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IRRI South Asia Regional Centre

Congratulations!

LOS BAÑOS, Philippines (August 01, 2023)

Deputy Director General for Research Dr. Ajay Kohli has been appointed interim Director General of the International Rice Research Institute (IRRI) by the Board of Trustees, effective 1 August 2023. He will be taking over from Dr. Jean Balié, who will transition to a new role in CGIAR as Director for the Impact Area Platform on Poverty Reduction, Livelihoods, and Jobs. Dr. Kohli brings 33 years of extensive experience and expertise in research and leadership in various capacities within IRRI, as well as in academia at universities and research institutes in India, the UK, USA, and Germany.

In his role as Deputy Director General for Research, Dr. Kohli led the development and operationalization of IRRI's four product-focused flagship programs (Direct Dry-Seeded Rice, Nutritious Products and Diet, Climate Resilient Farming, and Accelerated Impact) that address key challenges and provide significant opportunities for game-changing research leading to impactful product innovations.

During Dr. Kohli's tenure and under Jean Balié's oversight, IRRI's new institutional climate change strategy for rice-based systems was formulated, focusing on mitigating greenhouse gas emissions from rice production and developing climate-resilient rice varieties. This strategy has already been operationalized through an inter-departmental portfolio of upstream-to-downstream bilateral projects and CGIAR initiatives, with a pipeline of novel research projects and activities planned.

Under Dr. Kohli's leadership, IRRI's research activities have gained international recognition and acclaim. Most recently, the IRRI-led Seeds Without Borders received the David and Betty Hamburg Award, IRRI and AfricaRice's collaboration on flood-resistant rice won the Milken-Motsepe Prize, and IRRI's work on arsenic-safe rice was awarded the grand prize at the Global Food Systems Challenge. A recent 2022 study showed that the net returns from investments in IRRI and national partners' research remain strongly positive and continue to have enduring economic benefits for the Philippines and Bangladesh, the two countries evaluated, while similar studies are ongoing for other partner countries.

An invitation to transform the future of food systems from #GenetoGlobe

International Rice Research Institute (IRRI) is all geared up to host the world's largest and one of its kind forum for rice science in the form of International Rice Congress (IRC). Held every four years, this year IRC is going to be organized for the very first time in the Philippines from 16th-19th October, 2023, in coordination with the Philippine Department of Agriculture.

By Jean Balié, Outgoing Director General of the International Rice Research Institute

The fourth agricultural revolution is evolving rapidly and changing the way we produce and consume food. New knowledge, technologies, and systems are being researched and developed all over the world that have the potential to make food cultivation and value chains more productive, efficient, and sustainable.

This revolution comes at a critical juncture. The adverse effects of climate change are already constraining our ability to produce enough food, while growing populations and scarcity of resources compound food and nutrition insecurity in many parts of the world.

The rice sector is a prime candidate for this fourth revolution. This USD 287B industry feeds billions of people and provides livelihoods for hundreds of millions of farmers and value chain actors. Transforming rice-based food systems for the better will create a significant impact across the globe, but only if we all work together to make it happen.

To this end, I would like to invite everyone to help us shape the future of the rice sector from #GeneToGlobe at the 6th International Rice Congress, happening on 16-19 of October 2023 at the Philippine International Convention Center (PICC) in Manila, Philippines.

Join us at the International Rice Congress 2023

Organized every four years, the International Rice Congress (IRC) is the world's largest gathering of scientific experts, business leaders, government policymakers, trailblazing innovators, and other stakeholders in the global rice sector, coming together to share, discuss, network, and collaborate on current and emerging advancements, opportunities, and challenges in rice research, rice production, rice value chains, and the wider food, nutrition, and health sectors.

IRC is hosted by the International Rice Research Institute (IRRI), a non-profit scientific research organization established in 1960 by the Ford and Rockefeller Foundations to advance rice science for the common public good. Previous iterations of IRC were held in Beijing (2002), New Delhi (2006), Hanoi (2010), Bangkok (2014), and Singapore (2018). For this sixth congress, IRC will be held for the first time in the Philippines, the host country of IRRI Headquarters, and will be co-organized by the Philippine Department of Agriculture.

The theme of IRC 2023 will be "Accelerating Transformation of Rice-Based Food Systems: From Gene to Globe". Leveraging on the reach and r esources of our global stakeholders, the congress will encompass the entire spectrum of activities and innovations transforming the rice sector – from cutting-edge research and technologies at the genetic level to the socio-economic and environmental aspects of rice production, processing, policy, trade, and consumption on the regional and world stage.

What can you expect at IRC?

The signature event of IRC will be the International Rice Research Conference. It will run the whole four days and bring together prominent speakers, panellists, and thought leaders to discuss their experiences, ideas, and vision for the rice sector. Aside from the plenary sessions, numerous parallel sessions and breakout rooms focusing on specific topics such as genetics and breeding, data science, climate-smart technologies, and socio-economic impact will also be available for conference participants. Poster exhibits for scientific abstracts will allow scientists worldwide to present their exciting research to diverse and receptive audiences.

Another key event is the IRC Exhibition & Trade Show. Organized by our partner DLG Asia Pacific, the trade show will also run the whole four days and will showcase innovative technologies and services from exhibitors across the globe, promoting opportunities for business, partnerships, and investments. Examples of trade show exhibits include agricultural machinery, data analytics, sustainable farming, and digital systems.

Also happening during the congress are supporting special events from IRC partners. These include the 8th International Hybrid Rice Symposium (October 18-19), the 7th International Conference on Bacterial Blight of Rice (October 17-18), and the 1st Sustainable Rice Platform Symposium (October 17). Related contributed events from key sponsors such as Bayer and Regrow Ag will also have a prominent place in the congress program.

With diverse topics such as genetic research, breeding advancements, sustainable farming, climate resilience, value chain innovation, ecology and biodiversity, nutrition and health, social equity, markets and trade, and policy and governance, IRC 2023 will be an informative and eye-opening experience for many of our congress participants.

Good reasons to attend IRC

IRC is the world's biggest platform for driving innovation and transformation for our rice-based food systems. This event is particularly important and timely as we tackle the growing global demand for rice challenged by resource scarcity and climate change. For stakeholders in the rice and food sector, whether you are a scientist, part of the rice value chain, a corporate executive, a government official, or a startup innovator, IRC will be a key event of the year that you should not miss.

For scientists and researchers, IRC can help you stay up-to-date with the upstream-to-downstream work being done by public and private organizations across various countries. IRC will allow you to network and share experiences with your peers and colleagues. IRC can also provide you with a more holistic understanding of the rice sector across diverse topics, from advanced research on biotechnology and breeding to novel crop cultivation practices and digital technologies.

Corporations, businesses, and entrepreneurs within the rice industry can participate in IRC to showcase their technologies and innovations to a global audience, and to find opportunities for funding or collaboration. They can also explore new investments, markets, and opportunities by connecting with stakeholders across the rice sector.

For value chain actors like farmers, seed producers, millers, processors, and service providers, IRC can give them an insight into how disruptive technologies will impact the future of the rice sector, helping them stay at the forefront of new innovations and systems that make rice production more efficient, profitable, and sustainable.

National Agricultural Research and Education Systems (NARES) and government officials attending IRC will be able to gain knowledge and data that can influence evidence-based strategies, policies, and decision-making, and they will be able to explore how scientific advancements, technological innovations, and emerging trends can be harnessed as solutions to agricultural, socio-economic, environmental, and food security challenges in their countries.

For media practitioners and other stakeholders, IRC is the venue to engage with prominent thought leaders and learn about groundbreaking discoveries, pioneering research, and transformative innovations that will shape agriculture in the near future, impacting the lives and livelihoods of billions.

Empowering SAARC member asian countries for climate smart agriculture

28 senior government officials from Bangladesh,Bhutan, India, Maldives, Nepal, and Sri Lanka attended a four day training program to discuss strategies for upscaling climate smart agriculture in regional areas. With increasing climate stresses adversely affecting the agriculture sector in the present scenario, it is important to find solutions towards a sustainable development. Through this training program, the partners got an opportunity to identify the challenges in combating climate change as well as the event served as a forum to establish regional cooperation amongst member countries to achieve shared goals.

VARANASI , Uttar Pradesh (July 25, 2023)

The South Asian Association for Regional Cooperation (SAARC) Agriculture Centre (SAC) and International Rice Research Institute (IRRI) organized a four-day training program for SAARC member countries on Climate Smart Agriculture in South Asia: Technologies, Policies, and Digital Innovation. The training program was organized from 25 to 28 July 2023 at the IRRI South Asia Regional Centre (ISARC) in Varanasi, Uttar Pradesh with an objective to enhance the capacities of member states and promote regional cooperation among the member states for scaling up climate smart agriculture in the region. 28 senior government officials from Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka participated in this training program.

SAC and IRRI have partnered to organize the SAARC Regional Climate Smart Agriculture and the CGIAR Initiative on Digital Innovation training program which are part of the Consortium for Scaling-up Climate Smart Agriculture in South Asia (C-SUCSeS) project, said Dr. Md. Baktear Hossain, Director, SAC. Speaking at the inaugural session of the training program, he stated, "At SAC we are continuously striving towards strengthening the knowledge of the agricultural community towards the adoption of climate smart agricultural practices and we are delighted to be partnering with IRRI for realizing these goals. Climate smart agriculture is the need of the hour, especially for South Asian countries where the increasing number of climate stresses are becoming more frequent and are adversely affecting farmers, especially the smallholder and women farmers."

Congratulating IRRI and SAC, Dr. Suresh Kumar Chaudhari, DDG - Natural Resource Management, ICAR emphasized on the multitude of climate resilient agricultural practices. He said, "adopting sustainable measures for farming should be a global practice. It is important to prioritize resource optimization in terms of fertilizer use and laying some ground rules for greenhouse gas emission. With the Government of India's priority to cut down fertilizer consumption by 25 percent by 2030, the development of a bottom-up approach for climate resilient agriculture may prove to be a method to attain success to mitigate different climate related challenges." He concluded by mentioning the need for mapping areas that are vulnerable to climate calamities.

The first day of the training consisted of sessions on climate smart agriculture which included discussions on building climate resilient agriculture through adaptation and soil centric mitigation strategies and practicing of conservation agriculture practices and optimizing these techniques for use by farmers. The second day was dedicated to discussions on digital innovation with a focus on digital and precision agriculture, water stress management, use of IRRI's proprietary web based tool like Rice Wheat Crop Manager, measurement of sensor-based soil health management, and AgriGIS, etc. Other sessions included discussions on knowledge management and sharing, and development of youth and entrepreneurship with regards to climate smart agriculture, etc. During the training program, interactions with progressive farmers were also planned, along with a visit to Indian Institute of Vegetable Research.

Welcoming the guests from different SAARC member countries, ISARC Director, Dr. Sudhanshu Singh said, "Our farmers are continuously being challenged with more frequent extreme weather conditions like droughts, floods, and cyclones to maintain both productivity. Through programs like these with government officials we hope that we will be able to positively influence policies which would benefit the profitability of the farmers along with befitting our vision of a sustainable future."

The C-SUCSeS project is a four-year joint initiative between the SAC, International Food Policy Research Institute (IFPRI) and the International Fund for Agricultural Development (IFAD) and co-funded by SAARC Development Fund. The project fosters partnership and cooperation between SAARC member country governments, National Agricultural Research and Extension Systems (NARES), SAARC and IFPRI to further the agenda of climate smart agriculture. The specific objectives of the project are:

1. To accelerate the identification and scaling up of viable climate smart agriculture interventions through national policies and programs in South Asia.

2. To set up effective and efficient mechanisms for knowledge sharing, policy dialogue and cooperation and development programs among SAARC countries on climate smart agriculture.

The CGIAR initiative on Digital Innovation, which supported this training, is generating research-based evidence and solutions to accelerate transformation of agri food-systems, with an emphasis on inclusivity and sustainability. It forms part of CGIAR's new research portfolio, delivering science and innovation to transform food, land, and water systems in a climate crisis.

ISARC Director Dr. Sudhanshu Singh and SAC Director Dr. Md. Baktear Hossain facilitated the participants in the training

Assam's grand harvest program: fostering accelerated adoption of rice farm mechanization

Women farmers operating mini track-type combine harvester in Assam, India

In Assam State, India, agriculture is the backbone of the economy. The agro-climatic condition of Assam, with its highly fertile arable soils, abundant rainfall, and rich biodiversity favors the production of rice.

The majority of the farmers of Assam harvest paddy manually, which is labor-intensive and costly. Since the harvest window for boro paddy is very short due to the arrival of monsoons, the farmers face several challenges.

To address these challenges, the Assam Agricultural University (AAU) and the Department of Agriculture (DoA), Government of Assam, with the technical support of the International Rice Research Institute (IRRI) under the Assam Agribusiness and Rural Transformation Project (APART), have been advancing farmer-friendly modern harvesting and threshing technologies through the Grand Harvest program. These include mini combine harvesters, reapers, reaper binders, axial flow threshers, and open drum threshers. These technologies are being promoted and demonstrated among farmers through different trainings and demonstrations.

Technological demonstrations play a critical role in increasing awareness among key stakeholders, especially farmers and government officials of agriculture and allied departments. These help build awareness of farm mechanization and post-harvest technologies, as well as encourage entrepreneurship among youth and women.

The implementing partners, with the technical support of IRRI, are organizing Grand Harvest programs in various locations around Assam, with the objective to educate farmers about critical inputs, how to maximize yields, promote the adoption of modern mechanization, and to provide firsthand knowledge on the benefits of using improved technologies.

For the boro and sali season 2023-2024, 220 Grand Harvest programs have been scheduled to be organized across the state. 54 have already been successfully completed, attracting over 100 participants per event, including farmers, Farmer Producer Company (FPC) members, panchayat members, district administration representatives, and local members of the Legislative Assembly.

Awareness of modern farming techniques could greatly influence the livelihood of small holders. Farm mechanization and post harvest technologies knowledge have resulted in maximizing the yield. IRRI in collaboration with AAU is organizing Grand Harvest programs in various locations around Assam to educate farmers about benefits of using improved technologies for increased productivity.

These programs provided ideal opportunities for participants to see for themselves how the adoption of farm mechanization can deliver quicker, cheaper, and more sustainable means of cultivation. During these programs, demonstrations showcasing the efficiency of a combine harvester have helped spark discussions and inquiries among farmers on ways to transition from traditional manual harvesting and embrace modern technology.

The biggest motivation for the farmers on using improved technologies, as said by some progressive farmers, is that "with the use of post-harvest machinery, the field could be cleared early, which facilitates timely sowing of the next crop."

Given ample time, there is an optimistic outlook for a transformative shift in the farming community of Assam toward widespread adoption of farm mechanization, leading to enhanced yields and increased agricultural production.

Diving into new horizons of knowledge sharing through Open learning platform

LOS BAÑOS, Philippines (July 04, 2023)

IRRI Education, the educational arm of IRRI, has developed an opening learning platform to provide access to materials and resources for learners interested in food, land, and water systems. With three learning options suiting the needs of the learners, this initiative aims to transform the experience of learning and knowledge sharing.

The International Rice Research Institute (IRRI) is geared to transform the way we learn about water, land, and food systems with the launch of its open learning platform on July 4. IRRI Deputy Director General for Strategy, Engagement, and Impact, Joanna Kane-Potaka officially launched the platform during the IRRI Science Days.

The Open Learning platform, developed by IRRI Education, the educational arm of IRRI, is designed to provide access to materials and resources for learners worldwide. Through the platform, researchers, policymakers, partners, value-chain stakeholders, farmers, and anyone interested in food, land, and water systems can now access knowledge on the latest advancements of CGIAR driven by its research and innovations.

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 water, land, and food 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.

“At IRRI, we believe in the power of knowledge-sharing and collaboration. With our Open Learning platform, we are bringing together a diverse community of learners and experts from around the world to foster an interactive and engaging learning experience,” said Gopesh Tewari, Head of IRRI Education, about the impact the Open Learning platform is expected to have. IRRI Education, with support from scientist colleagues at IRRI and CGIAR, is actively working on creating research-driven courses to be offered worldwide through this platform.

Bridging the gap between traditional and regenerative agriculture with the agro-biodiversity index

The world is facing a rapid decline in biodiversity, including vital agro-biodiversity that plays a crucial role in supporting agriculture and food production. Agro-biodiversity encompasses cultivated crops and livestock as well as wild plants, animals, and microorganisms that contribute to essential ecological processes such as pollination, nutrient cycling, and pest control.

To combat this decline and improve nutrient outcomes, it is imperative to adopt sustainable farming practices that prioritize nutrition and biodiversity.

When considering the ABI, specifically for regenerative agriculture practices, the indicators should primarily assess the diversity and conservation of agro-biodiversity within these farming systems. The following indicators and sub-indicators can be included for this purpose (see Figure 1).

Regenerative agriculture presents a holistic approach to farming that not only focuses on enhancing soil fertility, carbon content, and nutrient availability but also integrates beneficial insects, birds, and other animals into the agricultural system. However, to evaluate the impact of resource-intensive and regenerative agricultural practices on agro-biodiversity, the development of an agro-biodiversity index (ABI) is necessary.

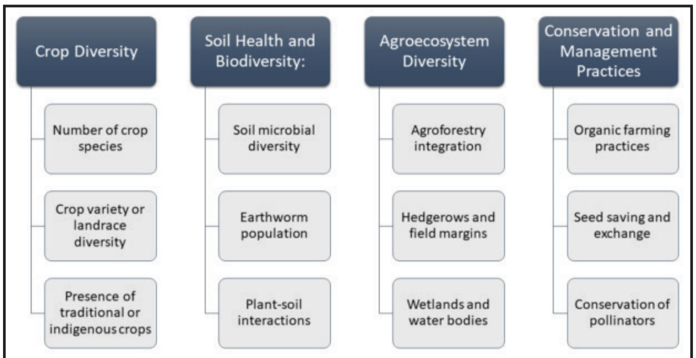


Figure 1: Indicators and sub-indicators for interpreting ABI

Calculating the ABI involves aggregating data from various indicators related to agroecosystem diversity.

While there is no standard formula for the ABI, the following generalized approach can be used:

- Determine the indicators.
- Collect data: Gather data for each indicator at the desired spatial scale (e.g., farm, region, or country) through surveys, agricultural census reports, biodiversity assessments, or other relevant sources.
- Normalize the data: Ensure that the data for each indicator are on a comparable scale by standardizing or transforming the values into relative proportions.
- Assign weights: Attribute weights to each indicator based on their relative importance in contributing to agro-biodiversity. These weights can be determined through expert judgment or stakeholder consultations.
- Calculate sub-indices: Compute sub-indices for each indicator by multiplying the normalized values by their respective weights, thereby quantifying their contribution to overall agrobiodiversity.
- Aggregate the sub-indices: Sum up the sub-indices to obtain the overall agro-biodiversity index value. This can be achieved through simple addition or weighted summation for further differentiation if required.

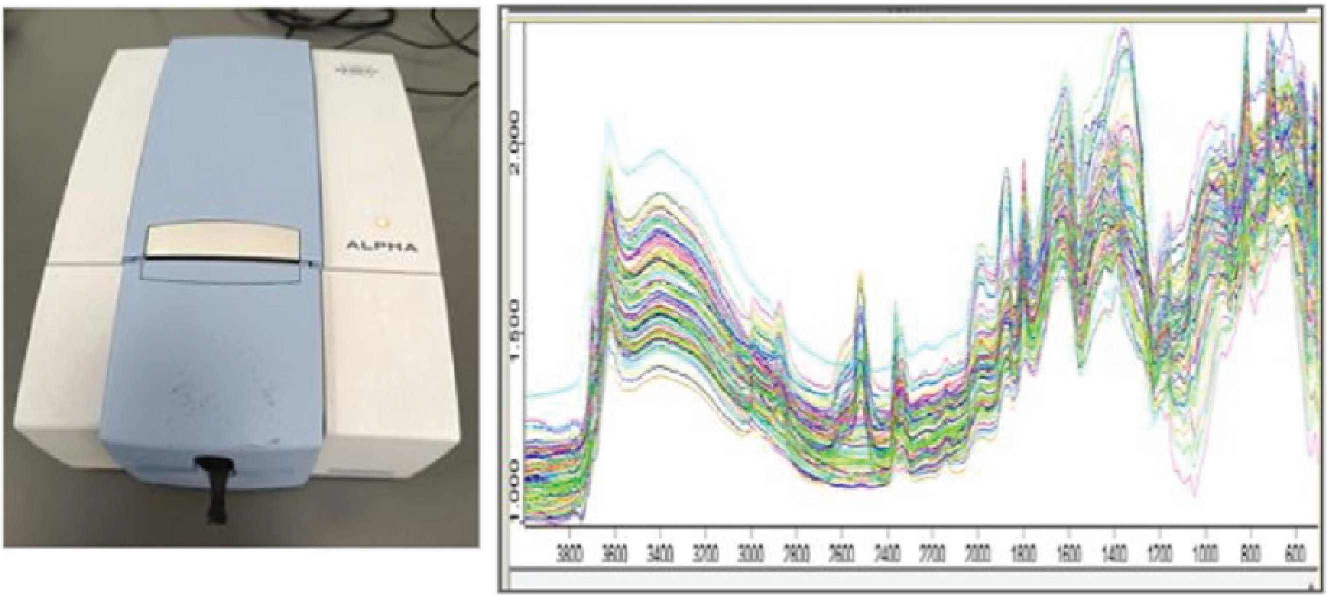
These indicators align with the core principles of regenerative agriculture, emphasizing the enhancement of biodiversity, soil health, and ecological resilience. The selection and customization of indicators may vary depending on the local context, available data, and specific goals of assessing the ABI for regenerative agriculture practices.

To promote ecological agriculture, it is crucial to implement comprehensive policies that facilitate the increase of native pest and pollinator populations, benefiting the agricultural landscape. Additionally, incentives should be provided to farmers who cultivate native varieties and conserve genetic diversity.

Furthermore, standardizing the ABI is essential for evaluating agricultural systems at a landscape scale.

Mid-infrared spectroscopy: an effective tool to enhance the soil health card scheme in India

Soil sample analysis with mid-infrared spectrometer for comprehensive soil health assessment (Photo: IRRI-South Asia Regional Centre, Varanasi India)



Periodically assessing the soil's health is very important to show the effect of current agricultural practices on the soil and maintain soil nutrients at optimum levels using new management practices. Mid-infrared (MIR) spectroscopy provides an alternative highly effective method for rapidly and cost-effectively estimating soil properties.

Precision fertilizer management at scale requires a thorough understanding of the spatial variability of soil characteristics. The rapid analysis of large numbers of soil samples within a short span of time is necessary for fertilizer recommendation. However, conventional methods of soil analysis (wet chemistry) are expensive, laborious, time-consuming, and rely on hazardous chemicals.

Mid-infrared (MIR) spectroscopy provides an alternative highly effective method for rapidly and cost-effectively estimating soil properties. MIR spectroscopy is a dry-chemistry-based soil analysis that does not use chemical reagents. Instead, it measures the amount of light reflected by a soil sample in the mid-infrared spectral regions as it reacts to its organic and inorganic composition.

Soil moisture, organic matter, carbonates, minerals, and texture are the main constituents influencing the shape of soil reflectance in the MIR region. Additionally, a single spectrum is sufficient for determining the properties of various soils.

The Soil Health Card

Periodically assessing the soil's health is very important to show the effect of current agricultural practices on the soil and maintain soil nutrients at optimum levels using new management practices. With this goal in mind, the Ministry of Agriculture and Farmers' Welfare, India, initiated the Soil Health Card (SHC) scheme in 2015 to provide field-specific nutrient recommendations.

By receiving the SHC every three years, farmers will be able to apply recommended doses of nutrients based on soil test values to improve soil health, reduce the cost of cultivation, and increase profits.

Conventional laboratory standard procedures are followed for the processing of soil samples and analysis of the following parameters:

- pH
- electrical conductivity
- soil organic carbon

- nitrogen
- phosphorus
- potassium
- sulfur
- boron
- zinc
- iron
- manganese
- copper

The soil samples are collected twice a year by the State Government's Department of Agriculture or an outsourced agency after harvesting when there is no standing crop in the field.

In the wet chemistry analysis, soil samples are mixed with an extractant solution which destroys the samples and prevents further analysis of it. In addition, the conventional lab analysis results tend to fluctuate due to differences in standards and methodologies adopted by laboratories across the country. Because soil samples can only be used once, conventional methods are overwhelmed by the large volume of soil samples collected within a short period of time, which may affect the generation of high-quality data.

Soil sample analysis using MIR spectroscopy

MIR spectroscopy is both fast and cost-effective. It only takes 30 seconds to test samples and is 10 times cheaper than conventional lab analysis. This method is environment-friendly, non-destructive, and reproducible. It reduces the need for wet chemistry-based soil analysis and is a repeatable analytical technique. Light reflectance, being a physical measurement, can provide greater consistency across laboratories compared with chemical reference methods.

It is recommended that soil samples should be air-dry and passed through a 2 mm sieve. Subsamples can be taken using the coning and quartering method and ground to a fine powder size between 20 and 53 microns using the RM 200 Restch motor grinder.

Fill the aluminium sample cup with finely ground soil to load the soil sample. It takes approximately one to two grams, depending on the type of soil. Remove any excess soil with a straight-edged tool, such as a glass slide. In the sample holder, place the loaded samples followed by making a data sheet that indicates the identification of the respective sample.

Most common applications of MIR Spectroscopy

Prediction of soil's chemical properties

Using MIR spectroscopy, it was possible to accurately predict soil pH, soil organic carbon, calcium carbonate, and available N content in the soil. Numerous studies reported correlation coefficients (R2) ranging from 0.8 to 0.9. between the actual and predicted values.

Prediction of soil's physical properties

MIR spectroscopy is capable of determining soil physical properties such as sand, silt, clay, and water-stable aggregates.

Prediction of soil's biological properties

The holistic view of soil quality requires multiple dimensions that demonstrate the biological properties of soil. MIR spectroscopy can accurately predict soil's biological properties such as respiration, microbial biomass carbon, active carbon, and autoclaved citrate extractable protein.

For the final prediction. calibration and validation datasets use various error metrics, including coefficient of determination (R2), root mean square error (RMSE), and residual prediction deviation (RPD). Careful development of calibration libraries is essential for the reliable use of MIR spectrometers.

Future perspective and ways forward

Under the SHC scheme, issuing a large number of SHCs to farmers within a predetermined time frame and using existing facilities that produce quality results is an arduous task. Exploring the potential for MIR spectroscopy to replace conventional laboratory testing partially can be facilitated by government policy briefs.

In India, research into the use of MIR spectroscopy to investigate soil is negligible. Using the country's spectral libraries, India needs to develop and validate soil property prediction models for site-specific nutrient management. India's soils should be used to compile a library of mid-infrared spectra for soil health evaluation.

MIRS can be an effective instrument for the development of cost-effective handheld sensors for nutrient recommendation to farmers under the SHC scheme. Soil spectroscopy could be integrated with soil health cards and thus regulate the use of fertilizers based on routine soil testing.

Mechanized seeding provides farmers with groundbreaking improvements in productivity, profits, and livelihoods

Under the DSR-Odisha Project and the Cereal Systems Initiative for South Asia (CSISA) Project, farmers in five districts of Odisha were introduced tomechanized direct seeded rice (DSR) and capacity building activities in kharif season for mass awareness and adoption of modern farming practices. Bikram Palatasingh, a smallholder farmer in Puri district, Odisha who once failed to operate agriculture machines due to lack of technical knowledge is now well versed in farm management practices through capacity building programs. Through mechanically established crops, Mr Palatasingh has achieved around 143 percent increment in his net income in comparison to traditional farmer's practices.

Bikram Palatasingh, 56, is a smallholder farmer from Gadasanput Village of Kanas block in Puri District. After completing his formal education, Mr. Palatasingh worked temporarily as an electrician at Central Rice Research Institute (CRRI). While working at CRRI, out of curiosity, he learned about improved rice farming methods. After leaving his electrician job, he went into farming to support his family.

When he became a farmer, Mr. Palatasingh could not own farm machinery because of his financial situation. It took him more than 20 years to be able to buy a tractor, a seed drill, and an electric open-drum-thresher through government subsidy schemes in 2009, 2013, and 2018, respectively.

Without any formal training on using the machines, he learned by doing. He used the machines mostly on his own farm. The tractor was also rented out for non-agricultural use.

His initial experience with the seed drill was not ideal. The machine did not sow the seeds uniformly hence he failed to achieve optimal plant population. He also faced weed infestation. For these reasons, he was not able to fully utilize the seed drill. Other farmers, after witnessing his unsuccessful attempts, lost their interest in sowing crops mechanically.

Technology and farmer-driven intervention

Strengthening and facilitating the access of small and marginal farmers to mechanized seeding and services for kharif rice and non-rice rabi season crops is one of the objectives of the Precision Direct-Seeded Rice-based Diversification Systems for Transforming Labour Requirement, Yields, and Profitability of Smallholder Farmers in Odisha (DSR-Odisha) Project.

The project, funded by the Government of Odisha, aims to address the numerous challenges that plague the agriculture sector in the state. These include traditional crop establishment practices that incur higher production costs and lower productivity, labor scarcity, drudgery, and unproductive fallows during the rabi season.

DSR-Odisha Project and the Cereal Systems Initiative for South Asia (CSISA) Project Team, in collaboration with partners, introduced mechanized direct-seeded rice (DSR) in kharif across five districts on a cluster approach for mass awareness and adoption. This was followed by mechanized sowing of non-rice crops in rabi season along with high-yielding varieties and hybrids, and best management practices.

Service providers, progressive farmers, women, and the youth were trained under the project on technological and business management aspects.

Based on CSISA's experience in scaling such technologies through service providers, the International Rice Research Institute (IRRI) identified potential service providers by reaching out to tractor owners, progressive farmers, the youth, and others. Mr. Palatasingh was one of them.

Palatasingh Singh, a progressive farmer in Odisha operating advanced multi-crop planter in his field

A warrior with the right weapon

The project assessed the capacity development needs and engaged with him on various agricultural extension activities such as hands-on training on the seeding machine, field days, travel seminars, exposure visits, and public harvests.

Besides training him on the precise operation and calibration of a multi-crop planter, Mr. Palatasingh received technological and business management support for providing customized services on mechanized seeding to farmers in his locality. In August 2022, he was also involved in an exposure visit to a successful program on direct-seeded rice (DSR) conducted by Praanadhaara, a non-government organization based in Baptla and Guntur districts of Andhra Pradesh.

Moreover, he was given linkage support. Demonstrations on mechanized sowing with improved rice and hybrid varieties and tailored agronomy were put in his field during the 2022 kharif season to ensure more confidence.

Besides involving Mr. Palatasingh in these capacity-building programs, the project lent him an advanced multi-crop planter to service provision to other farmers. This is part of the project's strategy of lending farmers project-owned machines to reach the maximum number of potential service providers and create a roster of established service providers.

"I felt like a warrior who had received the right weapon and nobody could stop me from winning the war now," Mr. Palatasingh said.

From setback to wider success

His initial experience with the seed drill earlier was unsuccessful because of his lack of technical knowledge and not having advanced machines.

"People often blame technology when they cannot get the desired results," Mr. Palatasingh said. "But in many cases, the farm machinery and equipment are not appropriate to the landscape or the operator is not skilled enough to operate the machines properly."

In the 2022 kharif season, after receiving support from DSR-Odisha and CSISA, Mr. Palatasingh targeted 48 hectares of rice lands under mechanized DSR. This time, however, he has acquired a good working knowledge of machine capacity, the time it would take to meet his goals, the liquidity required, and other factors.

He started aggregating demand for mechanized DSR, well before the season started.

Initially, he could not convince farmers to accept the technology as they had seen him fail to grow the crops properly earlier. But he, along with the project team, persisted in explaining how seeding with new and advanced multi-crop planters using improved crop varieties and improved management practices will help resolve poor crop establishment, weeds, water, lack of labor, high production costs, and time.

He arranged meetings with farmers in his village and invited the project team. With such an inclusive approach, he convinced around 60 farmers to opt for mechanized DSR in 40 hectares of land during the 2022 kharif.

Economics of providing mechanized services to farmers

In the rabi season 2022-23, Mr. Palatasingh provided mechanized sowing service to 54 farmers for groundnut(12 ha), gram(16.4 ha), and maize(1.2 ha).

The profits he derived as a service provider of mechanized DSR were USD 9.42/ha and USD 8.13/ha for the non-rice crops. But he projects the profit margin would increase in the coming years by maximizing the efficiency of machine operation, mobility (field to field and village to village), use of other resources, and, most importantly, by serving more farmers.

In the 2022 kharif season, he earned USD 1,270.00 with a profit margin of USD 377.00. In the rabi season, he earned USD 940.00 with USD 240.00 in profit. The gross income and profit margin for his first year of service provision for both seasons were USD 2,210.oo and USD 617.00, respectively.

Without any subsidy on machine purchase, the service provider can get back all the investment he or she makes on machine purchase within three years of service. But it can also be achieved earlier, if more farmers can be brought into the service. In Odisha, the government offers a subsidy for agricultural machine purchases which means service providers can recover the cost of a multi-crop planter in one and a half years or less.

Farmers are gaining high productivity through mechanized seeding and recommended management practices (Mr. Palatasingh in his land with high-yielding groundnut variety, Devi)

Ensuring higher system-level productivity and profitability through mechanized sowing

Under the supervision of the project team, Mr. Palatasingh adopted mechanized sowing on his farm for groundnut, green gram, and rice using tailored agronomy. Gains in productivity and production were expected from his mechanically established rice and groundnut.

The package incurred higher expenses on land preparation, sowing, and fertilizer.

The seed cost was also higher due to the higher price of improved and hybrid rice seeds (Swarna Masoori and Arize Dhani, respectively). But the seed rate was substantially lower at 20 kg/ha in drill-DSR compared to 62.5 kg/ha using traditional beushening (cross-plowing the dry-seeded standing rice crop 25-35 days after seeding when rainwater level in the field reaches 15-20 cm, followed by laddering and seedling redistribution).

The estimated cost of cultivation using Drill-DSR (USD 717.23/ha) and the cost of farmers' practice (USD 718.34/ha) were basically the same. However, the rice grain productivity in Drill-DSR was 35% higher at an average of 5.75 tons/ha against an average of 4.25 tons/ha for farmers' practice.

Overall, the cost of production in drill-seeded rice was 26% lower at USD 125.00/ton compared to USD 169.00/ton using farmers' practice. The estimated net income from mechanized DSR was USD 731.00/ha than in the case of farmers' practice at USD 361.00/ha. The benefit-cost ratio was 2.02 and 1.50, respectively.

Mr. Palatasingh cultivated the high-yielding groundnut variety Devi using mechanized seeding and the recommended management practices. He derived more benefits from this than traditional farmers' broadcasting practice and management, using the local variety Anugul Badam.

The cost of groundnut cultivation using mechanized seeding was USD 811.00 /ha or 23% lower than the cost of land preparation and sowing using farmers' practices. The mechanized seeded groundnut yield was 8.38 tons/ha compared to 1.88 tons/ha for farmers' practice. The production cost in drill-seeded was 42% lower at USD 312.00/ton compared to farmers' practice at USD 541.00/ton.

Regarding net income, Mr. Palatasingh earned an additional profit of USD 750/ha using mechanized seeding, high-yielding varieties, and best management practices for a total of USD 1,332/ha. Net income from traditional farmers' practice was only USD 582.00/ha. The benefit-cost ratio was 2.71 and 1.57, respectively.

During the 2022-23 rabi season using Drill-DSR and traditional broadcasting. He noted that the net return from mechanized sowing of green gram using high-yielding varieties and best management practices was much higher over traditional farmers' practice and management using a local variety.

"The cost of cultivation of green gram under mechanized seeding was USD 255.00/ha compared to the farmers' practice which was USD 236.00/ha," said Mr. Palatsingh. "The former was higher because of the costs the seed of improved variety, drill seeding, and best management practices."

The drill-seeded green gram crop yield was 3.98 tons/ha or 89% higher than that of farmers' practice at only 0.63 tons/ha. The resulting cost of production was 43% lower cost under mechanized seeding (USD 215.00/ton) compare to the farmers' practice (USD 377.00/ton).

The net income derived by Mr. Palatasingh was 143% higher through mechanically established crops getting USD 757.00/ha over traditional farmers' practice at USD 312.00/ha. The benefit-cost ratio was 3.97 and 2.32, respectively.

A win-win innovation

"Mechanized sowing and its custom service provision is a win-win innovation for both the farmers and service providers," said Mr. Palatasingh. "This will play a major role in reviving direct seeding in my district."

He said that it would be beneficial if one person can buy the machines and provide custom services to other farmers instead of a smallholder farmer buying a machine for self-use only.

Another approach is for more affluent farmers to buy agricultural machinery mostly for their own use and rent out the machines to service providers to extend such services to the needy farmers around. With such an agreement in advance, the project started creating service providers by developing their capacity through various means.

The case of Mr. Palatasingh highlights two aspects of mechanized sowing as an alternative crop establishment method. His experience in custom hiring service provision (the start-up, business management, costs, benefits) to farmers for mechanized sowing of rice and non-rice crops. And his experience as a farmer with the technology regarding its contribution to improving the system's productivity and profitability.

Such insights and feedback could serve as an example for other farmers and other stakeholders, especially for the rural youth and women, to opt for agricultural mechanization for cost-effective production and sustainability, promote crop diversification, and rice-fallow intensification in the state.

Service provision through mechanized sowing can also create livelihood opportunities (as service providers, machine owners, machine operators, mechanics, and demand aggregators) for many job seekers and hence such interventions can also strengthen the rural economy.

The creation of more service providers and the service provision initiative will also help bring sustainability to the technology.

However, to achieve all these, continuous collaboration and coordination between public and private stakeholders is indispensable until a good number of farmers are aware of the technology, a sufficient number of service providers are available, skilled operators are developed, the availability of quality machines is ensured, and a panel of people is trained to take the technology forward.

IRRI conducts Enterprise Breeding System (EBS) training towards increasing its adoption in south asia

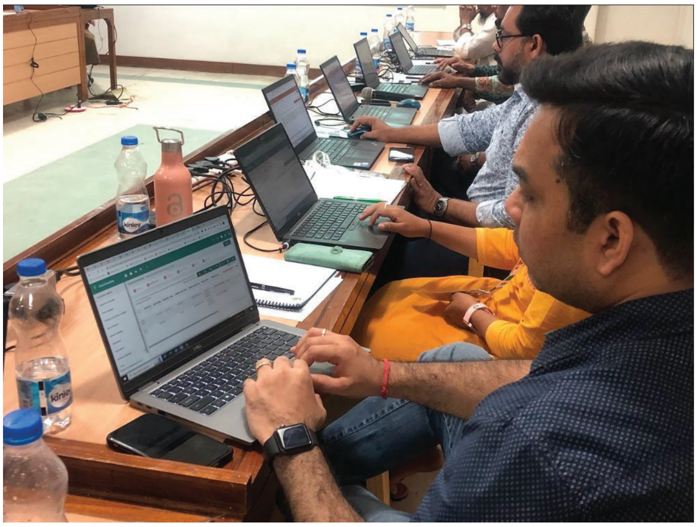
Trainers & Participants at IRRI South Asia Hub, Hyderabad (June 22,2023)

Recognizing the need to increase adoption of the Enterprise Breeding System (EBS) in South Asia, IRRI EBS Data Management Team conducted training among scientists, researchers, and technicians at the IRRI South Asia Hub, Hyderabad, India on 22-26 May 2023.

A total of 28 participants from IRRI's Bangladesh, Odisha, and Varanasi offices, attended the on-site training which aimed to increase uptake of EBS, promote good data management practices, and enable efficient data-driven breeding decisions. Two of the participants were from the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) Hyderabad office, who support Breeding Management System (BMS) and EBS users in the South Asia region.

IRRI EBS Data Management Specialists, Ma. Concepcion Lotho and Michael Reyes, served as resource speakers during the week-long training. Ms. Lotho and Mr. Reyes provided in-depth lectures and demonstrations of applications under Core Breeding (all tools), Service Management (Shipment), and Breeding Analytics (Phenotypic Data Manager and the Analysis Request Manager) domains to equip participants with essential EBS know-how—from creating experiments to analyzing collected data.

The training followed a workflow-based approach and covered relevant tools for the following supported experiment types: breeding trials, observations, generation nurseries, and cross nurseries. Important use-case scenarios were also highlighted to relate EBS processes to actual field practices, including germplasm selection, seed sources management, and shipment; experiment planning and execution (both in-house and in collaboration with NARES); data collection, cleaning, and analysis; and finally harvesting and advancement, among others.



As nearly half of the participants were specifically attending to improve their EBS data collection proficiency, the IRRI EBS team focused on using the Field Book application, which enables users to collect, quality check, and store data. At the end of each topic, the participants actively posed inquiries and hands-on activities were designed to assess their understanding of concepts and processes. Participants provided positive feedback on the training noting its appropriateness, helpfulness, and timeliness of the intervention.

Moving forward, the EBS adoption activities in the South Asia region will be evaluated through consistent use of the system.

The EBS aims to transform crop breeding by offering a single data management system that digitalizes the breeding process. More adoption activities, such as training and information sessions, can be expected in the future as the EBS becomes the sole breeding data management system across CGIAR Research Centers.

BADC and IRRI empower farmers with seed system and product management program in Bangladesh

BADC & IRRI officials at a training in Tangali, Bangladesh (June 09,2023)

The Bangladesh Agricultural Development Corporation (BADC) and International Rice Research Institute (IRRI) jointly organized a training on rice seed production, processing, preservation, and marketing for dealers and seed growers at Tangail Bangladesh. BADC-registered members from across the value chain were invited to introduce new varieties of rice and discuss the production and development of quality seed through processing, preservation, and marketing so that they can be extension advisors within their farming communities or networks.

Mr. Abdullah Sazzad, NDC, Chairman of BADC, stated that this collaboration between BADC and IRRI is important in boosting the production of high-quality seeds and improving rice seed research and development. BADC, under the Ministry of Agriculture of Bangladesh, is responsible for distributing high-quality seeds (including improved varieties and climate-tolerant varieties) to dealers in the country. Together, IRRI and BADC have been jointly implementing Seed System and Product Management in different regions of Bangladesh to collect data to verify the sustainability of modern and promising high-yielding varieties of rice through field trials.

The training programs are targeting around 200 BADC-registered seed dealers and growers in four different locations of Bangladesh to address the gap in the supply and demand of new and improved seed varieties, thus improving inclusivity in the value chain process for seed growers. The program currently engaged with NARES and other stakeholders like farmers, dealers, and millers to conduct on-farm trials and demonstrations for the identification and promotion of varieties. Qualitative feedback from farmers, dealers, and millers on new varieties of rice helps compare popular rice varieties with potential varieties in the trial beds which aids in the selection of region-specific suitable varieties leading to swift expansion of selected rice varieties at the farmers' level.

The training was coordinated by the Chief Coordinator of Research Cell, Dr. Md. Nazmul Islam; Deputy Manager of BADC Seed Wing, Dr. Md. Mahbubur Rahman; Head and Principal Scientific Officer, FFS, BRRI; Mr. Muhammad Ashraful Habib; and Dr. Saidul Islam from IRRI Bangladesh. Present at the inaugural session of the training were NDC Chairman (Additional Secretary), BADC, Mr. Abdullah Sazzad, as the chief guest; Chief of Party, IRRI Bangladesh, Dr. Md. Sirajul Islam; and Member Director (Seeds & Horticulture) Md. Mostafizar Rahman as the special guests and Additional Director, Seed Marketing Division, BADC, Dr. Md. Mahbube Alam as the chairperson of the training.

Training women farmers in scientific fish farming to boost production and income in the ganges delta

Women farmers participating in scientific fish farming, Ramgopalpur Village, West Bengal, India

Scientific fish farming is the key to enhancing the production efficiency of the aquaculture sector. However, in the Sundarbans Region in the Ganges Delta of West Bengal, India, fish farming practices are mostly traditional and labor intensive involving little pond management and feeding.

Realizing the need to introduce scientific fish farming practices among the farmers, the Indian Council of Agricultural Research-Central Soil Salinity Research Institute (CSSRI) in West Bengal, in collaboration with the International Rice Research Institute (IRRI), conducted the Scientific fish farming practices for enhanced production efficiency and income training in Ramgopalpur Village in South 24 Parganas District. The objective of the program is to secure the farmers' livelihood by increasing their knowledge in developing efficient fish production from the aquaculture system.

Women in this village play an important role in fish farming, and hence, the research team considered women farmers as suitable participants for the training on scientific fish farming. The off-farm training was conducted with 46 women farmers.

Drs. Dhiman Burman and Dr. Uttar Kumar Mandal, both scientists at CSSRI, discussed the role of women in farming. Mr. Rinchen Nopu Bhutia, a scientist also at CSSRI, provided the in-depth lecture on various activities such as pre- and post-stocking pond management in scientific fish farming.

The information provided would greatly help the farmers to greatly as through scientific farming with proper pond management and supplementary feeding, a faster growth of fishes and higher production can be achieved within short period, which will ultimately improve the farm income.

Because the cost of fish feed accounts for the major expense in aquaculture, the training taught the women farmers how to prepare low-cost feed using locally available feed ingredients (e.g., mustard oil cake, rice bran, fish meal). This is one of the topics that the participants found highly valuable and expressed their interest in more hands-on training on fish feed formulation.

"We were not aware of the nutrient requirements of the fishes and the nutritional properties of different fish feed ingredients", said Aparna Mondal, one of the participating farmers. The utilization of locally available feed ingredients could help the farmers to get better production from the ponds at a lower operational cost, according to Mrs. Mondal.

Additionally, leaflets with detailed information on fish farming was distributed among the participating farmers.

ISARC holds training for farmers to make rice production in India environmentally sustainable

Participants in training session at ISARC, Varanasi, Uttar Pradesh (June 10-11, 2023)

The IRRI South Asia Regional Centre (ISARC) organised a two-day training session for farmers on greenhouse gas (GHG) emissions, water-use efficiency, and soil health measurements in rice-based systems to make rice cultivation sustainable and increase yields and profitability of farmers.

The training, held on 10-11 June 2023 at Varanasi and Azamgarh in Uttar Pradesh, was organised as part of the public-private partnership project between IRRI and Bayer Crop Science. It provided 20 farmers from six different rice-growing states in India with the knowledge and skills on GHG emissions, water-use efficiency and soil health measurement focusing on agricultural GHG emissions, their effects, and ways of reducing them.

The activity covered theoretical and on-field sessions discussing advanced techniques of soil sample collection, water flow measurement, alternate wetting and drying (AWD) pipe installation and water depth measurements, installation of closed gas chambers, practical demonstration of gas (carbon dioxide, nitrous oxide, and methane) collection from the closed gas chambers, and best practices of gas analysis through gas chromatography. The on-field training in Azamgarh demonstrated the practical applications of the techniques.

The sessions were facilitated by Dr Ajay Kumar Mishra, a scientist at ISARC, Dr Munmun Rai, a consultant at IRRI; and representatives from Bayers.

Dr Sheetal Sharma, a soil scientist at IRRI's, Sustainable Impact Platform, discussed the objective of the project and the significance of a two-day hands-on training program on GHG, water and soil measurements. She also introduced the national partners (Banaras Hindu University, Varanasi, Uttar Pradesh; Bihar Agriculture University, Sabour, Bihar; CSIR-Intitute of Minerals and materials technology, Bhubaneswar, Odisha; University of Agriculture Sciences Raichur, Karnataka; Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu), who will contribute and coordinate GHG measurements in their respective institutes.

Pandit Purandare, the specialist at Bayer's Stakeholder Affair and Chaitanya Krishna Arimili, Corporate social responsibility, Business platform- Strategic Projects from Bayer. They highlighted the significance of public-private partnerships for achieving sustainable development goals through appropriate climate actions.

With more impetus being given to making agriculture increasingly environmentally sustainable, the farmers appreciated and welcomed such technologies.

ISARC represents rice research and innovations at state level events

Uttar Pradesh Chief Minister Shri Yogi Adityanath addressing the event at Karkhiayon, Varanasi, Uttar Pradesh (June 26, 2023)

ISARC showcased its ongoing activities and technologies at an event organised by Agricultural and Processed Food Products Export Development Authority (APEDA) on 26th June, 2023. The event was organised in Karkhiayon,Varanasi where the Uttar Pradesh Chief Minister Shri Yogi Adityanath flagged off GI-tagged fruits and vegetables from Varanasi to Sharjah through airways. Other important dignitaries including State Minister of Agricultural Education and Agricultural Research of Uttar Pradesh Shri Surya Pratap Shahi, Minister of Horticulture Shri Dinesh Pratap Singh, Additional Chief Secretary of Agriculture, Agricultural Education and Research, Agricultural Marketing, International Agricultural Trade and Export Promotion Dr. Devesh Chaturvedi were also present at the event.

ISARC scientists interacted with the dignitaries and presented the new innovations being carried out by ISARC such as high value products made by traditional landraces of rice, drone technologies for precision agriculture, development of stress tolerant rice varieties, low GI rice, biofortified rice lines, capacity building programs being offered by the institution etc.

In the series of events, Scientists from International Rice Research Institute South Asia Regional Centre, Varanasi also presented their views on the latest trends in rice research and development at "Kharif Kisan Gosthi" organized at Girija Devi Sanskritik Sankul, Varanasi . Uttar Pradesh Minister of State in the Ministry of Agricultural Education & Agricultural Research Shri Baldev Singh Aulakh along with other dignitaries were also present at the event. Scientists also presented the dignitaries with Kalanamak rice cookies being developed by the center.

ISARC scientists interacting with delegates at an event in Varanasi, Uttar Pradesh (June 30, 2023)

ACTIVITIES AT A GLANCE

DSR-Odisha and CSISA Project team organized 6 workshops on "Transforming mechanized DSR Service providers into technology advisors and aggregators" involving existing service providers (SPs) of Mechanized Seeding created under DSR-Odisha Project across 6 districts (Bargarh, Bhadrak, Ganjam, Kalahandi, Mayurbhanj and Puri) during June-July 2023. Along with this, an exposure visit cum interaction meeting on mechanized precision direct seeded rice was also organized at Delang Block, Puri district, Odisha on 27 June where IRRI's DDG Dr. Joana interacted with farmers of Puri District about the importance of mechanized DSR like low labor input, saving of water and high economic benefit.


IRRI DG SEI Dr. Joanna Kane Potaka interacting with farmers in Puri, Odisha (June 27, 2023)


ISARC Director interacting with delegates at an event in Varanasi, Uttar Pradesh (June 17-18, 2023)

The International Rice Research Institute South Asia Regional Center (ISARC) showcased its food products made from traditional rice varieties like Kalanamak rice cookies, rice muesli, and puffed rice at a two-day program organized at BHU on17-18 June. The event was organized by the Bharatiya Kisaan Sangh (BKS) to generate awareness among the farmers regarding new innovations in agriculture. BKS officials, farmers, and media personals visited the ISARC exhibition stall where they were briefed about the ISARC's activities in rice seed-seed research.

A two-day hands on training on "On-farm adaptive trials on wide-scale adoption of mechanized and precise Direct Seeded Rice (DSR)" was organized with Foundation for Advancement of Agriculture and Rural Development (FAARD), in Chandauli and Sonbhadra district in Uttar Pradesh on 28th June and 13th July.

Trainers & Farmers in training on precision DSR at Sonbhadra, Uttar Pradesh (July 13, 2023)

Training on AWD in Mandla, Madhya Pradesh (July 21-22, 2023)

As a part of the CORE project, a two-days training of trainers (ToT) on Alternate Wetting & Drying (AWD) and sustainable management practices was organized by ISARC from 21st-22nd July 2023 in Mandla district of Madhya Pradesh in association with UNWomen and Pradhan for wider dissemination and scaling of adoption of Alternate Wetting & Drying (AWD), direct seeded rice (DSR) and sustainable management practices for low carbon rice systems. Around 60 master trainers from Mandla and Balaghat districts participated in the training and had hands-on training for use of AWD technique.

ISARC conducted a two-day Capacity Development & Training Program on Direct Seeded Rice (DSR) for farmers from 7th-8th June 2023. The training was organized in collaboration with UP-PRAGATI Accelerator program. This training included in-class sessions, field demonstrations, and hands-on training covering aspects pertinent to DSR such as the Crop establishment method, its economic & environmental benefits, land preparation, water, nutrient & pest management. Other aspects of training included Business models in DSR, Suitable rice varieties in Uttar Pradesh, and farm machinery components & their operations.

Capacity Development training on DSR under UP-PRAGATI Accelerator Programat ISARC,Varanasi, Uttar Pradesh (June 07-08, 2023)

Training on seed production strategies and market linkages in Guwahati, Assam (June 15-16, 2023)

Assam Agricultural University in conjunction with the seed system and product management team of IRRI organized a two day workshop and seed dialogue at IIBM Guwahati on 15th - 16th June. The workshop focused on the theme of "Successful community-based seed production strategies and market linkages". The workshop brought together a diverse range of participants, including heads of KVK, Scientists for AAU & IRRI, officials & experts from ASCL (Assam Seed Corporation Limited) as well representatives from FPCs.

IRRI team with women seed producers for advancement of potential varieties and seeds in Bangladesh

Seed System team commenced working with Bangladesh women seed producers to identify ecology-fit and market-demanded rice varieties through the intelligence generated from OFT trials and stakeholder engagements. Team collaborated with seed producers for the advancement of potential varieties and seeds in Bangladesh. A significant quantity of breeder seeds (~8 ton) will be channelized through BRRI & BINA national breeder seed multiplication system and fast-paced seed production through different private seed companies. Similar efforts have been taken up in state of Uttar Pradesh where approximately 300 kg of breeders/foundation seeds have been distributed with different collaborative efforts. Following the harvest of all kinds, this will infuse an estimated 222 quintals of high-quality seed into the supply chain.

A three-day capacity development training was organized from 20-22 June for BAU scientists, researchers, and officials. The training is being organized under IRRI and Bihar Agricultural University's ongoing collaboration under the Climate Resilient Agriculture (CRA) Program. The training aimed to share knowledge related to the different aspects of climate-smart agriculture and mechanization such as policy context, climate-resilient rice varieties, digital tools and machinery, water management, direct seeded rice outcomes, and GHG emissions & carbon farming.

BAU scientists & officials in a capacity development training at ISARC, Varanasi, Uttar Pradesh (June 15-16, 2023)

Trainers & participants at a capacity building training on remote sensing & GIS in Biswanath, Assam (July 25-26, 2023)

Three new GIS data processing facilities have been set up under the Assam Agribusiness and Rural Transformation Project (APART) by Assam Agricultural University (AAU) with the support of IRRI at three colleges under AAU at Sarat Chandra Sinha College of Agriculture (SCSCA), Dhubri, Biswanath College of Agriculture (BNCA) and College of Horticulture and Farm System Research (CHFSR), Nalbari. These facilities are fully equipped with high computing workstations and associated hardware, storage, image processing and GIS software, as well as manpower (Assistant Project Scientists). A series of trainings in Jorhat, Dhubri, Biswanath and Nalbari were also organized with the objective of capacity building of in-house faculty, project staff and students of AAU in Remote Sensing & Geographical Information Systems (GIS) for geospatial analysis and mapping.

On farm demonstrations of bio-agents initiated in Assam

Farmers at demonstration training of bio agents in Assam, India

Assam Agricultural University with the technical support from IRRI has initiated demonstrations of bio agents at farm level through Farmer Producer Companies in 12 districts of Assam. The prime objective of the program was to increase the adoption of bio agents at small and medium scale level while providing technical knowledge on bio agents production, usage, and value addition of organic manures. The capacity building program includes both theory and hands-on training on usage and application techniques of bio-agents under field conditions. Under this program bio-agents Viz Trichoderma, Pseudomonas, Nitrogen Phosphorus Potash (NPK) bio fertilizer consortium and Zinc Solubilising Bacteria (ZSB) were distributed amongst 12 selected FPCs.

Mr. M. Devraj, IAS, Chairman of the Uttar Pradesh Power Corporation Limited (UPPCL) visited IRRI South Asia Regional Center (ISARC) for a momentous visit focused on showcasing the latest advancements in rice research, technological development and knowledge dissemination activities. Being an Agricultural graduate and post-graduate scholar, he expressed gratitude to IRRI for supporting his MS research during the nineties. The visit included field demonstrations, reflections, and interactive sessions centered on modern practices and technologies to further enhance rice production in Uttar Pradesh. While interacting with ISARC scientists, he discussed alternate power resources and its adaptation that could help tackle the challenges of power supply in the agricultural sector and could also positively impact the farmers income.

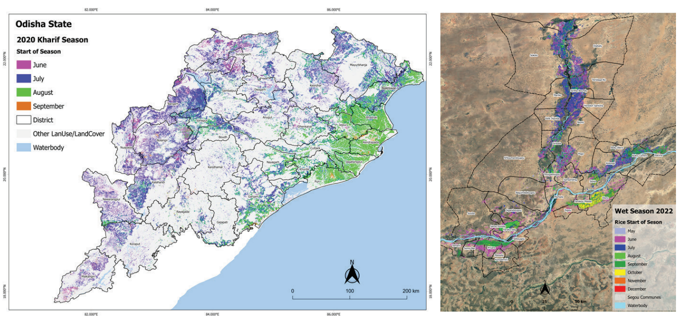

UPPCL Chairman Mr. M. Devraj interacting with scientists at ISARC, Varanasi, Uttar Pradesh (July 21, 2023)

ANNOUNCEMENTS

Online modules on solar irrigation for agricultural resilience launched!

IRRI Education, the educational arm of the International Rice Research Institute (IRRI) in collaboration with the International Water Management Institute (IWMI) developed and launched a series of micromodules entitled “Empowering Agriculture using Solar Irrigation Resilience”. The micromodules offer a gateway learning experience on solar irrigation for agricultural resilience. By providing a comprehensive understanding of the detrimental effects of greenhouse gas emissions and climate change on agriculture in South Asia, these micromodules underscore the critical role of clean energy in mitigating these impacts. It focuses on promoting SIPs in agriculture, presenting a unique opportunity to alleviate poverty, enhance food security, and build a more sustainable and resilient agricultural system in the region.

ISARC earth observation rice monitoring technology to be implemented by the european space agency



Rice area with start of season map for Kharif season (2020) in Odisha, India (left) and Wet season 2022 in Niger Delta of Mali (right) produced from the RIICE technology

The ISARC rice area/yield monitoring technology RIICE “Remote sensing based Information and Insurance for Crops in emerging Economies” has been selected by the European Space Agency to be mplemented on a global Earth Observation digital tool to deliver global Consistent Rice Information for Sustainable Policy (CRISP). ISARC in collaboration with sarmap, Switzerland and CGI, Italy has won the tender SDG 2.4 EO Scaling Up - Global EO solutions for rice monitoring to scale up advanced and cost-effective EO solutions to automatically monitor and derive relevant information on rice planted areas, rice crop growth and yield forecasts.The technology has been and is applied in the Philippines, Cambodia, Vietnam, India (Andhra Pradesh, Tamil Nadu, Odisha), Mali, Nigeria, and is piloted in Kenya, Ivory Coast, and Senegal in 2023.

Cookies infused with the essence of rice, millet, peanut, chocolate and jaggery flavor

As we commemorate the International Year of Millets (IYM2023), CERVA takes a proactive role in harnessing the potential of millets such as finger millet, pearl millet, foxtail millet, little millet, and sorghum (depicted in the image below). These millets serve as foundational elements in the creation of prototypes for both rice and millet-based cookies. Nutrient-rich cookies have been developed from a blend of rice, various millets, Jaggery, peanut and chocolate chips.

UPCOMING EVENTS

- Innovative Breeding team under Centre of Excellence in Sustainable Agriculture (CESA) vertical is going to organize One week workshop on “Speed breeding in crops with special emphasis on rice”.The training will focus on speed breeding technology where the participant can learn about the newly developed protocol and techniques to grow 3-5 generation of rice in a year using controlled conditions. NARES partners from India and one IRRI breeding partners will join this workshop.

- Centre of Education, Innovation, and Research for Development (CEIRD) is soon coming up with micromodules series in english on Post-Harvest Series, Rice Mechanization and Nutritional benefit of popped rice. Along with this, hindi micromodules series on Water Management, Regenerative agriculture & Site-specific nutrient management are also going to be launch on the open learning platform.

FEATURED PUBLICATIONS

Environmental Challenges, Volume 11, 2023,
Article 100724

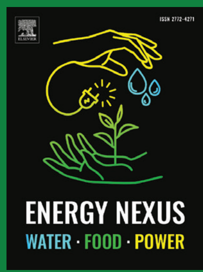
Do farmers pay for climate-resilient technology? Evidence from bidding experiments in eastern India

Varkey, L.M., Veettil, P.C., Patil, V.

Energy Nexus, Volume 11, 2023, Article 100224

Enhancement of thermal and techno-economic performance and prediction of drying kinetics of paddy dried in solar bubble dryer

Kumar, J.Y., Dash, K.S., Rayaguru, K., Pal, U.S., Mishra, N., Ananth, P.N., Khandai, S.



Field Crop Research, Volume 302, 2023,
Article 109078

Crop establishment and diversification strategies for intensification of rice-based cropping systems in rice-fallow areas in Odisha

Panneerselvam, P., Srivastava, A. K., Kumar, V., Seelan, L.P., Banik, N.C., Khandai, S., Parida, N., Kumar, V., Das, A., Pattnaik, S., Sarangi, D.R., Yeggina, P.K., Yadav, A., McDonald, A.J., Craufurd, P., Singh, S., Malik, R.K.

MDPI, Agriculture, Volume 13, Issue 8, 2023

Rice-Fallow Targeting for Cropping Intensification through Geospatial Technologies in the Rice Belt of Northeast India

Srivastava, A.K., Borah, S.B., Dastidar, P.G., Sharma, A., Gogoi, D., Goswami, P., Deka, G., Khandai, S., Borgohain, R., Singh, S

MDPI, Microorganisms, Volume 11, Issue 07, 2023

Influence of Asafoetida Extract on the Virulence of the Entomopathogenic Nematode Steinernema carpocapsae and Its Symbiotic Bacterium Xenorhabdus nematophila in the Host Pyrrhocoris apterus

Shaik, H.A., Mishra, A.


Open Access Article

Influence of Asafoetida Extract on the Virulence of the Entomopathogenic Nematode *Steinernema carpocapsae* and Its Symbiotic Bacterium *Xenorhabdus nematophila* in the Host *Pyrrhocoris apterus*

by Haq Abdul Shaik [1,*] and Archana Mishra [2,*]

[1] Institute of Entomology, Biology Centre, CAS, Branišovská 31, 37005 České Budějovice, Czech Republic

[2] South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses, Faculty of Fisheries and Protection of Waters, Institute of Aquaculture and Protection of Waters, University of South Bohemia in České Budějovice, Na Sádkách 1780, 37005 České Budějovice, Czech Republic

* Authors to whom correspondence should be addressed.

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Abstract

Nematode–microbe symbiosis plays a key role in determining pathogenesis against pests. The modulation of symbiotic bacteria may affect the virulence of entomopathogenic nematodes (EPNs) and the biological management of pests. We tested the influence of asafoetida (ASF) extract on the virulence of *Steinernema carpocapsae* and its symbiotic bacterium, *Xenorhabdus nematophila*, in *Pyrrhocoris apterus*. A total of 100 mg of ASF killed 30% of EPNs in 48 h, while *P. apterus* remained unaffected. The EPNs pre-treated with 100 mg of ASF influenced *P. apterus*'s mortality by 24–91.4% during a period of 24 to 72 h. The topical application of ASF acted as a deterrent to *S. carpocapsae*, lowering host invasion to 70% and delaying infectivity with 30% mortality for 168 h. Interestingly, *Steinernema*'s symbiotic bacterium, *Xenorhabdus*, remained unaffected by ASF. An in vitro turbidity test containing 100 mg of ASF in a medium increased the growth rate of *Xenorhabdus* compared to a control. A disc diffusion assay confirmed the non-susceptibility of *Xenorhabdus* to ASF compared to a positive control, streptomycin. Pro-phenol oxidase (PPO) and phenol oxidase (PO) upregulation showed that ASF influences immunity, while EPN/ASF showed a combined immunomodulatory effect in *P. apterus*. We report that ASF modulated the virulence of *S. carpocapsae* but not that of its symbiotic bacterium, *X. nematophila*, against *P. apterus*.

Keywords: asafoetida; *P. apterus*; *Steinernema carpocapsae*; *Xenorhabdus nematophila*; virulence; pro-phenol oxidase (PPO); phenol oxidase (PO); immunity

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IRRI South Asia Regional Centre

Dr. Sudhanshu Singh
Director, ISARC
sud.singh@irri.org

Dr. Panneerselvam Peramaiyan
Head, ISARC CESA
p.panneerselvam@irri.org

Dr. Nese Sreenivasulu
Head, ISARC CERVA
n.sreenivasulu@irri.org

Mr. Gopesh Tewari
Head, ISARC CEIRD
g.tewari@irri.org

IRRI South Asia Regional Centre
G.T. Road, Collectory Farm, Chandpur
Varanasi, Uttar Pradesh, India
Tel. no. (0542) 2518900

For more details, please email:
TC Dhoundiyal at t.dhoundiyal@irri.org and Ankita Tiwari at a.tiwari@irri.org