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# MEKONG SUSTAINABLE RICE

***Photo***
The PRG AGB-2019-153 ACIAR project team visited rice field of Mr. Nguyen Van Mot.

## Message from the project leader

Dr Jaquie Mitchell

Wow – what a busy time we are all having. Apart from the activity and engagement on the ground ramping up, our project members have been busy with preparation for the ACIAR annual written report due in early July, in addition to preparation of scientific abstracts for submission to the International Rice Congress later in the year. Behind the scenes, myself, Dr Binh Ho and key leaders from each Vietnamese project entity have been working hard to prepare for the Vietnamese members of the Project Reference Group (PRG) Familiarization Tour. This is no easy task on top of our already busy schedules, and I thank Dr Binh Ho and his team for the effort to organize this important "in the field/site visit" familiarization opportunity which will highlight the project engagement and initiatives on the ground. I also thank the strong commitment from team leaders of each entity who have made themselves available for discussions and learnings to be shared with the PRG members at this time.

It is great that preliminary results are coming in and we can start to synthesize these to address some of the important research questions aligned with challenges that smallholder men and women farmers experience in the Mekong Delta. I hope you take the time out to read and share with others the excellent project activities and recent highlights captured in the following pages.

***Photo***
Mekong rice – Binh Thanh, Dong Thap Province.

## IN THIS ISSUE

# SunRice Group's partnership enables high-quality rice production in the summer-autumn 2023 crop

SunRice Group

The summer-autumn season is the most challenging for farmers in the Mekong Delta because it's the wet season, and as such, pests and diseases can be a major problem. Varieties such as DT8, a key target of the project due to its suitability to the High Quality Export Market (HQEM), can be susceptible to certain pests and disease which can impact the farmers gross margins through increased costs and reductions in yield. Hence farmers are reluctant to grow them in the wet season. During the summer-autumn 2023 season, it was extremely important for SunRice Group to maintain relationships with grower/cooperative groups even when the favoured variety of rice was not selected by the grower to keep growers involved for future seasons with the concept of HQEM rice production as more suited varieties are identified and that trust could be built between the parties assisting in achieving the project goal of establishing sustainable agricultural practices. The SunRice Group remained dedicated to supporting their endeavors in producing high-quality rice.

Towards the end of the crop, just a few days before harvest time, SunRice successfully negotiated two purchases of fresh rice variety OM18 with two groups of farmers: the "Mười _ Một" farmer group in Dong Thap province and the "Nhan" farmer group in An Giang. As a result of the collaboration, SunRice Group have procured approximately 150 tonnes of fresh rice OM18 from the "Nhan" farmer group. Additionally, we are on the verge of harvesting 158 tonnes of fresh rice OM18 from the "Mười _ Một" farmer group. This rice will be exported however the premiums currently aren't available for this offering. The expected yield is quite high, averaging about 7 tonnes per hectare. Currently, we are in the process of finalizing a contract with Tan Quoi Cooperative, which also cultivates OM5451 rice and initially lacked a contract for this season. Once the summer-autumn 2023 crop concludes, it is anticipated both farmer groups and Tan Quoi Cooperative will collaborate with us to negotiate a new contract based on the DT8 planting plan, which will fit into the HQEM.

Despite the initial challenges faced during the summer-autumn 2023 crop, we persevered and engaged in productive discussions with the farmers to reach a consensus. Our shared aim is to move forward towards a future of fruitful cooperation, and we remain optimistic that everything will proceed according to plan.


***Photo***
Harvest activities in one of Mr. Nhan's fields, representing the "Nhan" farmer group.

# Elevated temperatures at grain fill influencing DS1 quality

Rice Research Australia Pty Ltd

Significant swings in grain appearance and cooking quality have been noted in DS1 as opposed to a Tropical Medium Grain (TMG) of a similar maturity between Wet and Dry seasons in tropical Australia (refer to "Seasonal variation in grain quality of DS1" Issue #03). Utilising polytunnels placed over plots at anthesis (Plate 1), each installed with a temperature and humidity sensors, an attempt was made to elevate temperatures during grain development in a replicated "managed environment" trial with DS1 and a TMG.

***Plate 1***

Construction of polytunnels over flowering plots to emulate elevated thermal conditions during grain development.

***Plate 2***

Rice panicles (not DS1 in this case) exhibiting symptoms of heat induced spikelet sterility.

Lower latitudes of experimentation in the temperate region, and the associated influence of daylength, saw larger than expected difference in phenological development between DS1 and TMG lines, with the latter flowering two weeks earlier, resulting in exposure to two different thermal regimes. The polytunnels only increased mean daily temperatures by 2 $^{O}$C during the two respective 30-day grain ripening treatment periods, however relative humidity was increased by 10 to 20%. Although, similar movements in grain dimension, gelatinisation temperature and grain protein were associated with elevated temperatures as observed between wet and dry seasons for the TMG, DS1 wasn't as responsive. Despite no significance difference in grain yield between treated and untreated plots (10-11 t/ha), significant difference was noted in harvest index and spikelet sterility, with a 15% higher sterility in the polytunnel plots of DS1 with no significant difference in these physiological parameters for the TMG line. Other evidence of sink related effects were observed for grain chalkiness which decreased under the polytunnel treatment for DS1, consistent with the failure to fill secondary florets on panicles. It is postulated that the higher humidity under polytunnel treatment together with end of flowering temperatures reaching above 36 $^{O}$C were enough for heat induced sterility (Plate 2) in DS1.

Currently staggered sowing dates (Plate 3) are being utilised to address phenological difference between varieties for future studies into different thermal environments during grain development.

***Plate3***

Freshly sown plots of earlier maturing varieties amongst established plots of longer duration in a drill sown field.

# Impact of seasonal variation on rice quality during transportation

An Giang University

The DS1 rice variety is grown twice per year in Vietnam, with each season significantly influencing the rice quality during transportation. The first growing period, the Summer-Autumn season, extends from April to November, coinciding with Vietnam's wet season. The climate during this period is predominantly rainy, resulting in fresh paddy with an average moisture content of 30-32%. Conversely, the Winter-Spring season, which spans from October to March of the following year, aligns with the dry spell in the Mekong Delta. This dry season leads to paddy with comparatively lower moisture content, approximately 2-3% less than that of the Summer-Autumn season.

Our recent data underscored a crucial finding - the timing of transportation directly influences the quality of the paddy, particularly during the Winter-Spring or dry season. Compared to the wet season, the dry season permits a longer transportation time, minimizing potential quality degradation. In the dry season, the head rice yield of fresh paddy begins to decrease if transportation exceeds 72 hours, whereas, in the wet season, quality reduction occurs after just 48 hours. Importantly, the colour of the fresh paddy during the dry season remains stable, even after three days of transportation.

These findings imply that farmers are afforded a more extended window to coordinate the transportation of their fresh paddy to the mill during the dry season. It's noteworthy that the Winter-Spring season is of utmost importance to rice growers as it yields the highest annual output. Consequently, farmers face intense pressure to promptly transport the fresh paddy to the mill within the given time constraints. This research provides invaluable scientific data that can help farmers and rice mills optimize the transportation process. By understanding the seasonal impacts, they can extend the transportation timeframe without compromising the quality of the paddy.


***Photo***
*AGU, ACIAR and UQ team visiting DS1 paddy field in Kien Giang province.*

# Seed production and distribution: variety stewardship and pure seed production

Cuu Long Delta Rice Research Institute

Seed quality plays a significant role in rice production. High-quality rice seeds have the potential to produce strong and healthy seedlings, increasing germination rates, improving pest and disease resistance, and tolerance to environmental stress thereby, ensuring stable and sustainable rice production. Therefore, the production of pure rice seeds is important for maintaining the genetic purity of rice varieties, as well as for ensuring the quality and yield of the rice crop. In seed production, pure seeds are produced from selected varieties through proper seed selection, seed treatment, and seed multiplication. This process ensures that the seeds produced are of high quality, disease-free, and have the desired characteristics. Once high-quality rice seeds are produced, they need to be distributed to farmers to ensure wide-scale adoption and maximize yield potential.

***Photo***
Rice seedlings emerged 7 days after sowing for seed production.

***Photo***
Workers transplant rice seedlings at a paddy field in CLRRI.

Purifying and maintaining the breeder's seeds is one of the important steps in variety stewardship and pure seed production. As part of the ACIAR project, a short-grain advanced rice line selected from the previous crop season was planted and monitored in the field to purify and maintain the breeder's seeds in the winter-spring 2022-2023 crop. This advanced rice line is in the 1st crop season ($G_0$): Evaluation and selection of individuals from the initial material). The process was followed as per the Vietnamese standard: TCVN 12181:2018. Two hundred homogeneous individuals selected and marked with tags on the field were collected and analyzed for quantitative traits. The analysis results showed that 126 $G_0$ individuals met the requirement. With a bloom time was 70 days; a ripening time was 98 days; the average value and standard deviation of plant height (80.35 cm, SD1.48), panicle length (18.13 cm, SD 1.30), panicles/individual (12.56, SD1.18), number of firm seeds/ individual (1163.74, SD 90.63), 1.000-grain weight (25.99 gram, SD 0.01) and yield (29.28 gram/individual, SD 0.71). The $G_0$ individuals that meet the requirement will be used to purify and maintain the breeder's seeds in the 2nd crop (summer-autumn 2023 crop): select separate lines ($G_1$). The $G_1$ rice lines that meet the requirement will be used for further multiplication/production and testing.


***Photo***
The $G_0$ short-grain advanced rice line growth ~60 days after sowing.


***Photo***
The $G_0$ rice line is going to the ripening stage.

# Collective resilience: women unite to minimize disparities with rice intensification

Mekong Delta Development Research Institute, Can Tho University

Rice intensification has brought numerous benefits to farmers and contributed to rural development. From a gender perspective, rice intensification provides employment, income, and food security. However, it also poses various challenges for women, particularly those who are poor and work as hired labourers.

A survey conducted by a gender research group in April 2023 in three provinces of Kien Giang, An Giang, and Đong Thap revealed that the main tasks of women involved in rice production primarily engage in gap filling (re-transplanting), weeding, and managing finances during rice sales. Gap filling is done when the rice plants are about two weeks after seeding, while weed removal and rouging of off-types (elimination) is typically done close to the rice harvest. For poor women without land for cultivation, they must work as hired labourers.

***Photo***
Mrs. Nguyen Thi Hanh, An Giang, Vietnam.

Mrs. Bảy exemplifies this situation. She is a 61-year-old poor woman from Binh Thanh Trung commune, Lap Vo district, Đong Thap province. Without land for farming and due to her advanced age, she is unable to undertake physically demanding work. Consequently,  she formed a group of 10 women in similar circumstances, specializing in transplanting and weeding rice. This group works around 15-20 days per month, and when there is no local work available, they travel to other communes and districts. The workday typically commences at 6:00 am and concludes at 12:00 pm, though during the peak season, it may extend until 5:00 pm. They earn an average of 25,000-30,000 Vietnamese dong per hour.

***Photo***
Women in rice field, Kien Giang, Vietnam.

While this work provides income, it also takes a toll on women's health. Mrs. Bảy mentioned that daily field work leaves her exhausted, especially when pesticide spraying is involved. During hot months and consecutive working days, women are prone to skin inflammation, rashes, and sometimes blisters, yet they have to continue working. This work also negatively affects their musculoskeletal system, causing back pain and hindering their mobility.

Furthermore, these women face difficulties in accessing scientific and technical knowledge and lack training in financial management. Consequently, their ability to care for their health and optimize rice production efficiency is constrained. Currently, Gender Research Team in ACIAR - SunRice project is studying and examining ways to enable women to access scientific and technical knowledge and develop management skills, thereby strengthening their empowerment and improving their living conditions in rural areas. These efforts aim to minimize the disparities and difficulties that women face in the rice intensification process.

***Photo***
Interviewing female farmers after working in the rice field in Hon Dat, Kien Giang, Vietnam.

In conclusion, rice intensification brings economic benefits and food security however, it presents challenges for rural women. Only by enhancing women’s knowledge and skills, protecting their health, and implementing supportive policies, can we promote sustainable and gender-equitable development for women participating in rice intensification.

# Unravelling HQEM value chain impact on rice farmers in Mekong Delta

The University of Queensland

Farmers in the verdant Mekong Delta, Vietnam, are navigating a complex landscape of economic and ecological challenges. With Activity 4.8, our endeavour to enhance farmers livelihoods hinges on assessing a high-quality export market (HQEM), MRL-compliant value chain against a traditional, high volume (non-MRL compliant) chain. The evaluation of this performance encompasses three fundamental objectives. First, we sought to diagnose the problem and establish a dynamic hypothesis of rice value chains. Second, the aim was to design system archetypes and propose policies or interventions. Lastly, the focus shifted to scrutinizing the overall performance of the value chain and weighing the pros and cons of proposed interventions.

***Photo***
Farmers engaging in focus group discussions and rice value chain actors participating in semi-structured interviews in the Mekong Delta.

To achieve these, we dove into literature reviews, facilitated focus group discussions (FGDs) with farmer groups, and held semi-structured interviews with cooperative leaders, input suppliers, traders, processors, and retailers. Through this immersive experience, we unearthed a web of issues besetting the farmers. They grapple with lower market prices, power imbalances, production of low-quality rice, declining productivity due to several factors (such as soil degradation, lack of quality inputs, pests and diseases, extreme weather, and technical limitations), rising production costs, price volatility, and restricted access to credit.

The introduction of the MRL-compliant production system brings a glimmer of hope amidst these challenges. Initial observations point out that while it may temporarily impact productivity and minimally influence market prices and costs, the system comes into its own when farmers collaborate directly with enterprises. Such partnerships lead to higher market prices for MRL-compliant rice, provide price certainty, allows upfront deposits from enterprises, and offers access to superior-quality inputs. Additionally, collaborations also open avenues for free technical advice to mitigate reduced productivity.

While the MRL-compliant system has its nuances, the key takeaway from our initial findings is its potential to significantly improve farmers' livelihood when paired with direct engagement with enterprises. We eagerly await the forthcoming results from semi-structured interviews, and as the year closes, we'll be embarking on a group model building session with stakeholders, allowing us to delve deeper into this intricate scenario.

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