Effect of Diversification on Smallholder Cocoa Farmers' Livelihood: Evidence from Atwima Mponua District in the Ashanti Region, Ghana

Samuel Afotey Anang, Bernard Tarkoh, Nicholas Oppong Mensah, Tekuni Nakuja

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ABSTRACT

Background: Cocoa is a very important economic crop to the world industries as many produced from it. Ghana makes significant contribution to the world cocoa production. Higher temperatures, erratic rainfall patterns, unpredictable and more severe droughts have threatened agricultural livelihoods especially for the smallholder cocoa farmers. In view of this, many smallholder farmers have diversified into several activities to enhance and improve livelihoods. The study therefore examines the effect of diversification on smallholder cocoa farmers' livelihood in the Atwima Mponua District of Ghana.

Methods: The study employed the cross-sectional survey approach of data gathering. A multistage sampling technique was used to sample one hundred and fifty (150) respondents for the study. The data collected was analysed using multinomial logistic regression, paired t-test and kendall's coefficient of concordance.

Result: The findings of the study revealed that smallholder cocoa farmers have diversified into several economic activities and diversification strategies were influenced by household head, household size (4-6), income and business opportunity.

Key words: Livelihood diversification cocoa, Multinomial logistic regression, Smallholder cocoa farmers.

INTRODUCTION

Agriculture and to a larger extent, cocoa (*Theobroma cacao*) serve as the backbone of the Ghanaian economy. Cocoa (*Theobroma cacao*), member of the family *Sterculiaceae*, is a South American tropical species and one of the world's most traded products (Tropical Commodity Coalition, 2012). According to Gockowski *et al.* (2011), Adu-Appiah *et al.* (2013) and Okoffo *et al.* (2016), Ghana is the second-largest producer of cacoa in worldwide production and produces the best cocoa beans second to her neighbour, Côte d'Ivoire. Farming is a highly important sector of the Ghanaian industry that contributes approximately 21.3 per cent of total GDP and also represents about 60 per cent of the labour force as a source of livelihood (direct or indirect) (Denkyirah *et al.*, 2016). Most cocoa farmers produce the crop on relatively small land area on average of about only 2.24 hectares (Hainmueller *et al.*, 2011) and more than two million farmers are threatened by climate change in their cocoa production which eventually affect their livelihoods.

Cocoa is an annual cash crop with one main stream of income flow, mostly for about four months, depending on the geographical location of the farm. For these many smallholder cocoa farmers to be resilient to climate change and to meet their basic needs, there is the need to diversify and have alternative sources of livelihood both off and on field. Also, to sustain rural development and poverty reduction, it requires that the incomes of poor households and the sources from which they derive their livelihoods be diversified and enhanced; therefore, pro-poor income growth needs to be encouraged. The ability of smallholder cocoa farmers to earn a living income is critical to ensure their viability and economic independence. It is against this background that, this study examines the factors that influence smallholder cocoa farmers' decisions to diversify into other sources of income, assess the impact of diversification on the income levels of smallholder cocoa farmers and examine constraints faced by smallholder cocoa farmers in diversifying.

Department of Agricultural Economics, Agribusiness and Extension, University of Energy and Natural Resources, Sunyani-Ghana.

Corresponding Author: Bernard Tarkoh, Department of Agricultural Economics, Agribusiness and Extension, University of Energy and Natural Resources, Sunyani-Ghana.
Email: bernard.tarkoh.stu@uenr.edu.gh

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MATERIALS AND METHODS

Study area

The district of Atwima Mponua in the south-western region of the Ashanti area covers an area of about 1883.2km, representing 7.7% of the whole region (24,370.5 km^2). After Sekyere Afram Plains, this is the region's second-largest district (4,101.6 km^2). The district shares borders with eight other districts, primarily, the Amansie West District in the

south, the Ahafo Ano South District in the north, the Atwima Nwabiagya District in the east and the Bibiani-Anwhiaso-Bekwai District of the Western North Region in the west. The population of the district, according to the 2010, Population and Housing Census, stands at 119,180; this figure is 2.49% of the region's total population (of 4,780,380), with 61,090 males and 58,090 females (Ghana Statistical Service, 2010). Majority of households in the district (98.6%) are engaged in farming of both cash or food crops or cultivation of either crop. The most dominated cash crop grown in the district is cocoa. The dominant animal reared in the district - which accounts for about 54 per cent - is poultry production (GSS, 2014).

Research design

The cross-sectional survey design was used to embark on an extensive survey. The data collection design used involved two basic types of questionnaires, open and close ended type of questionnaires.

Sampling method and sample size determination

The target population was smallholder cocoa farmers in the Atwima Mponua District of the Ashanti Region. Multistage sampling technique was used to select the sample for the study. In order to select the specific research communities and sampled farmers, the combination of purposive sampling, simple random sampling and snowballing procedures were used. Due to the intensity of cocoa production in the region, the Ashanti region of Ghana was deliberately selected initially. In the second stage, the Atwima Mponua district was chosen at random from among the region's cocoa-producing districts. In the third stage, six cocoa growing communities were chosen at random from a list of cocoa producing communities in the district: Ayinamso Numbers 1 and 2, Awhiafutu, Bontomuruso, Nagode, Nyinahin and Otaakrom. At the final stage, snowballing was used to sample smallholder cocoa farmers who have diversified their livelihood from each community. One hundred and fifty (150) farmers were used as the sample size as there was no available data on the number of smallholder cocoa farmers and smallholder cocoa farmers who had diversified their source of livelihood in the district. By signing informed consent forms, all participants agreed to take part in the study.

This technique helped to reduce variation, simplified the analysis and provided enough justification to generalise from the sample that was studied (Patton, 2002). In order to select the specific research communities and sampled farmers, the combination of purposeful sampling, simple random sampling and snowballing procedures was used.

Method of data analysis

Multinomial logistic regression was adopted to examine the factors influencing smallholder cocoa farmers' decision to diversify into other livelihood activities in the study area. This was computed as:

$$f(k,i) = \beta_{0,k} + \beta_{1,k}X_{1,i} + \beta_{2,k}X_{2,i} + \beta_{3,k}X_{3,i} + ... + \beta_i \quad .....(1)$$

Where

k = The possible outcomes.

$\beta_{m,k}$= Set of regression coefficients.

$X_{m,i}$ = Explanatory variables such as household head (HH), household size, (HS), income (I), risk aversion (RA), business opportunity (BO) and food security (FS).

Therefore, the equation incorporating all the independent variables is;

$$f(k,i) = \beta_{0,k} + \beta_{1,k}HH + \beta_{2,k}HS + \beta_{3,k}I + \beta_{4,k}RA + \beta_{5,k}BO + \beta_{6,k}FS + \beta_i \quad .....(2)$$

Multinomial logistic regression was used because it has nominal and/or continuous independent variables and has interactions between independent variables to predict the dependent variable.

Paired t-test was used to examine how diversification influences the income levels of the smallholder cocoa farmers because the researcher is interested in the difference between income before and income after diversification for the same subject. In the application of paired t-test, the dependent variable must be continuous, the observations must be independent of one another, the dependent variable must be approximately normally distributed and there must be no outliers in the dependent variable. It is therefore computed as:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left[s^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)\right]}} \quad .....(3)$$

In this formula, t is the t-value, x_1 and x_2 are the means of the two groups (*i.e.* income before and after diversification) being compared, s_2 is the pooled standard error of the two groups and n_1 and n_2 are the number of observations in each of the groups. A larger t-value shows that the difference between income before and after diversification is greater than the pooled standard error, indicating a more significant difference between the groups. The hypotheses for this objective were as shown below.

H_0: There was no significant difference in income before and after diversification of livelihood activity.

H_1: There was a significant difference in income before and after diversification of livelihood activity.

To examine the constraints faced by smallholder cocoa farmers in diversifying their livelihood activities in the study area, the Kendall's coefficient of concordance was used in ranking the constraints equation.

$$W = \sum_{i=1}^{N}(R_i - \bar{R})^2 \quad .....(4)$$

Where

W = Kendall's value.

N = Total sample size.

R_i = The rating rater.

$\bar{R}$ = Mean of the rank.

The interpretation of the value of W is high agreement when W=1, no agreement when W=0.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

Table 1 revealed the demographic characteristics of the respondents. The sample used for this study consisted of 59.3% males and 40.7% females. This means that more males are into cocoa farming as compared to women. Among these respondents, majority of farmers 57.3% were between the ages of 46-55 years. Moreover, 25.3% of the farmers between 56-65 years constituted the second-highest category. This was followed by 8.7% of the respondents who were between the ages brackets of 36-45 years. Generally, farmers had one form of education or the other, with most farmers' 71.3% attaining basic level of education while 23.3% had a secondary level education. 4.7% respondents indicated they have no form of education while the least - one respondent 0.7% had a non-formal education. More married farmers 83.3% than single 4.7% participated in the study. 6.7% respondents who participated in the study had divorced with the remaining 5.3% respondents widowed. The dominant religion of the respondents was Christianity 93.3%, while a few 2.0% were Traditionalists. 4.7% respondents were Muslims. The household head status of respondents indicated that most of the respondents 78.0% were the head of their households with the few 22.0% - respondents not being household heads. The average household size of respondents ranges between 1 and 6, while a few had household size between 7 and 12.

Factors influencing smallholder cocoa farmers' diversification

Table 2 indicated that household head status, household size between 4 and 6, business opportunity and income were the only significant determinants of additional livelihood diversification. Specifically, household heads were found to be one of the most important determinants of livelihood diversification as prior expectation. Household heads have a positive and significant ($p<0.05$) relationship with households' livelihood diversification. The result of the odds-ratio depicts that, keeping other factors constant, the odds-ratio in favour of the likelihood of the households to diversify into subsistence farming will increase by 2.3845 more than farmers who were not household heads. Additionally, farmers whose household size was between 4 and 6 were 2.6933 times more likely to diversify into subsistence livelihood than farmers whose household size was between 1 and 3. Practically, it was expected that farmers with higher number of households would engage in subsistence activities to feed their dependents. The finding from this study, thus, confirms the researcher's expectation. In addition, Asravor (2018) stated that, "Households with more family labour are more diversified than those with very little labour".

Furthermore, farmers who wanted to make extra income were 2.3608 times more likely to diversify into commercial livelihood activities than farmers who wanted to engage in the activity due to family necessity. Additionally, farmers who saw diversifying into other livelihood activities as business opportunities were 1.4938 times more likely to diversify into commercial livelihood activities than farmers who wanted to engage in the activity due to family necessity. This finding confirms the rationale behind engaging in commercial activities, which is primarily to make an additional income. According to the Random Utility Maximization theory, the decision of smallholder cocoa farmer households to choose a particular livelihood strategy is a function of the set of livelihood options available and accessible. The choice made by these households is based on the maximum satisfaction that the household head deems satisfactory in relation to the household's resources subject to assets. This largely confirms the claims of Eneyew and Bekele (2012) and Eneyew (2012). The result presented in Table 2 is in line with a study by Nasa'i *et al.* (2010), who stated that, respondents reported income as their first priority for engaging in livelihood diversification.

Effect of diversification on the income levels of smallholder cocoa farmers

The results in Table 3 revealed a mean and standard deviation of 391.9 and 572.8, respectively, for income before and after diversification on Pair 1. On Pair 2, expenditure before and after diversification had a mean of 167.6 and a standard deviation of 218.7. From the table, there is a

Table 1: Demographic profile of study respondents.

Characteristic		Percentage (%)	Frequency
Gender	Male	59.3	89
	Female	40.7	61
Age	18-25	1.3	2
	26-35	4.0	6
	36-45	8.7	13
	46-55	57.3	86
	56-65	25.3	38
	Above 65	3.4	5
Educational level	None	4.7	7
	Non-Formal	0.7	1
	Basic	71.3	107
	Secondary	23.3	35
Marital status	Married	83.3	125
	Single	4.7	7
	Divorced	6.7	10
	Widowed/Widower	5.3	8
Religion	Christianity	93.3	140
	Islam	4.7	7
	Traditional	2.0	3
Household head	No	22.0	33
	Yes	78.0	117
Household size	1-3	26.0	39
	4-6	42.0	63
	7-9	24.0	36
	10-12	6.7	10
	Above 12	1.3	2
Total		100	150

Source: Field Survey, 2020.

significant income disparity among farmers before and after diversification of livelihood activity as well as a significant difference between expenditure before and after diversification since p<0.000 is less than 0.05. From the foregoing, the researcher accepts the alternate hypothesis which is "There was a significant difference in income before and after diversification of livelihood activity". This present finding is consistent with earlier studies by Kolavalli and Vigneri (2011), McKinley *et al.* (2014), Friedman (2015), Tsiboe *et al.* (2016), Michler and Josephson (2017) and Bunn *et al.* (2019) who all found that diversification significantly impacts on the income and expenditure of farmers. This is because, farmers are able to get more than one source of income and are, therefore, able to spend more on luxurious items such as television and radio sets (Michler and Josephson, 2017).

Constraints facing smallholder cocoa farmers in diversifying their livelihood

The Kendall's rank technique showed that lack of access to credit, poor infrastructure and no ready market were the three most pressing constraints identified by the respondents. These three constraints had mean scores of 4.64, 4.37 and 4.15, respectively, which all indicate agreement (Table 4). The results regarding lack of access to credit is consistent with earlier studies by Ntiamoah, Li and Kwamega (2016) and Antwi-Agyei *et al.* (2013) which reported that a financial constraint (access to credit) is one of the key barriers to diversifying into different livelihoods among farmers in developing countries. In addition to the above, according to Assan (2014), credit was a major impediment to non-farm livelihood diversification. The result regarding poor infrastructure (such as lack of storage spaces and poor road) is consistent with a previous study by Vermeulen *et al.* (2012) who found that, due to lack of storage facilities, smallholder farmers accept whatever price they are offered for their produce. Finally, the result regarding no ready market is in line with earlier study by Vermeulen *et al.* (2012) who established that, the decision to diversify among smallholder farmers is heavily constrained by lack

Table 2: Multinomial logistic regression analysis of factors influencing smallholder cocoa farmers' diversification.

Variables	Odds ratio	p-value	95% confidence interval	
Subsistence basis				
Constant	0.7332	0.4308	-0.8487	1.7382
Household head	2.3845	0.0382**	1.0221	3.7620
Household size				
4-6	2.6933	0.0397**	2.3486	3.1483
7-9	0.7609	0.4257	-3.6722	1.0654
10-12	0.9064	0.0722	-0.5549	1.2643
Above 12	0.7459	0.1103	-0.8651	1.1454
Income	0.9426	0.3284	-1.7633	1.4255
Risk aversion	0.6651	0.0625	-0.2247	1.9863
Business opportunity	0.7363	0.697	-1.4377	1.0344
Food security	-0.5889	0.637	-0.6724	1.7363
Constant	0.8439	0.997	-0.6651	1.7459
Commercial basis				
Household head	1.9411	0.0611	-0.6887	2.5409
Household size				
4-6	0.7025	0.0598	-1.8349	1.2268
7-9	0.8252	0.374	-0.5328	0.6103
10-12	0.7987	0.6881	-0.1454	1.3835
Above 12	0.9958	0.0733	-0.0963	1.4423
Income	2.3608	0.0235**	1.9411	3.6093
Risk aversion	0.8487	0.3352	-0.2918	1.4783
Business opportunity	1.4938	0.0421**	1.0382	2.3646
Food security	0.8691	0.1802	-0.2093	1.7743
-2 Log likelihood	146.07			
Cox and Snell R^2	.62			
Nagelkerke R^2	.712			
Chi-square	71.69			
Sig.	.000			
Df	16			

Source: Author's Field Survey (February 2020). Note: ** is 95% confidence interval. Reference categories are: both subsistence and commercial basis, non-household head, 1-3 persons in household and family necessity.

Table 3: Paired samples test of the effect of diversification on income.

		Paired differences					T	Sig. (2-tailed)
		Mean	SD	Std. error mean	95% confidence interval of the difference			
					Lower	Upper		
Pair 1	Income before and after diversification	391.9	572.8	51.24	290.57	493.41	7.65	0.000
Pair 2	Expenditure before and after diversification	167.6	218.7	19.56	206.41	128.94	8.56	0.000

Source: Field Survey, 2020.

Table 4: Ranks of constraints faced by smallholder cocoa farmers.

Constraints	Mean rank	Rank
Poor asset base	3.61	6
Limited access to credit	4.64	1
Poor infrastructure	4.37	2
Lack of opportunities	3.47	7
Lack of training	3.65	5
Unfavourable weather conditions	4.11	4
No ready market	4.15	3
N=127		
Kendall's W=0.064		
Chi-Square=48.485		
df=6		
Asymp. Sig.=0.000		

Source: Field Survey, 2020.

of market. The Kendall's (W) coefficient of concordance was 0.064, indicating that there was 6.4% agreement among the rankers of the constraints ($p<0.000$).

CONCLUSION

This study has provided an understanding of the causes of livelihood diversification among smallholder cocoa farmers in the Atwima Mponua District. The study established several possible associated factors that prevent farmers from diversifying into other livelihood activities. In order of importance, lack of access to credit, poor infrastructure, no ready market, unfavourable weather conditions, lack of training, poor asset base and lack of opportunities by farmers are major constraints that hinder smallholder cocoa farmers' from diversifying their source of livelihood.

Smallholder cocoa farmers in the study area have diversified their livelihood strategies for survival due to various reasons: lack of access to credit, poor infrastructure, no ready market, unfavourable weather conditions, lack of training, poor asset base and lack of opportunities. Diversifying their livelihoods into other business opportunities may provide a path out of poverty for rural poor households in the Atwima Mponua District, as households that have already taken advantage of such opportunities now benefit from stable employment, increased income and reduced risk.

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