



Impact of Smallholder Agricultural Cooperatives on Market Participation of Vegetable Farmers in Cambodia: A Case Study of Svay Rieng Agro-Products Cooperative

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Abstract Agricultural cooperatives play a crucial role in improving Cambodian farmers' participation in vegetable markets. Cambodia's vegetable sector is afflicted by the dual problems of supply and quality; the country imports huge amounts of vegetables from Vietnam and Thailand, and most domestic vegetable production is still inorganic. This quantitative study shows the impacts of Svay Rieng Agro-Products Cooperative (SAC) on its members' participation in vegetable markets. Data was collected from a survey of 44 SAC members and 20 non-SAC members in Svay Rieng province. A market participation index was used to measure the level of respondents' market participation. Based on the quantity of vegetables sold, the 64 sample farmers represent four levels of market participation across 52 market participation scores: level 1 includes scores 4-16 (35.9% of total respondents); level 2 scores 12-32 (32.8%); level 3 scores 24-36 (17.2%); and level 4 scores 32-52 (14.1%). T-test analysis shows that the participation in vegetable market of SAC members is higher than that of non-members. Logit model reveals that variable of growing vegetables as a primary source of household income is positively related to the probability of selling vegetables to SAC. Tobit model is used to determine factors affecting market participation levels of SAC members. The study revealed five factors as critical variables affecting effective market participation: 1) education level of household head, 2) receiving market information, 3) volume of vegetable production, 4) distance to main market, and 5) the extent to which vegetable growers supply SAC. The study stresses the importance of agricultural cooperatives in improving farmers' participation in vegetable markets. Plus, the results concerning the probability of selling vegetables and level of participation in vegetable markets can usefully contribute to informing and improving the royal decree and prakas on agricultural cooperatives in Cambodia.

Keywords agricultural cooperative, market participation, Cambodia

INTRODUCTION

Cambodia's agriculture sector contributed about 27.5% of total GDP in 2012, and crop production alone accounted for 55% of agricultural GDP (MAFF 2013). Although vegetable production in Cambodia increased between 2007 and 2013 (MAFF 2013), Cambodia supplements 40-50% of its vegetable consumption with imports from Vietnam and Thailand. In 2010, for instance, vegetable imports amounted to 70 to 80 tonnes a day (Vietnam Business News, 2010). This huge volume of imports is affecting most stakeholders in the vegetable sector. The Cambodian government is committed to improving agricultural development and promoting smallholder livelihoods through the establishment of agricultural cooperatives. Agricultural cooperatives play an important role in rural

economic development and poverty alleviation (Chea, 2010). Yet few studies have examined the impact of agricultural cooperatives on farmers' participation in vegetable markets in Cambodia.

OBJECTIVE

The objectives of the study are to evaluate the impacts of SAC on market participation of SAC members, and to determine the factors affecting the extent of their market participation.

METHODOLOGY

Household survey: A structured questionnaire was used to gather information from 44 SAC member households and 20 non-member households. Household heads or other adult family members were interviewed face-to-face. Six of the 20 areas covered by SAC were selected for survey. These areas were chosen because the farmers there are more likely to grow the crops of interest, namely cucumbers, Chinese cabbage, Chinese greens, pickle cabbage and dwarf cabbage, than in the other areas. All farmers in the six areas who had produced these five crops in the previous growing season were engaged in face-to-face interviews.

Data analysis: Market participation index, T-test, logit and tobit regression models were used. Following Gani and Adeoti (2011), the market participation index was used to measure the level of market participation among respondents in the study areas. Table 1 describes the index used in computing the total market participation index (TMPI).

Table 1 Market participation index

Quantity sold (L)	Scores									
	Market location (X)					Period of sale (Y)		Buyer (Z)		
	Home- stead (X1)	Farm gate (X2)	Village market (X3)	Town market (X4)	City market (X5)	On- season (Y1)	Off- season (Y2)	Consu- mer (Z1)	Trader (Z2)	SAC (Z3)*
>0 - <450kg (L1)	1	2	3	4	5	1	2	1	2	3
451 - 1000 (L2)	2	4	6	8	10	2	4	2	4	6
1001-1450 (L3)	3	6	9	12	15	3	6	3	6	9
>1450 (L4)	4	8	12	16	20	4	8	4	8	12

Note: * Developed by authors

Source: Gani and Aeoti 2011

The total market participation index (TMPI) represents each respondent's score, and the score regulates the level of participation in the market. When the scores for the quantities of vegetables sold and other indices including market location, period of produce sale, and buyers were computed, the minimum market participation score 3 indicates the lowest level and 96 the highest level of participation.

$$\text{Minimum Score} = X1(L1) + Y1(L1) + Z1(L1) = 3$$

$$\begin{aligned} \text{Maximum Score} = & X1(L4) + X2(L4) + X3(L4) + X4(L4) + X5(L4) + Y1(L4) + Y2(L4) + Z1(L4) + Z2(L4) \\ & + Z3(L4) = 96 \end{aligned}$$

In addition, the different levels of farmers' participation in vegetable markets were determined using the following formula:

$$\frac{RTMPI}{NMPWC} \times \frac{100}{I}$$

where RTMPI = replication/frequency of total market participation indices, and NMPWC = number/size of market participants within a given category.

T-test as modeled by the t-distribution was used to test the statistical difference in the average market participation score of SAC members and non-members. Logit model was used to determine the probability of farmer-members selling vegetables to SAC. Tobit model was used to determine factors influencing the level of SAC members’ market participation in the study areas.

RESULTS AND DISCUSSION

Impact of Svay Rieng Agro-Products Cooperative on Market Participation

The four levels of market participation signify that although the 64 surveyed farmers participated in the market, they did so to different degrees. The various levels of market participation in the study areas and their scores are shown in Fig. 1; the main features of the data are described below.

At level 1, 23 respondents (35.9% of the total) participated in the market; score level 4 (4.35%) has the fewest and score level 16 the most participating farmers (4.35%). Majority of farmers in this level fall into score levels 8, 10, 13 (17.39% at each score level).

At level 2, 21 respondents (32.8%) participated in the market; score level 12 (4.76%) has the fewest and score level 32 the most participating farmers (4.76%). Most farmers in this level are concentrated in score levels 16 and 20 (19.05%) and 24 (23.81%).

At level 3, 11 respondents (17.2%) participated in the market; score level 24 (45.45%) has the fewest and score level 36 the most participating farmers (9.10%). Most farmers in this level have a score level of 24 or 30 (45.45%).

At level 4, 9 respondents (14.1%) participated in the market; score level 32 (22.22%) has the fewest and score level 52 the most participating farmers (44.45%) in this level. Most farmers have score levels of 52 (44.45%) or 30 (22.22%).

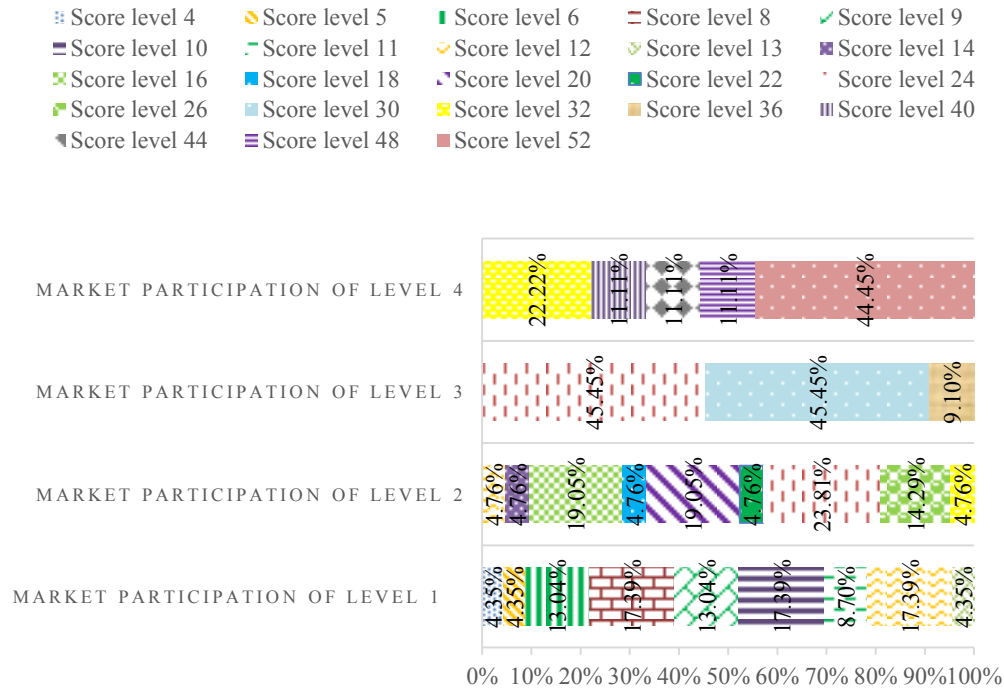


Fig. 1 Four levels of participation in vegetable markets

The level of SAC members' market participation is higher than that of non-members; the difference is statistically significant at the 5 percent level. The average market participation score of SAC members is 23.4, whereas that of non-members is 16.8 (Table 2).

Table 2 Comparison of market participation level between SAC members and non-members

Dependent variable	Members	Non-members	Difference	t-test
Market participation score	23.4	16.8	6.6**	1.97

Note: ** statistically significant at the 5% level

The logit regression model was used to determine the factors influencing the probability of selling vegetables to SAC; Table 3 presents the regression results. The fit of the data is statistically significant at the 5 percent level; the concordant is $R^2=0.22$. The results indicate that the specific regressors are 22 percent able to explain the probability of selling vegetables to SAC. The main income source (vegetables are a primary source of household income), which is positively statistically significant at the 10 percent level, relates to the probability of selling vegetables to SAC. A natural increase in main income implies a higher probability of selling vegetables to SAC. Six other variables positively affect the probability of selling vegetables to SAC but the results are not statistically significant. Those variables are age, education, male household head, family size, farm size and vegetable prices. Three other factors that negatively affect the probability of selling vegetables to SAC, and are also not statistically significant, are married status, dependency ratio and distance to main market.

Table 3 Logit model results for factors influencing the probability of SAC members selling vegetables to SAC

Variable	Definition of variables	Coefficients	Std.Error	Z-value	P-value
Age	Age of household head	0.026	0.038	0.680	0.497
Education	Number of years household head attended school (years)	0.193	0.121	1.590	0.112
Male	Household head is male (dummy)	15.407	1836.572	0.010	0.993
Married	Household head is married (dummy)	-16.909	1836.572	-0.010	0.993
Family size	Number of family members	0.253	0.183	1.380	0.167
Dependents	Dependency ratio (adults aged 15-65 years)	-0.765	0.827	-0.930	0.355
Farm size	Area of cultivated land (m ²)	0.000	0.000	0.520	0.605
Major income	Vegetable production is primary source of household income (dummy)	1.221	0.695	1.760	0.079
Vegetable price	Vegetable price (riel per kg)	0.000	0.000	1.190	0.236
Distance	Distance to main market (km)	-0.136	0.147	-0.920	0.356
Constant		-3.293	3.089	-1.070	0.286

Note: Number of observations 64; $X^2=18.55$ ($P<0.05$); log likelihood = -33.54 ($P<0.05$); concordant $R^2=0.22$

Factors Affecting Market Participation of SAC Members

In estimating the determinants of the extent of market participation, the tobit model involved nine regressors (Table 4). Chi-square of 75.21% at the 1% level of significance implies a good fit between the model and data. The log likelihood is -137.14 at the 1% level of significance; the R^2 of 0.22 signifies that independent variables account for 22% of the variability in the level of market participation. Education of household head, which has a positive sign, is significant at the 5% level; a

unit increase in the level of education will increase the level of market participation by 60%. Receipt of market information, which has a positive sign, is significant at the 5% level. Members who receive market information are at least three times more likely to take market participation more seriously than those who receive none at all. Vegetable production, which has a positive sign, is significant at the 1% level; a unit increase in vegetable production will increase the level of market participation by 1%. Distance to main market, which has a positive sign, is significant at the 5% level, meaning a 1 km increase in distance will increase the level of market participation by 68%. Because SAC cannot buy all the vegetables its members produce, farmers nearly always have to travel to sell their produce at more distant markets such as the Svay Rieng market and other district markets, where they get higher prices. If members sell their produce to wholesalers at the farm gate, they receive lower prices than if they were to sell directly on the main market. Supplying SAC, which has a positive sign, is significant at the 1% level. Members who supply vegetables to SAC are at least six times more likely to take market participation more seriously than those who do not. Two variables that positively affect the level of market participation but are not statistically significant are family size and vegetable prices. Four variables that negatively affect the level of market participation and are also not statistically significant are male household head, main income source, farm experience and number of training subjects.

Table 4 Tobit model results for factors affecting market participation of SAC members

Variable	Definition of variables	Coefficients	Std.Error	Z-value	P-value
Education	Number of years of household head attended school (years)	0.605	0.283	2.140	0.040
Family size	Number of family members (person)	0.416	0.492	0.850	0.403
Male	Household head is male (dummy)	-1.718	3.871	-0.440	0.660
Market information	Receipt of market information (dummy)	4.666	2.247	2.080	0.046
Main income	Vegetable is primary source of household income (dummy)	-0.259	1.984	-0.130	0.897
Farming experience	Years of growing vegetable (years)	-0.047	0.105	-0.450	0.657
Vegetable production	Total amount of vegetable production (kg/m ²)	0.014	0.001	10.390	0.000
Training	Number of training subjects covered	-0.246	0.671	-0.370	0.716
Distance	Distance to main market (km)	0.681	0.298	2.280	0.029
Vegetable price	Vegetable price (riel per kg)	0.000	0.000	0.700	0.490
Supply to SAC	Members selling vegetables to SAC (dummy)	6.479	1.901	3.410	0.002
Constant		-3.505	5.366	-0.650	0.518

Note: Number of observations 44; $X^2 = 75.21$ ($P < 0.01$); log likelihood = -137.14 ($P < 0.01$); concordant R² = 0.22

CONCLUSION

The study found that the vegetable market participation of SAC members is better than that of non-members. Vegetables are the primary source of household income, which is positively related to the probability of selling vegetables to SAC. The study identifies five factors that affect effective market participation: 1) education level of household head, 2) receipt of market information, 3) amount of vegetable production, 4) distance to main market, and 5) the extent to which farmers supply vegetables to SAC. The analysis emphasises the importance of agricultural cooperatives in improving farmers' participation in vegetable markets. Moreover, the insights into the factors that affect the probability of

selling vegetables and the level of market participation can usefully contribute to improving the royal decree and prakas on agricultural cooperatives in Cambodia.

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