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FACTORS AFFECTING THE PROFITABILITY OF RICE-PRODUCING HOUSEHOLDS IN THE MEKONG DELTA, VIETNAM

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ABSTRACT

The objective of this study is to identify factors that affect the profitability of rice farmers in the Mekong Delta, Vietnam. The study used stratified random sampling to collect data from 750 rice farmers in the Mekong Delta. Applying multivariate linear regression, the study has shown that reasonable investments in labor costs may enhance farmers' profit. In contrast, the cost of seed, fertilizer, pesticide, machinery, and depreciated cost negatively affect the profitability of farmers. Besides, the study pointed out the positive impact of education and technical progress on the profitability of rice farmers in the Mekong Delta, Vietnam.

KEYWORDS: profitability, rice production, farming households, Mekong Delta

I. INTRODUCTION

The Mekong Delta, with 4 million hectares of rice-cultivated area and over 21 million tons of output, owns 50% of the total rice output and 90% of the country's export rice. In the context of climate change and the competitive export market, local governments in the region have invested in agriculture, develop large-field models, promote mechanization, and apply technical advances into the rice production process. As a result, the rice industry in the Mekong Delta has made positive changes, creating a significant surplus of rice for export, contributing to regional economic development. However, farmers in the Mekong Delta are still facing challenges such as low technical skills, land fragmentation, and lack of production capital. In addition to this, the abnormal weather due to climate change and increasingly dangerous pests have adversely affected rice productivity and quality. Market fluctuations and passive outputs make it more and more difficult for farmers to re-produce (Nghi and Hien, 2014). Thus, the question is whether rice-producing households achieve investment efficiency or not and what factors affect their investment efficiency.

II. RESEARCH METHODOLOGY

2.1. Analytical methods

This study used descriptive statistics with indicators of mean, frequency, and proportion to analyze the situation of accessibility to scientific information and the application of technical advances into production. Also, the multivariate linear regression helps identify factors affecting the profitability of rice farmers in the Mekong Delta:

2.2. Data collection method

According to Ho (2012), the sample size depends on the estimation methods of each study and there are many different views about it. Green (1991), Tabachnick and Fidell (1996) have argued that the minimum sample size the regression analysis is calculated using the formula 50+8m (m: number of independent variables). To ensure the representativeness of the data, the study used stratified random sampling (with criteria such as geographical location, farm size, and farming method). Direct interviews surveyed 750 rice farmers in An Giang, Hau Giang, and Kien Giang Province in the Mekong Delta.

III. RESEARCH RESULTS AND DISCUSSIONS

3.1. The situation of production and technical advances application

Rice production area: According to the survey, the average rice production area of each household is 25.510 m^2. The lowest rice cultivation area is 1.000 m^2 and the highest is 156.000 m^2. The percentage of households with rice production areas of less than 15.000 m^2 is quite high (48.67%), from 15.000 m^2 to 30.000 m^2 accounts for 29.46%, and over 30.000 m^2 accounts for 21.87%. These figures indicate that most households have small scales of rice production. It has constrained the development of large-field models and the ability to apply mechanization into rice production of the region. Also, the rice production

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land of farmers in the last five years is relatively stable (86.67%). A small number of households have reduced the rice cultivation scale because of the low profit. In contrast, some of them rent or buy more land, apply advanced technologies to improve the scale efficiency.

Scientific and technological advances training: The survey indicates that there are 53.5% of households regularly participate in training courses on rice production techniques. The main course organizers are pesticide companies and local extension units. Training courses are mainly about new seed, production techniques following IPM models, seeding, 3 reductions 3 gains models, 1 must 5 reductions models. Moreover, trainers show directions to forecast and prevent pests. Most farmers participated in the training under the direct guidance of employees from pesticide companies (50.67%). Besides, extension officers (38.40%) are important factors in transfering new farming techniques to farmers. In addition to this, farmers have been transferred technical advances from The Mekong Delta Rice Research Institute, Can Tho University, and Farmers' association. These training sessions are experimental and usually take place on the field.

Table-1: Training courses organizers on scientific and technological advances

No.	Organizer	Number of households (N)	Percentage (%)
1	Pesticide company	380	50.67
2	Local Extension unit	288	38.40
3	Research institute/ University	82	10.93
4	Farmers' association	28	3.73
5	Others	18	2.40

Scientific and technical advances application: Based on the survey results, the percentage of households applying technical models to rice production is quite high (56.8%). This shows that farmers are aware of the benefits of new farming methods and invest in these models. The result also implies that new seed models are most applied by farmers (66.33%), followed by the seeding models (55.07%), 3 reductions 3 gains models (20.4). %), IPM models (12.13%), 1 must 5 reductions (12.13%), and other models. Besides applying each separate technical model, rice farming households also combine different models. In the case of combining 2 models, the most popular combinations are "new seed – seeding" (22.3%), "new seed - 3 reductions 3 gains" (19.9%), "new seed – IPM" (9.6%), "new seed - 1 must 5 reductions" (8%). Combining 3 models, they can be "new seed - seeding - 3 reductions 3 gains" (8.4%), "new seed - 3 reductions 3 gains - 1 must 5 reductions" (6%), "new seed - IPM - 1 must 5 reductions" (5.6%).

3.2. Investment cost and financial efficiency

Rice production cost: Investment costs for rice production do not vary widely between crops, showing that farmers apply a similar formula for fertilizing and spraying from crop to another. According to experienced farmers, fertilizer is an essential factor to increase rice yield. Fertilizing aims to provide nutrition, increase soil fertility, and improve productivity. Therefore, farmers invest large amounts of money into fertilizer. Moreover, most farmers cultivate rice for a long time that leads to soil infertility, so farmers pay more attention to using fertilizers to improve their fields. As a result, the fertilizer cost is the highest of the total investment cost. Pests and diseases on rice are becoming more and more complicated, so spraying pesticides is a "daily" measure that farmers use to prevent them. Pesticides prices are quite high and often fluctuate according to the market. Also, the machinery cost contributes to the investment cost for the rice production. Currently, mechanized agriculture has been widely applied in most stages in the production process such as soil preparation, pumping, harvesting, etc. Thus, the investment cost for machinery is arising. In contrast, rice-producing households can reduce labor costs in the context of the rural labor shortage. Furthermore, expenses for seed, land-leasing, depreciation, fuel, tax, etc. are also necessary for the rice production process.

Table-2: Rice production costs of farmers in the Mekong Delta

Unit of calculation: million VND/ha

Item	Winter-Spring		Summer-Autumn		Autumn-Winter	
	Mean	Deviation	Mean	Deviation	Mean	Deviation

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Seed cost	1,846.33	730.11	1,581.51	667.40	1,327.16	797.44
Fertilizer cost	5,757.00	1,842.70	5,851.92	2,012.28	5,169.52	3,010.08
Pesticide cost	5,192.58	1,616.27	4,622.08	1,833.29	4,788.82	2,915.78
Fuel cost	816.71	443.37	813.48	513.08	735.95	543.91
Labor cost	2,137.16	849.08	1,947.95	1,008.69	1,622.99	1,204.53
Machinery cost	4,670.69	798.36	4,428.44	1,180.83	3,679.06	1,767.92
Depreciated cost	272.75	358.11	238.10	334.45	276.67	360.27
Land-leasing cost	1,016.00	3,152.17	394.24	1,844.51	199.25	1,240.38
Tax, fee	19.81	126.53	6.98	38.06	101.50	516.66
Total cost	**21,729.04**	**4,211.12**	**19,878.26**	**5,161.05**	**17,900.92**	**8,428.06**

Financial efficiency: According to Table 3, farmers achieve investment efficiency in all three crops (Winter-Spring, Summer-Autumn, and Autumn-Winter), of which the financial efficiency got in the Winter-Spring crop is the highest. Farmers' production efficiency in the Winter-Spring crop is higher than in Summer-Autumn and Autumn-Winter crop. The favorable weather and irrigation conditions in the Winter-Spring crop help rice grow well. If investment costs are not different between crops, the profit earned in the Winter-Spring crop will be higher, thus financial ratios of this crop are also higher than the two other crops. Similarly, in comparison with the Autumn-Winter crop, financial ratios show that the Summer-Autumn crop has much higher investment efficiency.

Table-3: Financial efficiency of rice-producing households

Item	Winter-Spring		Summer-Autumn		Autumn-Winter	
	Mean	Deviation	Mean	Deviation	Mean	Deviation
Total cost (million VND/ha)	21,729.04	4,211.12	19,878.26	5,161.05	17,900.92	8,428.06
Price (thousand VND/kg)	4.88	0.56	4.80	0.93	4.24	1.94
Productivity (ton/ha)	7,587.65	966.66	6,135.52	1,275.21	4,980.99	2,300.14
Revenue (million VND/ha)	36,998.15	6,485.42	29,606.94	7,940.20	25,146.85	12,643.19
Profit (million VND/ha)	15,269.11	7,419.25	9,728.68	6,258.44	7,245.93	7,225.75
Profit/Total cost (time)	0.76	0.41	0.50	0.34	0.22	0.33

3.3. Factors affecting rice-producing households' profitability

According to the analytical result, regression models of Winter-Spring, Summer-Autumn, and Autumn-Winter crop are all statistically significant (Sig.F = 0.00), ie the 3 established regression models are appropriate. Besides, statistical tests prove that research models do not have multicollinearity and autocorrelation. Due to the limitation of the study content, the authors do not present these tests in detail.

Table-4: Factors afecting households' profitability

Variable		Winter-Spring	Summer-Autumn	Autumn-Winter
B_0	Constant	34,842.18*	29,085.48*	16,402.91*
X_1	Education level	53.49^{ns}	25.65^{ns}	271.72**
X_2	Technical advance	4,090.57*	474.44^{ns}	470.56^{ns}
X_3	Seed cost	(0.81)*	(0.46)**	(2.19)*
X_4	Fertilizer cost	(0.26)**	(0.69)*	(0.51)*
X_5	Pestiside cost	(1.14)*	(1.05)*	(0.95)*
X_6	Fuel cost	(1.96)*	(1.49)*	(1.89)*
X_7	Labor cost	$(0.12)^{ns}$	0.36***	0.54***

X_8	Machinery cost	(2.29)*	(1.78)*	(0.84)**
X_9	Depreciated cost	(0.85)*	(1.05)*	(0.76)*
R^2		0.372	0.300	0.206
P_value		0.000	0.000	0.000
Durbin_Watson stat		2.026	1.928	1.931

Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%, ^{ns} not significant

Based on Table 4, the factors of seed cost, fertilizer cost, pesticide cost, fuel cost, machinery cost, and depreciated cost are statistically significant and negatively correlated with the farmers' profitability. Therefore, farmers should consider and adjust these costs to increase profit. In terms of the labor cost, this factor is statistically significant and positively correlated with the profit in the Summer-Autumn and Fall-Winter crop. This is an important basis to prove that investing in labor has a positive impact on the production efficiency of farmers. Hence, farmers need to pay more attention to their fields to improve productivity and profit. Another finding is that the application of technical advances positively influences farmers' profit in the Winter-Spring crop, reflecting the important role of technology in rice production. Farmers should access to technological information and apply appropriate technological models to the cultivation process. Although the education level is statistically significant in the Autumn-Winter crop only, the study also finds out the positive effect of the education level on farming efficiency. Higher educated farmers are more likely to access the market information and technical news, participate in unions, so they have more opportunities to improve their investment performance.

IV. CONCLUSION

The study has shown that rice farmers in the Mekong Delta are very active in learning and applying technical advances into the rice production process. Farmers achieve investment efficiency in all three seasons (Winter-Spring, Summer-Autumn, and Autumn-Winter). The study has identified factors affecting the profitability of rice farmers in the Mekong Delta. Except for the labor cost, all of the input costs negative effect on farmers' profitability. In addition to this, the study demonstrates the positive impact of education level and technical progress on farmers' profitability. From that point out, farmers should learn and improve knowledge, apply technical advances into the farming process. Besides, adjusting input costs need to be taken into consideration to improve profitability.

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