Determinants of Income Diversification of Farm Households in the Western Region of Ghana

Bernard Archibald Senyo Agyeman,
Samuel Asuming-Brempong and Edward Ebo Onumah
University of Ghana, Legon, Ghana

Abstract

This study assesses the determinants of income diversification of farm households in the Western Region of Ghana. A censored Tobit regression model was used to find the determinants of the degree of income diversification measured by the Simpsons Index of Diversity (SID). The results indicate that a total of 65% of households engage in non-farm income sources. The estimated Share of Non-farm Income (SNFI) - 29.05% in total household income and SID-0.338 were found to be low. Age, number of years of education, female headed households, household income per capita, number of extension visits, productive assets owned and nature of road were found to be significant in determining income diversification of farm households in the Western Region. Farm households require government and private sector support to increase the gains made in participating in various diversification strategies through policy, provision of public goods, capacity building in order to raise their living standards.

1 Introduction

Farming as a livelihood activity is associated with immense risks (climatic, pest and diseases, price, policy etc.). This phenomenon is more severe in sub-Saharan African countries including Ghana where appropriate lasting mitigation solutions have yielded average results. Farm households (households who engage in the production of crops and/ livestock) in Africa have increasingly sought means of escaping from the detrimental consequences of poverty by inclining to diversification of their activities; within and outside the farm sector. This is to primarily address their income and food security shortfalls (BARRETT and REARDON, 2000; KORIR et al., 2005). Diversification therefore supports farm households to accumulate income for farm expansion engagement in non-farm businesses (DIMOVA and SEN, 2010; LAY and SCHULER, 2008) and to solve immediate household needs (food, shelter, health care, payment of school fees etc.).

ELLIS (2000a) defined livelihood diversification as a process by which *rural households construct an increasingly diverse portfolio of activities and assets in order to survive and improve their standard of living*. Therefore, an analysis of the diversification concept empirically, has been assessed from the asset, income or activity viewpoints. Asset measurement is deemed arduous and sometimes crudely estimated due to the poor development of asset market especially in most rural communities in Africa (BARRETT and REARDON, 2000). Drawing on MINOT et al. (2006), RONNING and KOVERIED (2006), this study defines income diversification as *"a situation where farm households rely on income from multiple sources; both farm and Non-farm"*. Income diversification is commonly specified in conformity with the standard practice of national accounting and macro input/output table construction where separation is made among sectoral, functional and locational or spatial (migration influences) classifications of diversification. The sectoral approach which categorizes income sources identical to the sectors of an economy such as primary (agriculture)-farm, secondary and tertiary-non-farm (BARRETT and REARDON, 2000) is used in this study.

Additionally, according to ELLIS (2000b), seasonality of farming resulting in labour idling during off farming seasons have led farm households to engage in activities (particularly non-farm activities) to use their full labour potential. Moreover, realization of economies of scope, diminishing returns to factor (land, capital, labour) use, response to liquidity constraints and availability of opportunities (infrastructural development, access to social amenities, increases in population etc.), have also backed farm households pursuance of diversification of their livelihood activities (BARRETT et al., 2001). BARRETT et al. (2001) further classifies reasons of livelihood diversification into pull (favourable conditions which draw farm households into diversification) and push factors (hash conditions that force households into diversification).

In Africa, an estimated number of 45-50% of farm households are into various income diversification strategies (BARRETT and REARDON, 2000); and in Ghana, empirical evidence show diversification among farm households (CANAGARAJAH et al., 2001; DAVIS et al., 2007; LAY and SCHULER, 2008). In the Western Region of Ghana, diversification of livelihood activities in the upper part of the region where majority of cocoa is produced as well as among women in Cape Three points amidst crude oil production (KNUDSEN and TIDSSKRIFT, 2007; BOOHENE and PEPRAH, 2011) in an exploratory study is also empirically available. However, literature on the patterns of income diversification and its associated determinants of farm households across the entire Western Region of Ghana is lacking. The nature of the Western Region and its observed activities serves as either pull or push factors and the general motive of farm households to raise their living standards underpin the evidence of the pursuance of income diversification by farm households in the Western Region of Ghana.

The degree to which farm households diversify their sources of income and the associated incomes generated have increasingly distinguished poor from rich households (CANAGARAJAH et al., 2001). Studies on income diversification have used the Herfindahl, Shannon, Simpson's indices among others to measure the degree to which farm households have diversified their assets, activity or incomes (JOSHI et al., 2003; BABATUNDE and QAIM, 2009; SCHWARZE and ZELLER, 2005). This study employs the Simpsons Index of Diversity (SID) to determine the degree of income diversification among farm households in the Western Region. The reason for the choice of this index stems from the fact that the SID takes into consideration the number of species and the evenness in their distribution. The SID therefore takes into account the evenness in the distribution between the incomes generated from the various activities undertaken by the farm households (MINOT et al., 2006). An understanding of the degree of income diversification in the region will provide basis for advocating for support from stakeholders involved in rural and farm economy development to appropriately respond to the needs of farm households in the Western Region of Ghana.

The estimated farm and Non-farm income shares suggest the activities available to farm households in the Western Region to exploit in times of favourable/unfavourable conditions (climate, availability of farming inputs, infrastructure, social amenities etc.); and the quantum of income generated from the livelihood activities. The estimated shares of the income sources in household's total income will also justify the importance of farming and the related activities as well as Non-farm income practiced by farm households in the Western Region. The determining factors of income diversification such as: age, market access, gender, credit access, productive asset ownership, irrigation, good road network, electricity, water, credit access, among other factors have been found by empirical studies.

However, the determinants of income diversification may be different from one geographical location to another owing to spatial variations of farm economies across the globe (ABDULLAI and CROLEREES, 2000; MINOT et al., 2006; KNUDSEN and TIDSSKRIFT, 2007). Moreover, farm households are confronted by different incentives and constraints due to the differences in transaction costs and market prices they face. This culminates into heterogeneity in the kind of income diversification strategies farm households pursue (BARRETT et al., 2005). Therefore, assessing the determinants of income diversification in the Western Region is expected to appropriately facilitate the provision of public goods (infrastructure, extension service delivery, research) and household empowerment programmes by the state and non-governmental organizations respectively to farm households in the region who produce most of Ghana's cash crops particularly cocoa and rubber. This study, therefore, explicitly seeks to: identify the sources of income and estimate the share of farm and Non-farm income in Total Household Income (THI), estimate the degree of income diversification as well as

examine the determinants of income diversification of farm households in the Western Region of Ghana.

2   Methodology

2.1 Description of the Study Area

The Western Region is located in the South-Western part of Ghana and bordered to the West by Ivory Coast, Central Region on the East, Ashanti and Brong-Ahafo Regions on the North and on the South by 192 km of coastline of the Atlantic Ocean. The region covers an area of 23,921km^2 representing about 10 per cent of Ghana's total land area. The Western Region has vast rain forest reserves, numbering 24 of which the Bia Forest Reserve, Cape Three Points National Park are some examples. The Western Region has 17 administrative districts/municipalities. The region is associated with moderate temperatures, ranging from 22°C to 34°C, with rainfall averaging 1,600 mm per annum. The high annual rainfall creates a relatively high humidity condition in most parts of the region (GSS. 2008; MoFA, 2011).The main crops grown in the region include: cocoa, oil palm, coconut (copra) and rubber. Food crops such as cassava, plantain, maize, rice and vegetables are also produced at a subsistence level. The Ghana Rubber Estates Limited (GREL), Benso Oil Palm Plantation (BOPP) and NorPalm Oil Mills are major agro-industrial companies found in the region. These industries together with commodity purchasing companies such as: Produce Buying Company, Amanjaro, Adwumapa Buyers etc., provide farm households with means of getting ready market and appreciable price for their harvests.

The Western Region has a long history of mineral exploration on both large and small scales. Minerals such as gold, manganese, bauxite and crude oil mined in the region have generally produce multiplier effects on the residents including farm households-providing them with a wide array of opportunities to exploit. The commercial production of crude oil which begun in the last quarter of 2010 is expected to further create a vibrant non-farm economy in the region (GSS, 2008; MoFA, 2011; WORLD BANK, 2009). The Western Region is also home to various tourist sites (Nzulezu stilt settlement, Domama Rock Shrine etc.) and other hospitality industry establishments (Hotels, Restaurants, Beach resorts etc.). The operation of these tourist sites/enterprises together with the above mentioned activities of mining and commercial farms have resulted in the influx of migrant households who hail particularly from the Northern Regions (Northern Region, Upper East and West Regions) and other regions (Volta, Ashanti, Brong-Ahafo) in Ghana to the Western Region. It is also common to find migrants from neighbouring countries such as Burkina Faso and Ivory Coast engaged in farming activities in the region. The migrants normally engage in share cropping systems of farming. This relates to either sharing of harvested crops or cultivated land.

The nature of the Western Region and the related dominant activities: farm and non-farm thus provides enough grounds to study the nature of income diversification and its determinants among the farm households in the region to inform policy and to add to existing literature on income diversification in Ghana.

2.2 Method of Data Analysis

The *Mean of Income Shares* approach was used to estimate the income shares obtained by the farm households in the Western Region of Ghana. This approach estimates the shares of incomes at the individual household level (DAVIS et al., 2007) by finding the share of each income source in THI for each household. The mean share for each income source for all households is then found. The general Mean of Income Shares formula is given as:

$$MS_i = \frac{\sum_{h=1}^{n} y_{ih}/Y_h}{n} \quad (1)$$

Where i= the income source, Y=Total Income, y= income from particular activity, h=the household, n= the number of households. Equation (1) is applied in this study as:

The sum of Total Household Income (THI) is given as:

$$THI = \sum_{j=1}^{9} Y_j \quad (2)$$

Where: THI=Total Household Income, thus income coming from all sources j
j=1, 2, 3, 4….9, farm and Non-farm income.

(a) The mean Share of Farm Income (SFI) is given as:

$$SFI = \sum \left(\frac{\sum fci/thi}{n} + \frac{\sum cci/thi}{n} + \frac{\sum nri/thi}{n} + \frac{\sum livsti/thi}{n} + \frac{\sum fwi/thi}{n} \right) \quad (3)$$

(b) The mean Share of Non-farm Income (SNFI) is given as:

$$SNFI = \sum \left(\frac{\sum nfwi/thi}{n} + \frac{\sum sei/thi}{n} + \frac{\sum rei/thi}{n} + \frac{\sum othersi/thi}{n} \right) \quad (4)$$

Where, *sfi*=share of farm income, *snfi*=share of Non-farm income, *thi*=total household income, *fci*=food crop income, *cci*=cash crop income, *nri*=natural resource income, *livsti*=livestock income, *fwi*=farm wage income, *nfwi*=Non-farm wage income, *sei*=self-employment income, *rei*=remittance income, *othersi*=other sources income, *n*=number of households.

Estimating the Degree of Income Diversification (Simpsons Index of Diversity)

The Simpsons Index of Diversity (SID) is used in this study to estimate the degree of income diversification among farm households in the Western Region. The SID takes into consideration both the number of income sources as well how evenly the distributions of the income between the different sources are (MINOT et al., 2006; JOSHI et al., 2003). This reason justifies the choice of the SID as applied in this study over other measures of diversification such as the Herfindahl, Shannon etc. The SID ranges between Zero (0) and One (1). Thus, 0 denotes specialization and 1 the extremity of diversification. The more the SID value is closer to one, the more diversified the household is.

The SID general formula is given as:

$$SID = 1 - \sum_{i=1}^{n} P_i^2 \tag{5}$$

SID=Simpsons Index of Diversity, *n*=number of income sources, P_i=Proportion of income coming from the source *i*, the value of SID ranges from Zero (0) to One (1), however, if there is only one Source of Income, P_i=1, then SID=0.

The SID model is expressed in this study as:

$$SID = 1 - \sum_{i=1}^{9} \left(\left(\frac{fci}{thi}\right)^2 + \left(\frac{cci}{thi}\right)^2 + \left(\frac{nri}{thi}\right)^2 + \left(\frac{livsti}{thi}\right)^2 + \left(\frac{fwi}{thi}\right)^2 + \left(\frac{nfwi}{thi}\right)^2 + \left(\frac{sei}{thi}\right)^2 + \left(\frac{rei}{thi}\right)^2 + \left(\frac{othersi}{thi}\right)^2 \right) \tag{6}$$

Where: *fci*=food crops income, *cci*=cash crops income, *nri*=natural resource income *Livsti*=Livestock income, *fwi*=farm wage income, *nfwi*=Non-farm wage income, *sei*=self-employment income, *rei*=remittance income, *othersi*=other income sources.

Determinants of Income Diversification of Farm Households

The Censored Tobit regression model is used to identify the factors which determine farm household engagement in income diversification-Simpsons Index of Diversity. SCHWARZE and ZELLER (2005), BABATUNDE and QAIM (2009), DAVENDRA et al. (2005)

used this method to analyse the determinants of income diversification. The presence of zeros in the dependent variable: Simpson's Index of Diversity for some respondents (thus showing no diversification) demands the use of the censored Tobit regression. The general formulation for Tobit specification is given (GREENE, 2003) as:

$$y_i^* = x_i^{'}\beta + \varepsilon_i$$

$$y_i = 0 \; If \, y_i^* \leq 0$$

$$y_i = y_i^* \; if \; y_i^* \succ 0 \tag{7}$$

Where y_i^* is a censored variable of the Simpson diversity Index (SID), β is a parameter to be estimated, x is a vector of explanatory variables and ε is the error term.

Determining Income Diversification (SID)

$$
\begin{aligned}
SID= \quad & \beta_0 + \beta_1 age + \beta_2 gendfemale + \beta_3 numyrsedu + \beta_4 marstatus \\
& + \beta_5 hhincpercapita + \beta_6 accelectric + \beta_7 accepipe + \beta_8 distmkt + \beta_9 tfarsize \\
& + \beta_{10} extvisit + \beta_{11} prodassets + \beta_{12} acccredit + \beta_{13} natroad + \varepsilon \tag{8}
\end{aligned}
$$

SID= is the Simpsons Index of Diversity, ε = error term

Sampling Procedure and Data Collection

A multi-stage sampling technique was employed in this study. The Western Region of Ghana was chosen purposively for this study. The region was clustered into two. Cluster one: represents districts proximal to the coast (coastal districts) and cluster two: for districts at the upper part of the Western Region (forest areas). In each cluster, three districts were selected randomly. Thus, in cluster one the Ahanta West, Jomoro districts; and Tarkwa Nsuaem municipality were selected, whilst Wassa Amenfi West, Juabeso and Bibiani/Ahwiaso/Bekwai Municipality were randomly selected in cluster two. In each district two communities were selected randomly, resulting in a total of twelve communities (Hotopo, Banso, Esougya, Simpa, Takinta, Effassu, Akyekyere, Asankra Saa, Afere, Katankrubo, Sefwi-Wenchi and Lineso). A total of 234 farm households were randomly selected for the study representing 39 farm households per district/municipality.

A cross-sectional data was collected for the study using a structured questionnaire with both close and open ended questions. The data collected covered: demographic characteristic, socio-economic characteristics, household participation in farm and Non-farm activities and the associated gross incomes generated in cash (and kind payments where applicable) in the survey year (12 months preceding time of data collection).

Information on productive assets owned and household expenditure were also obtained. In situations where a household head could not respond to the questionnaire in the formal English language; interviews were used following strictly the questions on the questionnaire. General observations were also made on the settings and activities of farm households in the Western Region. The Stata software was used for the data analysis.

3   Results and Discussion

3.1 Nature of Income Diversification of Farm Households

In all, Nine (9) sources of income categorized as coming from Farm and Non-farm sources were identified. A combination of three (3) income sources involved the majority of 39.1% of the surveyed farm households in the region. A total of 65% of farm households were found to be involved in various Non-farm activities which illustrates the importance of Non-farm income among farm households in the region. The key reasons given for the entry into Non-farm activities include: ability to cater for the needs of the household in terms of food security, payment of school fees, and accumulation of income to address risks associated with farming among other reasons. The number of farm households engaged in both Farm and Non-farm income sources in the Western Region of Ghana is shown in Figure 1.

Farm Income Sources

Food crops production had 221 (94.4%) farm households engaged in the activity. The crops grown include cassava, plantain, cocoyam, local vegetables (pepper, garden eggs, etc.) and on rare occasions maize was found to be grown. It is not surprising that, a majority of farm households engaged in food crop production to be able to meet their food security needs and for income obtained through deliberate sales and in cases of surpluses. *Cash crop production* had 215 (91.9%) of farm households engaged in the production of cocoa, rubber, oil palm, coconut, rice (mainly produced on marshy lands which do not support cocoa production was noticeably in the Tarkwa Nsuaem municipality and Juabeso district, under Block farming systems etc.). Sugar cane was also grown for cash. *Natural resource collection* with regards to fire wood collection, fishing, hunting activities was practiced by few farm households 11(4.7%) in the region. Fire wood collection was mainly female dominated and fishing and hunting the preserve of males. Trenches in rice farms was observed to be providing extra income to rice farmers as fishing was practiced in the trenches. Normally, bare hands and baskets are used for harvesting the fish.

Livestock production recorded 121 (51.7%) households engaged in the activity. Mostly domestic chicken were kept, this summed up to 1,809 birds. In addition, cattle (5), goat (431), sheep (386), pigs (89), grasscutter (8), guinea fowls (28), duck (39) and rabbit (5) were kept. Aquaculture was also practiced by some farm households of which a sum of 300 Tilapia fingerlings had been stocked. *Farm wage activities* such as weeding other farms, herbicide spraying, canoe dragging, rubber tree tapping services as well as temporary or permanent works as factory hands in established farms (e.g. Ghana Rubber Estates Limited etc.) was practiced by 25 (10.7%) farm households. Wage incomes from such activities were received by farm households on daily, weekly or monthly basis as either cash or kind payment (e.g. possibility of receiving a quantity of fish after helping to drag a canoe ashore was observed in fishing communities)

Non-farm Income Sources

Non-farm wage activity was practiced by 31 (13.2%) farm households. This include formal: teaching (in the normal school system), sanitation (e.g. in "Zoomlion", district/municipal sanitation establishments etc.) officers and Informal Non-farm works: construction works, masonry, vehicle station masters, mining works etc. were observed by the study *Self-employment* was practiced by 111 (47.4%) farm households. The self-employed activities pursued by the farm households include: tailoring, carpentry, oil processing, transport business operations (taxi and 'trotro'), lottery vending, masonry, purchasing clerks etc. To add, fish mongering, food ('Akyeke', 'Tokuma', 'fufu', boiled rice, porridge etc.) sales and petty trading in drinks (both alcoholic and soft) and agrochemicals were also practiced. Other activities such as sale of fishing gears and mending of damaged fishing nets for income were also observed among farm households who live closer to river bodies and the sea where fishing is practiced.

The study found 27(11.5%) of the surveyed farm households to have received *remittances income* in the survey year. These remittances were received from spouses and relatives living in cities such as Sekondi-Takoradi Metropolis, Kumasi, and Accra and more especially from those who have migrated to mining sites within the region. Remittances were used to expand farming and to cater for household needs. In some cases, remittances are received in kind. For instance, receipt of items such as farming inputs (cutlasses, spraying machines, wellington boots etc.), ice chest, mobile phones etc. were observed among farm households. *Other income sources* such as pensions, transfers, tips, winnings from lotteries among others involved 21(9.0%) farm households. In this category, pensions were received by retired teachers, security, and railway staff. In addition, receipt of awards from 'Farmers Day' ceremonies such as knapsack sprayers, roofing sheets, cutlasses, Wellington boots, and agrochemicals were found by the study. These awards tend to retain farm households in farming and

also serve as motivation for farm households to expand their farms and to venture into other Non-farm livelihood activities.

3.2 Mean Share of Farm and Non-farm Income in Total Household Income

Share of Farm Income (SFI): In this category, cash crops income source recorded the highest income share of 51.85%. Food crops income share had (13.41%) of the total household income. The low share of food crop income is as result of the fact that, less land (20.16%) is cropped compared to cash crops (79.84%) and the fact that a large proportion of the food crop is consumed at home. Farm wages, livestock and natural resources collection incomes shares averaged 2.89%, 1.70% and 1.10%, respectively. Thus, in total the farm income share represents 70.95% of Total Household Income. The results indicate the importance of farming and it is related activities to the economy of the Western Region. This provides a justification for the Western Region as one of the agrarian regions in Ghana.

Share of Non-farm Income (SNFI): Self-employment income share (19.07%) represents the largest share in the Non-farm income share category. Non-farm wage income share follows with (5.84%), Other income source share and Remittances recorded 2.18% and 1.96%, respectively. In total, the Share of Non-farm income in THI was found to be 29.05%, lower than the share of income generated from the farm sector by farm households. This finding on the shares of income coming from farm and Non-farm source is in line with the findings of SCHWARZE and ZELLER (2005) who found larger shares of farm income of 68% and 32% coming from the Non-farm sector of farm households in Indonesia. However, the finding is contrary to the works of IDOWU et al. (2011), who found 32.92% share of farm income in total household income and 67.08% of Non-farm income amongst rural farm households in southern Nigeria.

The results reveal that the farm sector continues to be vital to farm households in the Western Region, since a major portion of their income is derived from activities in the sector. This buttresses the argument for supporting farm households in the Western Region. Since farm or primary production continues to thrive despite the prolonged mineral exploration and recent crude oil exploration in the region.

3.3 Degree of Income Diversification of Farm Households

As the value of SID moves closer to one, the more diversified the households income is. A mean degree of diversification of 0.338 (33.8%) was found by the study. The Ahanta West, Jomoro, Wassa Amenfi West and Juabeso Districts respectively recorded 0.363, 0.261, 0.308, and 0.277 mean SID. However, Tarkwa Nsuaem municipality and the Bibiani/Ahwiaso/Bekwai municipalities respectively had 0.432 and 0.385 SID. The

relatively high degrees of diversification recorded by farm households in these districts could be attributed to the operations of mining activities in these areas which promotes brisk non-farm business activities and sale of agricultural products especially food crops which fetches relatively higher prices than the other districts. Generally, the stream of income generated as a result of the engagement in activities was found to be generally low and in some cases, some activities yielded no income leading to the low degree of diversification observed in the entire study area. The mean degree of diversification of 0.338 is lower than observed by BABATUNDE and QAIM (2009) of 0.479 in Nigeria. The low observed degree of income diversification shows that farm households in the Western Region are less diversified in relation to the income generating activities they engage in. Thus farm households tend to concentrate their sources of income in few activities especially farming related ones. There is therefore a need to support farm households to enhance the incomes generated from the activities they engage in. Also farm households could be equipped with skills to derive much income from the Non-farm activities they pursue. This practice could enable farm house smoothen their sources of income all year round.

3.4 Determinants of Income Diversification-Simpsons Index of Diversity (SID)

The result of the censored Tobit regression estimates of the determinants of income diversification (SID) is presented in Table 4. The age of household heads, number of years of education, female headed households, number of extension visits had, household income per capita, productive asset owned, and the nature of road were significant. The age of heads of households had a negative relationship with diversification (SID), which meant that as heads of farm households increases in age, the less they diversify their income sources. This is because they lack the physical strength and financial resources to add on to their farm or Non-farm activities, since a majority of these activities are found to be labour intensive. The results further show that the number of extension visits increases the degree to which farm households diversified their incomes. This outcome could be attributed to the fact that the presence of extension agents in farming communities have led to support for farm households to engage in other income generating activities by choosing new crop varieties and species of livestock and/or provision of agricultural services, (such as tractor or power tiller services) for income. Female headed households were also found to have a positive significance with income diversification in the Western region of Ghana as they tend to venture into both Farm and Non-farm activities.

The number of years of education of household heads was significant and positively influenced income diversification among farm households in the Western Region. Thus, having some educational level attainment facilitates entry into high paying jobs (YUNEZ-NAUDE and TAYLOR, 2001) such as: teaching, produce purchasing clerks,

masters of transport stations, lottery vending as well as improving farmers under-standing of farming practices and related issues as observed by this study.

The household income per capita of farm households in the Western Region was found to be significant but have a negative relationship with the degree of diversification (SID). Thus, larger farm households diversify less as much of their income is geared towards consumption and for household needs. Situations where households have larger proportion of members who are either schooling, engaged in apprenticeship or aged also negatively influenced the farm households` extent of diversification. This occurrence results in less labour and income available to households to add on more livelihood activities or expand existing ones. Productive asset ownership by farm households valued in Ghana cedis was observed by the study. The assets owned include: livestock, equipment and materials used for business e.g. pots for food preparation for sale, drums for the preparation and storage of the local Gin (Akpeteshie) and oil (palm and coconut oils), value of taxi cabs, ownership of canoes, corn mills, Fridges/deep freezers for the sale of water and drinks. Furthermore, ownership of canopies, chairs, mattresses among others for hiring were also observed by the study. The Productive assets owned by farm households were found to be significant and positively influenced their degree of income diversification. The ownership of such assets therefore facilitates entry into businesses (farm and Non-farm) to gain more income. This finding is similar to that of BABATUNDE and QAIM (2009). The nature of roads with regards to availability of tarred was found to positively influence income diversification by farm households in the region. Tarred roads promote business activities and results in a reduction in the transaction cost (transports fares, loading fares etc) associated with doing business. However, in raining seasons, communities with untarred roads experience tardiness in business activities or are cut-off completely from major markets, due to collection of water on the roads. Thus, vehicles which ply such roads do so at immense risk. In some situations long hours are spent on roads and sinking of vehicles into muds is common. Communities with tarred roads were found to be able to diversify their businesses throughout the seasons of the year.

4   Conclusion and Recommendations

The study found the Share of Non-farm Income to be 29.05%. Thus, farm households generally collect a majority (70.95%) of their incomes from the farm sector, with cash crop income alone contributing as much as 51.85% to THI. There is the need to ensure that productivity is attained in the farm sector especially cash crops such as cocoa, rubber and oil palm production since much income is still earned by farm households from the production and marketing of these crops. The degree of income diversification

of farm households across the region was found to be generally low. This implies that farm households generate their incomes from few livelihood activities. Farm households could therefore be supported to be productive and income oriented in the activities they pursue.

The determinants of income diversification strategies pursued by farm households in the Western Region are the age, female headed households, household income per capita, extension visits had, number of years of education, value of productive assets owned and nature of road (tarred roads). The study found older household heads to be less diversified in the sources of income they pursue. This requires the efforts of government and other stakeholders to build the capacity of the youth to engage in farming and income diversification to enable them accumulate income for investment and also to sustain the farm industry in the Western Region of Ghana.

The infrastructure (tarred roads, provision of electricity, pipe-borne water etc.) status of the farm economy in the Western Region should be improved. This could reduce entry barriers into both farming and Non-farm activities to enable households put their full capabilities into use. Productive asset ownership should be encouraged among farm households as this has a higher tendency of assisting households to diversify into farm and Non-farm activities. Moreover, extension service delivery should be strengthened in the Western Region by building the capacity of extension officers through training, provision of logistics as well as incentives. This is expected to result in provision of efficient extension services delivery to farm households.

The Non-formal school system in farming communities in the Western Region should be intensified to enhance farm households' ability to understand modern practices and government policies, so as to take advantage of them. In general, income diversification should be encouraged among farm households in the Western Region to enable them raise their total household income to address household demands and for accumulation and investment purposes.

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Contact author:
Bernard Archibald Senyo Agyeman
Department of Agricultural Economics and Agribusiness, College of Agriculture and Consumer Sciences,
P.O. BOX LG68, University of Ghana, Legon
e-mail: bas.agyeman@gmail.com

Appendices

Table 1.   Descriptive statistics

Variable		Description	Mean	STD
Age of household head	age	Number	47.99	13.56
Female headed household	gendfemale	Dummy (Female=1, Male=0)	0.7521	0.433
Number of years of education	numyrsedu	Number	6.7393	0.82
Marital status	marstatus	Dummy (Married=1, Single=0)	0.8205	0.385
Extension visits	extvisit	Number/ year	0.5641	1.22481
Access to electricity	accelectric	Dummy (Yes=1, No=0)	0.7821	0.413
Access to pipe-borne water	acepipewater	Dummy (Yes=1, No=0)	0.0769	0.27
Distance to nearest market	distmkt	Kilometers	8.1162	5.75
Total farm size	tfarmsize	Hectares	5.9553	6.68
Household income per capita	hhincpercapita	Total Household Income (GH¢)/Household size	881.59	1330.69
Access to credit	acecredit	Dummy (Yes=1, No=0)	0.1024	0.36960
Productive assets owned	prodassets	Ghana Cedis (GH¢)	2371.9209	3534.99
Nature of road	natroad	Dummy Tarred=1, untarred=0	0.483	0.500
Simpsons Index of Diversity	SID	Number (degree)	0.338	0.211
Share of Non-farm Income	SNFI	Number (share)	0.2905	0.327
Number of Income Sources/ activities	NIS	Number	3.223	0.933
Total Household Income (*gross income)*	THI	Ghana Cedis (GH¢)	5483.9264	7848.07

Source: computed from field data (2012)

**Table 2.　Mean share of farm and non-farm income in total household income**

Income sources	Mean income share (%)
Food crops	13.41
Cash crops	51.85
Natural resource collection	1.10
Livestock	1.70
Farm wages	2.89
Share of Farm Income (SFI)	**70.95**
Non-farm wages	5.84
Self-employment income	19.07
Remittance	1.96
Others	2.18
Share of Non-farm Income (SNFI)	**29.05**
Share of Total Household Income	**100.0**

Source: computed from field data (2012)

Table 3.　Degree of income diversification of farm households in the Western Region

District/municipality	Mean SID
Ahanta West	0.363
Tarkwa Nsuaem Municipality	0.432
Jomoro	0.261
Wassa Amenfi West	0.308
Juabeso	0.277
Bibiani/Ahwiaso/Bekwai Municipality	0.385
Entire study area **N for each district=39**	**0.338**

Source: computed from field data (2012)

Figure 1.   Percentage of farm households engaged in various income sources
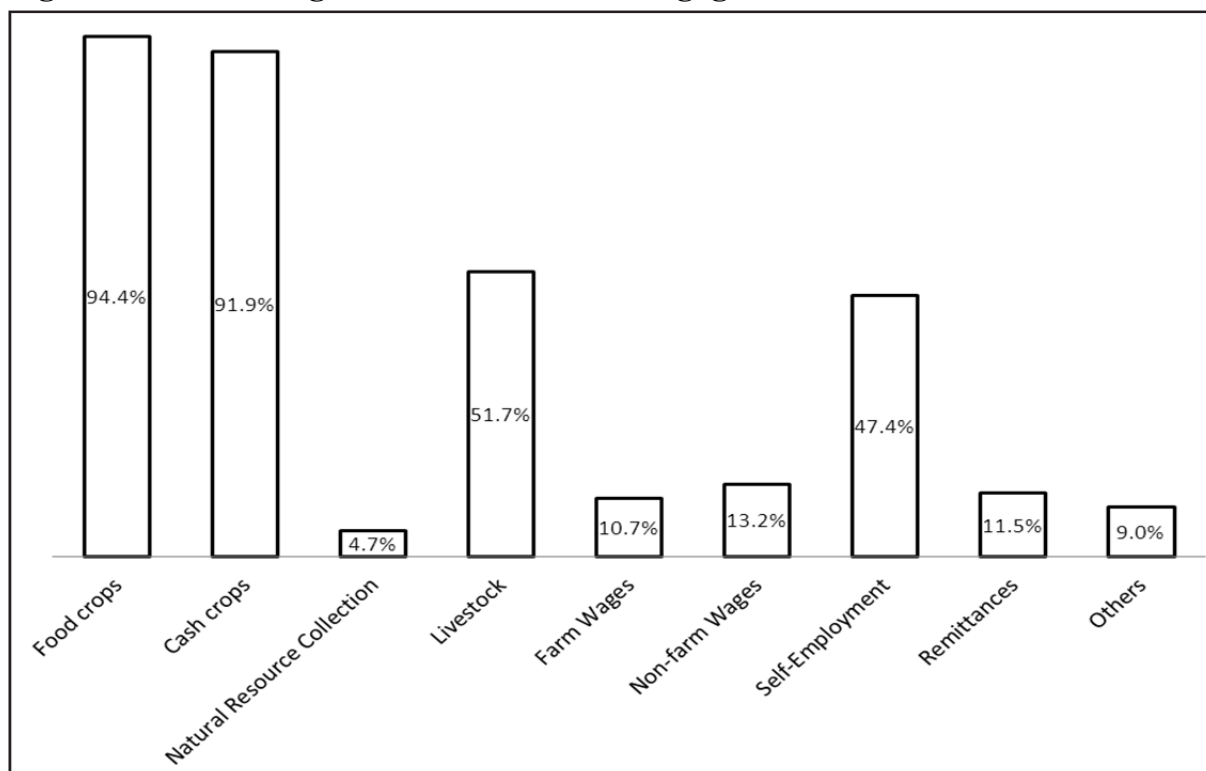
Source: computed from field data (2012)

Table 4.   Determinants of Income Diversification (SID) of farm households in the Western Region of Ghana

Variables	Coefficient	P-Value
Age	**-0.0053***	**0.000**
Female headed household	**0.07872***	**0.054**
Number of years of education	**0.00744***	**0.066**
Marital status	0.04406	0.314
Household income per capita	**-0.000046***	**0.000**
Access to electricity	-0.01753	0.687
Access to pipe-borne-water	0.057266	0.323
Distance to market	0.002598	0.341
Total farm size	0.0008557	0.692
Extension visit	**0.0228073****	**0.040**
Productive assets	**0.0000145***	**0.000**
Access to credit	-0.0019116	0.966
Nature of road	**0.07694****	**0.029**
Constant	0.41349	0.000
Prob> F=0.0000, Pseudo- R-Squared=0.7373 significance *10%, **5% and ***1%		

Source: computed from field data (2012)