

Research Article**IMPACTS OF GROUP ORGANIC CERTIFICATION OF COFFEE ON SOCIO-ECONOMIC AND ENVIRONMENTAL SUSTAINABILITY IN NEPAL****R. R. Kattel***

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ABSTRACT

Different certification schemes have been emerged as a source of significant and innovative revenue for standard setting and livelihood promotion in the environmental realm. This study examines the potential for group organic certification of coffee to contribute to socio-economic and environmental sustainability in the selected rural regions of Nepal. Data were collected by using semi-structured interviews as well as by conducting focus group discussion in Gulmi and Kavrepalanchok districts, Nepal. Three dimensional income sources realized from coffee farm in Nepal- mainly from coffee, shed trees, and inter crops. The findings revealed that group organic certification plays positive role on smallholders' livelihoods. Certification is seen as a catalyst to enter international markets coupled with environmental and social benefits. The regression analysis indicated experience in coffee cultivation, altitude of farm and the certification dummy as the key determining factors on household income from coffee sector. Findings suggest that participation in group organic certification increases farmers' welfare through increased income and environmental features.

Key words: Smallholders, revenue, welfare, livelihoods**JEL Code:** C01, O13, Q12, Q13**INTRODUCTION**

Among the different agricultural goods produced in and exported from Nepal, the competitiveness of coffee has quickly increased in recent years. The share of coffee exports currently amounts to around 7% of the country's total and 15% agricultural export share (FAOSTAT/World Bank, 2006). Annually, total coffee production and area of production of coffee in Nepal is increasing by 35% and 28%, respectively (AEC/FNCCI, 2007). Meanwhile, Nepalese coffee is exported as high-altitude product produced by resource-poor smallholders under organic conditions.

Several certification schemes have been introduced into the global coffee market. Fair Trade, organic, and shade grown are the major ones among them (Ponte, 2004). Originally, the objectives of these certification initiatives are different with response to different ecological and socio-economic concerns. All three certification schemes pay price premium to the producer/association though this premium varies with fair trade paying the highest premium followed by organic and shade-grown. Differentiated coffees can be clearly distinguished from mainstream coffees due to distinct origins, defined processes, or exceptional taste. They embrace geographic indications of origin, gourmet and specialty, organic, fair trade, eco-friendly or shade grown, private or corporate standards (Lewin,

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et al., 2004). Cooperatives are the main producers of fair trade and organic certified coffee (Rice, 2001). The standards for organic coffee depend on the importing country and the certification label since there is no single international accepted definition for the term “organic”. Yet, the International Federation of Organic Agriculture Movements (IFOAM, 2006) defined several principles on which organic agriculture is based.

The increasing popularity of organic or fair trade coffee among roasters and consumers in recent years is driven by quality but also by a social, environmental or health consciousness (Daviron & Ponte, 2005; Rice, 2001). Thus, national governments, NGOs and international donors promote the marketing of coffee through group-based, certified market channels as a viable business model for small farmers (Linton, 2008; Willer & Yussefi, 2007). Since the organic certification is too costly for an individual small-scale producer, farmers form producer groups or join cooperatives to obtain group certification (Rice, 2001). In order to be certified as a group, producers must keep detailed records of their farm management, have a proven internal control system and are inspected annually by a third-party certifier (Daviron & Ponte, 2005). One of their most important principles of the group certification is the system’ flexibility (Fonseca, 2004a), that means the schemes have to appropriate to the respective smallholder realities and have to allow for the different local circumstances (de Alcântara & de Alcântara, 2004). The basic underlying philosophy of the certification process is an emphasis on mutual control as well as mutual support. Thus, a learning approach with ‘grassroots’ participation is supported by the certification scheme (Fonseca, 2004a). The reasons for the development of ‘alternative’ methods of certification vary according to the local context. The most common motives appear to be high certification costs, disagreement over the paradigm for ensuring credibility, or a political ambition to strengthen the farmers’ role (de Alcântara & de Alcântara, 2004, p.32). IFOAM describes two main categories of alternative certifications, namely Group Certification and Participatory Guarantee System (PGS).

A central point in the group certification process, that allows offering certification at relatively low price, is the Internal Control System (ICS). Farmers are certified as a group (which varies in size), which shares the costs for certification. The group is homogenous in terms of their geographical location and production system, and the group markets their products collectively (Fonseca, 2004a; Myers, 2002). Unlike Third Party Certification (TPS) schemes, ICS schemes can be linked to the extension and advice system within group. The external inspector then mainly evaluates the functioning and efficiency of the ICS and only performs a few spot-checks of individual smallholders (IFOAM, 2006a; Wilhelm & Fürst, 2002). One of the main benefits (and the main reason for the development of such schemes) is the substantial reduction in costs, which makes certification feasible for smallholders. This combined with an improved market access can improve farmers’ incomes and livelihoods (Myers, 2002). The improved income is the most obvious benefit but there are also other, less tangible benefits for the farmers, which are mainly social or learning benefits. This can also create very strong networks among the farmers, which leads to mutual support, information exchange, advice, and machinery or product sharing (Myers, 2002). However, these schemes require a high degree of dedication and a lot of voluntary work from stakeholders to keep the costs for certification low (Fonseca, 2004a).

In Nepal, impacts of group organic certification of coffee on socio-economic and environmental sustainability is yet to be documented. Therefore, the objective of this study was to examine the potential for group organic certification of coffee to contribute to socio-economic and environmental sustainability in the selected rural regions of Nepal.

MATERIALS AND METHODS

According to BMZ “Federal Ministry for Economic Cooperation and Development” in Germany (2000), impact generally denotes aggregate changes observable after the completion of the whole project. According to Casley & Lury (1987), impact is to determine more broadly whether the program had desired effects on individuals, households and institutions. It can be accomplished comparing data from *with* and *without* the project population. According to FAO (2000), impact refers to the broad, long-term economic, social and environmental effects resulting from intervention. Such effects generally involve changes in both cognition and behavior. With-without (Treatment-Control) approach was used to collect data instead of Before-after approach due to lack of baseline household data of certified respondents before introduce group organic certification scheme. With and without approach is considered more appropriate in a situation where obtaining baseline data is problematic. Moreover, isolation of influence of exogenous factors (government policy, market condition) with this approach is relatively easier than the before and after approach.

In 2008, Primary data was collected through a survey conducted in two districts, namely Gulmi and Kavrepalanchok of Nepal from August to October 2008. A multi-stage sampling procedure was used to select districts, village development committee and small-scale coffee producers. A total of 120 respondents were selected on a three-stage sampling procedure. In the first stage, Gulmi and Kavre districts were purposively selected based on two considerations: (1) where, group organic certification/ Internal Control System has been applied in, and (2) they are the two major coffee producing districts in Nepal with similar geographic location of coffee farm. Since farmers in Gulmi district practiced group organic certification in each coffee producing sub-locations, the randomly selection of smallholder respondents with and without certification was not been possible. In the second stage sampling, three Village Development Committees (VDCs) in each district were purposively chosen following two criteria: (1) altitude of the coffee farms [high (>1000 m), medium (1000-850 m) and low (<850-700 m)] and (2) small-scale coffee farmers (having less than a hectare of coffee cultivation). Finally, in the third stage, 20 farming households were randomly selected from each VDC and interviewed using pre-tested semi-structured questionnaire.

Six focus group discussions were also conducted along with expert interviews with Coffee Cooperative Federation in Gulmi, two District Coffee Producers’ Associations and three traders/exporters. The focus group discussions and export interviews provided qualitative information for conducting a SWOT analysis of coffee production and marketing as well as contractual relationships between farmers and buyers (either cooperative or companies).

Data were analyzed based on three factors, namely economic, social and environment. For economic factors, regression model has been used to identify whether the certification (dummy) contributes to higher household income from coffee sector or not. The Ordinary Least Square (OLS) method was used to estimate the smallholder coffee farmer’ household income from coffee. The

multiple regression function estimated in the study can be expressed as (following Gujarati, 2003):

$$Y_i = \alpha + \beta_1.CERT_i + \beta_i X_i + \varepsilon_i, \quad i = 1, \dots, n \quad (1.1)$$

where, Y_i is the annual household income from coffee sector (dependent variable), α is the constant term, β_1 is the coefficient of the Certification Dummy (CERTI). β_i is the coefficient of the other estimators and X_i is the other independent variables in the regression model. The econometric model used in the study is specified as follows:

$$LnINCOME = f(CERTI, GENDER, EDUC, EXPE, SHADE, ALTI, SHOCK) \quad (1.2)$$

For the econometric regression model, explanatory variables needed to be selected according to their relevance. Generally, the explanatory variables covered characteristics of the farmers, characteristics of their farms, trading relations and marketing chains. Equation (1.2) hypothesized that the farmer's annual household income from coffee sector depends on the seven explanatory variables (Table 1), which also summarized the expected sign for the effect that they have on natural logarithm of coffee income ($LnINCOME$) for each case.

Table 1: Description of variables in the model and à priori expectation

Variables	Description	Type of variables	Expected sign
$LnINCOME$	Annual household income from coffee sector (Rs. in natural log form).	Continuous	
Independent variables:			
CERTI	Whether coffee is organically certified. (1=certified, 0=non-certified).	Dummy	+
GENDER	Sex of the household head (1=Male, 0=Female)	Dummy	+/-
EDUC	Education of the household head (Year of schooling)	Continuous	+
EXPE	Experience in coffee cultivation. (Years).	Continuous	+
SHADE	Percentage of shade trees cover. (%).	Continuous	+/-
ALTI	Altitude of village in which farmer grows coffee. (1=>1000m, 0 = Otherwise).	Dummy	+
SHOCK	Whether farmer faced coffee production related shocks during last two years. (1=Yes, 0=No).	Dummy	-

RESULTS AND DISCUSSION

Three dimensions income source from Nepali coffee sector

All of the coffee production system in the survey area has shown an organic production system where farmers have never used inorganic chemical fertilizers and pesticide, although not yet officially certified other than Gulmi district. Three dimensional incomes in the coffee farm have been found in the study area (Figure 1 and Table 2). Most of the respondents grow coffee in the marginal uplands with shade covers. Till three to four year before first coffee harvest, inter-plants are grown in coffee farm mainly ginger, garlic, maize, and some leafy vegetables. Additionally, Banana, citrus, guava, avocado, jackfruit, litchi, papaya, mango, peach, pear, pomegranate, lapsi (*Hug Plum-Spondias nepalensis*), pineapple and some fodder trees are grown as shade trees. Average share of annual household income from only coffee was 8%. That was higher in certified district (8.7%) than non-certified district (7.6%) that does not seem statistically significance different. Nevertheless, average household income share by coffee farm (including shade and intercrops) was 14%, ranging from 0.4% to 100%. Average Share of annual household income from coffee farm was higher in certified district (16.3%) than non-certified district (10.5%). Average share of shade trees revenue on annual household income was higher in certified district (4.7%) than non-certified district (1.8%) that seems statistically significant difference at 5% level.

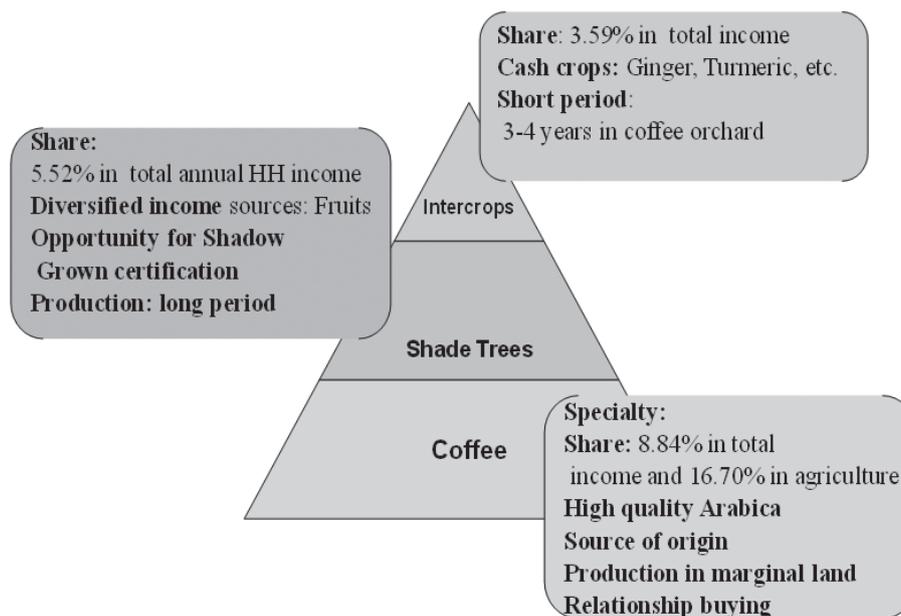


Figure 1: Three dimensions income sources from Nepali coffee farm

Share of intercrop on annual household income was also higher in certified area (2.9%) than noncertified area (1.1%) but that does not statistically significant difference among the groups. Thus, it has shown clearly that shade trees and intercrops in coffee farm have a great contribution on share of annual household income in certified area as compared to non-certified ones. Additionally, average share of annual household income from other crops (cereals, vegetables and fruits) and livestock was 41%. In non-certified area, farmers had more annual household income from other crops and livestock because of near center markets and great opportunities of vegetables and

livestock products for the central market. So, share of annual household income from other crops and livestock in certified district was 30% that was very high in non-certified district (52.8%) and statistically significance at 1%. Most of the respondents' annual household income share by off-farm activities in certified district (53.7%) was higher as compared to noncertified district (36.7%) that also seems statistically significant different at 5% level.

Table 2: Percentage of annual household income shares by the different sectors

Percentage of annual household income share by:	Total (N=120)	Certified (n=60)	Non-certified (n=60)	T-test
only coffee	8.1	8.7	7.6	0.407
shade tree revenue in coffee farm	3.3	4.7	1.8	2.499**
intercrop revenue in coffee farm	2.1	2.9	1.1	0.200
other crops and livestock	41.1	30.0	52.8	-3.997***
Off-farm activities (services, business, etc.)	45.4	53.7	36.7	2.596**

Notes: Independent sample t-test was conducted for comparing percent mean between Gulmi (Organic certified) and Kavre (Non-certified) districts. ** denotes statistically significance at 5% level; *** at 1% level.

Drawing a conclusion, in both districts' most of the respondents' households are depending on agricultural sector has a low income share with integrated and diversified farming practices. Thus, most of the smallholder coffee producers in organic certified area (an example from Gulmi) are highly depended on coffee those who live in far from central market with low financial resources than non-certified smallholders those live in near the central market access (an example from Kavre). Meanwhile, coffee is the newly identified cash crop under development with having a potential opportunity in future for improving livelihood of poor Nepali farmers.

Characteristics of group organic certified and non-certified coffee farming

The average coffee yield per hectare was 2.45 metric ton (mt) ranging from 0.25 to 8.14 mt ha⁻¹ fresh cherry. Average yield of fresh cherry per hectare was higher in non-certified farm (2.78 mt ha⁻¹) as compared to certified farm (2.07 mt ha⁻¹) that is significant difference between two groups (Table 3). The variability of coffee yield among the sampled farms may be partly due to climatic differences and biennial yield pattern of coffee. Yield of coffee in farm is mainly influencing by age of coffee trees and agronomical practices.

Percentage of coffee orchard with shade trees cover was 57 which was higher in non-certified farm (63.8%) than certified ones (50.7%). The difference is also statistically significant. Banana, citrus, guava, jackfruit, avocado, lapsi (Hug plum- *Spondias nepalensis*), litchi, papaya, mango, peach, pear, plum, pomegranate, pineapple, asparagus and some fodder trees have been used as shade trees in coffee orchard. Around 55 percent of the farmers in survey areas practiced intercropping and have got income from ginger, turmeric, cardamom (*Elettaria cardamomum*), maize, pea, bean, cowpea, chilly, sweet potato, radish and leafy vegetables in coffee farm. Regarding additional average income from intercrops and shade trees they are not significantly different between two groups.

Annual income from coffee was on average Rupees (Rs.) 11,311 in the total sample; ranging from Rs. 800 to Rs. 85,650. A comparison of the mean values between the groups clearly indicated that certified farmers had high annual income from coffee (Rs.13,722) compared to non-certified (Rs. 8,901), there is significantly difference between two groups. It was observed that the majority of coffee producers (71.7%) in certified areas were facing coffee production related shocks during last three years compared to non-certified producers (21.7%) and difference are significant between two groups.

It was observed that majority of the certified producers (43.3%) maintained record on coffee production and marketing activities (book keeping) as compared to non-certified ones (18.37%). About 92% of the certified producers had reported to have access to service facilities from cooperative, coffee producers' association, Winrock International /Nepal or Coffee Promotion Project/Helvetas, Nepal as opposed to 73% of the non-certified ones. The study also revealed that 33% certified producers had a membership on village level saving and credit cooperatives as compared to the 15% non-certified ones that are significantly different at 5% level. With respect to upgrading at farm and trading the training variable is not statistically significant between two groups.

Table 3: Comparison of group organic certified and non-certified coffee farmers

Description of the variables	Certified (n=60)	Non-certified (n=60)	Average (n=120)	Test of significance #
Characteristics of farmers				
Gender (Male=1)	51.7	65	58.3	2.194
Experience in coffee cultivation (years)	9.8	8.6	9.2	1.139
Education (Year of schooling)	3.8	2.8	3.4	2.315**
Household size (number)	6.5	7.6	7	-1.953*
Characteristics of farms				
Yield of coffee cherry in 2007 (qt ha ⁻¹)	20.7	27.8	24.5	-1.844*
HH coffee cherry production in 2007 (qt)	2.0	2.7	2.4	-1.073
Coffee cultivation land (ha)	0.12	0.09	0.11	1.624
% of shade trees cover	50.7	63.8	57.2	-2.457**
Income from coffee (Rs.)	13,722	8,901	11,311	1.674*
Income from shade trees (Rs.)	3,597	2,388	3,008	1.328
Income from intercrops (Rs.)	1,718	1,672	1,696	0.063
Altitude of coffee farm (>1000 m=1) %	27	30	28	0.164
Coffee production related shocks (yes=1)%	71.7	21.7	46.7	30.134***
Upgrading at farm and trading				
Training received (yes =1) %	70	58.3	64.2	1.331
Group membership (yes=1)%	33	15	24	5.502**
Book keeping on coffee (yes=1)%	43.3	18.3	30.8	8.792***

Notes: Statistical significance at the 0.01 (***), 0.05 (**) and 0.1 (*) level of probability. # t-test for continuous variables and Chi-square test for dummy variables (dummy in %, yes =1). One quintal (qt) is equivalent to 0.1 metric ton.

Benefits from group organic certification

About 78% smallholder farmers in certified district of Gulmi indicated their view that they have benefited from organic certification of their coffee. However, 8% smallholders did not feel any benefits due to more time invested to fulfill certification criteria as well as no price difference between certified and non-certified coffee in the domestic market. Some 10% of smallholders did not know about the benefits of certified organic coffee production.

Organic certified smallholders received 20% higher price premiums for fresh cherry than those non-certified smallholders in conventional market chain. Similarly, the certified smallholders had received 6% price premiums for dry parchment than non-certified smallholders in conventional market chain (Table 4). Surprisingly, farmers reported that there was no difference in the price of certified and noncertified ground coffee in domestic market.

Table 4: Average prices reported at the farm gate for the 2007-08 harvest

Farm gate price in 2007	Coffee Producers		t-test
	Certified (n=60)	Non- certified (n=60)	
fresh coffee cherry (Rs./kg)	30	25.08	11.195***
dry parchment (Rs./kg)	160	151.19	5.817***
dry cherry (Rs./kg)	70	No sale	

Note: *** indicates significant at 1% level.

Farmers in Gulmi district perceived price security due to market stability through cooperative in organic certified marketing chain, easy to sell in domestic market/international market due to market guarantee provided by cooperative, environmental benefits and high price of coffee as the most important benefits of group organic certified coffee production, where as the quality and diversified income were seemed as the least important benefits (Table 5).

Table 5: Types of benefits reported from certified organic coffee production

Types of benefits of certified organic coffee (n=47)	Score						Total	Index	Rank
	6	5	4	3	2	1			
Price security	31	8	5	1	1	0	251	5.5	I
Easy to sell/market guarantee	10	12	10	10	3	1	197	4.3	II
Environmental benefits	8	10	10	4	10	4	174	3.8	III
High price of coffee	4	5	16	6	15	0	161	3.5	IV
Better coffee quality	1	2	2	6	10	25	87	1.9	V
Diversified income sources	0	1	5	0	10	30	75	1.6	VI

Note: The scale values considered were 6 for very high, 4 for high, 3 for medium 2 for low, and 1 for very low benefits from certified organic coffee production.

Determinants of household income from coffee

The econometric analysis focused on the 120 smallholder coffee producers spread in the certified and non-certified district clusters. It was expected that the coefficients indicating the nature of relationships between smallholder household income from coffee and socio-economic attributes would be negative for shocks, and positive for all explanatory variables given listed in equation 1.2. The income from coffee sector refers to household income earned from coffee sales in 2007. Initial regression runs revealed Heteroscedasticity (H.S.), in variance of annual household income from the coffee sector. To achieve approximately normality and homogeneity of error term, the variables of annual household' income from coffee and yield of coffee in 2007 were transformed in to natural logarithms (following Gujarati, 2003). Table 6 showed the summary statistics of empirical variables that were used in the regression model.

Table 6: Summary statistics of the empirical variables

Variable	Description	Mean	S. D.	Min	Max
LnINCOME	Annual income from coffee (Rupees in natural log)	8.27	1.18	5.88	11.35
CERTI	Certification (Yes=1)	0.50	0.50	0	1
GENDER	Sex (Male=1)	0.58	0.49	0	1
EDUC	Education (Year of schooling)	3.35	2.44	0	8
EXPE	Experience (Year)	9.15	5.85	3	25
SHADE	Shade tree cover (%)	78.87	31.19	0	100
ALTI	Altitude (above 1000 masl =1)	0.28	0.45	0	1
SHOCK	Production related shocks (Yes=1)	0.46	0.50	0	1

The value of coefficient of multiple determination (R^2 of, 0.62) showed that 62% of the variation in the annual household income from coffee is explained by the independent variables in the econometric model. Table 7 showed that the F- statistic (7.10) confirms the stability of the overall regression equation and joint significant at 1% level ($P=0.000$) in explaining smallholder household coffee income as well as also confirm the coefficients to changes in specifications. Variance Inflation Factor (VIF) presents results according to expectation: mean VIF is 1.22 and none of the variables has VIF value higher than 2, it means there is no multicollinearity between independent variables included in the model. Error terms are also randomly distributed that has been checked by plotting them against predicted value of the dependent variable (refer Annex 1). The regression specification error test (RESET) conforms model has no omitted variables.

The econometric results presented in Table 7 showed that the 'certification dummy' (**CERTI**) has positive and significantly impact on the household coffee income at 5% level of significance. This is due to the certified farmers received 6 to 20% price premium compared to non-certified received. Gender of the household head (**GENDER**) has negative but not statically significant impact on annual household income from coffee sector. It indicates that female household head is more actively participated on coffee production than male. Also, education of the household head

(EDUC) has a positive but not significant on annual household income from coffee sector of the smallholder. It was observed that farmer experience in coffee cultivation (EXPE) has a positive and significant impact on household coffee income at 1% level of significance. It is indicated that when farmer's experience on coffee production increases by 1 year, there is an increase of 4.4% in the annual household income from coffee. However, percentage of shade tree (SHADE) has a positive but not significant impact on income to the smallholder.

Altitude of the coffee orchard (>1000 meters above sea level) (ALTI) has also a positive and statically significant impact on annual household coffee income. It is indicated that those farmer who produced coffee above from 1000 masl has 55% more annual household income from coffee sector than those produced less than 1000 masl. Result also showed that, a coffee production shock faced by smallholder (SHOCK) has a negative but significant impact on smallholder household income from coffee at 1% level. It is indicated that those farmer who has facing coffee production related shock has less annual household income from coffee as compared to those who did not face coffee production related shock.

Table 7: Econometric estimated for determinants of household income from coffee in 2007

Variables ^a	Coefficient	Robust Std. Error	T- value
CERTI	0.496**	0.234	2.12
GENDER	-0.284	0.194	-1.46
EDUC	0.047	0.038	1.23
EXPE	0.047***	0.016	2.65
SHADE	0.002	0.002	0.85
ALTI	0.557***	0.198	2.80
SHOCK	-1.185***	0.220	-5.38
CONSTANT	7.831***	0.320	24.47

Summary Statistics:

F-value (7, 113) : 34.10***

R- Square : 0.62

Mean VIF : 1.22

Ramsey RESET test (ovtest) : F(3, 109) = 0.35, Prob > F = 0.792

Number of observation (n) : 120

Notes: *Significant at 10% level (p=0.10), **Significant at 5% level (p=0.05), and *** Significant at 1% level (p=0.01). ^a Definition for variables as Table 1 and Table 6.

CONCLUSION

The findings showed that product/process upgrading for improving yield of coffee and processing/handling of coffee separately, according to altitudes, are not strictly practiced by certified and conventional smallholder farms. The results from econometric model revealed that group organic certification, experience in coffee cultivation, and the altitude dummy (>1000 m above sea

level) play a significant and positive role on annual household income from coffee. This findings indicated that developing both institutional supports such as group level organic certification with strong social networking, provision of research and extension programs; farm level management practices such as improving yield by controlling the epidemic of white stem borer; effective shade trees management; and upgrading of wet processing technology at farm level are required to benefit the farmers from coffee cultivation. Thus, group organic certification is considered a catalyst to increase exports, with farmers benefiting in economic (price premium), environmental and social development.

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