Factors Influencing Rice Productivity in Rainfed Areas of Cagayan

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Abstract

The province of Cagayan, Philippines comprise of 30,653 hectares of rain fed land. The province's yield of 3.84 MT /ha. for rain fed low land is low compared to 4.2 MT/ha. for the region. Hence, the need to determine the factors influencing rice productivity in rain fed areas of Cagayan.These factors include farmers profile, cultural management, environmental and technological factors, marketing practices and support services. Respondents come from municipalities with highest, middle, and lowest average yield. Descriptive-correlational design was used. Farmers have farming experience of 25 years and reached primary education only. Farm operation is shouldered by farmers/land owners and additional expenses financed from traders/banks with 6% interest payable in 5 months. Environmental factors included flat lowland farms with loam/clay loam soil; and farm-to- market roads classified as cemented/ rough, climatic factors and insufficient water supply. Few farmers use hybrid seeds and follow straight line planting. Most farmers use inorganic fertilizers, foliar fertilizer and chemical based herbicides, insecticides, molluscides, fungicide and rodenticide. Farm activities from land preparation to harvesting are mostly manual. Farm mechanization is high during land preparation and use of thresher is higher than manual. Majority of farmers in the three categories sell their produce to traders. Support services are delivered by Department of Agriculture focus on seed selection, land preparation, soil nutrient management, pest and disease control, provision of farm inputs and farm planning and budgeting. Factors correlated with yield were harvesting practices, post harvesting practices, form of product sold, marketing practices, land preparation, pest and disease management, harvest time and nutrient management. Stochastic Frontier Analysis revealed that 16 and 23 farmers in the high and low yield municipalities, respectively, have yield higher than the predicted SFA during wet cropping season. Farmers in the middle yielded lower than the predicted SFA yield.

Keywords : : Rainfed, rice productivity, correlation, stochastic analysis

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Introduction

Cagayan, classified as first class province, is located in the north eastern part of mainland Luzon. About 94,470 hectares of irrigated land and 30,653 hectares of rain fed land in Cagayan is planted with rice. The average yield of 4.18MT/hectare during dry season for irrigated land, low land and upland and 3.84 MT /hectare during wet season for the same ecosystem is considered low(BAS, 2013). Yet, the province is considered as rice self-sufficient. The need to increase rice productivity in the province and other provinces in the region is necessary. The study aimed to determine the profile of rainfed rice farmers in Cagayan, the cultural management of rice farmers, the factors influencing rice productivity, support services accorded to rice farmers and to evaluate the yield and response to the factors affecting rice production.

Materials and Methods

Based on yield/area, municipalities were chosen considering the top three, middle three and the lowest three rice producers in the past five years. From these nine municipalities, three barangays with the biggest rice land area per municipality were taken as actual study sites. The stratified random sampling was used to get the proportional number of respondents from sub-populations across ecosystems. Sample sizes were determined using Slovins formula with a margin of error at 5%. Total number of respondents is 140 , 113 and 131 in the top 3, middle 3 and bottom 3, respectively.

Enumerators were hired to handle the survey and data collection. Data gathering was complemented with actual observations and documentation. Secondary data needed in the study was secured from files and reports of concerned agencies. Researchers, together with the statistician, designed an encoding template in Excel and data analysis using SPSS and Minitab statistical packages was done using descriptive statistics like frequency counts, percentages, means and standard deviation. Regression was employed to test any significant relationship of variables. **Stochastic Frontier Analysis (SFA)** was used to evaluate production efficiency of rice farmers.

Results and Discussion

Like other developing countries, production of rice is influenced by several factors (Ayoola et al., 2011). Most farmers in the three categories apply Inorganic fertilizers before transplanting and as top dressing. Only 5 farmer respondents applied four bags of organic fertilizers. Random transplanting is followed. Like in other rice growing countries, machineries are rarely used in rice production (van der Eng, 2004 and Devi, and Ponnarasi, 2009). Across the categories other farms activities like repair of dikes, seedbed preparation, planting practices, irrigating, fertilizer application, weeding, pest and disease control are done manually.

Farmers shoulder their farm expenses and most usually borrow additional capital at 6% interest payable in 5 months from banks and traders. Profile of farmer respondents is reflected in Table 1. Mean of quantity and total cost of some farm inputs are reflected in Table 2.

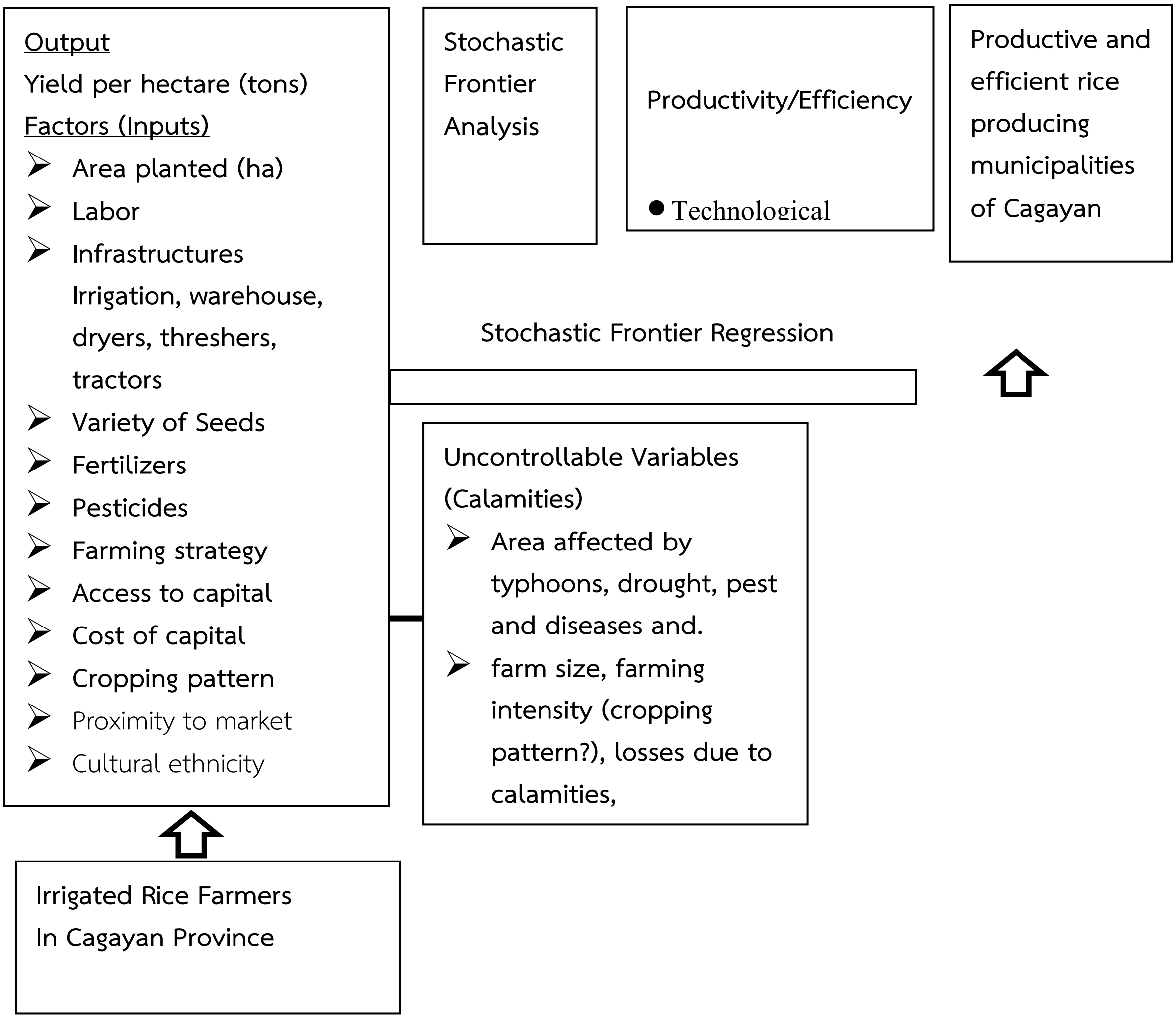

Figure 1.The SFA framework for evaluating rice production efficiency in Cagayan Valley Region

Table 1. Profile of Rain-fed rice Farmers in Cagayan

Profile	Categories		
	Top 3(N=140)	Middle 3(N=113)	Bottom 3(N=131)
Demographic Profile			
Mean age, years	49.2	49.3	49.4
Sex	71.1% male	79.3% male	
Ethnicity	100% Ilocano	100% Ilocano	78.6% Ilocano
Religion	80% Catholic	83.2% Catholic	89.3% Catholic
Household Size, mean	4.3	4.7	5
Social			
Education	Highschool graduate	Highschool graduate	High school level
Economic Profile			
Tenurial Status	68% owner	73.9% owner	46.8% owner
Mean area cultivated, ha	0.563	0.565	0.554
Capital borrowed,mean	P 28,456.6	P21,791.7	P 26,718.7

Yield, kg/ha	2,270.5	2,137.5	1,575.5

Table 2. Mean of Quantity and Total Cost of Selected Farm Inputs

Inputs	Mean quantity			Mean total cost, PhP		
	Top 3	Middle 3	Bottom 3	Top 3	Middle 3	Bottom 3
Hybrid seeds	90.3 kgs	105.7 kgs	22.05 kgs	5,199.6	P 11,230	P 4,000
Inbred seeds	44.49 kgs	40.59 kgs	36.92 kgs	P 2,378.3	P 2,161.2	P 2,063.4
Urea	379.5 kgs	289 kgs	278 kgs	P 8,252.5	P 6,085	P 6,934
Foliar fertilizer	325-600 grams	325-600 grams	325-600 grams	P 817	P 400	P 506
Herbicides				P 963	P 329	P364
Rodenticide				P 229.1	P134	P 117

The Department of Agriculture RO2 provides assistance in the form of technical information, material inputs, and training. Other support services focus on seed selection, land preparation, soil nutrient management, pest and disease control, and farm planning and budgeting. Assistance provided by Farmer field extentionist and Provincial LGU technician is very limited. Modalities mostly given by the private sector like Techno Gabay IEC materials, Radio and TV agri Programs were rated by most farmers as not effective.

Concerns of farmer respondents include the high cost of farm inputs like seed, and fertilizer; high labor cost and shortage of labor during peak season of planting and harvesting confront farmers. As to farm implements, farmers' concern include the high cost of mechanized farming, wastage of grains during harvesting by reaper, and shortage of machiner during peak season.

The positive value of coefficients of irrigation, weeding and pesticides both for top 3 and bottom 3 categories indicate that cost of these input variables contribute to the increase of yield. The negative coefficients of weeding and disease control for the middle 3 indicate that for an increase of P1 on cost of these technology factors would decrease yield/production.

SFA results showed that quantity of labor has positive impact to rice yield in the top 3 and the application of fertilizer before planting, for first and second top dressing also had positive impact on yield in the middle 3. Area has positive impact on rice yield in the middle 3. These confirm result of previous study which revealed that fertilizer, area and other variables are factors that affect both production and technical efficiency of rice production. Quantity of labor had high positive coefficient in the top 3 and middle 3 while cost of farm services had high positive coefficient in the middle 3 and bottom 3. This confirm the previous result indicating that intensive labor in rice cultivation, irrigation are the most important factors having positive impact on technical efficiency(Khai, 2011)

Table 3. Multiple Regression Results on the Correlation of Input Cost to yield

Significant variable	Categories					
	Top 3[a]		Middle 3[b]		Bottom 3[c]	
	Adj. R square	B coeff	Adj. R square	B coeff	Adj. R square	B coeff
Irrigation	0.839	0.224			0.756	0.303
Pesticide	0.854	0.158			0.705	0.315
Weeding	0.861	0.165	0.134	-0.336	0.569	0.483
Land Preparation	0.792	0.505				
Dike repair			0.094	0.575	0.762	0.115
Disease Control			0.037	-0.408		
Seed bed Preparation					0.722	-0.288

[a] F ratio for regression (df=4/139=216.75, Prob 0.000 significant)
[b] F ratio for regression (df= 3/112= 6.752, Prob 0.000 significant)
[c] F ratio for regression (df=5/130= 84.119, Prob. 0.000 significant)

Conclusions

1. Farmer respondents have a mean age of 49, have 4 household members. Most farmer respondents reached secondary education and had farming experience of 24-25 years. Majority of the respondents are male -Ilocanos and they till mean area of 0.554-0.565 hectare of lowland farm.

2. Most of the farmer respondents plant different inbred varieties and they practice manual random planting. Very few farmers practice straight planting and fewer number practice direct seeding. Most farmers apply manually inorganic fertilizer for basal, first and second top dressing. Only five farmer respondents are using organic fertilizer. They likewise use foliar fertilizer, herbicides, rodenticides, insecticides and molluscides. Very few farmers apply fungicides.

3. Cost of variables such as irrigation, pesticides and weeding have significant positive correlation to yield in the bottom 3. Correlation of cost of the same variables and land preparation had higher correlation to yield in the top 3 category.

4. Support services and technical assistance are provided by the Department of Agriculture. It was observed, however, that there are no technicians to monitor on a regular basis the implementation of these supports provided.

5. SFA results showed that variables such as quantity of fertilizer, quantity of seeds, quantity of labor, and cost of farm services have the highest positive impact to yield.

Table 4. SFA Results on Contribution of Significant Variables to Yield.

Variables	Top 3		Middle 3		Bottom 3	
	Coeff	Signif	Coeff	Signif	Coeff	Signif
Constant	4.268	**	4.802	**	1.904	**
Quantity of fertilizer	0.204	**	-0.089	ns	-0.065	ns
Quantity of seeds	0.340	*	0.017	ns	-0.446	**
Labor in man-days	0.632	**	0.761	**	0.0823	ns
Cost of Fertilizer	-0.076	**	-0.044	*	-0.044	ns
Cost of seeds	-0.177	ns	-0.033	ns	0.259	**
Cost of pesticides	0.016	ns	0.025	ns	0.115	**
Cost of farm services	0.148	ns	0.284	**	0.585	**
Inefficiency effect						
constant	-0.727		-0.210	ns	1.158	ns
Household Size	-0.003	ns	0.052	ns	-0.126	**
Household Income	0.000	**	0.000	**	0.000	**
Area	0.323	ns	0.254	**	-0.081	**
Fertilizer application before planting	0.226	ns	0.496	**	0.040	ns
First top dressing	0.786	ns	1.468	**	-0.115	ns
Second top dressing	0.702	ns	0.437	**	-0.243	ns
Sigma squared	0.255		0.124		0.222	**
Sigma	0.796		1.000		0.873	**

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