Federal Ministry of Education and Research

OrganoRice

UNU EHS

# The Non-Economic Benefits of Transitioning to Organic Rice Farming

TASK 1.5.1.4 ASSESSMENT OF NON-ECONOMIC BENEFITS OF CONVERTING TO ORGANIC RICE PRODUCTION IN THE VIETNAMESE MEKONG DELTA

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## Summary

This report presents findings on the non-economic benefits of transitioning to Organic Rice Farming (ORF) in the Vietnamese Mekong Delta, as part of Task 1.5.1.4 of Work Package 1 of the OrganoRice project. Data was gathered through interviews with key stakeholders, including farmers and cooperative leaders and decision-makers across 5 provinces in the Mekong Delta region, namely, Vinh Long, Dong Thap, An Giang, Tra Vinh and Ca Mau. The results indicated that rice producers were primarily motivated to convert to ORF to improve the environmental conditions of their farms and surrounding areas, improve their own and their family's health, and to increase their profits. Several respondents acknowledged the interconnectedness between these benefits, highlighting the importance of enhancing all three simultaneously. The majority of respondents reported experiencing positive environmental, livelihood-related and well-being impacts as a result of organic conversion, primarily due to the elimination of agrochemical use and adoption of organic practices. Benefits cited included improved soil, water and air quality, improved aquaculture production, increased availability of wild foods, enhanced rice plant's resistance to pests and diseases, increased rice plant's resilience to climatic events and natural hazards, and increased biodiversity. Health-related benefits were largely attributed to farmers' reduced exposure to agrochemicals. Rice yields were generally reported as having decreased, although many producers also reported higher profits and improvements in rice quality.

The findings revealed the synergistic relationships between various benefits resulting from the ORF conversion. Organic practices, including the elimination of chemical inputs, improved the farm's environmental conditions, including enhanced soil, water and air quality. These improvements fostered a healthier ecosystem, creating a more suitable environment for various species that are valuable to farmers. For instance, increased presence of fish, frogs, eels and wild vegetables enhanced food availability for household consumption. An increase in natural enemies such as fish, various insects and birds contributed to pest and disease control, which can further decrease dependency on chemical inputs. The increased presence of worms and fish, both used as shrimp and crab feed, supported aquaculture production, an important livelihood for farmers in Tra Vinh and Ca Mau. In addition, improved quality of rice straw provided healthier feed for cows and resulted in better-quality mushrooms.

Despite the multiple benefits provided by adopting organic practices, it is important to appropriately acknowledge and address the persisting challenges and barriers to conversion in order ensure that rice producers in the region are well-equipped for a successful conversion and are able to maximise the potential benefits of ORF. Based on our findings, one key challenge related to shifting farmers' perceptions and behaviours. For instance, farmers that are unfamiliar with organic production may be initially sceptical of the benefits of converting to ORF, and may therefore be reluctant to take the risk of converting to a new production system. However, it appears that once farmers had the opportunity to directly observe the materialisation of ORF benefits, such as from fellow farmers who had successfully converted, they were more willing to convert. In addition, some certified farmers had initially struggled to adjust to the organic requirements and procedures, such as bookkeeping requirements or shifting from herbicide application to manual weeding. Another challenge presented by organic producers was limited access to either domestic or international markets, or both. In some cases, producers' profit potential was limited by unsatisfactory prices

offered by purchasing companies and reliance on middlemen. An additional issue for some transitioning farmers was cross-contamination of water due to a shared irrigation system between organic and conventional fields, highlighting a significant barrier to conversion for farmers potentially interested in transitioning to organic in the future. On the other hand, a key factor in ensuring a successful conversion to ORF is the cooperative's human resources, particularly the staff's technical expertise in organic production procedures, which enables them to provide farmers with effective guidance and support.

Although many of our findings were comparable between different organic rice producers and across provinces, it is important to keep in mind how geographic and other contextual factors can influence the manifestation of ORF benefits or the challenges that producers may experience. For instance, farm elevation or location may influence access to water or susceptibility to inundation. Additionally, although most organic rice respondents reported increased profits despite reductions in rice yields, it is important to consider that farmers that exclusively produce rice and have no other significant source of income, may perceive reductions in rice yields as a greater threat compared to those practicing mixed rice and aquaculture production.

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# 1. Description of Study

This evaluation is part of Task 1.5, under Work Package 1 of the OrganoRice project. The overarching goal of the project is to demonstrate the feasibility of organic rice production in the Mekong Delta and provide guidance for the successful introduction of organic rice production in other Vietnamese regions. Project partners UNU and SERI have been tasked with leading the evaluation of the conversion to organic rice production. While SERI will focus on the socio-economic impacts, UNU is responsible for assessing the non-economic impacts of the conversion.

This evaluation outlines the methodological approach for assessing the non-economic impacts of the transition, data analysis and presentation of key results from data collected during fieldwork carried out in November 2024. Although the initial plan was to assess the impacts of organic transition in Vinh Long, An Giang and Dong Thap provinces, due to a lack of organic farmers in these provinces, additional certified and transitioning organic farmers were identified and interviewed in Tra Vinh and Ca Mau. Moreover, practitioners of less intensive production systems, namely Safe Rice (SR) and Ecological Rice (ER), were also interviewed. SR production is characterized by limited use of chemical inputs, reduced environmental impacts, high production and storage standards, clear origin and traceability (Huynh et al., 2021), and is considered a healthier option for consumers compared to conventionally grown rice. Similarly, ER aims to minimise farmers' reliance on inorganic inputs by replacing them with organic fertiliser and biopesticide to reduce environmental impacts (Tran, 2024). Although the ER model does not appear to require adherence to specific cultivation standards, general standards such as the Sustainable Rice Platform (SRP), Integrated Pest Management (IPM) and the "1 Must, 5 Reductions" practices may be applied; the "1 Must" refers to the use of certified rice varieties, while the "5 Reductions" refers to reducing the use of seeds, pesticides, nitrogen fertiliser, water usage and post-harvest losses (Tran, 2024). ER certification is relatively easy to obtain compared to organic certification (Nam, 2019).

**Main questions addressed in this report:**

1. *What are farmers' main motivations for transitioning to Organic Rice Farming (ORF)?*
2. *What challenges do farmers face during their transition to ORF and post-transition?*
3. *What are the non-economic (environmental and health) impacts of transitioning from conventional to ORF?*
4. *How does transitioning to ORF impact rice crops' resilience to climatic events/ natural hazards experienced in the Mekong Delta?*

# 2. Methodology

Respondents across Vinh Long, Dong Thap, An Giang, Tra Vinh and Ca Mau provinces were selected through a mix of purposive and convenience sampling. These included farmers and cooperative leaders and decision-makers from the following

production systems: certified organic, transitioning to organic, SR and ER farming (Table 1). Respondents were interviewed in groups of 2 – 4.

Questionnaires were designed to include a mix of close- and open-ended question to facilitate comparability across respondents/ production systems/ provinces while leaving space for qualitative insights capturing individual's perceptions, experiences and motivations. The final environmental, well-being and livelihood-related variables that were included in the questionnaires were selected based on a previous literature review identifying multiple values related to organic rice production (OrganoRice Activity 1.5.1.1) and data gathered during fieldwork carried out in March 2024. These variables were then further narrowed down to fit the interview duration.

Interview tools were developed and tailored to different respondent types. Questionnaires were first designed in English, then translated into Vietnamese and applied in Vietnamese by a native speaker. Interviews were recorded where possible, with respondents' prior informed consent and responses were recorded on paper by interviewers. Interview notes were consolidated and finalised in English for analysis. A systematic content analysis of the data was carried out.

The results from sections 3.1 – 3.4 are solely based on interviews with ORF producers, while results sections 3.5 – 3.7 also include some data gathered from interviews with producers of other rice production systems. This is further specified in each respective section. Table 1 provides a comprehensive list of all stakeholders interviewed during fieldwork carried out in November 2024.

*Table 1. Number of respondents and respondent types across Vinh Long, Dong Thap, An Giang, Tra Vinh and Ca Mau provinces.*

| Province | Number of respondents | Respondent type and production system | Total Number of respondents |
|---|---|---|---|
| Vinh Long | 3 | Transitioning to OR farmers | 3 |
| Dong Thap | 1 | ER Cooperative Director | 7 |
| | 6 | ER farmers | |
| An Giang | 1 | Transitioning to OR Cooperative Chairman and Director | 6 |
| | 1 | SR Cooperative Director | |
| | 4 | SR farmers | |
| Tra Vinh | 1 | OR Cooperative Director | 7 |
| | 4 | Certified OR farmers | |
| | 2 | Transitioning to OR farmers | |
| Ca Mau | 1 | OR Cooperative Director | 4 |
| | 3 | Certified OR farmers | |
| | | **Total** | **27** |

# 3. Results

## 3.1. Interviewee's Information

Results related to the environmental and well-being impacts of converting to ORF include data collected from 12 organic rice producers (7 certified organic farmers and

5 transitioning organic farmers who are not yet certified) across Vinh Long, Tra Vinh and Ca Mau provinces (Figure 1). Farmers interviewed were mostly male (11) and 1 female farmer, ages ranged between 42 – 71. The majority of farmers had attained a secondary level of education. Number of years practicing organic farming ranged from 1 – 21 years, with most farmers having practiced for 7 years or less. Farm sizes ranged from 0.2 – 2 ha. Additional interviewees included cooperative leaders and decision makers, including Managers, Chairmen and Directors, from cooperatives in Vinh Long, Tra Vinh and Ca Mau.

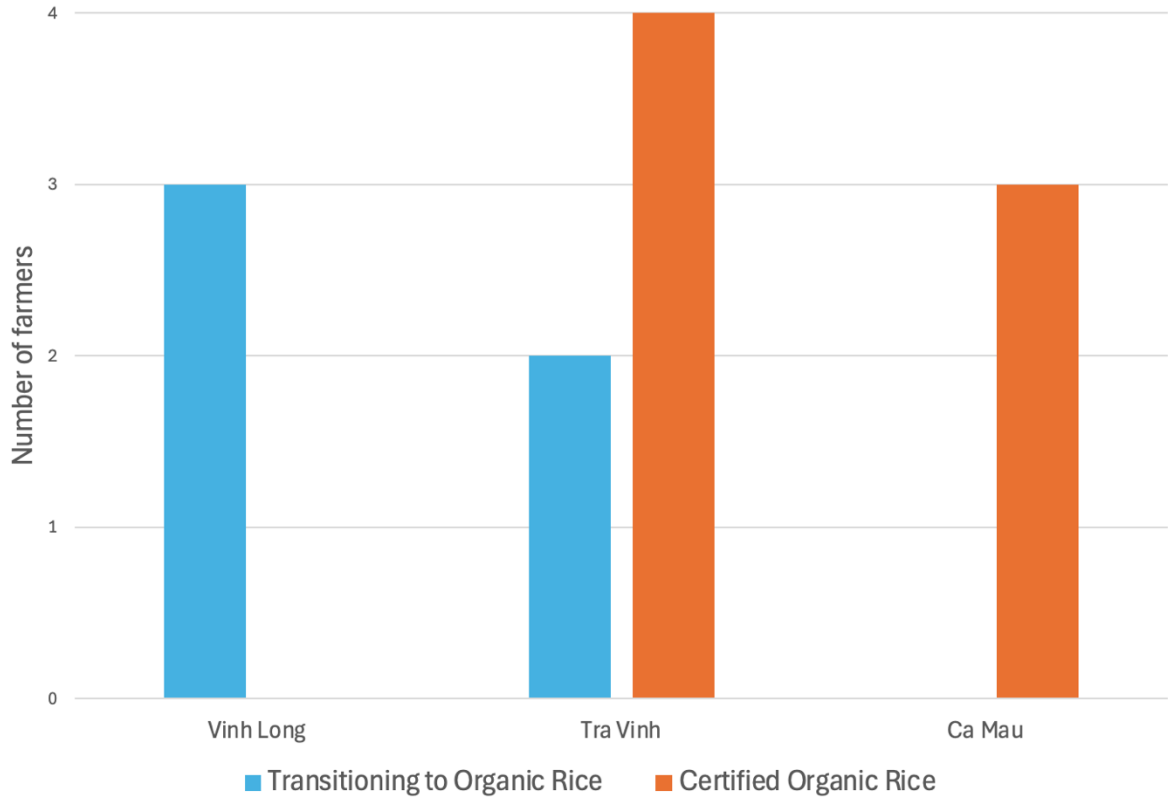


*Figure 1. Number of ORF farmer respondents across Vinh Long, Tra Vinh and Ca Mau.*

## 3.2. Motivations for Converting to Organic Rice Farming

**Key Motivations**

The majority of farmers reported that their initial motivations for converting to ORF included:

1. Increasing their profits
2. Seeking health improvements for
    a. themselves
    b. their families
    c. their community
    d. consumers
3. Improving the conditions of the natural environment

Farmers practicing mixed rice and aquaculture production noted that they were initially interested in organic rice production for the purpose of improving and supporting their shrimp and crab production, which are negatively impacted by the use of

agrochemicals. One certified rice-shrimp/crab farmer from Ca Mau expressed his desire to reduce chemical inputs on his farm in order to improve his health, soil and water quality, as well as to support the presence of wild animals and vegetation surrounding his farm. He stated the following:

*"I farm organically to ensure the safety and health of the [crabs and shrimp] I raise, the safety and health of people, and to protect the environment"*. (Certified rice-shrimp/crab farmer, Ca Mau)

**Prioritisation of Benefits**

When asked to rank benefits relating to income, health and the natural environment based on their current level of priority, just over half of the farmers gave an equally high priority to all three benefits, stating that the benefits were equally important to them due to their interconnected nature and that they must therefore be addressed simultaneously. The rest of the farmers gave a slightly higher priority to health and environmental benefits over income. For example, one farmer from Vinh Long, who was in the process of transitioning to organic, emphasized that his current priority was to enhance his knowledge of organic practices rather than to immediately increase his income, noting that increased income would be meaningless if it came at the expense of his health and the environment. 1 farmer from Tra Vinh shared a similar sentiment, explaining that, due to his old age, he was more concerned with enhancing the environmental conditions to improve his family's health and support the health of future generations, he stated the following:

*"I don't need excessively high profits because the environment affects the lives of my children and grandchildren as well. The profit comes from the fact that the saltwater used to raise shrimp after growing organic rice yields higher productivity, leading to higher profits… health is the top priority, so is the natural environment. People need good health to be able to work for a long time, and the environment is for my children and grandchildren in the future."* (Transitioning rice farmer, Tra Vinh).

## 3.3. Environmental Benefits of Organic Rice Farming

Based on their own experiences and observations since converting to ORF, farmers across provinces confirmed the provision of various environmental benefits as a result of transitioning to ORF. Most notably, all farmers reported improved water quality and enhanced biodiversity, and the majority reported increased soil quality.

### *3.3.1. Improved Water, Air and Soil Quality*

All farmers reported improvements in water quality, describing it as clearer, less acidic, and with a noticeably reduced odour, attributing this to the elimination of chemical inputs. Moreover, the Chairman and Cooperative Director from Tra Vinh also stated that improvements in water quality are also evidenced by the fact that water discharged from the agricultural fields is cleaner, and both the Chairman's and the Director of the Ca Mau cooperative mentioned that the shrimp's ability to thrive indicates that the water is sufficiently clean.

Although farmers were not specifically questioned regarding changes in air quality following conversion to organic production, 6 of the 7 certified farmers reported improvements in air quality, which they attributed to the elimination of chemical pesticides.

Interviewees listed various methods used to maintain or improve soil fertility under organic production, including placing cow or chicken manure on the fields or using Trichoderma to process the rice straw and thatch, which is then applied as natural fertiliser onto the fields. Certified farmers from Tra Vinh, who practice mixed rice-shrimp production, explained that following the completion of a rice crop cycle, they leave the root of the rice plant in the field to either be consumed by the shrimp in the following shrimp crop or to naturally decay in the field. They indicated that they do not apply additional methods due to the already good quality of the soil. Certified farmers in Ca Mau reported using organic fertiliser imported from Italy as well as using rice straw and grass that grows in their fields as natural fertiliser.

According to the majority of farmers, soil quality and health improved following conversion to organic production. Farmers described the soil as more soft and "spongy" and easier to work with compared to when they were applying conventional methods, citing the elimination of chemical inputs and application of organic fertiliser as key reasons for the changes.

#### *3.3.2. Improved Biodiversity*

All certified and transitioning farmers observed an increase in biodiversity on their farms or surrounding area, such as increased presence of fish, swamp eels, birds and frogs. According to farmers in Vinh Long, swamp eels and frogs increased significantly in their organic rice fields, while in their conventional fields, these species often die due to exposure to chemical pesticides. Moreover, certified farmers from Tra Vinh observed an increase in storks on their farms, which they attributed to the greater availability of fish surrounding their rice fields. In addition, farmers perceived the landscape and local area as more beautiful as a result of increased biodiversity, enhancing farmers' sense of happiness. This highlights how improvements in ecosystem health can increase species abundance and attract additional wildlife to the farm, further increasing the aesthetic qualities of the environment and, consequently, positively influencing people's general sense of well-being.

## 3.4. Organic Rice Farming Contributions to Well-being and Farmers' Livelihood

The conversion to ORF generally resulted in improvement in farmers' health, increased availability of foods for household consumption, and positive impacts on other factors contributing to farmers' livelihood. Most notably, all farmers noted improvements in their health and almost all farmers reported enhanced availability of wild foods on their farms. In addition, all farmers reported improvements in rice plant's resistance to pests and diseases and increased presence of natural enemies. Moreover, farmers practicing mixed rice and aquaculture production noted improvements in their shrimp and crab production. However, the majority of farmers experienced a decline in rice yields.

It is relevant to note that certified organic rice producers in Tra Vinh and Ca Mau used rice varieties like ST24 and ST25, high quality varieties well-suited to organic production in the Mekong Delta. These rice varieties have good disease resistance, high yield potential, and good adaptability to diverse soil types, including saline soils (Vietnamese Business Forum, 2022; Phan et al., 2022, Son, 2020). Moreover, they may provide farmers with a market advantage due to their internationally recognized status as high quality rice varieties (Son, 2020). Farmers reported these varieties as partly contributing to pest and disease resistance, as well as resilience to salinity intrusion.

### *3.4.1. Changes in Rice Yields*

Both transitioning and certified organic farmers across all three provinces reported reduced rice yields compared to conventional production, however, most farmers also reported higher profits, and improvements in rice quality were highlighted by 3 respondents from Ca Mau and Tra Vinh. Increased profits were attributed to reduced production costs and premium prices for organic rice. All 4 certified organic farmers from Tra Vinh, who had been practicing ORF for about 21 years, acknowledged that, although they experienced about 10% reduction in rice yields, their rice profits increased by 20-30% and their production costs decreased. The 3 transitioning farmers from Vinh Long, who had completed just 3 organic rice crop cycles, reported reduced rice yields, however, they also noted that rice yields had gradually increased with each cropping season.

### *3.4.2. Benefits for Combined Rice-Shrimp/ Crab Production Model in Tra Vinh and Ca Mau*

All 7 certified farmers, who had rice-shrimp/ crab production models, observed noticeable improvements in their shrimp/ crab production. Improvements were attributed to enhanced water quality resulting from the elimination of chemical inputs on the farm. Moreover, certified farmers from Ca Mau noted that the increased presence of worms in the soil benefited shrimp and crab production, as the worms served as a natural feed source. Similarly, certified farmers in Tra Vinh also benefitted from increased presence of fish on their farms, with smaller fish serving as feed for the shrimp. These positive impacts exemplify the interlinkages between various ORF benefits, specifically, how improved environmental conditions and the resulting increase in biodiversity leads to enhanced aquaculture production – an important livelihood for farmers in Ca Mau and Tra Vinh.

### *3.4.3. Improved Availability of Wild Foods*

Wild foods refer to edible products that are naturally occurring in the environment - in other words, those that grow and exist without human cultivation or intervention. All certified farmers and most of the transitioning farmers reported an increase in wild foods, including crabs, fish, mussels, frogs and wild vegetables, found in or around their rice fields. These resources primarily serve as additional food sources for farmers and their households, underscoring the positive cascading benefits of eliminating inorganic inputs and enhancing environmental conditions to provide a healthier habitat for various species. As evidenced by a statement made by a farmer from Ca Mau:

*"I've noticed more vegetation growing than before, specifically water spinach, rambutan… as for other organisms, in the water there are apple snails, mussels, and worms to use as bait for crabs and shrimp".* (Certified rice-shrimp/crab farmer, Ca Mau)

### *3.4.4. Changes in Availability of Raw Materials: Rice Straw*

Relating to raw materials available on the farm, farmers only mentioned rice straw, which was used either as cow feed, as a substrate for mushroom cultivation, as natural fertiliser, or sold for additional income. Several farmers reported improvements in the quality of their rice straw. For example, transitioning farmers in Vinh Long, who use rice straw for mushroom cultivation during the rainy season and as cow feed in the dry season, observed improved mushroom quality and noted that it provided healthier feed for their cows.

### *3.4.5. Pest and Disease Occurrence, Management and Resistance*

**Pest and Disease Management Strategies**

Farmers revealed different approaches to managing pests and diseases in their rice fields. Transitioning farmers in Vinh Long use a homemade pesticide made of chili, garlic, ginger and Vietnamese white wine, and, in some cases, rats are caught using traps. In Tra Vinh, transitioning farmers apply biopesticide as needed, while certified farmers flood their fields. When pests are detected about 40 days into the rice plant's growth, these farmers will open up their sluice gates to flood their fields, submerging the plants up to the tip for 1-3 hours to eliminate pests. They then drain the fields, leaving about 5cm of water. Fish and birds, whose presence has increased following conversion to organic, also support this pest control process by feeding on pests and their eggs. These organic approaches allow farmers to control threats to their crops without the need for harmful chemicals. Farmers from Ca Mau reported no specific pest management strategy, citing minimal pest occurrence.

**Increased Presence of Natural Enemies**

As a result of general improvements in the natural environment following conversion to ORF, all farmers reported an increased presence of different species of natural enemies of rice plant pests, including dragonflies, spiders, ladybugs and wasps. Farmers specifically attributed this enhancement to organic farming practices, as exemplified by the following statement made by a farmer from Tra Vinh:

*"I see dragonflies, and spiders spinning webs from one rice stalk to another. Butterflies are less common because their presence usually indicates the presence of pests. The abundance of dragonflies and spiders is due to the organic farming practices that allow these beneficial natural enemies to grow."* (Certified rice-shrimp/crab farmer, Tra Vinh)

**Reductions in Pest and Disease Occurrence and Increased Rice Plant's Resistance to Pests and Diseases**

The majority of farmers indicated a general decrease in pests and disease occurrence following their conversion to organic production. For instance, transitioning farmers in Vinh Long reported reductions in pests such as Asiatic rice borer (Chilo suppressalis) and rice ear-cutting caterpillar (Mythimna separata), transitioning farmers in Tra Vinh

reported reductions in rice leaf roller *(*Cnaphalocrocis medinalis) and certified farmers in Ca Mau observed reductions in leaf miners (Hydrellia griseola) and rice stinky bug (Oebalus pugnas), to name a few examples. Ca Mau farmers attributed the decreased occurrence of pests to organic practices as well as the high quality ST25 rice variety.

All certified and transitioning farmers believe that the rice plant's overall resistance to pests and diseases has increased after converting to organic production. Vinh Long farmers described their rice plants as healthier, attributing this improvement to using organic pesticide and fertiliser. Similarly, one transitioning farmer from Tra Vinh remarked that his rice plant leaves were thicker and stronger, preventing pests from causing as much damage to the plant. Certified farmers from Tra Vinh credited the increased resilience of their rice plants to the use of organic fertiliser as well as the high-quality rice varieties ST24 and ST25, which are known to be particularly resistant to pests and diseases.

### *3.4.6. Improvements in Farmers' Health*

All farmers experienced health improvements after transitioning to organic production due to the elimination of agrochemical use, resulting in reduced direct exposure to harmful chemicals, cleaner air, and improved water quality. Farmers across all provinces reported either decreased occurrence or complete cessation of skin rashes caused by contact with polluted water. This is exemplified by a statement made by a farmer in Ca Mau, who said the following:

*"By using organic fertilizers and pesticides, when I go out to the fields, I feel healthier compared to when using chemicals. I feel more in tune with nature and don't experience the itching caused by toxins."* (Certified rice-shrimp/crab farmer, Ca Mau)

Moreover, according to Vinh Long respondents, farm workers experienced a reduction in fatigue, breathing problems and stomach issues, highlighting how organic production supports a safer work environment.

### *3.4.7. Changes in Community Benefits*

A few farmers reported on community impacts, specifically certified farmers from Tra Vinh and transitioning farmers from Vinh Long. The certified farmers highlighted overall benefits for the community, describing ORF as a suitable option for their local environmental conditions, which has led to greater profits for farmers that have converted. The elimination of chemical inputs in the Vinh Long organic farms brought notable benefits to the local community. A Vinh Long Cooperative manager recalled that, prior to conversion to ORF, chickens and ducks from neighbouring households would occasionally die after accidentally consuming the conventionally grown rice, however, such incidents no longer occur. On the other hand, farmers from Vinh Long, who began their transition in early 2024, stated that it was too soon to assess the impacts of the transition on the community, highlighting how community-wide benefits may take longer to manifest. However, they believe that if they were to expand their organic production, the community would experience benefits due to the elimination of chemical inputs.

## 3.5. Resilience to Climatic Events and Natural Hazards

To evaluate whether transition to ORF affected rice crop resilience to climatic events and natural hazards, we first collected data from farmers, cooperative leaders and decision-makers (linked to different rice production systems) on the types of climatic events and natural hazards experienced across provinces. A total of 27 respondents were interviewed across Vinh Long, Dong Thap, An Giang, Tra Vinh and Ca Mau provinces (Table 1). We investigated the occurrence and perceived threats of drought, extreme floods, saltwater intrusion, unpredictable weather, storms, and any other climatic event/ natural hazard reported by interviewees. Next, we asked the ORF practitioners if they observed any changes in their crop's resilience compared to their pre-transition state.

### *3.5.1. Climatic Events and Natural Hazards Experienced Across Mekong Delta Provinces*

The climatic events/ natural hazards that were mostly cited as occurring (irrespective of level of perceived threat/ concern) were erratic rainfall, storms and drought, which were reported by respondents across all provinces. High temperatures were reported in Dong Thap, An Giang and Tra Vinh, saltwater intrusion in Vinh Long, Tra Vinh and Ca Mau, and inundation of rice fields in Tra Vinh and Ca Mau. Interestingly, extreme floods were not reported by any respondent. Interviewees were questioned about their level of concern ("not concerned", "slightly concerned" or "very concerned") regarding each climatic event and natural hazard experienced in their respective province. Their responses (reflected in Table 2) revealed that they are primarily concerned about erratic rainfall, drought, storms, and high temperatures, however, results varied between provinces and, in some cases, also varied between farmers from the same cooperative. It is important to note that this variation in the experiences and perceptions of climatic event/ natural hazards were likely due to geographical or other contextual factors associated with an individual farm or group of farms located in the same area.

*Table 2. Provinces where respondents reported climatic events/ natural hazards as a concern for rice production*

| Climatic Event/ Natural Hazard | Provinces where climatic events/ natural hazards were reported as a concern for rice production | | | | |
|---|---|---|---|---|---|
| | Vinh Long | Dong Thap | An Giang | Tra Vinh | Ca Mau |
| Erratic rainfall | | ● | ● | ● | ● |
| Drought | | | ● | ● | ● |
| High temperatures | | ● | ● | ● | |
| Storms | | ● | ● | ● | ● |
| Saltwater intrusion | ● | | | | ● |
| Inundation of rice fields | | | | ● | |

**Erratic Rainfall Patterns**

Erratic rainfall patterns, such as extended periods of rainfall (which can last up to 20 days) and unusually heavy rainfall, can result in inundation of rice fields, which can

negatively affect rice yields and quality. This was cited either as a slight concern or high concern by most respondents from An Giang and Tra Vinh and 1 respondent from both Dong Thap and Ca Mau. In An Giang, Tra Vinh and Ca Mau, heavy rainfall causes water levels in the fields to rise rapidly, inundating the fields and making it challenging to pump out the excess water quickly enough. To address this, farmers strengthen their polders and prepare the pumps in case excess water needs to be removed. According to a representative of the Agricultural Extension Center from An Giang, abnormal rainfall patterns, including extended periods of rainfall, have become more frequent in the recent years during the summer-autumn and the autumn-winter seasons, so the issue has become of higher concern for local authorities. Irregular precipitation patterns can affect various stages of rice production, including seeding and harvesting. For instance, heavy rain occurring soon after sowing can negatively affect rice yields, and abnormal rainfall occurring during the flowering stage can negatively affect rice quality.

**Drought**

Most respondents from Vinh Long, Dong Thap and Tra Vinh did not consider drought a concern, while all Ca Mau respondents and a few respondents from An Giang and Tra Vinh regarded it as either slightly or very concerning issue. For farmers in Ca Mau, who rely solely on rainwater to water their rice fields, lack of rain can pose a big threat. In fact, in 2015 and 2019 there was insufficient rain, which resulted in loss of all rice crops. The Cooperative Director from Dong Thap indicated that water scarcity occurs during the dry season, resulting in increased time and costs for pumping water into the fields. The Director of the Tra Vinh Cooperative indicated that drought, generally occurring most severely between the months of May and June, mostly affects rice farms rather than mixed rice-shrimp farms. In fact, all 4 certified farmers we interviewed in Tra Vinh had rice-shrimp fields located on a river island, and, although they reported experiencing drought, they did not consider it to be an issue. On the other hand, a rice farmer from the same cooperative, who generally experiences water scarcity during the summer-autumn season, explained that during this period, he is unable to pump sufficient water into his farm due to excessively low water levels in the canals.

Several approaches to adapt to drought conditions were reported. Tra Vinh rice farmers, who practice 2 rice crop cycles per year, have shifted their rice production activities (such as sowing period) to better align with the climatic conditions. A representative of the Agricultural Extension Center from An Giang explained that, due to the increased occurrence of extended periods of high temperatures in the recent 3-4 years during the winter-spring period, water scarcity has become an issue, specifically for rice fields located further than the 1$^{st}$ or 2$^{nd}$ level canals. The local authorities have attempted to address the issue by improving the field irrigation system by adding additional pumps at the 1$^{st}$ and 2$^{nd}$ and field-level canals to deliver more water. Moreover, rice producers from An Giang noted that the local government has implemented a dredging program to facilitate the distribution of water.

**High Temperatures**

High temperatures were cited as a concern by a few respondents, across Dong Thap, Tra Vinh and An Giang. One Dong Thap respondent identified high temperatures as

the greatest risk and their biggest concern in the upcoming 5 years. They explained that increasing temperatures leads to increased pest and disease occurrence, ultimately resulting in yield losses. One example is the Asian rice gall midge (Orseolia oryzae), a new insect pest that has emerged in the area. In addition, An Giang respondents noted that high temperatures reduce water availability for irrigation. According to An Giang farmers, high temperatures, typically occurring between November and March, can damage rice seedlings. While households located closer to the 1st level canal (which is directly connected to the river) are able to pump and store water in their fields, those located further away, closer to the 3rd level canals, face challenges in managing phases of prolonged heat, often resulting in yield losses. During hot days, the water temperature of shrimp ponds in rice-shrimp farms in Tra Vinh increases, leading to heat stress that adversely affects shrimp health and survival. To address this issue, farmers increase the water level in their shrimp ponds and place an aerator in the water to cool down the water temperature.

**Storms**

Storms were reported as slightly concerning by several respondents from An Giang and Ca Mau, and 1 respondent from Dong Thap and Tra Vinh. Similarly to erratic rainfall, storms can impact rice yields and quality by damaging rice plants during various stages of rice growth, such as the flowering or harvesting stage. For example, a Dong Thap respondent explained that heavy rains occurring during harvesting time can break the rice plants, resulting in yield losses. Similarly, An Giang producers noted that storms that last for long periods of time cause the soil to become very soft and the rice to fall, resulting in up to 50-60% yield losses. Moreover, storms occurring immediately after sowing can wash away seeds, requiring farmers to re-sow, resulting in additional work. In Tra Vinh rice-shrimp farms, storms wash the alum from the surrounding landscape into the shrimp ponds, decreasing the water pH, which negatively influences the shrimp. To mitigate the damages caused by storms, Tra Vinh farmers flood their fields with water up to the tip of the rice plant. This helps to stabalise the plants by preventing them from falling over due to strong winds.

**Saltwater Intrusion**

Saltwater intrusion was a significant concern for Vinh Long farmers and slightly concerning for Ca Mau farmers, although it was not an issue for Dong Thap, An Giang and Tra Vinh respondents. Vinh Long farmers explained that the Cai River sluice gate is closed when higher salinity levels are detected at the gate; in case farmers have not yet sown the rice, they are not allowed to extract water from the Cai River to irrigate their fields, resulting in having to abandon that crop, however, if the rice has already been sown, they are allowed to irrigate their fields. Moreover, in case the Cai River sluice gate is not closed promptly causing saltwater to infiltrate the rice fields, they are forced to abandon that crop. Unfortunately, Vinh Long farmers are unable to address this issue themselves because they do not manage the sluice gates and must rely on the sluice gate operators. A representative from the Technical Service Center of Agriculture of Vinh Long explained that the local authorities are addressing salinity intrusion by improving the canal systems by adding sluice gates at most canals. They have also established a forecasting system that monitors water salinity levels; if, based on the data, salinity intrusion is predicted to be an issue, the sluice gates will be shut, and the freshwater will be redirected and stored in a freshwater lake.

On the other hand, certified farmers in Tra Vinh practicing alternating rice-shrimp production reported that salinity intrusion is not a big concern. This is due, in part, to the rice varieties used, ST24 and ST25, which can tolerate salinity concentrations of 0.1-0.3%, and also due to the practice of "washing" the fields with freshwater to dilute salinity concentrations following the 6 months of saltwater shrimp production. Similarly, Ca Mau farmers use rainwater to dilute salinity levels in their fields.

**Inundation of Rice Fields**

Due to their farms' location surrounded by a river, the 4 certified rice-shrimp/crab farmers from Tra Vinh identified inundation caused by strong water currents as a major concern. To mitigate this issue, farmers have raised the height of their polders by adding more soil. In case inundation occurs, they must extract the water from their fields to prevent damage to their rice plants.

**Extreme Floods**

None of the respondents interviewed reported the occurrence of extreme floods, and therefore, did not perceive extreme floods as a threat. One Dong Thap respondent noted that the closed dikes provide farms with sufficient protection from floods, while another respondent indicated that pluvial flooding is not a big concern due to her capacity to manage it. Interviewees' perception appears to contrast with some of the existing literature which highlights the region's vulnerability and susceptibility to various flooding events, including the risk of fluvial and coastal flooding (Nguyen, 2021; Nguyen et al., 2007; Van et al., 2024). This may perhaps be explained by the fact that annual flooding, occurring between July and November, is a regular occurrence in the Mekong River Delta (Nguyen et al., 2007). Flooding is an integral part of life in the region and is recognised for supporting local livelihoods. As such, it is generally viewed as a natural phenomenon rather than a serious disaster, unless severe damage and danger to local populations is experienced (Tuan et al., 2007) such as 12 recorded damaging floods that took place between 1960-2020 in the Vietnamese Mekong Delta (Nguyen, 2021).

**Improvements in Rice Crop's Resilience**

The majority of ORF practitioners observed an overall increase in their rice crop's resilience to climatic events and natural hazards, while some observed no change compared to their pre-transition conditions. Respondents from Tra Vinh and Ca Mau described their rice plants as being less susceptible to damage caused by strong winds and rain, and more resilient to drought, extreme heat conditions and abnormal weather events. Moreover, as previously noted, ST24 and ST25 rice varieties are more tolerant to slightly higher salinity concentrations, rendering these varieties more resilient to saltwater intrusion. In fact, for Vinh Long, where concern for saltwater intrusion was reportedly high, a representative from the Technical Service Center of Agriculture reflected that rice plant's resilience to saltwater intrusion mainly depends on the rice varieties, therefore, selecting varieties that are more adaptable to varying salinity levels is important.

## 3.6. Ecological Rice and Safe Rice: A Step Towards Organic Rice Farming

ER and SR production systems are both considered less intensive than the conventional farming model, characterized by reduced agrochemical use and the partial substitution of chemical inputs with organic alternatives. We can observe parallel challenges linked to the impacts of intensive farming practices, for SR, ER and ORF respondents, as well as a common desire to enhance ecological conditions and health of farmers and community members. As a result of decades of employing conventional practices, respondents noted a reduction in soil fertility resulting in reduced rice yields, water pollution, negative impacts on biodiversity and adverse health impacts on farmers and community members. A Cooperative Director from An Giang expressed his concern for the degraded state of the soil, explaining that after 20-30 years of conventional practices, the soil had become severely degraded and harder to work with due to the over-application of chemical inputs; while in the past they were able to produce 1.2-1.3 tonnes of rice per hectare, their current output has decreased to 500-600 kg per hectare. As a result of such challenges, farmers were particularly motivated to shift to less intensive production systems. The following statement, made by a Safe Rice farmer from An Giang, elucidates these points:

*"Previously, the impact of conventional rice farming practices on health wasn't apparent, but recently, we've seen more health issues, such as cancer. This is due to the heavy use of chemicals in agricultural production. These chemicals run off into the rivers, and we draw water from these rivers, filter it, and drink it over a long period of time. The same applies to the rice itself. In conventional rice farming, chemicals are sprayed one last time before harvest, and consuming this rice isn't good for our health. Therefore, we now need to reduce the use of chemicals."* (Safe Rice farmer, An Giang)

Similar types of benefits can be observed between farmers that converted from conventional to ORF, ER and SR production; this highlights how reduction in chemical use and introduction of organic inputs and farming practices significantly contributes to the benefits experienced across production systems. Namely, ER and SR respondents observed the following benefits: improved soil conditions (including reduced soil acidity and improved soil consistency), resulting in easier sowing of seeds and quicker absorption of biopesticides and organic fertiliser; increased wild foods, including fish, eels, frogs, crabs, used for self-consumption; enhanced biodiversity such as increased presence of birds and insects; increased presence of natural enemies such as dragonflies, ladybugs, spiders and butterflies. One ER farmer also noted increased rice yields and income, improved water quality and better reputation as a farmer due to improved and "cleaner" rice quality. Moreover, she highlighted overall health improvements for herself and her family, indicating reduced skin irritation following contact with contaminated water and decreased occurrence of headaches and digestive issues. Given that organic production imposes stricter limitations on the use of inorganic inputs compared to ER and SR systems, the benefits observed could potentially be further amplified with the full implementation of ORF practices. In addition, respondents currently practicing either SR or ER production anticipate improvements in their rice plant's overall resilience once they do convert to organic. According to these respondents, improvements are expected due to enhanced environmental conditions, including improvements in soil and water quality, which are

likely to improve plant health and resilience to pests, diseases, climatic events and natural hazards.

Producers generally viewed ER/ SR production as a transitional step towards ORF and expressed their interests to fully convert to organic production in the future. However, they acknowledged that more time is required for environmental conditions such as soil quality, to improve sufficiently enough for ORF standards to be met. As such, ER and SR are viewed as an accessible first step towards organic production, with lower production requirements compared to ORF.

## 3.7. Challenges Experienced During Transition to Organic Rice Farming and Post-Transition, and General Barriers to Conversion

Despite the numerous benefits acquired from converting to ORF, farmers and cooperative decision-makers highlighted several challenges they faced during the conversion phase and ongoing challenges post-conversion.

**Challenges Changing Farmers' Behaviours and Perceptions of ORF**

Most farmers were initially sceptical about the effectiveness of organic techniques or lacked sufficient motivation to follow through with a conversion. The Chairman and the Director of the Ca Mau Cooperative explained that although they would like to expand their organic production from their current 50 ha to 200 ha, one of the main challenges they are currently facing is persuading farmers to convert to organic farming methods. It is important to note that the consensus threshold within the cooperatives we visited was 60%, meaning that a decision required approval from at least 60% of the cooperative members in order to be accepted and implemented. Similarly, according to the Chairman and Director of the Tra Vinh cooperative, only 20-30% of cooperative members initially agreed to try organic practices, however, more farmers were eventually willing to convert after observing the positive outcomes of the first crop cycle. This highlights the importance of communicating and showing benefits of ORF conversion across farmer networks, and possibly also communication and knowledge sharing amongst farmers.

Some farmers revealed that it was initially challenging for them to adopt organic techniques, as they required time to familiarize themselves with the new methods and procedures, including the regular recordkeeping requirements needed to ensure compliance with organic standards and certification processes. For example Tra Vinh farmers had to shift from managing weeds with herbicide application, to manual removal of weeds, which they were initially resistant to. These producers outlined their conversion timeline and journey, explaining that the first 2 years were dedicated to familiarising themselves with organic practices. By the 3$^{rd}$ year, their rice plants were growing well, by the 5$^{th}$ year farmers felt fully comfortable with the organic methods and procedures and their rice plants had fully adapted to the new environmental conditions.

**Limited Market Access**

Respondents across provinces highlighted challenges related to limited market access, including international markets, and emphasized their need for support in exporting their rice and ensuring compliance with legal requirements. The Chairman

and the Director of the Ca Mau cooperative revealed that despite their rice being certified under USDA, Japanese and EU standards, they are dissatisfied with the price offered by the purchasing company. The cooperative's reliance on this middleman for buying and exporting their rice significantly limits their profit potential. Moreover, according to farmers from the same cooperative, the low demand for organic rice in Vietnam is also restricting their ability to capitalize on the premium prices that organic production can offer. Similarly, the Chairman and Director of the Tra Vinh cooperative noted that the cooperative currently only sells its rice in Ho Chi Minh and would like to export it internationally to boost profits and to enhance the cooperative's reputation.

**Cross-Contamination From Nearby Conventional Fields**

Cross-contamination of water from upstream conventional fields, due to shared irrigation systems, was an issue for transitioning farmers in Vinh Long. Moreover, although the farmers we interviewed in Ca Mau did not appear to face any cross-contamination challenges, they voiced the need to convince additional farmers in the surrounding area to convert to ORF to ensure that the entire area would be dedicated exclusively to organic production. They believe that this would help address any possible cross-contamination issue, increase the quality of their organic rice and transform the area into an organic rice production hotspot.

**Concerns Over Yield Losses and Income**

As indicated in section 3.4.1, although the majority of respondents reported reductions in rice yields, many also noted increased profits from rice production. However, a few producers expressed concerns related to yield losses and unchanged income. One certified farmer from Ca Mau, who had been practicing organic production since 2019, noted that his income had yet to improve, and expressed needing support in reducing his production costs and acquiring inputs. Vinh Long farmers, who had started transitioning their farms in the beginning of 2024, expressed concern over yield losses during the conversion phase, emphasizing the need for compensation to offset potential losses. They stated that they would be more willing to continue organic production if risks related to reduced rice yields were addressed. It appears that farmers practicing mixed rice and aquaculture production were able to better deal with the challenge of reduced rice yields experienced during the transition phase by relying on earnings from their shrimp/ crab farming. However, this is not an option for farmers that exclusively produce rice and that may not have other significant sources of income. As such, reduced rice yields may be perceived as a greater threat to these producers.

**Insufficient Training, Information and Support**

Several organic farmers reported receiving sufficient training, information or support to effectively transition to organic production, while a few reported this was not the case. In Tra Vinh, 2 of the 4 certified farmers we spoke to had attended an 8-week training course facilitated by the Sub-department of Agriculture, while the other 2 certified farmers and 2 transitioning farmers from the same province received instructions and training provided by the cooperative leaders. According to the Tra Vinh cooperative Chairman and Director, a key factor in facilitating a successful transition to ORF is the cooperative manager's own capacity and technical knowledge of production procedures. He explained how most of the cooperative's staff members had previously studied at the agricultural college and had been through training courses provided by the Tra Vinh Department of Agriculture and Rural Development's

(DARD) Agricultural Extension services. As a result, they were able to effectively guide and support farmers through their transition. In Ca Mau, farmers receive training on organic practices once per year from the DARD. Moreover, the Ca Mau cooperative has a handbook detailing ORF production procedures. When farmers decide to transition to ORF, they receive tailored instructions based on this handbook and are enrolled in a specialised training course to learn ORF practices.

On the other hand, Vinh Long farmers reported that they received insufficient information, training and support from experts and are therefore attempting to supplement and enhance their knowledge and skills by observing farmers working on the OrganoRice project's experimental site. As such, they underscored the need for proper training in ORF methods to equip farmers with the necessary skills to effectively implement organic practices and ensure the attainment of the certification following the transition period. The Vinh Long manager added that it is essential for producers to receive expert guidance to optimize soil quality, thereby ensuring productive yields and a sustainable income.

**Barriers of Conversion to ORF for SR and ER Producers**

Although SR and ER cooperative farmers and decision-makers expressed interest in ORF, they revealed several potential barriers to conversion as well as challenges in integrating SR and ER practices. SR producers from An Giang recalled that only about 20% of farmers in their commune had agreed to transition to ORF, while the majority preferred to continue with conventional production, primarily due to a lack of familiarity with organic methods as well as fears of reduced rice yields and potential income losses. Moreover, an ER respondent identified additional challenges to ORF conversion, including cross-contamination from surrounding conventional farms sharing irrigation canals, poor soil and water quality in the area, limited market access, and resistance from farmers unwilling to transition. In fact, despite cooperative leadership providing guidance on ER practices, only about 50% of farmers adhered to the instructions. Those who followed the advice were typically either aware of the benefits or had observed tangible improvements from adopting ER practices.

**Trade-offs Between Non-Economic Benefits**

One example of a trade-off between different ORF benefits was observed in Tra Vinh, specifically between shrimp production and increased presence of wild fish on the farm. Certified farmers reported that fish species from the surrounding Mekong River enter their rice-shrimp farms and consume the shrimp feed. This issue was exacerbated following organic conversion, as the elimination of chemical inputs and improved environmental conditions led to an increased presence of wild fish in the fields. To address this, farmers apply Tuba (Derris elliptica) root juice to the water surrounding their rice fields at the start of the shrimp cropping season. The Tuba root juice kills the wild fish without harming the shrimp. Large fish are then collected, dried, and used for household consumption, while smaller fish are used as shrimp feed.

*Figure 2. An organic rice-shrimp farm in Tra Vinh province.*

# 4. Conclusion

Based on farmers' and cooperative leaders' observations and experiences of practicing ORF, the evidence suggests that ORF can provide multiple benefits for the environment while supporting farmers' well-being. Environmental benefits include improved water, soil and air quality as well as enhanced biodiversity on the farm. Contributions to well-being and farmers' livelihood include improvements in farmers' health, increased availability of wild foods for household consumption, improved rice straw quality, increased presence of natural enemies, enhanced rice plant resilience to pests and diseases and enhanced resilience to climatic events and natural hazards. Moreover, despite reductions in rice yields, organic production generally resulted in higher profits for rice producers. As such, we can conclude that a transition to organic production has delivered multiple benefits that farmers value and prioritise.

ORF delivers significant benefits through improvements in environmental conditions, including improvements in soil, water and air quality. These benefits are synergistically interlinked, highlighting the positive cascading effects of organic conversion. For instance, the elimination of agrochemical use not only reduces health issues among farmers but also increases the availability of edible species such as fish and wild vegetables, which are used for household consumption. ORF also enhances the presence of natural enemies that can support pest and disease control of rice plants and promotes the improved resilience of rice plants. Moreover, aquaculture production is improved, ultimately contributing to farmers' livelihood. In addition, the increased

availability of various species on the farm, such as fish, is a food source for wildlife, attracting more wildlife to the area. Although farmers attributed many of the benefits to organic practices, some of the benefits were partly attributed to high-quality rice varieties used by farmers. Benefits that may be partly linked to the ST24 and ST25 varieties included improved resistance to pests and diseases and adaptability to higher salinity levels. This highlights how the choice of rice variety can amplify the positive impacts of ORF, and should therefore be carefully considered.

Farmers generally viewed ER and SR as an intermediary phase towards ORF. Benefits experienced by ER and SR producers are largely comparable to those reported by organic rice farmers in terms of types of benefits reported. These benefits included improved soil conditions, increased availability of wild foods, enhanced biodiversity, increased presence of natural enemies and reduced health issues. Such transition production systems exemplify the significant benefits of reducing chemical inputs and replacing them with organic inputs, suggesting that a full conversion to organic production would further amplify the benefits experienced by these rice producers.

Common challenges of transitioning to organic production must be considered and addressed appropriately, including challenges related to changing farmers' behaviours and perceptions of organic practices, addressing issues related to cross-contamination from conventional farms, ensuring farmers have access to good training, information and support to successfully transition to ORF, ensuring producers have adequate market access to benefit from premium prices, and ensuring they are supported to manage the risks posed by yield and any potential income losses experienced during the transition phase. Moreover, the transition may result in trade-offs between some of the benefits. For example, organic producers generally reported reduced rice yields, although many also noted higher profits and better rice quality. In addition, the increased presence of fish in organic rice-shrimp farms created competition between fish and shrimp for food, however, farmers were able to effectively address the issue.

While the data revealed general trends relating to the impacts of ORF, it is essential to consider the influence of geographical conditions and other contextual factors that may vary between provinces and cooperatives, and which may either facilitate or impede the manifestation of different ORF benefits. For instance, the farm's location in relation to the river may influence the farmer's ability to access water, particularly during periods of drought, or a farm's lower elevation level compared to the surrounding landscape may result in damages caused by frequent inundation of farm fields.

The insights collected on how farmers value and perceive different benefits of ORF, as well as common challenges experienced among rice producers, can help to inform policies on how to best support and engage farmers towards making a successful organic transition. However, a mixed methods approach would be needed, in order to further cross-verify and consolidate the qualitative findings in this report with other relevant quantitative data collected across the OrganoRice consortium, thus allowing for a more comprehensive understanding of the insights presented in this report.

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