - Nitika Sandhu

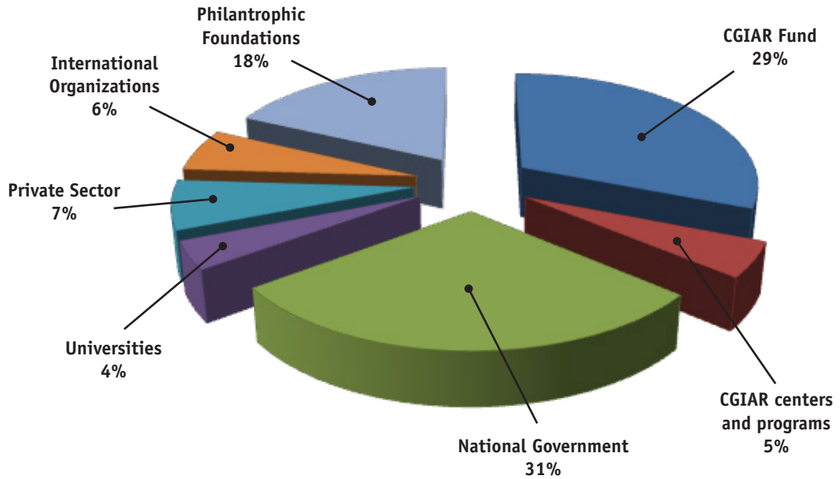
Statement by the Chair of the IRRI Board of Trustees For the year ended 31 December 2017

Financial highlights

Despite CGIAR Fund budget cuts in 2017, IRRI's financial position remains stable, with total assets of USD 87.896 million compared with USD 98.631 million in 2016. This reduction of USD 10.735 million is offset by a corresponding decrease in liabilities and decrease in net assets. IRRI had a net deficit of USD 2.951 million. The liquidity and long-term stability indicators continue to remain above CGIAR benchmarks.

In 2017, IRRI's grant revenue was USD 63.954 million, which includes USD 4.277 million of CGIAR RICE Windows 1 and 2 funds for our CGIAR partners, AfricaRice, and CIAT. IRRI continues to successfully attract significant new investments to further its mission as well as to cover gaps due to CGIAR Fund budget cuts in 2017.

In 2017, the institute converted its financial reporting to the International Financial Reporting Standard (IFRS). The full adoption of IFRS required the reworking of IRRI's 2016 Financial Statements and the 2015 Statement of Financial Position previously prepared in compliance with CGIAR financial guidelines. IRRI's Financial Statements are now fully compliant with IFRS standards. With this change, IRRI's financial statements are now aligned with international quality standards for financial reporting that are recognized inter alia by donors, banking industry, partners, and potential collaborators.



Investing in IRRI

Every dollar channeled through IRRI brings us a step closer to ensuring improved quality of life among those who depend on the rice sector – for food, nutrition, and livelihood.

The positive results we have achieved in 2017 are proof of the commitment and combined efforts of our investors and partners who continue to believe and share in our mission to enable positive change through rice science. Together, we have rapidly moved ideas, sparked innovations, and forged strategic partnerships across the globe to accelerate innovation, development, and adoption where these are urgently needed.

As one of 15 member organizations, IRRI receives funding support from the CGIAR, a global research partnership dedicated to reducing poverty, enhancing food and nutrition security, and promoting sustainability, globally.

Investors

IRRI's investors inspire us to achieve more. Their commitment drives us to tackle the most challenging global development issues. They have fueled us to reach hundreds of thousands of our stakeholders globally, through delivering comprehensive yet locally targeted solutions and breakthrough interventions in 2017. These are the enablers that serve as the lifeblood of IRRI's work and impact.

Bill & Melinda Gates Foundation

Republic of India
- Department of Agriculture, Cooperation and Farmers Welfare
- Government of Andhra Pradesh State
- Government of Karnataka
- Government of Odisha
- Indian Council of Agricultural Research

Republic of the Philippines
- Philippine Council for Agriculture Aquatic and Natural Resources Research and Development
- Bureau of Agriculture Research-Department of Agriculture
- Bureau of Plant Industry-Department of Agriculture
- Agricultural Training Institute-Department of Agriculture
- Regional Field Offices- ARMM, CAR,I, II, IVA, IVB, V, VI, VIII, IX, X, XI, XII, XIII

United States of America
- National Science Foundation
- United States Agency for International Development
- United States Department of Agriculture

Federal Republic of Germany
- Deutsche Forschungsgemeinschaft (German Research Foundation)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- Federal Ministry of Economic Cooperation and Development (BMZ)

Global Crop Diversity Trust

Japan
- Japan International Cooperation Agency
- Japan International Research Center for Agricultural Sciences
- Ministry of Agriculture, Forestry and Fisheries
- Ministry of Foreign Affairs

Swiss Agency for Development and Cooperation

United Kingdom of Great Britain and Northern Ireland
- Biotechnology and Biological Sciences Research Council
- UK Space Agency

Council of Agriculture, Executive Yuan, Republic of China, Taiwan
European Commission
Food and Agriculture Organization of the United Nations
International Fund for Agricultural Development
Lee Foundation
Rural Development Administration
Syngenta Asia Pacific Pte. Ltd.
The World Bank
United Nations Environment Programme

Access Agriculture
Agricultural Technology Adoption Initiative
Australian Centre for International Agricultural Research
ASEAN - China Cooperation Fund
Asian Development Bank
AXA Research Fund
People's Republic of Bangladesh
BASF SE, Germany
Bayer
People's Republic of China
- Chinese Academy of Agricultural Sciences
- Ministry of Agriculture-Department of International Cooperation
- South China Agricultural University

DKT International
Give2Asia
Republic of Indonesia
International Cooperation and Development Fund
International Finance Corporation
International Initiative for Impact Evaluation
International Seed Testing Association
Kellogg Company
Monsanto Fund
Ministry of Agriculture, Republic of Mozambique
Instituto de Investigacao Cientifica Tropical (Tropical Research Institute)
Land Bank of the Philippines
Provivi, Inc.
Reliance Industries Limited
National Research Foundation, Republic of Singapore
Ministry of Agriculture and Cooperatives, Kingdom of Thailand
General Directorate of Agricultural Research and Policy, Republic of Turkey
Socialist Republic of Viet Nam
- Ministry of Agriculture and Rural Development
- Vietnam Academy of Agricultural Sciences
- Zegar Family Foundation

Funding Partners

IRRI takes pride in working with experts from different institutions and in various sectors around the world to drive impact where it is needed the most. Through our trusted partners, IRRI's research expertise and innovations reach even the farthest farmers and communities. Without them IRRI could make little impact. These are the conduits that expand IRRI's impact to the world.

Africa Rice Center
Australian National University
Carnegie Institution of Washington
Catholic Relief Services
Colorado State University
Columbia University
Commonwealth Scientific and Industrial Research Organisation
Cornell University
Cranfield University
HarvestPlus
Heinrich Heine University
International Center for Tropical Agriculture
International Crops Research Institute for the Semi-Arid Tropics
International Food Policy Research Institute
International Maize and Wheat Improvement Center
Justus Liebig University Giessen
Kansas State University
Nagoya University
National Institute for Agro-Environmental Sciences
National Institute of Agricultural Botany
National University of Singapore
New York University
North Carolina University
Rajiv Gandhi Mahila Vikas Pariyojana
Rothamsted Research Ltd.
SARMAP S.A.
UN University
United Way Worldwide
Université Catholique de Bukavu
University of California - Berkeley
University of Cambridge
University of Exeter
University of Nottingham
University of Oxford
University of Sheffield
University of South Carolina
University of Tasmania
University of the Philippines Los Baños
University of York
University of Zurich
Virginia Polytechnic Institute and State University
Wageningen University

Human Resources

Diversity is our Strength

Central to any organization are its people. IRRI owes its success to the dedication of its employees; those who put into action the ambitious goals of transforming lives through the global rice sector. They are committed to delivering the best in research and innovation to farmers, producers, and consumers and achieving sustainable development through rice science.

As an institute working in the face of complex global challenges, we recognize that diversity of viewpoints and experience make us stronger and more able to achieve our ambitious goals.

Quick Facts

1,144
Worldwide staff

130
Globally recruited staff

989
Locally recruited staff

39
Nationalities

15
Offices in Asia and Africa

4
out of 10 IRRI staff are women

22
Key positions filled

234
New staff

31%
IRRI staff are young professionals

Great people, great purpose

IRRI delivers through research excellence

Team IRRI, no boundaries

Diversity is our strength

We work *for* IRRI

The honest broker in rice

Bold, proactive, and agile

Wise stewards of our resources

Global expertise embedded locally

Compelling storytellers

We hire and develop great people

A magnet for diversified funding and support