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ECONOMIC PERFORMANCE OF RICE PRODUCTION TOWARDS VIETGAP IN PHONG BINH, PHONG DIEN, THUA THIEN HUE

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Abstract: This study assesses the economic efficiency of rice production of households towards VietGAP in Phong Binh, Phong Dien, Thua Thien Hue. The authors use semi-structured questionnaires to survey 90 rice households (45 households towards VietGAP and 45 conventional households) and hold a focus group discussion to accumulate the data. The results show that households practising VietGAP use only seeds, phosphate, NPK fertilizers as guided by the agricultural co-operatives. In the Winter-Spring crop 2017–2018, these households produce about 6.67 t/ha. The rice production profit of the VietGAP mode is relatively low, about 14,079,320 VND/ha, which is 948,200 VND/ha higher than that of the conventional mode. The profit-cost ratio of rice production with VietGAP is not significantly higher than that with conventional rice production.

Keywords: economic efficiency, rice household, VietGAP, conventional rice production

1 Introduction

Being aware of the importance of the increasing demand of consumers and exporters to produce grains with better quality, the Ministry of Agriculture and Rural Development of Vietnam issued a standard called Vietnamese Good Agricultural Practices (VietGAP) in 2008. VietGAP consists of different criteria for different agricultural products including vegetables, rice, fruit, etc. It is the principles, orders, and procedures to guide organizations and individuals to produce, harvest and ensure safer products, improve product quality; ensure social welfare and the health of producers and consumers; protect the environment and trace the product origin. VIETGAP is based on 4 groups of criteria: Assurance of food safety; environmental protection; health assurance of workers and social welfare; and product quality assurance. The emergence of VietGap is an indispensable trend, laying the foundation for sustainable agricultural development. It has been considered as a "conversion period" towards organic production [1, 4]. In recent years, VietGAP rice production has been implemented in many localities in the whole country [11]. In addition to improved outcomes, such as improved output quality, increasing production efficiency and improved production environment, rice production under VietGAP standards also has many difficulties like the control of the product quality, price, and output markets [4, 5].

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Phong Dien district is located in the northern part of Thua Thien Hue Province, Central Vietnam with a population of 100,405 people. The majority of the district's labour force is engaged in agriculture (67.9%). The main crop of households in the district is rice with an area of more than 10,000 ha. However, the efficiency of the production is not high, and the product quality is not guaranteed [9, 10]. Therefore, the local government of the district has issued many policies and plans to tackle these problems as well as consumption. In 2016, a model of rice production towards VietGAP was implemented in several communes in the district such as Phong Binh, Phong Hoa, Dien Hoa, and Phong Chuong. However, the real effectiveness of this model has not been fully evaluated. Therefore, assessing the efficiency of the model is necessary to help local authorities have a practical basis for replicating it in the whole district. This study was conducted in Phong Binh Commune as a representative site of the district with the following specific objectives: (i) To assess the current status of rice production of households towards VietGAP and (ii) To analyse the economic efficiency of rice production of households in the study area.

2 Materials and methods

2.1 Research location

Phong Binh commune has a population of 7,975 people, of which the working-aged proportion is 42.5%. Most of the labour force in the commune is in the agriculture, forestry and fishery section and is not trained. The commune has an area of agricultural land of 1,404.82 ha, of which 96% is allocated for rice production. The commune implemented a model of rice production towards VietGAP in 2016. Currently, the production area is 251.3 ha (Figure 1).

Prior to the implementation of the model, the local households produce rice according to their experience characterized by high adoption of inputs such as seed, fertilizers and plant protection pesticides. Within the model, the households properly use seeds and fertilizers and especially minimize the pesticides used following the guidance of the staff of agricultural cooperatives. In fact, they are asked to apply 61 sub-standards of VietGAP for rice production with 11 major standards, namely Evaluation, selection of production areas; Land management; Seed using; Fertilizer and other additives; Water management; Use of agricultural chemicals; Harvest and post-harvest treatment; Management waste disposal; Employees; Record-keeping and traceability; Internal inspection; and Complaints and complaint settlement. The households are compulsory to use certified rice seeds; cultivate in the areas planned by local authorities; apply techniques of care, fertilizer and plant protection according to the technical procedures guided by the agricultural co-operatives; and record diary of the production process and use of inputs and outputs. Other sub-standards are encouraged among households.

Figure 1. Administrative map of Phong Dien District, Thua Thien Hue Province, Vietnam

2.2 Data collection

The secondary data were collected from the reports related to rice production towards VietGAP in the study area. They were also collected from the studies and reports of agencies, institutes, universities, etc. on the efficiency of rice production according to VietGAP standards.

The primary information was gathered from July to August 2018 through semi-structured interviews of 45 households in the model and 45 households with conventional rice production. To ensure the collection of information to be reliable representing the study site, the households were selected randomly. The study compares the two methods of rice production. The households cultivate in the same area.

2.3 Data analysis

Descriptive statistics including mean, ratio, frequency, and percentage were employed to analyze the collected data on household characteristics and the profitability of rice production. In fact, we mainly used the test for data analysis such as compare-means by independent-sample t-test employed to explore the significant differences of the variables related to

household characteristics and economic returns between the two groups of households. The data were analysed with the SPSS 19 software.

The income of rice farmer households is calculated in terms of gross return or net return from rice production. The economic return of rice cultivation is measured by using a budgetary technique based on the profit or profit-cost ratio as in formula (1).

$$PCR = ANR/ATC \quad (1)$$

where PCR is the profit-cost ratio; ANR is the average net return; ATC is the average total variable cost; AGR is the average gross return; ANR = AGR – ATC. Variable costs comprise the costs of seeds, fertilizers, land preparation, labour, harvesting, and irrigation.

The profit-cost ratio expresses the economic performance of rice production of farmer households. When PCR > 0, the production of a farmer household is economically efficient; when PCR < 0, the production of a farmer household is economically inefficient and when PCR = 0, the production of a farmer household is at the breakeven point.

3 Results and discussion

3.1 Development of rice production towards VietGAP in Phong Binh commune

Phong Binh commune has a rice production area of 671.7 ha. Since the 2016–2017 Winter-Spring crop, to improve the production efficiency and product quality of households under the support of Phong Dien District People's Committee, Phong Binh commune has implemented the model of rice production towards VietGAP.

The data in Table 1 shows that in the first year of implementing the model, the scale of production and the number of households participating in rice production towards VietGAP are very large. The rice area towards VietGAP in 2016-2017 Winter-Spring in Phong Binh commune is 251.4 ha (accounting for 37.4% of the total rice area of the commune); however, this area is not increased in 2018. The number of households producing rice towards VietGAP is 804 households in the Winter-Spring crop 2016–2017, but this number remains the same in the Winter-Spring crop in 2017–2018. The results of group discussions show that many households can engage in rice production towards VietGap because the conditions for participation are quite easy. Households have to use certified rice seeds, produce in areas planned by agricultural cooperatives, apply care techniques, and fertilize the crop according to the technique trained by the co-operative staff. Many households engaging in production and large-scale production cause major obstacles in directing and monitoring households to apply technical processes. Therefore, the rice yield of towards-VietGAP households is unsiginificantly higher than that of conventional rice households in both Winter-Spring crop in 2016-2017 and 2017-2018.

Table 1. Rice area, yields and number of households engaging in rice production towards VietGAP compared with conventional rice production in Phong Binh commune in 2017–2018

Variables	2016-2017 Winter-Spring		2017-2018 Winter-Spring	
	Rice production towards VietGAP	Conventional rice production	Rice production towards VietGAP	Conventional rice production
Area (ha)	251.4	420.3	251.4	420.3
Yields (quintal/ha)	67.0	66.2	66.6	66.3
Number of households	804	1,576	804	1,576

Source: Report on rice production towards VietGAP of Phong Binh, 2017–2018

3.2 Characteristics of households

The characteristics of farmers are closely related to their ability and investment capacity in production. Thus, the characteristics of the household groups are closely related to the efficiency of rice production of the households. The results are shown in Table 2.

Table 2. Some key characteristics of households

Variables	Towards VietGAP rice households	Conventional rice households	*P-value*
Age of household heads (years)	54.4	54.0	0.810
Education level of household heads (grade)	6.3	6.5	0.542
Household size (person)	5.6	6.0	0.324
Labour of the household (person)	4.1	4.3	0.356
Agricultural labour (person)	2.6	2.7	0.721
Production experience (years)	24.9	25.6	0.503
Total income from cultivation (1,000 VND)	9,644	8,730	0.000
Income from rice production (1,000 VND)	7,778	6,570	0.000

Table 2 shows that there is no significant difference in demographic characteristics, labour, and rice production experiences between the two groups. The average age of household heads in both groups is quite high (about 54 years). This implies that most household heads with high age in the research site engage in rice production while young household heads engage in other production activities. The educational level of household heads is quite low (around 6th grade). Their low level of education is the factor limiting their access to scientific and technical information through mass media and training courses. The household size is from 5.6 to 6.0 persons. Both household groups have a relatively high rate of working people, with an average of 4 labours per household. However, the number of labours engaging in agricultural

production is relatively low, with an average of 2.5 labours per household. This is because many labours of rice-growing households work far from home or study at universities or colleges. Both two groups have rich experiences in rice farming (over 25 years). In other words, nearly half of their whole life has tied to rice cultivation.

The income of the rice households practising VietGAP is significantly higher than that of conventional rice ones ($p < 0.01$). In general, the income from cultivated products of the two groups is low (about 8–9 million VND per household per year). In particular, income from rice production of the households accounts for about 80%. The low income from crop production can be a limiting factor of the production investment of household groups.

3.3 Rice production of households towards VietGAP

Seeds and fertilizers are two important inputs that greatly affect the productivity, quality, and efficiency of rice production. Hence, the study surveyed the amount of seed and fertilizer that households used in reality compared with the guidance provided by agricultural co-operatives (Table 3).

It can be seen that towards-VietGAP rice households use only seeds, phosphate, NPK fertilizers as guided by the staff of agricultural co-operatives. There is a significant difference in the use of seeds and potassium fertilizers between towards-VietGAP rice households and conventional households ($p < 0.01$).

The towards-VietGAP rice households use the amount of seed as guided (96 kg/ha), 16 kg/ha less compared with that used by conventional rice farmers. For fertilizers, except for potassium, the amount of other fertilizers is not significantly different between the two groups of households. In general, households use 225–230 kg of nitrogen fertilizer; 188–196kg of potassium; 490–502 kg of phosphate and 100–112 kg of NPK fertilizer/ha/crop. According to the guideline, the nitrogen and potassium use of towards-VietGAP rice households is 15–30 kg higher per hectare. Indeed, farmers tend to overuse inorganic fertilizers, especially nitrogen fertilizer compared with the rates recommended by agricultural extension agencies [7].

The households in both groups do not apply organic fertilizer (manure/bio-organic fertilizer) and lime while this is vital for improving and enhancing the fertility of soil [6].

Table 3. Seed and fertilizer use of households compared to guidance of agricultural co-operatives

	Quantity of seeds and fertilizer as guided (kg/ha)	Towards VietGAP rice households (kg/ha)	Conventional rice households (kg/ha)	*P-value*
Seeds	80–100	96	112	0,000
Ure	160–200	225	230	0,137
Potassium KCl	180	196	188	0,007
Phosphate (Ninh Binh)	500	502	490	0,550
NPK 16:16:8	100	105	100	0,104
Manure/ bio-organic fertilizers	10,000/1,000	0	0	0
Lime	0	0	0	0

The data in Table 4 show that there is no significant difference in rice area and yield between households towards VietGAP and conventional ones. In general, the rice area of two household groups is small, about 0.36-0.40 ha per household. Towards-VietGAP rice area of households is 0.16 ha (accounting for nearly 40% of the total rice production area of the households). This is explained by the fact that the condition to engage in producing rice towards VietGAP is relatively easy and households are aware of the practical benefits of this type of production such as ensuring the health of the producers and better product quality. The rice yield of the Winter-Spring crop 2017–2018 in both groups is relatively high, about 6.67 tons/ha which is 0.48 tons/ha higher than average rice yields of Thua Thien Hue [2].

Table 4. Average area and yield of rice in Winter-Spring crop 2017–2018 of households

Indicators	Towards VietGAP rice households	Conventional rice households	*P-value*
Total rice area (ha)	0.405	0.360	0.080
Rice area towards VietGAP (ha)	0.160	0.0	–
Rice yield (tons/ha)	6.66	6.68	0.823

Source: Survey data, 2018

3.3 Rice production efficiency of households towards VietGAP

Cost of rice production of surveyed households towards VietGAP

The cost of production is one of the determinants of the household's production efficiency. The results in Table 5 show that the cost of rice production towards VietGAP and conventional rice production is similar and there is no statistically significant difference at 5% (*p=0.784*). In general, the cost of rice production in the two groups is relatively high, about 23,000,000–

23,300,000 VND/ha. In terms of costs, the labour cost and fertilizer cost account for the highest share of households' total rice production costs.

Table 5. Cost/ha of towards VietGAP rice production and conventional rice production households in Winter-Spring crop 2017–2018

Types of cost	Towards VietGAP rice households (VND)	Conventional rice households (VND)	% increase (+) or reduce (–)	*P-value*
Seeds	1,255,240	1,447,560	–13.3	0.000
Land preparation	2,140,000	2,124,000	0.8	0.928
Artificial fertilizers	6,024,400	5,830,500	3.2	0.018
Organic fertilizers	–	–		–
Lime	–	–		–
Plant protection	1,352,000	1,876,000	–27.9	0.000
Irrigation	1,350,000	1,381,000	–2.2	0.910
Harvesting	2,114,000	2,172,000	–2.7	0.890
Labour	8,729,180	8,487,780	2.8	0.620
Total cost	22,964,820	23,318,840	–1.5	0.784

The inorganic fertilizer cost of rice households towards VietGAP is 3.2% higher than (equivalent to about 193,900 VND/ha) that of conventional rice households. Other types of expenses such as labour, harvesting, plowing, and irrigation in the two groups are similar.

The seed cost of rice production towards VietGAP is 13% lower than that of conventional rice production (about 192,320 VND/ha). The plant protection cost of rice households towards VietGAP is nearly 30% lower than that of conventional households. The results of group discussions show that rice households towards VietGAP are only allowed to use pesticides when it is needed under the guidance of the technical staff of agricultural cooperatives. Besides, the households do not use pesticides and herbicides with high toxicity such as insecticides and wild herbicides, while these are still used by conventional rice households.

Rice production efficiency of households towards VietGAP

The economic performance of the household in rice production is reflected with indicators such as selling price, gross revenue, costs, net revenue, and profit-cost ratio. The survey results are shown in Table 6.

Table 6. Economic performance/ha of rice production towards VietGAP and conventional rice production households in Winter-Spring crop 2017–2018

Indicators	Towards VietGAP rice households	Conventional rice households	% increase (+) or reduce (–)	*P-value*
Yields (quintal/ha)	66.6	66.8	–0.3	0.823
Output prices (VND/kg)	5,693	5,587	+1.9	0.050
Gross revenue (VND)	37,915,380	37,321,160	+1.6	0.096
Total costs (VND)	22,964,820	23,318,800	–1.5	0.784
Net revenue (VND)	14,950,560	14,002,360	+6.3	0.090
Profit cost ratio (VND)	0.65	0.60	+7.8	0.114

The data in Table 6 show that except for the output price, the remaining indicators do not differ significantly at 5%. The rice yields in both groups are similar, about 65.7 quintal/ha. This yield is 15 quintals/ha lower than the average rice yield of farmers in the Mekong Delta [3, 8]. The output rice price of households towards VietGAP is about 5,700 VND/kg, which is although higher than that of conventional rice households statistically (p = 0.05) but has no practical significance (Appromixately 2%).

The income from rice production of households towards VietGAP is higher than that of conventional rice ones but not significant. On average, the gross revenue from rice production of towards-VietGAP households is 37,915,380 VND/ha, an increase of about 1.6% compared with that of conventional rice households. Besides, the total cost of rice production towards VietGAP is approximately 23,000,000 VND/ha, about 350,000 VND/ha lower than that of conventional rice production.

The net revenue of rice production in both groups is rather low and there is no statistical difference between the two groups (p = 0.09). On average, the net revenue of rice households towards VietGAP is 14,950,560 VND/ha, which is 948,200 VND/ha higher than that of conventional rice production. The net revenue of this study is 1,400,000 VND/ha higher compared with that of Le Van Nam et al. in a study conducted in Quang Binh province in 2017 [8]. However, the net revenue from the rice production towards VietGAP of the surveyed households in the this study is about 2,000,000 VND/ha lower compared with that of some studies in the Mekong Delta [3, 8]. The profit-cost ratio of the rice production towards VietGAP households is higher than that of the traditional rice production but the increase is not significant.

In general, the economic efficiency of rice production towards VietGAP in the study area is not significantly higher than that of conventional rice production.

4 Conclusions

From the research results on rice production towards VietGAP of households in Phong Binh, we draw some main conclusions as follows:

Rice area towards VietGAP of households is relative, 3.2 sao per household, accounted for nearly 40% of their total rice area. Towards-VietGAP rice households use only seeds, phosphate, NPK fertilizers as guided by agricultural co-operatives. They use 16 kg/ha of seeds less than that of the conventional rice households. Households in both groups tend to use more potassium and nitrogen fertilizers than the guidelines of agricultural cooperatives. The rice yields of the Winter-Spring crop 2017–2018 of households towards VietGAP is equivalent to that of conventional rice ones, about 66.7 quintal/ha.

The cost of rice production towards VietGAP and conventional rice production is quite high, from 23,000,000 to 23,300,000 VND/ha. In particular, the inorganic fertilizer cost of rice households towards VietGAP is not significantly higher than that of conventional rice ones. Other types of expenses such as labour, harvesting, plowing, and irrigation are similar in the two groups. The costs of seeds and plant protection of rice households towards VietGAP are significantly lower than that of conventional rice ones.

The net revenue of rice production in both groups is rather low. The net revenue of households towards VietGAP is about 14,950,560 VND/ha, which is 948,200 VND/ha higher than that of conventional rice households. The profit-cost ratio of households towards VietGAP is also higher than that of conventional households but the increase is not significant.

To improve the economic efficiency of rice production towards VietGAP, households should cooperate in production as well as cooperate with enterprises and companies in supplying inputs and consuming outputs. More seminars and training courses concerning capacity building for market access and implementing technical procedures under VietGAP standards should be organized for households.

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