Original Research Article

Market Information and Extent of Agricultural Commercialization: Empirical Evidence from Smallholder Farmers in Effutu Municipality of Ghana.

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ABSTRACT

Aims: Agricultural commercialization literature has shown that access to market information influences market participation by smallholder farmers. However, documentation on which type of access to market information influences the extent of market participation in the study area is missing. Therefore, this paper analyzed the effect of the different types of access to market information on the extent of agricultural commercialization by using data on smallholder maize farmers in the Effutu Municipality of Ghana.
Study design: The study basically used primary data collected through farmer interviews. A structured questionnaire was used to collect information on demographic characteristics, institutional factors, production, marketing and post-harvest activities.
Place and Duration of Study: The study was conducted in 15 communities of Effutu Municipality of Ghana between April and May, 2011.
Methodology: The selection of 150 farmers followed a multi-stage systematic random sampling technique. The truncated regression model was used for the analysis.
Results: The truncated regression estimate revealed that gender, total number of male adults within the household that assist with farming activities, education, market information, farm size, access to land and non-farm income significantly explain variation in the extent of agricultural commercialization.
Conclusion: The study concluded that the type of access to market information is critical for decision making for the market. Access to market information from informal sources, such as farmer association, friends and relatives significantly has an impact on the extent of household agricultural commercialization. It is recommended that agricultural development projects strengthen the delivery system of the informal market information by strengthening farmer based organizations complemented with incentive packages to sustain farmers' interest.

Keywords: Market information, Agricultural commercialization, Smallholder, Ghana, Truncated

1. INTRODUCTION

The agricultural production system in Ghana is dominated mostly by smallholder farmers who are faced with myriads of challenges ranging from technology adoption to post-harvest activities. Production is largely rain-fed with relatively lower output as a result of low investment in infrastructure like irrigation and market intelligence centers. However, they play a major role in food production and market participation. Smallholder agriculture is likely to remain the major engine for rural growth and livelihood improvement for some time in most of sub-Saharan Africa [9]. Development of the smallholder systems in Africa can lead

to the development of the agricultural sector in many African countries. However, non-competitive value chains, limited information about remunerative markets and risk aversion of smallholders limit their integration into markets [2]. Agricultural support to smallholder farmers in the form of business capacity development, technology dissemination, training through farm demonstrations, provision of input credit, market information and infrastructure may lead to a sustainable growth in the agricultural system of Ghana.

Agricultural production entails investment of resources and farmers will have no incentive for making investments in areas where there is little opportunity for marketing their products or if the returns accruing from the sales of agricultural products do not reflect the opportunity cost of investment. As a result, most farmers in areas with few marketing opportunities are engaged primarily in subsistence agriculture, which has constrained improvement in their quality of life [26]. The problem of market access is linked to the inability of farmers to meet market standards, low volumes of produce, wide dispersion of producers, presence of middlemen and perceived low prices in the formal market [9, 14, 18, 19, 21]. Therefore, development policies in Ghana have focused on the modernization and commercialization of the agricultural sector in addressing the major agricultural production and marketing challenges. [38, 39]. The development policy of the Food and Agricultural Sectors II (FASDEP II) is notably among these policies. It seeks to increase both the competitiveness and integration of farmers in domestic and international markets by producing the required volumes as well as the quality of commodities on a timely basis. Specifically, strategies adopted by this policy to enhance the competitiveness and integration of farmers into markets efforts includes improvement in access to market information and intelligence, relevant market infrastructure and agricultural financing.

Lack of access to market information is a major constraint to the intensity of agricultural commercialization. Smallholder farmers in most developing economies find it difficult to participate in markets because of numerous constraints and barriers [35]. These are mostly reflected in the hidden costs that make it difficult to access the input and output markets. Transaction costs are the embodiment of access barriers to market participation for most resource-poor smallholders [7,17]. A fundamental transaction cost these farmers face is the cost of obtaining information [41]. Imperfections in information markets make costs of obtaining reliable information prohibitively high, creating welfare losses for participants and barriers to entry for others [8]. Information asymmetry is more likely to cause market failure [40]. Individuals in the value chain may hold on to market information at the detriment of the other players thus affecting the extent of commercialization.

Baseline studies conducted in Ghana show that the use of radio, agricultural extension agents, friends and mobile phones are the major source of market information to smallholder farmers [25]. Radio, television and wireless technology as well as the internet are important tools for meeting the information needs of small scale farmers which range from extension of education and agricultural technology to agricultural credit and marketing [31]. However, the use of mobile phone is increasingly becoming a major source of market information. [26] established that the use of mobile phone significantly influence the choice of marketing channel by smallholder yam farmers in Brong Ahafo region of Ghana. The establishment of Agribusiness Centres (ABCs) also serves to supply the marketing needs of farmers by providing them with market information. Glut situation mostly occurs as a result of oversupply of farm produce to the market due to lack of market information. The process leads to a downward pressure on the market price and subsequently to a fall in income. The access to market information can enhance farmers' access to markets through better negotiation and meeting the demands of the market [5,28], on the condition that constraints of the access to inputs are addressed. Improved telecommunications can lower the cost of acquiring information, lower risks in addition to improving market efficiency. These services

can offer previously unconnected farmers to gain access to up-to-date price information and broaden the market participation [12]. Time and money can be saved by substituting travel to markets with telecommunications and these savings can be especially important for small scale farmers. The facilitation of greater access to farmers' knowledge about markets and prices can contribute effectively to breaking the cycle of poverty [40].

Several approaches have been used to analyze factors influencing agricultural commercialization of smallholder farmers in Africa. The econometric specification usually depends largely on the objective of the study and the type of data available [42]. Some studies have modeled agricultural commercialization as a two-step analytical approach which involves the unobservable decision to commercialize and the observed degree of commercialization [47,1]. The truncated regression model was used to determine the factors that influence the degree of maize commercialization among households in Ondo State, Nigeria [34]. It was observed that age, experience of the household head, farm practice and quantity of harvested maize had significant influence on the proportion of maize sold in the rural area of the State.

Furthermore, the double hurdle model which combined a binary model to predict zero values and a zero-truncated continuous distribution to predict non-zero values was used to analyze the factors that influence the intensity of member participation in certain group activities [13]. Two different specifications, one with the quantity and the other with the share of collectively sold bananas as dependent variables were used for the second hurdle. As a consequence, it was found out that factors like access to irrigation facilities, yield, number of groups, education, household size, farmers' perceived degree of exploitation, group size and delayed payment by traders significantly influenced the share of collectively sold bananas in Kenya.

[33] employed the truncated regression model to analyze the factors that determined the percentage sale of milk, vegetable and maize by smallholder farmers in Kenya. Based on the analysis, it was concluded that the total output of milk produced, distance to the market and market information from informal source significantly explained the percentage of milk sold. In the case of vegetable, it was observed that male-headed households, total output of vegetable produced, distance to the market, market information from formal source and unit price significantly determined the extent of participation in vegetable market whereas education, non-farm income, total output of maize and distance significantly explained the variation in the intensity of maize commercialization.

The application of the logistic regression model within the transaction costs framework to analyze the factors enhancing market participation by small-scale cotton farmers in South Africa showed that age, ability to speak/understand English, region, ownership of transport, access to market information, distance to market, dependency ratio, trust, land size and ownership of livestock influenced the degree of commercialization [37].

Agricultural commercialization literature has shown that access to market information influences market participation by smallholder farmers. However, documentation on which type of access to market information influences the degree of market participation in the study area is missing. The different sources of access to market information, such as access to mobile phones, membership of a farmer association and access to extension agents are employed in this paper to empirically determine their effect on the intensity of agricultural commercialization. Therefore, the present study tests the hypothesis of whether the type of information source has a significant effect on maize commercialization. In this connection, this paper analyzed the effect of access to market information on the extent of agricultural commercialization using data on smallholder maize farmers in the Effutu Municipality of

Ghana. The findings of the study will make empirical contributions to the body of literature and policy formulation to ensure sustainable growth in the crop sub-sector of Ghana.

2. METHODOLOGY

2.1 Study Area

The Effutu Municipal is situated between the latitudes 5020 north, 0025 west and 0037 west on the eastern part of the central region of Ghana. It is bordered to the north by Agona municipal, to the north-east by the west Akim Municipal, to the south by the Gulf of Guinea, to the east by Gomoa district and Ga west Municipal, and to the west by the Gomoa district. The municipal covers an area of 417 square kilometres. The Effutu Municipality has a population of 68,597 people which represents 11% of the population of the central region according to the 2010 population and housing census. The topography of the area is characterized by isolated, undulated highlands located around the Effutu sub-district. The lowlands are found along the coastline-Senya and Winneba areas with isolated hills. The municipal experiences a five month dry season starting from November to March and this season is followed by a seven month rainy season from April to October. Rainfall figures of the municipal are quite low (40cm-50cm) along the coastal line but are higher in the hinterlands with the mean annual rainfall ranging between 50cm and 70cm. The loamy soil which is mostly found in the semi-deciduous forest zones of the district supports the production of cassava, plantain, yam, maize, cocoa, cola nuts, pineapple, citrus and pawpaw. Agriculture constitutes the main economic activity of the district economy and employs about 58% of the district population. Seventy percent of the district population produces at the subsistence level. Crops, livestock and fisheries are the main sectors of agricultural production in the district. Crop production employs about 50% of the total population.

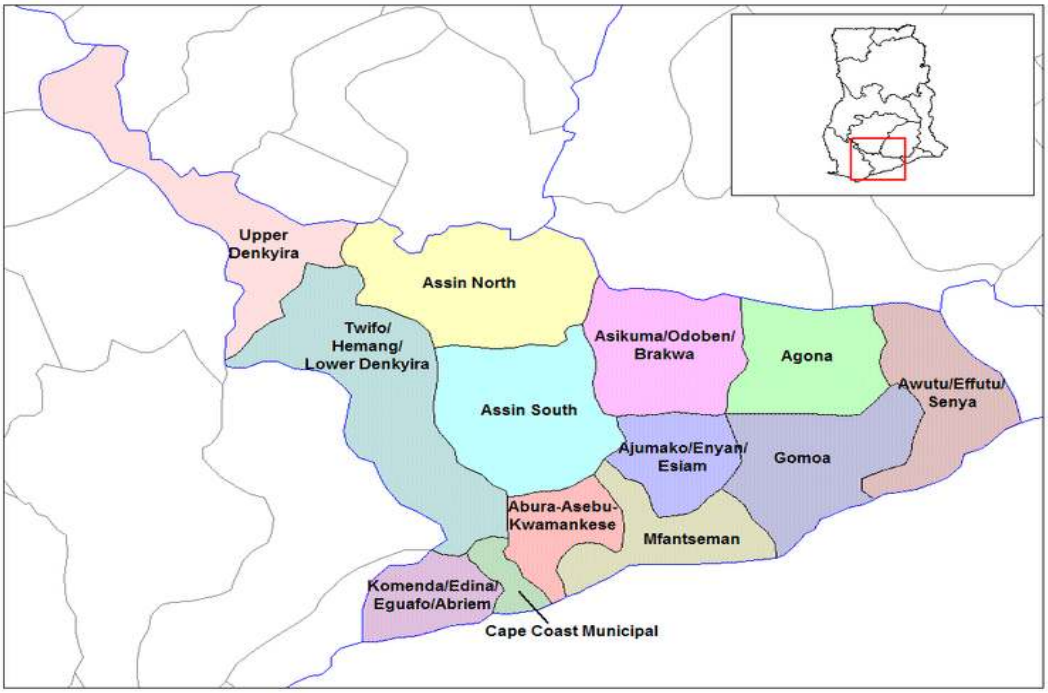

Figure 1: Administrative Map of Effutu Municipality

2.2 Data and Sampling Technique

The data for this study was obtained from primary source with the aid of a structured questionnaire. The data on household level included the household characteristics, institutional factors, production and sales volumes, household income and off-farm income. Maize was the main household food crop by the majority of the farmers. A total of 150 smallholder maize producers was systematically selected and interviewed. The selection of the maize producers followed a multi-stage systematic random sampling technique. The first stage involved a purposively selection of 15 communities based on the level of maize production, while the second stage involved a random selection of 150 farmers from the 15 selected communities in the Effutu Municipality of Ghana.

2.3 Method of Analysis

An individual participates in a market if the utility derived in participation exceeds the utility of non-participation. It is assumed that the decision to participate and the intensity of participation are independently determined. [6] showed that marketing decisions are often made sequentially rather than simultaneously. Based on data and nature of the analysis, the truncated regression model was chosen over the Tobit model. The truncated regression model was employed to determine the effect of access to market information on the intensity of maize market participation. The model was chosen based on the current data where some farmers did not meet the minimum threshold of participation. Observations on positive and greater than the lower intensity of maize commercialization are used in the analysis. The intensity of maize commercialization (Y_i) is specified as:

$$Y_i = \frac{Value\ of\ Maize\ Sold\ (GHS)}{Value\ of\ Maize\ Produced\ (GHS)} \quad (1)$$

Smallholder farmers who do not commercialized were excluded as the lower boundary of truncation. According to [15], the model assumes normal distribution with constant variance specified as follows:

$$Y_i^* = \beta_i X_i + \mu_i, \ \ \mu_i \sim N(0, \sigma^2) \quad (2)$$

Where Y_i is the degree of maize commercialization which depends on the latent variable Y_i^* being greater than zero and conditional to the decision to adopt fertilizer, and X_i is the vector of explanatory variables hypothesized to influence the degree of maize commercialization. The empirical model employed to determine the fertilizer use intensity is given as:

$$\begin{aligned} Y_i = \beta_0 + \beta_1 Agehh + \beta_2 Gend + \beta_3 Eduhh + \beta_4 Eduhh2 + \beta_5 Adl + \beta_6 Extacs + \beta_7 Assoc \\ + \beta_8 Lansta + \beta_9 fmsize + \beta_{10} Crdav + \beta_{11} Lanaces + \beta_{12} Dismkt + \beta_{13} ofmi \\ + \beta_{14} Acsmob \ + \mu_i \end{aligned} \quad (3)$$

Where, β_0 is the constant term $\beta_1, \beta_2, \beta_3, \ldots\ldots, \beta_{14}$ are the parameters of the respective explanatory variables in the model and μ_i is the error term. The estimates for these parameters were obtained using the STATA SE software version 11. Table 1 summarizes the host of explanatory variables that are potentially expected to explain variation in the degree of maize commercialization and their *a priori* expectations.

Table 1. List of Explanatory Variables

Variable	Description	A priori Expectation
Age	Age of household head in years	+/-
Gender of household head (Gend)	1 if male and 0 other wise	
Education (Eduhh)	Number of years	+
Education squared (Eduhh2)	Number of years squared	-
Total adults in household (Adl)	Total number of adults that assist on the farm	+/-
Membership of farmer association (Assoc)	1 if member of farmer association and 0 otherwise	+
Access to Extension agent (Extacs)	1 if farmer has access to extension and 0 otherwise	+
Access to credit (Crdav)	1 if household receive credit and 0 otherwise	+
Farm size (Fmsize)	Farm size of household measured in acres	+
Land ownership status (Lansta)	1 if household owns land and 0 otherwise	+
Access to farm land (Lanaces)	1 if household has access and 0 otherwise	+
Distance to market (Dismkt)	Distance in Km from farmstead to market	-
Off-farm income (ofmi)	Income from off-farm measured in Ghana cedi (GH₵)	+
Access to market information through an informal source (Accmob)	1 if farmer has access to information from friends and relatives and 0 otherwise	+

The age of household head is expected to influence maize commercialization both positively and negatively. It is expected that younger farmers are more dynamic, open to new ideas and may have better understanding of commercialization issue since most of the older farmers view farming as a way of life rather than a business [37]. Alternatively, age serves as a proxy measurement of experience and availability of resources. It is possible that older and more experienced heads are able to take better production decisions and have greater contacts which allow trading opportunities to be discovered at lower cost than younger ones [10].

Gender of household head is expected to capture the differences in market orientation between males and females. Male-headed households are expected to have a higher propensity to participate in markets than their female counterparts.

Education is expected to exert a positive effect on commercialization. [10,45,43,30] argued that education will endow the household with better production and managerial skills. [16] also observed that education is an important tool to escape poverty once the content of the education addresses the needs of the target people. It enhances farmers' access to and interpretation of information and also enables individual farmers to make informed decision on commercialization. It is also possible that education increase the chances of the

household head to earn off-farm income which can reduce the household dependency on agriculture especially where there are competing and more remunerative employment opportunities [23]. The study further tested the hypothesis that farmers would move out of agriculture into more remunerative employment opportunities at a certain level of education by including a square term of education as covariates in the model.

The total number of adults in the household that assist on the farm is expected to influence commercialization both positively and negatively. This study focused on the proportion of male adults who assist on the farm. The size of the household represents the productive and consumption unit of the household [24]. The total number of adults in the households who assist on the farm are expected to serve as a source of supply of family labour for the production activities and such a situation has a positive impact on commercialization. It is also argued that there is continuous development with intensive agricultural systems. As the household size increases, the productivity of the land rises and exceeds the subsistence requirements which will lead to an increase in the marketed surplus. However, the total number of adults may increase the household size and lead to a greater food demand which reduces market participation. The propensity to participate in the market economy declines with numbers of household members [23].

The sources of market information were measured by three main variables namely access to extension services, membership of farmer association and information access through friends and relatives who are non-members of farmer associations. The effect of the type of market information sources is tested empirically to establish a conclusive directional effect. Access to informal source of market information as measured by membership of farmer association/group, is expected to exert a positive effect on commercialization. Access to market information is necessary for making both production and marketing decisions [32]. Belonging to a farmer association enhances the opportunities for share of information and reduces the transaction cost of search for market information. The farmer organization also serves as a collective action for strengthening farmers' bargaining and lobbying power and facilitates obtaining institutional solutions to some problems and coordination [27]. Information is expected to empower the individual farmers to make informed decision regarding resource allocation, market-driven commodity, effective demand, pricing and distribution pathway.

Access to extension agents is used as a proxy measurement of formal source of production and market information. Extension agents are the conduit for the transfer of technology developed by research which is expected to impact positively on the output of farmers *ceteris paribus*. In some cases, extension agents may provide useful information to farmers through farmer fora, such as Farmer Field School (FFS) and Farmer Learning Centres (FLC) due to logistical constraint associated with personal contact. However, It is argued that the quality of extension programmes rather than the access is essential in the realization of farmers need. Extension services can be an effective tool in delivering the information needed for farmers to make informed decisions about new marketing strategies [29,22]. A positive relationship is expected between extension access and the extent of agricultural commercialization. The access to market information from informal sources, such as relatives, friends and neighbours are expected to have a positive impact on the degree of commercialization. The transaction cost associated with access to market information from informal source is relatively lower than the access to market information from formal sources. Farmers with lower transaction costs are more likely to participate in the market.

Farmers who have access to credit are more likely to intensify the sale of maize. Research has shown that measures to alleviate smallholders' constraints, such as access to credit and technology generate a larger supply response than price and trade incentives, such as

changes in the level of import tariffs [4]. Availability of credit and the associated cost of credit are crucial in the success of the agricultural industry [44]. Credit is used to purchase factor inputs (planting material, fertilizer and crop protection), pay wages and invest in machine. The availability of credit is expected to lead to increased agricultural productivity and greater commercialization.

Access to land is a key determinant of commercialization. Access to production input like land complemented by the right technology can increase the output of farmers and commercialization. Farm size is expected to influence the extent of commercialization positively. Farm size may have indirect positive impacts on market participation by enabling farmers to generate production surpluses as well as overcoming credit constraints [32]. Farmers with larger farm sizes are likely to enjoy economies of scale and suffer less from high transaction costs.

Land ownership is used as a proxy measurement of wealth. Farmers with productive assets are less vulnerable to shocks. [16] argue that acquisition and ownership of productive assets can pave the way for a family to participate in economic activities. Assets empower the rural poor by increasing their incomes, preserve them from shocks and offer them choices to escape from harsh and exploitative conditions. Renting of land can provide farmers with the liquidity to access and use technology to produce marketable surplus.

Distance to market captures the transaction cost incurred by the farmers in terms of transportation of their produce to the market. According to some studies distance to the market negatively influences both the decision to participate in markets and the proportion of output sold [20] and [24]. A higher transaction cost limits farmers participation and intensity of commercialization. Greater distance poses higher transaction cost to farmers, a situation which affects the type of crop cultivated and technology adopted.

Finally, off-farm income influences commercialization positively especially where the gains are reinvested in agricultural technologies. Access to off-farm income may lead to risk reduction in household decision making and thus increase the propensity to undertake higher risk activities such as selling of crops or producing for the market. [1] also noted that off-farm income contributes to a higher volume of marketed output if the off-farm income is invested in farm technology and other farm improvements activities. In other words farmers report a decline in output if off-farm income leads to off-farm diversification.

2.4 Limitation of the Study

Measurement of some of the explanatory variables used in the model had some limitations due to missing data and subjectivity problems. Access to extension service was measured as a dummy variable as supposed to the frequency of extension contacts. Access to market information was not adequately measured due to missing data. Future studies can take into consideration the number of market contacts per month/season. The study did not take into consideration, the role of ICT in market participation. It is recommended that future studies should look at the effect of ICT on agricultural commercialization.

3. RESULTS AND DISCUSSION

3.1 Characteristics of Farm Households

Table 2 presents the selected characteristics of the farm households. The results show that majority of the sampled households were male-headed with an average age and farming experience of 43 years and 12 years respectively. The sampled households can be described as being economic active. A typical sampled household consist of an average of six members. The results also show that almost 80% and 82% of the household heads have had some basic education and married respectively.

Membership of farmer organization is one of the major source of market information and advocacy. It was observed from the study that 85% of the sampled household heads belong to a farmer association. This suggest that farmers are gradually appreciating the importance of working as a collective body to effect change. About 34% and 41% of the sampled household heads have had contact with extension agents and accessed production credit respectively. Transportation is one of the key challenges affecting most producers in rural areas. However, the results show that 78% of the household heads have access to vehicle.

On the average, a household head cultivates 0.63 ha of maize and travels an average distance of 18km to access output market. The average income of a household head from the sale of maize is GH₵464.

Table 2. Characteristics of Farm Households

Characteristics	Mean	Standard Deviation
Male	83.00	
Age of household head (years)	43.00	11.40
Household size	6.00	2.88
Educated heads (%)	79.60	
Marital Status (%)	81.60	
Farming experience (years)	21.00	12.40
Membership of FBO (%)	85.20	
Contact with extension (%)	33.60	
Area under maize production (ha)	0.63	0.40
Access to production credit (%)	40.80	
Access to vehicle (%)	78.40	
Distance to output market (Km)	18.00	6.15
Income from maize sales (GH₵)*	464.00	366.34

* GH₵: Ghana cedi 1 USD = GH₵2.4

3.2 Factors Influencing Agricultural Commercialization

The analysis of the determinants of access to market information on the extent of agricultural commercialization was conducted on 150 households selected from different communities within the Municipality. Table 2 presents the result of the truncated model estimation for the identification of the effect of market information access on the extent of agricultural commercialization. The significant Wald chi-square value of 107.22 indicates that the explanatory variables jointly influence the extent of agricultural commercialization**.** Gender, total number of adults in the household, education, farmer association, farm size, access to land and off-farm income were the significant factors influencing the extent of maize commercialization in Effutu Municipality of Ghana. Among all these variables, farm size was the highest determining factor of the degree of market participation statistically and numerically (Table 2).

Gender exerted a positive effect on commercialization. The result indicated that the intensity of agricultural commercialization by males was 9% lower than females. Males were expected to participate intensively in the market due to access to productive input like land and input credit which is estimated to stimulate production volume. However, the result deviated from

the *a priori* expectation because female farmers in the study area had contractual obligation with male farmers by selling directly to them after harvest. In conclusion, females tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities [11].

The proportion of male adults in the household was associated with an inverse relationship with the degree of agricultural commercialization. A unit increase in the number of adults in the household was likely to decrease the degree of agricultural commercialization by 2%. This implies that the household members depend more on the farm produce for food. This result confirms the findings of a study which established a negative effect of household dependency ratio on commercialization [37]. However, this situation is valid for growing maize and may change in case of other products. For instance, in case of cassava, an additional adult member of a household increases the extent of cassava sales by 0.8% [26]. The household depends more on maize for food with respect to cassava and the labour-intensive nature of cassava production accounts for the importance of family labour. As a result, this finding implies the importance of enhancing human productivity through agricultural training and participation in farm demonstration.

The number of years of education and conventional education squared both influenced the extent of agricultural commercialization positively. A unit increase in the number of years of formal education increased the extent of maize commercialization by 3%. Similar results showing positive effect of education on the extent of maize commercialization in Ghana and Kenya were also obtained from other studies [26]; [33]. Human capital development is crucial for adoption and application of agricultural technologies like the use of improved seed and improved crop management practices to increase surplus production for market. The result is rather not surprising because the farmers in the study area are more exposed to education especially at the lower level due to the influx of education facilities put up by the colonial masters. In order to further test the hypothesis that enhanced education beyond a certain minimum was likely to decrease the extent of commercialization, education squared term covariate was included in the model. The result confirms the hypothesis as a result of the negative effect education squared posed on commercialization variable. A unit increase in education beyond certain minimum level decreased agricultural commercialization by 0.3%. The result suggested competition in terms of demand for farmers' skill either in agriculture or off-farm employment opportunity which is more remunerative. This result is also supported empirically by the fact that most of the study areas are accessible to major urban centres where other employment opportunities are prevalent [26].

Market information has been proven by the study to have a positive effect on agricultural commercialization. Market information sources were captured by membership of farmer association, access to extension services and access to information from friends and relatives. The directional effect of the market information variable on commercialization varied with the type of information source. It was observed that access to market information through the extension services and informal sources (friends and relatives) had a negative effect on the extent of maize commercialization although not significant. The insignificant negative effect of access to market information through access to services of extension may possibly be due to the inadequate content of extension information as well as the insufficiency of extension agents since they lack resources and motivation. Nonetheless, access to market information through a farmer based organization exerted a positive effect on the extent of maize commercialization. The finding indicated that the intensity of maize commercialization by farmers who had access to market information through a farmer association (informal source) was 6% higher than non-members of farmer association. This finding confirms an earlier study where a 2% increase was observed in market participation among farmers with access to market information through an informal source [37]. Contrary

to the present finding, [33] observed that access to market information through a formal source influences the extent of maize supply in the peri-urban areas of Kenya. However, they observed that increased access to market information through an informal source impacts positively on the extent of vegetable supply in Kenya. Due to the fact that most farmer groups provide technical, marketing and financial services for farmers at a reduced transaction cost, access to market information through informal sources may be a necessary but insufficient condition for intensifying maize commercialization. The type of informal source of market information also plays a major determinant role as a result of different levels of access, participation and usage among target farmers. The implication of the result is that both governmental and non-governmental development projects must strengthen the informal sources of market information.

Farm size significantly influenced the extent of maize commercialization positively. A unit increase in farm size increased the extent of maize commercialization by 19%. The result confirms the findings of [26] who established a 10% increase in maize commercialization for an additional unit of increase in farm size. An increase in farm size normally leads to an increase in surplus for both the household consumption and the market. However, [37] and [3] established a significant negative effect of farm size on market participation. According to them, gains in land productivity and/or market sales were not large enough to offset the costs associated with the increase in production. Therefore, these studies recommend that efforts to expand farm size should be accompanied by similar efforts to raise the land productivity.

With respect to access to land, the present study established a positive effect between access to productive land and the degree of agricultural commercialization. The extent of agricultural commercialization is higher for farmers with access to productive land relative to those without access by 3%. Traditional laws and customs limit access to productive land in farming communities with natives having more access to land than their non natives counterparts. This result implies that agricultural development projects should target native farmers to guarantee unlimited access to land for demonstrations of farm technologies.

Finally, income from off-farm employment opportunities influenced the extent of agricultural commercialization negatively. The extent of maize commercialization decreases by 2% for every additional Ghana cedi[1] of income earned from off-farm activities. The result confirms the findings of [33] who established that non-farm income significantly reduces the amount of vegetables sold. [1] and [26] also obtained a similar result in their independent studies on agricultural commercialization in Kenya and Ghana respectively. It is likely that off-farm income triggers investment in non-farm activities. Empirically, cost of education and household food demand attracts a larger share of household off-farm income in the study area.

[1] Cedi is the national currency of Ghana

Table 3. Truncated Regression Estimates of Degree of Agricultural Commercialization

Variable	Marginal Effect (dy/dx)	Robust Std. Error	P>|Z|
Gender	-0.0916	0.0420	0.029**
Total number of adults that assist on the farm	-0.0201	0.0120	0.094*
Age	0.0022	0.0018	0.231
Number of years of education	0.0272	0.0165	0.099*
Number of years of education squared	-0.0027	0.0016	0.095*
Access to extension services	-0.0053	0.0483	0.913
Membership of farmer organization	0.0600	0.0340	0.078*
Land ownership status	-0.0841	0.0565	0.136
Farm size	0.1875	0.0538	0.000***
Access to credit	0.0396	0.0362	0.273
Access to productive land	0.0262	0.0064	0.000***
Distance to nearest market	-0.0041	0.0026	0.113
Off-farm income	-0.0200	0.0109	0.066*
Informal source of market information	-0.0014	0.0543	0.979
Wald chi2 (14)		107.22	
Prob>chi2		0.0000	
Log pseudolikelihood		41.2297	

Dependent Variable = Degree of agricultural commercialization ***p < 0.01, **p < 0.05 and *p < 0.10

4. CONCLUSION

This paper examined whether the type of access to market information has any significant effect on the extent of maize commercialization in Effutu Municipality of Ghana. The study revealed that gender, total number of adults that assist with farming activities, education, market information, farm size, access to land and non-farm income significantly explain variation in the extent of agricultural commercialization. It was confirmed by the study that the type of access to market information is critical for market decision-making. Furthermore, access to market information from informal sources like farmer associations significantly has a positive effect on the extent of household agricultural commercialization.

In this regard, these findings should be taken into consideration for shaping agricultural policies in Ghana. Both governmental and non-governmental institutions should channel agricultural development projects through farmer organizations with emphasis on market participation coupled with tangible benefits to ensure effective participation and sustained interest.

Government policy that aims at increasing agricultural commercialization and productivity through technology adoption must target and support educated and relatively large farm size holders.

Finally, policies on agricultural commercialization must give recognition to female farmers through trainings and financial support.

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ABBREVIATIONS

ABC	Agribusiness Centers
FFS	Farmer Field School
FLC	Farmer Learning Centers
FASDEP	Food and Agriculture Sector Development Policy
IFAD	International Fund for Agricultural Development
ICT	Information and Communication Technology

APPENDIX

Appendix 1: Truncated Regression Estimates of Agricultural Commercialization

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Truncated regression
Limit:         lower =          0                      Number of obs =    126
               upper =       +inf                      Wald chi2(14) = 107.22
Log pseudolikelihood =  41.229725                      Prob > chi2   = 0.0000
```

yi	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gend	-.0916385	.0419719	-2.18	0.029	-.1739018	-.0093752
adl	-.020067	.0119931	-1.67	0.094	-.0435731	.003439
agehh	.0021907	.0018273	1.20	0.231	-.0013907	.0057722
eduhh	.0271816	.0164764	1.65	0.099	-.0051115	.0594747
eduhh2	-.0027063	.001622	-1.67	0.095	-.0058853	.0004727
extacs	-.0053004	.0482512	-0.11	0.913	-.0998711	.0892703
assoc	.0599765	.0340319	1.76	0.078	-.0067249	.1266778
lansta	-.0840608	.0564533	-1.49	0.136	-.1947072	.0265855
fmsize	.1875422	.0538236	3.48	0.000	.0820499	.2930344
crdav	.0396305	.0361614	1.10	0.273	-.0312445	.1105056
lanaces	.0262066	.0064392	4.07	0.000	.013586	.0388273
dismkt	-.0041164	.0025967	-1.59	0.113	-.0092058	.0009731
ofmi	-.0199626	.0108591	-1.84	0.066	-.041246	.0013208
info	-.0014189	.0543367	-0.03	0.979	-.1079168	.105079
_cons	.4366075	.1120595	3.90	0.000	.216975	.65624
/sigma	.1770767	.0110312	16.05	0.000	.1554558	.1986975