IRRI

CGIAR

Transforming Food Systems in Africa and Asia

IRRI ANNUAL REPORT 2022

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Director General's Message

2022 was marked by a fresh beginning and new accomplishments as IRRI delivered on game changing innovations in rice-based systems, actively participate in the One CGIAR transition, and reopen our headquarters and country offices after 2 years of COVID-19 restrictions. Throughout the year, our scientists and staff remained focused on the core business of research-for-impact and through extraordinary teamwork delivered exemplary scientific and on-the-ground achievement.

As the world wrestles with the climate crisis, IRRI acted on its responsibility to provide solutions in climate-change mitigation and adaptation. In 2022, we formulated a comprehensive institutional strategy for climate change that spans upstream and downstream activities, which we will implement through a portfolio of bilateral projects and CGIAR Initiatives. By leveraging our strengths in varietal development, crop cultivation, agronomy, spatial analyses, and policy guidance, we are investing in innovative research domains to spearhead the development of next-generation solutions such as methanogenesis (production of methane by bacteria or other living organisms), remote sensing of greenhouse gas emissions, low-carbon farming, rice-carbon credit markets, and policy support for rice-based systems transformation.

With a renewed focus on our four flagship programs and a clear strategy to strengthen our regional work in Asia and Africa, IRRI has been engaging with key stakeholders to understand and align with their priorities to cocreate solutions. The outcomes of projects such as the Regional Great Lakes Integrated Agricultural Development Project for Africa (PRAIDGL), the Support Project for the Transformation of Agriculture in the Natural Region of Bugasera (PATAREB), the Assam Agribusiness and Rural Transformation Project (APART), the Climate-Smart Mapping and Adaptation Planning (CS-MAP), and others, played a significant role in strengthening the trust among IRRI and its national partners, resulting in additional support and funding.

IRRI achieved remarkable progress with its proposals in 2022, with an 85% success rate in terms of USD value and a 72% success rate based on scientific submissions to all concerned institutions. It was a significant improvement compared to 2021, which already stood at a high level of 59% and 69%, respectively.

IRRI strengthened its engagement work in 2022 to foster opportunities for collaboration and funding. Our focus has been on shaping the CGIAR Southeast Asia & the Pacific (SEAP) Regional Hub, specifically through the design and approval of the ASEAN-CGIAR Innovate for Food Program. This program has eight innovation packages, designed through a collaborative approach with all 10 ASEAN member states as well as the eight CGIAR Centers active in the region. Two funding organizations—the Australian Centre for International Agricultural Research (ACIAR) and the UK's Foreign, Commonwealth and Development Office (FCDO)—have already come on board to support the first pilot year.

In November 2022, IRRI demonstrated the value of science diplomacy for action by brokering the new iteration of the "Seed without Borders" agreement that was signed in Thimphu, Bhutan, by 10 countries from Asia and the Pacific. New signatories include the Philippines, Vietnam, and Fiji.

Throughout 2022, we also engaged to consolidate and give a new impetus to our long-standing collaborations with strategic partners including the governments of Bangladesh, Burundi, India, Indonesia, Kenya, South Korea, Vietnam, and the Philippines (our host country via its Department of Agriculture) as well as the Asian Development Bank, the World Bank, and the Council of Partnership on Rice Research in Asia. These efforts reflect our dedication to fostering strong partnerships, securing funding, improving the legitimacy of our science, and maximizing our impact.

While we have had remarkable successes in scientific advancements, we also need to strengthen IRRI's credibility and visibility in downstream activities, particularly in impact evaluation. IRRI is developing a methodology that assesses the impact of technologies or bundles of technologies and evaluates the impact of its institutional presence in a particular country or region.

To align our corporate strategy with our mission of improving sustainability, IRRI also signed on to become a member of the United Nations Global Compact (UNGC). To further cement our commitment, a Green Team was assumed, which will serve as an advisory body to the Executive Team. The Green Team will coordinate IRRI's sustainability efforts and ensure compliance with the UNGC.

The Institute is also working on setting up Greenhouse Gas Accounting to show its commitment to reducing its carbon footprint to mitigate the impact of its operations on climate change. With the recent rise in global interest in sustainability accounting, this initial step will also prepare the Institute for the eventual implementation of disclosures for social, environmental, and governance impact as an integral part of our financial reporting in the future.

In 2022, IRRI announced that its milestone sixth edition of the International Rice Congress will be held on 16–19 October 2023 in Manila, Philippines. Co-organized with the Philippine Department of Agriculture, the Congress is expected to continue to be the largest gathering in the rice world of scientists, government leaders, NGOs, and business innovators, which demonstrates IRRI's unmatched ability and reputation to convene stakeholders from across the sector. To learn more about the Congress, go to irc2023.irri.org.

As the host country of IRRI's headquarters in Los Baños, Laguna, the Philippines has been a long-standing partner for over six decades. In close collaboration with the country's Department of Agriculture and organizations such as the Philippine Rice Research Institute, IRRI has developed an impressive range of technological and institutional innovations specifically tailored to Philippine conditions. In 2022, many of these initiatives are now primed for scaling. The strong relationship between IRRI and the Philippines was underscored in November 2022 when the Institute was honored with and deeply appreciative of the high-level visit of Philippine President Ferdinand Marcos, Jr., who toured the headquarters and met with leadership and scientists to discuss enhancing the country's rice sector with innovative tools and technologies.

As I look ahead to 2023, I sincerely believe that IRRI is well positioned to take significant steps forward to make transformative change. By ceaselessly striving for excellence in research, collaboration, and impact, we will continue to expand our position as a trusted collaborator, convener, and innovator to address the pressing issues of improving farmer livelihoods, climate change, sustainability, and regeneration of natural resources, food and nutrition security, and social equity. As we move forward, IRRI is poised to continue driving game changing reform in rice-based systems , advancing the frontiers of rice research, and shaping the future of agriculture for a more sustainable and food- and nutrition-secure world.

Jean Balié
Director General
IRRI

Statement of the Board Chair

As more businesses opened their doors to additional in-person interactions in 2022, IRRI embraced the opportunity to operate in new ways in a post-pandemic world. The transition to working onsite was a gradual process and challenges were met as staff navigated the hybrid working set-up. Nonetheless, the Institute and its staff proved to be resilient and adaptive. The great effort that went into the four Flagship Projects and One CGIAR initiatives and the outputs of those efforts can be attributed to the persistence of IRRI staff and their dedication to the mission and mandates of the Institute.

Financial Highlights

Good financial management across the research and corporate areas is highly welcomed and applauded and continues to strengthen the Institute. This is especially recognized given the last few years of a particularly challenging environment.

The effect of the COVID-19 pandemic—aggravated by the Russia-Ukraine conflict resulting in volatile market conditions and local currency fluctuations translating into unrealized investment losses—were the critical challenges in 2022. Through the collective efforts across the Institute to effectively manage overhead costs, further strengthen donor engagement, and accelerate research activities made possible by the easing of restrictions in the second half of 2022, the Institute managed to end the year with a net surplus of USD 70,000 as IRRI's grant portfolio increased to USD 56.262 million in 2022 from USD 52.462 million in 2021.

Research Achievements

Climate change is a priority

In 2022, IRRI focused on climate change and related issues central to protecting the food systems of vulnerable communities. This translated into the IRRI Climate Change Strategy for 2022–2027 . IRRI capitalizes on its current strengths and plans to invest in uplifting or establishing novel strengths necessary to complement and advance the present strengths. With a focus on low-carbon farming, rice-carbon credit markets, and policy support and analyses, IRRI aims to collaborate with national and international partners to co-create and disseminate solutions at scale.

In the regions

In Africa, combining the best varieties with high-quality seeds, good agronomic practices, and relevant harvest and postharvest technologies led to improved yield and low production costs within the selected communes. In Asia, a recent study showed that the net returns from IRRI rice varietal development efforts in the Philippines and Bangladesh returned more than what was invested by partners. The returns amount to USD 3.61 billion and USD 33.32 billion, respectively from 1990 to 2018.

Vietnam is a prime example where our technologies, such as Climate Smart Mapping and Adaptation Planning, are actively adopted by stakeholders, leading to an increase in rice production and income of rice farmers. Our research efforts in India have also continued. The government funded the second phase of the IRRI South Asia Regional Center (ISARC) with USD 16.7 million from April 2022 to March 2027 to scale-up existing activities and partnerships for food and nutrition security in South Asia using technologies under the Centre of Excellence in Rice Value Addition.

Lastly, our partnership with the Philippines saw many outcomes as the Institute, the Department of Agriculture, and agencies such as the Philippine Rice Research Institute developed ready-to-scale technologies and innovations tailored to Philippine conditions, which offer multiple benefits such as increased productivity and reduced production costs.

Partnerships for Impact

The year has been eventful as IRRI participated in several global events and organized or co-hosted engagements that connected us with key players in the food and agriculture sector. Several country and regional visits such as India, Bhutan and others were arranged with our national partners to continue and create new collaborations post-pandemic.

Leading the way

IRRI's vision is to continue its mandate of being the center of excellence in rice research, a hub with enabling conditions where the most talented scientists in rice research can continue to explore game changing innovations through science. The Institute will push this strategy forward by developing more effective cutting-edge technologies and varieties that will cater to the needs of our stakeholders, recommending science-based policies, and making sure that national partners are trained to master these advanced methods in rice research. Our close cooperation with centers in the One CGIAR and national systems will help us reach a new era that changes the game for rice-based systems.

Cao Đức Phát
Board Chair
IRRI

Philippine President's Engagement with IRRI

President Ferdinand "Bongbong" Marcos visited IRRI headquarters in Los Baños, Laguna to talk about how innovations and technologies could transform the Philippine agriculture sector and improve the lives of Filipino farmers.

President Marcos was welcomed by IRRI Director General Jean Balié and he met with several IRRI scientists. He also toured the International Rice Genebank, which contains the largest collection of rice gene diversity in the world.

During his visit, President Marcos pointed out the need to adopt supportive policies to modernize the rice sector as part of a vibrant agri-food industry in the country.

"There are new technologies that address the problems that we are facing and those technologies are beginning to be disseminated down to the local farmers," the President said.

As the Secretary of the Department of Agriculture, President Marcos serves as an ex-officio member of IRRI's Board of Trustees. At the board meeting he attended, members discussed how to address challenges in agriculture due to climate change and to ensure that vulnerable nations become food- and nutrition-secure in the coming years.

As concurrent head of the Department of Agriculture amidst the looming global food crisis, inaugural message on 30 June, the President noted in his inaugural message on June 30 that the country's agriculture sector "cries for urgent attention" after years of neglect and misdirection.

His plan of action for the short-term is to increase the yield of the country's main staple and provide support to those in need of government assistance. Over the long-term, he is pushing for multi-year planning focused on the restructuring of the food value chain from research to development to retail.

Research Highlights

IRRI's Four Flagships for Research and Deployment

IRRI has launched four flagships (three devoted to research and one to the dissemination of the research outputs) to address the biggest needs and where we have identified the biggest opportunities for game changing innovations. This involves dynamic and rigorous prioritization for fast-tracking to success with high-value deliverables.

The underlying strategy is to lead to game changing success with a disruptive/ differentiating product. The renewed and reinvigorated credibility accruing from delivering innovative products under difficult circumstances has lead to the ripple effect of successes with other projects.

IRRI reoriented its research into four flagships, each of which has at least two such outputs, i.e., the flagship products, that can be with the stakeholders in 2 years, have broader implications on climate-resilient agriculture, and can affect transformative impact through the rice-based agri-food systems to be of wider interest on socioeconomic, environmental, and climate health.

The three research flagships are being supported by inputs from IRRI units or departments on Gender and Livelihoods, Digital Tools and Big Data, Impact Evaluation Policy and Foresight, and Markets and Consumers. Possible products, processes, and policy briefs from these three flagships will be deployed via the fourth dissemination flagship for adoption through various partnerships.

Flagship 1: Direct-seeded rice (DSR)

IRRI has established a transdisciplinary network—the Direct-Seeded Rice Consortium, which is a public–private multi-stakeholder research-for-development platform. It is designed to address complex research issues of DSR and to catalyze scaling through public-private partnerships to create impact at scale. Through this consortium, IRRI has established a robust DSR results for development network especially in India, Cambodia, Philippines, and Vietnam.

Over the last 3 years, specific breeding of varieties suitable for DSR was undertaken. Simultaneously, great progress has been made in the following areas:

- synthesizing the current status of DSR adoption globally and regionally;

  developing methodologies for identifying suitable areas for precision targeting and differentiating
- DSR from transplanting for M&E using GIS and remote-sensing approaches;
- quantifying the benefits of DSR in terms of yield, net income, resource saving, and reduction in GHG emissions across wide geographic areas;
- developing risk-reducing practices (e.g., soil mulch DSR, anaerobic germination-tolerant varieties, precision seeding with precision seeders, seed priming, iron-coating of seeds, etc.) to ensure good crop establishment;
- developing robust integrated weed management options including herbicide programs for herbicide-tolerant rice technology;
- identifying robust mechanization options for dry and wet DSR and a strengthened service provision model to enhance access of capital-intensive technologies to smallholders;
- developing precision nutrient management to address the trade-off of nitrous oxide emissions in DSR;
- optimizing and quantifying the benefit of drip irrigation in DSR-based systems (rice-rice, rice-wheat, and rice-maize);
- optimizing the seeding rate for dry and wet DSR;
- understanding adoption constraints at farmers' and service providers' levels through an ex-post survey of them;
- developing digital solutions to drive service provision brokering through a market dashboard;
- facilitating market development for new products in areas where DSR has good scope for expansion through public-private partnerships; and
- building capacity of stakeholders across the value chain.

Direct seeding is a crop-establishment system wherein rice seeds are sown directly into the field as opposed to the traditional method of growing seedlings in a nursery and then transplanting them into flooded fields.

In the next 25 years, rice production needs to increase by 25% to meet global demand. Meeting this challenge requires producing more rice efficiently with less labor, water, energy, and agro-chemicals in a sustainable way. DSR offers both adaptation (to water shortages and weak and variable monsoons) and mitigation (reducing GHG emissions) options to climate change. There is also substantial evidence that specific management practices under DSR can improve crop productivity and quality.

Flagship 2: Nutrition

We are working with NARES partners to develop more nutritious rice varieties, such as the beta carotene-fortified Golden Rice and high-iron and zinc-fortified rice, to improve the nutrition intake of the estimated 900 million poor and undernourished people worldwide who depend on rice as producers or consumers.

Increasing the micronutrient content of rice grains, even by small amounts, can have a significant impact on human health due to the rice being a staple of half the world's population. By steadily increasing the vitamin and mineral content of rice through underpinning its genetics adds value to it as a "preventive-medicine" food.

Zinc (Zn) is an essential trace element in the human diet that is critical to boosting the immune system. Interestingly, Zn deficiency in the human diet coincides with Zn deficiency in soils where rice is grown. In South Asia, we enriched rice with Zn through fertilizer-application and crop-management practices. This is a very cost-effective and sustainable solution for South Asia.

On other nutrition fronts, we have identified genes, genetics, and genotypes for transferring to rice grains with a low glycemic index (a value used to measure how much specific foods increase blood sugar levels), high protein, and high-resistant starch (a type of starch that isn't fully broken down and

absorbed, but rather turned into short-chain fatty acids by intestinal bacteria, which can lead to some unique health benefits). Within 2 years, we can generate independent lines for these three traits. Such highly value-added and differentiated lines are the beginnings of new-market products. Importantly, in little more than 3 years, we hope to generate lines that contain all three of these traits in a single background making such varieties top-of-the-line premium rice with high export possibilities valued at billions of dollars.

We developed a digital tool, the Food Choice App, to critically assess how behavioral change communication (BCC) impacts diets under income shocks. A sample of 192 urban and rural Indian households from low- and middle-income classes in West Bengal, India, used the app to plan and budget their weekly diets under budget constraints. Women were found to be more empowered in planning for household food choices, especially when they are involved in food preparation for a large household.

We have also identified genes and genotypes among colored rice landraces that are high in anti-cancer bioactive metabolites. In addition, genes for high productivity and starch structure for good texture and taste have also been identified. These can be pyramided together to generate healthier, high-yielding varieties without compromising grain, cooking, and eating qualities. They can be processed into products such as biscuits, popped or flattened rice, baby food, and ice cream.

In Bihar, India, through a qualitative photovoice study, we did a deeper analysis on socio-cultural and other food environment drivers that shape rural consumers' food purchase decisions and eating habits. By studying the rural food environment, we can now understand the effect of agriculture to deliver nutritional outcomes.

Flagship 3: Climate-Resilient Farming

Residue management in a circular economy

IRRI has developed a rice straw-based circular economy that includes sustainable rice contract farming, rice straw-based bio-fertilizer, bio-plastics, and urban agriculture. These residue-management options are being coupled with the promotion of ICT-based tools for optimizing effective rice-straw utilization. Moreover, these operations are being guided by proven business models and behavior-change interventions that are targeted to different stakeholder groups. Ultimately, technical and social interventions together will upgrade agrifood value chains, increase rice-based farmers' income by at least 10%, and decreased the carbon footprint by at least 20%.

Mechanization to support climate-resilient rice

Laser land leveling (LLL) helps to optimize water management and enables farmers to apply AWD to reduce water use and GHG emissions by up to 50%. LLL—integrated with mechanized direct seeding—helps significantly to increase agronomic use efficiency by reducing seed rate, irrigation water application, agronomic inputs such as fertilizer, pest and disease risks, lodging, and postharvest losses. In addition, postharvest management practices, which include solar bubble dryers, flatbed dryers, two-stage drying systems, hermetic storage, bioenergy, and the EasyHarvest App for smart mechanization, all help to reduce postharvest losses as well as the yield-scale carbon footprint.

Climate-smart maps (CS-MAP)

CS-MAP is a participatory approach that integrates local knowledge and science-based research in developing maps of climate-related risks and adaptation plans for crop production, which is suitable to location-specific conditions. It has been effectively implemented in five ecological regions of Vietnam, including the Mekong River Delta, in order to help farmers mitigate climate-related risks, such as flooding, drought, and salinity intrusion. CS-MAP was developed and implemented by the Department of Crop Production of Vietnam and IRRI, through the CGIAR Research Program on Climate Change, Agriculture and Food Security in Southeast Asia.

Flagship 4: Dissemination via the OneIRRI Network and IRRI Education

All products, processes, and policy briefs must reach the respective stakeholders, i.e., farmers, customers, governments, countries, regions, the private sector, and others. Local and regional partnerships are critical for deployment, stewardship, and replacement of the products. Hence, partners cannot be just project-specific but must become part of a growing and interactive club that we call the OneIRRI Network. Products in the form of varieties, machines, models, databases, maps, apps, and reports are the currency for our credibility. For such product development, deployment and success, the training, education, and knowledge transfer processes must be in place. Our partnerships and digital platforms for such actions are all set and function as business units.

Dissemination of education, training, knowledge, and expertise is facilitated through the IRRI Education Unit. Digital and paper library of reports, manuals, peer-reviewed books, and papers are also available. The recent initiation of the Bio-Innovation Centre facilitates business incubators that use IRRI space, expertise, and technologies for their own product formulations on a paid basis.

IRRI in Africa

IRRI-AFRICA has been developing and delivering solutions in Africa for nearly 60 years. Across the countries, we are working in over 15 countries in Africa with offices in five countries. IRRI-AFRICA leverages the extensive technologies and expertise from its work globally, to customize solutions for Africa in Africa.

The needs and opportunities—why it is critical to invest in rice in Africa

Consumption of rice is rising more rapidly than any other commodity in sub-Saharan Africa

Rice imports are soaring in sub-Saharan Africa, already costing the region USD 6.4 billion/year in 2018 and expected to reach USD 11 billion by 2030 unless serious measures are taken. Many countries in Africa have a high policy priority to reduce dependence on imported rice and be self-sufficient.

Over 230 million ha of inlands are estimated to be suitable for rice production yet roughly only 12 million ha are currently being used for the crop.

Yields have been improving but are still too low, at about half of the world average.

It is a critical time where the rice industry is significantly expanding in Africa, when we can achieve the greatest impact in ensuring sustainable and healthy rice systems that are resilient and profitable for the smallholder farmers.

IRRI-Africa Research Partners Adopt the Tricot Research Methodology

IRRI-AFRICA introduced this new method to help farmers identify the most suitable technologies and products via field trials. It has been was widely adopted by three partner countries:

- In Kenya where 24 tricot trials were conducted in 11 rice-growing hubs.
- In Tanzania where 12 trials were distributed in 10 districts.
- In Mozambique where 14 trials were held in 10 rice-growing hubs.

These field trials—along with product profiling—generated key information on varietal advantages over the benchmark and local check varieties. This served as the basis for strategic product positioning and scaling in the respective market segments.

The introduction of the tricot methodology is part of IRRI-AFRICA's effort to unify and modernize existing rice-breeding efforts in sub-Saharan Africa—as well as South Asia—under the Accelerated Genetic Gain in Rice (AGGRi) Alliance. Funded by the Bill & Melinda Gates Foundation, AGGRi's aim is to increase rice yield and improve livelihoods of farmers in these diverse regions by strengthening its partnership with national research and extension systems.

Komboka, a New Superior Rice Variety Reaches Farmers

One key rice variety promoted by IRRI-AFRICA is Komboka, which has several important traits superior to the commonly grown local variety including producing a higher number of tillers, longer panicles, and higher yields. In addition, the grains are aromatic and easy to thresh.

> In crop demonstration sites, African farmers unanimously preferred Komboka. The variety has achieved widespread adoption by farmers in Kenya, where certified seed sales increased from less than 1 ton in 2020–21 to 66 tons in 2021–22. A similar trend is also expected to take place in Tanzania and Mozambique.

Komboka was developed through a collaboration among the Kenya Agricultural and Livestock Research Organization (KALRO), the National Irrigation Authority, and IRRI-AFRICA. It was released in 2020 by KALRO. Other organizations such as the Mwea Rice Growers Multi-Purpose Co-operative Society, the County Government of Kirinyaga, the Alliance for a Green Revolution in Africa (AGRA), and the Kilimo Trust under the Competitive African Rice Initiative in East Africa provided support via assessment and demonstrations of Komboka.

Scaling Africa's Rice Seed Systems

A number of capacity building activities were conducted in Eastern and South Africa (ESA). More than 100 seed producers including smallholder farmers were trained in quality seed production and business development, out of which about 28% were female participants.

These efforts provide promising trends for women-led farmers' collectives in participating across both formal and informal seed markets in ESA. Capacity building efforts are geared to train and transition these women farmer groups into formal quality seed businesses.

Moreover, a high-yielding variety Komboka was scaled up significantly in Kenya. More than 80 tons of certified seeds of Komboka were sold in 2022 compared to mere 900 kgs sold in 2020.

Several countries like Kenya, Tanzania and Mozambique have adopted these innovative models around varietal demonstration, positioning and scaling through critical partnerships with national partners and other scaling partners.

Some of the key partners working with IRRI-AFRICA who have adopted the innovations in support of rice seed sector transformation are:

- The Kenya Agricultural and Livestock Research Organization (KALRO),
- Tanzania Agricultural Research Institute (TARI),
- Mozambique Institute of Agricultural Research (IIAM)
- Mwea Rice Growers Multipurpose Co-operative Society Ltd. (MRGM)
- National Irrigation Authority (NIA), Kenya
- Nafaka Kilimo, Tanzania
- Nabwabini Environmental Health Care Intervention Programme (NEHCIP), Kenya

These efforts are tied to IRRI Flagships 3 and 4: Climate-Resilient Farming and Dissemination, respectively.

Eleven New Climate-Smart and High-Nutrient Rice Varieties for Burundi's Farmers

11 new climate-smart and nutritious rice varieties were developed and released to meet farmers' needs. These include:

- Two high-zinc rice varieties intended as a complementary intervention to help address malnutrition among target populations. Note that high levels of zinc has now been mainstreamed into the breeding pipeline for all future varieties.
- Two aromatic supa-type varieties with higher market value to boost farmers' income.
- Three high-yielding long-rain varieties to increase production.
- Three drought-tolerant varieties for areas prone to water scarcity.
- One variety resistant to rice yellow mottle virus to replace susceptible varieties in parts of the country.

Regarding near-future plans, the Institut des Sciences Agronomiques du Burundi (ISABU) will provide breeder seeds to individuals or groups of farmers to produce basic seeds for each season. Seeds will also be multiplied by producers and be made commercially available to farmers.

The new rice varieties were released by ISABU in collaboration with IRRI-AFRICA under the Great Lakes Regional Integrated Agriculture Development Project (PRDAIGL), which is the World Bank's program on improving productivity and reducing production cost.

These efforts are in conjunction with Flagship 2 and 3.

Training on New Technologies to Increase Burundi's Rice Yields

IRRI-AFRICA held Farmer Field School trainings to introduce science-based solutions to 537 rice farmers (over half were women) and 10 agricultural technicians. There were demonstrations on how these solutions can help them in their daily lives from their own perspective. As pointed out below, rice production in one target area increased by as much as 73% after one season.

The participants were trained on good agricultural practices (GAP), small-scale mechanization, and postharvest technologies. The training area covered more than 8 ha for the first season and 10 ha for the second season in Nyabikere and Gihogazi Communes in Karusi Province.

The impact of the training in improving rice yield was significant. In Gihogazi, there was a 70% yield increase from 2,504 to 3,585 kg/ha during the first season and a 62% increase from 2,766 to 4,438 kg/ha during the second season. In Nyabikere, there was a 73% yield increase from 2,614 to 3,596 kg/ha during the first season and a 65% yield increase from 2,729 to 4,205 kg/ha during the second season.

The training was part of the fifth phase of Increasing Economic and Food Security in Burundi through Rice Production Project implemented by IRRI-AFRICA from July 2020 to June 2022. The work is funded by George Liang, a philanthropist based in Hong Kong, who has funded this farmer capacity building for nine consecutive years.

This is part of IRRI's Flagship 4.

IRRI in Asia

Catalyzing change and impact in the region with science and technology

Asia, with millions of families coming from a wide diversity of socioeconomic, political, religious, and cultural backgrounds, is united in one meal staple: a bowl of rice. Across the world, leading rice producing countries are found in Asia (yields), with India (46.28 m/ha), China (29.92 m/ha), Bangladesh (11.62 m/ha), Indonesia (11.6 m/ha), Thailand (10.7m/ha), and Vietnam (7.19 m/ha) in the lead. However, as the population and rice demand increase, rice farmers continue to struggle as they face the effects of climate change, loss of arable land, and shortages of agricultural labor due to urban migration.

In business now for 62 years, IRRI in Asia continues to provide innovative technological solutions to address problems and gaps in rice-based systems in partnerships with the state, private sector organizations, and financing institutions.

Country-Specific Highlights

Philippines

Healthier rice as a nutrition intervention: Insights from consumers' acceptance and valuation of brown, colored, and low-GI rice

Insights on consumers' food choices through their behavioral intentions to consume healthier rice types (i.e., brown, pigmented, low-GI) may guide policymakers and nutritionists in designing and implementing nutrition-sensitive interventions.

Nutrition is the critical link between the components of the food systems and health and nutrition. Unacceptable levels of malnutrition persist globally, particularly in low-income countries where it is critical for reducing diet-related diseases.

An online survey of Philippine household food-related decision-makers revealed that middle-class consumers are willing to pay approximately USD 0.97/kg for healthier rice types, which is significantly more affordable than the market price of premium white rice.

Incorporating consumers' food choices in the design of nutrition interventions is important because choices are not only based on physiological needs, but also on preferences, hedonic motivations, and socio-demographic contexts.

Pest surveillance and early-warning system

IRRI, in partnership with the Bureau of Plant Industry (BPI), the Philippine Rice Research Institute (PhilRice), and the Department of Agriculture (DA), have developed and operationalized a national pest surveillance and early-warning system for rice. Through a 4-year project, the Pest Risk Identification and Management (PRIME, https://pestrisk.da.gov.ph), a standard procedure to assess and report the incidence of rice pests and diseases has been adopted by regional partners who regularly monitor about 2,800 rice fields throughout the Philippines. The collected pest-surveillance data serve as the basis for the development of pre-semester and monthly bulletins that provide timely pest-management recommendations to reduce yield losses and mitigate pest risks. In addition, an automated alert or early warning is sent via email to relevant offices and regional partners when elevated pest cases are reported. In 2022, the management of PRIME was transferred to BPI, which has the mandate on pest surveillance and early warning.

Optimizing nitrogen management for maximizing yield and reducing greenhouse gas emission in dry direct-seeded rice (dry-DSR)

IRRI used ammonium sulfate (AS) in dry direct-seeded rice, as it reduced methane emissions (23%), ammonia volatilization, and nitrous oxide emissions (7%), versus using urea, a common low-cost nitrogen fertilizer form. Using AS also helped increase rice yield by 18–20%.

Combining anaerobic germination (AG) and iron coating of rice seeds to increase chances of seedling growth in DSR systems

Results showed that, under continuous flooding (5-cm depth) during the first 16 days, seedlings' emergence has increased from 15 to 32% with the use of the AG-tolerant rice variety Ciherang sub-1 + AG1 as compared to the same variety without the AG tolerance trait (Ciherang or Ciherang sub-1). Emergence further increased to 62% when seeds of the AG-tolerant variety were iron-coated. These results show the synergistic effect of combining an AG-tolerant variety with iron-coating of the seeds in addressing risks of early flooding in DSR.

Vietnam

Helping reduce greenhouse gas emissions in the global food system

CGIAR is sponsoring a 3-year initiative in Vietnam and six other countries in Asia, Africa, and South America called Research for Low-Emission Food Systems (MITIGATE+). It is expected to reduce annual global food emissions by 6.5% by 2030.

IRRI contributes to MITIGATE+ through research and evidence to support multi-level (regional and project) monitoring, reporting, and verification (MRV) of emission reduction and operationalizing carbon markets to scale low-emission technologies. This work builds on the legacy of the CCAFS program to continue working towards integrating IRRI science into government practices, such as: the Nationally Determined Contributions (NDCs); a transparent national GHG inventory; a cost-effective, accurate, and transparent MRV system; and policies and tools to enable participation in global compliance and voluntary carbon markets.

Rice produces methane and is a high-GHG crop, typically 2 to 5 times higher in emissions than other staple crops such as maize and wheat. Given that most rice is grown in Asia, this presents an enormous opportunity to attract climate financing that can be channeled to rural communities and small-holder farmers for reducing emissions. Yet, despite the enormous relative mitigation potential from rice (36% globally) compared to other methane-producing sectors such as fossil fuels, waste, and livestock, there is comparatively very limited financing for methane mitigation in rice. IRRI is continuing to work in this arena to raise awareness and finance for mitigation in rice.

Closing the rice-yield gaps

Closing Rice Yield Gaps in Asia with a Reduced Environmental Footprint (CORIGAP) was a 10-year initiative that concluded in 2022. In the project's last phase, numerous knowledge resources such as papers, articles, and videos were shared through different learning alliances. A total of 282 knowledge products are available at the CORIGAP Legacy site to learn more about the rice management practices to help reduce the yield gap.

CORIGAP was divided into three phases: (1) understanding the yield gap and its contribution to food security, (2) promoting sustainable best-management practices for reducing rice yield gaps in the lowlands, and (3) developing knowledge products and learning alliances, ensuring that sustainable management practices were shared through key stakeholders.

For some background on the CORIGAP-Vietnam connection to achieve a sustainable rice sector there, view a video on YouTube at https://youtu.be/5jegamdq1OQ.

Promoting agricultural transformat ion towards climate resilience in the Asian Mega-Deltas

With the goal of promoting resilient, inclusive, and productive deltas, the CGIAR Initiative on Asian Mega-Deltas (AMD) was launched in Can Tho City, Vietnam, in June 2022 and has started implementing its activities and forging partnerships in its priority countries of Vietnam, Bangladesh, and Cambodia.

In its first year, AMD produced 84 new knowledge products, the majority of which are open access and available online, focusing on building learning alliances on diversified production systems, promoting nutrition-sensitive interventions, developing digital climate advisory and bundled services, designing socially-inclusive policies, and supporting evidence-based delta development planning. In the area of capacity sharing for development, AMD conducted 30 capacity building activities and learning events, including the Learning Alliance workshop and Agritechnica Asia Live in Vietnam, reaching nearly 7,000 people.

Building on the work of previous CGIAR research programs and other IRRI bilateral projects, AMD has influenced policies at local and national levels in Vietnam. AMD innovations were integrated in policies, such as the inclusion of Climate-Smart Maps and Adaptation Plans (CS-MAPs) in the National Green Growth Strategy and AWD technology in the NDCs.

AMD also attracted investments on climate change adaptation and mitigation in the deltas, such as USD 200,000 from the Asian Development Bank and AUD 1 million from the Australian Government Department of Foreign Affairs and the Trade's Business Partnerships Platform.

Mechanized direct seeding for increased farming efficiency and reduced carbon footprint in lowland rice production (mDSR)

IRRI has developed a technical package of mechanized wet-direct seeding (mDSR) tailored to improved agronomy, climate adaptation, and mitigation in rice production. mDSR was developed in association with supporting technologies such as precision land leveling, water management, and fertilizer and pest management. It was also integrated with digital agriculture for optimized crop management and harvest and postharvest management.

The benefits of mDSR were verified through the field trials conducted in the Mekong River Delta (MRD) in 2020–23. The results demonstrated that mDSR reduced seeding rate by 3 times compared with broadcast seeding (150 kg/ha), increased nutrient (NPK) use efficiency by at least 30%, slightly increased yield, and reduced the carbon footprint (GHG emissions per kg of rice) by at least 10%. In addition, IRRI, in collaboration with national agricultural research and extension systems (NARES), has promoted mDSR through several farmer field days such as demonstrations of mechanized and precision DSR for about 4,000 farmers and related stakeholders during Agritechnica Live in Vietnam in August 2022.

Thailand

Thai Rice NAMA (Nationally Appropriate Mitigation Action) applies low-emission rice farming

A joint project with the Thai government, GIZ, and other partners, Thai Rice NAMA encourages local rice farmers to implement low-emission rice farming and makes climate-friendly services and technologies accessible to farmers. It is funded by GIZ's NAMA Facility, which supports projects in developing countries to accelerate carbon-neutral development

The project targets 100,000 farming households as well as agricultural service providers in six relevant provinces in the Central Plains of Thailand. The project works with farmers and farmers' associations as well as external service providers in adapting advanced farming practices and developing respective incentive schemes, including financial support. The switch to low-emission cultivation of rice is estimated to have a potential of avoiding emissions of 2.2 Mt CO2e (carbon dioxide equivalent) cumulatively over the 5-year lifespan of the project with increasing annual mitigation potential, reducing baseline emissions from irrigated rice by more than 26%.

This project also supports Thai agencies to develop an MRV system framework for the rice sector that meets international standards. The Thai MRV framework has been established by GIZ and IRRI with the SECTOR Tool as a core component. IRRI's SECTOR tool has played a central role in quantifying GHG reduction from rice-farming practices and is considered for future GHG assessment and development of the MRV system in rice.

To develop the skills necessary for fulfilling the MRV system framework, the Thai Rice Department collaborated with GIZ and IRRI to develop a knowledge-management package, which includes learning materials and training on the detailed protocols on gas sampling and measurement. Comprising a handbook, printed products, and a series of training videos, the package serves as a tool for transferring know-how to support the MRV process. The target groups include rice researchers, agricultural extension officers, and lead farmers.

Lao PDR

Growing the agricultural value chain through a state partnership

IRRI provided consultation services to Lao's Ministry of Agriculture and Forestry in order to bolster the competitiveness of selected agricultural value chains through the Lao Agricultural Competitiveness Project (LACP). In this initiative, the Institute promoted the adoption of good varieties and quality seeds through seed management policy and application guidelines. LACP proposed a rice-export strategy that targets new opportunities for rice growers and generates revenue for the government. It also provides assistance to the Department of Industry and Handicrafts by improving the rice mill standard promotion policy and technical support to upgrade rice mills and certification. To ensure its sustainability, IRRI, through the project, designed a new sanitary and phytosanitary monitoring and evaluation system and a new plant quarantine inspection system.

Indonesia

Localizing IRRI's technology: Layanan Konsultasi Padi for climate-smart management practices

To help increase rice production, especially in the wake of the COVID-19 pandemic, IRRI, in partnership with Indonesia's government agencies, released a local version of the Rice Crop Manager, known as Layanan Konsultasi Padi (LKP) Indonesia. It is a digital tool that helps farmers decide on the best nutrient and climate-smart management practices, with the expectation that it will help increase yield.

LKP is at the development stage with a plan to roll it out across the country. It is projected that 100,000 farmers could obtain seasonal yield increases of from 389 to 545 kg/ha and from 106 to 117 USD in additional income.

Partnering with a global multinational corporation to achieve zero net gas emissions by 2050

To achieve Nestle's ambition in this arena, the company has partnered with IRRI in Indonesia to demonstrate and scale cost-effective, resource-efficient, and suitable management practices and cropping systems in Nestle's rice-production areas in the country. The partnership aims to encourage the use of resource-efficient alternate rice management methods, such as site-specific nutrient management and AWD technology. It promotes Layanan Konsultasi Padi and other smart-nutrient digital tools. The collaboration also promoted an Internet of Things (IoT) advisory service for sustainable water management and reducing the carbon footprint based on a water management decision support tool. In 2022, the project covered 218 hectares and reached 752 farmers.

India

Utilizing cutting-edge rice research to develop healthy biofortified rice and help improve the rice-based food system

The IRRI South Asia Regional Center (ISARC), located in Varanasi, India, entered its second phase of development. The state-of-the-art research center aims to develop and disseminate high-yielding, stress-tolerant and bio-fortified rice that is high in zinc and low in glycemic index; support national and regional breeding programs to promote rice lines and certified grain quality; help increase the appetite of producers' and consumers' preference for new varieties; improve nutrient-use efficiency, soil health, and water productivity; and develop inclusive value-chain business models, among others.

Through ISARC, the country aims to help 5 million farmers secure affordable biofortified rice varieties and products to enhance the health and nutrition of 0.5 million women and children. The collaboration also aims to contribute to the doubling of income of 2 million smallholder women and men farmers in India and even beyond its borders.

Using the Gastronomic Systems Research (GSR) framework to analyze behavioral drivers of food choice in eastern India

We developed a toolkit of data-gathering techniques based on the GSR framework to capture the diversity and drivers of food choice in eastern India. It is applicable in identifying entry points for introducing (1) novel food products or ingredients (e.g., biofiortified rice) and/or (2) nutrition interventions into a target population to achieve certain outcomes (market share of novel food products or ingredients and/or healthy diets). The toolkit includes a three-stage mixed-methods research approach in the qualitative quantitative continuum: (1) expert elicitation, (2) consumer surveys, and (3) behavioral experiments.

Applied in the case of eastern India, use of the toolkit was able to reveal the diversity and drivers of food choice and the suitability of novel food products within consumers' diets and the response of households to nutrition interventions and budget constraints. The toolkit can be applied in predicting the market shares and price premiums consumers are willing to pay for a novel ingredient and the concomitant change in diets that consumers are willing to adopt in response to nutrition interventions in the face of income shocks and growing incomes due to urbanization and economic growth.

The toolkit can be used to assess appropriate interventions that either encourage adoption of new food products by the target population or to increase acceptance of solutions to improve the target population's nutritional status. Finally, it can help policymakers in assessing and testing a diverse portfolio of "nudges" in order to eventually close the missing link in humanity's ambitious quest to achieve health diets across the planet.

Technical support to Assam's Department of Agriculture though training and climate-resilient technologies

Together with the Department of Agriculture's Agricultural Management Agency and Assam Agricultural University, IRRI is providing technical support to the Assam Rural Infrastructure and Agricultural Society to help strengthen the rice-based cropping system in the state through testing and applying climate-resilient technologies such as the rice-based cropping system knowledge bank, made available in Assamese and English and the AWD method.

Benefits of DSR quantified and research gaps closed to make the system more successful

Mechanized DSR with best-management practices and inbred varieties showed higher yield (by 1.0 t/ha) compared to the farmers' traditional practice of rice cultivation called "beushening" at the field site of Odisha state. When mechanized DSR was combined with hybrid rice, yield gain increased to 1.5 t/ha. The income gain with mechanized DSR + an inbred variety was INR 19,100/ha (USD 242.57/ha) and with hybrid it was INR 28,402/ha (USD 360.70/ha) as compared to the farmers' practice.

In Punjab state, based on 960 crop cuts, mechanized DSR gave yields that were similar to puddled transplanted rice but with INR 6,280/ha (USD 79.756/ha) lower production cost and 18% less water.

In Bihar state, yield of mechanized DSR and best-management transplanted rice were similar but 15 to 20% higher than transplanted rice done with the farmers' practice; cost saving in cultivation was INR 7,900/ha (USD 100.3/ha). It was observed that DSR enabled farmers to plant their succeeding wheat crop 10 days earlier than when grown after puddled transplanted rice. Getting the wheat crop out 10 days sooner minimized the negative impact of terminal heat stress on the crop.

In Assam state, both dry and wet DSR resulted in higher yields as compared to transplanted rice with net income gains of from INR 13,000 to 30,000/ha (USD 165- 381/ ha). Another benefit could be reduction in global warming potential by from 26 to 33%.

State-specific released rice varieties suitable for use under DSR conditions have been identified for Punjab, Haryana, Eastern Uttar Pradesh, and West Bengal. Hopefully, this will proliferate the adoption of DSR in these states.

Developing precision nitrogen management options for DSR-based systems

There is a need to develop optimal nitrogen (N) management practices for DSR to address the trade-off of the nitrous oxide gas emission that is higher in DSR compared to puddled transplanted rice.

A collaborative study with the Indian Agricultural Research Institute (IARI) in New Delhi and IRRI showed that using a leaf color chart (LCC) guide for better N management in DSR produced from 14 to 26% higher rice yields than the standard rate. These results suggest that LCC-guided N management had greater potential to improve N-use efficiency, lower N fertilizer application, and increase rice yields than using the standard N-fertilizer recommended doses.

Nepal

New rice varieties increase chances of survival in the country's diverse topography

Seven new varieties were released in 2022 by the National Board of Nepal to spur higher yields across the country's diverse terrains. Recommended for specific conditions are:

- Khumal Basmati-16 for growing on hilly areas;
- Hardinath-5 for lowland and river basins up to 700 m;

  Hardinath-4 and Ghaiya-3 for rainfed, shallow wetlands, upland areas, and river basins up to 1,000 m;
- Ganga-Sagar 1 and 2 for flood-prone and submerged conditions; and
- Hardinath-6 for both fully and partially irrigated conditions.

All these varieties also have multiple traits including high grain production, superb grain quality, and resistance to pests and diseases. These varieties could help lift domestic rice production and assist in improving new business opportunities for the country's rice-based system.

Cambodia

Helping farmers adapt to DSR technology

To understand the usage and promotion of precision DSR in the country, IRRI has worked there to provide comprehensive research trials to analyze the gaps, constraints, and opportunities for a sustainable and efficient DSR.

On-farm trials showed that mechanized DSR with tailored agronomy gave farmers higher yields (from 0.4 to 0.9 t/ha) and income (USD 158/ ha) compared with farmers who used broadcast direct-seeded rice.

Bangladesh

Strengthening and increasing capacity in rice breeding and seed-system capacity through a public-private partnership

For feeding Bangladesh in the future, IRRI's Rice Breeding Public Private Partnership (PPP) platform has contributed to increasing rice productivity via the country's private sector by strengthening its rice-breeding and seed-systems capacity (physical, human, and institutional). IRRI trained personnel in the private-partner companies in modern rice breeding, provided them with rice germplasm, and gave technical support to develop their rice-breeding infrastructure and facilities.

Developing new rice varieties to adjust in local ecosystems

Under the Transforming Rice Breeding Project, IRRI contributed to modernizing the rice breeding program of the Bangladesh Rice Research Institute (BRRI) with a focus on shortening the breeding cycle and enhancing genetic gains. IRRI provided technical support and trained scientists to modernize BRRI's rice-breeding program with a focus on using cutting-edge breeding methods. In addition, IRRI has provided advanced rice germplasm to develop even more improved varieties.

Rice researchers have identified advanced breeding lines suitable for various types of environments. These could help in developing new breeding lines and varieties that are highly adapted to the country's local ecosystems to help farmers increase productivity and, in turn, strengthen food security. The lines were tested for short-, medium-, and late-maturity alongside tolerances for cold, salinity, and submerging or flooding.

Under the project, Development of Short-Duration Cold-Tolerant Rice Varieties for the Haor Areas of Bangladesh, IRRI is collaborating with BRRI to develop much needed short-duration, cold-tolerant rice varieties for this northeastern part of the country where a wetland ecosystem predominates. Nearly 20 million people live in the Haor Region, which produces around 20% of the country's rice harvest.

Awards

IRRI scientist team members awarded for work with IPM Innovation Lab

The Integrated Pest Management Innovation Lab, a global group led by Virginia Tech and composed of scientists from the U.S. and organizations across Asia and Africa, including IRRI, won the Integrated Pest Management Team Award for Excellence at the 10th International IPM Symposium in Denver, Colorado, on 28 February.

One of the Lab's programs is IRRI's project, Development of Ecologically-based Participatory IPM Package for Rice in Cambodia (EPIC). IRRI scientists Virender Kumar and Rica Joy Flor were recognized as part of the IPM Innovation Lab Team tied to their work with EPIC.

IRRI visiting scholar wins 1st place at the 2022 Penn State Biology Student Research Showcase

Christian F. Cantos, a plant biology Ph.D. student at Pennsylvania State University, won first place for his poster presentation, Natural variant of rice G proteins subunit, RGA1, shows high performance under drought stress. The study aimed to utilize the natural variation of rice G-protein (Ga) subunits across the rice 3K panel and determine its field performance under drought stress.

"Rice research has been the cornerstone of my career," Mr. Cantos said. "I believe this work will have a great application for crop improvement and rice breeding with favorable traits, which can potentially help contribute to food security worldwide."

IRRI wins Global Food Systems Challenge for arsenic-safe rice project

IRRI was awarded the Global Food Systems Challenge Grand Prize for its arsenic-safe rice project. Groundwater levels of the carcinogen arsenic in many rice-growing areas in South and Southeast Asia are up to 100 times higher than the World Health Organization's recommended limit. Although arsenic contamination in rice has been documented for the past 2 decades, farmers in arsenic-affected areas have had no access to acceptable arsenic-safe rice germplasm.

Through this project, IRRI is testing, validating, and distributing rice varieties that (1) demonstrate reduced arsenic uptake from the soil and water, (2) keep arsenic content in grain and straw within safe limits for human and livestock health, and (3) meet the market requirements especially for grain and eating quality. These rice varieties will be made available and accessible to all stakeholders, particularly smallholder farming families and women.

The Global Food Systems Challenge aims to inspire and support innovative, diverse, and multidisciplinary teams to create game-changing innovations that will help transform food systems.

IRRI 2021 annual report included in the 2022 Hallbars Best of World Sustainability Reports Award

The Hallbars Sustainability Research Institute has included IRRI's 2021 Annual Report in its 2022 Best in the World list under the category of agricultural research institutions.

The Hallbars Awards review thousands of corporate sustainability reports, integrated annual reports, institution reports, and documents from over 100 countries and ranks them based on top quality and effective research. It showcases efforts worldwide for sustainability in both private corporations and public institutions.

Communications and Advocacy

Media mentions about IRRI

7,018 mentions

a surge of 80% compared to the previous year of 3,990 mentions

Some notable global media coverage are with Time, BBC Indonesia, and Manila Bulletin

Social Media Reach

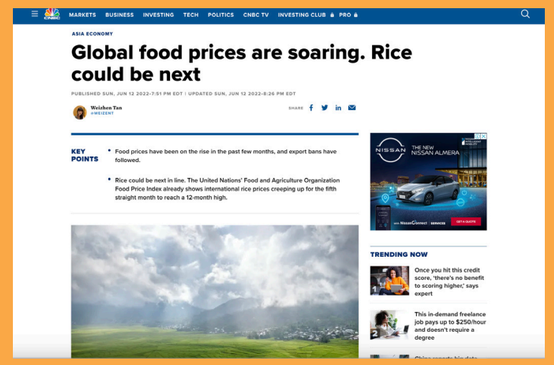
Facebook (62,184) **Twitter (37,245)** **Linkedin(45,298)**

IRRI Website visitors

38,717 average unique visit per month

Global Media Coverage

Translated as: Rice self-sufficiency award for President Jokowi, ‘without touching the welfare of farmers’



IRRI Education

Number of courses and training activities hosted in 2022

32

Number of scholars taught in Asia

174

Number of short course trainees in Asia

1,142

Number of scholars and short course trainees in Africa

16

Students' countries of origin

Bangladesh	Colombia	Indonesia	Japan	Nepal	Senegal	Thailand	USA
Bhutan	France	Italy	Malaysia	Nigeria	South Korea	Uganda	Uzbekistan
Burundi	Ghana	Iran	Mongolia	Pakistan	Sri Lanka	United Kingdom	Vietnam
Cambodia	India	Jamaica	Myanmar	Philippines	Tanzania		

Number of short course trainees in Africa

8

Human Resources and Organizational Development

Number of staff

954

Number of nationalities

32

Number of globally recruited staff

100

Number of nationally recruited staff

854

Percentage of women in the workforce

43%

Number of staff working in Asia

889

Number of staff working in Africa

65

Number of staff who were trained and developed

129

Finance

Source	2022 Grant Income	%
CGIAR fund	19,954	35%
National Governments	14,802	26%
Philanthropic Foundations	12,425	22%
International and Regional Organizations	4,010	7%
CGIAR centers and programs	2,354	4%
Private Sector	1,108	2%
Universities	1,609	3%
TOTAL	56,262	100%

Portfolio Development and Management Office

Number of general agreements in 2022

27

New agreements and amendments including hosting agreements

3

Memoranda of Agreement

4

Memoranda of Understanding

20

Let us work together.

Throughout this annual report, IRRI has demonstrated its scientific leadership to the key stakeholders in the public and private sectors to critically address food and nutrition insecurity, poverty, climate change, and social equity.

In the face of possible food crises in various parts of the world and climate change globally, the Institute is urgently looking for critical funding from philanthropic foundations, private sector institutions, state government, and international and local organizations.

If your organization wishes to inquire about how we can work together, please email us at info@irri.org.