

2023 ANNUAL REPORT

International Rice Research Institute

IRRI

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Joint Message from the Interim Director General and Chair of the Board of Trustees



The year 2023 was good for IRRI breakthroughs. IRRI led the charge in scientific and systems innovations in rice science. IRRI's initial salvo for its low glycemic index (GI) rice at the 6th International Rice Congress (IRC2023) was met with positive response following its endorsement from Philippine President H.E. Ferdinand R. Marcos, Jr. This provided a strategic push for IRRI to work more closely with the Philippine Department of Agriculture, through the Philippine Rice Research Institute, on next steps to accelerate the release of these healthier varieties to the market.

IRRI developed groundbreaking protocols of Speed Breeding for indica and japonica rice that will accelerate the development of climate-resilient new rice varieties within 4 years. We developed technological platforms to help farmers tide over the increasingly negative effects of climate change, without compromising yields. For example, the Rice Crop Manager (RCM), locally known as Layanán Konsultasi Padi (LKP) in Indonesia was formally launched in its Version 2. We also signed a more farmer-friendly agreement with Philippine partners to establish an 'area-based yield index' insurance for rice, using satellite data from the Philippine Rice Information System (PRISM). Through the CGIAR Asian Mega-Deltas Initiative, we introduced the Climate Smart Maps and Adaptation Plans (CS-MAP) tool, which helps smallholder farmers to mitigate the effects of flooding, drought, and salt intrusion in their lands. In Vietnam and India, pilot demonstrations on Direct Seeded Rice (DSR) resulted in an increase in farmers' incomes while saving seeds, water, and labor inputs, and reducing greenhouse gas emissions.

Beyond IRRI, our work within the One CGIAR placed emphasis on synergized approaches to harmonize breeding processes and product development opportunities across research centers handling the world's most vital crops and resources. For example, the Global Market Intelligence Platform (GloMIP) and the Breeding Portal were successfully linked to strengthen decision-making in CGIAR crop breeding programs. The adoption of IRRI's OneRice breeding strategy by the Global Rice Breeding Program (GRBP) is beginning to revolutionize breeding operations across the CGIAR. It includes developing market segments and breeding pipeline frameworks for new and desirable varieties preferred by the farmers.

2023 was also filled with pride and honor. Our scientists gained recognition as key food systems innovators on the global stage for agricultural research and development. These accomplishments represent the scientific pedigree we support and nurture and the culture of innovation that we uphold in what we say and do.

As we look ahead, IRRI will continue to explore innovative pathways in digital transformation, data driven solutions, and farmer-centric approaches to ensure that we remain at the forefront of agricultural innovations. I would like to thank our global network of partners and enablers for their continued trust and collaboration. Together, we will make a difference in the lives of millions and lay the groundwork for a sustainable, food-secure future, through rice. We look forward to your continued partnership and to more shared wins in the following years.

- Dr. Ajay Kohli - Interim Director General

In 2023, IRRI has made significant strides in delivering innovative solutions through our cutting-edge research in climate-resilient rice varieties, water-saving technologies, and precision agriculture, all of which would not have been as resounding without the support and trust of our partners and funders. A significant portion of your investments went into research endeavors that aimed to increase farmers' yield, improve consumers' health, and accelerate speed of varietal production and distribution. We used this year to enter into even more strategic partnerships with the goal of furthering our intended short and long term outcomes, particularly as it relates to our climate and nutrition work.

Among IRRI's pivotal 2023 highlights is its membership to the First Movers Coalition for Food, an initiative of the World Economic Forum, which "aims to accelerate sustainable farming and production methods and technologies by leveraging collective demand for low-carbon agricultural commodities." Having IRRI included in this global undertaking further validates our bold aspirations of promoting sustainable rice-based food systems. Among these initiatives is the 1 Million Hectare High Quality and Low Emission Rice Program in Vietnam. We are keen to leverage similar global

partnerships to expand this aspiration and program to other countries and regions where IRRI is present and where the needs for similar research interventions are just as urgent.

Indeed, our expanded global partnerships with governments, research institutions, and the private sector have diversified and increased our portfolio and enabled us to accelerate the adoption of resilient rice technologies across Asia and Africa. We are grateful to our investors for enabling IRRI to directly support global efforts to achieve the United Nations Sustainable Development Goals (SDGs), particularly those related to zero hunger, climate action, and sustainable agriculture.

We capped off 2023 with even more exciting news, with the recruitment of Dr. Yvonne Pinto as IRRI's new Director General. We are excited for the energy and innovative thinking that she will bring to the table as IRRI's current strategy draws to a close and a new one takes shape. IRRI is bracing for even more meaningful impact and we hope to take you along with us.

- Dr. Cao Duc Phat - Chair of the IRRI Board of Trustees



IRRI by the numbers

IRRI's growth and milestones in 2023, told in numbers



19% increase in grant portfolio

72 million USD

Total value of 80 projects signed in 2023



14 new partners



53 new projects

27 ongoing projects with additional funding

45 of these projects were completed in 2023

Largest investments focused on projects that



Increase farmers' yield



Improve consumers' health



Accelerate speed of varietal production and distribution

IRRI in the Media

IRRI's viewpoints contributed to global food conversations and emphasized the strategic importance of rice as a global staple.



Why India's export ban and the looming El Niño spell big trouble for global rice stocks



What role does agriculture have in the climate crisis?



In the face of extreme weather, scientists look to adapt crops



Indian scientists search for a safer, greener rice



The return of the rice crisis



The global rice crisis



Big wins

2023 was a significant year for IRRI in terms of research milestones and international recognition

Research Highlights

Developed the framework for launching the Global Rice Breeding Program, which aims to deliver better varieties and hybrid faster using CGIAR's global science and capacity.

Public breeding is slowly transforming through newer, better, and faster technologies and practices. IRRI has significantly advanced a unified rice breeding strategy that can serve as a model for other CGIAR centers to overcome barriers and bottlenecks in breeding programs. As a more integrated One CGIAR moves



forward, the lessons learned by IRRI will provide a vital template for success to ensure farmers get the crop varieties they need when they need them.



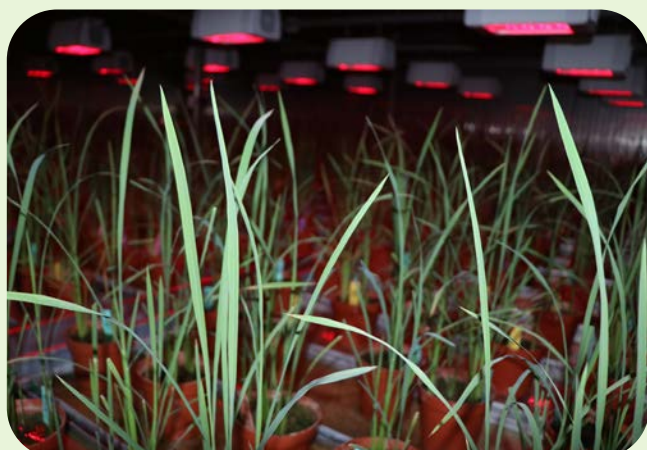
Over 50 advanced lines were nominated into the NARES Partners' varietal release system in Asia and Africa.

About 50 high-yielding breeding lines from IRRI's breeding pipelines, covering early, medium, and late duration programs, were evaluated at NARES locations (defined TPE). The evaluation targeted market segmentation and was aligned with the OneRice Breeding strategy. After two years of MLT testing of Stage 1 and 2 trials at NARES locations, promising lines for national testing were jointly identified. These selected advanced breeding lines possess high-yielding traits and are also tolerant to biotic and abiotic stresses, making them suitable for transplant and direct-seeded systems in Asia and Africa.

Developed SpeedFlower, the first ever speed breeding protocol for rice.

IRRI South Asia Regional Centre (ISARC) opened up new avenues to address the challenges related to food security through the development of the SpeedFlower protocol. This comprehensive speed breeding initiative accelerates rice breeding by enabling four to five generations per year, compared to just one or two under traditional methods.

Validated on all 12 major rice subgroups and able to boost genetic gains, this breakthrough requires infrastructure investment and strategic partnerships to expand its application to other crops and maximize its impact worldwide.



A resistance strategy for leaf + neck blast, bacterial blight, and rice yellow mottle virus has been developed.

Blast and bacterial blight (BB) are two of the most destructive rice diseases globally, while RYMV is the most significant in Africa. Together, these diseases cause annual yield losses of 20-30%, enough to feed 70 million people.

R genes are the most effective way to boost plant resistance, but each gene targets a specific pathogen group. To achieve broader resistance, stacking or pyramiding multiple R genes is essential. However, selecting the right genes is challenging. With over 13 R genes identified for BB, 23 for blast, and 3 for RYMV, the key question is which genes and alleles to stack for broad-spectrum resistance. Fewer genes make the process faster, but too few can weaken resistance.

Based on knowledge from IRRI and other rice pathologists, a strategy was developed. For blast, Pi9 and Pik-h (race-specific) were combined with Pi35 (broad-spectrum). For BB, xa13, xa25, and xa41 were stacked with Xa4, xa5, Xa21, and Xa23. For RYMV, rymv1-2 or rymv1-5 were combined with rymv2 and RYMV3. These pyramids have been deployed in elite genomic backgrounds at IRRI, showing strong resistance in the Philippines, India, Burundi. Notably, the blast pyramid protects against both leaf and neck blast. This 3- and 4-gene stacking strategy could potentially offer global resistance to blast, BB, and RYMV for the next 30-50 years.



Very high-yielding lines under both dry-DSR and transplanting methods were identified.

Scientists have recently identified rice lines that have high yield potential when grown using both traditional transplanting or direct seeding, making these varieties highly adaptable and effective across different planting methods and ecosystems.

Novel genes identified on chromosome 2 to develop the ultra-low GI trait with higher upper secondary rachis branches.

A study conducted in collaboration between researchers in the Philippines, the United States, Germany, and Bulgaria have identified genes and markers that correspond to lower glycemic index and higher protein content in rice, advancing possibilities for breeding new rice varieties that are healthier for human diets.



New world-class agri genomics center to rise in PH university

The UPLB Agricultural Genomics Research Center (AGRC) was conceived to facilitate and strengthen scientific and academic collaborations between IRRI, the UP System, and South Korea through KOICA. This partnership includes capacity-building activities as well as high-impact genomic programs that advance agricultural research and development in the region.



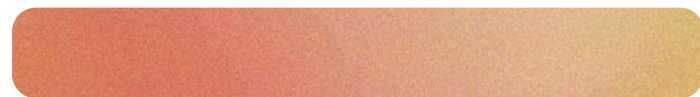
Odisha farmers benefit from Precision Mechanized DSR demos

The DSR-Odisha project, titled “Precision direct-seeded rice-based diversified systems for transforming labor requirement, yields, and profitability of smallholder farmers in Odisha,” is being carried out in five districts of Odisha: Ganjam, Mayurbhanj, Bargarh, Kalahandi, and Puri. The project is supported by the Department of Agriculture and Farmers Empowerment (DAFE), Government of Odisha, and initially planned to run for three years from April 2021 to March 2024, but later got extended to December 2024. Precision mechanized DSR has emerged as an economically viable and environmentally promising alternative to current practices of lessening and puddled transplanted rice (PTR) for achieving productivity gains with less labor, less water, reduced production cost, and reduced GHG emissions.



DSR was scaled in Odisha, where demonstrations were held in > 2000 ha in 6 districts.

In the second phase of the DSR-Odisha project, the implementation of the DSR project included a sixth district - Bhadrak, which was also covered by the CSISA. The mandate of the second phase emphasized large-scale cluster demonstrations of technological interventions, along with best agronomic practices, mechanization, and use of appropriate varieties. Additionally, it involved GIS analytics for suitability mapping and precision targeting of interventions. This phase also focused on entrepreneurship development, particularly for women and youth, farmers’ participatory adaptive research to develop R4D products, and capacity development of value chain actors, including FPCs and FPOs. It also aimed to influence policy for a more enabling environment.



Milestones in wild species propagation in 2023 prepares IRRI for the increasing global demand for the technology

In 2023, significant strides were made in the propagation and study of wild rice species. The entire wild rice collection, comprising around 4,300

Introducing the development of GloMIP, a homegrown public platform for sharing market intelligence to inform market segmentation, Target Product Profile design, seed systems, and R&D investment decisions in genetic innovation.

Pioneered with the support of IRRI scientists and community, the Global Market Intelligence Platform (GloMIP) is getting ready for launch. Now at its pilot testing stage, the public platform is designed



to enable breeders, researchers, managers, and investors to prioritize CGIAR breeding pipelines and tailor them to reach the largest and most marginalized stakeholder and maximize the impacts of genetic innovation programs globally.

Climate-smart maps of local risks and adaptation plans have been developed for rice production regions in Vietnam and scaled to Bangladesh, Cambodia, and the Philippines.

Climate-smart Mapping and Adaptation Planning (CS-MAP) is a participatory approach where rice farmers and rice scientists work together to produce risk maps and plans to help smallholder farmers mitigate the effects of flooding, drought, and salt intrusion in their lands. This method is now

integrated in Vietnam’s Green Growth Strategy and will be introduced through hands-on workshops in Cambodia and Bangladesh, specifically in provinces that surround the mega-deltas.



accessions, underwent genotyping, offering valuable insights into its genetic diversity. This information facilitated the development of a SNP (Single Nucleotide Polymorphism) chip, enabling precise species identification through genotyping. Moreover, the collection was digitized, and this digital dataset was used to train a machine learning model called DIGI, which can identify accessions based on seed images. These advancements not only deepen our

understanding of wild rice but also enhance their utilization and leverage their inherent resilience to climate change. Additionally, a recent Genebank user survey suggests an increasing global demand for wild rice species in the coming years, positioning IRG (International Rice Genebank) to better serve its clients and meet this growing demand.



IRRI received Google support to apply AI for climate resilient rice development

IRRI received a 2 million USD grant from Google.org. This fund will be used to harness the power of Artificial intelligence (AI) to fast-track the development and deployment of high-yielding, climate-resilient rice varieties and sustain/increase rice production in the face of climate change. Researchers from the institute's Fit-for-Future Genetic Resources unit will apply a combination of AI and high-throughput phenotyping methodologies to assess the IRG rice collection's tolerance to abiotic stresses. This will also promote the enhanced utilization of the genebank's resources.

IRRI, DA-PhilRice, and PCIC team up for innovative crop insurance for rice.

The Philippine Rice Research Institute, Philippine Crop Insurance Corporation, and IRRI signed an agreement to develop an area-based rice yield index insurance using satellite data. The partnership is a step toward making crop insurance products available to some 2.4 million rice farmers in the Philippines. Crop insurance will help protect farmers vulnerable to yield losses caused by typhoons, droughts, and floods intensified by climate change. The collaboration is supported by the CGIAR initiative on Climate Resilience, which aims to transform the climate adaptation capacity and increase the resilience of smallholder production systems to withstand severe climate change effects in six countries.



Indonesian farmers to adopt informed and improved farming with LKP2.0 launch

Rice Crop Manager (RCM), locally known as Layanan Konsultasi Padi (LKP), was launched in 2023. This digital platform provided Indonesian farmers site-specific information to help them achieve better yield and income. The platform will be introduced to more provinces in Indonesia and Philippines in its coming phases through a series of seminar-trainings.



Awards & recognition



Google provided USD 2 million to fund AI-powered Next-Gen Genebank



Dr. Swati Nayak received the prestigious Borlaug Field Award



Drs. Abdelbagi Ismail and Umesh Singh received the AAAS award for Seeds without Borders



IRRI-AfricaRice ranked third place at the Milken Motsepe Prize in AgriTech

IRC2023

1,011

research studies presented through posters (505) and oral (506) presentations

2,219

participants

3

Memoranda of Agreement/Understanding signed



MOU between IRRI and the Islamic Organization for Food Security for Institutional Cooperation



MOU between IRRI and Dr. B.S. Konkan Krishi Vidyapeeth for Cooperation in Agricultural Research Research and Education



MOA among IRRI, the Philippine Rice Research Institute and the Philippine Crop Insurance Corporation for Collaboration on Area-Yield Index Insurance for Rice Based on Satellite Data

352,961

USD in sponsorships and trade show returns



Building capacity

2023 was a year of building and scaling stakeholder capacities

IRRI Launched Open Learning Platform openlearning.cgiar.org

IRRI Education launched the Open Learning platform in July to provide access to accessible learning materials for the rice-based agri-food sector actors anytime and anywhere. Through the platform, researchers, policymakers, partners, value-chain stakeholders, farmers, and anyone interested in food, land, and water systems can access the latest knowledge from CGIAR research advancements.

Open Learning currently offers three learning options that learners can choose from to suit their needs. Microlearning, are bite-size modules covering vital concepts, skills, technologies, and innovations related to food, land, and water systems. Open Online Courses are 2-4 week immersive courses in science, technology, and leadership. Enrolled learners will also have the opportunity to interact with the subject matter experts throughout the learning journey. Meanwhile, Self-paced E-learning Modules are interactive modules designed to achieve specific learning objectives.

IRRI Education by the numbers

1,500 farmers in India, Bangladesh, and Nepal trained in seed production and varietal intelligence

64 students and 6 faculty members were hosted at IRRI through the National Agricultural Higher Education Project (NAHEP) of the Indian Council of Agricultural Research (ICAR)

112,452 individuals, including farmers, researchers, extension agents, students, scientists, government employees, technicians, policymakers, educators, and private sector representatives, participated in trainings conducted by IRRI

834 researchers, policymakers, and extension workers trained in seed systems, rice production, and digital knowledge and tools for precision farming

MSI Grants for the PhD Sandwich degree programs were launched

277 scholars, interns, and on-the-job trainees from 23 different countries and 70 universities/shosted

32 interns, 7 MS, and 5 PhD students were welcomed under the KOICA-UPLB-IRRI project

Student engagement through the AgHoc Series

42 virtual sessions with	→	699 students
5 on-site group visits from	→	281 students



Stories of impact

Read how IRRI's technologies help rice-based systems beat the odds and rise against climate change and food and nutrition insecurity

THE SCIENCE

Revolutionizing rice research: IRRI's groundbreaking SpeedFlower protocol for accelerated breeding

International Rice Research Institute's South Asia Regional Centre (ISARC) in Varanasi, Uttar Pradesh, unveiled the revolutionary SpeedFlower protocol in December 2023. This pioneering effort is the world's first comprehensive speed-breeding initiative for rice and represents India's initial success in speed-breeding in any crop. Spearheaded by ISARC's state-of-the-art SpeedBreed facility, the SpeedFlower protocol promises to transform rice breeding and enhance global food security.

The primary objective of the speed breeding technique is to accelerate crop research by surmounting challenges such as longer generation times and seasonal constraints, including specific growing

seasons, temperature requirements, and day-length sensitivity. Inspired by NASA's research on plant growth in space and the University of Queensland's speed breeding studies, the SpeedFlower protocol accelerates rice research by enabling four to five generations of rice within a year. Traditional methods yield only one or two generations annually under field conditions. This acceleration is achieved through the intelligent manipulation of light parameters, including a high red-to-blue spectrum ratio and a 24-hour photoperiod, combined with optimal growth conditions such as temperature, humidity, and nutrient levels.

SpeedFlower protocol was validated on all 12 rice subgroups of major cultivated rice, and the finding was

published in the Plant Biotechnology Research journal. This finding not only enhances genetic gain but also has the potential to nourish half of the world's rice-dependent population. The project is part of a larger initiative funded by the Department of Biotechnology (DBT), with additional support from the Ministry of Agriculture and Farmers' Welfare (MOA & FW) and the Indian Council of Agricultural Research (ICAR), Government of India.

The ISARC Speed breeding team highlights the significance of their latest development. "SpeedFlower is a game-changer in rice breeding, allowing us to rapidly develop new varieties that are resilient to climate change, thus addressing both food and nutritional security challenges on a global scale," according to IRRI Scientist Uma Maheshwar Singh. The SpeedFlower technique significantly reduces the time required for late-duration varieties and photosensitive landraces, which are typically challenging to utilize due to their long growth periods.

While SpeedFlower represents a major leap forward, considerable challenges remain. Scaling this technology requires substantial investment in infrastructure and resources. To fully realize SpeedFlower's potential, we seek support from donors

and partners committed to addressing global food security issues. Recognizing the technology's potential in crop improvement, ~ 10 Speed Breeding facilities have been funded in India, with ISARC providing technical support.

Immediate next steps include expanding the SpeedFlower protocol's application across various rice subgroups and extending its use to other crucial crops. There is also a need to enhance research facilities and form strategic partnerships to facilitate this scaling process. With continued investment and collaboration, SpeedFlower can play a pivotal role in meeting the world's food needs and adapting to the challenges posed by climate change.

As a versatile tool, the SpeedFlower protocol extends beyond rice, offering applications to other crops and accelerating diverse research activities. While speed breeding has already been successfully applied to several long-day crops such as oats, canola, and chickpeas, and short-day crops like rice, soybean, and amaranth, among many others, there remains untapped potential in many other crops. This transformative approach is crucial for meeting the global population's growing food demands by 2030 amidst climate change. ■



Accelerating impact through standardized breeding

The Breeding Resources Initiative (BRI) has IRRI as a chief proponent to improve breeding programs' genetic, economic, social, and environmental performance across the CGIAR-National Agricultural Research and Extension System (NARES) Breeding Network. Through data-driven and ultra-modern breeding, BRI aims to ensure that breeding programs can quickly develop and deliver the right seeds faster to smallholder farmers struggling with climate change and nutritional and economic challenges.

IRRI has been a key player in the initiative by working with partners to help breeding programs access tools, technologies, and shared services for developing new crop varieties quickly and efficiently.

IRRI was pivotal in helping BRI advance its mission of providing CGIAR-NARES networks with first-class breeding services, practices, and technologies such as enhanced genotyping laboratory services, biochemical quality and nutritional services, and analytical pipeline.



These innovative technologies are powerful tools that harness big data to enhance decision-making in breeding processes.

BRI signifies a shift towards a more straightforward, efficient, and standardized breeding approach. Moreover, the initiative is a dynamic system that evolves and improves over time. ■

Building a better genebank

Working with Google, the International Rice Genebank is leveraging AI to manage information faster and smarter, helping secure food and nutrition security for all.

In Russia during the early 1900s, the first genebank was established by Nikolai Vavilov, who was known as the "Father of Genebanks". At its time, it was the world's largest seed collection, with over 370,000 seeds sourced from 64 countries. This genebank became legendary during the siege of Leningrad in World War II when scientists reportedly starved to death rather than eat the seeds they were protecting.

Many mandates and processes of over 1,500 modern genebanks today can be traced back to Vavilov's genebank and his vision of "a world without famine." In addition to conserving seeds for future generations, genebanks gathered



and preserved information about their collections, such as physical characteristics, average yields, and disease resistance. This allowed scientists to breed and experiment purposefully, like crossing cultivated crops with hardy wild relatives to create new varieties with high yields and resilience.

With the advent of the digital age and next-generation technologies, genebanks are revolutionizing how their information is gathered, analyzed, and used. The International Rice Genebank (IRG), stewarded by the International Rice Research Institute, is one of the genebanks leading global efforts to leverage advancements in artificial intelligence to improve operations, accelerate discovery, and ensure future food security.

Revolution through information

The IRG currently maintains over 132,000 rice accessions, the largest repository of rice genetic diversity in the world.

Screening and cataloging this massive collection used to be done manually, a slow and expensive process that not only creates a backlog of seeds entering the genebank, but also constrains the full utilization of genetic resources already in the genebank.

Artificial intelligence has been the game-changer.

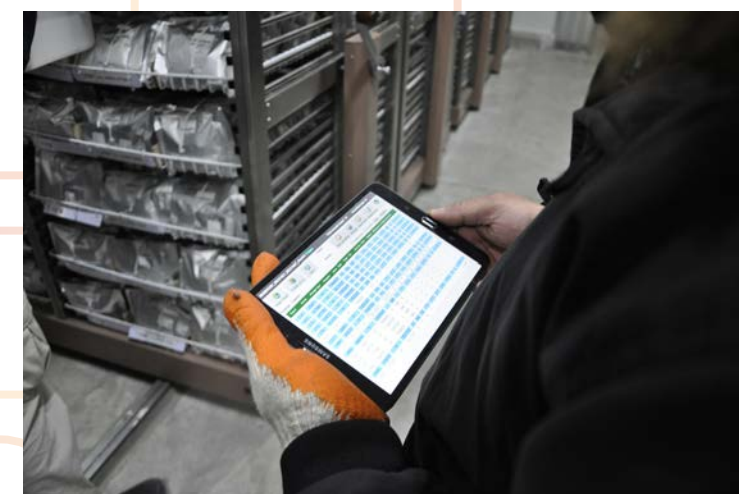
Through high-throughput phenotyping methodologies combined with computer vision and machine learning, the AI has been trained to recognize batches of rice seeds by their characteristics, such as size, shape, color, and texture, and then to sort them accordingly, with humans performing final quality assurance.

Currently, only about 5 percent of the genebank's total collection has been fully utilized in breeding. Through AI, it is estimated that 100 percent of the collection can be comprehensively identified and cataloged within just two years instead of decades, and will cost 16 times less.

AI can also significantly accelerate the development of new rice varieties. For experiments on flood

tolerance, rather than manually labeling individual plants, samples can now be sown in bulk, with AI doing precise tracking. Through this process, scientists have been able to screen ~60,000 genebank samples in just one year, compared to only ~20,000 in the past 50 years. This holds significant promise for fast-tracking the development of new rice varieties with urgently needed traits, such as less input requirements, climate resilience, and enhanced nutrition.

AI's capacity to process large amounts of data will allow scientists to gain novel insights in their research, and to ask (and answer) questions that before would never have been possible. For data curation, the genebank is also using a large language model (LLM), a type of AI, to make it much easier and faster to process information and interrogate big, complex data. Downstream, this wealth of data can also be utilized through practical digital tools that focus on the different needs of researchers, breeders, and farmers.



Innovating for the future

Aside from AI, the IRG is also innovating with other technologies in other areas. Automation and robotics are already being used for repetitive and sterile tasks. Multispectral imaging is utilized in the lab and on drones to identify and characterize rice seeds, plant biomass, and even pathogens much faster

and more efficiently. To replenish its seed collection, the genebank is experimenting with enclosed container greenhouses with lights that radiate at various wavelengths to study how different light spectra can positively affect plant growth.

In 2023, IRRI received a significant boost for its AI initiatives with a USD 2 million grant from Google.org's AI for the Global Goals Impact Challenge. IRRI was one of 15 organizations selected to receive technology and funding support to advance AI-driven innovations that contribute to the UN's Sustainable Development Goals. Based on projections, economic returns across Asia and Africa for IRRI's use of AI are expected to reach USD 30 billion within five years. ■



Collective action towards a more sustainable Asian Mega Deltas

The CGIAR Initiative on Asian Mega-Deltas (AMD), led by the International Rice Research Institute (IRRI), has been instrumental in fostering sustainable and equitable development in delta regions across Asia. By focusing on building partnerships, promoting food systems-focused activities, developing digital climate tools, and advocating for inclusive policies, AMD has empowered smallholder farmers and vulnerable communities in Bangladesh, Cambodia, India, Myanmar, and Vietnam.

In 2023, AMD's activities extended to 93 capacity-sharing for development, stakeholder consultations, and workshops, benefiting nearly 14,000 stakeholders. Stakeholders include government officials and staff, research and extension partners, students, cooperatives and farmers, and others who participated in AMD-organized training programs and knowledge exchange events to improve agricultural practices,

enhance food security, and promote sustainable farming, and in the establishment of learning alliances to address climate-related challenges in rice-based cropping systems.

Impact in the Lower Mekong River Basin (LMB)

The Lower Mekong River Basin (LMB) is a particularly vulnerable region within the Mekong Delta, facing significant threats from climate change. Its countries are prioritizing agricultural adaptation and mitigation to safeguard food security and nutrition. To support these efforts, AMD has played a pivotal role in the LMB countries of Cambodia, Thailand, and Vietnam. Through innovations like the rice straw-based circular economy, RiceMoRe, and Agro-Climatic Bulletins, AMD has been integrated into national and sub-national policies and programs. AMD has played a pivotal role in the development of Vietnam's "Sustainable Development of One Million

Hectares of High Quality and Low-Emission Rice Associated with Green Growth in The Mekong River Delta By 2030" program, a national program aimed at promoting sustainable and high-quality rice production and reducing greenhouse gas emissions. AMD provided technical inputs and organized related events for intensifying knowledge exchange, demonstrating relevant innovations and strengthening collaboration among key stakeholders. As Mr. Le Thanh Tung, Deputy Director for South of the Department of Crop Production, noted, "being a major contributor to the development of the 1M ha farming program, AMD innovations, such as AWD, mDSR, rice straw circular economy, RiceMoRe, and CS-MAP, will be integrated in the program's strategy. Tested and implemented in the Mekong River Delta, these technologies can contribute to achieving the program goals."

Furthermore, AMD has been instrumental in mainstreaming its innovations into national policies and programs. The Ministry of Agriculture and Rural Development (MARD) in Vietnam has issued policy documents supporting the scaling of AMD innovations, including guidelines for rice straw management and the adoption of the Rice Activity Monitoring and Reporting (RiceMoRe) System. Agro-Climatic Bulletins (ACBs), developed by AMD, have been recognized by the Ministry as valuable tools for agricultural and rural development.

AMD's work has been integrated into national food and nutrition security policies in LMB countries.

AMD's research has informed policies like Cambodia's National Strategy for Food Security and Nutrition, which aims to enhance food security, nutrition, and health. Vietnam's MARD-Department of Cooperatives and Rural Development recognized AMD's technical support in the development of the National Action Plan on Zero Hunger and included AMD scientists in their expert group.

Through its engagement with Thailand, AMD played a crucial role in promoting the inclusion of low-emission rice production in the country's updated NDC. Additionally, the Initiative consistently collaborated with stakeholders from LMB countries to scale up climate-resilient strategies and technologies for sustainable development in the Mekong Delta.

Work in Irrawaddy and Ganges-Brahmaputra Deltas

AMD has implemented various activities in the Ganges-Brahmaputra Delta region in Bangladesh and India to improve agricultural practices, enhance food security, and promote sustainable farming. These activities have focused on training farmers, developing innovative farming practices, supporting climate-smart agriculture, and providing farmers with digital tools.

AMD conducted agronomy trainings to equip local service providers and aquaculture professionals with the knowledge and skills needed to improve farming practices. These trainings covered topics such as crop-specific needs, sustainable fish farming, and the use of digital tools like the Rice Crop Manager app.

AMD also developed and tested innovative farming practices, including diversified and intensified rice-based cropping systems, improved community-led water governance, and cluster farmer field school models. These practices have helped farmers increase their productivity and resilience to climate change.

In Myanmar's Irrawaddy Delta region, a private sector collaboration reached 10,000 farmers (5,000 growing crops and 5,000 raising fish) by providing monthly and weekly digital climate advisory, including a micro-credit component for selected fish farmers. ■



THE PARTNERSHIPS

The IRRI and AfricaRice Story: Leveraging regional partnerships for a more resilient rice future

In 2023, severe flooding and landslides devastated hundreds of people in Africa. The Red Cross reported that this was the worst disaster in Northern Kenya for the past century, with about ten thousand citizens losing their homes and livelihoods. In Nigeria, 24.5 million people faced a food crisis after experiencing their worst flood in a decade.

The intensity and frequency of flooding in Africa are becoming increasingly severe because of climate change. This is mainly driven by global warming, lowland settling, and poor drainage systems. This, in turn, affects the food and income security of families relying on rice as a primary crop. In Kenya and Tanzania, rice farmers rely on rainfed lowland ecologies because they lack access to consistent and timely irrigation. This, in turn, makes them highly vulnerable to flooding.

“After planting the seed, the flood came for three weeks.”, shared a rice farmer from Nigeria. Usually, farmers from the villages of Egbanti, Badeggi, and Sachi-Nku in Nigeria cultivate MADUYANPA and WALUYE rice varieties. As for Tanzania, Mozambique, and Madagascar, SUPA, Makassane, and FOFIFA160 were planted. However, with most farmers vulnerable to flooding, these varieties are unsuitable since they cannot survive more than five days of complete submergence.

As a solution, IRRI and the Africa Rice Center (AfricaRice) worked together to develop rice that can

survive flooding much longer while ensuring consistent and higher yields. In 2022, trials were conducted in Sub-Saharan Africa, particularly in Nigeria, Sierra Leone, Tanzania, Mozambique, and Madagascar. For this, FARO66 and FARO67 were the flood-tolerant varieties tested. These rice varieties carry the SUB1 gene, allowing rice to survive complete submergence for over two weeks. Furthermore, these varieties can produce over 2 tons/hectare more yield compared to the current varieties and landraces that farmers cultivate.

“Hope has been lost because of the flood.”, the farmer recounted. “But we were happy to see that [after the flood] it performed very well, even more than the local rice. Its yields bring more profit to the farmer.” These improved varieties have a 1:43 cost-benefit ratio, which means that growing rice varieties that carry the SUB1 gene is more profitable to farmers. It can provide them with about USD 700 per hectare as additional income. “This rice has been nicknamed by our farmers as a ‘poverty eradicator.’” the farmer continued.

Because of this, the innovation won the inaugural Milken-Motsepe Prize in AgriTech award, bagging them USD 150,000 for flood-proofing African rice farmers’ livelihoods. The team is now on the road to developing the SUB2 gene, which, in complementary to the SUB1 gene, will further lengthen the survivability of rice under water. Beyond the development of the variety, the initiative envisions creating demand, strengthening seed systems, and further linking value chain actors to ensure a holistic and streamlined approach to disseminating flood-tolerant rice varieties.

The joint expertise and knowledge of IRRI and AfricaRice are the key to delivering meaningful impact in the regions. Leveraging these partnerships will ensure African stakeholders access to quality, affordable, and locally-produced rice. ■



The Great Homecoming: The 6th International Rice Congress (IRC 2023) pays homage to the Philippines



The sustained running of the International Rice Congress for two decades is indicative of IRRI’s requisite role in steering critical discourse around the most important issues in the global rice sector.

Since its inaugural kick-off held in 2002 in China, IRRI has been mounting the IRC to nurture exchanges of ideas on rice research across national and international boundaries. Partnerships for event hosting have rotated around valued country rice research partners through the years, with previous IRCs being held in China (2002), India (2006), Vietnam (2010), Thailand (2014), and Singapore (2018).

For its 6th installment, IRRI paid homage to the Philippines, the host country of IRRI’s Los Baños Headquarters for over 60 years. IRC 2023 marked yet another milestone in IRRI’s decades-long partnership with the Philippine Department of Agriculture. The main driver of the country’s agriculture sector, the DA served as IRC 2023 co-organizer. Their collaboration helped IRRI achieve record-breaking IRC success.

IRC2023 by the Numbers

- 2,219 registered participants (36.6% female and 57.6% male)
- From +50 countries
- 1,011 presented abstracts
- Sponsored 80 young researchers from low-middle income countries
- Attended by 50 Philippine farmer group representatives
- 3 International MoUs signed

While rice science innovations continue to be the cornerstone of IRC, the 6th International Rice Congress (IRC2023) proved to be a testament to the strategic value of going Beyond the Science; by harnessing inclusive partnerships to make rice growing populations truly benefit from IRRI’s research.

Nurturing partnerships with the Philippine Department of Agriculture (DA)

IRC 2023 saw the fruition of new research programs and partnerships with the DA and other global partners



The signing of a Memorandum of Agreement by IRRI, the Philippine Rice Research Institute (PhilRice), and the Philippine Crop Insurance Corporation for the “Collaboration on Area-Yield Index Insurance for Rice Based on Satellite Data” will bring innovative crop insurance products to improve the resilience of Filipino farmers to climatic risks.

Research products for rice sustainability introduced
Exciting new research products like the Global Handbook of Rice Policies, a result of the collaboration by IRRI, the University of Arkansas, University of Missouri, and AfricaRice, gathered immense interest from policymakers and researchers alike. Like its predecessor, the 2013 Handbook on Rice Policy for Asia, the Global Handbook of Rice Policies is expected to revolutionize the understanding of global rice policies and offer crucial insights to researchers, trade analysts, and policymakers.



Taking Filipino Farmers' voices to the fore
Another key highlight of IRC 2023 was the Farmer's Day, where some 50 representatives from regional Filipino farmer groups, and experts from the DA and IRRI, discussed persistent gaps they experience in their rice fields. Practical solutions were imparted and new ideas were exchanged to increase their farm productivity and incomes. Emerging programs were also reviewed to promote and make sustainable practices and technologies even more accessible to farmers.

The book titled Closing Rice Yield Gaps in Asia: Innovations, Scaling, and Policies for Environmentally Sustainable Lowland Rice Production was also launched at IRC 2023. The book chronicles achievements of the 10-year, IRRI-led Closing Rice Yield Gaps in Asia (CORIGAP) project, in reaching some 883,000 of Asian farmers and raising their productivity. Farmers who adopted CORIGAP technologies and management practices increased their rice yields between 1-20% and their profits between 15-30%. The book marks the culmination of over two collaborative decades between IRRI, the Swiss Agency for Development and Cooperation (SDC), national agricultural research and extension systems (NARES), and government agency partners across China, Indonesia, Myanmar, Sri Lanka, Thailand, and Vietnam.



The Attendees Speak: Uncovering rice science themes that truly matter
The inclusive and strong representation from the scientific, government, and public and private sectors, generated offshoot outcomes for IRRI beyond the 4-day conference. Results from the external evaluation exercise on IRC 2023 participant reaction, learning, and intended behavior reveal positive results particularly on new climate-resilience and social equity topics presented at the conference,

Established Networking Pathways for Shared Impact
IRC2023 created unprecedented opportunities to foster knowledge exchange and network building. Embedded IRC2023 side conferences like the International Rice Research Conference, the Sustainable Rice Platform Symposium, the International Conference on Bacterial Blight, and the International Hybrid Rice Symposium served as platforms where researchers were able to share findings from their most recent works, and learn from peers in the rice science community, in a coordinated manner. These separate programs indicate the diversity of interests accommodated at the IRC2023 - from highly specialized to more expansive takes on research and development interests around rice. ■



toward solving urgent climate, food, and nutrition security challenges. With the Philippine government hosting the latest IRC through the DA, particular emphasis was placed on science-based solutions to climate-related shocks and malnutrition experienced by Filipino farmers and consumers.

A hallmark event at IRC 2023 was the ceremonial handover of Low- and Ultra-Low Glycemic Index (GI)

rice samples to the President of the Republic of the Philippines, His Excellency, Ferdinand Romualdez Marcos, Jr. The President urged increased cooperation between the DA and IRRI to accelerate the propagation and release of the nutritious alternatives to help curb increasing cases of diabetes, whilst providing a healthier alternative for health conscious Filipinos.

among other themes, which can serve as realistic indicators that may inform IRRI's short to long term research strategy and priorities, in view of existing and emerging partnerships. The evaluation also affirms that IRRI's research priorities are attuned with global rice research trends and perceptions.



Global Rice Breeding Program - a more integrated and impactful rice breeding research platform

Improving the quality of life of smallholder rice farmers and consumers in the developing world is a monumental undertaking. Rice scientists are racing to keep up with current and emerging challenges to long-term food security, such as increasing agricultural input costs, weather unpredictability caused by the climate emergency, and growing constraints in farming.

Three CG centers are leading the charge to ensure that rice production, a staple of over 4 billion people, remains sustainable and future-proof: the International Rice Research Institute (IRRI), Africa Rice Center (AfricaRice), and International Center for Tropical Agriculture (CIAT).

Many of the most influential scientific progress and milestones in rice production in the past six decades can be traced to the three organizations in one way or another.

In 2023, Hans Bhardwaj, head of the Rice Breeding Innovation Platform at IRRI, initiated the Global Rice Breeding Program (GRBP). The program aims to unite the independent efforts of IRRI, AfricaRice, the Alliance of Bioversity International, and CIAT to leverage CGIAR's global science and capacity to develop

and deliver improved rice germplasm and market-demanded rice varieties.

Organized under the aegis of CGIAR Genetic Innovation (GI) Science Group, the three participating CGIAR Centers and the GI leadership signed a Letter of Understanding agreeing to basic operating principles and strategy for the operation of GRBP, building on combined global science, competencies, and resources.

"GRBP is a mechanism to bring together CGIAR's work on rice breeding towards the common aim of increasing genetic gain in farmers' fields," said GI Managing Director Sonja Vermeulen, "It ensures we meet farmers' and consumers' needs and respond to future challenges."

According to Dr. Bhardwaj, the platform, formally launched in January 2024, allows IRRI, AfricaRice, and CIAT to collaborate seamlessly and capitalize on CGIAR's global capacity and assets. "GRBP helps us work more efficiently and do better to achieve our shared goal of improving the quality of life of smallholder rice farmers and consumers in the developing world," Dr. Bhardwaj said. "It is a platform for creating a more impactful and integrated rice breeding framework." ■

Milestone carbon credit methodology for rice launched with help from IRRI

In July, Gold Standard launched a new carbon credit methodology for reducing greenhouse gas emissions in rice cultivation. Developed with inputs from the International Rice Research Institute (IRRI), this new methodology, can help farmers reduce emissions from rice fields, as well as open a new source of income from the sale of carbon credits, incentivizing sustainable rice farming.

Globally, rice cultivation is responsible for around 10% of total agricultural emissions of methane, a potent greenhouse gas. Most of these emissions are produced by bacteria in the soil of flooded rice paddies and not by the rice plants themselves. Research and trials have shown that reducing and managing water use can significantly reduce emissions of methane from rice fields by as much as 50%.

The Methodology for Methane Emission Reduction by Adjusted Water Management Practice In Rice Cultivation comprises instructions to estimate baseline and project emissions, as well as monitoring guidelines and requirements for stratification of reference and project fields. Building on recent efforts to scale carbon market access for smallholder farmers, this methodology can be applied to large, small, or micro-scale projects globally, and can provide a cost-effective, accessible, and practical pathway for smallholder farmers to monetize emissions reductions through carbon credits, increasing the likelihood of achieving carbon reduction outcomes at scale.

Key IRRI scientists involved include climate specialists Dr. Bjoern Ole Sander, Dr. Katherine Nelson, and Dr. Reiner Wassmann. They contributed technical inputs, particularly on the stratification categories that enable grouping based on patterns of cultivation conditions. This improvement addresses an important concern from the global community of the lack of guidance for field stratification that was not included in the previous methodology. Additionally, this new methodology

also accounts for changes in nitrous oxide emissions.

"This new methodology improves on some shortcomings of a previous methodology, and can be used from now on to register low-carbon rice farming projects in irrigated rice areas around the globe," said Dr. Sander. "For this to be effective, it will be important to ensure that rice farmers get a fair share of the carbon credit proceeds."

Interventions and technologies mentioned in the methodology mitigate anaerobic decomposition of organic matter in rice-cropping soils, particularly through water management. These include: changing the water regime during the cultivation period from continuously to intermittently flooded conditions; a shortened period of flooded conditions; using the alternate wetting and drying method; adopting aerobic rice cultivation methods; and switching from transplanted to direct-seeded rice (DSR).

The methodology was developed as part of a Gold Standard - IRRI partnership funded by the Australian Department of Foreign Affairs and Trade through its Business Partnerships Platform. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH provided co-funding and the Eurecat Centre Tecnològic de Catalunya provided additional technical inputs. ■





IRRI facilitates agreement between KALRO and Advanta Seeds International in efforts to enhance access to seeds of improved rice varieties in Africa

In many African countries, rice consumption outstrips production, which leads to huge imports to meet local demand. One of the key challenges affecting the rice sector in the region today is the lack of efficient seed production and delivery systems that would encourage wider use of quality seed of improved, climate resilient, and high-yielding varieties. Developing a competitive formal seed sector will ensure the timely availability of quality seeds of new varieties at affordable prices, particularly to smallholder farmers. Public-Private-Partnerships (PPP) are critical for the seed sector in developing countries because, unlike the private sector, investment by public institutions in productivity-enhancing agricultural systems is low because of their limited capacity and other priorities.

The International Rice Research Institute (IRRI) has been at the forefront of catalyzing public-private

partnerships by initiating negotiations between various entities in the seed value chain to break existing barriers. On 15 February 2023, Kenya Agricultural and Livestock Research Organization (KALRO) and Advanta Seeds International (Advanta) signed a licensing agreement after several months of consultations. The license provides Advanta non-exclusive rights to producing and distributing certified seeds of the variety IR 05N221, named 'Komboka', in Kenya, through their production and distribution network. In the current context, Advanta will obtain basic seeds of the IR 05N221 variety from KALRO and subsequently produce and market certified seed of the variety starting the 2023 rice growing season in Kenya. The International Rice Research Institute facilitated discussions between the two institutions to come to an agreement on objectives, roles, responsibilities, and incentives pertaining to each

of the two institutions. KALRO is a semi-autonomous government institution in Kenya whose mandate includes streamlining, promoting, coordinating, and regulating research in crops including rice. On the other hand, Advanta, a subsidiary of Indian multinational UPL Limited, is a global leader in the production and marketing of high-quality seeds for various field crops including rice. In East and Southern Africa, the company has production fields and facilities in a number of countries including Kenya. This move of venturing into up-scaling of rice seed in the region has been because of a huge demand for seed for the variety IR 05N221 in Kenya following IRRI-supported awareness creation activities over the last two years.

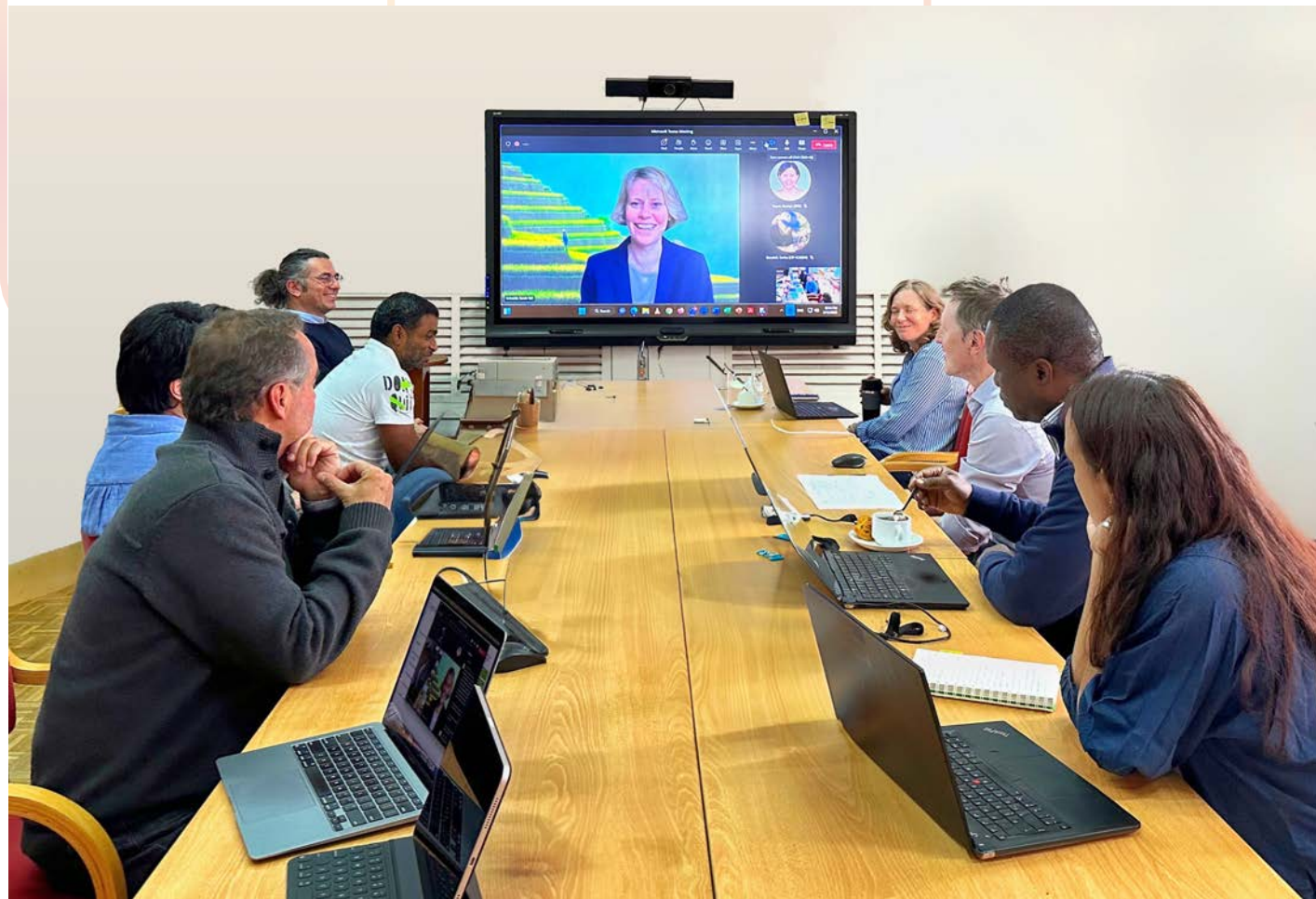
According to The African Seed Access Index (TASAI) report for 2022 the number of merchants registered to be engaged in the production, processing, and/or marketing of certified seed or planting material of any crop in Kenya stood at 185. However, there were only a few of these companies engaging in rice seed. The licensing agreement between KALRO and Advanta is expected to accelerate the scaling and reach of CGIAR-IRRI's innovations and technologies to benefit farmers, particularly smallholders. The success of this partnership is likely to have a positive spillover effect locally and across the region. Hence, this PPP agreement offers a potentially important opportunity for farmers to access improved technologies not only in Kenya but also in other countries in the continent and would probably be the key to unlocking the agricultural potential in Africa.



“Kenya currently imports about 89% of rice it consumes and the Kenyan government is trying hard to minimize this gap through various value chain interventions. This includes expanding the area under rice production and providing the needed policy support. Some of the existing irrigation schemes in western Kenya are undergoing a significant expansion which is primarily meant for rice production. Overall, the government is aiming to expand the rice area in Kenya by about 20,000 ha. This kind of PPP is an urgent need not only to meet the current demand for the quality seeds of improved rice varieties but also to cater to the future quality seed demand”, according to Dr. Ajay Panchbhai, IRRI's Regional Breeding Lead for Africa.

Similar agreements were executed by KALRO in the recent past with the private sector enterprises and farmers' cooperatives such as Magos Farm Enterprises and Mwea Rice Growers Multipurpose Co-operative Society (MRGM) to accelerate quality seed production and dissemination of new high-yielding rice varieties. IRRI is in the process of further strengthening MRGM's and KALRO's infrastructure capacity to modernize and accelerate the processing of certified seeds to cater to the increasing demand. These partnerships in the rice seed chain in Kenya, which are being supported by BMGF-funded AGGRi and OneCGIAR Seed Equal initiatives, are paving the way to increasing rice production through strengthening the rice seed systems, ultimately contributing to the food, income, and nutrition security in Africa. ■





IRRI Leads the Way: How the Global Market Intelligence Platform is Transforming Market Intelligence for Genetic Innovation

Since its inception in 2022, the CGIAR Initiative on Market Intelligence has contributed significantly to advancing the global shift towards demand-led breeding. This year, the transdisciplinary team led by IRRI scientists is driving genetic innovations to new heights by introducing its latest innovation: the Global Market Intelligence Platform (GloMIP).

Collaboration at the Center

Creating impact-driven solutions requires a data-driven understanding of real-world challenges. But how can market intelligence data be accessible to help address the world's pressing challenges? Designed as a public good platform for crowd-sourcing, analyzing, and sharing market intelligence, GloMIP positions itself to bridge the growing gap between insights and impact.

The vision for GloMIP takes its roots from the team's involvement in IRRI's pioneering efforts on market segmentation for rice and developing digital innovation

tools such as the AGGRI's Global Product Repository and Priority Setting Dashboard for genetic innovation. Building on these notable works, GloMIP grew to become a one-stop shop for market intelligence, creating a central platform to streamline these existing tools and data across the CGIAR network, with added features to accommodate the evolving needs and priorities of its stakeholders.

With IRRI scientists at the forefront of its development, the homegrown innovation then evolved from the piloting support of the IRRI community, having its experts and breeders become GloMIP's first users and feedback providers. Eventually, as GloMIP invested heavily in collaborations within and beyond CGIAR, the platform used these formative insights to scale. Now, GloMIP offers end-to-end market intelligence support to donors and investors, breeding program leads and managers, crop breeders, scientists, and researchers working on CGIAR's impact areas.

As of December 2023, GloMIP boasts six portals (three now fully operational) and has achieved interoperability with the CGIAR Breeding Portal developed by the CGIAR Initiative on Accelerated Breeding. In the next few years, the platform shall continue to work with strategic partners to introduce features such as foresight, crop modeling, climate modeling, spatial market segmentation, and data on other food commodities.

Investing in the future

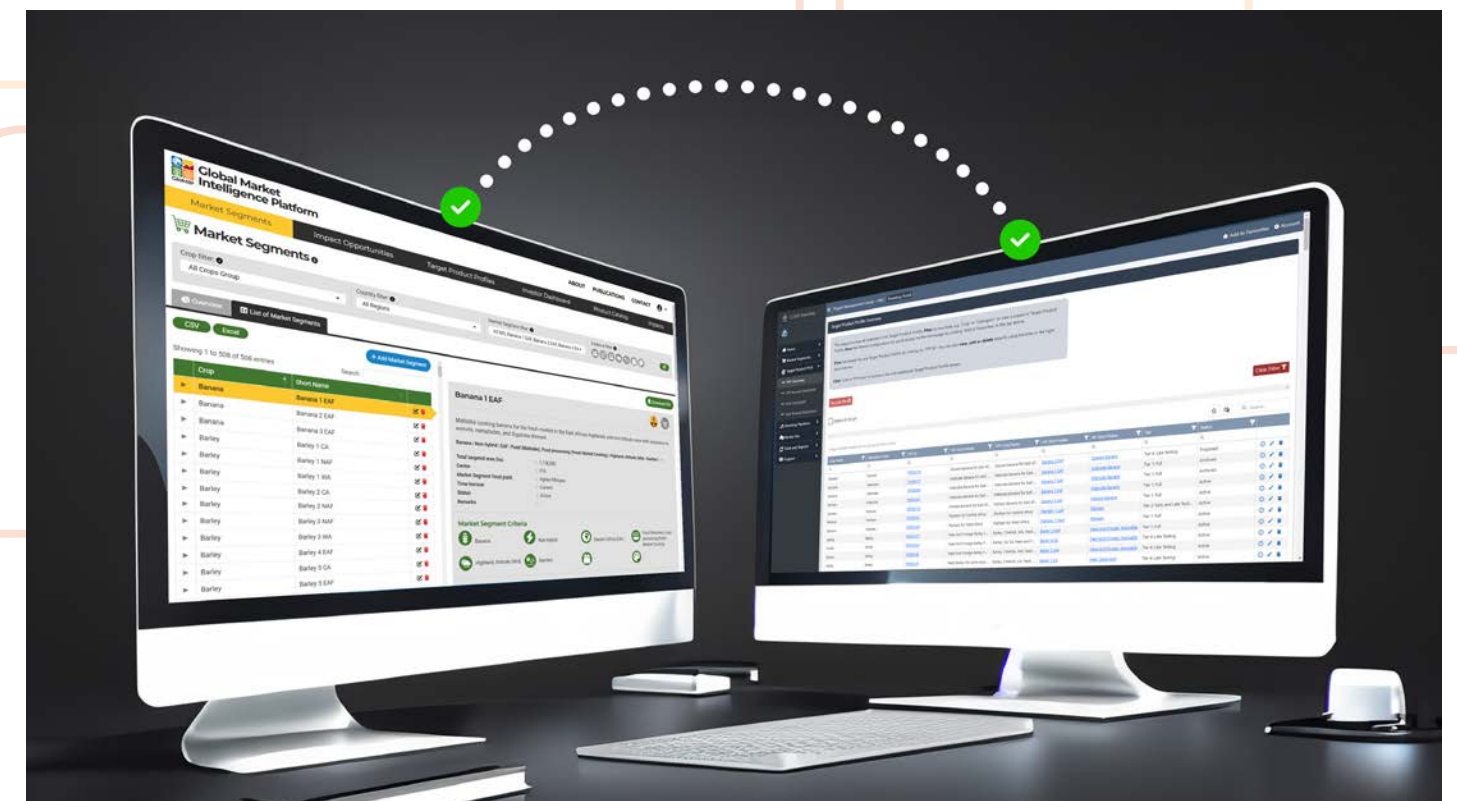
The platform is accessible online and has drawn optimistic feedback from early adopters. In IRRI alone, GloMIP is now widely used to design project proposals and make solid cases for donor investments.

Beyond the Institute, some of its notable users include the Bill & Melinda Gates Foundation's Seed Systems and Variety Improvement (SSAVI) team, which has been using GloMIP to guide its funding decisions for impact projects in agriculture.

"The portal was a game-changer," Dr. Young Wha Lee, Senior Program Officer of the Foundation's Crops Research and Development, shares, "after introducing it to the team, the positive feedback was overwhelming. It's an invaluable tool shaping our approach and decisions moving forward."

GloMIP continues to bank on a co-developing process for the platform, incorporating lessons from stakeholders through a series of consultations, learning events, and user-centric design workshops. Backed by this strong foundation of support from its community of partners such as IRRI, GloMIP is poised to continuously transform as an avenue of collaboration, bound to break new ground in genetic innovation and beyond. ■

**The platform was officially launched last June 2024.*



The Power of Collective Action

Rice is a staple in most parts of India and is cultivated in Odisha for two seasons per year. However, for the past few years, the state has continuously experienced extreme weather stresses like cyclones, flooding, and erratic rainfall resulting from climate change, directly impacting rice production. Climate change challenges have reduced productivity and income for farmers, especially smallholders and women farmers. High-yielding and climate-resilient rice varieties are urgently needed for farmers in Odisha to ensure livelihood support and food security.

“When we started the Loisingha Women Farmers Producer Company, we aimed to engage more women farmers in seed production, said Anjali Nag, Chairperson of the Board of Directors at LWFSPCL. “In the last Kharif season, we produced 224.1 tons of paddy seeds. In the 2024 rabi season, we aimed for over 120 tones of seed production. We have established three Farmer Service Centers in each Gram Panchayat. In the coming days, we plan to expand beyond seed production, set up a processing unit for value addition, and target an annual turnover exceeding US\$ 1.8 million.”

Bhumisuta Pradhan, a LWFSPCL member and paddy seed farmer, stated, “We have been cultivating paddy for over ten years, but they (male farmers) rarely care about our preferences in farming, whether it is the variety of paddy or the marketing of our produce. But LWFSPCL has given us a voice to express our opinions and made us more visible in the seed production and rice farming space.”

Seeding resilience

The LWFSPCL has been incubated by the International Rice Research Institute (IRRI) as part of the ClimatePRO project in the Balangir district of Odisha. Apart from Balangir, the ClimatePRO project is also being implemented in the Ganjam and Mayurbhanj districts of Odisha, focused on enhancing the climate and livelihood resilience and improving farmers’ income, Odisha’s Ganjam and Mayurbhanj districts, especially that of small, marginal, and women farmers. The project strives towards fostering gender-equitable



sustainable intensification of rice-based agri-food systems.

LWFSPCL, established in 2022, demonstrates the courage and dedication of women farmers to take matters into their own hands to transform rice production in the state and a commitment to adapt and progress. In 2023, the women farmers who are members of the FPC have made significant progress in seed production, covering over 450 acres with 133 seed growers cultivating 11 high-yielding varieties, including climate-resilient rice varieties like MTU 1153, MTU 1156, MTU 1010, MTU 1001, BB 11 and Swarna Sub – 1. The FPC has also diversified into selling agricultural inputs, contributing to a total turnover of around USD 0.145 million in 2023. With 566 new shareholders in the FY 2023-24, the LWFSPCL now has 1310 women farmers as its members. Its share capital has grown to USD 25,000.

The FPC has partnered with organizations like Sansar Agropol Pvt. Ltd. And DeHAAT for scaling up seed production and developing market linkages covering an additional area of 200 acres with an estimated turnover of more than INR 1 crore for the 2024 Kharif season. Additionally, the women farmers of LWFSPCL are participating in establishing crop cafeterias, identifying potential rice varieties based on farmers’ preferences, climate suitability and yield potential. These strategic partnerships will further strengthen the role of these women farmers in promoting sustainable agriculture and empowering these communities. ■

Escalating Agricultural Transformation in Assam: The Role of Farmer Producer Companies (FPCs) in Driving successful mechanization



In Assam, agriculture underwent a significant transformation, driven by the introduction of advanced mechanization under the Assam Agribusiness and Rural Transformation Project (APART). Custom Hiring Centers (CHCs) under Farmer Producer Companies (FPCs) are central to this transformation, and their collective efforts have played a crucial role in accelerating the adoption of modern farming technologies across the region.

Assam’s agriculture, especially in districts like Lakhimpur, has historically been labor-intensive. Farmers rely heavily on manual methods for key operations such as planting and harvesting. These traditional practices were time-consuming and increasingly unsustainable due to rising labor costs and inefficiencies. For instance, manual transplantation required 30-35 person-days per hectare, leading to significant delays and financial strain on farmers.

FPCs in Assam recognized the need for a paradigm shift and took the lead in facilitating the introduction of mechanized solutions under the APART. The project is funded by the World Bank, to which IRRI has provided support as one of the technical partners in collaboration with Assam Agriculture University (AAU) and the Department of Agriculture (DoA), Govt. of Assam.

In Bongalmora and Naharani villages, FPCs organized demonstrations and hands-on training sessions to familiarize farmers with these new technologies. The introduction of combine harvesters reduced the time required for harvesting to just 2-3 hours per hectare, a dramatic improvement from the previous 8-10 days needed for manual harvesting. This saved time and reduced post-harvest losses, which had been a persistent problem in the region.

The success of these initial interventions led to a broader adoption of mechanization across Assam. FPCs played a pivotal role in scaling up these efforts, helping more farmers access and benefit from modern equipment. As a result, by 2023, over 80% of the farmers in these regions were using mechanized solutions for at least one stage of rice cultivation.

The economic impact was significant. Using mechanical transplanters and harvesters led to a 50% reduction in labor costs and a 20-25% increase in yield due to more timely and efficient operations. Moreover, the time required for crucial farming operations was reduced by 60-70%, enabling farmers to manage larger areas and diversify their cropping patterns.

FPCs also facilitated access to financial services, helping farmers secure loans and subsidies for purchasing or renting equipment. This financial support was crucial in ensuring that even smallholder farmers could participate in the mechanization drive.

Farmers like Mr. Anoop Deori from Bongalmora village attest to the transformative impact of mechanization. “With the combine harvester provided by our FPC, I was able to harvest my entire crop in just two hours, which would have otherwise taken me more than a week,” he said. Similarly, Mrs. Jaya Saikiya, a member of another FPC, highlighted how mechanization had reduced her dependency on costly labor, allowing her to reinvest the savings into expanding her farm.

These testimonials underscore the critical role the FPCs have played in driving agricultural transformation. By sensitizing farmers, negotiating better terms for

equipment, and providing ongoing support, these cooperatives have not only facilitated the adoption of mechanization but also strengthened the economic resilience of their members.

The agricultural transformation in Assam, driven by advanced mechanization under the APART, is a testament to the power of collective action. The role of FPCs in this transformation has been pivotal, enabling widespread access to modern farming technologies and ensuring that the benefits of mechanization reach even the most marginalized farmers.

As Assam’s farmers continue to embrace these innovations, supported by their FPCs, they are enhancing their productivity and profitability and laying the foundation for a more sustainable and prosperous future for the entire region. ■

Agricultural Systems that Empower Women

Rice, a staple crop in South Asia, covers 70% of cultivated land in Bangladesh. However, extreme weather stresses due to climate change challenges pose long-term threats to the country’s agriculture sector and food security.

Bangladesh’s predominantly smallholder farmers practice the rice mono-cropping system, growing rice for two seasons a year. This results in high water usage, low income, and low dietary diversity for the farmers. These smallholder farmers practice subsistence farming with limited room for further increasing yield.

Driving change

The Sustainable Intensification of Mixed Farming Systems Initiative (SI-MFS) project, led by IRRI and supported by CGIAR, aims to empower women to become entrepreneurs. By tapping this underutilized sector and providing them with livelihood options, the project may help build resilient economies. Women are being given small agricultural machines and the know-how to become entrepreneurs.



“Previously, my family and I lived in poverty. After receiving the training and the chopper machine as part of the SI-MFS project, things have gotten better for my family. Our lives have changed. I now make 90 to 120 USD per month. I can invest this income in purchasing land, cows, and goats. My family is no longer suffering in poverty”, said Shahina Akter, a 48-year-old mother of two who was given a chopper machine and trained for entrepreneurship.

Shahina strives daily to be in business and extends her services to other farmers related to the SI-MFS project and other villagers.

Mustard cultivation has been introduced between rice crops to increase crop intensification and diversification. Women farmers have been given mustard oil extraction machines and trained to use them, developing local entrepreneurs and value chains of diversified crops.

Aruna Rani Roy, a 35-year-old entrepreneur trained to use an oil extraction machine, states, “After the training, I received a mustard extractor machine from the SI-MFS project. We have a women’s cooperative in this village, which used the mill for oil extraction after it was set up. I can extract around 60 to 80 kg of mustard seeds daily and earn a net income of USD 3.8. Four months after harvesting the mustard seeds, I earned around USD 114 monthly. Now we can use mustard oil in our daily cooking from our mill.”

An agri-food system that empowers

IRRI works with 5497 households in 16 villages as part of the SI-MFS project. In the southern districts of Patuakhali and Barguna, we are working with 3380 households in 13 villages. The project entails reducing the dependence of smallholder farmers on the rice mono-cropping system by designing and implementing

more than ten farming innovations that will allow them to diversify by combining agriculture and livestock. These innovations include livestock rearing like cows, goats, and poultry and integrating farming and livestock with farming results in a mutually beneficial relationship, where the livestock feeds on agricultural by-products, crop residue, and kitchen waste, and the animal manure can be used for fertilizing crops through nutrient cycling. Livestock rearing has added benefits like milk, meat, and egg production for household consumption and sale. Other innovations include integrating legume crops in the cropping system to enhance soil nitrogen and reduce farmers’ dependence on chemical fertilizers, empowering women farmers to include vegetable production, which can fulfill and diversify their dietary needs, generate higher income, and increase their reliance on home-grown food; encouraging the composting and vermicomposting to help improve vegetable production and soil fertility; promotion of agroforestry by the planting of fruit trees and nitrogen-fixing trees; and developing women and youth-led entrepreneurship by providing them small machines and training. These interventions are aimed at crop intensification and diversification to reduce the financial risks associated with rice production. ■

Yielding results through Mechanized direct seeded rice in the Mekong Delta

Mr. Vo Hoang Than, a rice farmer from Can Tho, Vietnam, has firsthand experience with the challenges of rice cultivation. Rising input costs, increasingly unpredictable weather patterns, and associated pests and diseases have significantly impacted farmers’ livelihoods. Mr. Than’s family has fully embraced mechanization to overcome these hurdles, from preparing the fields to harvesting the crop. This strategic shift has yielded impressive results.

During the summer-autumn and winter-spring seasons, Mr. Than participated in the CGIAR Initiative on Excellence in Agronomy (EiA), where he tested a mechanized direct seeder (mDSR) provided by IRRI. This innovative method involves planting rice seeds directly into the field at a lower density and wider spacing compared to traditional broadcasting. By adopting mDSR, farmers can reduce seed, pesticide, and fertilizer use while mitigating pest and harvest risks. Moreover, this approach has proven to boost crop

yields by 5% and farmer income by \$200 per hectare, decreasing carbon emissions by 10%.

Than’s experience with mDSR has been transformative. Compared to his previous broadcast seeding method, which required 150-200kg of seed per hectare, the mechanized direct seeder reduced seed usage by over 50%. This resulted in a 40% decrease in production costs. On his four-hectare farm, Than achieved a 7% increase in yield and a 17% boost in profits. These figures highlight the significant economic benefits of mDSR for individual farmers and their communities.

To further validate the effectiveness of mDSR, EiA conducted trials in collaboration with HK Company in Cai Lay District, Tien Giang Province. Results revealed a remarkable 35% increase in paddy yield while using half the amount of seed compared to conventional methods. Additionally, the trials demonstrated

reductions in nitrogen fertilizer and pesticide applications and optimized water use. These findings align with the Vietnamese government's ambitious goal of establishing one million hectares of high-quality, low-emission rice in the Mekong Delta by 2030.

To support the widespread adoption of mDSR, the Department of Crop Production and IRRI jointly developed the "National Technical Guidelines for Mechanized Direct Seeding." Released in October 2023, these guidelines provide farmers with essential information on implementing mDSR effectively. Recognizing the importance of this innovation, the Vietnamese government integrated the guidelines into its comprehensive "Sustainable Development of One Million Hectares of Specialized High Quality and Low Carbon Rice Production Areas under the Green Growth Agenda in the Mekong Delta Region" program strategy.

Mr. Nguyen Cao Khai, a rice farmer and Director of Tien Thuan Cooperative in Can Tho, is among the first farmers to implement the One Million Hectare Program. His cooperative will pilot mDSR with fertilizer deep placement on 50 hectares during the summer-

autumn 2024 crop. Mr. Khai anticipates substantial cost reductions, increased efficiency, and higher profits than traditional farming methods. Most importantly, he emphasizes the model's potential to significantly reduce greenhouse gas emissions and increase profits, which are the key objectives for farmers participating in the program.

At the International Rice Festival in December 2023, the Vietnamese government recognized the significant contributions of CGIAR, IRRI, and the EIA Initiative to sustainable rice production. The organizations were awarded a plaque for their work on mDSR, which has played a crucial role in promoting more efficient and environmentally friendly farming practices in Vietnam. This recognition underscores the importance of international collaboration and innovation in addressing global food security challenges.

The Vietnam Use Case was also awarded the Key Result Story of the Year at the inaugural Excellence in Agronomy Initiative Awards during the 2023 EIA Annual Learning Event. ■



