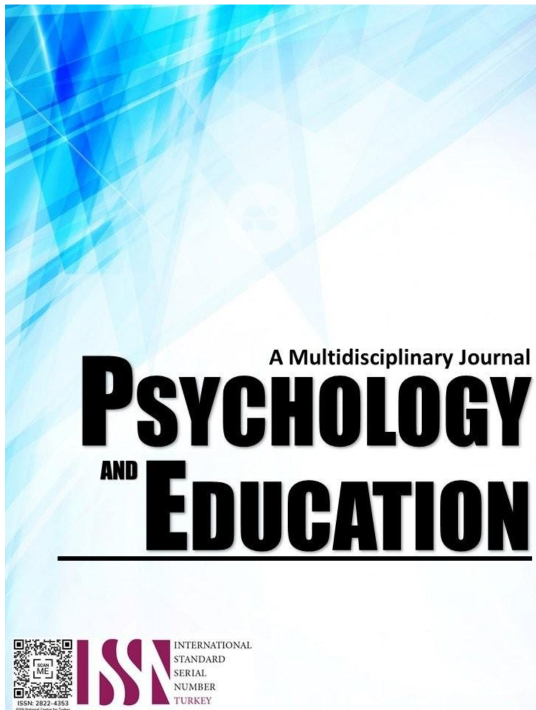
FACTORS AFFECTING THE ADOPTION OF PALAY CHECK SYSTEM TECHNOLOGIES AMONG RICE FARMERS IN BAYBAY CITY, LEYTE



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Factors Affecting the Adoption of Palay Check System Technologies Among Rice Farmers in Baybay City, Leyte

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Abstract

Despite sustained government efforts to achieve rice self-sufficiency in the Philippines, inadequate production continues to challenge national food security. In response, the Philippine Rice Research Institute (PhilRice) and the United Nations–Food and Agriculture Organization (UN–FAO) introduced the Palay Check System. This comprehensive framework promotes best practices to enhance productivity, profitability, and environmental sustainability. This study investigated the adoption levels of Palay Check technologies among rice farmers in Baybay City, Leyte, and examined how selected demographic profiles influenced adoption outcomes. Quantitative data were gathered through structured interviews with 185 randomly selected farmers using a validated interview schedule. Descriptive statistics, Chi-square tests, Spearman's correlation, and frequency analysis were employed to analyze the data. Results revealed that Harvest Management (89.19%) and Seed Quality (77.3%) had the highest adoption rates, with most farmers reaching the final stage of Rogers' Five-Level Adoption Process. In contrast, Land Preparation (40.49%) and Pest Management (46.49%) showed lower adoption rates, with many respondents remaining at the awareness stage. Technologies such as Crop Establishment, Nutrient Management, and Water Management are clustered in the evaluation and trial stages, indicating partial implementation. Statistical tests showed that sex was significantly associated with the adoption of Seed Quality (x2 = 9.73) and Crop Establishment (x2 = 4.98), while educational attainment (x2 = 6.37) and tenure status (x2 = 8.12) were linked to Nutrient Management. Income and farm size were positively correlated with the adoption of Seed Quality, Crop Establishment, and Pest Management. Farmers identified financial difficulty (n = 137) and insufficient water supply (n = 83) as significant barriers. Suggested solutions included irrigation projects (n = 31) and increased availability of organic inputs (n = 30). These findings underscore the need for inclusive, resource-sensitive interventions to support sustainable technology adoption.

Keywords: *technology adoption, training evaluation, agricultural innovation*

Introduction

Agriculture remains the backbone of economic development in most Asian countries, with rice as the principal staple and a critical component of food security. In the Philippines, rice remains central to the diet and livelihoods of millions of farming households. Over the years, the government has implemented a range of initiatives, including Masagana 99, the Rice Productivity Enhancement Program (RPEP), Ginintuang Masaganang Ani (GMA), and Agri-Pinoy, to achieve rice self-sufficiency. Despite these interventions, the country continues to face recurring rice insufficiency, which limits progress toward long-term food security. Recognizing this gap, research and extension programs have increasingly emphasized science-based and farmer-centered strategies to strengthen rice production.

Research emphasizes that agricultural technology adoption is shaped by multiple factors, including farmers' socio-demographic characteristics, access to training, and resource constraints (Alvarez et al., 2022). Theoretical models, such as Rogers' diffusion of innovations, highlight that adoption occurs through sequential stages influenced by personal, economic, and social contexts (Rogers, 2003, as cited in Nguyen et al., 2021). However, literature points to uneven uptake of rice-related innovations in Southeast Asia, with adoption rates often slowed by financial barriers, limited irrigation, and labor constraints (Lan et al., 2025; Samoy-Pascual et al., 2021). This underscores the need to examine in more detail how farmers in specific localities perceive and apply crop management systems.

One primary intervention is the Palay Check System, developed by the Philippine Rice Research Institute (PhilRice) in collaboration with the Food and Agriculture Organization (FAO). This system presents a series of "Key Checks" or best practices designed to improve productivity, profitability, and environmental sustainability by encouraging farmers to compare their practices against optimal standards. While the system is widely promoted, limited evidence exists on the extent of its adoption and the contextual factors influencing farmers' decisions in specific rice-growing communities such as Baybay City, Leyte. Understanding these dynamics is vital to inform more responsive agricultural extension strategies.

Thus, this study seeks to determine the effects of socio-demographic, cultural, economic, and training-related factors on the adoption of Palay Check System technologies among rice farmers in Baybay City, Leyte. By doing so, the study provides empirical evidence to guide policy and extension services in enhancing the adoption of sustainable rice production practices.

The findings of this research contribute to both theory and practice by contextualizing technology adoption frameworks in the case of Palay Check, thereby advancing understanding of how farmer profiles and socio-economic conditions shape innovation uptake. At a practical level, the study offers insights for policymakers, agricultural training institutes, and local government units in designing targeted interventions that address financial and infrastructural barriers. Ultimately, strengthening the adoption of Palay Check technologies supports national food security goals while improving the resilience and livelihoods of rice farming communities.

Research Questions

This study determined the effects of certain factors on the adoption of Palay Check System technologies by rice farmers in Baybay City, Leyte. Specifically, it aimed to answer the following:

1. What are the farmers' levels in the adoption process of the Palay Check technologies in terms of:
    1.1. awareness;
    1.2. interest;
    1.3. evaluation;
    1.4. trial; and
    1.5. adoption?
2. Is there a significant relationship among the socio-demographic, cultural, economic and training-related factors to the adoption of these technologies by rice farmers?
3. What are the problems encountered by farmers in relation to technology adoption and what are their suggestions and recommendations to solve these problems?

Literature Review

Rice plays a vital role in food security and economic development, prompting countries to adopt technologies such as the Palay Check system, also known as Rice Integrated Crop Management (RICM). This system emphasizes a holistic and integrated approach to managing production factors that affect yield, quality, and environmental sustainability rather than isolated practices (Samoy-Pascual et al., 2021; Nguyen & Dao, 2022). Since the implementation of the FAO's Global Good Agricultural Practices (GAP) certification, Asian rice exporters such as Thailand and Vietnam have increasingly relied on integrated approaches to achieve better results (Lan et al., 2025).

The adoption of such technologies, however, depends on multiple factors. Extension services frequently promote innovations but often lack systematic monitoring to assess their effectiveness (Alvarez et al., 2022). Continuous farmer feedback during research and field trials is critical to ensure acceptability and practicality (Adamsone-Fiskovica & Grivins, 2022). Recent studies identify four main factors influencing adoption: socioeconomic characteristics of farmers, production and land ownership conditions, technology-specific traits, and systemic influences (Arslan et al., 2022). Adoption is also shaped by social dynamics, including peer effects, organizational pressures, and community norms (Hidayat et al., 2022). Factors such as education, farming experience, tenure status, access to credit, and levels of commercialization significantly affect technology uptake (Balisacan, 2003, as cited in Li et al., 2022).

Socio-demographic factors play a key role. Age influences adoption: younger farmers are generally more inclined towards new practices due to lower risk aversion, while older farmers tend to rely on experience and are more cautious (Jiang et al., 2022). Civil status also matters; married individuals often take on greater responsibilities that affect their farming engagement, while youth disengagement continues to pose challenges for the future of agriculture (Chen et al., 2023). Education is positively correlated with technology adoption, as it equips farmers to understand and apply innovations more effectively (Abdul-Rahman et al., 2021). Larger households and active involvement in organizations, especially in leadership roles, also enhance the potential for adoption (Addai et al., 2022).

Cultural and economic contexts also influence adoption. Traditional beliefs and gender roles can limit farmers' willingness to adopt new methods, especially among women, who may face constraints on decision-making (Rosales et al., 2024). Higher farm income and diversified earnings generally encourage adoption; conversely, reliance on off-farm income and low farm productivity can reduce incentives (Samoy-Pascual et al., 2021).

Access to capital remains a critical barrier for many smallholders lacking credit (Lan et al., 2025). Farm size also influences technology adoption, with larger farms more likely to adopt innovations, though smallholders may adopt innovations for efficiency (Nguyen et al., 2021). Land ownership fosters innovation adoption since owners enjoy greater autonomy and direct benefits compared to tenants (Arslan et al., 2022).

Training-related factors such as the clarity and applicability of training modules and the effectiveness of resource persons are fundamental to successful technology adoption (Alvarez et al., 2022). The trainer's ability to communicate and motivate is pivotal in overcoming barriers and changing perceptions (Rosales et al., 2024). Gender roles and household duties often constrain women's access to training, but in some contexts, increased mobility and targeted training opportunities have improved participation, positively impacting adoption (Addai et al., 2022).

Overall, technology adoption among rice farmers involves a complex interplay of socio-demographic, economic, socio-cultural, land tenure, and training-related factors. Understanding these dimensions is essential for developing interventions that effectively support sustainable agricultural development.

Methodology

Research Design

The study employed a descriptive–correlational quantitative design to examine the effects of socio-demographic, cultural, economic, and training-related factors on rice farmers' adoption of Palay Check System technologies in Baybay City, Leyte. This design allowed for the systematic description of the respondents' profiles and the extent of technology adoption while simultaneously assessing the relationships between various independent variables (socio-demographic, cultural, economic, and training factors) and the dependent variable (level of technology adoption). A descriptive–correlational design is appropriate for agricultural adoption research because it enables the identification of patterns and associations among variables without manipulating conditions, providing empirical evidence on how farmer characteristics and contextual factors influence decision-making (Arslan et al., 2022).

Respondents

The respondents consisted of rice farmers from Baybay City, Leyte, identified from a comprehensive list of farmer participants provided by the Agricultural Training Institute and the City Agriculture Office (CAO). From this population, 185 farmers were selected using simple random sampling. To implement this, each farmer on the list was assigned a unique identification number, and a computer-generated random number sequence was used to determine the final sample. This procedure ensured that every farmer had an equal probability of being chosen, thereby reducing selection bias. Moreover, the sampling frame covered all registered farmer participants in the locality, thereby enhancing the sample's representativeness by reflecting the diversity of age, farm size, and socioeconomic background within the farming community. This approach strengthened the validity of the findings by ensuring that the sample closely matched the characteristics of the broader rice-farming population in Baybay City.

Instrument

The instrument was initially developed in English and subsequently translated into Cebuano Bisaya to facilitate respondents' understanding of the research topic. It consisted of sections assessing the respondents' characteristics in terms of sociodemographic variables (i.e., age, sex, civil status, religion, educational attainment, family size, and affiliations), cultural and economic factors (i.e., sources of income, annual family income, length of farming experience, size of farm, tenurial status, and farming beliefs), and training-related profiles. Additionally, it evaluated the farmers' status according to Rogers' five levels of the adoption process (awareness, interest, evaluation, trial, and adoption) concerning the seven technologies of the Palay Check System, namely: seed quality, land preparation, crop establishment, nutrient management, water management, pest management, and harvest management. The instrument also explored problems and suggested solutions related to the adoption of the Palay Check Technologies, along with the reasons for respondents' (non-)adoption.

The interview schedule was pilot tested among 20 farmers with similar demographic characteristics to assess clarity, relevance, and comprehensiveness. Feedback from the pilot test informed revisions to improve question wording, sequencing, and overall flow. Content validity was established through review by a panel of three experts: two agricultural specialists and one research methodologist, who evaluated the alignment of items with the intended constructs. Reliability was computed using Cronbach's alpha across the adoption process subscales, with items grouped under Rogers' five stages. The resulting coefficient of 0.78 indicated acceptable internal consistency, particularly for the scaled items measuring farmers' adoption levels. This combination of expert validation and statistical reliability testing ensured that the instrument was both conceptually sound and empirically robust.

Procedure

The procedures involved several key steps, beginning with the acquisition of a complete list of farmer participants from the Agricultural Training Institute (ATI) and the City Agriculture Office (CAO) in Baybay City. Using this list, the researcher randomly selected respondents and conducted face-to-face, structured interviews at their residences between June and August 2015, with their voluntary and informed consent. Interviews were conducted in Cebuano using the validated structured interview schedule, ensuring clear communication and accurate elicitation of responses.

Data Analysis

To address the study's objectives, a combination of descriptive and inferential statistical techniques was employed, each selected to align with the type of data collected and the specific questions. Frequency and percentage were used to determine the level of adoption of Palay Check technologies among farmers. These descriptive statistics were appropriate because the adoption stages were categorical, allowing for a clear presentation of the proportions of farmers at each stage. This provided an overview of the distribution of adoption levels across the sample. The next step was to examine the significant relationships among the socio-demographic, cultural, economic, and training-related profiles of farmers' adoption of farming technologies. Chi-Square tests examined associations between categorical variables and adoption levels. This test was justified because it evaluates whether distributions of categorical variables differ significantly, thereby identifying patterns of association. Meanwhile, Spearman's correlation coefficients were used to identify the strength and direction of relationships among ordinal data. Together, these tests provided a comprehensive analysis of how farmer characteristics were related to adoption behavior. Lastly, to examine the problems farmers encounter when adopting Palay Check technologies and their suggestions for solutions, frequency analysis was again used. This method was justified because the responses were categorical and descriptive, allowing identification of the most commonly reported challenges and recommendations. Summarizing these frequencies highlighted the practical barriers to adoption and the farmers' proposed strategies for improvement. By employing these statistical procedures, the study ensured methodological rigor and alignment among its questions, variable types, and chosen analyses. This approach strengthened the validity of the findings and provided both descriptive insights and inferential evidence regarding the factors influencing technology adoption among rice farmers in Baybay City.

Ethical Considerations

The study adhered to essential ethical principles to protect the dignity and rights of participating rice farmers in Baybay City, Leyte. Prior to data collection, informed consent was obtained from each respondent, with the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without penalty clearly explained. Interviews were conducted with respect for respondents' privacy and confidentiality, and respondents were assured that personal information and responses would be kept strictly confidential and used solely for this study's purposes. The use of the Cebuano dialect during interviews demonstrated cultural sensitivity and facilitated effective communication, ensuring participants fully understood the questions and were comfortable sharing their views. Furthermore, the instruments were pilot-tested to minimize potential distress or confusion, thereby enhancing clarity and appropriateness. The study also minimized the risk of harm by refraining from intrusive or sensitive questioning and by ensuring that data collection methods were conducted professionally and respectfully. Finally, findings were reported objectively and honestly, avoiding any misrepresentation of participants' views or experiences, thus upholding the integrity of the research process.

Results and Discussion

This section presents and discusses the study's findings.

Farmers' Level in the Adoption Process of the Palay Check Technologies

Table 1. *Farmers' Level in the Adoption Process of the Palay Check Technologies*

Palay Check Technologies	*Levels of the Adoption Process*									
	Awareness		*Interest*		*Evaluation*		*Trial*		*Adoption*	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Seed Quality	19	10.54	12	6.49	8	4.59	2	1.08	143	77.3
Land Preparation	75	40.49	24	13.02	1	0.54	1	0.54	84	45.41
Crop Establishment	2	1.08	10	5.44	71	38.38	6	3.24	96	51.86
Nutrient Management	1	0.54	7	3.78	52	28.37	21	11.09	104	56.22
Water Management	2	1.08	38	20.44	40	21.62	1	0.54	104	56.32
Pest Management	86	46.49	8	4.32	10	5.41	32	17.3	49	26.48
Harvest Management	3	1.62	6	3.24	5	2.7	6	3.25	165	89.19

Table 1 presents the distribution of farmers across Rogers' five levels of the adoption process (i.e., Awareness, Interest, Evaluation, Trial, and Adoption) for each of the seven Palay Check technologies. The data reveals varying levels of adoption, with technologies like Harvest Management and Seed Quality showing high adoption rates (89.19% and 77.3%, respectively), while others, like Land Preparation and Pest Management, show more farmers at earlier stages. The uneven adoption levels suggest that while some technologies are well-integrated into farming practices, others face barriers at earlier stages of the adoption curve. For instance, Crop Establishment shows a high percentage in the evaluation stage (38.73%), indicating farmers are still assessing its feasibility. This underscores the need for improved training with clearer demonstration of benefits or better alignment with farmers' capacities, especially for technologies with low adoption. Samoy-Pascual et al. (2021) and Nguyen and Dao (2022) emphasize that integrated systems like Palay Check require a holistic understanding and tailored support. Adamsone-Fiskovica and Grivins (2022) argue that continuous farmer feedback is essential, as reflected by the data that adoption is not uniform and must be monitored systematically. The variation also aligns with Arslan et al. (2022), who identify technology-specific traits and systemic influences as key factors in adoption.

Test of Relationships Between Profiles and Farmers' Adoption of Palay Check Technologies

Table 2. *Computed Chi-square Values between Selected Respondent Profiles and Adopted Palay Check Technologies*

Palay Check Technologies	*Sex*	*Religion*	*Civil Status*	*Educational Attainment*	*Tenure Status*
Seed Quality	9.730*	6.716ns	3.742ns	1.635ns	4.080ns
Land Preparation	1.320ns	. 076ns	.210ns	1.508ns	.358ns
Crop Establishment	4.980*	7.869ns	1.993ns	1.324ns	.664ns
Nutrient Management	.055ns	2.680ns	2.088ns	6.371*	8.119*
Water Management	.820ns	9.426ns	2.460ns	3.140ns	4.110ns
Pest Management	.000ns	12.213ns	1.245ns	2.981ns	2.250ns
Harvest Management	1.867ns	1.234ns	4.094ns	.733ns	1.696ns

*** Highly significant at 1% *Significant at 5% ns- Not significant*

Table 2 shows the statistical significance of relationships between socio-demographic variables (e.g., sex, religion, civil status, education, tenure status) and the adoption of Palay Check technologies. Significant associations were found between sex and adoption of seed quality and crop establishment. A significant relationship was also found between educational attainment and tenure status with nutrient management.

The findings suggest that sex, educational attainment, and tenure status significantly influence the adoption of certain Palay Check technologies. For example, the association between sex and technologies like seed quality and crop establishment reflects gendered roles in decision-making and labor allocation. Extension programs must consider these demographic factors when designing interventions. Gender-sensitive training and inclusive outreach strategies could improve adoption rates, especially for technologies with low uptake. Rosales et al. (2024) highlight how gender roles can constrain adoption, particularly among women. Meanwhile, Abdul-Rahman et al. (2021) affirm that education enhances farmers' ability to understand and apply innovations. Arslan et al. (2022) also note that land tenure influences adoption as owners are more likely to invest in long-term technologies.

Table 3. *Computed Spearman Correlation between Selected Respondent Profiles and Adopted Palay Check Technologies*

Palay Check Technologies	*Age*	*Income*	*Affiliations*	*Years in Farming*	*Household Members*	*Farm Size*
Seed Quality	.048ns	180*	.093ns	.073ns	-.124ns	219**
Land Preparation	-.084ns	.015ns	.015ns	-.067ns	.012ns	-.023ns
Crop Establishment	.057ns	.254**	.090ns	-.003ns	-.024ns	.145*
Nutrient Management	.056ns	.132ns	.159*	.042ns	-.084ns	0.75ns
Water Management	.097ns	.104ns	.176*	.086ns	.078ns	0.67ns
Pest Management	.109ns	.225**	.132ns	.116ns	.178*	.143ns
Harvest Management	-.007ns	-.163ns	.004ns	.066ns	-.108ns	-.133ns

*** Highly significant at 1% *Significant at 5% ns- Not significant*

This table presents correlation coefficients between continuous variables (e.g., age, income, affiliations, years in farming, household size, farm size) and adoption of Palay Check technologies. Significant positive correlations were found between income and technologies such as Seed Quality, Crop Establishment, and Pest Management; between affiliations and technologies such as Nutrient and Water Management; between the number of household members and Pest Management; and between farm size and technologies such as Seed Quality and Crop Establishment. Higher income and larger farm size are positively associated with technology adoption, suggesting that economic capacity and land access facilitate the adoption of innovation. Interestingly, age and years in farming showed no significant correlation, indicating that experience alone may not drive adoption.

Findings imply that programs aiming to increase adoption should prioritize financial support mechanisms and land access policies. Smallholders may need targeted subsidies or access to credit to overcome economic barriers. Samoy-Pascual et al. (2021) and Lan et al. (2025) emphasize that access to capital is a major determinant of adoption. Nguyen et al. (2021) note that larger farms are more likely to adopt innovations due to economies of scale.

Problems Encountered in Adopting Palay Check Technologies and Recommended Solutions

Table 4. *Problems Encountered by Farmers in Adopting Palay Check Technologies*

Problems (n = 185)	*Frequency*
Financial difficulty	137
Insufficient water supply	83
Hassle in loan application	36
Inactive members in the training	24
Infestation of pest and diseases	20
Old aged and sick farmers	9
Political affiliation	7
Tenancy problem	2
Cannot understand the module	1
Extensive use of chemical fertilizer and pesticide	1
None	18

Table 4 lists the challenges faced by farmers, with financial difficulties (n = 137) and insufficient water supply (n = 83) as the most frequently cited problems. Other issues include loan application hassles, inactive training members, pest infestations, and political or tenancy-related constraints. The dominance of financial and infrastructural barriers indicates systemic limitations that hinder adoption, while training-related and institutional issues suggest that even well-designed technologies may falter without adequate support.

Thus, addressing these barriers requires multi-sectoral collaboration, including government support, improved irrigation infrastructure, and streamlined access to credit. Training programs must also be evaluated for effectiveness and inclusivity. Alvarez et al. (2022) stress the importance of monitoring extension services. Lan et al. (2025) and Arslan et al. (2022) highlight financial constraints and tenancy issues as major obstacles. Adamsone-Fiskovica and Grivins (2022) advocate for continuous feedback loops to refine training and support systems.

Table 5. *Suggested Solutions Identified by the Farmers*

Solutions (n = 86)	*Frequency*
Improve the water system by having an irrigation project	31
Commercial organic fertilizers and pesticides should be available in the market	30
In-depth assessment and evaluation from the training agency	13
Direct assistance from the government	10
Provide loans for farmers	6
Follow the technology in Palay Check	1

Table 5 presents farmer-proposed solutions to adoption barriers. The most common suggestions were irrigation projects (n = 31) and availability of organic inputs (n = 30 responses), followed by calls for training evaluation, government assistance, and loan provision. Farmers are not passive recipients; they actively propose practical, context-specific solutions. Their emphasis on infrastructure and input availability reflects a desire for systemic support rather than isolated interventions. Therefore, policymakers and extension agencies should incorporate farmer feedback into program design. Participatory approaches that empower farmers to co-create solutions can enhance adoption and sustainability. Adamsone-Fiskovica and Grivins (2022) and Alvarez et al. (2022) emphasize the value of farmer feedback in shaping effective interventions, much like Hidayat et al. (2022) and Rosales et al. (2024), who highlight the importance of community-driven solutions and responsive training systems.

Conclusions

The Palay Check System technologies had a positive impact on the lives of rice farmers who attended the training, enhancing their knowledge and skills across various practices and enabling them to evaluate the technology's benefits. Using Rogers' theory of adoption, it was found that the majority of respondents had already reached the adoption stage. Despite the challenges they encountered, farmers embraced the Palay Check technologies, likely because rice farming is their primary source of income. Factors such as the farmers' age and years of farming experience did not significantly influence adoption. However, variables including sex, religion, civil status, educational attainment, tenure status, income, organizational affiliation, household size, and farm size were found to affect adoption rates. These findings suggest that, regardless of age, farmers who rely primarily on farming as their livelihood are motivated to adopt new technologies. Farmers with higher educational attainment showed better recognition of the advantages of the new technology and acquired the technical knowledge necessary for successful adoption. While farmers identified several constraints hindering the adoption of Palay Check technologies, financial difficulties were the most commonly reported barrier. Nevertheless, despite low incomes derived from farming and other challenges, these farmers remained determined and committed to continuing their practices.

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