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Research Article

Sustainable Practices for Rice Agripreneurs

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ABSTRACT

This study, "Sustainable Practices of Rice Agripreneurs," examines how rice agripreneurs in Villasis, Pangasinan, can integrate organic farming, modern farming methods, and smart farming activities into improving the sustainability of agriculture. Although technology has been developed, barriers to access to new technology by many farmers include limited capital, technical skills and training, creating a disparity between the non-modern and modern farming systems. It utilized a quantitative descriptive study design based on validated questionnaires given to 35 registered agripreneurs of rice in Villasis, Pangasinan. Statistical analysis was used to interpret data in terms of frequency, percentage, weighted mean, and Pearson correlation, to determine sustainable practices and their association with business profiles. This research is also anchored in the UN-SDGs 1, 2, 4, 10, 12, 15, and 17. The majority of the respondents possess vast agribusiness experience, operate small to medium-size farms, most of which are rented. Most common was modern farming practices (AWM = 3.28), then organic farming practices (AWM = 2.89), and then smart farming tools were sometimes practiced (AWM = 2.21). These results show that despite the use of sustainable practices by agripreneurs, there is minimal technological practice. The findings of the study showed that business profiles and sustainable practices did not show any correlation, which suggests the same adoption regardless of experience or size of farms. The results are concluding that rice agripreneurs are more sustainability oriented, but they need to have a greater access to technology, funding, and institutional support. It proposes introduction of the GreenGrain: Empowering Sustainable Rice Agripreneurs to Inclusive Growth, the extension program that enables education, e-literacy, and other eco-friendly

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innovations to enhance productivity, profitability and environmental sustainability.

Keywords: *Modern farming techniques, Organic farming, Rice agripreneurs, Smart farming tools, Sustainable practices*

Background

Rice continues to be the staple of food security and a major means of livelihood to thousands of Filipinos, as it is the source of income and nutrition to rural Filipino communities (Delas Alas et al., 2024). Nonetheless, growing rice in the Philippines is perpetually facing threats, such as climate change, water shortage, rising costs of inputs, and unfriendly farming technology (Bo and Mutuc, 2019). Access to technology, education, and institutional support of smallholder farmers adds to these problems and prevents their potential adoption of sustainable and innovative farming systems (Alamgir et al., 2021).

Sustainable agriculture, which Sekhar et al. (2024) affirm, advances the aspect of integrating traditional knowledge and contemporary agricultural practices to increase productivity and environmental resiliency. However, the uptake of this kind of practices in local rice agripreneurs is minimal because of financial constraints and technical training (Briones et al., 2024). Though the government programs and digital solutions have been launched to establish eco-friendly farming, a number of local farmers do not know or cannot utilize these opportunities (Abioye et al., 2022).

Within Villasis, Pangasinan, the shift to sustainable agriculture is slow and lumpy as most rice agripreneurs persist in the use of conventional farming techniques. Therefore, the aim of this study was to evaluate how much rice agripreneurs use organic, modern practices, and smart farming in their activities. The study is pegged on the United Nations Sustainable Development Goals which aim to alleviate poverty, secure food, engage in sustainable production, and enhance partnerships in the field of agricultural innovation.

Methods

Subsection 1

The research design used in the study was quantitative-descriptive research design in order to determine the level of sustainable farming practices in rice agripreneurs. The method was appropriate in profiling the present level of adoption in the various farming categories.

Subsection 2

The study was carried out in Villasis, Pangasinan, particularly barangays Bacag, Barangobong, San Nicolas and Tombod. The 35 respondents were registered rice agripreneurs, chosen using purposive sampling because of the following criteria: registered in the Municipal Agriculture Office registry, had at least one harvesting cropping season in the previous 12 months, personal involvement in agribusiness beyond primary production (e.g. direct marketing, input sales), and voluntary informed consent. All these criteria guaranteed that the participants were real agripreneurs, who had practical experience in sustainable farming operation.

Subsection 3

Data on business profile and sustainable practices (organic, modern, smart farming) were collected with the help of a structured questionnaire. In order to have validity and reliability, three experts reviewed the draft and evaluated each item based on its relevance and clarity. The instrument was refined using their contribution. The questionnaire was then piloted on 30 rice agripreneurs of a nearby barangay that had similarities with the target respondent but did not form part of the final sample of 35.

Subsection 4

Frequency and percentage were used to analyze the data and describe business profiles, AWM to establish the level of sustainable practices, and Pearson Product-Moment Correlation to establish the relationships between business profiles and sustainability practices. The interpretation of the AWM results was provided on the basis of a 4-point scale with the following descriptive equivalents: 3.50-4.00 (Always Practiced - always applied, with some discrepancies), 2.50-3.49 (Practiced - often applied, but not always with full integration), 1.50-2.49 (Sometimes Practiced - occasionally applied), and 1.00–1.49 (Rarely Practiced – seldom done, requiring greater support). This enabled every mean calculated to have its own qualitative connotation, a clear indication of the level of adoption of the various sustainable practices quantified.

Result and Discussion

Table 1. Business Profile of Rice Agripreneurs

n=35

Variables	Indicators	Frequency	Percentage
Years of Experience in Agribusiness	1-5 years	5	14.3
	6-10 years	7	20.0
	11-15 years	5	14.3
	16-20 years	2	5.7
	> 20 years	16	45.7
Size of The Farm	1-3 hectares	16	45.7
	4-6 hectares	10	28.6
	7-9 hectares	5	14.3
	> 9 hectares	4	11.4
Type of Land Ownership	Own land	13	37.1
	Rent/ Leased Land	20	57.1
	Family Heritage Land	1	2.9
	Co-Owned Land	1	2.9
Rice Farming Cycle	Twice a year	30	85.7
	Three times annually	3	8.6
	Four times annualy	2	5.7
Pest Control Frequency	Once a month	3	8.6
	Twice a month	22	62.9
	Biweekly	5	14.3
	Weekly	4	11.4
	Daily	1	2.9
Fertilization Frequency	Once per season	1	2.9
	Twice per season	28	80.0
	Thrice per season	6	17.1

The findings show that the majority of rice agripreneurs are very experienced with 45.7 percent having over 20 years' experience in agribusiness which means that they have ample practical experience in farming gained over a long period of time. Conversely, the number of people with 16 – 20 years of experience is only 5.7%. With regards to the size of their farm, 45.7% of respondents operate small to medium farms between 1 and 3 hectares and only 11.4% operate large farms which are above 9 hectares, which indicates limited access to large landholdings. In terms of land tenure, more than half of the respondents have a farm on rented or leased land to 57.1% with only 37.1% owning their land implying that land cost and ownership restriction is also a factor that affects farming practices.

The production outcomes indicate that 85.7 percent of rice agripreneurs are those who produce rice twice yearly, which is the most acceptable and viable farming cycle with only 5.7 percent producing four times a year. The pest control practices show that 62.9 percent of the respondents use pest control practices twice a month and only 2.9 percent use them on a daily basis, showing that they are more inclined to use sustainable and economical pest control practices. In addition, 80.0 percent of the respondents use fertilizer twice in each growing season with only 2.9 percent using it once showing that they follow balanced and efficient fertilization practices. Comprehensively, the findings indicate that agripreneurs who are experienced and have small to medium-sized farms use moderate and sustainable production systems to manage resources and sustain productivity well.

Table 2. Sustainable Practices of Rice Agripreneurs in term of Organic Farming

Indicators	Weighted Mean	Descriptive Equivalent
1. Organic fertilizers (e.g., compost, vermicast) are used to enhance soil quality.	2.80	Practiced
2. Animal waste and natural soil enhancers are incorporated into the farming routine.	2.11	Sometimes Practiced
3. Farm waste is regularly composted to create fertilizer.	2.89	Practiced
4. Crop rotation is practiced to maintain soil nutrients and productivity.	3.17	Practiced
5. The use of synthetic pesticides and herbicides is avoided.	2.89	Practiced
6. Natural repellents and biological controls are relied upon to manage pests and diseases.	2.80	Practiced
7. Traditional planting techniques that protect the environment are practiced.	3.74	Always Practiced
8. Complementary crops (e.g., legumes) are grown alongside rice to support soil balance.	2.37	Sometimes Practiced
9. Organic seeds are produced and stored for future planting.	2.66	Practiced
10. Participation in organic farming seminars and trainings is maintained to enhance farming knowledge.	3.51	Always Practiced
Average Weighted Mean	**2.89**	**Practiced**

Table 2 presents the results of organic farming. The mean score was 3.74 that agripreneurs of rice said that they used Traditional planting methods that conserve the environment, which implies that they are always practiced. This implies that rice agripreneurs use traditional knowledge to perpetuate their farming practices. Conversely, the lowest score of 2.11, or "Always Practiced," on the scale was on "Animal waste and natural soil enhancers are incorporated into the farming routine," which suggests more of a structural constraint than a mere lack of resources: the slow, resource-intensive nature of organic nutrient management is in direct competition with precarious off-farm livelihoods, while organic inputs are either unavailable or unsubsidized These practices can be more effectively embraced by rice agripreneurs with the support of systems, including the availability of organic inputs, practical training and community composting or waste management initiatives.

Table 3. Sustainable Practices of Rice Agripreneurs in term of Modern Farming Techniques

Indicators	Weighted Mean	Descriptive Equivalent
1. Mechanized equipment is used for planting and harvesting rice.	3.80	Always Practiced
2. Soil is tested for dryness before applying fertilizers.	2.49	Sometimes Practiced
3. Climate-resilient and high-yield seed varieties are adopted.	3.63	Always Practiced
4. Irrigation is scheduled based on the rice plant's growth stages.	3.91	Always Practiced
5. Water-saving irrigation methods (e.g., alternate wetting and drying) are used.	3.69	Always Practiced
6. Weed control techniques that reduce chemical usage are implemented.	3.51	Always Practiced
7. The rice cropping calendar is planned based on weather patterns.	3.46	Practiced
8. Livestock or poultry is integrated with rice farming to promote sustainability.	2.17	Sometimes Practiced
9. Pesticides are applied safely and at appropriate times when needed.	3.71	Always Practiced
10. Production is tracked using basic record-keeping methods such as logs.	2.40	Sometimes Practiced
Average Weighted Mean	**3.28**	**Practiced**

Table 3 outlines modern farming techniques. Results show that "Irrigation is scheduled based on the rice plant's growth stages" had the highest mean of 3.91, or "Always Practiced," which indicates rice agripreneurs' awareness of proper water management for improving crop productivity. In contrast, "Livestock or poultry is integrated with rice farming to promote sustainability" obtained the lowest mean of 2.17, indicating "Sometimes Practiced," which suggests limited integration due to resource or facility constraints, as well as a lack of institutional or technical support systems to encourage its adoption.

Table 4. Sustainable Practices of Rice Agripreneurs in term of Smart Farming Tools

Indicators	Weighted Mean	Descriptive Equivalent
1. Drones or satellite technology are used to monitor crop health and assess pest infestations.	1.06	Rarely Practiced
2. Smart technology is used to monitor soil health for sustainable farming.	2.06	Sometimes Practiced
3. GPS-guided tractors or automated machinery are used for planting, fertilizing, or harvesting.	2.91	Practiced
4. Precision irrigation systems (e.g., sprinklers, moisture sensors) are used to manage water.	1.97	Practiced
5. Automated planting machines (e.g., rice transplanters) are used for seedling planting.	1.54	Sometimes Practiced
6. Soil sensors are used to monitor and maintain soil health and nutrient levels.	1.23	Rarely Practiced
7. Weather forecasting apps are used to schedule planting and harvesting.	3.23	Practiced

Indicators	Weighted Mean	Descriptive Equivalent
8. Smart irrigation systems are used to regulate water usage efficiently.	3.37	Practiced
9. Digital record-keeping systems are used to track farm activities and costs.	2.11	Sometimes Practiced
10. Automated pest control systems are used to manage insect and disease threats.	2.57	Practiced
Average Weighted Mean	**2.21**	**Sometimes Practiced**

Table 4 shows that among smart farming tools, the use of " Smart irrigation systems are used to regulate water usage efficiently" had the highest mean of 3.37 or "Practiced", indicating that rice agripreneurs is using irrigation system for efficient water usage. In contrast, "Drones or satellite technology are used to monitor crop health and assess pest infestations" had the lowest mean of 1.06 and is "Rarely Practiced", due to high costs or limited access. Providing training and access to affordable organic inputs can help rice agripreneurs apply these practices more effectively and sustainably.

Table 5. Summary of the Level of Sustainable Practices of Rice Agripreneurs as to Organic Farming, Modern Farming Techniques, and Smart Farming Tools

Variables	Average Weighted Mean	Descriptive Equivalent
a. Organic Farming	2.89	Practiced
b. Modern Farming Techniques	3.28	Practiced
c. Smart Farming Tools	2.21	Sometimes Practiced
Overall Average Weighted Mean	**2.79**	**Practiced**

Table 5 summarizes the overall weighted mean of the three variables related to sustainable practices among rice agripreneurs: organic farming, modern farming techniques, and smart farming tools. The overall average weighted mean for these variables is 2.79, with a descriptive equivalent of Practiced, indicating that rice agripreneurs generally apply sustainable practices. The weighted mean of first variable, organic farming was 2.89 with Practiced being the mean. Modern farming techniques were the second variable with an average weighted mean of 3.28 (Practiced). The third variable, smart farming tools, had an average weighted mean of 2.21, which was sometimes practiced. This means that agripreneurs in rice are moving towards sustainable practices which is reflected in the largest weighted mean of the modern farming practices. The high-weighted mean indicates that the rice agripreneurs tend to be more consistent in adopting advanced yet practical practices which directly increase productivity, like mechanization, balanced fertilization, and irrigation.

Table 6. *Relationship Between the Business Profile of Agripreneurs and Their Level of Sustainable Practices*

n = 35

Profile Variable	X^2 Value	Df	p-value	Decision on H_0	Interpretation
1. Years in Agribusiness	12.8	12	0.381	Not rejected	No significant association
2. Size of Farm	8.35	9	0.499	Not rejected	No significant association
3. Type of Land Ownership	6.093	9	0.737	Not rejected	No significant association

Profile Variable	X^2 Value	Df	p-value	Decision on H_0	Interpretation
4. Rice Farming Cycle	1.73	6	0.943	Not rejected	No significant association
5. Maintenance of Crop					
5.1 Pest Control Frequency	4.04	12	0.983	Not rejected	No significant association
5.2 Fertilization Frequency	3.16	6	0.789	Not rejected	No significant association

The association between agripreneurs' business profile factors and their level of sustainable practices is shown in Table 6 above. The study found no strong relationship between the profile characteristics and the level of sustainable practices, as all p-values were greater than 0.05. The null hypothesis was retained. This means that variations in years engaged in agribusiness, farm size, type of land ownership, rice farming cycle, and crop maintenance practices, such as pest control and fertilization frequency, do not significantly influence the respondents' level of sustainable practices.

It implies that the sustainability level of rice agripreneurs is not that different when it comes to their personal and business profiles. That is, new and experienced farmers are likely to practice similar degrees of sustainable farming practices. Rather, it implies that access to training, resources, and awareness is what affects adoption. Rice agripreneurs understand the sustainable practices but cannot afford it due to financial constraints and lack of support and that is why training and government support are necessary.

Conclusion

The findings indicate that the majority of rice agripreneurs are the ones with a long history of working in the agribusiness and run small to medium farms, which enables them to monitor and use the resources effectively. Most of them, however, fall on rented or leased land which might restrain long-term investment and innovation. Nevertheless, they use standard crop rotation, and use pesticides and manure regularly, which are indicative of practical and disciplined farm management. The research also reveals that rice agripreneurs embrace sustainable practice by using organic and modern farming techniques, but there is a low use of smart technologies. This implies that further education and encouragement is required to enhance the use of data-driven and precision farming methods. The College of Business Management and Accountancy can use the proposed extension program to enhance sustainable practices among rice agripreneurs further. This is suggested to be adopted by local government units in collaboration with the Department of Agriculture and enact the proposed extension program and reinforce training in addition to availing access to organic inputs. Subsidies on modernization of farms in terms of equipment, development of irrigation and climate-resistance seeds are also supported. Furthermore, collaboration between government agencies and the private sector is recommended to provide affordable smart technologies, digital skills training, and financial assistance to enhance productivity and sustainability among rice agripreneurs.

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