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MEKONG SUSTAINABLE RICE

Message from the project leader

Dr Jaquie Mitchell

I am delighted to introduce our inaugural project newsletter summarising the results to date, from the first of its kind public-private partnership between ACIAR and SunRice Group for the "Planning and establishing a sustainable smallholder rice chain in the Mekong Delta" project.

Our project team consists of over 50 members from five organisations and institutions from Australia and Vietnam, SunRice Group, The University of Queensland, An Giang University, Can Tho University and Cuu Long Delta Rice Research Institute, combining their expertise in agribusiness, agronomy, quality and breeding.

Our project commencement meeting was held on the 16th of June 2022 at An Giang University, with members from the Australian team travelling to the Mekong Delta. This was the first time Australian team members were able to meet in person with Vietnamese colleagues since the pandemic. The nine activity leaders presented their objectives, expected outcomes, and shared their progress to date.

Since the project commenced in February 2022, we have initiated engagement with smallholder farmers in the Mekong Delta, conducted a quick survey of cooperatives to determine who would benefit from participating in the project, some of which have subsequently been subcontracted by SunRice Group, conducted a two-day Value Chain & Systems Thinking workshop, conducted the first crosses to breed for a higher quality short grain rice adapted to the Mekong Delta and long grain rice for northern Australia, and conducted preliminary quality assessment to identify intervention points in the value chain.

I am proud of the progress that has been achieved to date despite the various challenges, and I look forward to sharing results with you as the project gains momentum that undoubtably will lead to a greater understanding of the challenges, solutions and potential impact that results of this project activities will yield to support smallholder farmers in engaging in a market-led rice export value chain. I encourage you to read about some of the activities in the following pages.

Australian Centre for International Agricultural Research | Australian Aid | SunRice Group | The University of Queensland Australia | Create Change

UQ is leading an ACIAR project: "Planning and establishing a sustainable smallholder rice chain in the Mekong Delta"

University of Queensland Team

Rice is the staple food for almost half of the human population distributed across all the continents of the world. About 90% of the world's rice is grown in Asia, and flood plains of Asian rivers like the Mekong are geographically suitable for growing rice. It also provides an essential source of livelihood in rural Asia; for example, about 1.5 million smallholder farmers in the Mekong Delta are involved in rice cultivation. While Vietnam is the world's third-largest exporter of rice and about half of its total rice production comes from the Mekong Delta, smallholder farmers are experiencing myriads of problems like soil degradation, environmental pollution, availability of quality seeds and reduced profitability. One fundamental limitation for smallholder farmers that reduces profitability is limited market access and reliance on traders. An Australian Centre for International Agricultural Research (ACIAR) project led by Dr Jaquie Mitchell and a large transdisciplinary team (the University of Queensland as the commissioned organisation, have partnered with Vietnamese researchers and SunRice Group.) is working towards sustainable rice production systems and inclusive value chain driving improved outcomes for all parties, particularly smallholders, their communities and the environment.

Project members attending the project commencement meeting at An Giang University in June 2022.

Photo: An Giang University

This project is the first public-private partnership between ACIAR and SunRice Group (an Australian company that is the owner and operator of a recently refurbished Lap Vo rice mill in Dong Thap Province, Vietnam). The project is working with rice producing farmer groups to encourage the adoption of sustainable practices including various agronomic interventions concerning fertiliser, irrigation and pesticide use, to achieve quality standards resulting in an increased economic value. Through this project, the grower groups are expected to see the proposed system's advantage and adopt the same practices. The project commencement meeting took place on June 16th 2022, at An Giang University, Vietnam. Researchers from collaborating institutes in Australia and Vietnam are actively working toward achieving the research outcomes of the project's first year. A formal project launch event took place in Vietnam on October 19th 2022.

Commercial production to benefit smallholder farmers

Ricegrowers Singapore

There are many advantages and disadvantages (challenges and opportunities) for smallholder rice farmers (via cooperatives) in engaging in a high-quality export value chain driven by international sustainability standards. One of the difficulties is that the smallholder rice growers are unable to organise supply of wet paddy directly to the mill. This is also a key barrier that the SunRice Group in Vietnam is facing as it engages with smallholder farmers to improve the rice value chain in the Mekong Delta region.

The SunRice Group's team in Vietnam is coordinating with Can Tho University and other project stakeholders to establish a highly productive, sustainable, traceable, quality-assured value chain in the Mekong Delta, especially in Dong Thap, An Giang and Kien Giang provinces via working with cooperatives or representative of farmer group leaders to engage them joining in the project with an expected outcome of benefiting rice-farming households and meeting established SunRice Group market requirements.

Smallholders and their communities will benefit from the opportunity to engage market-led high-value export rice value chains, improving the consistency and sustainability of income/rewards from rice growing and improving long-term outcomes for natural resource management and long-term agricultural production in the Mekong Delta.

Mr Tung Lam (SunRice Group) at Cooperative Tan Quoi to discuss potential for project involvement (Long Dien B Commune, Cho Moi District, An Giang Province.

Photo: RGS

The partnership between the SunRice Group and ACIAR will instil quality-driven goals throughout the value chain (from land preparation through to finished product), driving improved outcomes for all parties, particularly smallholders. As one example, establishing a well calibrated quality appraisal system will measure and quantify improvements to grain quality, driving value back through the chain to smallholders.

In August 2022, some cooperatives and farmer groups were invited to participate in the project. Those that accept will be encouraged to implement sustainable practices with the guidance and support of SunRice Group agronomists, Can Tho University-Mekong Delta Development Research Institute (CTU-MDI) staff and the local Department of Agricultural and Rural Development (DARD). In the process of this, participating cooperative farmers and other actors in the rice value chain will be involved in capacity building activities to improve understanding and knowledge of integrated pest management, crop nutrition and agronomic management techniques to minimize chemical inputs and enhance the capacity to achieve high yielding, Maximum Residue Limit (MRL) compliant rice products. The high-value rice product will potentially provide access to international markets previously unreachable by smallholders in the Mekong Delta. It is expected that benefits will return to farmers engaged in higher-value product delivery, and that this sustainable approach to growing rice will result in improved health and environmental outcomes.

The SunRice Group's Ricegrowers Vietnam subsidiary has successfully engaged paddy consumption linkage contracts with Tan Quoi cooperative in An Giang province and two groups of farmers in Dong Thap to supply rice varieties of DT8, OM18 and DS1. It is expected that these cooperative and farmer groups will sustainably engage during the project duration and beyond so that the results of engaging activities in the project will contribute to an enhanced understanding of the farming system characteristics that best comply with the Sustainable Rice Platform (SRP) production. Tan Quoi cooperative has 22 households growing 28.9 hectares of DT8 for the project. These crops are expected to be harvested from mid-October with expected production of 180 tonnes.

The Fields of Cooperative Tan Quoi, Long Quoi 2 Hamlet, Long Dien B Commune, Cho Moi District, An Giang Province.

Photo: RGS

Some key findings from the experience included:

- Vietnamese rice smallholder farmers prefer to sell paddy in the field. They do not want to transport paddy to Lap Vo mill because it requires a lot of investment in human resources and management capacity from the farmers and cooperatives.
- A majority of farmers prefer a fixed-price contract, while the others are interested in a market price. It was explained that signing a contract with a fixed selling price will help them calculate their costs and profits in advance so that they can concentrate on field management activities to reduce cost and increase yield without the worry of the flexibility of price at the end.
- Cooperatives are sometimes hesitant about developing formal contract to avoid administrative complexities.

Our team is continuing to identify more cooperatives/farmer groups to join the project in October 2022.

AGS installing PaddyVision® at Ricegrowers Vietnam

Australian Grain Storage

AGS is a subsidiary of Ricegrowers Limited (SunRice Group) in Australia. AGS has expertise in paddy receival, drying and storage, and physical quality testing of paddy. Recently an instrument (PaddyVision®) was developed at AGS to objectively measure paddy quality, including cracked and immature grains and length and width.

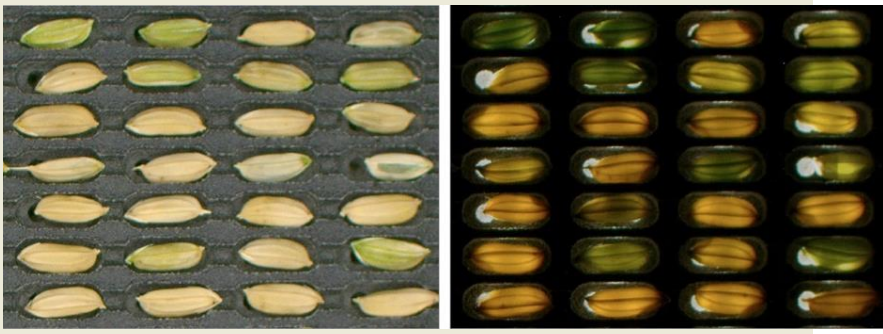
Drone image of Gogeldrie AGS receival site during the 2022 harvest. **Photo**: AGS

The PaddyVision® instrument has recently been installed at the Lap Vo Mill in Vietnam, and will be used to calibrate measurements taken on the instrument with existing SunRice Group manual analysis procedures. AGS will work closely with Ricegrowers Vietnam agronomy managers and An Giang University team members in integrating the PaddyVision® within the Centre of Excellence based at the Lap Vo Mill.

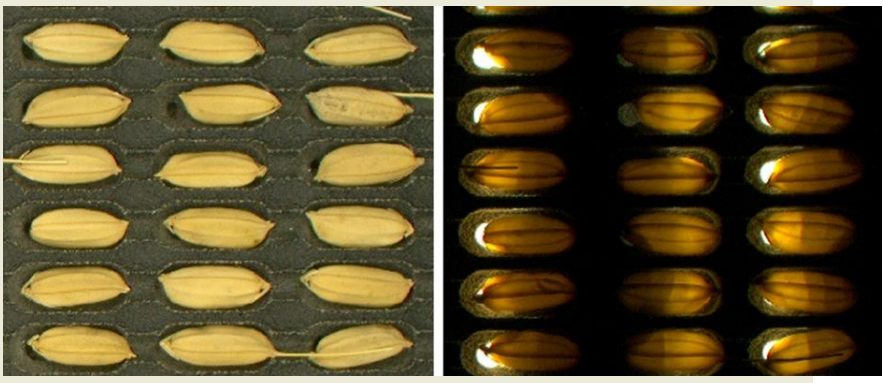
Specifically, the PaddyVision® will be utilised for:

- Calibration of the PaddyVision® for Vietnam varieties.
- Benchmarking PaddyVision® measurements with mill Head Rice Yield (HRY) output.
- Optimisation of drying procedures to suit the Mekong Delta region.

By collaboratively working within the Centre of Excellence the PaddyVision® will be further developed to provide a key role for analysing certain aspects of physical rice grain quality for existing and emerging Vietnamese varieties, and in optimising paddy drying conditions for tropical environments.



Example montage of high moisture (26%) Viand grain captured on the PaddyVision®. Left shows the reflected light image, right shows grains illuminated from below (**photo:** AGS).



Example montage of cracked Reiziq grain captured on the PaddyVision®. Left shows the reflected light image, right shows grains illuminated from below to highlight the cracks (***Photo:*** AGS)

Research pursuits in Australia to align with targeted variety types in Vietnam

Rice Research Australia Pty Ltd

Previous travels by SunRice Group's Rice Research Australia Pty Ltd (RRAPL) staff and their involvement in ACIAR projects in South East Asia, has highlighted the agronomic benefits of Vietnamese sourced rice varieties in other production systems in countries across the region.

Furthermore, varieties like DS1 have performed well in District Variety Trials (DVTs) in Northern Australia, being the benchmark for which any Australian-bred Tropical Medium Grain (TMG) aspires to meet. Assessing quality parameters for tropical-grown rice varieties in Australia is difficult given the geographical distance, legislative control (between states) and logistics in seed movement between the tropical north (two season per year) and the temperate south (one season per year) where all our quality assessment capabilities reside.

The SunRice Group's Australian Grain Storage (AGS) subsidiary has developed the Paddy Vision® (PV) tool, which provides a portable option to assess quiet an array of physical quality attributes on freshly harvested paddy.

In collaboration with AGS, RRAPL has instigated experiments in the temperate south and tropical north of Australia to ensure the PV was able to capture day of harvest quality parameters on DS1 and other TMG varieties. In the temperate south, to emulate higher humidity's and warmer grain filling conditions often encountered in the humid tropics, an experiment was conducted utilising poly houses over field plots of DS1 and a TMG as they were flowering.

"Poly-house" erected over maturing plots of DS1 and TMGs the southern production site at NSW DPI (Yanco). Note the date palms in the backgrounding indicating the inherent dry environment encountered in temperate Australia's rice production hub.

Photo: Peter Snell

Preliminary results from the "Poly-house" trial illustrated above, indicated PV successfully and statistically differentiated treatment and varietal trends, the results of which will be expanded on in subsequent reports. We would like to acknowledge the NSW DPI (Yanco) for their assistance with the "Poly-house" experiment. The deployment of PV to northern production hubs in Australia will help in real time, provide quality parameters of current and future activities of RRAPL for this project that includes:

- On varieties in current "Dry" season DVTs, and wet/main season DVTs in northern and southern nodes
- Assess superior DS1 earlier maturing derivates for the lucrative short grain market.
- Influences of pre- and post-harvest activities (drying, tempering) on achievement of a more consistent product for TMG systems.
- Providing paddy sample to AGS over a range of grain moistures of varieties for which PV calibrations aren't at this stage well developed.

Understanding and enhancement rice quality in Mekong delta, Vietnam

An Giang University

The An Giang University (AGU) team, as part of this ACIAR-SunRice Group project aims to establish the optimum harvest and post-harvest processes for the popular rice varieties DS1 and Dai Thom 8 (DT8) in the Mekong Delta. As part of the project a Centre of Excellence (COE) in Milling, Postharvest Drying and Quality Analysis, will be developed and located at SunRice Group Lap Vo Mill. This joint venture aims to be a resource that will be of benefit to SunRice Group Lap Vo Mill, AGU and be accessible for the wider industry by conducting training programs on quality control. The expected benefit of this venture aims to endure beyond the life of the project. A quality network will be established linking Lap Vo Mill and AGU to develop quality lab protocols and knowledge sharing opportunities. Capacity building will be achieved through opportunities to teach lead farmers, cooperative staff, AGU students and staff to gain knowledge, skills and training in the operation and requirements of a premium commercial supply chain operation. Further enhancing the collaboration in rice research in the Mekong Delta, Vietnam.

At present AGU is conducting quality analysis of DS1 and DT8 rice varieties delivered as wet paddy at various intervention points to identify where in the value chain rice quality is most affected. The first harvest of DS1 is underway, with the AGU team collecting fresh paddy from the field and monitoring temperature and humidity fluctuations while fresh paddy is in transport. Analysis will be conducted to determine intervention points in the harvest, transport, mill site, after drying, before and after storage process that leads to the highest quality rice.

AGU and SunRice Group team member collecting fresh DS1 paddy at My Hiep, Hon Dat, Kien Giang province. From left at the back Mr Danh Trinh (DS1 rice grower), Mr Nhat Thanh (Taki – SunRice Group Lap Vo mill staff), Dr Khang Tran and Mr Duy Trinh (AGU team), Tuyet Nguyen, Phuoc Dat and Quoc Cuong (second year and third year AGU students).

Photo: Duy Trinh

Preliminary work by AGU has shown that drying methods significantly affected rice quality indicators such as head rice yield and gumminess, which is well known in the industry. This work will further expand our understanding of what affects quality and how to maintain and improve it throughout the MD value chain.

ACIAR-CLRRI-Vietnam a young generation of breeders advancing short-grain rice variety development

Cuu Long Delta Rice Research Institute

The Mekong Delta's leading government institution with a focus on rice breeding and production is the Cuu Long Delta Rice Research Institute (CLRRI) (Figure 1). The CLRRI plays a crucial role in Vietnam's rice agricultural science priding itself for its dynamic and cutting-edge research and training facility. To guarantee that its programs are appropriate to today's fast-paced and forever evolving world, the CLRRI works collaboratively with commercial, trade, and governmental research institutions on a national and international level. Its main goal is to create an environment where academic research on rice-related challenges can be conducted from a comparative and wider perspective.

CLRRI's has four research departments: Department of Genetics and Breeding; Department of Agricultural Engineering; Department of Plant Protection and Department of Agronomy, to investigate every facet of rice farming and rice-based farming systems. In addition, the CLRRI has two supporting departments (that are General Administrative Office, Scientific Management and International Cooperation), as well as three Centres (Centre for Environment, Agricultural Supply, and Crop Products Analysis; Applied Biotechnology and Agricultural High-Tech Centre and Centre for Agricultural Technology Advance Transfer). The CLRRI's rice production and quality are being improved, which is the government's aim. There are 134 employees at CLRRI, including 29 Ph.Ds., 70 MScs, 26 BScs, and 8 other workers. OM rice varieties developed at CLRRI have been planted on 70% of the area in the Mekong Delta and have been expanded to other regions of the country.

The CLRRI's young researchers, led by Team leader Dr. Tran Ngoc Thach, conducted crosses involving artificial hybridisations and gamma radiation-induced mutagenesis to search for suitable rice materials and implemented genetic materials for breeding a new super plant. Eight short-grain rice parents with the desired agronomic qualities were crossed in a full diallel mating strategy for 56 new crosses. The F1 plants were cultivated from the F0 seed. After the F1 plant's seed was gathered, it was planted, observed, and generated the F2 seeds. The F2 seeds, with approximately 2, 000 individuals per cross, were delivered directly to the field trials to reach the maximum amount of segregation per population.

CLRRI cross-team is creating new crosses, propagation F1, F2 seed in greenhouse.
Photo: CLRRI

For 20 mutant populations, the development of gamma ray-mutated rice short and medium varieties with four radiation doses are already used at M3 generation by the breeding group. To pick up ten advanced lines from already available material evaluated and selected in a total of 1200 individuals from F4-F8, BC2F4-8 populations. The most promising advanced rice lines will be submitted for molecular and grain quality investigation. In addition, the molecular biology and grain quality groups regularly work to optimise the required testing protocol for this project exploiting short-grain rice varieties. To advance this process, the coming crop will typically use for the production and selection of a large number of the F2, F3, and M3 generations onward during the winter-spring season (dry season).

The F2, M3, and a total of 1200 individuals from F4-F8, BC2F4-8 populations are planted, harvested, dried during the wet season of 2022.

Photo: CLRRI

Cooperatives-based sustainable rice production model in the Mekong Delta

Mekong Delta Development Research Institute, Can Tho University

Rice farmers of Mekong Delta are currently facing many challenges such as climate change impacts, pressure of pests on rice, substantial price increase of input materials and fluctuation in the rice selling market. These have caused low profits from rice production, impacting farmers' livelihoods and wellbeing. Improving rice production value and rice farmers' income has become an emerging issue in the Mekong Delta. There are many policies issued by the Vietnamese Government to support the rice sector such as promoting rice export and linking rice producers and buyers in the rice value chain. Under those policies, several desirable solutions have been developed and applied. Of which, producing rice with high standards through collective farming practices is one of the encouraged measures.

Project team works visits VINACAM Coop in Hon Dat district, Kien Giang province.
Photo: Tin Hong Nguyen

The Can Tho University-Mekong Delta Development Research Institute (CTU-MDI), in collaboration with the University of Queensland (UQ), SunRice Group in Vietnam, and the Department of Agriculture and Rural Developments (DARDs), have been building up a Cooperative (interested farmer groups) based sustainable rice production model in the intensive rice areas of three provinces: An Giang, Kien Giang and Dong Thap. This model employed the SRP framework as standards and requirements for rice production. Rice farmers will be encouraged to apply SRP with the aim of developing export quality product assuming MRL (maximum residue level) compliance is achieved.

In July and August 2022, the CTU, UQ, SunRice Group and DARDs teams visited and worked with potential Coops. The team shared the project objectives, activities, and approach to collaborate with Coop members. At the meeting, DARDs also presented local policies on supporting the rice sector and farmers. Rice farmers gave a lot of feedback and recommendations on applying SRP in rice production and the linkage model between Coops and SunRice Group for SRP rice consumption.

Some key findings:

- Most rice farmers agree with project activities and objectives, and they are enthusiastic to be involved with the project, particularly several women and young farmers;
- Project objectives and activities are suited to local needs, so the DARDs will integrate some extension activities into the project;
- Some Coops want to work with SunRice Group on contract farming. However, some want to have more clarification on requirements of SunRice Group regarding rice quality and selling price policies.

CTU and SunRice Group are continuing to communicate and foster stronger working relationships with Coop and farmer groups.

Collaborative research in action

University of Queensland Team

It is often assumed that sustainable labels can improve farmer livelihood due to the price premium associated with these labels. However, findings have increasingly shown that this may not be the case if: productivity decreases due to reduced chemical and fertiliser use; production costs increase due to higher quality or labour requirements; there is insufficient infrastructure in place to facilitate a sustainable trade; or there is a lack of demand leading to farmers requiring to sell sustainable food at the same market price as their conventional counterparts.

The agribusiness team at UQ is on the quest to understand whether the adoption of SRP production can improve farmer livelihood compared to conventional farming systems. A value chain approach integrating systems dynamics is used to identify and quantitively assess the underlying issues affecting farmer livelihood between value chain systems. This will aid in developing policy interventions and recommendations toward sustainable production as Vietnam shifts towards higher quality rice production.

In July 2022, the UQ team facilitated a workshop in CTU to explain the theory of systems dynamics and its application. Led by the systems dynamic expert Dr Yanti Nuraeni Muflikh, the two-day workshop gave the team a better understanding of system dynamics and how they will be applied to achieve the project's objectives. We also had the opportunity to visit and speak with value chain actors and stakeholders to conduct a rapid assessment of the rice value chain. This gave us a preliminary and broad understanding of the rice value chain in the Mekong Delta.

Dr Yanti building a Causal Loop Diagram based on farmer motivation to adopt sustainable production systems with Professor Sanh. This provided the team with an opportunity to apply theory to practice.

Photo: Julia Checco

Some key findings from our field trip include:

- Some SRP requirements were difficult to follow (e.g., bathing after chemical application and record keeping);
- SRP lowered production costs by 500,000VN/1260 m2 (~ US$166/ha)
- Farmers are concerned about future harvest due to decreased seed and fertiliser use
- Labour costs increased as SRP production required more monitoring
- Market price remained the same despite sustainable production

Our team is preparing for primary data collection in November 2022.

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http://mekongsustainablerice.com/

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

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