

Original Research Article

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

ABSTRACT

Aims: Agricultural commercialization literature has shown that access to market information **influences** (influence) market participation by smallholder farmers. However, documentation on which type of **access to market information** (market information access) influences the extent of market participation in the study area is missing. **Therefore**, this paper (therefore) analyzed the effect of the different **types of access to market information** (market information access) 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** (in the) 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 adults that **deal with** (assist with) farming activities, education, market information, farm size, access to land and nonfarm income significantly explain variation in the extent of agricultural commercialization.

Conclusion: The study concluded that the type of **access to market information** (market information outlet) is critical for **decision making for the market**. (market decision-making.) Access to market information from informal sources, **(a comma here)** such as farmer association, friends and relatives significantly **has an impact on** (impacts on) the extent of household agricultural commercialization. It is recommended that agricultural development projects strengthen **the delivery system of the informal market information** (the informal market information delivery system) by strengthening farmer based **organizations** (organization) 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 **the adoption of technology** (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]. **According to a study,** (According to [2],) **the** development of the smallholder systems in Africa can lead to **the** development of the agricultural sector in many African countries. **However,** (They further stated that) non-competitive value chains, **a comma here** (and) limited information about remunerative markets, (no comma here) and risk aversion of smallholders limit the integration into markets. [2] Agricultural support to smallholder farmers in the form of business capacity development, technology dissemination, training through farm demonstration provision of input credit, market information and infrastructure may lead to a sustain growth in the agricultural system of Ghana. Agricultural production entails investment of resources, (no comma here) and farmers will have no incentive for making investments in areas where there is little opportunity for marketing their products, (no comma here) 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]. (According to [9, 14, 18, 19, 21]) The problem of **access to the market** (market access) is linked to **the inability of farmers** (farmers' inability) to meet **the** 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]** (In addressing the major agricultural production and marketing challenges in Ghana, development policies have focused on the modernization and commercialization of the agricultural sector [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.** (Notably among these policies is the Food and Agriculture Sector Development Policy II (FASDEP II) of Ghana which seeks to increase competitiveness and enhance integration of farmers into domestic and international markets.) **Avoid repetitions.** (The aim is to enhance Ghana's comparative advantage and translate it into competitive advantage in producing the needed volumes and quality of commodities on a timely basis.) Efforts at improving access to market information and intelligence, relevant market infrastructure and agricultural financing are some of the strategies adopted by **this policy.** **Avoid repetitions** (the policy to enhance the competitiveness and integration of farmers into markets). Lack of access to market information is a major constraint to the intensity of agricultural commercialization. (According to [35],) 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 **reach** (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** (shows) that **the** use of radio, agricultural extension agents, friends and mobile phones **is** (were) the major source of market information to smallholder farmers [25]. Radio, television and wireless technology as well as the internet **is all** important tools **to meet** (for meeting) the information needs of small scale farmers which **range** (ranges) from **the** extension of education, (no comma here) and agricultural technology, (no comma here) to agricultural credit and marketing [31]. However, the use of mobile phone is increasingly becoming a major source of market information **and it significantly influences the choice of marketing channel by smallholder yam farmers in Brong Ahafo region of Ghana. [26]** ([26] established that the use of mobile phone significantly **influences** (influence) the choice of marketing channel by smallholder yam farmers in Brong Ahafo region of Ghana.) **The** establishment of Agribusiness Centres (ABCs) also **serves** (serve) to supply the marketing needs of farmers. Glut situation mostly **occurs** (occur) 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 (to) the** access to inputs are addressed. Improved telecommunications can lower the cost of acquiring information,(no comma here) **and risks** **Avoid repetitions (lower risks) in addition to improving** (, and improve) 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, (no comma here) and these can be especially important for small scale **dealers (sellers)**. (According to [40],) **The** facilitation of greater access to knowledge about the market and prices (**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 (involving)** 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]** (In determining the factors that influence the degree of maize commercialization among households in Ondo State, Nigeria, [34] used the truncated regression model.) **It was observed (They 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 .([13] used the double hurdle (DH) model to analyze the factors that influence the intensity of member participation in certain group activities. The DH model combined a binary model to predict zero values and a zero-truncated continuous distribution to predict non-zero values. For the second hurdle, they used two different specifications, one with the quantity and the other with the share of collectively sold bananas as dependent variables. They concluded that access to irrigation facilities, yield, number of groups, education, and household size, farmers' perceived degree of exploitation, group size and delayed payment by traders significantly influenced the share of collectively sold bananas in Kenya.)

The truncated regression model was used to analyze the factors that determined the percentages of milk, vegetable and maize sales by smallholder farmers in Kenya. [33] ([33] used 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. (Based on the analysis, they concluded that total output of milk produced, distance to market and market information from informal source significantly explained the percentage of milk sold.) In the case of vegetable, **it was observed (they 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 **the** vegetable market whereas education, **nonfarm (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 (by [37]) showed that **the** age, ability to speak/understand English, region, ownership of transport, access to market information, distance to **the** 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** (influence) market participation by smallholder farmers. However, documentation on which type of **access to market information** (market information access) influences the degree of market participation in the study area is missing. **The different sources of access to market information** (In this paper, the different access to market information sources) , **a comma here** 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** (The present study therefore) **tests** (test) the hypothesis of whether the type of information source has a significant effect on maize commercialization. **In this connection,** this paper (therefore) 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.

METHODOLOGY

2.1 Study Area

The Effutu Municipal is situated between **the** latitudes 5020 north, **0025 west and** (and latitudes 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,**(no comma here)** and **to** (on) 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, **a comma here** 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.

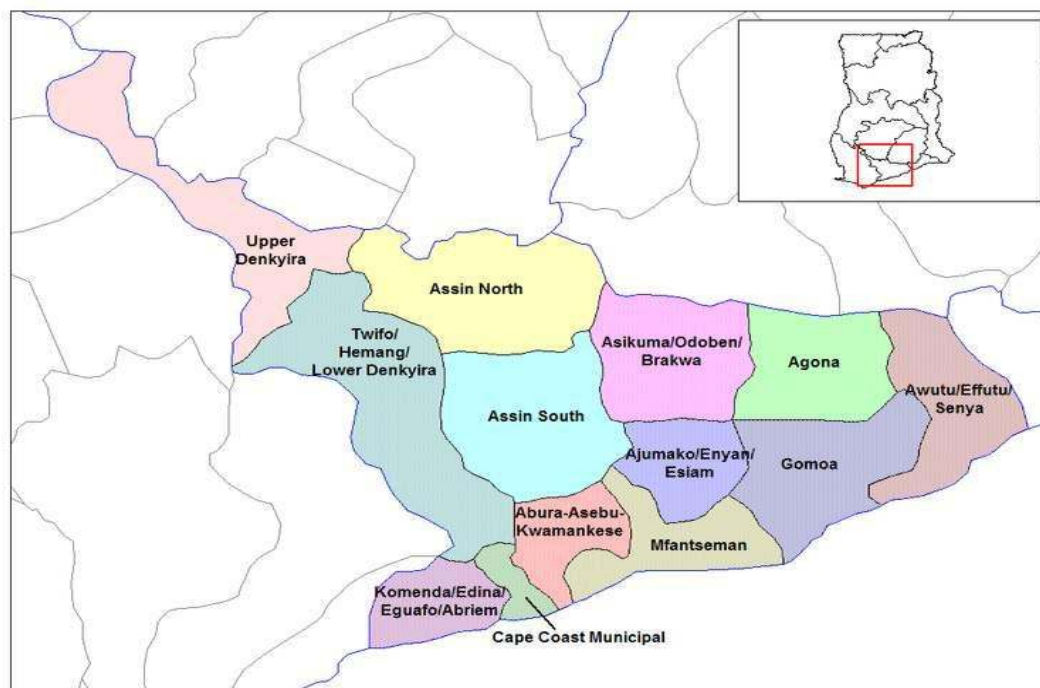


Figure 1: Administrative Map of Effutu Municipality

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 (volume), household income and nonfarm (off-farm) income. Maize was the main household food crop by the majority of the farmers. A total of 150 smallholder maize producers was (were) systematically selected and interviewed. The selection of the maize producers followed a multi-stage systematic random sampling technique. The first stage involved a purposive 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. (In the first stage, 15 communities were purposively selected based on the level of maize production. The second stage involves random selection of 150 farmers from the 15 purposively selected communities in the Effutu Municipality of Ghana.)

2.3 Method of Analysis

An individual participates (participate) in a market if the utility derived from a (in) participation exceeds the utility of non-participation. It is assumed that the decision to participate and the intensity of participation are independently determined. The marketing decisions are often made sequentially rather than simultaneously [6]. ([6] showed that marketing decisions are often made sequentially rather than simultaneously). When the data and nature of this analysis were taken into account, the truncated regression model was chosen over the Tobit model in order to determine whether access to the market information influences the intensity of maize market participation. (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 whether access to market information influences the intensity of maize market participation.) Observations that are (on) positive and greater than the lower intensity of maize commercialization are used in the analysis. The intensity of maize commercialization (π_i) is specified as:

Formula 1

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

Formula 2

Where π_i is the degree of maize commercialization which depends on the latent variable π_i^* being greater than zero and conditional to the decision to adopt fertilizer and $\mathbf{x}_i$ 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:

Formula 3

Where, α is the constant term $\alpha_0, \alpha_1, \alpha_2, \dots, \alpha_k$ are the parameters of the respective explanatory variables in the model, ϵ_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.

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 a association (Assoc)	1 if member of a farmer association and 0 otherwise	+
Access to Extension agent (Extacs)	1 if farmer has access to extension and 0 otherwise	+
Access to credit (Crдав)	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 (Distant) to market (Dismkt)	Distance in Km from farmstead to market	-
Nonfarm (Off-farm) income (ofmi)	Income from nonfarm (off-farm) measured in Ghana cedi (GH¢)	+
Access to market information through an informal source (Access to informal market information)(Accmob)	1 if farmer has access to information from friends and relatives and 0 otherwise	+

208 **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 **the** commercialization issue **since** (as) most **of the** older farmers view farming as a way of life rather than a business [37]. Alternatively, age **can** (could) serve as a proxy measurement of experience and **an** availability of resources. It is possible that **the** older and more experienced heads are able to take better production decisions and have greater contacts which allow trading opportunities to be discovered at **a** lower cost than **the** younger ones [10].

215
216 **The** gender of household head is expected to capture the differences in market orientation
217 between males and females. Male-headed households are expected to have a higher
218 propensity to participate in markets than their female counterparts.

219
220 **Education is expected to exert a positive effect on commercialization since it will endow the household with better production and managerial skills [10,45,43,30].** (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. (According to [16]) Education is an important tool to escape poverty once the content of the education addresses the needs of the target people. [16] It enhances farmers' access **to** and interpretation of information and also **enables** (enable) individual farmers to make informed decision on commercialization. It is also possible that education **can** (could) increase the

chances of the household head to **earn nonfarm income which can reduce the dependency of the household on agriculture.** [23] (earning non-farm income.) (This **can** (could) reduce the household dependency on agriculture especially where there are competing and more remunerative employment opportunities available in the area that require skills that are enhanced by more education [23]-**This sentence is too long, complicated in meaning and includes repetition.**). The study further tested the possibility of the hypothesis that (at a certain level of education,) farmers **would** (will) 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 **in** (on) the farm is expected to influence commercialization both positively and negatively. **This study focused on the male adults who assisted in the farm for the household size.** (For this study, the focus on the household size was the male adults that assist on the farm.) **The size of the household represents the producing and consuming units of the household.** [24] (According to [24], the size of the household represents the productive and consumption unit of the household.) Adults in the households **who** (that) assist **in** (on) the farm are expected to serve as a source of supply of family labour for **the** production activities and (in) such a situation **has a positive impact** (impact positively) on commercialization. It is also argued that there is continuous development with intensive agricultural systems. (, no comma here) **As the** household size increases, **a comma here** the productivity of the land rises and exceeds **the** subsistence requirements **which** (and this) 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** (thus demand greater food needs) which reduces market participation. **As a result,** ([23] also hypothesized that) the propensity to participate **in** (into) the market economy declines with numbers of household members. [23]

The sources of market information (Market information sources) were measured by three main variables **which are** access to **the** extension services, **the** membership of **a** farmer association and **access to information** (information access) through friends and relatives who are **nonmembers** (non members) of farmer associations. The effect of **the** type of market information sources **is** (are) tested empirically to **establish** (established) a conclusive directional effect. **The** access to **an** informal source of market information, **which is measured by** (as measured by) membership of farmer association/group, **a comma here** is expected to exert a positive effect on commercialization. **The** 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** (information sharing) **and reduces** (thus reducing) 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 **by making** (to make) informed decision regarding **the allocation of resources** (resource allocation), market-driven commodity, effective demand, pricing an distribution pathway.

The access to extension agents is used as a proxy measurement of **a** formal source of production and market information. Extension agents are the conduit for **the** transfer of technology developed by research which is expected to **have a positive impact** (impact positively) on **the output of farmers** (farmers output) *ceteris paribus*. In some cases, extension agents may provide useful information to farmers through farmer for a, **a comma here** such as Farmer Field School (FFS), **no comma here and** Farmer Learning Centres (FLC) due to **the** logistical constraint associated with personal contact. **However,** it is (however) argued that the quality of extension programmes rather than the access is essential in the realization of (the) 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 **the** extension **of** access and **the** extent of agricultural commercialization. Farmers who have access to credit are more likely to intensify **the** sale of maize. (According to [4]), **Research** has shown that measures to alleviate smallholders' constraints, **a comma here** such as access to credit and

technology generate a larger supply response than price and trade incentives, **a comma** such as **the** changes in the level of import tariffs [4]. **The** availability (of credit) and the associated cost of credit (according to [44]) are crucial in the success of the agricultural industry. [44] Credit **can** (could) be used to purchase factor inputs (planting material, fertilizer and crop protection), pay **the** wages, invest in machinery, or (to smooth consumption. What does this mean?) 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 **the** 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. (According to [32],) Farm size may have indirect, **a comma here** positive impacts on **the** market participation by enabling farmers to generate production surpluses as well as overcoming credit constraints. [32] Farmers with larger farm **sizes** (size) are likely to enjoy economies of scale and suffer less from high transaction **costs** (cost).

Editor's note: It will be a lot better if this paragraph is here because the previous paragraph just describes the 3 sources of market information, one of which is the access to market information through informal sources. Therefore, it is not correct to divide a complete paragraph this way. **The** access to market **information** (informal) from informal sources, **a comma here** such as relatives, friends and neighbours are expected to **have a positive impact** (impact positively) on the degree of commercialization. The transaction cost associated with **access to market information** (market information access) from informal source is relatively lower than the **access to market information from formal sources**. (formal sources of market information access) Farmers with lower transaction costs are more likely to participate in **the** market.

289 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. [16] Assets empower the rural poor by increasing their incomes, **preserving them from shocks** (reserves against shock) and **offer them** choices to escape from harsh and exploitative conditions. Renting of land can provide farmers with the liquidity to **use** (access) technology to produce marketable surplus.

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

302 **Finally, nonfarm** (off-farm) income influences commercialization **in a positive direction** (positively) especially where the **gains** (gain) are reinvested in agricultural technologies. Access to **nonfarm** (non-farm) income may lead to **a** risk reduction in household decision making and thus **to** increased propensity to undertake higher risk activities, **no comma here** **when** (notably) selling crops or producing for the market. [1] also noted that **Nonfarm** (Non-farm) income contributes to **a higher volume of** (more) marketed output if **it** (non-farm) is invested in farm technology and other farm improvements. [1] In other words, **a comma here** farmers report a decline in output if **nonfarm** (off-farm) income leads to **a nonfarm** (off-farm) diversification.

317 3. RESULTS AND DISCUSSION

318 3.1 Factors Influencing Agricultural Commercialization

The analysis of **the** determinants of **access to market information** (market information access) 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 **to identify the effect of access to market information** (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 **nonfarm (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)** (Statistically and numerically, farm size was the most determining factor of degree of market participation (Table 2).

330 Gender exerted a positive effect on commercialization. The result indicated that **the**
 331 intensity of agricultural commercialization by males was 9% lower than females. Males were expected to participate intensively in **the** market due to **the** 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** (have) contractual obligation with male farmers by selling directly to them after harvest. [11] showed that) **In conclusion**, females tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities. [11]

339 Total number of adults was associated with an inverse relationship with **the** degree of
 340 agricultural commercialization. A unit increase in the number of adults in the household **was** (is) likely to decrease the degree of agricultural commercialization by 2%. This implies that
 341 **the** household members depend more on the farm produce for food. **This (The)** result confirms the findings of **a study, which establishes a negative effect on household dependency ratio on commercialization. [37]** (They established a negative effect of household dependency ratio on commercialization.) **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]** Contrary to the result, [26] found that an additional adult member of a household increases the extent of cassava sales by 0.8%. **The** household depends more on maize for food **with respect to** (relative to) cassava **and** the labour-intensive nature of cassava production accounts for the importance of family labour. **As a result, this finding (The present finding by the study)** implies the importance of enhancing human productivity through agricultural training and participation in farm demonstration.

351 **The** number of years of education and (the) 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 the positive effect of education on the extent of maize commercialization in Ghana and Kenya were also obtained from other studies. [26], [33]** ([26] and [33] both established a positive effect of education on the extent of maize commercialization in Ghana and Kenya respectively.) Human capital development is crucial for **the** 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** (increased in) education beyond a certain minimum **was** (is) 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.) **It was found that** a unit increase in education beyond **a** 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. **What does this sentence mean?**) **This (The)** 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].

371 Market information has been proven by the study to **have a positive impact** (impact

372 positively) on agricultural commercialization. Market information sources were captured by membership of a farmer association, access to the extension services and access to information (access) 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 impact (impacts negatively) on the extent of maize commercialization although (though) this impact was not significant. This (The) insignificant, a comma here negative effect of access to market information through access to services of extension (extension access) can (could) possibly be due to the inadequate content of extension information as well as the insufficiency of extensional agents since they have lack of resources and motivation. (as a result of reduction in the number of contact and inadequate content of extension information. Extension agents are poorly resourced and motivated which impact negatively on effective delivery.) Nonetheless, access to market information through a farmer based organization exerted a positive effect on the extent of maize commercialization. The finding indicated (indicates) that the intensity of maize commercialization by farmers who had access to market information through a farmer association (informal source) was 6% higher than the farmers who were non-members of a farmer association. This finding is in the same line with the finding of another study where a 2% increase was observed in the market participation among farmers with access to market information through an informal source. [37] (The finding of this study confirms that of [37] who observed a 2% increase in market participation among farmers with access to informal market information source) On the other hand, some studies demonstrated that the access to market information through a formal source also influenced the extent of maize supply in the peri-urban areas of Kenya. [33] (Contrary to the present finding, [33] observed that access to the formal source of market information 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 has a positive impact (informal market information 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 associated with search of information and transportation, access to market information through informal sources may be a necessary but insufficient condition for intensifying maize commercialization. (Most farmer groups provide technical, marketing and financial services for farmers at a reduced transaction cost associated with information search and transportation. It can therefore be concluded that access to market information through informal sources may be a necessary condition for intensifying maize commercialization but not a sufficient condition.) The type of informal source of market information also (informal market information type) plays a major determinant role as a result of different levels (level) of access, participation and usage among target farmers. In conclusion, both the governmental and nongovernmental development projects should strengthen the informal sources of information. (The implication of the result is that governmental and non- governmental development projects must strengthen the informal sources of 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%. This (The) result confirms the findings of a study [26] which (who) establishes (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. (Farm size) However, there are some studies ([37] and [3]) which show (established) a significant negative effect of the farm size on market participation. [37],[3] According to them, the gains in land productivity and/or market sales are 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. (The reason underlying their finding was that, gains in land productivity and/or market sales were not large enough to offset the costs associated with the increase in production thus recommended that efforts to expand farm size should be accompanied by similar efforts to raise 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 by 3 % than (relative to) those without it (access by 3%). Traditional laws and customs limit access to productive land in farming communities with natives having more access to land than their nonnative (non-natives) counterparts. This result (The finding) implies that the agricultural development projects should target native farmers to guarantee unlimited access to land (for demonstrations of farm technologies for increased adoption and production volume.-This part of the sentence is excessively long)

Finally, a comma here the income from nonfarm (off-farm) employment opportunities influenced the extent of agricultural commercialization negatively. The extent of maize commercialization decreases by 2% for every additional Ghana cedi-An explanation that cedi is the national currency of Ghana should be added as a footnote here. from (of) the earned nonfarm (off-farm) income (earned). This result is in the same direction with the findings of another study where nonfarm income significantly reduced the amount of vegetables sold. [33] Moreover, there are also other independent studies that obtain similar results on agricultural commercialization in Kenya and Ghana respectively. [1], [26] (The result confirms the findings of [33] who established that non-farm income significantly reduce 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 the nonfarm (off-farm) income triggers investment in nonfarm (non-farm) activities. Empirically, bearing the cost of education and the food demand of household attracts a larger share of household nonfarm (off-farm) income in the study area. (Empirically, cost of education and meeting household food demand attracts a larger share of household off-farm income in the study area.)

440 Table 2: 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 a 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
Nonfarm (Off-farm) income	-0.0200	0.0109	0.066*
Access to market information through an informal source (Informal market information access)	-0.0014	0.0543	0.979
Wald chi2 (14)		107.22	
Prob>chi2		0.0000	
Log pseudolikelihood		41.2297	
441 Dependent Variable = Degree of agricultural commercialization		***p < 0.01, **p < 0.05	
442 and *p < 0.10			

4. CONCLUSION

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

In this regard, these findings should be taken into consideration for shaping agricultural policies. Both the governmental and nongovernmental institutions should channel the agricultural development projects which not only enhance the adoption of technology, but also increase the market participation through farmer organizations to ensure effective participation and sustained interest. (The policy implication of the finding is that there should be a continuous effort by both governmental and non-governmental institutions to channel agricultural development projects that enhances technology adoption and increase market participation through farmer organizations to ensure effective participation and sustained interest.)

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642

643 ABBREVIATIONS

644

645	ABC	Agribusiness Centers
646	FFS	Farmer Field School
647	FLC	Farmer Learning Centers
648	FASDEP	Food and Agriculture Sector Development Policy
649	IFAD	International Fund for Agricultural Development

APPENDIX

651

Appendix 1: Truncated Regression Estimates of Agricultural Commercialization

653

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	Robust		z	P> z	[95% Conf. Interval]	
	Coef.	Std. Err.				
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

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