

Assessment of Key Players in the Special Rice Value Chain in Nueva Ecija, Philippines

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Abstract

This study traced the special rice value chain, described the various players' roles, assessed the identified chains' performance, determined the constraints and opportunities, and identified interventions to improve the special rice value chain in the province. Key informant interviews with government and nongovernment organizations (NGOs) and surveys among different special rice value chain players were done. The special rice industry in Nueva Ecija is relatively limited and consists of aromatic, pigmented, and glutinous rice. The value chain mapping for special rice in Nueva Ecija starts downstream (traders) and moves upstream (input provider). Some of the identified constraints within the market levels of the chain are as follows: Farmers' limited access to affordable yet quality seeds, the volatility of the price of paddy rice in the market, and the rapid changes in the prices of production inputs, such as seeds, fertilizers, pesticides, and others. Moreover, natural factors like typhoons, floods, droughts, insect pests, and weeds were noted. One major problem identified by the institutional buyers was the limited demand for special rice. To improve competitiveness, the special rice industry should focus on developing and promoting pest-resistant varieties and cost-reducing technologies. Furthermore, promoting special rice among consumers is needed to increase demand and encourage more farmers to engage in special rice production. The government agencies should continue supporting special rice farmers not only in production but also in postharvest and marketing aspects. Provision of seminars, trainings, and machinery related to special rice is recommended. Regression analysis using backward method of analysis was found to be significant in three (3) variables, namely, household size, years in school, and labor.

Keywords

Constraints, Interventions, Value-Addition

1. Introduction

As a cereal grain, rice is the most widely-consumed staple food for a large part of the world's human population, especially in Asia. It is the primary source of carbohydrates for many Filipinos' dietary allowance. In the 2013 food consumption survey by the Food and Nutrition Research Institution [1] among Filipino households, rice was ranked first, followed by salt and cooking oil. In recent years, there has been a renewed interest in the production of special rice in the province of Nueva Ecija. This is partly due to the call for value-adding measures to help local farmers improve their farm income.

The special rice category includes glutinous, aromatic, pigmented, Japonica, and micronutrient-dense rice. Special rice are those varieties with excellent eating and nutritional quality. Glutinous rice (*Oryza sativa* var. *glutinosa*) is also called sticky rice, sweet rice, or waxy rice. Its raw grains have an opaque white color that becomes translucent after cooking, generally by steaming. In Asia, especially in ASEAN countries, it is an important specialty rice variety in various dimensions, such as food, socioeconomic, culture, and community security. Aromatic rice is medium- to long-grained rice known for its aroma and taste. According to [2], aromatic rice belongs to a small but important subgroup of rice that is highly regarded for its excellent aroma and superior grain quality. This kind of rice, especially Basmati and Jasmine, is traded in the local and global markets, where it commands a high price. Pigmented rice is mainly black, red, and dark purple rice. Like brown rice, black rice is rich in bran which contains purple anthocyanin pigments. The high pigment color is dark purple to black. Black rice is a source of anthocyanin that provides potential health benefits, including antioxidant, anti-inflammatory, anticancer, and antidiabetic properties [3] [4].

The Philippine Rice Research Institute [5] conducted a study on brown and pigmented rice varieties to address malnutrition in the Philippines, especially among marginalized groups. Brown rice is a source of B vitamins, minerals, and dietary fiber that can be made part of a person's diet. Suantai *et al.*, [6] demonstrated red Jasmine rice extract's nutritional value and biological activity on HSV, free radicals, and cancer cell inhibition.

Nueva Ecija has long been known as the "Rice Granary of the Philippines". It is the largest province and the biggest rice producer in Central Luzon, with a total land area of 318,284 hectares (ha) devoted to rice production.

However, special rice production in the province remains relatively limited. The production of traditional and modern varieties of special rice constitutes only 1.56% of the total rice production area. The average yield of traditional specialty rice varieties is 5.0 - 6.0 metric tons per hectare (MT/ha), while that of the modern varieties is 6.0 - 8.0 MT/ha. They are usually planted in lowland irrigated areas during the wet and dry seasons (PhilRice, 2013) [5]. Special rice production has a bright prospect. One farmer in the province stated that they were able to deliver an average milled rice of 5000 - 6000 kilograms (kg) every

cropping period to a processor. The yield is relatively lower than regular rice, but the income is higher due to higher milling recovery and price.

Special rice has great potential to increase the income of rice farmers due to increasing demand and a limited supply in the local and international markets. Based on the cost and return analysis for 1 ha of Basmati rice production during the dry season, the recorded net income was PHP 31079.20 for commercial, PHP 65753.10 for milled rice, and PHP 95055.57 for seeds [7]. The awareness of most Filipinos regarding special rice is still limited. Many rice farmers still grow regular rice, and only a few produce aromatic and pigmented rice. Considering the high potential of special rice, examining the province's special rice value chain to determine points of impact interventions is a must.

This study aimed to evaluate the special rice industry in Nueva Ecija. In particular, the study attempted to describe the socio-demographic and economic profile of the key players in the special rice value chain; map out the value chain of specific special rice in the province; identify, document, and analyze the various key players, their roles, and specific activities within the special rice value chain; assess the performance of the industry in terms of productivity and profitability to determine the constraints and opportunities of special rice in the province; and identify areas for improvement or intervention points to improve the special rice value chain in the province.

2. Materials and Methods

2.1. Time and Place of Research

Tracing the special rice value chain started in Nueva Ecija. The institutional buyers in the top three populated cities in the province were selected as the reference points for the study. According to the Philippine Statistics Authority's [8] data, the cities' populations were 302,231 for Cabanatuan City; 139,738 for San Jose City, and 110,303 for Gapan City. The rest of the respondents were identified based on chain tracing. Moreover, the movement of special rice within and outside the province was also considered when identifying the respondents.

2.2. Population and Sampling Procedure

The institutional buyers of special rice who had been in the business for at least one year were chosen. The route or chain of special rice was traced from the institutional buyers down to the farmers' level. The public market was the starting tracing point in the absence of an institutional buyer. The identified special rice value chains are aromatic rice, pigmented rice, and glutinous rice.

Primary data were gathered through a survey, specifically personal interviews with the respondents. Specific questionnaires were formulated and used for the special rice farmers, traders, institutional buyers, and millers.

Secondary data were collected from the Office of the Provincial Agriculturist of Nueva Ecija and the Office of the City Agriculturists (OCAs) and City Business Permit and Licensing Offices (CBPLOs) of the local government units of

Cabanatuan City, Gapan City, and San Jose City, Nueva Ecija. Furthermore, key informant interviews were done among representatives and staff of relevant government agencies and other stakeholders.

2.3. Methods of Data Analysis

Value chain analysis (VCA) is a process where a firm identifies the primary and support activities that add value to its final product and then analyzes these activities to reduce costs or increase differentiation [9]. Flowchart analysis was used to map the specific value chain for special rice from downstream to upstream. VCA begins downstream (traders) and proceeds to upstream players (input providers). It includes identifying the key players of the value chain, their respective roles and activities, logistics issues (inbound and outbound), external influences, products, information, and payment flow among the market levels. At least one shipment was traced from the product's origin to its final destination. All costs associated with each activity along the value chain, product volume, and quality changes were determined and quantified.

The descriptive statistics such as means, averages, and frequency distribution were estimated to describe the socio-economic characteristics of the respondents. The mean and average formula is described in Equation (1). The frequency is the number of times a particular value for a variable has been observed to occur. The relationship of income and selected independent variables were also determined using multiple regression analysis described in Equation (2).

$$x = \sum x/n \quad (1)$$

where x is the mean, $\sum x$ is sum of all data values, and n is sum of data items in sample.

$$Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + b_nX_{ni} + u_i \quad (2)$$

where Y_i is the dependent variable, b_0 is the intercept, $b_1 \dots b_n$ is the coefficient of Regression, $X_{1i} \dots X_{ni}$ is the independent variable, and u_i is the disturbance error.

After validating the information gathered and conducting a thorough analysis, the areas for improvement of the value chain were identified to provide specific policy recommendations.

3. Results and Discussion

3.1. General Characteristics of the Value Chain Actors

3.1.1. Seed Growers

Ten seed growers of special rice were included as respondents in the study. They were predominantly male (90%) and, on average, 55 years old, with the youngest being 33 and the oldest, 72. All were married (100%), affiliated with a relevant community organization (100%), and had been in school for an average of 13 years. They were all self-employed (100%) with an average monthly net income of PHP 353,928. The lowest net income reported was PHP 17,500, while the highest was PHP 1.2 million per month.

3.1.2. Farmers

A total of 60 farmers were covered by the study. They were predominantly male (90%) and, on average, 55 years old, with the youngest being 22 and the oldest 74 years old. Most were married (85%), and the group was about equally divided in terms of organizational membership, with those who reported no organizational membership comprising slightly more than 50%. They had been in school for an average of 10 years. The majority were self-employed (77%), while the rest were employed in either a government (10%), nongovernment organization (NGO) (8%), or private organization (3%). The average monthly net income of farmers was PHP 37,476. The lowest reported net income was PHP 2250, while the highest was PHP 500,000. Most of the farmers were owners (73%) of the land they tilled, while the rest were either tenants (23%) or lessees (3%). They had been farming for an average of 8 years. The shortest reported farming experience was 2 years, while the longest was 40 years.

3.1.3. Rice Millers

Five millers were interviewed for the study. Four (80%) of them were male. They were, on average, 53 years old. The youngest miller was 31 years old, while the oldest was 72. All but one (80%) were married, and all had an organizational affiliation (100%). They had been in school for an average of 13 years. All (100%) were self-employed, with an average monthly net income of PHP 80,000. The lowest reported income was PHP 60,000, while the highest was PHP 100,000.

3.1.4. Traders

Five traders took part as study respondents. Three (60%) were male. The average age of this group was 53 years. The youngest trader was 40 years old, while the oldest was 69. They were all married (100%), and three (60%) of the five traders reported having organizational membership. They had been in school for an average of 14 years. All (100%) were self-employed, although they were not keen on disclosing their income.

3.1.5. Rice Processors

Two processors, a male and a female, served as study respondents. One was 37 years old, while the other was 50 years old. One was married, while the other was still single, and both were Roman Catholics. They were self-employed with an average monthly net income of PHP 70,000.

3.2. Value Chain Map of Special Rice

The special rice industry in Nueva Ecija is composed of different key actors: input providers, special rice farmers, traders, and consumers (**Figure 1**). Market demand areas are in Gapan City, San Jose City, and Cabanatuan City, all in the province of Nueva Ecija, while some key players (*i.e.*, seed growers) and farmers operate outside the province. They were all considered since they were identified as part of the value chain.

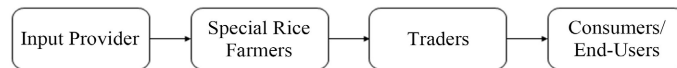


Figure 1. Special rice value chain map.

3.3. Roles of Key Players in the Special Rice Value Chain

The functions of each key player are presented in **Figure 2**. The details of the specific function of each player are discussed in the following sections.

3.3.1. Input Provider (Seed Growers)

Farmers who plant special rice for seeds are known as seed growers. They are responsible for providing special rice seeds to other farmers. Crop care and maintenance, harvesting, drying, storing, packaging, and marketing are all part of seed grower operations. They have a dedicated solar drying facility for special rice seeds to maintain the purity of the seeds. The moisture content (MC) of the stored seeds should be less than 12%. They directly sell the seeds to farmers, other agricultural suppliers, and seed centers.

3.3.2. Special Rice Farmers

Farmers who grow special rice are the most important players in the value chain. Their primary responsibility is to produce special rice that meets the quality requirements of traders and consumers. Planting, crop care and maintenance, harvesting (traditional/mechanized), drying, storing, packaging, and marketing are all part of their operations. Farmers sell their harvested rice in two forms: fresh (24% MC) and dried (14% MC).

3.3.3. Rice Millers

Rice millers are among the logistics providers in the special rice value chain. Their main business is to provide milling services to customers. One of the requirements of special rice consumers is the excellent quality of rice grains. Hence, owning a modern rice milling machine is important because a miller can produce good or whole rice grain. Rice millers also provide sacks or packaging material. The payment system to them is per kilogram of rice milled.

3.3.4. Traders

As wholesalers or retailers, traders are the special rice value chain players that buy produce in bulk. Traders buy directly from farmers through agents. They are involved in drying, milling, and marketing special rice. According to the agents, the traders set the rice price based on the quality and physical characteristics of the paddy rice, volume, and the marketing cost of hauling and packaging. The agents also serve as the traders' rice classifiers. They use sun and machine drying methods to dry their purchased special rice paddy. A trader in Gapan City, Nueva Ecija, owns a machine dryer commonly used on rainy days.

3.4. Relationship of Income and Selected Independent Variables

The relationship of income and selected independent variables was presented in **Table 1**. Regression analysis using backward method of analysis shows that the

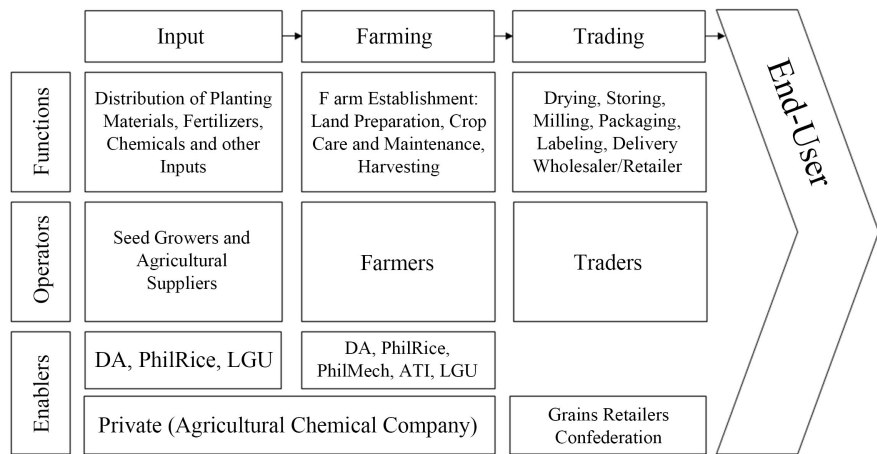


Figure 2. Functions of key players of the special rice value chain.

Table 1. Summary of multiple regression analysis between income from special purpose rice and selected independent variables.

Variables	Unstandardized Coefficients		Standardized Coefficient	t	Sig.
	B	Std. Error	Beta		
(Constant)	101130.373	33911.805		2.982	0.004
Household Size	-5503.040	3064.832	-0.219	-1.796	0.078*
Years in School	2932.231	1666.386	0.220	1.760	0.084*
Labor	1.118	0.375	0.372	2.977	0.004***
R ² = 0.217					
F-value = 4.907***					

***Significant at 1%, *Significant at 10%.

three (3) variables were found to be significant. The coefficient of determination (R²) was 0.217, it indicates that approximately 22% of the variation of the total income of farmers producing special purpose rice could explained by the three variables included in the model (household size, years in school and labor). The F-value was 4.907 with a p value of 0.004, indicating that the model was statistically significant.

The coefficient for household size was negative and significant at 10% level of significance while the years in school was statistically significant (0.084) and had a positive value. Also, the labor in producing special rice, which has the highest level of significance (0.004), had a positive value.

4. Conclusions

The study’s analysis revealed that the province’s production of special rice and its high domestic price were influenced by high production costs [10], lack of access to quality seeds resulting to low yields [11], insufficient infrastructure such as irrigation system, storage facilities, farm-to-market roads, and equip-

ment needed to prevent losses from exposure, pests, and natural deterioration [12] [13], high marketing costs due to rice price and road quality [14], and low consumer demand. Production costs in the Philippines were relatively higher than in Thailand and Vietnam by PHP 4 - 6 per kg [15]. Similarly, marketing costs were substantially greater in the country than in Thailand [14] [15].

High marketing costs in the Philippines are brought about by lower economies of scale and underutilized rice mills, high costs of transport and packaging, and high paddy prices that increase the cost of working capital. Moreover, the presence of many profit-seeking players involved in the chain has also contributed to the higher unit margin of rice [16].

Issues and concerns were identified by the special rice chain key players (*i.e.*, seed growers, farmers, institutional buyers, millers, and processors). Seed is one of the most critical single inputs in crop production. It significantly affects overall productivity. The farmers' limited access to affordable yet quality seeds is a major concern. Use of high-quality seeds results in high germination rate, lower seeding rate, more vigorous seedlings, and more efficient crop establishment, high-quality seeds are resistant against pests and diseases [17]. They also grow, mature, and ripe uniformly, which leads to more efficient harvesting activities. Concerning this, seed growers dealt with complaints from special rice farmers regarding the poor germination of seeds and requests for a lower price of seeds. Seeds that rice farmers claimed to have not germinated were replaced with new seeds. Over the past years, the major concerns of the rice farmers were the volatility of the price of paddy rice in the market and the rapid changes in the prices of production inputs, such as seeds, fertilizers, pesticides, and others [12] [13]. Another major concern was natural factors like typhoons, floods, droughts, insect pests, and weeds [18].

One major problem identified by the institutional buyers was the limited demand for special rice. According to them, selling special rice to ordinary people was difficult because of its high price. However, the demand for pigmented rice is increasing due to the consumer changing to a healthy lifestyle. As producers and traders, they understand the consumer's needs and wants, they lack access of consumers' information [19]. Some customers preferred to buy imported rice because it was cheaper than locally-produced rice [20]. In addition, the supply of special rice in the province was limited; hence, institutional buyers and even processors looked for it in other provinces.

Rice processors were concerned about inconsistent pricing or the lack of a fixed rate for glutinous rice. It was difficult for the processors to change prices because of the volatility of the cost of ingredients. In the Philippines, rice price stability has not ensured for many years [21].

The coefficient for household size was negative and significant at 10% level of significance. This implies that a decrease by one unit in the household size would reduce the income by P5503.04, other variables held constant. This is in line with the theoretical expectation that farmers who had more members in

their family to help in farming activities would be a great success in their work. This finding is consistent with the study of [22] that family size increases farmers tend to have and use more family labor which invariably reduces cost of production.

The total income in producing special rice and selected independent variables were analyzed using multiple regression analyses. This analysis was performed to determine the extent of effect of the six variables such as age of the farmer, household size, years in school, fertilizer, chemicals and labor with income derived in producing special rice.

Years in school was statistically significant (0.084) and had a positive value. This implies that more knowledge gained in school which enhances their ability to do proper and meaningful management in decision making would result for better production and income. Similar result on the study of [23] that education could influence the rice production commercialization. [24] also stated that education appeared to be an important factor in adoption decisions of new improved rice variety which is more productive that may result to higher income of the farmers.

Labor in producing special rice was the highest level of significance (0.004) and had a positive value. Farmers who have access on labor which is needed in rice production would be a more likely to become success. This result is similar with the finding of [24] that the most important factor affecting farmers income is the labor-land ratio. Additionally, the result obtained by [25] that rice production enterprise is labor expensive, hence, availability of labor is critical for it to succeed.

Household size, years in school and labor were significant variables affecting the income derived from producing special purpose rice. The R^2 was 0.217, which means that 22% of the variation of the total income from special purpose rice was explained by the three variables included in the model hold other things are constant.

5. Recommendation

To address the various problems and challenges of the special rice value chain actors, the following are the recommendations and suggestions to improve the competitiveness, emerging market, and crop production of special rice in the province. For farmers/seed growers, reduce operating expenses (labor) and material inputs (seeds, fertilizers, pesticides, and others) through the use of applicable technologies, such as farm machinery to reduce labor cost and organic fertilizers and biopesticides and other integrated pest management (IPM) practices to reduce cost on fertilizers and chemicals, improve soil condition, and promote environmental protection and human safety. Strengthen farmer organizations and cooperatives and promote an agro-enterprise clustering approach to enhance production and marketing activities and make special rice farming more efficient, economical, and profitable. For institutional buyers, strengthen part-

nerships, linkages, and collaboration with the government, nongovernment, and private sectors. Activities to be done by the institutional buyer and government and nongovernment agencies include promoting special rice and informing the consuming public of the health benefits of special rice. Special rice is not typically popular in the Philippines, especially in the province of Nueva Ecija. Institutional buyers should be consistent in buying/trading so that farmers will continue to produce special rice. And for government agencies, continue supporting special rice farmers not only in production but also in postharvest and marketing aspects. Providing seminars, training, and machinery related to special rice is recommended. Partnerships and linkages with other stakeholders should also be strengthened. Provide irrigation support in non-irrigated areas to sustain special rice farmers' production activities.

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Conflicts of Interest

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

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