MEASURES TO INCREASE INCOME OF COFFEE-PLANTERS IN WESTERN HIGHLANDS

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Vietnam has become the world's second largest exporter of coffee and the largest exporter of robusta bean. In the past ten years, coffee has been one of Vietnam's staple exports that has made great contributions to the industrialization and modernization process. Living standard of coffee-planters, however, has not much improved because revenue from selling coffee is not much higher than production cost. This problem means that scientific solutions to income rises are real challenges to policy-makers. To find a solution, it is necessary to identify factors that affect the income of coffee planters. Employing the theory of agronomy and realities in Vietnam, authors have developed a multivariate regression model to quantify the factors that affect the income of coffee planters. A direct investigation of 293 coffee-growing families in provinces of Lâm Đồng and Đắk Lắk was carried out with a view to testing and putting the model into practice. Results show that the income is affected by four factors: coffee-growing area, strain of coffee, coffee-planters' knowledge, and application of biological techniques.

Keywords: coffee, income of planter families, multivariate regression

1. Introduction

Coffee is one of the farm products that yields high values and is an important source of income for many countries including Vietnam. In the past decade, it has been one of staple exports of Vietnam and made great contributions to the industrialization and modernization process. From 2005 on, export of coffee has brought Vietnam in from US$1.6 to 2.0 billion a year. Coffee planters, however, still face a lot of difficulties and their income from coffee is sometimes lower than the production cost. To find a scientific solution to this problem, therefore, is a real challenge to policy-makers. Identifying factors affecting coffee planters' income is necessary for this task. Hence, this paper focuses on two aspects: (i) identifying factors affecting the income; and (ii) offering some solutions to improvements in coffee planters' income.

2. Theoretical basis and income-affecting factors

According to Park S.S. (2002), labor productivity is a condition for changes in the income. What affects the productivity will have impacts on the income. Lewis (1955), Oshima (1995), and Randy Barker (2002) [2], conclude that factors affecting the labor productivity in agriculture comprise of farming area per coffee planting household, mechanization (rental of machines), loan capital, agricultural knowledge, and biological cost (expenses on seeds, fertilizer and chemicals). Đinh Phi Hổ (2010) [4] presents factors affecting the income of peasants in the following model:

$$\text{Ln } Y = B_0 + B_1\text{LnDT} + B_2\text{LnMC} + B_3\text{CA} + B_4\text{LnKL} + B_5\text{LnLC} + B_6\text{LnBC}$$

where dependent variable Y denotes income, and independent variables are farming area per

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household (DT), mechanization cost (MC), loan capital from formal sources (CA = 1, with loan; CA = 0, without loan), agricultural knowledge (KL), labor cost (LC), and biological cost (BC).

Our investigation in the Western Highlands shows that besides these factors, the coffee planters' income is also affected by contracts to sell exchanged with trading companies and strains of coffee they produce. Annual income of a coffee-growing household equals proceeds of the coffee crop minus costs and expenses (on biological techniques, labor, hired machines, loan capital, and other annual expenditures on the plantation).

The selected model of factors affecting Western Highlands coffee planters' income is as follows:

$LnThunhap = b_0 + b_1 lnDTthuhoach + b_2 lnLaodong + b_3 lnVonvay + b_4 lnTDsinhhoc + b_5 lnTDcogioi + b_6 lnTDkienthuc + b_7 Loaicaphe + b_8 Hopdong$

Table 1: Variables of the model

Variables	Expected sign
Dependent variable Thunhap: Annual income of coffee growing household (VNDmillion)	
Independent variables	
DTthuhoach: Area of coffee to harvest (ha)	+
Laodong: Direct laborers of household (person)	+
Vonvay: Loan capital for formal sources (VND million)	+
TDsinhhoc: Application of biological techniques reflected in expenses on fertilizer, pesticide and watering (VND million)	+
TDcogioi: Mechanization reflected in purchase or rental of machines (VND million)	+
TDkienthuc: Householder's agricultural knowledge (point)	+
Loaicaphe: (dummy variable): strain of coffee equaling 1 if it is Arabica and 0 if it is Robusta	+
Hopdong: A dummy variable whose value is 1 if a contract to sell exists and 0 otherwise	+

Estimates of parameters are conducted with OLS method based on SPSS and comprise the following steps:

Step 1: Running the linear regression with all variables selected for the model to produce initial results

Step 2: Assessing the fit of the model (through adjusted R^2 and ANOVA test) before taking the step 3

Step 3: Checking for violations of necessary assumptions:

- Multicollinearity (by VIF and Pearson correlation matrix): If multicollinearity exists, each variable will be tested until the multicollinearity is eliminated.

- Heteroskedasticity (using Spearman rank correlation test): If the heteroskedasticity is found in a variable, the variable will be removed from the model and the regression is run again. The step 2 is repeated until no heteroskedasticity is found in all remaining variables.

3. Empirical study of the model

The authors conducted a survey in December 2010 in 22 communes of eight districts in provinces of Lâm Đồng and Đắk Lắk. The survey covered 293 households/ plantations as samples selected at convenience; and direct interviews with these families were conducted in this survey period [3].

a. Results:

Table 3 shows that four estimated coefficients (farming area, biological techniques, householder's knowledge and strain of coffee) are statistically significant at 5% levels. Tests for fit of the model, multicollinearity, autocorrelation and changes in residual variance found no violation.

b. Discussions and conclusion:

- Discussions: With an adjusted R^2 of 0.538, the model shows that 53.8% of coffee planters' income can be explained by independent variables in the regression model. The regression

Table 2: Samples surveyed

No	Province	District	Commune	Questionnaires	As %
01	Đắk Lắk	Cư Kuin	Hòa Hiệp	15	5.1
			Ea Tiêu	18	6.1
			EaBhok	15	5.1
		Buôn Ma Thuột	Hòa Thuận	19	6.8
			EaKao	10	3.4
			Cư Êbur	20	6.8
		Krông Buk	Cư Pơng	20	6.8
			Ea Sin	14	4.8
			Cư Né	15	5.1
02	Lâm Đồng	Bảo Lộc	B'Lao	4	1.4
			ĐamBri	12	4.1
			TP.Bảo Lộc	2	0.7
		Bảo Lâm	Lộc Thành A	10	3.4
			Lộc thành B	9	3.1
		Đà Lạt City	Trạm Hành	20	6.8
			Xuân Trường, Đà Lạt	40	13.6
		Đức Trọng	Tân Hội	10	3.4
			Tân Thành	2	0.7
		Lâm Hà	Nam Ban Town	11	3.7
			Nam Hà	13	4.4
			Liên Hà	10	3.4
			Mê Linh	4	1.4
Total	2	8	22	293	100

Table 3: Regression results of the model

	Unstandardized coefficient		Standardized coefficient		Collinearity statistics	
	B	Standard error	Beta	Sig.	Tolerance	VIF
(Constant)	4.021	.599		.000		
lnDTthuhoach	1.311	.178	.919	.000	.274	3.649
Lnlao dong chinh	-.117	.200	-.041	.562	.852	1.174
lnVonvay	.057	.086	.050	.510	.760	1.316
lnTDsinhhoc	-.278	.133	-.221	.039	.380	2.632
lnTDkienthuc	.459	.120	.259	.000	.934	1.071
Loaicaphe	.553	.162	.279	.001	.640	1.563
Hopdong	.068	.129	.038	.597	.848	1.179
Adjusted R^2: 0.538 ANOVA: F-value (18.97); Sig.: 0.0000						
Durbin – Watson: 1.691; Significance level of coefficients in Spearman rank correlation test from 0.2 to 0.9						

Dependent variable: LnY (Thunhap)

equation predicting impacts of the said factors on income is as follows:

Thunhap = 4.021+ 1.311DTthuhoach – 0.278TDsinhhoc + 0.459TDkienthuc + 0.553Loaicaphe

Regression coefficients of the model allow the following explanations:

+ When farming area increases by 1%, the household income rises by 1.311% (corresponding to the unstandardized correlation coefficient of

1.311). The relation with independent variables is positive as expected.

+ When biological cost rises by 1%, the household income drops by 0.278% (the unstandardized correlation coefficient is 0.278). The negative relation with independent variables is not expected. The cause of this negative relation might be caused by the overuse of biological substances (fertilizer, water, or pesticide) in hope that productivity will be improved.

+ When householder's agricultural knowledge expressed in points increases by 1%, the income rises by 0.459 because the unstandardized correlation coefficient is 1.311. The relation with independent variables is positive as expected.

+ When the planter replaces Robusta with Arabica strain, their income rises by 55.3% (the unstandardized correlation coefficient is 0.553), and the relation with independent variables is positive as expected.

+ The standardized regression coefficients (Beta) show importance of independent variables in the model. The coefficient of DTdientich is 0.919. This means that this variable explains 91.9% of changes in the planter's income, followed by Loaicaphe, TDkienthuc, and TDsinhhoc.

- Conclusion: Tests of the regression model show that the factors that affect coffee planters' income are area of coffee to harvest, strain of coffee, planter's agricultural knowledge and application of biological techniques.

4. Policy implications

To improve the income of coffee planters in Western Highlands, full attention must be paid to the following issues:

Firstly, a new policy should be adopted to encourage owners of small coffee plantations to join co-operatives or similar organizations in order to establish larger plantations where mechanization can be carried out easily. To facilitate this process, the government should provide a legal basis that allows accumulation or exchange of pieces of land with a view to developing large plantations thereby enjoying economies of scale.

Size of coffee plantation in surveyed districts is usually very small. The smallest plantation is about 0.1 hectare and the largest 5 hectares. All plantations are equipped with pumping and threshing machines, and even mini-dryers, which leads to higher production cost.

Secondly, planters' knowledge of coffee farming and processing techniques should be improved. Our survey shows that the highest score gained by surveyed planters is 8 out of 10 points, while the average score is only 3.9. This means that coffee planters' knowledge of farming techniques is very poor. The government should give more financial support to agricultural extension centers of district level to help their technicians live and work with coffee planters, thereby providing necessary knowledge, especially to planters with low education level or of ethnic minorities. According to recommended harvesting techniques, coffees are picked when 75% of them are ripe. The fruits are dried on cement yards and special care must be taken to keep their peelings from being damaged in order to preserve good quality of coffee bean.

Thirdly, area of Arabica coffee should be increased in districts where natural conditions are favorable because the price of Arabica coffee on the world market is always higher than that of Robusta coffee from 1.6 to 1.85 times, and even from 2.2 to 2.5 times in the last two years [8]. This is a valuable chance for coffee planters in Vietnam because (i) potentials for more area for Arabica coffee in Vietnam have not been fully tapped; and (ii) the demand for Arabica coffee in the coming years is still very high because the supply from Colombia cannot increase fast after its coffee plantations are recovered. At present, Colombia's coffee export drops to 9 million bags from 13 million bag in the past few years.

Finally, coffee planters should be provided with knowledge about supply of water and fertilizer to coffee plants. Our survey reveals that coffee planters tend to overuse biological substances in an effort to gain a higher coffee

yield. According to the Western Highlands Agro-Forestry Scientific and Technical Institute [6], planters usually supply a volume of fertilizer that is from 10% to 23% higher than the necessary level, and an extra volume of 300 to 400 liters of water in each watering time. A huge volume of water is wasted when planters usually water their plantations five times a day during the dry season.

District centers of agricultural extension should disseminate new fertilizing and watering techniques among coffee planters, such as replacing inorganic fertilizers with organic ones and maintaining humidity by scattering hay at the foot of coffee plants, and encourage coffee planters to join their trade associations to help them acquire certificates for standard quality of coffee from such famous organizations as GAP, 4C, Utz, Rainforest Alliance, GlobalGap, and VietGap in order to obtain higher selling prices■

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