An analysis of the Peruvian jungle cocoa farmers: Acopagro cooperative vs. intermediaries – a case of study

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Abstract

In the Peruvian jungle, there are two main cocoa marketing channels: the intermediaries and the cooperative. The Acopagro Cooperative, a Peruvian organization, for example, has contributed to the shift from illegal crops like cocoa to an alternative crop like cocoa which gives small scale farmers a sustainable welfare. A survey of 243 farmers in Juanjui, San Martin-which is the main cocoa production area in Peru-was carried out between December 2009-January 2010. This study analyzes Peruvian cocoa farmers' socio-economic characteristics as these attributes affect their decision-making process in the cocoa commercialization for their self-improvement and evaluates if the farmers' participation in Acopagro or not influences the increment of the cocoa production. Policy makers and farmers' organizations should consider these results in order to contribute to improve the competitiveness of the farmers' marketing channels not only towards the development of these organizations' but also to that of their communities as a whole.

Key words

Cooperative, socio-economic characteristics, logistic model, multiple regression function, cocoa production, marketing channel, farmers' organization.

Introduction

The value of agricultural cooperatives can be very significant because they can assist small farm producers to effectively access new niche markets for their products, offering a promising option for rural poverty reduction (Donovan, J., 2006). Participatory cooperatives are very helpful in overcoming access barriers to assets, information, services and the markets within which small-holders wish to sell high-value items (Holloway, G. et al., 2000). In the Peruvian jungle, there are two main marketing channels. First, there are the intermediaries who just focus on the high prices without concern about the quality of the beans. Then there are the cooperatives who pay attention to cocoa beans differentiation due to their participation in the international market. These cooperatives provide benefits, such as, credits and technical assistance, as well as international prices information to members (M. Wollni, M. Zeller, 2007).

Since 1972, the Peruvian jungle was a perfect terrain for cultivating cocoa, which was the most profitable crop in remote areas. As a consequence of terrorism and drug trafficking, farmers were abandoned in the free market without financial or technical support. Consequently, the cocoa crop became an alternative to cocoa leaves (Ruiz, R., 2007). Nowadays, Peru is the second world cocoa leaves producer with 59,900 hectares, being 92% used for drugs usage (ONUDD, 2009). Acopagro cooperative, a Peruvian organization created in 1992 with United Nations support, for example, has contributed to the shift from illegal crops like cocoa to an alternative crop like cocoa. This shift helps small scale farmers in the Peruvian jungle to increase and diversify their income in a legal and sustainable way, preserving the environment at the same time. Due to this effort, the production of
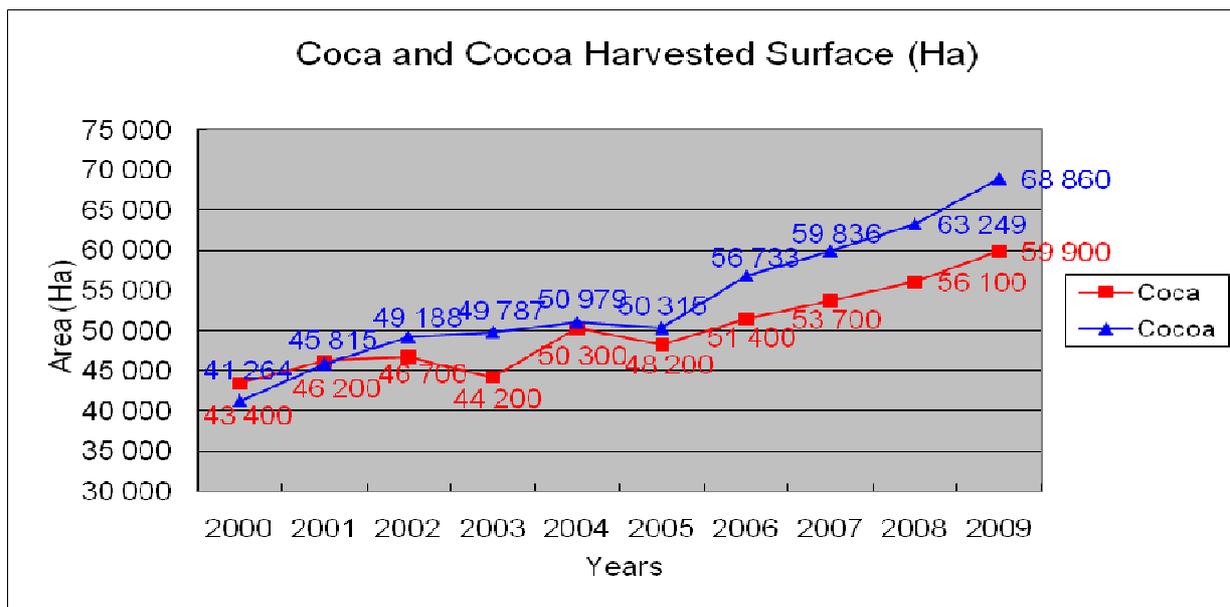
Graph 1.

cocoa beans has increased immensely in the past years. This can be seen when comparing previous years to the present.

Measuring farmers' perceptions as well as studying the socio-economic characteristics and information-seeking behavior that influence those perceptions should be the preliminary steps towards the development of extension programs to promote sustainability among farmers and rural population (Füsun Tathdil, F. et. al., 2009). Therefore, it is necessary to understand the socio-economic characteristics for making judgments about the effects of different policies on economic welfare (Glewwe, P., 1991). Participation in an institution like the cooperative involves the adoption of quality standards and specific production techniques for exporting the product (M. Wollni, M. Zeller, 2007). Consequently, mainly having access to extension services which help farmers to increase the quality of their cocoa is presumed to have a positive influence on their participation in Acopagro. On the other hand, farmers who commercialize through the intermediaries just focus on the cocoa for the national market, which pays a higher price without caring about the drying and fermentation of the beans. (IICA, 2009).

It is expected that having a higher education level can influence the probability of participating in the cooperative positively. This is because naturally,

farmers are more able to adopt new technologies; understand price and market information; and have more access to credit and other forms of capital (Norton, G. W., et. al, 2006). Experience in cocoa cultivation is also expected to be positively associated with participation in the cooperative as farmers can demonstrate a greater capacity to bear the risk involved in adoption of innovations (M. Wollni, M. Zeller, 2007). Another characteristic like being older is also positively related to participation due to intergenerational differences in cooperative values. In addition, many of the cooperatives have launched projects intended to strengthen the role of women (Murray, D. L. et al., 2006). Therefore, female membership is also positively related as gender equity improves their process of economic development (M. Wollni, M. Zeller, 2007).

Many tropical and subtropical crops as cocoa display the tendency to produce low yields after years of large yields (Florkowski, W. J. and Sarmiento, C., 2005). Moreover, small cocoa producers do not possess high technology equipment. As a result, most of them are not able to produce in scale economy. However, access to institutional support services plays a significant role in enhancing smallholder intensity of input use, crop productivity and market orientation,

Variable	Description	Total (n=243)		Coop member (n=103)		Non coop member (n=140)	
		Mean	SD	Mean	SD	Mean	SD
Coopmemb	Dummy variable which takes the value of 1 if the farmer participates in Acopagro;0= not a member	0.42	0.03	1.00	0.00	0.00	0.00
Experience	Experience in cocoa cultivation (years)	6.31	0.20	7.77	3.29	5.24	2.43
Livestock	Land for livestock (ha)	0.51	0.14	0.82	2.65	0.28	1.81
Othercrop	Land for other crops except cocoa (ha)	0.91	0.08	1.16	1.43	0.73	1.17
Maleadult	Number of male farm workers (>18 years old)	1.50	0.05	1.27	0.73	1.66	0.66
Parttime	Number of workers hired as part time labor	1.17	0.11	1.51	2.05	0.91	1.41
N.intcha-1	No. of institutions that gave technical assistance discarding the cooperative (No. Institutions – 1)	0.53	0.73	0.89	0.78	0.26	0.57
Cocoa	Cocoa cultivation before (1= yes, 0= no)	0.48	0.03	0.64	0.48	0.36	0.48
Distance	Distance to gathering center > 2 km (0= yes,1= no)	0.65	0.03	0.31	0.47	0.90	0.30
Sex	Sex (1= male, 0= female)	0.96	0.01	0.93	0.25	0.99	0.12
Age	Farmer's age (years)	45.35	0.76	49.22	12.27	42.50	10.82
Education	Farmer's education (years)	8.78	0.23	7.66	3.50	9.58	3.42
Married	Farmer's civil status (1= married, 0= other)	0.57	0.04	0.52	0.50	0.56	0.50
Occupation	Farmer's main occupation (Agriculture=1, Other=0)	0.91	0.02	0.98	0.14	0.86	0.35
Cocoaprod	Cocoa production (tons)	1.72	0.78	1.81	1.21	1.65	1.23
Cocoalnd	Cocoa land (ha)	2.31	1.27	2.44	1.10	2.20	1.38
Proptitle	Have a property title (Yes=1, No=0)	0.61	0.49	0.58	0.50	0.64	0.48
Machine	Have a machine for cultivating cocoa (Yes=1, No=0)	0.30	0.46	0.17	0.38	0.39	0.49
Fertilizer	Total amount of fertilizer (soles/year)	134.89	290.60	49.64	155.34	197.61	346.40
Variable	Description	Total (n=243)		Coop member (n=103)		Non coop member (n=140)	

Table 1: Summary Statistics.

controlling other factors (Gebremedhin, B., et. al., 2009). Consequently, it is expected that the cooperative, which provides technical assistance and training, influences the farmers' cocoa production volume.

Two objectives are anticipated to be reached in this paper: First, to identify and analyze the socio-economic characteristics that influence membership in the Acopagro cooperative by comparing cooperative members to cocoa farmers who distribute their product through intermediaries. The second objective is to measure whether being member of Acopagro or not impact the current cocoa production volume.

Materials and methods

A survey of the cocoa producers was carried out in December 2009-January 2010 in Juanjui, San Martin (which is the largest cocoa producer region in Peru). Primary data was gathered by using a structured questionnaire at the study site with cooperative support, covering topics as the socio-economic characteristics of households and marketing information. As a result, a total sample of 243 farmers was collected. Personal interviews

with the general manager as well as one farmer community leader were also conducted for qualitative description purposes.

Socio-economic variables are commonly used by many researchers to compare or study the influence of different factors on some behaviors of a specific group of people (Füsun Tathdil, F. et. al., 2009). To identify the factors that make farmers choose which marketing channel they would like to use in order to commercialize their cocoa, a bivariate logistic regression was used to analyze and examine the effect of each explanatory variable on the dichotomous dependent variable. In this case study, the dichotomous dependent variable is the membership in Acopagro or distribution of their products through intermediaries.

The logistic regression equation is based on the principle which uses logarithmic terms to express the multiple linear regression equation. Thus, the problem of violating the assumption of linearity is overcome. For interpretion purposes, the odds ratio is reported as this proportionate change in odds. Moreover, it can be interpreted as a multiplier of the odds of being a member or not of the cooperative. If the value is greater than 1, then it indicates that as the predictor increases, the odds of cooperative membership increase. Conversely, a value less than 1 indicates that as the predictor increases, the odds of cooperative membership decrease (Field, A., 2009).

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_1 + b_2 X_2 + ...b_i X_i...+b_n X_n + \mu)}} \quad \textbf{(1)}$$

Using the Binary logistic regression model equation (1) for the model purposes, Y is the marketing channel that the farmer chooses (if Y=1, the farmer belongs to Acopagro cooperative, otherwise if Y=0, the farmer chose the intermediaries). P(Y) is the probability of participation in a marketing channel; b^0 is the intercept; b_i (i= 1~n) are the estimated model coefficients; x_i (i= 1~n) are the independent variables and finally, μ is a random error term. Summary statistics for the variables included in the logistic model are given in Table 1.

Growth in output per worker in agriculture is generally recognized a necessary condition for economic development. Institutions as a cooperative supplies technical inputs to their

farmers and provides them with the knowledge and skills to make a productive use of the new inputs (Hayami, Y. and Ruttan, Vernon W., 1985) in order to produce more volume of a product. It is expected to find an important influence in the cocoa production volume, given the quality and consistency requirements of the dedicated cooperative members. A multiple regression model was used to explain the variability in the cocoa production volume and estimate the effect of being member of Acopagro or not among other various factors.

$$y_i = a + b_1 x_1 + b_2 x_2 + ...b_i x_i ...+ b_n x_n + \mu \quad \textbf{(2)}$$

Where y_i is the cocoa production volume (tons), a is the intercept; b_i (i= 1~n) are the estimated model coefficients; x_i (i= 1~n) are the independent variables and finally, μ is a random error term. Summary statistics for the variables included in the multiple regression model are also given in Table 1.

Results and discussion

Table 2 shows the results of the logistic regression model, previously testing the presence of multi-collinearity between the explanatory variables used in this model. The aftermath confirms the positive effect of receiving technical assistance for participating as a member in the Acopagro cooperative. Particularly in this case, bias was controlled by not considering Acopagro as an institution that gives technical assistance to the farmers (N.instcha-1). This was because if cocoa farmers belong to the Acopagro cooperative, they would then have free access to technical assistance-an advantage for members over non members. This factor would then become a potential source of partiality in this model. As the number of institutions that give technical assistance to the farmers increased by a unit, the change in the odds of membership to Acopagro is 2.53. In other words, farmers who belong to Acopagro are concerned about learning competitive sustainable techniques based on high export standards. This knowledge acquistion then translates into high income for them.

Although former studies conducted by Boz and Akbay (2005), M. Wollni, M. Zeller (2007), Füsun Tathdil, F. et. al. (2009) showed education as a significant variable for a positive effect on

cooperative values, the results in this case demonstrated the opposite. Namely, most of the farmers who are Acopagro members have only an elementary school level and agriculture is their main income source. Thus, the theory that mainly the education level can influence the probability of becoming a member in the cooperative positively is rejected as it did not have a significant impact on participation. Instead, the farmers who commercialize on their own have higher level of education than the ones who chose Acopagro.

As it was expected, being older than 40 years old and the experience of cultivating cocoa have a positive effect on the odds of cooperative membership (1.06 and 1.33 respectively). Also, the number of male household members has a significant but negative effect (decreasing 0.32, $p<0.05$). This is because farmers who belong to Acopagro prefer to send their young people to study at school instead of having them help out on the farm. Consequently, part time labor, used by the farmers, is a positive variable and significant in this model (1.31). In 2007, Acopagro increased their female members to 12% in 2007 (Ruiz, R., 2007). It is confirmed in this paper's model that the odds of a woman entering a cooperative as a member is nine times more likely than her commercializing through

intermediaries. The longer the distance to distribute the product and the larger cocoa production (significant at 1 and 5% respectively), the more positive the effect for commercializing through intermediaries.

Table 3 shows the final selection of the variables and the parameter estimation results for the multiple regression equation. Although quantitative variables were few, the model proved to be a useful tool for analyzing relationships between individual factors in their effect on the cocoa production volume.

R^2 is the proportion of cocoa production volume variation explained by the model and its value of 0.73 which means that explanatory variables included in the model explained 73% of the cocoa production volume variation. In other words, the model explains 73% of the variation in the dependent variable.

Many studies as the one conducted by Aspiazu, J. (2010), pointed out that an association generates greater production tradable volumes. Nonetheless, regression findings show that participation in Acopagro is not significant and even the effect inthe cocoa production volume is negative. Part of

Variable	$\beta(SE)$	95% confidence intervals for odds ratio		
		Lower	Odds ratio	Upper
Intercept	0.53(2.12)			
Experience	0.29(0.09)***	1.12	1.33	1.56
Livestock	0.07(0.11)	0.87	1.08	1.33
Other crops	0.12(0.17)	0.81	1.13	1.57
Male adult	-1.13(0.30)***	0.18	0.32	0.58
Part time	0.27(0.14)**	1.01	1.31	1.71
N.instcha-1	0.93(0.32)***	1.36	2.53	4.72
Cocoa	0.40(0.44)	0.63	1.49	3.53
Distance	-3.25(0.48)***	0.02	0.04	0.10
Sex	-2.23(1.33)*	0.01	0.11	1.44
Age	0.06(0.02)***	1.01	1.06	1.11
Education	-0.03(0.07)	0.86	0.98	1.11
Married	-0.21 (0.47)	0.33	0.81	2.02
Occupation	0.53(1.10)	0.20	1.71	14.65
Cocoaprod	-0.50(0.21)**	0.40	0.61	0.92

Note: [a] R^2= 0.52 (Cox & Snell), 0.70 (Nagelkerke), 0.26 (H&L goodness of fit),*$p<0.10$,**$p<0.05$,***$p<0.01$.
[b] B are the estimated coefficients. Standard errors are in parenthesis (SE).
[c] SPSS version 15.0 was used for estimating the binary logistic model.

Table 2: Results from binary logistic regression analysis of Acopagro membership.

Variable	$\beta(SE)$	T-value	P-value
Intercept	-0.70(0.18)***	-3.98	9.34E-05
Coopmb	-0.11(0.10)	-1.05	0.29
Cocoalnd	0.68(0.04)***	16.14	7.11E-40
Proptitle	0.18(0.09)**	2.07	0.04
Part time	0.07(0.02)***	0.03	2.69
Machine	0.11(0.10)	1.07	0.29
Experience	0.06(0.02)***	4.17	4.31E-05
Education	0.02(0.01)	1.29	0.20
Fertilizer	0.00(0.00)*	1.74	0.08

Note: [a] R^2= 0.73, adjusted R^2= 0.72, standard error= 0.64,*p<0.10,**p<0.05,***p<0.01.

[b] B are the estimated coefficients. Standard errors are in parenthesis (SE).

[c] Excel 2003 was used for estimating the multiple regression model.

Table3: Results from the multiple regression analysis.

this reason is that the intermediaries collect raw material quantity, not classifying the cocoa using quality standards while Acopagro cooperative cares about the drying and good fermentation of the cocoa. This is the main reason why the Acopagro cooperative distributed cocoa quantity is low.

Cocoa land represents a form of internal capital accumulation. Therefore, as it increases, the product volume also increases. If the cocoa area increases by one unit holding other factors fixed, then the total cocoa production volume is predicted to change by about 0.68 metric tons. Experience is also another important factor that contributes to the cocoa volume (0.06). As years pass, farmers gain better skills for cultivating the crop. In perennial crops this fact is even more accentuated, because the more years that the tree has, the more and the better is the production. Nevertheless, the production is not sensitive to the education factor, as it appears as a non significant variable.

Peru was endowed with a favorable land-labor ratio (Hayami, Y. and Ruttan, Vernon W., 1985) and this can be appreciated specially in the jungle that there is no pressure regarding to the limitation of the land resources. Therefore, as the part time labor increases, the total volume of cocoa production also increases (0.07). In addition, having a property title, contributes also to the cocoa volume production (0.18). As the jungle is a vast region, farmers tend to get a piece of land without having a property title and this affect the production as it is not really owned by the farmer. Finally, biological improvements as fertilizers are associated with higher levels of yield (0.00031).

Conclusions

Acopagro cooperative offers a promising option for rural poverty reduction, providing benefits that influence the participation of the cocoa farmers in this institution. Numerical results confronted with personal interviews made by the author, illustrate that farmers who join the cooperative possess strong willingness to learn through technical assistance. This is because they can learn more techniques to improve their welfare. They can also improve their cocoa production to yield higher revenues that can provide stability to their families. Although earlier works mentioned education as a significant variable, this research's outcomes show that farmers who belong to Acopagro have just an elementary school level of education. Thus, this is not a significant factor for their joining the cooperative.

Lack of access to main cities due to the wide geography of the jungle made it difficult for cocoa farmers to receive a good education and have access to health services. Consequently, they found in. Acopagro a way to overcome poverty by cooperating with farmers who belong to their communities. In this way, they try to pursue long term prosperity, for example, by sending their children to the school.

Results also demonstrated that farmers who possess the following attributes were more likely to participate in the Acopagro cooperative: 1) older than 40 years old 2) cultivation of cocoa experience 3) less family male members on the farm 4) hired part time labor and 5) female. Alternatively, farmers who commercialize through intermediaries have more cocoa production and go further to

gather their crops in order to receive higher prices for their raw material.

The multiple regression function outcomes show a non significant and even negative relationship between the cocoa volume production and the participation in Acopagro cooperative. Acopagro cooperative takes care about the quality of the cocoa as it is one of the main requirements for exporting, obtaining as a result less quantity of raw material. Findings that influence in higher cocoa production volume are: 1) cocoa land 2) cultivation of cocoa experience 3) labor 4) have a property title and 5) use of fertilizer.

In a nutshell, farmers who belong to Acopagro depend on the Cooperative for commercializing their cocoa due to their basic education and their willingness to learn more techniques. This gives them a means to compete more effectively against farmers who sell through intermediaries. The farmers who rely on intermediaries sell their cocoa to those who care about the quantity not the quality, because the raw material is mainly destined for the national market.

Development programs over the medium to long run will need to take into account the changing nature of farm-level investments thus implied (Hernandez, R. et al., 2007). The Peruvian Government should consider these socio-economic facets when constructing bridges for connecting districts; improving the roads as well as building good schools and hospitals for the enhancement of these farmers' communities. Conversely, contemplating these factors are important for the development of farmers organizations as well as the long term improvement of the region as a whole.

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