ANALYSIS OF FACTORS AFFECTING THE AWARENESS PROBABILITY ABOUT THE FAIR-TRADE MODEL OF THE COFFEE FARMERS IN XUAN TRUONG COMMUNE, DALAT CITY, LAM DONG PROVINCE

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Abstract

Fair-trade in coffee production offers an opportunity to improve farmers' position in the market. The research has used a multinomial logit model with the MLE method to analysis the factors affecting the awareness probability about the fair-trade model of the coffee farmers Data were collected by directly interviewing 220 farmers in Xuan Truong Commune, Da Lat City, Lam Dong Province where the fair- trade model has been applied to coffee production at the Cau Dat coffee cooperatives. The results showed that the awareness probability of farmers about the fair-trade coffee model was 21,68% while there was only 0.12% of famers knowing this but not clear. In addition, factors affecting the awareness probability in the fair-trade coffee model are educational level, experience, communication, understanding of fair-trade, and coffee cultivation; of which communication and understanding of fair-trade positively influencing the farmers' awareness.

Keywords: *fair-trade, coffee production, multinomial logistic regression.*

1. Introduction

Coffee is one of the major export products in Vietnam. Currently, Vietnam is the largest exporter of coffee. In 2018, coffee exports reached 1.88 million tons worth USD 3.54 billion and contributed about 15% of total value of the exported agricultural products (Vicofa, 2018). The coffee plantation area is mainly concentrated in the highlands of Vietnam (Kontum, Gia Lai, DakLak, DakNong, Lam Dong province). According to the planning of the Ministry of Agriculture and Rural Development, the coffee plantation of the region is 530,000 ha in 2020. However, coffee producers are faced tremendous challenges because of current farming methods. The infrastructure of coffee production is unsustainable with 90% of the area adopting traditional intensive methods; lack of shade trees and forest trees; abuse of chemical fertilizer, pesticides; and 40% of irrigation area required to do groundwater levels attenuation (Nguyen & Sarker, 2018; Le Chi Hieu, 2017). Therefore, the coffee production needs to be turning to sustainable production.

Currently, certification on sustainable

coffee production is being issued widely in the highlands. The popular is 4C, UTZ, Rainforest Alliance, and Fair-trade. The fair-trade coffee certification program was kicked off in the highlands in the middle of the year 2008. In Lam Dong province, as of 2017, over 4,000 farmers participated in coffee production with a fair-trade certification. However, the implementation of the fair-trade certification for coffee has faced the problems of difficulties such as: community's joining fees, market issues, and awareness of the farmers. The goal of this research is: (1) to analyze the factors affecting the awareness probability about the fair-trade model of the coffee producers in Xuan Truong Commune, Dalat city, Lam Dong province' and (2) to propose policy implications to enhance the ability of fair-trade model recognition of coffee farmers.

2. Materials and Methods

2.1. Conceptual framework

Fair-trade is giving farmers equal opportunity to improve their market position. The standards for small producers include the economic, social, and environmental criteria. Fair-trade contributes to the development potential as well as facilitating groups of producers establishing democratic and transparent governance mechanisms (Fairtrade International, 2011). In Lam Dong, Cau Dat cooperatives in the Xuan Truong commune has been granted the certificate of fair-trade. Cau Dat cooperatives will be to deduct 20%-30% of the income generated from coffee production to support local community. Participating the model, farmers must comply with the rules which are non-chemical cultivation, non-use pesticides, harvest when the berries reach over 90% to ensure the best quality of the coffee.

In the coffee production, farmers involved in manufacturing standards (4C, UTZ, Rainforest Alliance, Fair-Trade) will bring certain benefits such as: (1) increased earnings for reduced input costs; (2) increased the benefit-cost coefficient and increased their position (Jezeer et al., 2018; Le Chi Hieu, 2017; Makita, 2012); and (3) created a stable raw material zone and a branded, high-quality export coffee source (Naylor, 2018; Nguyen Thanh Truc, 2013). However, other studies showed that there was no connection between fair-trade certification and a better price or income (Ruben & Fort, 2012). Farmers producing organic coffee which was certified fair-trade have become poorer than those with conventional productions (Zeller & Beuchelt, 2011). Some farmers find that direct benefits are relatively limited because not all of their products are sold under fair-trade terms (Elliot, 2012). On the other hand, studies have shown that farmer's ability to recognize in models of agricultural production is positively influenced by factors such as education level, age of majority, experience, the scale of production, number of employees (Mabe et al., 2016; Kumar, 2011; Briz & Ward, 2009), information on sustainable agricultural production techniques (Rigby & Caceres, 2001).

2.2. Methodology

Multinomial Logit (MNL) model is one of the most popular tool used to express the multi categorical responses. The model is used to predict and explain relationships among variables in a wide variety of areas, including business, economics, education level, healthcare, and geography. As it is an enhanced version of logistic regression,

multinomial logistic regression shares the problem associated with logistic regression but with more complications involved (Changpetch & Lin, 2015).

The MNL model is expressed as follows:

$$Log\left(\frac{p_{ij}}{p_{i1}}\right) = x_i\beta_j \text{ for j = 1,...,j,i=1,...,N}$$

Where, P_{ij} is Prob(Y=j/x), which is obtained as follows:

$$p(y = j / x_i) = \frac{\exp(x_i\beta_j)}{1+\sum_{j=1}^{j}\exp\left(x_i\beta_j\right)}$$

The maximum likelihood method was used to estimate the results in the model, the awareness probability of farmers about the fair-trade coffee model is obtained as follows:

$$p(Y=1) = \frac{1}{1+\sum_{j=1}^{j}\exp\left(x_i\beta_j\right)}$$

$$p(Y=j) = \frac{\exp(x_i\beta_j)}{1+\sum_{j=1}^{j}\exp\left(x_i\beta_j\right)}$$

The advantage of using multinomial logit model is that it models the odds of each category relative to a baseline category as a function of covariates, and it can be used to test the equality of coefficients (Kohansal & Firoozzare, 2013).

In this study, the Multinomial Logit (MNL) model is used to analysis the factors affecting awareness probability the coffee farmers about the fair-trade model. Variables were defined in the Table 1.

Table 1. Variables used in the multinomial logit model and their expected outcome

Variables	Definition and measurement	Expected outcome
Y	0: No known of fair-trade model (base outcome) 1: Known but no clear awareness of fair-trade model 2: Clear awareness of fair-trade model	
X_1	Age of the household head (years)	+
X_2	Education level of the household head	+
X_3	Experience of the household head (years)	-
X_4	Farm-scale ($1000m^2$)	-
X_5	Farm labor (peoples/household)	
X_6	Communication (Using the Likert scale; and including level in watching of agricultural news, participating the union, communicating with the other farms)	+
X_7	Perception regarding of benefit of the fair-trade (Using the Likert scale; and including transparency, fair price, gender equality, environment protection, economic efficiency)	+
D_1	Gender of the household head (Dummy variable: 1: male; 0: female)	+
D_2	Cultivation (Dummy variable1: synchronized; 0: monoculture)	+

Marginal probabilities of effects can be calculated from the equation below:

$$\frac{\partial P_j}{\partial X_k} = P_j(\beta_{jk} - \sum_{j=1}^{j} P_j \beta_{jk})$$

The probabilities for primary choice in adaptability of farmers can be calculated, *ceteris paribus.* tThe empirical specification for examining the influence of explanatory variable which are described in table 1 on the choice of Y is given as follows:

$$Y_{i=1,2...j} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 D_1 + \beta_6 D_2 + \beta_7 D_3 + \varepsilon$$

2.3. Data sources

In this study, a sample of 222 coffee farmers in Xuan Truong district, Da Lat city was used (2009). This coffee producing area comprising the Cau Dat coffee collaborative which was certified as fair-trade model. Data were collected through direct interview using questionnaires. In addition, secondary data were collected from various sources, including local authority reports, and relevant scientific journals. Limdep 9.0 software was employed for data analysis.

3. Results and Discussion

3.1. Data description

The research was conducted by interviewing 222 coffee farmers which were divided into two groups. Group 1 includes 28 coffee farmers who clearly aware of the fair-trade model. Group 2 is 192 observations which comprise 42 coffee farmers who are vague about the fair-trade model and 152 coffee farmers who are unclear character or meaning of the fair-trade model. The results from Table 2 show that the respondents are diverse in ages and educational levels. The average age of the household head is about 50 years old, of which age from 40 to 50 accounts for the highest proportion of 35.7% and 33.0% for group 1and group 2, respectively; at this range of ages, the farmers still have enough health to directly participate in the coffee production.

Table 2. General information about the interviewees

Category	Group 1		Group 2	
	N	ratio(%)	N	ratio(%)
1. Gender				
Male	17	60.7	135	69.6
Female	11	39.3	59	30.4
2. Age				
<= 30 years old	3	10.6	5	2.6
30 – 40 years old	5	17.9	31	16.0
40 – 50 years old	10	35.7	54	27.8
50 – 60 years old	5	17.9	64	33.0
>= 60 years old	5	17.9	40	20.6
3. Education				

Category	Group 1		Group 2	
	N	ratio(%)	N	ratio(%)
Illiterate	0	0.0	2	1.0
Primary school	5	17.9	18	9.3
Secondary school	10	35.7	102	52.6
High school	13	46.4	69	35.6
College	0	0.0	3	1.5
4. Experience				
<= 5 years	3	10.7	6	3.1
5 – 10 years	3	10.7	16	8.2
10 – 15 years	2	7.2	26	13.4
15 – 20 years	4	14.3	22	11.3
> 20 years	16	57.1	124	64.0
5. Farm size				
<= 5.000 m^2	3	10.7	12	6.2
5.000 m^2 – 10.000m^2	5	17.9	37	1.1
10.000 m^2 – 15.000 m^2	6	21.4	21	10.8
> 15.000 m^2	14	50.0	124	63.9

Note: Group 1 - clearly aware of fair-trade model; Group 2 - vague and unclear of character or meaning of fair-trade model

On the other hand, the education of the household head is mainly secondary and high school which may help them to follow up the market information as well as to access technology when participating the fair-trade model. Experience of the household head is other factor affecting coffee production, the statistical results show that 57.1% and 64.0% of household have experience over 20 years for group 1 and group 2, respectively.

Table 3. Cultivation types

Category	Group 1		Group 2	
	N	ratio(%)	N	ratio(%)
Monoculture	11	39.3	71	36.6
Coffee and fruit tree	15	53.6	115	59.3
Coffee and perennial tree	2	7.1	8	4.1
Coffee and others	0	0.0	0	0.0

Table 3 shows that intercropping cultivation between coffee and fruit trees takes 53.6% for group 1, and 59.3% for group 2. Intercropping has helped coffee trees increase drought resistance and reduce watering in the dry season.

3.2. Analysis of factors affecting of awareness probability the coffee farmers about the fair-trade model

3.2.1. Farmers' perceptions of the benefits the fair-trade coffee model

Table 4 shows that farmers' perceptions of the benefits when participating the fair-trade model. The results show that there are differences in farmers' perceptions of the benefits obtained from the fair-trade model. For group 1, the mail benefits gained from fair-trade model are higher economic efficiency (3.75), better working conditions (3.79), improving educational levels (3.92),) and the sustainable trade relationship (3.93), safe working environment (4.00), and environmental protection (4.21). While the awareness of the group 2 is average, but the farmers highly appreciate the benefit obtained regarding the environmental protection, safe working environment and improving the educational levels.

Table 4. The benefits obtained from fair-trade model

Category	Group 1		Group 2	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**
- Better working conditions	3.79	0.157	3.35	0.057
- Information transparency	3.71	0.134	3.21	0.057
- Improving educational levels	3.82	0.115	3.52	0.054
- Fair price	3.50	0.181	3.29	0.066
- Gender equality	3.68	0.126	3.22	0.052
- Safe working environment	4.00	0.126	3.53	0.051
- Environment protection	4.21	0.127	3.56	0.052
- Support of credit	3.71	0.177	3.15	0.069
- Higher economic efficiency	3.75	0.175	3.41	0.068
- The sustainable trade relationship	3.93	0.125	3.30	0.064

3.2.2. The regression model of factors affecting awareness probability the coffee farmers about the fair-trade.

The results obtained from the multinomial logit model are shown in Table 5. The R^2 coefficient of the model is 52.4% and Prob (F-stat) = 0.000 < α = 5%, which indicates the suitability of the multinomial logit model and the independent variables in the model explained the awareness probability in the fair-trade coffee model is at 52.4%. This indicates that the awareness probability of farmers about the fair-trade coffee model was fairly low, 21.68% (Y1/Y0) awareness but not clear and 0.12% (Y2/Y0) clear awareness in the fair-trade coffee model.

Table 5. Estimation results of multinomial logistic regression model

Interpretation	Y=1		Y=2	
	Coefficient	**P-value**	**Coefficient**	**P-value**
C	-4.229		-6.240	
X_1 (Age of the household head)	-0.007^{ns}	0.589	0.002^{ns}	0.153
X_2 (Education level of the household head)	0.092^{*}	0.014	0.139^{*}	0.085
X_3 (Experience of the household head)	-0.245^{***}	0.000	-0.190^{*}	0.064
X_4 (Farm-scale)	-0.238^{ns}	0.142	-0.638^{ns}	0.213
X_5 (Farm labor)	0.246^{ns}	0.305	-0.133^{**}	0.023
X_6 (Communication)	3.435^{***}	0.001	6.558^{***}	0.000
X_7 (Perception of the fair-trade benefit)	0.995^{*}	0.023	6.328^{***}	0.000
D_1 (Gender)	-0.241^{ns}	0.606	0.032^{ns}	0.974
D_2 (Cultivation)	0.927^{**}	0.034	0.811^{**}	0.011
N	222			
Pseudo R-Square	0.524			
Model fitting information				
Likelihood ration test Chi-square=193.18 DF= 18 sig< 0,00000				

*Note: ***, **, *significant at 0.01, 0.05, 0.10; ns is not statistically significant.*

The results from Table 5 showed that variables such as the educational levels, experience of the household head, communication, perception of the fair-trade benefits and cultivation significantly affected the awareness probability of farmers. Meanwhile, the age of the household head and farm scale were not statistically significant in explaining the awareness probability. However, farm labor was statistically significant for the group 1 but not statistically significant for group 2.

Table 6. Marginal impact

	Marginal impact		
	Y=0	**Y=1**	**Y=2**
X_1 (Age of the household head)	0.001	0.000	-0.001
X_2 (Education level of the household head)	-0.007	0.012	0.004
X_3 (Experience of the household head)	0.021	-0.029	-0.008
X_4 (Farm-scale)	0.029	-0.016	-0.012
X_5 (Farm labor)	-0.024	0.024	0.002
X_6 (Communication)	-0.394	0.279	0.114
X_7 (Perception of the fair-trade benefit)	-0.161	0.018	0.143
D_1 (Gender)	0.022	-0.026	0.040
D_2 (Cultivation)	-0.096	0.089	0.007

The results in Table 6 illustrated the marginal impact of the factors on the relative odds ration of the group 1. The awareness probability the coffee farmers about the fair-trade model with the baseline outcomes (group of no awareness of fair-trade model selected as the base). The higher the regression coefficient of a factor showed that the greater the marginal impact of that factor on the relative probability of this factor; which means a greater effect on the awareness probability the coffee farmers about the fair-trade model.

In this model, the awareness probability the coffee farmers about the fair-trade model was 1.2% for group 2 and 0.4% for group 1 when the farmers educational levels was increased one year; meanwhile the probability of getting away the fair-trade model was 27.9% for group 2 and 11.4% for group 1 when the communication of the farmers increased by one unit. Through communication activities farmers will receive more information in production, especially when they participate in Good Agricultural Practice courses that can help them to be more aware of the benefits of fair-trade model.

Similarly, the awareness of fair-trade model will increase by 8.9% for group 2 and 0.7% for group 1 when farmers diversify their cultivation. The fair-trade model in coffee production always ensures an environmentally sustainable production and

the diversification is very suitable for the fair-trade model. However, when the farmer's experience increases by one year, their ability to awareness about fair-trade model will decrease by 2.9% and 0.8% for group 2 and group 1, respectively. Coffee farmers do not want to change their production techniques as they cumulated much experience.

Table 7 showed the predicted outcomes of the model, with the correct prediction of 83.33%. This means that the regression coefficients in the model were appropriate for explaining the awareness probability of farmers about the fair-trade coffee model.

Table 7. Predictable outcomes of the model

Indicator	Household	Prediction of model		
		Y =0	Y=1	Y=2
Y =0	153	148	5	0
Y=1	41	24	12	5
Y=2	28	2	1	25
% correct prediction		83.33%		

3.3. Proposing policy implication to improve the awareness of farmer households about fair-trade model

Through the analysis results, in order to improve the awareness of farmer households about fair-trade model, some solutions are necessary.

Identifying the fair-trade model may help the farmers to limit risks in production and consumption, linking between harvest and processing. Farmers should actively change their perception tending to the Good Agricultural Practice by attending extension classes, participating on-farm practice classes regarding applying high-tech agriculture in order to change the conventional production to the environmentally friendly production.

The potential of fair-trade certification has many opportunities because Lam Dong has a large coffee production area. Therefore, the government also needs to develop and implement the active plans so that farmers can visualize their view and understand the long-term benefits of fair-trade. On the other hand, the government needs to create opportunities for farmers to participate in fair-trade certification.

4. Conclusion

The Vietnam's coffee industry characterized by an agricultural sector with small and medium-sized farmer households, the fair-trade in coffee production offers an opportunity to improve farmers' position in the market. The study used the multinomial logit model with the MLE method to analyze the factors affecting awareness probability the coffee farmers about the fair-trade model. The results showed that 21.68% of the farmers were aware but not be clear about fair-trade model; and 0.12% of farmers were aware clearly of fair-trade model, so the ability of awareness of farmers about fair-trade

model is quite low. In addition, the results of analysis show that the factors such as education level, experience, communication, perception of the fair-trade benefit and cultivation significantly affect the awareness of farmer households on fair-trade model, in which the factors of communication and perception of the fair-trade benefit are strongly and positively effect the awareness of coffee farmers.

Conflict of Interest

The authors declare no conflict of interest.

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