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# Empowering Rice Farmers in Nueva Ecija, Philippines: A Strategic Approach to Boosting Income through Special Purpose Rice Production

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## Abstract

Low income is the main problem of millions of farmers who are cultivating 4.81 million hectares in the Philippines. This problem is attributed to challenges specifically low yield, low quality of produce, and significant post-harvest losses, particularly in a resource-scarce setting. This study aimed to help increase the farmers' income in selected towns of Nueva Ecija through the promotion and use of special purpose rice production technology. Twenty (20) farmer-cooperators in three towns of Nueva Ecija were selected to demonstrate the production technology covering a total area of 4.75 hectares during the dry season, and 3.3 hectares during the wet season, both in 2023. Extension modalities such as training, techno-demo establishment, information material and technical assistance provision, and market linkage were undertaken to enhance their knowledge, attitude, and skills on special rice production and enterprise. The study utilized the descriptive quantitative method wherein the data were gathered through surveys, specifically personal interviews. Results showed that 70% of the farmer-cooperators were male and 60% were living below the poverty threshold. The farmers were 53 years old on average and engaged in farming as their primary source of income. The average yield of special purpose rice particularly the CLS-2 variety was higher (6.46 MT/ha and 6.22 MT/ha during dry and wet seasons, respectively) than that of inbred or non-special rice. The income per hectare from special purpose rice production per hectare was Php 75,420.00, which is higher than that of regular rice at Php 29,389.00, giving a higher benefit of Php 46,031.00. The

technology adopters and area planted increased (from 6 to 9 and from 1.4 hectares to 2.75 hectares, respectively) in Licab, Nueva Ecija. The opposite was true in Sto. Domingo and Guimba, Nueva Ecija where farmers were discouraged by the marketing issues that arose.

## Keywords

Special Purpose Rice, Technology Promotion, Extension Modality

## 1. Introduction

*Oryza sativa L.*, the most extensively cultivated rice species globally, serves as the primary dietary staple for an estimated 3.5 billion individuals worldwide [1]. Its cultivation and consumption are particularly pronounced within Asian communities [2]. Notably, China and India singularly contribute to roughly 50% of global rice production. When combined with Asian nations like Indonesia, Bangladesh, Vietnam, Myanmar, Thailand, the Philippines, Japan, Pakistan, Cambodia, the Republic of Korea, Nepal, and Sri Lanka, these countries collectively represent 90% of the world's total rice output [3]. In the context of the Philippines, approximately 4.81 million hectares of land area are dedicated to rice farming, yielding an estimated production of 19.96 million metric tons [4]. This shows that one-third of the country's land area is dedicated to rice [5]. Rice, locally known as "palay" in its raw form, "bigas" when milled, and "kanin" when cooked, holds significance within Filipino culture. Its importance is deeply embedded in historical narratives, cultural practices, and traditions across the three main islands: Luzon, Visayas, and Mindanao [6].

The conventional practices of rice farming, which is a staple in diets worldwide, encounter several sustainability obstacles. These predicaments adversely affect soil health and farmer incomes while causing water scarcity and excessive consumption of refined white rice-related medical issues [2]. The hurdles involved yield reduction or low-quality production, notable losses after harvests along with the need for high amounts of water resources—an issue that becomes pronounced amidst population growth trends and global warming concerns as these lead to limited availability [4].

Moreover, the consumption of rice has been associated with several health issues. Research indicates that an increased intake of rice could potentially lead to chronic conditions such as type 2 diabetes [7]. In addition, excessive consumption may escalate the risk of cardiovascular complications, skin ailments, and squamous cell carcinoma on the skin's surface due to certain varieties containing high levels of arsenic leading to bladder cancer [7]. The National Nutritional Council [8] highlights that regular consumption of white rice, especially among Asian adults, may heighten the risk of metabolic syndrome.

To overcome these challenges, rice strains with distinct purposes have been created. These are known as Special Purpose Rice (SPR) and boast a more desir-

able nutritional makeup that encompasses vital micronutrients, antioxidants, gamma-aminobutyric acid, and dietary fiber; setting them apart from typical white rice [9] [10].

The exceptional characteristics of SPR varieties like aroma, texture, and flavor make them highly sought after by the market. The special rice category comprises glutinous, aromatic, pigmented, japonica, and micronutrient-rich types that offer superior gastronomic experiences with excellent nutritional value. Pigmented rice is mainly black, red, and dark purple rice. It has been used for strengthening kidney function, treating anemia, promoting blood circulation, removing blood stasis, treating diabetes, and ameliorating sight in traditional Chinese medicine for it contains a variety of flavones, tannin, phenolics, sterols, tocols, y-oryzanols, amino acids, and essential oils [11]. Notably, SPR exhibits resilience to environmental stressors, aligning with the evolving preferences of consumers seeking superior grain quality, and commanding higher market value, particularly advantageous for smallholder farmers [12].

However, in nations like the Philippines, the volatile pricing of regular rice poses significant impediments to the profitability of small-scale farming operations, thereby heightening the levels of household food insecurity experienced [13]. Nonetheless, the cultivation of SPR presents a potential remedy by mitigating income risks through specialized market channels that recognize and reward the unique nutritional and functional attributes of these rice varieties.

A recent study highlighted the significant potential of SPR in augmenting the income of rice farmers. This potential stems from the rising demand for SPR coupled with its limited supply in both local and international markets. [14]. Envisioned enhancements in yield, consistent grain quality, and favorable pricing associated with SPR varieties suggest considerable potential for augmenting profitability among marginalized rice producers, while also addressing the evolving dietary preferences and health concerns.

In this sense, this research endeavors to delve into the prospective advantages of SPR production in uplifting the incomes of smallholder farmers through the facilitation of agro-enterprise development in the Philippines. Because for numerous years, rice price stability has remained elusive in the Philippines [15]. The primary objective revolves around fortifying income generation among SPR farmers through the implementation of collaborative agro-enterprise models. The study aims to offer insights and recommendations geared towards strengthening the economic sustainability of SPR cultivation, thereby advocating for sustainable rural development. Additionally, this study aims to help increase the farmers' income in selected towns of Nueva Ecija through the promotion and use of special purpose rice production technology. Through an extensive exploration of SPR's potential, this research endeavors to illuminate pathways that empower farmers and foster resilient and prosperous agricultural communities.

## 2. Materials and Methods

### 2.1. Time and Place of the Study

The study centered on three carefully selected municipalities in Nueva Ecija: Guimba, Licab, and Sto. Domingo. These areas were chosen based on the presence of farmers engaged in the production of SPR. The research explored the dry (December 2022-May 2023) and wet season (June-November 2023) production periods' dynamics.

### 2.2. Research Design

The research employed the descriptive quantitative approach, collecting data through surveys and on-site visits to establish technology demonstration areas focused on SPR. The findings were presented in an organized tabulated format for ease of comprehension.

Through purposive sampling, a non-probability technique used to select participants based on criteria relevant to the objectives of the study [16], 20 farmers were intentionally chosen as respondents. This method ensures that those selected possess valuable expertise and experiences necessary for effectively addressing research inquiries.

### 2.3. Extension Modality as Technology Promotion Activities

#### 2.3.1. Capability Building

As a component of the initiative aimed at building the capacity of farmers in the production and enterprise management of SPR, two participatory training sessions were organized. These sessions sought to augment the knowledge, attitudes, and skills of the participants. Farmer cooperators, agricultural technologists assigned in the barangays, and other interested individuals actively participated in these training events. Resource speakers and technical experts from CLSU facilitated the sessions, utilizing lecture discussions complemented by PowerPoint presentations, workshops, and open forums to effectively attain the specified learning objectives. Training programs were designed to equip farmers with the knowledge and skills needed to adopt modern and sustainable agricultural practices. These programs often cover a range of topics, including crop management, pest control, and the use of new technologies. Training can take the form of hands-on sessions, workshops, or even online courses, depending on the context and resources available [17].

#### 2.3.2. Techno Demonstration Farm Establishment

In order to highlight the practicality of SPR production technology, technology demonstration farms were set up in collaboration with selected farmer-cooperators across the three municipalities. They were provided with seeds and fertilizers as their start-up kit or post-training support to commence their enterprises. A total of 20 techno demonstrations on SPR, encompassing a combined area of 50,500 square meters, were established in these areas. Techno-demonstrations involve

showcasing the practical application of agricultural technologies on the farm. These demonstrations provide farmers with a firsthand view of new techniques and technologies, helping them understand the potential benefits and challenges. Techno-demonstrations often involve collaboration between researchers, extension agents, and farmers to facilitate learning and adoption [18].

#### 2.3.3. Information, Education, and Communication (IEC) Material Production and Dissemination

To support farmers, a leaflet outlining SPR production technology was developed as a convenient reference. Before finalization and printing, the leaflet underwent pretesting and was crafted in Filipino. Copies were reproduced and distributed to farmers and other interested individuals during training sessions, technical support visits, and field days. Additionally, an Audio-Visual Presentation (AVP) in Filipino was created, providing an eight-minute video guide on the different stages of SPR production. This AVP was played during farmer meetings and training sessions for discussion purposes. IEC refers to the systematic process of generating, disseminating, and managing information to facilitate learning and understanding among target audiences. In agriculture, IEC strategies involve the development of materials and campaigns to raise awareness, educate, and encourage the adoption of best practices [19].

#### 2.3.4. Farmers' Field Day

The field day was organized to boost public awareness and enthusiasm for innovative technologies, like SPR farming. A single field day was arranged and attended by a total of 49 participants, including farmers, extension workers, and other stakeholders. A field day is an event organized to bring farmers together for a practical, on-site learning experience. It often includes tours of demonstration plots, interactive sessions, and discussions on best practices. Field days provide a platform for farmers to interact with experts, share experiences, and learn from each other [20].

#### 2.3.5. Assistance in Marketing

The farmers were organized into local groups within the area in order to produce a larger volume of products with the desired quality. The farmers then were linked to a buyer who offered a premium price.

### 2.4. Data Gathering

#### 2.4.1. Household Profiling

A household survey instrument was prepared and administered to collect baseline data and derive the socioeconomic and demographic profiles of the farmers in the community. The survey instrument was meticulously designed to capture relevant information on various aspects of their households, such as household members, economic activity, income, education, health, and living conditions. During the administration process, measures were implemented to ensure the reliability, validity, and accuracy of the gathered data. The generated socioeco-

nomic and demographic profiles provided a comprehensive framework to comprehend the farmers' characteristics and identify areas requiring attention. The collected data effectively depicted the socio-demographic attributes of the farmers, encompassing factors such as age, gender, education level, occupation, and income.

#### 2.4.2. Data Sheet Preparation

The project team established a well-organized data sheet that was distributed to the cooperators. This data sheet served as a tool for the farmers to document and monitor their observations, as well as record various direct and indirect costs associated with SPR production. These costs include expenditures on items such as seeds, fertilizers, pesticides, labor, and other relevant inputs. Furthermore, the data sheet featured designated sections to record sales data, including the quantity of unhusked rice sold, the price per unit, and the overall revenue generated.

#### 2.4.3. Focused Group Discussions

In addition to the monitoring activities and technical assistance, focused group discussions were also conducted with the cluster of farmers. These discussions provided a platform for in-depth conversations and exchange of ideas among the participants. The focused group discussions are structured to explore specific topics or themes relevant to the farmers' concerns and challenges. The participants had the opportunity to share their experiences, perspectives, and insights on these topics, as well as discuss potential solutions and actions to address them. The insights and outcomes from the focused group discussions have been documented and analyzed, providing valuable inputs for decision-making and further support to the cluster of farmers.

#### 2.4.4. Secondary Data from the LGU

Local Government Unit (LGU) served as the primary source of secondary data for gathering information on SPR in selected municipalities of Nueva Ecija. The LGU played a crucial role as a valuable data source, providing pertinent information on different aspects of SPR production in the target areas. This encompasses future data on historical production figures, trends, market conditions, government support programs, and other relevant data associated with SPR.

### 2.5. Methods of Analysis

The demographic and economic analyses were analyzed using descriptive statistics of key measures, such as mean, standard deviation, range, and percentages. The number of farmers and the area that was planted with SPR, the harvest report, and the economic analysis were measured and described in terms of average and return on investment. These measures were employed to provide a summary and descriptive analysis of the data. Apart from recording the revenue and cost of SPR production, a benefit-cost ratio analysis was conducted to assess the profitability of this venture.

### 2.6. Ethical Consideration

Farmers provided informed consent, while privacy safeguards protected their personal information. Precautions ensured no harm from treatments and technologies. Operations were adjusted to suit farmer's needs while respecting their culture and individuality. The project engaged stakeholders, including communities, businesses, and governmental organizations, from conception to evaluation. Sustainability and scalability were considered. The project team's commitment to ethical principles and responsible practices aimed to benefit farmers, communities, and the environment, creating lasting positive impacts.

## 3. Results and Discussion

### 3.1. Socio-Demographic and Economic Profile of the Respondents

The farmer-cooperators' socio-demographic and economic profile is summarized in Table 1. There were 20 farmer-cooperators in total, and 14 of them, or 70% were men. This situation is typical of the Philippines and demonstrates the predominance of males in agriculture [21]. According to them, 77% of the agricultural labor force is composed mainly of men, while the remaining 23% is women. The physical demands of the work in the sector are again blamed for this scenario.

The farmer-cooperators were 53 years old on average. This confirms a key issue of the sector that was predicted by the expert, that the Philippines will experience a catastrophic shortage of farmers in 10 - 12 years, which corresponds with the national average of 55 - 59 years [22]. This will threaten not only the plans for achieving rice sufficiency but also food security because of its effect on agricultural productivity. At the time of the study, 16 farmer-cooperators, or 80%, were married, with the exemption of four or 20%. This demonstrates that the farmers are responsible individuals who have their own families.

Based on the farmers' educational attainments, majority of them were college graduates (11% or 55%), followed by college level (3% or 15%), and vocational, high school, and elementary graduates with 2% or 10% each, respectively. Therefore, farmer-cooperators can learn new agricultural methods and be expected to pass that knowledge along to other farmers. In addition, they can relate to and reach other farmers in their areas thus, farmers play a crucial role in the diffusion of technology. As predicted, 19 out of 20 farmer-cooperators, or 95%, stated that their income came from farming. This confirms that since the Philippines is an agricultural country, agriculture is the primary source of income for farmers and rice is their staple food. This could be one reason they were interested in expanding their enterprise. With regards to their monthly income, majority or 60% of the cooperators lived below the poverty threshold and were considered poor [23]. It means that these 12 cooperators belong to 19.99 million Filipinos whose income cannot sufficiently meet their basic food and non-food needs. On the other hand, the remaining eight cooperators are earning a gross monthly income of more than 12,000.00 pesos.

**Table 1.** Farmer's socio-demographic profile.

| Profile | Frequency (n = 20) | Percentage (%) |
|---|---|---|
| **Sex** | | |
| Male | 14 | 70 |
| Female | 6 | 30 |
| **Age** (Years) | | |
| 30 - 40 yrs. old | 5 | 25 |
| 41 - 50 yrs. old | 2 | 10 |
| 51 - 60 yrs. old | 8 | 40 |
| 61 - 70 yrs. old | 4 | 20 |
| 71 - 80 yrs. old | 1 | 5 |
| Mean: 52.85 | | |
| SD: 12.54 | | |
| Range: 30 - 72 | | |
| **Marital Status** | | |
| Single | 4 | 20 |
| Married | 16 | 80 |
| **Educational Attainment** | | |
| College Graduate | 11 | 55 |
| College Level | 3 | 15 |
| Vocational | 2 | 10 |
| High School Graduate | 2 | 10 |
| High School Level | 0 | 0 |
| Elementary Graduate | 2 | 10 |
| **Primary Source of Income** | | |
| Farming | 19 | 95 |
| Government Employment | 1 | 5 |
| **Gross Monthly Income** | | |
| Below 12,000.00 | 12 | 60 |
| 12,000.00 - 20,000.00 | 2 | 10 |
| 20,001.00 - 28,000.00 | 2 | 10 |
| 28,001.00 - 36,001.00 | 2 | 10 |
| 36,001.00 - 44,000.00 | 1 | 5 |
| 44,001.00 - above | 1 | 5 |
| Mean: 14,811.92 | | |
| SD: 13,854.85 | | |
| Range: 3,637.67 - 50,000.00 | | |

### 3.2. Number of Farmers and Area Planted with SPR per Municipality during Dry and Wet Season 2023

The number of farmers and the area planted with SPR per municipality during the dry and wet seasons of 2023 is presented in Table 2. A total of 20 farmers from three municipalities planted SPR covering a total area of 4.75 hectares as a technology demonstration to show its viability to other farmers and stakeholders in dry season 2023. This shows that there is a stable interest and engagement among farmer-cooperators in the project.

However, there was a decline in the number of cooperators and planted areas in the municipalities of Sto. Domingo (from 8 farmers to 7 and from 1.6 hectares to 0.7 hectare) and Guimba (from 6 farmers to 4 and from 1.75 hectares to 0.4 hectare) during the transition from dry season to wet season, 2023. This decrease was attributed to the availability of trucks for the transportation of their produce and the freight cost which they found a significant amount that could be deducted from their profit due to the remote location of the partner buyer.

On the other hand, Licab exhibited a considerable increase in the number of technology adopters (from 6 - 9) and total planted area (from 1.4 hectares to 2.75 hectares) during the wet season. This positive trend indicates an increasing interest among farmers in SPR production.

### 3.3. Harvest Report of SPR per Municipality during Dry and Wet Season 2023

Table 3 reveals the SPR harvest of cooperators in three municipalities during the dry and wet seasons of 2023. During the dry season, the average harvest of the three municipalities was 6.46 metric tons per hectare where Licab has the highest yield of 6.54 metric tons per hectare followed by Sto. Domingo and Guimba are 6.47 and 6.38 metric tons per hectare, respectively.

During the wet season of 2023, the average yield of SPR in the three municipalities was 6.22 MT/ha where Licab also has the highest yield of 6.29 MT/ha compared to Sto. Domingo and Guimba, have an average yield of 6.21 and 6.16 MT/ha, respectively. The yield slightly declined compared to the dry season.

Table 2. Number of farmers and area planted with SPR per municipality during dry and wet season 2023.

| Municipality | Dry Season 2023 | | | Wet Season 2023 | | |
|---|---|---|---|---|---|---|
| | No. of farmer | Variety | Total Area Planted (ha) | No. of farmer | Variety | Total Area Planted (ha) |
| Sto. Domingo | 8 | CLS-2 | 1.6 | 7 | CLS-2 | 0.7 |
| Guimba | 6 | CLS-2 | 1.75 | 4 | CLS-2 | 0.4 |
| Licab | 6 | CLS-2 | 1.4 | 9 | CLS-2 | 2.75 |
| **Total** | **20** | | **4.75** | **20** | | **3.85** |
| **Average** | **6.67** | | **1.58** | **6.67** | | **1.28** |

**Table 3.** Harvest report of SPR per municipality during the dry and wet season of 2023.

| Municipality | Variety | Dry Season 2023 | | Wet Season 2023 | |
|---|---|---|---|---|---|
| | | Total Area (ha) | Average Yield (MT/ha) | Total Area (ha) | Average Yield (MT/ha) |
| Sto. Domingo | CLS-2 | 1.6 | 6.47 | 0.7 | 6.21 |
| Guimba | CLS-2 | 1.75 | 6.38 | 0.4 | 6.16 |
| Licab | CLS-2 | 1.4 | 6.54 | 2.75 | 6.29 |
| **Total** | | **4.75** | **19.39** | **3.85** | **18.66** |
| **Average** | | **1.58** | **6.46** | **1.28** | **6.22** |

Higher grain yield is usually achieved during dry season due to higher and longer light radiation from the sun particularly during flowering and filling of grains [24].

The average yield of SPR (CLS-2) is higher than that of NSIC Rc 160 (5.6 MT/ha), NSIC Rc 216 (6 MT/ha), NSIC Rc 218 (3.8MT/ha), and NSIC Rc 222 (6.1 MT/ha) [25]. This report is supported by the Rice Data Analytics Dashboard [26] where Nueva Ecija Province as the rice granary of the Philippines, has an average yield of 6.08 metric tons per hectare in the year 2022.

### 3.4. Production Cost and Income

To determine the benefits of the technology promotion and utilization of SPR production in Nueva Ecija, Philippines, income from yield was determined. Management practices and technology protocols were employed by the farmers. The income from the SPR by the clustered farmer-partners depends on the area planted. On average, the total yield harvested for one hectare was 5814 kg. during the dry season of the year 2023 and sold at P25/kg. (dry un-milled rice) with total cash sales of about P145,350.00 (**Table 4**). This result is higher compared to the yield per hectare of white rice in the region with 5130 kg. at a price of P17.65/kg. (dry un-milled rice) in the year 2022 with a total value of P90,545.00 [26].

Costs of production in planting of SPR were divided into labor and material inputs. Farmer-partners allocate the majority of their labor expenses to crop establishment, fuel and electricity, harvesting, and trucking with 87% of the total labor cost. Moreover, fertilizers incurred the majority of expenses for the material inputs with 75% shares. Their expenses merely depend on the size of the area they are planted with SPR and based on the result, the average cash cost of input was Php69,930 for one hectare. The production expense for SPR is a little bit higher compared to the production cost of white rice in the region with a total of P61,156.

The total benefits associated with the production of SPR and regular rice are presented in **Table 5**. The net benefit shows that the average net income for SPR is a total of Php75,420 per hectare, which is higher than Php29,389 for white

**Table 4.** Cost and return analysis of SPR production in Nueva Ecija, Philippines.

| PARTICULARS | Special Purpose Rice CLS-2 (1 hectare) |
|---|---|
| **I. Gross Income** | |
| Total Yield (kg) | 5814.00 |
| Price per kilogram (dry basis, Inst. Buyer) | 25.00 |
| **Total Gross Income** | 145,350.00 |
| **II. Expenses** | |
| **1. Labor** | |
| Land preparation | 4833.00 |
| Crop establishment | 11,458.00 |
| Fuel and Electricity | 10,043.00 |
| Harvesting | 12,221.00 |
| Drying | 2000.00 |
| Trucking | 12,800.00 |
| **Total Labor Cost** | 53,355.00 |
| **2. Materials Inputs** | |
| Seeds | 3000.00 |
| Fertilizers (Synthetic) | 12,373.00 |
| Pesticides (Synthetic) | 1200.00 |
| **Total Material Inputs** | 16,573.00 |
| **Total Expenses** | 69,930.00 |
| **IV. Net Income** | 75,420.00 |
| **V. Return on Expenses (%)** | 109.00 |
| **VI. Average Production Cost (P/kg)** | 12.03 |

**Table 5.** Benefit-cost analysis of SPR, Nueva Ecija, Philippines.

| Particular | SPR | Regular Rice* |
|---|---|---|
| Benefit | 145,350 | 90,545 |
| Cost | 69,930 | 61,156 |
| Net Benefit | 75,420 | 29,389 |
| Difference | 75,420 - 29,389<br>**46,031** | |

*Source: https://www.philrice.gov.ph/ricelytics/.

rice. This explained that planting SPR over regular rice benefits the farmer partners with an additional net income of Php46,031 per hectare. In addition, the resulting 109% return on expenses indicates that for every peso spent on SPR

production, there is a return of about Php1.09. In other words, the SPR is generating a profit of 109% over the total expenses in one production cycle. In support, the average cost of production per kilogram is lower (Php12.03) than the selling price (Php25) which is generally favorable as it means that less money is spent to produce a kilogram of SPR.

### 3.5. Problems Encountered and Recommended Solution to Improve the Utilization of SPR

Despite the successful promotion and the utilization of SPR technology in Nueva Ecija, Philippines, several challenges have emerged during its operation. The most notable issues include a lack of market for the harvested rice, susceptibility to insect pests, and low yields attributed to incorrect and excessive use of fertilizer. This summarizes that the yield of the crops is influenced by technological (agricultural practices), biological (diseases, insects, weeds), and environmental factors [27].

A comprehensive marketing strategy is essential to overcome the challenges of a limited market outlet. One of the primary solutions to address issues involves working alongside local government entities, fostering connections with retailers, and executing awareness campaigns specifically tailored to consumers.

In addition, exploring export opportunities or collaborating with businesses that specialize in niche agricultural products can help broaden the market reach. With the occurrence of insect pests particularly during the late stage of the crop, it is recommended to implement integrated pest management practices that involve a combination of biological, cultural, and chemical control methods. Educating farmers on pest identification and promoting the use of eco-friendly pest control measures can contribute to minimizing pest-related issues.

Moreover, encourage farmers to utilize the appropriate quantity of fertilizer and apply following the recommended number of days of the crop to address the issue of low yields. Establish monitoring systems to track the performance of SPR farms and implement advisory services that provide farmers with real-time feedback on corrective measures and best practices. This proactive approach can help contribute to the overall performance of SPR production, leading to a more resilient and successful agricultural system.

## 4. Conclusions

In conclusion, this study examines how SPR can help address the complex issues faced by traditional rice farming in Nueva Ecija, Philippines. The research offers a detailed analysis of the socio-demographic profiles of farmers who use SPR and highlights agriculture as their primary source of income. It also emphasizes that beyond being an alternative food option, implementing SPR could lead to economic progress for these communities.

The benefits of cultivating SPR are promising regarding sustainability efforts and mitigating health problems related to conventional rice consumption. Yield

data and cost-benefit analyses indicate significantly higher potential incomes when compared with standard rice varieties.

However, challenges like restricted market access, pest susceptibility concerns along difficulty applying fertilizers need tailored approaches such as smart marketing strategies, integrated pest management practices, or even education on optimal fertilizer usage. Implementing strategic interventions based on innovative measures would expand market reach and further safeguard crops against vulnerabilities thus fostering sustainable growth within agricultural landscapes.

## 5. Recommendations

This study underscores the need for collaborative endeavors among stakeholders—farmers, government entities, and industry participants—to fully harness the potential of SPR cultivation. Additionally, sustained research into soil health, environmental impacts, and comparative nutritional analyses would further enrich the knowledge base and contribute to sustainable agricultural practices.

In essence, this research spotlights SPR's promising trajectory in enhancing farmer incomes, fostering agricultural sustainability, and addressing dietary concerns. It underscores its potential as a cornerstone for sustainable rural development in the Philippines.

## Authors' Contributions

Each author made equal contributions to the study's conceptualization and design. All authors have reviewed and approved the final version of the manuscript for publication.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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