Case Study

Evaluate The Economic Efficiency of Agricultural Production Models: A Case Study in Thap Muoi District, Dong Thap Province

Bui Van Trinh[1], La Nguyen Thuy Dung[2], Nguyen Quoc Nghi[2]

[1]University of Cuu Long, Vietnam
[2]Can Tho University, Vietnam

Corresponding Author: Nguyen Quoc Nghi

ABSTRACT

The study aims to evaluate the economic efficiency of the three-rice-crop and the two-lotus-crop model in Thap Muoi District, Dong Thap Province. The study data were collected from 158 farmers (98 households producing three rice crops per year, 60 remaining households plant two lotus crops per year) by stratified random sampling. The research result shows that both models above bring economic benefits to farmers. However, the two-lotus-crop model is less costly, the selling price is stable and tends to increase. Moreover, it takes advantage of idle labor in the family, so its economic efficiency is higher than the three-rice-crop model.

Keywords: economic efficiency, three-rice-crop model, two-lotus-crop model.

1. INTRODUCTION

Thap Muoi District has the largest area in the province, locates in the middle of the Dong Thap Muoi area. The district has favorable conditions for comprehensive agricultural development, especially rice cultivation, lotus cultivation, and other aquaponics. Over the years, local authorities and people have made full use of their potential and strengths to develop agricultural farming models, including the three-rice-crop and two-lotus-crop. In recent years, the model of planting two lotus crops is encouraged and replicated in the whole district. This is a low-cost model and suitable for households with idle workers while bringing high profit. Besides, the three-rice-crop farming model is a traditional agricultural model that many farmers apply for years. This model has provided the main source of income for farmers in the area. The fact shows that both models raise incomes and improve the lives of households; however, from the scientific perspective, few studies are exploring the difference in their economic efficiency. Therefore, this study analyzes and compares the economic efficiency of the two models above to provide scientific arguments for the agricultural sector of Dong Thap Province to have a comprehensive orientation for the district and Dong Thap Province.

2. RESEARCH METHODOLOGY

The data were collected by direct interviews of 158 farmers (98 households producing 3 rice crops/year, 60 households producing 2 lotus crops/year). The authors used stratified random sampling with criteria such as production scale and farmers' resources. The descriptive statistics (frequency, ratio, average) and financial metrics (cost, income, net income, income/cost, profit/cost, profit/working day, etc) were used to evaluate and compare the economic efficiency of the two production models.

3. RESEARCH RESULTS AND DISCUSSION

3.1. Farmers' characteristics

In terms of the rice production model, most farmers in Thap Muoi District produce three crops per year. The winter-spring crop starts in mid-October and lasts until mid-January. The spring-summer crop is from mid-February to May. The remaining time is the summer-autumn crop. However, for the lotus growing model, because the cultivation time of lotus is long, farmers grow only two crops per year. The winter-spring crop starts in mid-August and lasts until mid-December. The rest of the time is the spring-summer crop.

To study the resources of farmers, the study conducted statistics on the following criteria: land area, number of direct workers, the household's education level, and production experience.

Table 1: Overview of information about the two groups of farmers Unit: %

Criteria		Three rice crops	Two lotus crops
Land area	Under 10,000m^2	48.0	56.7
	Over 10,000m^2 to 20,000m^2	46.0	43.3
	Over 20,000m^2	6.0	0
Direct family labor	From 2 to 3 people	84.0	86.6
	From 4 to 5 people	14.0	10.0
	More than 5 people	2.0	3.4
Education level	Primary school	32.0	43.3
	Secondary high school	54.0	40.0
	High school	14.0	16.7
Production experience	Less than 10 years	26.0	93.3
	From 10 years to 20 years	58.0	6.7
	Over 20 years to 30 years	16.0	0

The above table shows that most households have an area of less than 10,000m^2 (48%) that produce three rice crops per year. The percentage of households with an area of 10,000m^2 to 20,000m^2 that produce three rice crops is quite high (46%). Meanwhile, most two-lotus-crop models belong to households having an area of less than 10,000m^2 (accounting for 56.7%). No household uses the over 20,000m^2 land area for growing lotus. The average number of direct workers of both models is 2 or 3 people. Both groups of households have secondary education levels, while the percentage of households having high school levels is quite low. Most lotus farmers have less than ten years of production experience (93.3%), while most rice farmers have 10 to 20 years of experience (58%).

3.2. Production cost and economic efficiency of the three-rice-crop model

The cost-benefit analysis of the three-rice-crop model shows that the cost of fertilizers (33.59% - 35.82%) and pesticides (14.93% - 17.11%) account for the highest proportion when investing in the model. In addition to the above two costs, the cost of harvesting accounts for a significant proportion (10.72% - 10.91%).

Comparing the yield of three rice crops, the winter-spring crop achieves a higher yield (782 kg/1000m^2) than the summer-autumn crop (667 kg/1000m^2) and the autumn-winter crop (674 kg/1000m^2). Besides, the winter-spring crop is harvested in the dry season; the rice quality is higher and sold at a higher price than the other two crops. Out of the three rice crops, the winter-spring crop has the lowest total cost, and the family labor involved in the production is also lower than the other two crops. So, it brings higher incomes and profits. Considering the entire rice production model, after deducting expenses, the profit of all three crops is over 1,200,000 VND/1000m^2.

Table 2: Production cost structure *Unit: VND/1000m²*

Indicators	Winter-spring		Summer-autumn		Autumn-winter	
	Mean	%	Mean	%	Mean	%
Land preparation cost	122,389	6.95	110,881	6.24	114,368	6.38
Seed cost	111,965	6.36	103,632	5.83	106,371	5.94
Pesticide cost	265.153	14.93	304,209	17.11	307,836	17.18
Fertilizer cost	630,497	35.82	597,210	33.59	604,324	33.72
Sowing and transplanting cost	35,798	2.03	36,879	2.07	37,507	2.09
Care cost	21,970	1.25	25,632	1.44	22,842	1.27
Harvest cost	188,666	10.72	193,897	10.91	193,897	10.82
Transportation cost	42.546	2.42	45,336	2.55	44,987	2.51
Irrigation cost	115,920	6.59	115,920	6.52	115,920	6.47
Family labor cost	226,678	12.88	24,115	13.73	244,115	13.62
Total cost	1,761,582	100	1,777,711	100	1,792,167	100
Productivity (kg/farmer)	782		667		674	
Selling price (VND/kg)	4,820		4,484		4,462	
Income	3,727,009		3,030,071		2,994,558	
Economic profit	1,965,427		1,252,360		1,202,391	

3.3. Production cost and economic efficiency of the two-lotus-crop model

According to the research results, the cost of lotus crops is similar to the cost of rice crops, but the cost of family labor is very high, accounting for 35.27% to 36.74%. This model is suitable for households that have idle laborers because the lotus growing model requires a lot of manual labor in production. In terms of the investment cost for rice crops, the production cost of lotus crops is much lower. The pesticide cost accounts for 3.38% - 4.55%, the cost of fertilizers accounts for 27.70 % - 27.82%.

Table 3: Production cost structure of the two-lotus-crop model *Unit: VND/1000m²*

Indicators	Season 1 (Winter-spring)		Season 2 (Autumn-winter)	
	Mean	%	Mean	%
Land preparation cost	112,917	9.51	113,333	9.65
Seed cost	95,990	8.09	96,240	8.19
Pesticide cost	54,004	4.55	39,658	3.38
Fertilizer cost	330,333	27.82	325,292	27.70
Care cost	12,917	1.09	14,583	1.24
Harvest cost	14,792	1.25	15,625	1.33
Transportation cost	25,000	2.11	16,042	1.37
Irrigation cost	122,500	10.32	122,500	10.42
Family labor cost	418,750	35.27	431,250	36.72
Total cost	1,187,203	100	1,174,523	100
Productivity (kg/farmer)	449		391	
Selling price (VND/kg)	8,117		6,320	
Income	4,455,224		2,199,527	
Economic profit	3,268,021		1,025,004	

Comparing the yield of the two lotus crops, the Winter-spring crop has a higher yield (499 kg/farmer) than the autumn-winter crop (391 kg/farmer). Thanks to the favorable natural condition in the winter-spring crop, the quality of lotus and the selling price are higher than the other crop. In recent years, the increasing selling price of lotus in the market helps lotus farmers improve their income and profit. Comparing the two crops, although the production costs are similar, the yield and selling price of lotus in the winter-spring crop is higher than in the autumn-winter crop, so the profit is higher than in the autumn-winter crop.

3.4. Economic efficiency of the three-rice-crop model and two-lotus-crop model

Although the three-rice-crop production model costs more than the two-lotus-crop model, the income and profit are lower than the two-lotus-crop model. The income/cost proportion of the two-lotus-crop model reaches 2.82 higher than the three-rice-crop model (1.83). Besides, the profit/cost proportion of the two-lotus-crop model is higher than the three-rice-crop model (1.82 > 0.69). To sum up, the economic efficiency of the two-lotus-crop model is higher than that of the three-rice-crop production model.

Table 4: Comparing the economic efficiency of the three-rice-crop and the two-lotus-crop model *Unit: VND/1000m²*

Financial indicator	Three-rice-crop	Two-lotus-crop	Difference
Production cost (VND/1000m²)	5,331,460	2,361,726	2,969,734
Income (VND/1000m²)	9,751,638	6,654,751	3,096,887
Profit (VND/1000m²)	4,420,178	4,293,025	127,153
Income/cost	1.83	2.82	1.04
Profit/cost	0.69	1.82	0.04
Profit/Income	0.82	0.83	0.04

The ratio of income/cost and profit/cost of the lotus growing model is higher than that of the rice growing model, which is analyzed based on the family's idle labor resources. However, for an accurate comparison of the economic efficiency of these two models, the study analyzes the opportunity cost of the household. The opportunity cost is calculated based on the local average wage and the capital used for each model.

Table 5: Comparing the economic efficiency of the three-rice-crop and the two-lotus-crop model at opportunity costs *Unit: VND/1000m²*

Indicator	Three-rice-crop	Two-lotus-crop
Cash cost	5,331,460	2,361,726
- Material cost	4,831,460	1,811,726
- Labor cost	500,000	550,000
Opportunity cost	753,315	443,617
- Family labor cost	700,000	420,000
- Cost of capital (1%*cash cost)	53,315	23,617
Total cost	6,084,775	2,805,343
Income	9,751,638	5,143,025
Profit	4,420,178	4,293,025
Profit minus opportunity cost	3,666,863	3,849,408
Capital efficiency (opportunity cost excluded)	1.83	2.82
Capital efficiency (opportunity cost included)	1.60	1.83
Labor efficiency	305,572	198,423

After deducting all costs, the labor efficiency of the two types of models is still higher than the local average wage. This shows that focusing on exploiting resources to improve production brings benefits to farmers. The model of producing two lotus crops uses more labor than the three-rice-crop model, so it creates jobs for local people. The analysis result also shows that the labor efficiency of the three-rice-crop model is higher than that of the two-lotus-crop model, while the capital efficiency (opportunity cost included and excluded) is lower than that of the lotus-planting model. This further confirms that the economic efficiency of the model of producing 2 lotus crops is better than the three-rice-crop model in Thap Muoi District, Dong Thap Province.

4. CONCLUSION
In general, the study has figured out three main points: (1) The model of production of 2 lotus crops requires more manual labor than the model of 3 rice crops, so this model is suitable for households with a large number of idle laborers and little growing land; (2) The 3-rice-crop production model is suitable for households with extensive farming experiences and production area; (3) Both production models bring economic benefits to farmers; however, because the lotus production model requires low investment in costs, takes advantage of idle labor in the family, has a stable selling price and the price tends to increase, so its economic efficiency is higher than the model of producing three rice crops

REFERENCES
1. Trinh, N. T. T., & Nghi, N. Q. (2020). Exploiting tourism from the value of Dong

Thap lotus. *Vietnam Travel Magazine, 4,* 42-43.

2. Nghi, N. Q. (2013). Value chain of the rice industry in Dong Thap Province. *Quang Nam University Journal of Science, 2,* 80-91.

3. Nghi, N. Q. (2011). Factors affecting the application of technical advances in rice production in Dong Thap Province. *Journal of Agriculture and Rural Development, 4,* 3-9.

4. Nghi, N. Q. (2010). Factors affecting formal credit needs of rice farmers in Dong Thap. *Journal of Scientific Activities, 614,* 49-50.

******