

RESEARCH ON FACTORS AFFECTING THE CONVERSION OF CROP COMPOSITION ON RICE-LAND IN HAU GIANG PROVINCE – VIET NAM

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Abstract

Research on factors affecting the conversion of crop composition on rice-land was carried out from April to September 2017 to study the outcomes of the conversion of crop composition on rice-land as well as to identify the reasons why farmers decided to change their crop composition. Data were collected from May 2017 by conducting questionnaire interviews with 180 farming households. Results show that households who grow 2 rice crops and 1 other crop can earn more profits as compared to those who grow 3 rice crops a year. Profit margin (net income/revenue) earned by farming households who grow 2 rice crops and 1 other crop is 0.49 and this is higher than that (0.41) earned by farming households who grow 3 rice crops a year. Households growing leaf vegetable can earn higher profits as compared to that earned by households who grow other crops on rice land. Testing the difference of costs, profits and profit margin between the two compositions show that there's a difference with $\alpha=5\%$. Factors affecting the outcomes of crop composition conversion include: financial resources, effects from FFS training course, support from the Government and Local authorities, irrigation system (canals) and water quality. Among these factors, financial resources variable has the biggest impact on the outcome of crop composition conversion.

Keywords: conversion, production, outcome, 3 rice crops, 2 rice crops - 1 other crop

1. INTRODUCTION

Farming plays an important part in agriculture as it provides food for human, raw materials for industry as well as profitable sources for export. According to Department of Crop Production (2013), there should be about 3.8 million hectares of land used for food production in order to maintain national food security. According to the Government, rice farmers can only get benefits if profits from growing rice make up about 30% of selling price. However in recent years this is hard to achieve for farmers as rice prices have continuously decreased in the context costs keep rising and impacts from climate changes become more and more severe. In recent years, Vietnam rice production has to face with huge difficulties as rice export markets have become more competitive and reduced, export price has been declining continuously. As the result, in the coming years it is forecast that Vietnam export market still has to face with enormous difficulties. Farmers' income from rice will be less profitable as compared to expectation. Besides, as one of the consequences from climate changes, the Mekong Delta's land is more prone to saline and alum intrusion. This has bad impacts on crop yields and plant quality. Furthermore, growing 3 crops of rice a year causes land erosion therefore more chemical fertilizers have been used in farming. This leads to increase in costs and decrease in profits.

In the past, farming households in Hau Giang province grew 3 crops of rice a year with relatively low productivity and high cost. Then many among them have converted from 3 rice crops to 2 rice crops and 1 other crop a year. Crop rotation between rice and other crops can help improve soil's quality then less water needed, smaller risk of diseases transmitting from Winter-Spring plants to other crops. In the current context, to select a suitable and sustainable production method as well as a proper crop composition to the local condition and at the same time can bring high profits is a urgent need. Research on the possibility of crop composition conversion to 2 rice crops and 1 other crop in Hau Giang province was conducted to analyze the financial benefits of the

composition as well as factors that affect the conversion from 3 rice crops to 2 rice crop and 1 other crops a year.

2. MEANS AND RESEARCH METHODS

2.1 Data collection method

Primary data to analyze the effectiveness of the converted crop composition on rice-land were collected by convenience sampling and the law of large number to ensure the accuracy of the research. The data were collected in three districts including Chau Thanh A district, Phung Hiep district and Vi Thanh town. With the total of 180 farming households there are 60 farming households from each district/ town joining the research. The farming households were grouped into two different groups which are group of farming households growing 3 rice crops and group of households growing 2 rice crops and 1 other crop a year.

Table 1. Data collection (unit: person)

Location	Farming households growing 3 rice crops a year	Farming households growing 2 rice crops and 1 other crop a year
Chau Thanh A	30	30
Phung Hiep	30	30
Vi Thanh	30	30
Total	90	90

2.2 Data analysis method

Collected data were checked, encrypted then analyzed by Excel and SPSS software. Besides indexes including profit/cost, profit/revenue, revenue/cost were used to measure the financial outcome of the composition. Binary Logistic was also applied in the research to predict factors affecting the crop composition conversion via binary variables included in the questionnaires to farmers.

3. RESULTS AND DISCUSSION

3.1 Financial factors analysis

3.1.1 Production cost and profit

According to Table 1, costs of growing 2 rice crops - 1 other crop are relatively lower than that of growing 3 rice crops a year. For Winter-Spring season, cost of growing 3 rice crops a year is around VND 17 million/hectare while it only costs VND 16.7 million/hectare to grow 2 rice crops and 1 other crop a year. Similarity, for Autumn-Winter and Summer-Autumn season, costs of growing 3 rice crops a year are VND 18.1 million and VND 17.9 million/hectare respectively. While the cost of growing 2 rice crops - 1 other crop is VND 17.6 million/hectare in Autumn-Winter season, for Summer-Autumn season these farmer households grow other crop on rice land. It is a fact the, growing 3 rice crops years costs more but can earn less profit as compared to these factors of growing 2 rice crops and 1 other crop a year (the profit gap is VND 1.3 million/hectare).

Table 1. Production costs and profits of growing 3 rice crops and 2 rice crops and 1 other crop a year (unit: million VND/hectare)

Season	3 rice crops a year		2 rice crops 1 other crop a year	
	Cost	Profit	Cost	Profit
Winter-Spring	17.0	18.9	16.7	16.5
Summer-Autumn	18.1	8.9	//	//
Autumn-Winter	17.9	8.3	17.6	10.1
Average	17.7	12.0	17.2	13.3

Source: Survey on 180 farmers in Hau Giang province, 2017

Costs, profits, revenue and related factors of growing 3 rice crop and 2 rice crop - 1 other crop a year are shown in Table 2. As shown in Table 2, profits earned by growing 2 rice crops - 1 other crop are higher than that of growing 3 rice crops a year. Besides, for households who grow mixed crops, other members can also join production this help increase income. About profit, growing mixed crops can produce about double profits as compared to profit earned by growing 3 crops of rice a year (approximately 1.9 times). The ratios revenue/cost and profit/cost of growing 2 rice crops 1 other crop are 1.95 and 0.95 respectively. These ratios are higher than that of growing 3 rice crops a year (1.68 and 0.68 respectively)

The ratio profit/ revenue earned by households who grow 2 rice crops - 1 other crop is 0.49, higher than that of households who grow 3 rice crops a year. It is clear that, the 2 rice crops - 1 other crop composition is more profitable than the 3 rice-crop composition.

However, there are still few households who convert their crop composition to 2 rice crops - 1 other crop. Reasons are many, including: (1) non-rice crop requires more labors while the majority of young labors in the areas have moved to work in other fields; (2) farmers still prefer 3 rice crops a market for non-rice products is unstable with fluctuated prices.

Table 2. Comparison between growing 3 rice crops and 2 rice crop - 1 other crop a year on financial factors (unit: million VND/hectare)

Factor	Composition		T index (sig.)
	3 rice crops	2 rice crops - 1 other crop	
Revenue	89.1	138.3	0.000
Cost	53.0	70.8	0.000
Profit	36.1	67.4	0.000
Revenue/cost	1.68	1.95	0.000
Profit/cost	0.68	0.95	0.000
Profit/revenue	0.41	0.49	0.027

Source: Survey on 180 farmers in Hau Giang province, 2017

3.1.2 Cost and profit earned by 4 different types of non-rice plants on rice land

Based on costs, size of cultivation land and characteristic of different non-rice crops, the research divided into four different groups including: group 1 of households growing leafy greens such as lettuce, malabar spinach; group 2 of households growing corn; group 3 for households growing watermelon, cassaba melon and group 4 of households growing birthwort such as gourd, bitter gourd. Analysis and comparison between cost and profit of the four groups are shown on Table 3. Group 3 of households who grow watermelon and cassaba melon has the highest cost (VND 41.6 million/hectare/crop). This groups is also the group can earn relatively high profit of VND 46.8 million/hectare/crop. Group 1 of leafy greens is the group that has the lower cost but can produce the highest profit (VND 49.7 million/hectare/crop). Among the four groups, group 2 (group of households growing corn) has the lowest cost as well as profit which are VND 21.2 million/hectare/crop and 21.0 million/hectare/crop respectively. Group 4 of households growing plants like gourd has the cost VND 25.2 million/hectare/crop with profit of 37.4 million/hectare/crop. It is a fact that, cost of growing other crops on rice land is relatively high but profit is also large as compared to these of growing 3 rice-crop a year.

Table 3. Cost and profit comparison of the four non-rice crop groups growing on rice land (unit: million VND/hectare/crop)

Type of crop	Household number	Size of lan	Cost	Profit	Profit/cost
Group 1	31	0.32	39.9	49.7	1.25
Group 2	19	0.41	21.2	21.0	0.99
Group 3	26	0.43	41.6	46.8	1.13
Group 4	14	0.33	25.2	37.4	1.48
Total	90	1.49	127.9	154.9	1.21

Source: Survey on 180 farmers in Hau Giang province, 2017

3.2 Analysis on factors affecting crop composition conversion

In the research, Binary Logistic Regression is used to analyze the date. The model includes dependent variable (on the left of the equation) with 2 values of 0 - if the households do not convert their crop composition and 1 - if the if the households convert their crop composition into 2 rice-crop - 1 other crop. On the right, there are 5 different variables including characteristics of farmers, characteristics of farming households, Government's policies, market connection, climate, land & water.

The equation is as following:

$$\text{Loge } P(Y=1)/P(Y=0) = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + a_8X_8 + a_9X_9 + a_{10}X_{10} + a_{11}X_{11} + a_{12}X_{12} + a_{13}X_{13} + a_{14}X_{14} + a_{15}X_{15}$$

Each variable explains the possibility of crop composition conversion.

In the regression model, there are 5 groups of variables: (1) characteristic of farmers (farmers' age and education background); characteristic of farming households (labor force, land for agricultural production, financial resources); (3) Government's and local authorities' policies regarding the crop composition conversion (role of agricultural stimulation activities, impacts from relevant training courses, impacts from policies to support production); (4) products and market connection; (5) variables of climate, land & water (internal irritation system, land and water suitable for crop conversion, impacts of climate on production).

Table 4. Description of variables in the Binart Logistic model

Variable	B	S.E.	Wald	Sig.	Exp
X ₁ Age	-0,026	0,023	1,217	0,270	0,975
X ₂ Education background	0,051	0,081	0,395	0,529	1,052
X ₃ Family labor force	0,296	0,285	1,084	0,298	1,345
X ₄ Production land size	-0,386	0,353	1,197	0,274	0,680
X ₅ Financial resources	5,414	1,472	13,522	0,000	224,516
X ₆ Role of agricultural stimulation activities	-0,124	0,318	0,152	0,697	0,883
X ₇ Impacts from training activities	1,254	0,316	15,773	0,000	0,285
X ₈ Support from the Government and local authorities	1,995	0,475	17,608	0,000	7,354
X ₉ Impacts from market	-0,335	0,333	1,012	0,315	0,715
X ₁₀ Connection in production	0,494	0,304	2,639	0,104	1,638
X ₁₁ Internal irrigation system	-1,052	0,455	5,349	0,021	0,349
X ₁₂ Irrigation management	0,215	0,476	0,204	0,651	1,240
X ₁₃ Land condition	23,438	8,903	0,000	0,998	1,511
X ₁₄ Water condition	2,264	0,597	14,410	0,000	9,626
X ₁₅ Impacts from climate	0,886	0,555	2,546	0,111	2,426
Constant	-35,135	8,903	0,000	0,997	0,000

Source: Survey on 180 farmers in Hau Giang province, 2017

As shown in Table 4, independent variables X₅; X₇; X₈; X₁₁; X₁₄ have statistical meanings while X₁, X₂, X₃, X₄, X₆, X₉, X₁₀, X₁₂, X₁₃, X₁₅ have no statistical meaning in the model.

- Variable of farming household's financial resources (X₅) has impact on the decision of conversion into crop diversification. Results show that, crop composition conversion requires a specific amount of financial investment, especially for farming households who convert in a large area. Therefore, households who have adequate financial resources will find it easier to change to crop diversification. In the model, the variable has $\alpha < 0.05$ ($\alpha = 0.000$).
- Variable of impacts from training activities (X₇) has Sig. = 0.000 ($\alpha < 0.05$) and B = 1.254. It means that for farmers who had chance to join training activities on conversion of crop composition are more likely to apply what they had learned in order to earn more income.
- Variable of support from the Government and local authorities (X₈) has có giá trị Sig. = 0.000 and B = -1.995, a direct proportion with the conversion of crop composition. This means if the farmers receive more support from the Government they are more likely to convert their crop composition, especially for financial as well as technical support for more effective conversion.
- Variable of internal irrigation system (X₁₁) has Sig. = 0.021 ($\alpha < 0,05$) and B = -1.052. There are two ways of explanation here: on one hand it create favorable conditions for conversion but on the other hand it can also act as a barrier. It means that in areas that have suitable canal system for irrigation or suitable internal irrigation system, rice is the main crop. On the other hand, in areas without enough water for irrigation, especially in summer-autumn crop, conversion into other crops that requires less water is a good solution for farmers. In the model, B of variable

X_{11} is negative (-), this means lack of irrigation water is a factor that make farmers convert into other suitable crops, for more efficient use of their agricultural land.

- Variable of water condition (X_{14}) has Sig. = 0.000 ($\alpha < 0.05$) and B = 2.264. This means that for areas with good and suitable irrigation water and for other crops, the farmers will change agricultural land-use to other crops for higher income.
- In the model, variables of characteristics of farmers including age and education background have no statistical meaning (Sig. are 0.270 và 0.529 respectively). For age variable, it is assumed that older farmers are less likely to change their crop composition. As for them, it's not easy to acquire new knowledge or adapt to changes. Besides, they already have rich experience in cultivating rice then they are not willing to change to other crops. However, within the scope of the research, in our opinion it's a macro issue and it depends on other objective factors as well on each farmer's determination.

By Binary Logistic Regression model, 2-log likelihood is 103.081 and Cox & Snell R Square is 0.557 while Nagelkerke R Square reaches 0.742. It means that about 74.2% factors of the model can be explained by the model and this is rather high value. Via Homer và Lemeshow test, Chi-square is 19.245 with Sig. = 0.014 ($\alpha < 0.05$). The 2-log likelihood of the model is rather high 90.6% it means that the use of binary logistic regression in the research is suitable.

4. CONCLUSION

Research results show that, farmers who grow 2 rice crops - 1 other crop a year can earn more profits than farmers who do 3 rice crops a year. Other crops grown on rice land include (1) leafy greens, (2) corn, (3) watermelon, cassaba melon, (4) birthwort for fruits. Growing cassaba melon and watermelon costs the highest while growing leafy greens is the most profitable. Factors affecting the outcomes of crop composition conversion are financial resources, impacts from Farmer Field School training courses, support from the Government and local authorities, internal irrigation system for the conversion and water suitable for crop. Among these, financial resources factor has the biggest impact on crop composition conversion by farmers.

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