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MEKONG SUSTAINABLE RICE

Message from the Project Leader

Dr Jaquie Mitchell

It was an absolute pleasure to accept an invitation from Dr Thach of CLRRI to join farmers, cooperative leaders and industry from across the Mekong Delta (MD) region at the Variety Evaluation Workshop at CLRRI on 28 Feb. Attended by more than 500 people it was a great opportunity to share in the experience of this event with other project team members from SunRice, CLRRI, and CTU. In addition, Dr Tin and CTU team promoted our ACIAR-SunRice-UQ public private partnership project outputs and learnings with members of this large audience from across the MD – a great communication and information dissemination opportunity was had! It was also great to see the OM82

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(ACIAR 17) direct-seeded rice experiment exploring a range of sowing rates at CLRRI which was harvested the following day.

We also had the opportunity to visit Mr. Tran Phuoc Nhan's farmer group in An Giang, who has transitioned from farmer group leader to trader and now to cooperative leader - a development enabled and facilitated by project support, demonstrating one of the many significant impacts of the project. You can read a bit more detail of his transition in this current newsletter.

Furthermore, in this newsletter we capture details of the recent installation of the advanced colour sorter technology in the CoE at Lap Vo Mill, with rapid and precise rice quality assessments that can be made. This combined with strengthened scientific capacity of staff and students (in particular females) from An Giang University, provides further opportunities for improved rice quality. Additionally, we hear from another one of our UQ PhD candidates, Ms Ezinne Okorie, who is exploring genotypic responses to improved nitrogen management for aerobic rice.

Overall, a big thanks to VNU - An Giang University team for hosting our visit to the MD which was highly productive.

I hope you enjoy reading about a number of recent project activities captured in the following newsletter pages.

Photo
Dr Thach (CLRRI), Assoc. Prof. Jaquie Mitchell (UQ), Dr Tin Nguyen (CTU) and a representative from RYNAN at the CLRRI Variety Evaluation Field Day.

Enhancing Rice Quality Assessment with Advanced Colour Sorter Technology

SunRice Group

The recent arrival and commissioning of the advanced colour sorter marks a significant milestone in our project. This state-of-the-art equipment enables rapid and precise analysis of small sample lots, mirroring the capabilities of commercial machines. By integrating this technology, we can efficiently evaluate the agronomic impacts on rice quality, facilitating the development of targeted projects aimed at optimising rice production. The colour sorter's ability to swiftly and accurately assess grain quality will not only streamline our research processes but also enhance the overall quality assurance within the rice value chain.

The introduction of the colour sorter brings several additional benefits to the project. Firstly, it allows for more detailed and accurate data collection on rice quality, which is crucial for understanding the effects of different agronomic practices. Specific examples of these practices include:

- **Fertilisation:** By analysing the quality of rice samples (e.g. the % of chalky kernel), we can determine the impact of types and amounts of fertilisers needed to enhance grain quality and yield.
- **Water Management:** The colour sorter helps in assessing the impact of various irrigation techniques on rice quality (e.g., the % of immature of green kernel), enabling the development of water management strategies that conserve resources while maintaining high-quality yields.
- **Pest and Disease Control:** By evaluating the quality of rice (e.g., the % of damage kernel) affected by different pest and disease control methods, we can identify the most effective and sustainable approaches to protect crops and improve overall quality.

Photo
Key personnel of RGVN, from right to left: (i) Mr. Nguyen Van Nhu _ RGVN _ staff; (ii) Mr. Le Hoang Khai _ RGVN _ Shift Coordinator; (iii) Mr. Nguyen Quang Hung _ Satake (HT) technician _ Trainer; (iv) Mr. Vuong Hoang Tri _ RGVN _ Color sorter Operator; (v) Ms. Nguyen Thi Bich Thuy _ RGVN _ QA/QC manager; (vi) Mr. Nguyn Quang Long _ RGVN _ Senior Quality Supervisor in Lap Vo mill were attending a training on operating the color sorter in the CoE.

The ability to quickly analyse small sample lots means that we can conduct more frequent and comprehensive assessments, ensuring that any issues with rice quality are identified and addressed promptly. This leads to several expected outcomes for farmers:

- **Increased Yields and Income:** By optimising agronomic practices based on precise quality assessments, farmers can achieve higher yields and better-quality rice, leading to increased income.
- **Access to High-Quality Export Markets:** The enhanced ability to meet international quality standards opens up new market opportunities for farmers, allowing them to sell their rice at premium prices.
- **Improved Sustainability:** The colour sorter supports the project's sustainability goals by reducing waste and improving efficiency. Accurate sorting and grading minimise the amount of substandard or rejected grain, maximising the use of harvested rice and contributing to environmental sustainability.
- **Enhanced Livelihoods:** With higher incomes and access to better markets, farmers can invest in their farms and communities, leading to improved livelihoods and economic stability.

Overall, the commissioning of the colour sorter is a significant advancement for the project, providing numerous benefits that will enhance rice quality, improve efficiency, support sustainability, and open up new market opportunities. This technology will play a crucial role in achieving the project's goals and ensuring a prosperous future for rice farmers in the Mekong Delta.

Photo
Key personnel of RGVN in Lap Vo mill were attending training on operating the colour sorter in the CoE.

Enhancing the Scientific Research Capacity of Women in the Analysis, Evaluation, and Quality Management of Rice in the Mekong Delta

An Giang University

The 2024 report by the General Statistics Office of Vietnam reveals that 63% of Vietnamese women are actively participating in the labor force, an impressive figure compared to the global average. In both lowland and mountainous regions, the proportion of female workers in the agricultural sector reaches up to 70%, playing a pivotal role in the production of rice, coffee, pepper, and export-oriented fruits. Their contributions not only ensure national food security but also enhance the global market value of Vietnamese agricultural products. However, in the domain of scientific research and rice quality management, no precise statistical data is currently available.

Nonetheless, empirical evidence clearly indicates that the presence of female personnel in rice processing and international rice inspection firms remains remarkably limited. This discrepancy is paradoxical, given that Vietnamese women are known for their dexterity and diligence. If they were adequately equipped with expertise in rice quality analysis, evaluation, and management, their contributions to the rice industry would be profoundly significant in the future. In practice, the AGU research team has greatly benefited from the active involvement of female faculty members and the scientific research initiatives undertaken by female students within the framework of the project.

The AGU research team currently has one official female researcher, Dao Vu, who has played an important role in the project's execution. She is primarily responsible for crucial tasks, including analysing key quality indicators of freshly harvested paddy upon its transportation to the laboratory. The specific parameters under her supervision include physicochemical and microbiological properties—both of which require specialised expertise, in-depth knowledge, and advanced food analysis skills. Thanks to her contributions, the AGU research team has obtained valuable data on the quality degradation of freshly harvested rice during storage (before drying) and successfully identified the optimal storage duration for the DS1 and DT8 rice varieties. Based on these findings, the team has provided tailored recommendations to SunRice and the cooperatives participating in the project. Dao Vu has also expressed that her involvement in the project has significantly enhanced her expertise in rice analysis and scientific research. Currently, she continues to provide technical contributions to the AGU research team while simultaneously overseeing critical administrative procedures for the project in Vietnam.

Figure
Ms. Dao and the female students are engaged in the collection of fresh paddy samples in Kien Giang province, February 2023.

Additionally, as of now, the AGU research team has mentored eight female students in scientific research. All of their research topics are directly related to AGU's project components, with a specific focus on DS1, DT8, and OM18 rice varieties, sourced from participating cooperatives or third-party collaborators. Through these research activities, the students have acquired essential scientific research skills, particularly in rice studies, as well as advanced analytical and quality assessment techniques. Below is the list of female students and their respective research topics:

- Tran Thi Gia Han: Investigation of the impact of transportation duration on the quality of dried rice (2022–2023)
- To Ngoc Minh Vy: Investigation of the effects of transportation on the quality of freshly harvested rice (2022–2023)
- Pham Thi My Duyen: Research on the effects of cultivation methods, crops, and transportation-storage time on the quality of DS1 rice (Japonica) (2023 – 2024)
- Nguyen Thi Tuong Vy: Research on the effects of cultivation methods, crops, and transportation-storage time on the quality of DT8 (Đài Thơm 8) rice (2023 – 2024)
- Phan Thi Cam Duyen: Research on the effects of the whitening process on the nutritional quality of rice varieties - DS1 (Japonica) and DT8 (Dai Thom 8) bran (2023 – 2024)
- Nguyen Thi Kim Son: Research on the effects of the polishing process on the quality of rice varieties DS1 (Japonica) and DT8 (Dai Thom 8) (2023 – 2024)
- Tran Thi Thanh Ngan: Comparison of DS1 (Japonica), DT8 (Dai Thom 8), and OM18 rice quality analysis methods using Paddy Vision equipment with traditional methods (2023 – 2024)
- Nguyen Trinh Thu Tuyet: Examination of the impact of post-drying storage time and temperature on the milling quality of rice (2024–2025)

Ms. Dao Vu and the eight female students have significantly enhanced their scientific research competencies through their direct or indirect participation in the project. The students' research endeavours also served as their undergraduate theses, with seven of them having successfully graduated. These graduates will contribute to a highly skilled female workforce specialising in rice research and quality management in the Mekong Delta in the future.

Photo
The female students are cultivating microorganisms under the guidance of Ms. Dao in the AGU laboratory, Long Xuyen City, February 2025.

Evaluation of Advanced Short-Grain Rice Lines in the Summer-Autumn 2024 Season

Cuu Long Delta Rice Research Institute

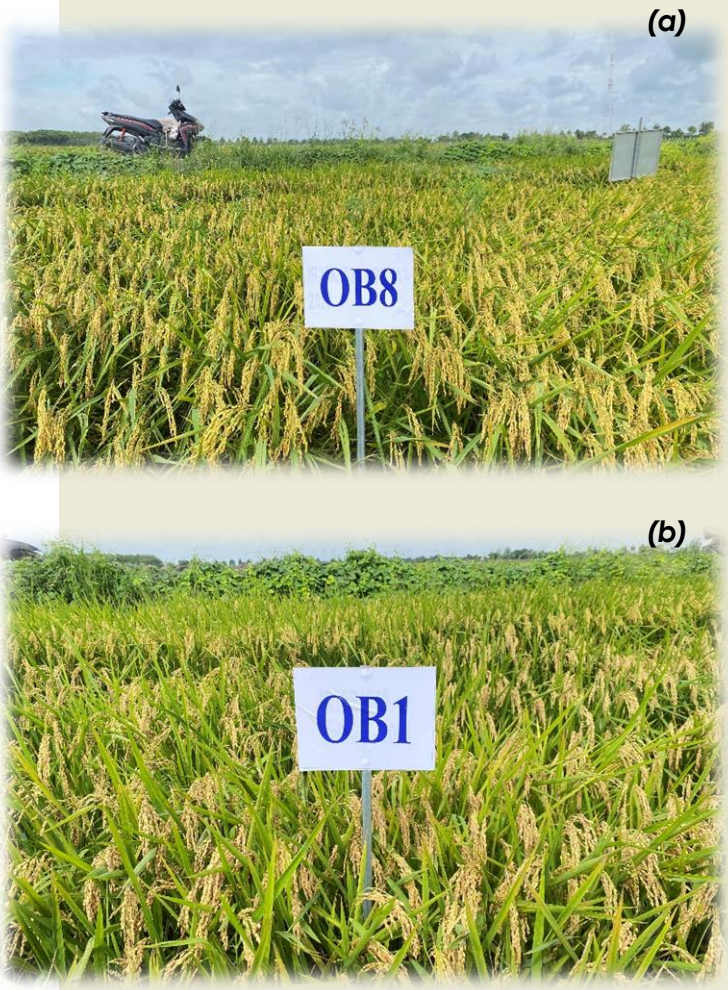

Photo
Observing advanced short grain rice lines in Summer-Autumn 2024 crop season. (a, b) Some short-grain promising lines in the observation experimental field.

An extensive field evaluation of 20 advanced short-grain rice lines derived from existing genetic materials was conducted during the Summer-Autumn 2024 crop season. Despite generally favourable weather conditions for rice cultivation, several environmental challenges were observed. Prolonged heavy rain at harvest time complicated harvesting operations, while extreme heat events associated with the El Niño phenomenon adversely affected grain quality, particularly by increasing the chalkiness rate.

The study provided significant insights into the agronomic performance, biophysical characteristics, and quality attributes of these rice lines:

Growth Duration and Plant Height:
The evaluated lines exhibited a growth duration ranging from 95 to 110 days, considerably shorter than the benchmark variety DS1, which required 118 days. In terms of plant height, one line was below 95 cm, eighteen lines including DS1 ranged from 95 to 100 cm, and one line exceeded 110 cm.

Lodging Resistance:

- The lodging resistance of the lines varied from level 1 to 7, Grain Quality Parameters:
- Significant variation was observed in chalkiness levels: ten lines exhibited low chalkiness, five lines had medium chalkiness, and five lines showed high chalkiness compared to DS1, which maintained a low chalkiness rate. Amylose content, a key determinant of rice texture, ranged from 15.6% to 18.4% across the tested lines. In terms of grain dimensions, kernel length varied between 4.80 mm and 5.63 mm, while width ranged from 2.55 mm to 3.06 mm. Protein content ranged between 6.5% and 9.6%. Whole grain yield percentages spanned from 54.0% to 64.8%.

Biotic Resistance and Yield Potential:
Disease resistance evaluations revealed that resistance levels varied between 1 and 3 for blast, planthopper (PBH), and bacterial blight (BB). Yield potential across the tested lines ranged from 3.21 to 5.32 tons per hectare, with DS1 demonstrating a yield potential of 4.45 tons per hectare.

Based on these observations, several promising lines have been identified that meet the project's selection criteria. These lines will undergo MET trials in the next cropping season to further assess their adaptability and performance across different environments. This research contributes to the development of climate-resilient, high-quality, short-grain rice varieties for sustainable rice production.

Rice Farmers in An Giang Embrace Cooperative Model for Sustainable Growth

Mekong Delta Development Research Institute, Can Tho University

Currently, Rice farmers in the AGB-2019-153 project site (Ninh Thanh Hamlet, An Tuc Commune, Tri Ton District, An Giang Province) are entering the Winter-Spring harvest season with renewed enthusiasm. Leading the charge is Mr. Tran Phuoc Nhan, newly appointed Director of Phuoc Nhan Agricultural Cooperative, who is embracing his expanded role beyond rice farming to support cooperative members and local farmers involved in rice trading and related services.

Mr. Nhan, concurrently Chairman of the Board of Directors, is preparing to host the cooperative's first shareholders' meeting to approve its production and business plan. At the same time, infrastructure, office facilities, and organisational structures are being finalised to ensure the cooperative's official launch in early 2025. Reflecting on the transformation, Mr. Nhan shared that before the upgrade, his farmer group primarily produced and collected rice for buyers like SunRice and other rice collection companies. Now, with the cooperative structure and support from the AGB-2019-153 project, they have expanded services to include input supply (seeds, fertilisers, pesticides), land preparation, spraying, fertilisation, harvesting, and transportation. These services provide cooperative members and local farmers with cost-effective access to resources, reducing production costs and increasing profitability.

As part of its rice production strategy, the cooperative aims to implement Maximum Residue Limit (MRL) standards across 100% of its members' cultivated areas tapping into premium market segments.

Explaining the motivation behind transitioning to a cooperative and adopting MRL standards, Mr. Nhan emphasised that the cooperative model enables legal contracting with major rice buyers, expanding business opportunities. More importantly, it strengthens contract farming arrangements between rice growers and enterprises, ensuring stable incomes and promoting sustainable practices. Farmers producing MRL compliant rice benefit from an additional premium of VND 300 per kilogram while simultaneously reducing production costs and minimising the use of hazardous pesticides. In the long term, Mr. Nhan believes this approach aligns with the sustainable development of the Mekong Delta's rice industry.

Photo
Mr. Nhan (left) with his Coop Vice director at the Coop office.

Government officials, including Mr. Quoc and Mr. Nato from the Department of Agriculture and Rural Development (DARD), see the establishment of Phuoc Nhan Cooperative as a step in line with provincial agricultural policies. The cooperative also serves as a key participant in the government's one-million-hectare rice program, demonstrating a sustainable linkage model between farmers, cooperatives, and rice enterprises.

Currently, cooperative members have sown 300 hectares for the Spring-Summer rice crop. Beyond SunRice, several partners and rice companies have expressed interest in collaborating with the cooperative under the MRL rice standard. Mr. Nhan hopes the transition to a cooperative will enhance production efficiency by lowering costs and boosting profits. However, he acknowledges the challenges of managing a large-scale cooperative, particularly in strengthening leadership and governance.

To support this transition, the CTU Research Group has pledged assistance in capacity building, production planning, and supply chain connections. Meanwhile, SunRice remains a strategic buyer, ensuring stable market access. With this support, Phuoc Nhan Cooperative is poised for sustainable growth, promising improved livelihoods for its members and contributing to the socio-economic development of rural communities in the Mekong Delta.

Photo
Project team with Mr. Nhan at his new house

Photo
Mr. Nhan at his rice field.

Fine-tuning Nitrogen Management for Sustainable Aerobic Rice Production

The University of Queensland

Rice production globally has traditionally relied on flooded cultivation methods to maximise yields, including in Australia. However, water security is increasingly impacting the sustainability of Australian production. An aerobic rice system, where rice is grown in unsaturated, non-flooded, yet well-watered conditions, was proposed as an alternative approach to improve water productivity while maintaining high yield. Nitrogen (N) is crucial for plant growth and in key processes that drive crop yield. Yet, in aerobic production systems where N losses are high, applying the right amount is a challenge. Farmers often rely on fixed N application rates and the assumption that more fertiliser will always lead to higher yields. However, our recent research suggests that N management should be tailored to genotypes ability to acquire and utilise N.

We tested diverse rice genotypes with shallow and deep rooting under different N management conditions to understand how N uptake influences yield formation. Our findings revealed that N uptake efficiency was the primary driver of grain yield at low N. In contrast, N utilisation efficiency played a more significant role under high N. To explore this further, we evaluated four deep-rooted genotypes with high N uptake capacity under five N rates (0, 75, 150, 225, 300 kg N/ha). Grain yield of all four genotypes increased with N application. However, three of the four genotypes peaked at 150 kg N/ha, showing no significant benefit from additional N fertiliser. One genotype differed with its grain yield increasing up to 225 kg N/ha, demonstrating a higher response to N application and a superior ability to convert absorbed N into grain.

Our findings challenge conventional N management. Instead of a one-size-fits-all-approach, N application in aerobic rice should match genotype capacity for N use efficiency. A lower N rate may be optimal for rice genotypes with higher N uptake but limited yield capacity. While genotypes with both high N uptake and superior N utilisation efficiency can benefit from higher N application. Ultimately, the key to optimising N management in aerobic rice is not just about how much N we apply. By tailoring N management to plant capacity for N use efficiency, we can move towards a more sustainable and productive future for aerobic rice production.

Photo
Ezinne Okorie, a PhD candidate at UQ, in her field conducting research on nitrogen management in aerobic rice.

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https://www.aciar.gov.au/project/agb-2019-153

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