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INFO NOTE

RiceMoRe – The digital solution for monitoring and reporting rice activities at different management levels

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KEY MESSAGES

- *The Rice Activity Monitoring and Reporting System (RiceMoRe) is a digital solution designed for rice management to enhance the efficiency, accuracy, transparency, traceability, and accessibility of agricultural data.*
- *The system supports Monitoring, Reporting, and Verification (MRV) for greenhouse gas (GHG) inventory and tracks progress on Nationally Determined Contributions (NDCs) at the national level. It also supports MRV for carbon reduction at the farm/field level through tracking the adoption of low-emission practices.*
- *Developed on open-source platforms and designed for flexibility, RiceMoRe can be replicated in various Southeast Asian (SEA) countries without incurring any licensing fees. By adopting this digital solution, countries can achieve scalable, transparent, and more accurate estimation of GHG emissions in rice cultivation.*

This publication presents the success story of a digital MRV solution designed to enhance rice management and facilitate MRV of low-emission practices in rice cultivation. This initiative was co-created and implemented in Vietnam from 2018 to 2024. Additionally, we highlight RiceMoRe's readiness for replication in other countries across the SEA region and beyond.

Methane reduction effort in rice sector

With nearly 30% of the world rice areas, SEA plays a significant role in world rice production and also contributes 29% of global rice methane emissions. To address global warming and other climate change issues, various SEA countries have developed plans to reduce GHG emissions from agriculture production, including the rice sector, as part of their long-term national GHG mitigation and green growth strategies. Several countries have committed to reducing GHG emissions, particularly from rice production, in their NDC submitted to the United Nations Framework Convention on Climate Change (UNFCCC). In recent years, there has been a growing demand for developing an MRV system for the rice sector in many SEA countries. However, most countries lack a digital system to track the performance and progress toward emission reduction targets to support the implementation of national mitigation plans.

Technical limitations in MRV technology

While several MRV platforms developed by organizations can support rice decarbonization projects, they are often unsuitable or too costly for regional or national-scale applications. Additionally, recent advancements in MRV technology, such as modeling, machine learning, and satellite imagery, show promise but require further research and significant upfront investments before becoming viable.

[1] https://www.irri.org/where-we-work/countries/southeast-asia2
[2] https://essd.copernicus.org/preprints/essd-2024-90/

DTS agriculture
Climate Smart Agriculture Initiative New Zealand
Funded by the European Union
IFAD
TRANSITIONS
CGIAR Initiative on Asian Mega-Deltas
CGIAR Initiative on Low-Emission Food Systems

For instance, remote sensing technology is proven as an advanced solution to provide insights into observable processes and changes over time at a large scale but low spatial resolutions, cloud cover, and long passover periods are a current limitation when capturing the high variation of rice farming patterns, especially in smallholder systems prevalent in SEA. In addition, rapid changes in rice phenology and dynamic water management in rice fields over short periods present additional challenges for timely acquisition of satellite images and accurate interpretation of captured information. High-resolution satellite imagery or data from advanced sensors (e.g., hyperspectral or SAR) may be costly and not universally accessible, limiting their use for large-scale MRV systems in resource-constrained countries. Further, there are management practices, such as fertilizer types and rates and straw management, that are crucial for estimating GHG emissions but unobservable from satellite imagery.

Using simulation and machine learning models for MRV can be another advanced solution. However, models often require substantial training using extensive, high-quality management data and accurate calibration and validation processes, which are expensive and time-consuming to implement. The majority of countries in SEA and beyond do not currently have extensive, frequent, and high-quality data on farmer practices related to GHG emissions that can be used to train, calibrate, and validate models at a national scale. Furthermore, models may not perform well across diverse soil types, agro-climatic zones, or under varying rice cultivars and farming practices, especially at regional and national scales. The low compatibility of data from different sources significantly increases the challenges of data analysis and the reliability of analysis results.

The absence of an applicable MRV system at the national level poses considerable challenges for countries seeking to demonstrate their achievements in climate mitigation efforts and access climate finance opportunities.

The low-cost solution

To address this challenge, a multi-step approach to MRV development can be highly effective. In recent years, the International Rice Research Institute (IRRI) has focused on bridging gaps in the Monitoring and Reporting components and assisting rice-producing countries in establishing a low-cost MRV system that improves emission assessment, reduces investment risk, identifies mitigation opportunities, and tracks progress toward emission reduction targets.

Since 2022, with financial support from the New Zealand Ministry for Primary Industries through the Agricultural Greenhouse Research Center (NZAGRC), CGIAR's initiatives on Securing the Food Systems of Asian Mega-Deltas for Climate and Livelihood Resilience, Low-Emission Food Systems, and the Agroecological Transition Program for Building Resilient and Inclusive Agricultural Food Systems, IRRI has collaborated with international and national research partners in Vietnam to develop and validate the Rice Activity Monitoring and Reporting System (RiceMoRe).

RiceMoRe is not a new data collection technology but provides a digital solution for rice management and contributes to improved efficiency, accuracy, transparency, traceability, and accessibility of agricultural data. It makes use of the reporting line that is already established and operated in the country, which involves thousands of government officials from local to national level. Instead of the manual reporting method typically used, RiceMoRe is digitized allowing local officials to use a computer or smartphone to quickly update rice production information in the national database including but not limited to planting and harvesting dates, variety, farming practice, yield, loss and damage. By standardizing digital entry templates, the system has minimized human-generated errors while ensuring hierarchical quality controls and structured data flows defined by government norms. The standardized activity data collected at the commune levels are stored in a government-managed repository.

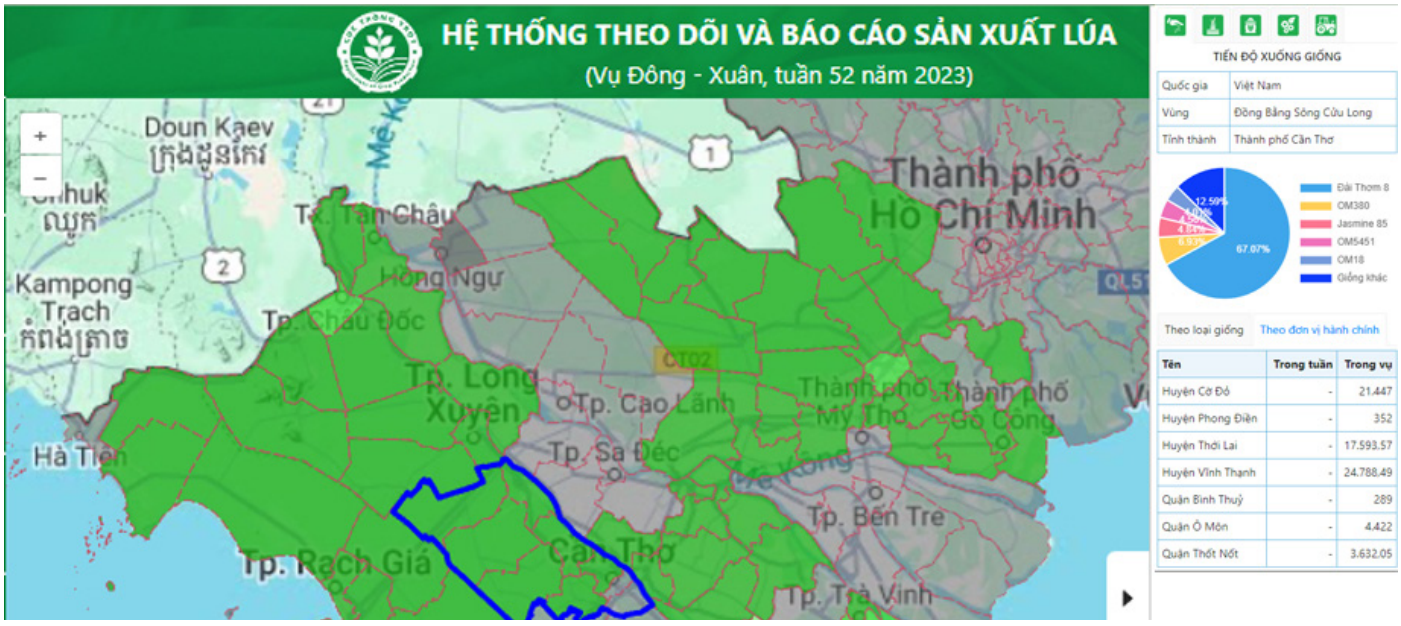

Figure 1: User interface of the upgraded RiceMoRe system

Figure 2. Signing the Memorandum of Handover of RiceMoRe at the MARD office

To support MRV at the project level, the system also allows monitoring and reporting of rice activity data at the farm level. Details of farm characteristics and farming practices are recorded and stored in a separate database defined by the project manager. The farm activity data is linked with an independent calculation tool via an Application Programming Interface (API) for the automated response of estimated GHG emissions. This component benchmarks farmers' performance according to sustainable practices outlined in the innovation farming packages such as "1 Must-do 5 Reductions", Sustainable Rice Platform (SRP), System of Rice Intensification (SRI), and others. The survey component is flexible allowing for tailored survey development according to the needs and interests of the project. It enables tracking of farmers' progress towards sustainable goals or certification of sustainable products as well as providing a medium for the co-creation of solutions for sustainable and low-emission rice farming.

The RiceMoRe system has been developed using open-source programming languages, including .Net Core 5.0, Angular 11, and Bootstrap. It links rice activity data with commune-level administrative maps using the GeoServer - an open-source server for sharing geospatial data (Figure 1). RiceMoRe manages big data through the Microsoft SQL Server platform. These programming technologies allow RiceMoRe to operate without a license fee and can be replicated in different countries.

The system was developed following the participatory approach with the technical consultation of government officials at different administrative levels, and through 6 steps; (1) situation analysis and need assessment, (2) prototype development and pilot, (3) evaluation of system operation, (4) system improvement, (5) data security assessment, and (6) institutionalization for actual implementation. It targets two groups of end-users. The advanced users include government officers, extensionists, project managers, and officers who are granted personal accounts to work with the database. Public users can access limited functions of the system without creating a user account or they can create a user account to store data. Public user groups may include, but are not limited to, farmers, researchers, policymakers, and development agencies. They can use the tool to estimate farm/field-level GHG emissions by entering data on farming practices; however, data from users without a login account will not be stored in the system database. This functionality is inclusive to multiple user types and is useful for identifying areas for improvement and discussing recommendations to improve rice farming practices in a participatory manner.

At both national and project levels the system optimizes data entry and management, creating a clear streamlined workflow. The traceability facilitated by the system is also essential for accountable agricultural practices, as it enables more transparent data flows and supports compliance with national and international sustainability standards. With the harmonized and flexible design, the system has been able to overcome technical issues in activity data collection, establishing a strong foundation for future scaling of the system beyond Vietnam.

To date, the system has been officially adopted by the Ministry of Agriculture and Rural Development of Vietnam (MARD) (Figure 2). It has been scaled across Vietnam's various agroecological regions by the Department of Crop Production (DCP) and the National Agricultural Extension Center (NAEC), covering approximately 75% of the country's rice planting areas.

REPLICATION POTENTIALS

Other Southeast Asian countries have similar existing rice management structures and reporting lines to those in Vietnam. A scoping study conducted in Cambodia and the Lao People's Democratic Republic (Lao PRD) revealed that these countries have mandated reporting lines for weekly rice management but lack digital platforms for monitoring rice activities. Currently, the weekly rice production reports submitted by village agriculture officers are compiled manually and forwarded to higher administrative levels. The data submission methods vary and can include text messages via social networks like Telegram (in Cambodia) and WhatsApp (in Lao PRD), printed templates with official stamps, Word or Excel tables, or verbal reports during in-person meetings. This inconsistency in data formats presents significant challenges and increases the workload for agricultural officers at all management levels. As a result of the absence of a digital system for tracking rice activities, national GHG inventories for the rice sector are often developed using various unstandardized sources and assumptions.

These issues in current rice management monitoring and reporting protocols in many countries underscores the potential for replicating the RiceMoRe system throughout the SEA region and beyond. The RiceMoRe system is designed to be adaptable to the specific needs of each country, offering a low-cost and efficient solution to support GHG inventories, carbon credit projects, and sustainable rice management on a larger scale. Furthermore, SEA countries will also directly benefit from the lessons learned and outcomes observed from the implementation of RiceMoRe in Vietnam. In the near future, this standardization and digitization of management data through RiceMoRe will provide the extensive, high-quality management data such that RiceMoRe can be integrated with remote sensing and machine learning models to significantly enhance GHG inventories, establish credible baselines, and improve transparent MRV at any scale.

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