



Income Generation and Expenditure of Organic Rice Farming Households: Case Study of Preah Vihear Province, Cambodia

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Received 31 January 2022 Accepted 22 April 2022 (*Corresponding Author)

Abstract In Cambodia, organic rice farmers commonly engage in integrated farming and off-farm activities to supplement their income. To identify factors for income optimization, this study attempted to assess the income and expenditure structure of organic rice farm households in the Preah Vihear Province, Cambodia. Guided with a structured questionnaire, a total of 90 and 50 randomly selected farmers were interviewed in 2019 and 2021, respectively. This study utilized both descriptive and multiple regression analyses. Overall, farmers tended to expand their cultivation area and increase income from off-farm jobs. Particularly, large-scale farmers (5ha<) significantly expanded their farmland area and increased their livestock and off-farm activities, while small-scale farmers (5ha>) reduced their farmland area and increased their off-farm activities. Moreover, the multiple regression analysis revealed that secured spare time from combine-harvester usage opened opportunities for farmers to engage in off-farm jobs. These off-farm jobs, particularly by male farmers, boosted their respective annual income. On the other hand, existing loans gave several farmer respondents negative profit in 2020. Thus financial management seemed to be a factor affecting farmers' incomes in rural areas. For further study, farm household employment choice behavior, particularly on labor mobility and off-farm activities, is recommended.

Keywords expenditure, income, off-farm activities, organic rice, rural area

INTRODUCTION

Agricultural development is the most effective way to reduce poverty (World Bank, 2008). Two effective agricultural development strategies are commonly practiced: engaging in organic agriculture and growing energy crops (Markandya and Setboonsarng, 2015). In Cambodia, agriculture contributed to poverty reduction from 50% in 2007 to 9.4% in 2017. Moreover, rice is the predominant crop, occupying 80% of the total crop area, and about 90% of the poor live in rural areas and rely on rice farming for their primary income sources (NIS, 2013). The agriculture sector still shared around 20% of GDP in 2019 (MAFF Cambodia, 2020). However, evidence suggests that rural households' livelihoods draw on various activities in developing countries. From rural development and food security viewpoints, it is critical to understand the structure of farm households' earnings and income levels (Helmerts et al., 2004; Tong and Phay, 2013). Located in the Northern part of the country, Preah Vihear province is one of the main producing area of organic rice in Cambodia. This rural province produces organic rice once a year. Thus, all farmers have off-farm activities and produce other crop to support their daily lives. Commonly, farmers produce rice, other crops, and livestock (e.g. cattle, poultry), and do other off-farm activities as

wage-earners and migrants to the city or neighboring country to do other jobs to maximize their incomes (Preah Vihear Provincial Department of Agriculture, 2019). Little research has been performed on organic farm households' expenditure and income generation, especially in rural areas (Uddin and Takeya, 2006). However, no researcher has measured the expenditure and income generation of organic rice farm households in integrated farming based on-farm size and family structures (e.g. gender, age, family member, and off-farm activities) in Cambodia.

OBJECTIVE

This study aims to assess the income and expenditure structure of organic rice farm households in the Preah Vihear province, Cambodia, to determine the most suitable choice for organic rice farm households to maximizing income. Specifically, this study aims to identify the characteristic of organic rice farm households in the study area; clarify the structure of income sources of farm households; and assess their expenditures.

METHODOLOGY

Study area: Data collection was conducted in Preah Vihear province, the largest organic rice producing area and largest contract farming area in Cambodia. This region was characterized as a rural area, with 85% of the population (approximately 60,605 households in 2019) relying on agriculture. Hence, farmers were the main actors in this rural area.

Sample selection: Questionnaire survey and in-depth interviews were conducted randomly of 50 organic rice farmers in contract farming during the fields survey 2021. Collected data were processed and compared with the previous field survey of 90 respondents in 2019 in the same study area. Qualitative data were also collected regarding constraints, opportunities, and other impact factors, including environmental and social factors.

Data analysis: Descriptive and multi-regression analyses were utilized. The multiple-regression model below was adopted from Uddin and Takeya (2006) study.

$$\ln AI = \ln a + b_1 \ln X1 + b_2 \ln X2 + b_3 \ln X3 + b_4 \ln X4 + b_5 \ln X5 + b_6 \ln X6 + b_7 \ln X7 + b_8 \ln X8 + U_i$$

Ln = Natural logarithm

Y = Annual income of farm household

a = Constant or intercept of function

X1 = Total owned land

X2 = Working days per year on farm activities by male

X3 = Working days per year on farm activities by female

X4 = Working days per year off-farm activities by male

X5 = Working days per year off-farm activities by female

X6 = Family member

X7 = Family member engage in Agri.

X8 = Age of head household

$b_1 \dots b_8$ = Coefficients of respective variables;

U_i = Error terms.

RESULTS AND DISCUSSION

Farmer respondents were divided into three groups according to their owned land size, as shown in Table 1. Family members and members engaged in agriculture decreased yearly, for overall farmers and or group categories. From 2018 to 2020, farmers seemed to increase their cultivation areas. However, only farmers who own land more than 5 ha increased their cultivation areas, and farmers who own land larger than 10 ha expanded all their cultivation areas in a fast pace. In contrast, farmers who own land less than 5 ha seemed to decrease their rice cultivation. From field observation, farmers tend to operate inherited land and sell some of their land. They were more involved in off-farm activities than on-farm activities.

Table 2 shows income sources and expenditure of farmer respondents in the study area. The main job of farmer respondents are organic rice farming. However, since organic rice could only be produced once a year, farmers need to do other jobs to increase their annual incomes as shown in

Table 2, such as other crops farming (cassava, cashew nut), vegetable farming, livestock, and off-farm jobs (e.g. wage earner from other farm, construction workers, small grocery owner, government officer). From Table 2, income from rice farming remained high, but income from off-farm jobs farmers are increasing annually. In general, farmers had lower incomes in 2020 except for those who owned less than 5 ha. Farmers who owned land more than 5 ha relied more on organic rice farming compared to other farmers, thus the impact of natural disasters was also high. At the same time, farmers are also increasing income from livestock, and other crop farming, Farmers who own larger than 10 ha increased their livestock farming income in a fast pace. From the interview, farmers said that even though the use of agricultural machinery is still limited, either owned or rented, and it has secured them more time to do off-farm jobs or expand their cultivated land.

Table 1 General characteristic of farmers respondents from 2018 to 2020

Items	Overall			Less than 5 ha			5 to 10 ha			More than 10 ha		
	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020
Number of household	90	50	50	42	25	20	37	20	21	11	5	9
Family member (person)	4.6	4.2	4.0	4.2	3.6	3.4	4.8	4.2	4.1	5.4	5.2	5.2
Member engage in Agr. (person)	3.4	3.1	2.9	3.1	2.6	2.5	3.7	3.2	3.1	3.9	3.6	3.4
Education (years)	5.1	5.5	5.6	5.4	5.8	5.4	5.7	5.2	5.2	5.1	5.2	6.3
Age (years)	43.6	46.4	47.4	45.1	45.6	49.5	45.2	46.4	47.4	52.1	51.1	43.9
Rice cultivation area (ha)	3.8	4.1	4.3	3.2	2.3	2.1	4.1	4.1	4.3	6.7	8.8	9.2
Other crop cultivation area (ha)	1.3	1.6	1.9	0.2	0.7	0.9	1.3	1.6	1.9	2.9	4.0	3.7
Fallow land (ha)	1.1	0.7	0.6	0.1	0.2	0.1	1.0	0.7	0.6	2.8	2.0	1.2
Total owned land (ha)	6.2	6.3	6.8	3.5	3.2	3.2	6.0	6.4	7.2	12.4	14.8	14.8

Source: Field survey, 2019 and 2021

Table 2 Income sources and expenditure of farmers by year and groups

unit: thousand riels/household

	Overall			Less than 5 ha			5 to 10 ha			More than 10 ha		
	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020
Number of Households	90	50	50	42	25	20	37	20	21	11	5	9
Income sources												
Rice	4,790	5,624	4,300	3,819	3,494	2,312	5,680	5,934	4,316	12,155	13,449	9,477
Other crops	1,363	593	1,739	512	685	869	639	1,218	1,906	2,400	2,508	3,585
Off farm	2,617	5,716	6,389	3,066	6,273	7,977	2,344	5,049	4,705	2,200	5,473	6,645
Vegetable	n/a	749	637	n/a	472	517	n/a	627	772	n/a	1,200	600
Livestock	1,814	1,884	2,884	1,565	1,934	2,165	1,718	2,350	2,316	1,502	8,003	8,489
Total incomes (1)*	10,584	14,566	12,429	8,962	12,858	13,840	10,381	15,178	14,015	18,257	30,633	28,796
Expenditure												
Food	6,627	6,859	6,999	5,535	5,730	5,848	5,471	5,665	5,782	8,211	8,503	8,679
Children	1,390	1,423	1,457	1,163	1,190	1,219	1,194	1,223	1,253	3,417	3,500	3,585
Loan	779	969	981	449	558	565	535	666	675	1,943	2,422	2,453
Transportation	632	813	823	760	979	991	442	571	578	865	1,118	1,132
Utility	230	350	358	190	290	297	184	282	289	480	736	755
Phone	235	351	360	195	291	297	189	283	289	246	369	377
Other	517	666	955	374	482	694	460	594	856	1,010	1,306	1,887
Total Expenses (2)	10,409	11,429	11,934	8,665	9,521	9,911	8,476	9,284	9,721	16,172	17,955	18,868
(1) - (2)	175	3,137	495	297	3,337	3,929	1,905	5,894	4,294	2,085	12,679	9,929

Source: Field survey, 2019 and 2021

Note: *All the production costs of farming are excluded from incomes 1USD=4,050 riels

All the essential daily or monthly expenditures of farm households are included in Table 2 except the production cost of farming. More than 50% of total expenses accounted for food consumption. Farmers are also willing to invest more in their children's education, about 15% of total expenses, and more than 15% for farmers with land larger than 10 ha in 2020. Moreover, the annual loan tends to increase because farmers are more engaged with loans to increase cultivated land or other purposes, and farmers who own larger than 5ha are more involved with the loan.

Farmers mainly borrowed from banks, micro-finance, and a small amount of money from agricultural cooperatives, with the monthly interest rates ranging from 1.75% to 2.5%. In addition, phone payment is increasing because recently, farmers have recently started to use smartphones to receive more information. Lastly, other expenses in Table 2 included health care, social/religious ceremonies, and house repair. As shown in Table 2, farmers could not sufficiently save in 2020, and from observation, several farmers lost their profit in 2020, which will be further discussed in Table 3.

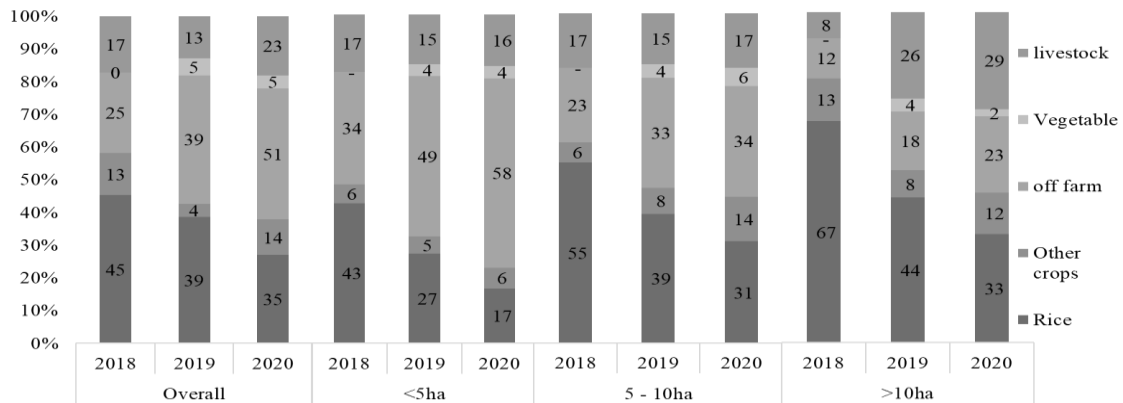


Fig. 1 Percentage of income sources by farmer groups

Source: Field survey in 2019 and 2021

Table 3 Income sources and expenditure of farm households who lost profit in 2020

unit: thousand riels/household

Items		Overall	Less than 5 ha	5 to 10 ha	More than 10 ha
Income sources	Number of Households	13	5	6	2
	Rice	3,727	2,246	4,247	6,346
	Other crops	1,812	1,164	1,907	3,425
	Off farm	5,809	8,910	3,346	5,123
	Vegetable	-	-	-	-
	Livestock	1,216	578	1,651	1,605
Total incomes (1) *		12,564	12,899	11,152	16,499
Expenditure	Food	6,687	6,213	6,995	6,760
	Children	2,320	2,190	2,190	2,798
	Interest	3,253	2,202	2,814	6,032
	Transportation	1,083	1,862	704	669
	Utility	441	514	404	416
	Phone	381	451	350	336
	Other	1,014	576	1,114	1,497
	Total Expenses (2)		15,179	14,007	14,570
(1) - (2)		(2,615)	(1,108)	(3,418)	(2,009)

Source: Field survey, 2021

Note: *All the production costs of farming are excluded from incomes, 1USD=4,050 riels

Although most farmers reported that the main job is rice farming, Figure 1 clearly shows a natural shift of farmer income sources to off-farm activities. Moreover, only farmers who own land less than 5 ha rapidly increase off-farm jobs and decrease share income and cultivated rice farming land from 2018 to 2020. This can be attributed to farmers selling of inherited rice cultivated land. In addition, farmers who own land 5 to 10 ha are increasing off-farm, and other crops farming and farmers who own land larger than 10 ha are more increasing in livestock because they have larger land and capital.

During the field survey in 2021, some farmers had no profit due to high expenses, as shown in table 3. All those farmers spent more on paying loan interests, while the income in 2020 decreased. From field observation, farmers who owned land between 5 to 10 ha engaged more in loans to expand their land cultivation and other activities. Unfortunately, the rice yield was low, which decreased income, and farmers could not afford the repayment. In addition, some farmers who owned less than 5 ha needed to sell their lands to afford the repayment to the bank, which made farmers decrease their owned land, while those who owned land of more than 5ha sold their livestock and other machinery to repay the loan. Those problems made these farmers further smaller in scale. Therefore, farmers seemed to need to understand more about financial management to lower risk in the future.

Table 4 shows the result of multiple-regression on total annual income with working labors, family members, and age of farm households in 2020 by dividing into two groups: farmers who owned less than 5ha and a combination of all farmers who owned land larger than 5ha. It should be noted that the farmers who owned more than 10 ha were not grouped separately due to small

sample size of nine respondents. As a result, besides the land size, off-farm activities significant increased the total annual income. Working off-farm jobs for male has boosted their annual income, especially farmers who owned less than 5 ha. On the other hand, working on the farm for females resulted to negative impact because female farmers are only good at transplanting and harvesting. During land preparation, most female families go together to cook for their husbands or family members at the fields and do side-works nearby, such as picking some dead trees. On-farm work of males is much better during land preparation and other works. Besides that, family members, members engage in agriculture, and the age of the head of households are not significant to increase the income.

Table 4 Multiple-regression of model of farm households’ incomes based on groups

< 5 ha (2020) (20 respondents)	Estimate	Std. error	t-value	Pr (> t)	
(Intercept)	11.214	1.483	7.558	0.000	***
Land size	0.612	0.345	3.724	0.011	*
Working on-farm male	0.139	0.094	1.462	0.171	
Working on-farm female	-0.073	0.137	-1.534	0.303	
Working off-farm male	0.330	0.136	2.422	0.032	*
Working off-farm female	0.292	0.236	2.082	0.064	*
Family members	0.227	0.238	0.942	0.360	
Family members engage in farming	0.190	0.272	1.991	0.116	
Age	0.145	0.350	0.416	0.580	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘.’ 1
 Multiple R-squared: 0.6657, Adjusted R-squared: 0.5247

> 5ha (2020) (30 respondents)	Estimate	Std. error	t-value	Pr (> t)	
(Intercept)	14.766	3.191	4.627	0.000	***
Land size	1.324	0.253	5.221	0.000	***
Working on-farm male	0.554	0.270	2.051	0.053	.
Working on-farm female	-0.550	0.281	-1.954	0.064	.
Working off-farm male	0.208	0.073	2.815	0.010	*
Working off-farm female	0.105	0.060	1.739	0.097	.
Family member	0.091	0.230	0.396	0.696	
Family member engage in farming	0.140	0.130	1.080	0.292	
Age	0.079	0.132	0.603	0.553	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘.’ 1
 Multiple R-squared: 0.742, Adjusted R-squared: 0.640

Source: Field survey in 2021

Table 5 Total annual income and labors input by group in 2020

Items		Overall		Less than 5 ha		5 to 10 ha		More than 10 ha	
Number of households		50	%	20	%	21	%	5	%
Income sources (Thousand riels/HH)	Rice	4,300	35	2,312	17	4,316	31	9,477	33
	Other crops	1,739	14	869	6	1,906	14	3,585	12
	Off-farm	6,389	51	7,977	58	4,705	34	6,645	23
	Vegetable	637	5	517	4	772	6	600	2
	Livestock	2,884	23	2,165	16	2,316	17	8,489	29
	Total income	12,429	100	13,840	100	14,015	100	28,796	100
Labors input (People/HH)	Total labors	436	100	462	100	366	100	550	100
	Rice (male)	47	11	33	7	51	14	74	13
	Rice (female)	49	11	34	7	52	14	79	14
	Other crops (male)	21	5	10	2	21	6	44	8
	Other crops (female)	19	4	10	2	21	6	36	7
	Off-farm (male)	201	46	231	50	159	44	227	41
	Off-farm (female)	101	23	143	31	61	17	91	16

Source: Field surveys in 2021

1 USD = 4,050 riels

Even the regression analysis showed that farmers could boost their annual incomes by engaging in off-farm activities in the current situation, farmers who used about 22% of total labor inputs on rice farming only received about 35% of total income (Table 5). On the other hand, farmers who used about 70% of total labor on off-farm activities received about 51% of total income. This conveys that farmer may achieve more labor and income efficiencies by organic rice farming. However, seasonality of organic rice farming and difficulty in expanding land for organic rice cultivation (mainly small-scale farmers) are the core reasons on further shifting to off-farm activities.

CONCLUSION

In general, the cultivation area has been increasing from 2018 to 2020. Farmers who own land more than 5 to 10 ha increased all the cultivated lands, especially on other crops. However, farmers who own less than 5 ha seemed to rapidly increase their off-farm jobs and decrease their rice land.

Regarding expenditure, farmers spent more than 50% of total expenses on their food consumption, followed by 15% spendings on their children's education. This trend is prevalent to farmers are currently more engaged in loans. Unfortunately, several farmers (especially farmers who owned land less than 5ha) could not repay the loan in 2020, forcing them to sell their lands or other properties to repay the loan and making small-scale farmers further smaller in scale.

However, rice farming still seemed to offer opportunities for farmers to boost their annual incomes in terms of labor inputs and incomes if farmers could expand their rice land and do proper financial management.

Nevertheless, instead of expanding rice cultivation, farmers (especially farmers who owned less than 5ha) tend to increase their annual income by engaging in off-farm jobs in the current situation. On the other hand, farmers who owned less than 5 ha are better off in securing more spare time to do off-farm jobs, especially males, have more potential to boost the farm households' annual incomes.

Therefore, farm households' employment choice behavior, particularly labor mobility, off-farm activities, and loans, is recommended for further study to find more solutions for maximizing the farm households' income.

ACKNOWLEDGEMENT

The authors wish to extend sincere appreciation to Research Institute for Agricultural and Life Sciences (RIALS) for partially supporting this research.

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