# DETERMINANTS OF COMMERCIALISATION OF MAIZE PRODUCTION IN THE EAST AKYEM DISTRICT OF GHANA

BY

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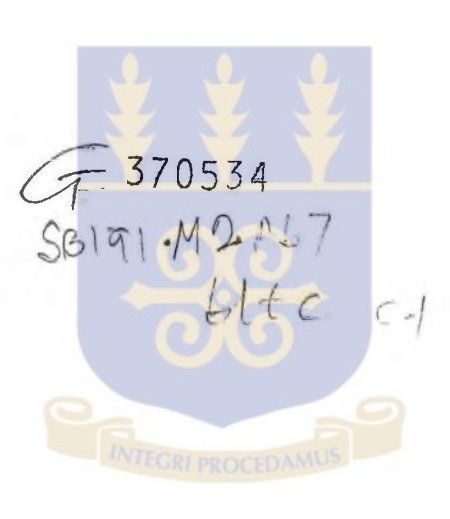

## DEDICATION

This piece of work is dedicated to:

**THE ALMIGHTY GOD, MY BUTTRESS AND FORTRESS.**

## DECLARATION

I, Noah Osei Aboagye, the author of this dissertation titled, " Determinants of Commercialisation of Maize Production in the East Akyem District of Ghana," do hereby declare that with the exception of references to past and present literature duly cited in this study, the entire research leading to this dissertation was done by me at the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon. I further declare that the research has never been presented either in whole or in part for any degree in this University or elsewhere.

.....

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**(CANDIDATE)**

This dissertation has been submitted for examination with my approval as Supervisor.

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**K. YERFI FOSU**

**(SUPERVISOR)**

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## ABSTRACT

The present study quantifies the effects of the determinants of commercialisation of maize production in the East Akyem District of Ghana. The Tobit model is used. The conventional t-test is also performed to examine the differences between the characteristics of the commercial and non-commercial maize farmers in the East Akyem District of Ghana. The study observes, inter alia, that farmer age, marital status, time farmer spends on maize farming, farming system, whether male family members assist in maize farming, proportion of time family children in the household assist in maize farming, size of land owned by farmer, access to vehicles for conveying produce from village to the nearest market, distance to the nearest health post, farmers own funds, amount of formal credit and amount of informal credit positively influence commercialisation of maize production.

It is found that farmers do not generally use new (improved) technology. Yield depends on rain fed agricultural system. Farmers do not have access to agricultural extension services. In order to enhance commercialisation of maize production in the East Akyem District, this study recommends, inter alia, that credit facilities should be made available to farmers in the form of farm inputs: micro-finance approaches which are applicable to each locality should be introduced. Finally, a good road network should be developed and maintained throughout the district to create avenues for farmers to have vehicles to convey maize from farmers' farm to the nearest market. Suggestions for future research are also made in the study.

# TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ACRONYMS

| | |
|---|---|
| **GDP** | Gross Domestic Product |
| **MOFA** | Ministry of Food and Agriculture |
| **NGO** | Non-Governmental Organisations |
| **UNESCO** | United Nations Education Scientific and Cultural Organisation |

# CHAPTER 1

# INTRODUCTION

## 1.1. Background

Agriculture in Ghana in general and subsistence farming in particular are as old as the nation. The reason is that the first settlers on the soil of Ghana were farmers. According to La Anyane (1963), it is difficult to say exactly when cultivation of plants and rearing of animals began in Ghana, although it is known to be over 3000 years ago. Ghana covers an area of 91,844.4 square miles or 239,000 square kilometers. It lies between latitude 4° 45' and 11° North and it is tropical in its flora and fauna. Out of this stretch of land, 35 percent is cultivable or arable (specifically, is 13.6 million hectares) and out of this, 20 percent is unutilized (Ibid) The nation's food supply comes from only 15 percent of the nation's arable land. Ghana has a population with a growth rate about 2.8 percent per annum. About 70 percent of the population earn their livelihood from the land. Agriculture is the largest single industry, employing about 50 percent of the total adult population to produce food alone (Otumfuo, 2001). Also, 90 percent of the nation's food needs is satisfied with production from domestic agriculture (Otumfuo, 2001). There are about 2 million small-scale farmers with 85 percent farm households whose output provides about 80 percent of the food consumed in the country (MOFA, 2001).

Agriculture's contribution to the economy of Ghana is immense. About 75 percent of the nation's export earnings come from it (MOFA, 2001).

There are many kinds of agriculture which are practised. Farming in the tropics is termed as tropical agriculture. Agriculture can also be classified as

extensive or intensive. Extensive agriculture is practised where farmers have enough land and capital and the soil is highly fertile, so that increased output is achieved through increased land area cultivated. With intensive farming, there is extensive limitability in resources (*World Book Encyclopedia*, Vol.1, 1994). Therefore, improved technologies are applied to achieve high yield.

Agriculture can be classified as commercial farming or subsistence farming. There are many writers with different definitions. Generally, it can be accepted that with commercial farming, large quantities of goods are produced for sale, whereas for subsistence; quantities produced are purposely for home consumption with very little for sale. With subsistence, farmers may have one or more plots of land that they farm year by year. In some countries, many subsistence farmers do not have permanent farms (*World Book Encyclopedia*, Vol.1, 1994). Subsistence farming depends on physical labour which could be household or hired. Southworth and Johnston (1967) indicate that subsistence depends on muscle power from both animals and humans. Farm sizes are small and simple tools are used. It is difficult for such farmers to bear the risk of adopting new methods and new techniques. They live in villages, which have little or no access to transportation and communication infrastructure. There are two types of subsistence farming. These are known as "Shifting Cultivation" and "Nomadic Herding" (*World Book Encyclopedia*, Vol.1, 1994). Commercial farming can be divided into "Specialized Farming" and "Diversified Farming". With specialized farming, the farmer raises one crop or livestock. Technoserve (1997) indicated the dimension of commercial farming by observing that for

agriculture to develop, farmers must be encouraged to view agriculture as a business. Commercial farming with its high production level, is market oriented, as producers alone cannot consume the products.

A greater part of the farm population in Ghana with 85 percent farm households whose output respond to food demand in the country, is in subsistence farming. Subsistence farming is still considered as a low prestigious occupation in Ghana. Its low status springs mainly from the low returns to investment as well as many other constraining factors facing rural communities. Some of these factors include lack of water, electricity, transportation and other social infrastructure. In the rural communities, the youth associate farming with poverty and illiteracy and exploitation by the more sophisticated classes in society. One other attribute of low returns in subsistence farming is the fact that villages in Ghana are dispersed and this leads to lack of mutuality and cooperation (La Anyane, 1963). Thus, the horizontal linkage is minimal among the farmers and this leads to poor vertical linkage with government supporting agencies (La Anyane, 1963).

As Ghana is predominantly agricultural, the most certain way to promote industrialisation is to lay the foundation for a sound agricultural policy, which can enhance productivity of food. With an increase in production, a major proportion of the population, which is involved in agriculture, will experience an increase in standard of living. Increased productivity associated with technology will require less labour for agriculture, and labour can be provided for the industrial sector. The ideal situation of food production is that one farmer should produce for ten to fifteen others (La Anyane 1963). In order to achieve this, it is the function of the

Ministry of Food and Agriculture (MOFA) to stimulate, encourage and support subsistence farmers through agricultural extension education, to adopt improved farming techniques, make available to them agricultural research information and actively support them to increase their productivity to enable them to raise their standard of living.

To buttress the importance of agricultural commercialisation, Technoserve (1999) indicated that people practising agriculture in Ghana are categorised into the following groups. First, those who indulge in it as a secondary activity. Second, those who engage in it as a means of subsistence support and third, those who pursue it as a form of business. Furthermore, farmers in the first two categories are not as productive as they should be and if farmers could act as businessmen, they would require essential inputs like appropriate market, information and technical know how (Technoserve, 1999). These essential ingredients would enable farmers to improve upon their operations and identify new opportunities. Additionally, if agriculture in Ghana is commercialised, as agriculture contributes tremendously to the nation's economic development, the Gross Domestic Product (GDP) and earnings from exportation will increase. The South-East Asians have the notion that, only a population with its basic needs (that is, food and shelter) met can be further cultivated as a resource (Naya and McCleery, 1994). There are economic challenges confronting man each day. One of these challenges is food security. This calls for intensive agricultural development to provide food for the entire population.

The classical economists believe that the agricultural sector is subject to diminishing returns. This implies that agricultural production increases up to a certain level and begins to fall as farmers move to poorer land; yet they agree that when both agriculture and industry grow together the economy could be balanced (Gillis, Perkins, Roemer, Snodgrass, 1992).

In addition, agriculture has a large work force that industry can dwell upon. As agriculture develops, it will provide more labour to industry and this will lead to growth in industry. The theory of economic growth expands on the two-sector labour surplus model (Ibid.). Its focus is on what are the implications of surplus labour for income distribution. It says if both agriculture and industry develop together, the level of income will be high so there will be equity in income distribution (Ibid.). The neo-classical economists conform to the fact that industrial progress depends on simultaneous growth in agriculture and industry (Ibid.). Since agriculture is and will continue to be necessary for general economic growth, the needs for increased agricultural output and productivity are obvious. If agriculture is developed and commercialised, it will help the income and living standards of the farming population to improve. For example, cocoa production has helped many cocoa farmers to be able to send their children to school and build better houses. The improved income enables the farmers to make purchases especially inputs. It has reduced inequalities in income between rural and urban sector, based on improved terms of trade. When agriculture is commercialised, labour disguisedly or chronically unemployed may be released to the industrial sector.

Maize is one of the main staples in Ghana. Maize is used as food for humans and livestock. It is also processed into industrial products. When maize production is commercialised in Ghana, the ability to compete in the maize trade will be certain. If maize production is commercialised, then large quantities of maize which are required on high value markets can be delivered. The national production of maize is about 1,000,000 metric tonnes per annum (MOFA, 2000). More than 60 percent of this volume comes from the Brong Ahafo to the Ejura Sekyeredumasi area in the Ashanti Region. The vast stretch of the vegetation in the East Akyem District is tropical in nature, and it is a potential food basket, particularly with reference to maize production. However, maize farmers in the East Akyem District tend to be characterized by low income and poor standard of living. Furthermore, some NGOs are promoting the production of oil palm, and this has caused many farmers to go into oil palm production. As it is known, it takes a longer time for the oil palm tree to produce yields. If maize, which produces annually is commercialised, then it will help the farmers to get some money to use before their oil palm trees mature. If maize production is commercialised in the District, then the nation will increase its maize production and improve upon the standard of living of the people in the area.

## 1.2. Problem Statement

Many factors have been outlined as the cause of the recent low output in Ghana's agricultural production. Notable among these is the low productivity in the sector (Fosu, 1990).

In fact policies and strategies aimed at instituting corrective measures for the low output have not been successful largely because of the relatively lower role accorded to producing oversight. Some decision-makers hold the notion that the needed increase in agricultural output should come mainly from an extension of cultivated land rather than increasing yields on existing farms (Johnson, 1990). However, with the relatively high rate of population growth of about 2.8 percent per annum coupled with the ever increasing competition between food crops and cash crops for the rich forest lands, it is becoming increasingly clear that the needed increase in agricultural production including maize could be obtained much more cheaply and rapidly, inter alia, by commercialising maize production in Ghana, especially the East Akyem District where the potential vegetation for maize production is lying in waste. Maize generates fast income because within three months it is ready for the market. This raises the following issues: What factors influence the commercialisation of maize production in the East Akyem District in Ghana? What are the effects of these factors on the commercialisation of maize production in the East Akyem District? What strategies can be adopted to increase the commercialisation of maize production in the East Akyem District? These are the issues which the present study addresses.

### 1.3. Objectives of the Study

The primary objective of the present study is to analyze the effects of the determinants of the commercialisation of maize production in the East Akyem District in Ghana.

The specific objectives are the following:

a. To identify the determinants of the commercialisation of maize production in the East Akyem District.
b. To quantify the magnitudes and the directions of the effects of the determinants of commercialisation of maize production in the East Akyem District.
c. To recommend strategies for increasing the commercialisation of maize production in the East Akyem District.

## 1.4. Relevance of the Study

There are several reasons why the present study is important. First, agriculture is the bedrock of the nation's economic development, as has already been stated. Agriculture creates jobs for a greater percentage of the adult population in Ghana. It contributes immensely to the nation's GDP and earns foreign exchange. Agriculture provides food for a large number of people in both rural and urban areas. Agriculture supplies the raw materials required by the agro-based industries. Foreign exchange earned from agricultural exports enhances the importation of capital goods and raw materials which cannot be domestically produced but are needed by the industrial sector.

Second, it has been indicated that agriculture in Ghana is largely of the subsistence type (La Anyane, 1963). This has brought about low productivity in output, leading to poor standard of living of farmers (ibid). In addition, the ideal situation of food production is that one farmer should produce for ten to fifteen others (ibid). However, this is not the case in Ghana, suggesting the need to

increase the levels of output and commercialisation. Technoserve (1997) observes that, for agriculture to develop, farmers should be encouraged to view agriculture as a business. The subsistence farmers should be encouraged to move into commercial farming where activities are market driven.

Third, maize serves as a staple crop and cash crop in Ghana. It is used as food for people and feed for livestock. It is also processed into a number of industrial products. Hence, any study such as the present one on maize is justified.

Fourth, virtually no rigorous research has been done on commercialisation of maize in the East Akyem District. Despite the importance of agricultural commercialisation, the existing relevant literature does not concur on a common definition of agricultural commercialisation. Each piece of literature has its own definition. Another thing is that, each individual literature fails to treat all the potential determinants of agricultural commercialisation which could improve maize production in the East Akyem District. The present study contributes to narrowing these gaps in knowledge.

Fifth, the present study focuses on the East Akyem District. Although crop farming is the highest income source (East Akyem District Planning Office, 1996) in the District, yet food (15.3 percent) and education (15.2 percent) are the major expenditures. The average gross household annual expenditure is ¢1,078, 193. The income distribution in the district is as follows. The upper 20 percent of the people receive about 50 percent of the total income in the district. The lower 20 percent of the people receive only 3 percent of the total income of the district. The lower 50

percent of the population receive only 20 percent of the total income of the district (East Akyem District Planning Office, 1996).

In accordance with the World Bank 's approach to measuring poverty levels, two poverty lines are identified. One, the "poverty line" measuring those who earn two-thirds of the average income per annum. Two, "hard core" measuring those who are below one-third of the average income per annum. Using an annual expenditure of ¢1,078,093, it was found out that about 46 percent of the population in the district are below the poverty line (ibid). Additionally, 26 percent are in hard-core poverty. Poverty is more pronounced in the rural areas than in the urban areas. The district is therefore confronted with poverty, which is a great challenge. Commercialisation of maize production could be an important mechanism for addressing this poverty problem in the district.

Notably, this present study is important to the Agricultural Administrator. This is because knowledge of the effects of the determinants of commercialisation of maize production will help this Administrator to formulate and implement policies to stimulate sustained high levels of commercialisation of the production of the commodity in the district.

Finally, the present study is useful to the private sector, since knowledge of the determinants of commercialisation will help to increase farmers' production and marketed surplus of maize and thereby improve upon their income, which will in turn have a positive effect on their livelihood. The study will also help the government in making good policies, which will enable farmers to improve upon

their standard of living and thereby reduce poverty in the district. In view of the foregoing, the present study is very relevant.

## 1.5. Organisation of the Study

The present study has five chapters. Chapter 2 presents a review of the relevant existing literature. Chapter 3 describes the methodology employed in addressing the issues and achieving the objectives of this study. Chapter 4 presents the results of the study while Chapter 5 presents the summary and recommendations.

# CHAPTER 2

# LITERATURE REVIEW

This chapter first presents the concept of agricultural commercialisation. Next, the list of the factors which influence agricultural commercialisation, and the reasons why each of the factors influences agricultural commercialisation are detailed.

## 2.1. Concept of Agricultural Commercialisation

***Concept 1***

Braun, Haen and Blanken (1991) specified how the term subsistence and commercialisation were used in their study. The term subsistence was used in two different ways. First, it describes production of goods for consumption by farm household. Second, subsistence is a concept which describes a minimum standard of physical and mental survival and productive efficiency. To them, the term commercialisation, on the other hand, defines the volume of produce and household resources which enter the exchange economy. It may include sales or barter of farm products not used for subsistence and off-farm employment of labour and capital.

Agricultural commercialisation is perceived as agriculture which applies improved technology to achieve high yield (*World Book Encyclopedia*, Vol.1, 1974). It tends to adopt the method of producing in large quantities for sale and can be divided into specialised farming where farmer raises one crop or livestock and diversified farming where farmer grows a variety of crops or livestock. Agricultural commercialisation has high production level and it is market-oriented,

since the producer alone cannot consume all of the products (*World Book Encyclopedia*, Vol.1, 1974).

In the existing literature, a number of methods have been used to measure commercialisation. According to Braun, Haen and Blanken (1991), increased market integration of traditional agriculture is part of a development strategy oriented toward growth. Integration in the local, national and international exchange economies promise gains through specialisation. They went on further and opined that, it is the design of programmes and policies and their actual implementation which determine whether or not the poor obtain a fair, or even a positive, share of gains from agricultural commercialisation directly or indirectly.

***Concept 2***

Commercialisation is here measured by the extent to which farm households do not consume out of their aggregate agricultural produce as compared with the value of total agricultural produce (Braun, Haen and Blanken, 1991).

$$C1 = 1\text{-}CA \qquad (1)$$

where CA = AS/AP and C1 denotes the degree of commercialisation, CA denotes agricultural subsistence ratio, AS denotes value of non-marketed agricultural produce, AP denotes total value of agricultural production.

Added to the output-oriented concept, they found that subsistence agriculture develops toward "commercialisation" on the input side but not on the output side; for instance, farm households may sell their labour in the off-farm labour market and invest proceeds in augmenting their subsistence production.

***Concept 3***

Subsistence orientation at the income generation side of the household is defined as follows (Braun, Haen and Blanken, 1991):

$$CY = AS/Ytot \quad (2)$$

where AS is as already defined, and total income Ytot given by (3):

$$Ytot = AP - AC + Yo + Yw + Y1 \quad (3)$$

where CY denotes subsistence share in total income, AC denotes cost of agricultural production, Yo denotes any other income from transfers or renting out assets (such as land), Yw denotes off-farm wage income (from integration into labour market), and Y1 denotes income equivalent of leisure. AP is as already defined. Commercialisation C2 is given by C2 = 1-CY

***Concept 4***

Subsistence orientation at the consumption side is evaluated with the ratio Cx (Braun, Haen and Blanken, 1991):

$$Cx = XS / XTOT \quad (4)$$

where Cx denotes subsistence share in total consumption, XS denotes total value of goods consumed out of home production, XTOT denotes total consumption value of the household, including purchase and own-produced items for consumption, such as the value of subsistence food. Commercialisation degree C3 is given by C3 = 1-Cx.

## 2.2. Determinants of Agricultural Commercialisation

The determinants of agricultural commercialisation identified in the existing relevant literature are farm size, household size, access to credit, roads, vehicles, market, health and education infrastructure, time spent on farm, research, weather and membership of farmer associations. In what follows, the specific pieces of literature concerning each determinant are presented.

### Farm size

Land is a natural resource and one of the factor inputs employed in agricultural production (Schultz, 1945). Good agricultural performance depends upon the nature of land. Wharton Jr (1969) supports the importance of the availability of arable land in determining the size of farm. He states that, if additional arable land, not in farms is available, or if some farmers leave for employment in the towns, the farms of the remaining farmers can increase in size. Wharton Jr. (1969) laments that this situation cannot happen in all localities and even in large regions, because of the rapid rate of population growth and the lack of industrialisation which will keep as many people as are now in agriculture on farms for a long time to come and farms will remain small. He suggests that large farms can experience increases in productivity, which are likely to stimulate higher levels of commercialisation.

**Household size**

van Anrooy (1997) presents two arguments here. He indicates that following the classical Malthus' theory, as household size increases, there will be scarcity of food supply. In contrast to this, he then presents Ester Boserup's argument that there is a continuous development with intensive agricultural systems. As household size increases, productivity of land rises and exceeds subsistence requirement; this will lead to an increase in marketed produce. Wharton Jr. (1969) divides the size of a farm family into *dependants* and *workers*. He then examined the effects of changes in the number of these two groups of people in a farm family. He finally observed that an increase in the number of workers in a family is likely to increase the amount of family labour utilised. Also, he found out that an increase in the number of the dependent members of a farm family will increase the family labour utilised which will in turn stimulate higher levels of commercialisation of agricultural production.

**Credit**

Provision of credit facilities to farmers can accelerate farmers' adoption of improved technology. Subsistence farmers obtain low income resulting from low productivity. For farmers to improve upon production, they need to apply new technology. Southworth and Johnson (1967) evidently support the view that the provision of credit facilities to farmers enables them to adopt new technology rapidly. "Efficient source of production credit may be important in enabling more rapid adoption by farmers of new technology that requires use of purchased inputs".

Emphasising the importance of credit facilities to farmers, Schultz (1945, p.167) comments, "to examine the more important means used to regulate agricultural economy ... acreage allotments and commodity loans are the most important. Fostering mutual relationship between farmers and financial institutions and private investors will enable farmers to access credit and funds required for input". This is possible when farmers are linked with NGOs, which are ready to show financial institutions how to serve the rural poor, minimise risk and still earn profit. Technoserve (1997) elaborates that; the provision of bridges and business connection to farmers will enable them to become part of larger business networks and an integral part of the domestic and global economy. Credit facilities to the farmer are a support to get a fair share of consumer prices that leads to fair income and reinvestment in agriculture and other agro-allied industries. Providing credit to farmers for the purchase of additional inputs that could substantially increase agricultural production is an important factor (Wharton Jr. 1969). Purposes for credit demands are improvement of individual farms and materials such as improved implements to work on the farm which will stimulate higher levels of agricultural commercialisation (Belshaw, 1959).

**Access to Roads**

Reardon, et al (1995) argue that good feeder roads which connect with link roads and then with highways make transportation easy for the farmer. Markets can be reached at lower cost. This stimulates an increase in the level of commercialisation.

**Access to Vehicles**

Explaining the importance of vehicles in accelerating agricultural commercialisation, Wharton Jr. (1969) asserted that unlike other industries, agriculture cannot be concentrated near its ultimate customers or near existing transportation facilities. Transportation facilities of one kind or another, especially vehicles which convey farm produce must reach (or must be near to) each farm. Increased access to vehicles which convey farm produce from a farmer's village to a market is therefore likely to stimulate higher levels of commercialisation.

**Access to Markets**

There are two markets for farm products, both are very important. These are the home market and the export market. The home market must always be looked after because it is one of the best in volume and in terms of price (Trant and Hiscocks, 1972, p.19). More can be done with it but over reliance on the domestic market can be dangerous because it has only a limited growth potential in relation to the growth capacity of Ghanaian agriculture. Growing price spreading from the farm level to the retail level can be accounted for in an efficiency context by increasing proportions of services between the farmer and the consumer and by changes in the costs of these added non-farm services.

The traditional middlemen as market intermediaries undertake certain duties to ensure that produce is conveyed from the farm gate to the consumer. Some of these activities involve financing the cost of bringing the produce from the bush where the produce is farmed where transport cannot reach. In some villages,

farmers walk more than 6 kilometers to get to their farms. The way leading to the farms may not be motorable so people are hired to carry the produce from the farm to where a vehicle comes and packs them. Also, some villages suffer from irregular transportation. Vehicles go to such villages occasionally.

Molnar and Clonts (1983) advised that good marketing systems could be achieved when there are co-operative organisations for farm products: "cooperatives are often thought of as immediate panacea to all marketing ills in developing areas" (ibid, p.108). Lack of markets and low prices are a disincentive to the expansion of agricultural production (Technoserve, 2000). On the other hand, van Anrooy (1997) argues that it is likely that the production of cash crops (and the degree of commercialisation) will increase as a result of increased marketing opportunities. In the same way, Wharton Jr. (1969) who supports this view, argues that markets for farm products and a marketing system which gets agricultural commodities to where they are wanted, are very essential. To this end, there should be someone somewhere who wants to use the farmer's product. There should be a marketing system to get the product from the farmer to the consumer, and the farmer should have confidence in this marketing system. Farmers must be able to sell to others, at home or abroad, which will stimulate higher levels of commercialisation.



**Time spent on farming**

Southworth and Johnson (1967) observe that work time is one of the most important factors of a nation's resources. If it is not used well, the capacity of the

economy to yield a surplus will seriously reduce. Wharton Jr. (1969) asserts that, a subsistence-production part-time family farm may be rich whereas a subsistence-production full-time family farm may have income which is likely to be low. He continues that there are about three million farms in Japan and almost all of them fall into three categories, namely, commercial full-time family farm, commercial part-time farm and subsistence production part-time family farm. He concluded that the proportion of those three categories in total farm households were 21, 37, and 42 percent respectively in 1965. The proportion of the first category has been decreasing, whereas the proportion of subsistence part-time family farms have been increasing rapidly in recent years.

The time a farmer spends on farming is of utmost importance in agricultural commercialisation. Most literature agree that farmers engaging in non-farm activities to earn more income are likely to record higher levels of commercialisation than those who engage in full time subsistence farming ( see for instance, Wharton Jr. 1969; Southworth and Johnson, 1967).

**Education**

The noun ***education*** is derived from the verb ***educate*** which means to provide schooling for, to develop mentally or morally especially by instruction (Webster Merriam, 1977). The ultimate objective of educating the subsistence farmer is to increase production and income. The specific goals of educating the farmer are the following: to use resources efficiently, to develop decision-making ability, and to motivate change. Southworth and Johnston (1967) pointed out that,

"not knowing that fertiliser increases yield but to understand how it increases in order to apply the proper kind and quantity of fertiliser in relation with water supply available whether rainfall or irrigation" (ibid., p.148)

The farmer needs to understand why changes are desirable, and how to apply a single action such as planting of seed of an improved variety or a set of interrelated technologies, how to improve nutrition, disease control and sanitation. Education provides programmes to develop the ability to understand, to accept and to use knowledge about improved practices and new enterprises, to make independent choices. Education for agricultural development should be designed to train and develop middlemen, traders, and other businessmen who render services essential for commercial agriculture (specifically, buying, selling, transporting, storing, financing agricultural products, and so on).

Farmers mostly have little formal preparation for their mammoth task. To ensure proper management of labour, fixed equipment, machinery, crops in relation to soil and weather, marketing, cash flow, records and capital, farmers' education must be put in place. There should be a pervasive increase in farmer education if high yield is to be realised. Agricultural advisory and extension services, commercial firms and governments have a responsibility to ensure that pesticides are used properly. This is because "for most pesticides the danger lies not in the proper use but the misuse through ignorance, carelessness and sometimes deliberate greed" (CAB 1980, p.253). In many countries, government funds could be usefully diverted to agricultural education from more prestigious, but in the long term, less worthwhile programmes.

Farmers need to understand that maximum output should not be viewed on an annual basis but over a much longer period. Schultz (1945) mentioned education, among medical services, nutrition and housing, as one class of investment in people. He continued that education is the investment that enhances a person's productivity and adds to his mobility. Ofori (1993) argues that, if a greater percentage of the farming population has had formal education up to at least the secondary school level, the rate of demand for extension services will be substantial. The possibilities of increasing crop yields through utilisation of improved varieties of seeds and fertilisers and insecticides, and the adoption of improved cultivation techniques can be achieved through educating farmers. The significance of farmer education cannot be overemphasised, because the application of improved technology contains a series of instructions and guidance usually in written form. This makes the transfer of information on agricultural inputs easy. If farmers are educated formally, dissemination of such valuable information or ideas helpful for agricultural progress will be easier and cheaper. It will require the farmer to just pick up the piece of information in writing and read and apply the method. Mosher (1966) acknowledges that "as a person, a farmer has four capacities of importance to agricultural development: to work, to learn, to think imaginatively and creatively, and to aspire for the farmer to achieve favourable result in fertiliser application" (ibid., p.28). Ryan and Perrim (1972) stress the essence of education as follows: "there should be a technique to extract information from the fertiliser response data. There should be different fertiliser

for different soils based on its soil test and different fertiliser for different crop as well" (ibid., p.337).

Rural farmers' inability to perform basic arithmetic calculations and maintain simple enterprise records has resulted in the stagnation of rural businesses and low participation in community activities. Technoserve (1999) observes that Technoserve has trained 870 rural women in numeracy skills and about 300 in simple bookkeeping techniques. There has been dramatic improvement, as many women have been able to identify and write down figures as well as perform simple calculations since 1977. According to Wharton Jr. (1969), whether agriculture is subsistence or commercial, there are several additional activities or services which can accelerate the process of development, viz., general education, training of agricultural technicians, and education of the urban elite (who influence governmental policies affecting agriculture) about the need and the requirements for agricultural development. Farmer knowledge of applying improved technology and skills to operate agricultural machines acquired through education are likely to stimulate higher levels of commercialisation.

**Health**

UNESCO (1978) and Kishor (1992) observe that many diseases associated with the tropical forest ecosystem endanger tropical farmers' health. When a certain disease affects the farm population, especially the younger group, there is drastic reduction in labour resources for agricultural production. This is *likely to decrease the levels of commercialisation* (emphasis mine).

**Research**

Agricultural development requires the discovery or invention or development of better farming methods largely through formal research. This involves developing new fertilisers, evolving effective means of controlling pests and diseases, developing new implements and power sources to accomplish improved techniques of cultivation and husbandry (Wharton Jr.1969, Fosu 1990). Agricultural research is likely to stimulate higher levels of commercialization, since the use of these improved pieces of technology is likely to lead to increased productivity and product supply; in addition, pieces of improved technology are purchased inputs whose acquisition requires equity or debt financing.

**Weather**

The subsistence-farming calendar is dependent on the rhythm of the seasons. At present, the main source of water for plant life in Ghana is rainfall. The seasonal distribution of rainfall determines the cycle of farming activities. The irregularities in the seasonal distribution of rainfall are another problem to the farmers. "Its distribution in time may be irregular within a season and this impairs the healthy growth of plants. The number of rainy days during each of the two seasons may be taken as a guide to the regularity in distribution" (Ofori 1973, p.72).

Trant and Hiscocks (1972, p.19) commenting on the effect of the weather on agricultural production in Canada stated that, "our best opportunities for

favourable volume and price come about as a result of good harvest here and unfavorable weather elsewhere." It is obvious in the study of Trant and Hiscocks that, regular distribution of rainfall throughout the farming year is likely to increase higher levels of commercialisation, ceteris paribus.

**Farmer Associations**

According to Wharton Jr. (1969), another accelerator of agricultural development is voluntary farmer association of various types, such as co-operative societies, 4-H clubs, farmer clubs, and community construction projects. These can get tasks accomplished which individual farmers, operating alone cannot achieve. They also shift the social organisation of the locality away from groups, based largely on birth, or on the needs of a largely state society, towards groups and prestige based on developmental activities which are likely to stimulate higher levels of commercialisation.

## 2.3. Literature on Ghana

There is very scanty literature which rigorously analyse the effects of the determinants of agricultural commercialisation in general and commercialisation of maize production in particular. Therefore, the present study which contributes to knowledge by closing this gap in knowledge is relevant.

# CHAPTER 3

# METHODOLOGY

The study employs the conventional method of test of differences between the means of the characteristics of maize farmers who commercialise and those who do not commercialise. It also employs the Tobit model to quantify the effects of the factors which have been of commercialisation of maize production in the East Akyem District which have been identified from the review of the relevant existing literature as potential determinants. The hypothesis validated in the present study, as well as the sources of the data employed and the study area are described in this chapter.

## 3.1. Theoretical Framework

The existing literature presents the reasons why some variables influence commercialisation. In what follows, the arguments are briefly presented. Notably, these arguments are based in the literature already presented in chapter 2.

Household size is expected to exert a positive effect on commercialisation. van Anrooy (1997) presents two arguments here. The Classical Malthus' Theory states that when household size increases, there will be scarcity of food supply. In contrast, Ester Boserup argues that there is continuous development with intensive agricultural systems, as household size increases, the productivity of the land rises and exceeds subsistence requirements and this will lead to an increase in marketed surplus (van Anrooy, 1997).

Access to roads is expected to exert a positive effect on commercialisation. Reardon, et al (1995) argue that good feeder roads, which connect with link roads and then to the highways make transportation easy for the farmer. Markets can be reached at lower cost, stimulating increased levels of commercialisation.

Access to goods vehicles is expected to exert a positive effect on commercialisation. Better access to vehicles, which convey farm produce from a farmer's village to a market, are likely to stimulate higher levels of commercialisation.

Access to markets is expected to exert a positive effect on commercialisation. van Anrooy (1997) argues that it is likely that the production of cash crops (and the degree of commercialisation) will increase as a result of increased marketing opportunities.

Access to storage facilities is expected to exert a positive effect on commercialisation. For example, van Anrooy (1997) observes that farm produce is perishable. Hence they need good storage facilities to keep meeting good prices. The level of commercialisation is, thus, expected to increase as access to storage facilities increases.

Access to extension services is expected to exert a positive effect on commercialisation. Schultz (1945), Southworth (1967), Ofori (1973), Molnar (1983), and Technoserve (1999) note that the significance of farmer education cannot be overemphasized. This is because the application of improved technology contains a series of instructions and guidance that require the services of extension service staff, which will stimulate higher levels of commercialisation.

Access to credit is expected to exert a positive effect on commercialisation. Schultz (1945), Southworth and Johnston (1967) and Technoserve (1997) indicate that fostering mutual relationship between farmers and financial institutions and private investors enable farmers to better access the credit and funds required for the purchase of inputs. This is likely to stimulate increased levels of commercialisation.

Access to land is expected to exert a positive effect on commercialisation. Schultz (1945), Southworth and Johnston (1967), Ofori (1973), Ellis (1993) and Reardon, et al (1995) argue that good agricultural performance depends on the nature of land. Better access to good quality agricultural land is likely to lead to higher levels of agricultural output stimulating increased levels of commercialisation.

Access to improved technology is expected to exert a positive effect on commercialisation. Schultz (1945), von Braun (1989) and Reardon, et al (1995) observe that the utilisation of improved seed (hybrid, high yield), fertiliser, agro-chemicals, irrigation and mechanization tend to stimulate high levels of productivity. In most parts of the tropics, there are long seasons with little or no rain, even though annual rainfall is heavy. Here, additional water during the dry months would permit year-round cropping. Just as pesticide, herbicides, small tools and machinery substitute for labour; fertiliser among other modernized inputs substitute for both organic fertilisers and for land, which is likely to stimulate higher levels of commercialisation.

Access to health facilities is expected to exert a positive effect on commercialisation. UNESCO (1978) and Kishor (1992) observe that tropical farmers' health is endangered with many diseases associated with the tropical forest ecosystem. Poor health, thus, is likely to discourage high levels of commercialisation.

Education status of a farmer is expected to exert a positive effect on commercialisation. Southworth and Johnston (1967), Schultz (1945) and Ofori (1973) argue that education provides programmes to develop the ability to understand, to accept, and to use knowledge about improved practices and new enterprises, to make independent choices, and to act on the basis of the decision, as well as increase the tendency to co-operate with other people and participate in group activities. If a greater percentage of the farming population has had formal education up to at least the secondary school level, the rate of demand for improved technology will be high, and this is likely to stimulate high levels of commercialisation.

Farm size is expected to exert a positive effect on commercialisation. Schultz (1945), Southworth and Johnston (1967) and Technoserve (1997) argue that to curtail misuse of land, acreage allotment helps to protect land use from being expanded unnecessarily. Farm size could be either smaller or larger than that which farmers would otherwise plant and harvest, stimulating increased levels of commercialisation.

### 3.2. Statement of Hypotheses

From the arguments in the theoretical framework, the following null hypothesis ($H_0$) and alternative hypothesis ($H_1$) are stated for validation.

I. $H_o$: Access to credit exerts no effect on commercialisation production,

versus

$H_1$: Access to credit exerts a positive effect on commercialisation of maize production.

This hypothesis is repeated for access to roads, goods vehicles, markets, health facilities, farm size, age of farmer, educational status of farmer, farming system, gender, marital status, farming experience, family member assistance with maize production, time allocated to maize production, and market distance.

### 3.3. Empirical Model

The empirical model for quantifying the effects of the determinants of commercialisation is specified in (5).

$$Y_i = a + \sum_j \beta_j X_{ji} + \varepsilon_i \quad (5)$$

where Y denotes agricultural commercialisation, $X_j$ denotes the level of the j th determinant of agricultural commercialisation and $\varepsilon_i$ denotes a stochastic error term.

This study uses Tobit model this is because the dependent variable $Y_i$ is censored (Pindyck, 1991). In this study commercialisation level is measured as the volume of maize output which is marketed.

$Y_i$ is a continuous variable which can take on values including zero. When a farmer does not engage in commercialisation, $Y_i$ is equal to zero.

Tests of differences between the means of the characteristics of commercial and non-commercial maize farmers are also performed. The conventional student t-statistic is employed (Koutsoyiannis A., 1977).

### 3.4. Description of Variables and Sources of Data

The indicator of commercialisation employed in this study is the volume of maize output which is sold by a farmer. Notably, for a farmer who does not commercialise (that is, does not sell any output at all), the volume sold is zero. Hence, the dependent variable is censored, requiring a Tobit model. The variables employed in the Tobit model are as follows:

X1 = age of head of farm household in years.

X2 = marital status of head of farm household (married= 1; zero otherwise).

X3 = gender of head of farm household (male=1; female= 0).

X4 = proportion of time which the head of farm household allocates to maize production (in percentage).

X5.1 = farming system: maize pure stand = 1; 0 otherwise.

X5.2 = farming system: maize and cassava mixture = 1; 0 otherwise.

X5.3 = farming system: maize and yam mixture = 1; 0 otherwise.

X5.4 = farming system: maize and plantain mixture = 1; 0 otherwise.

X5.5 = farming system: maize and cocoyam mixture = 1; 0 otherwise.

X6 = number of years which the head of the farm household has been planting maize.

X7.1= number of adult males of the family assisting in maize farming.

X7.2 = number of adult females of the family assisting in maize farming.

X7.3 = number of children of the family assisting in maize farming.

X8.1= proportion of time adult males in the family allocate to maize farming (in percentage).

X8.2 = proportion of time adult females in the family allocate to maize farming (in percentage).

X8.3 = proportion of time children in the family allocate to maize farming (in percentage).

X9 = area of head of farm household's land in acres cultivated to maize.

X10 = number of years for which head of farm household has had formal education.

X10.1= highest level of education of head of farm household (primary school = 1; 0 0therwise).

X10.2 = highest level of education of head of farm household (middle school = 1; 0 otherwise).

X10.3 = highest level of education of head of farm household (junior secondary school = 1; 0 otherwise).

X10.4 = highest level of education of head of farm household (secondary = 1; 0 otherwise).

X10.5 = highest level of education of head of farm household (tertiary = 1; 0 otherwise).

X11.1 = road link between market and farmer's village is a feeder road = 1; 0 otherwise.

X11.2 = road link between market and farmer's village is a link road = 1; 0 otherwise.

X11.3 = road link between market and farmer's village is a highway = 1; 0 otherwise.

X12 = farmer has access to vehicles for conveying maize to market = 1; 0 otherwise.

X13 = distance between the farmer's village and the nearest maize market in kilometers.

X14.1 = farmer has access to a health post = 1; 0 otherwise.

X14.2 = farmer has access to a clinic = 1; 0 otherwise.

X14.3 = farmer has access to a polyclinic = 1; 0 otherwise.

X14.4 = farmer has access to a hospital = 1; 0 otherwise.

X15.1 = amount of farmer's own funds (farmer's equity) in cedis.

X15.2 = amount of formal credit in cedis used by farmer.

X15.3 = amount of informal credit in cedis used by farmer.

The data relating to the variables in the present study are obtained from a detailed survey of sales of output (whether farmer sells some of the output at all

and the quantity of output sold in kilograms) and the socio-economic characteristics of the maize farmers in the district. Questionnaires were administered to the maize farmers (Appendix 1). The survey was undertaken in April 2002 in the East Akyem District in the Eastern Region of Ghana. A sample survey of 124 randomly selected maize farmers in four randomly selected villages in the East Akyem District is employed in the present study. Stratified Random Sampling is employed at the village level. The study obtained the list of all villages in the district from the District Planning Office. The study area was stratified into four subsets (strata) from which four villages were selected. In each of the four selected villages, every other head of farm household was selected. The study used the conventional procedure to obtain the optimum number of villages and maize farm households selected in the district.

The selected villages are Abomosu, Sankubanase, Ekorso-Akwadum and Anyinam-Osino where maize production is concentrated. The conventional formulae are also used to obtain the optimum number of selected maize farmers from the selected villages.

### 3.5. The Study Area

The East Akyem District is one of the districts in the Eastern Region of Ghana. It shares borders with other districts in the Eastern Region such as Kwahu South, Birim North, Kwaebibirem, Suhum-Kraboa Coaltar, New Dwabeng, Yilo Krobo and Fanteakwa Districts. It is divided into two main local councils, namely, Abuakwa and Kwabeng local councils. The major towns are Kyebi which is the

district headquarters, New Tafo, Anyinam, Kukurantumi, Asiakwa, Apedwa and Osiem (Appendix 2).

The East Akyem district has a population of about 190,347 as at 1984 with the growth rate of 3.4 percent (Ghana statistical Service, 2002). About 74 percent of the total population are farmers. The average farm size is 3.5 acres, compared with a national average farm size of 5.0 acres. There are fourteen sub-districts, with only 29 percent of farmers having access to extension services. Farmers are mixed crop planters, cultivating maize, cassava, plantain, cocoyam, yam, cocoa and oil palm. Maize productivity in the district is 1.8 metric tonnes per hectare as against 1.2 metric tonnes per hectare in the nation as a whole (East Akyem District Planning Office, 1996). The details of yields per hectare (metric tones) for other crops are in Table 1. There is no yield data for oil palm, because the plantations have been newly introduced.

**Table 1. Yields of Selected Crops in the East Akyem District**

| Crop | District Output | National Output |
|---|---|---|
| Cassava | 11.0 | 7.8 |
| Plantain | 8.0 | 7.1 |
| Cocoyam | 6.5 | 5.6 |
| Yam | 2.3 | 6.1 |
| Cocoa | 2.0 | 1.8 |

**Source: East Akyem District Planning Office (1996)**

The system of farming is bush fallowing, practised by about 50 percent of the farmers, followed by shifting cultivation with 42 percent and cooperation with 8.0 percent (East Akyem District Planning Office, 1996). Agriculture is the main occupation in the district and it is still at the rudimentary stage. About 97 percent of the farmers still use traditional methods like slash and burn with tools such as hoe and cutlass. About 81.4 percent of the farming population engage in mixed cropping. The advantage of the mixed cropping is the protection of the soil from erosion and depletion of fertility of the soil. Almost all the farmers (specifically, about 98 percent) finance their farming activities from their own savings.

The district is confronted with marketing problems such as low prices offered by buyers, inadequate transportation, lack of modern and appropriate storage facilities (silos, storage barns and so on.). Storage depends on traditional methods such as crib-barns, kitchen and storerooms. Farmers in the district also face the problem of post harvest losses, inadequate credit facilities, inadequate farm inputs, poor land tenure system and lack of access to agricultural extension services.

The sources of income generation in the district are crop farming (39.6 percent), which is the major source and salaries which contribute 27.4 percent, trading and business 25.9 percent, remittances 3.9 percent, rent and lease 1.3 percent and livestock 0.1 percent (East Akyem District Planning Office, 1996). It is established that average household annual income is ¢824,141. Some farming activities are at the subsistence level. Also, farmers sell a portion of their

production for their needs, leaving a part, which cannot support them all year round.

# CHAPTER 4

# EMPIRICAL RESULTS

This chapter first presents a description of the characteristics of the farm households, based on the survey results. Next, statistical tests of the differences between the means of the characteristics of commercial and non-commercial maize farm households are performed. Finally, Tobit analysis is performed to explain commercialisation of maize production in the East Akyem District.

## 4.1. Characteristics of Farm Households

The present study, as already indicated, employs a sample size of 120 farm households. Table 2 details the characteristics of these households, whereas Table 3 provides the definitions of the relevant variables. About 90.8 percent of the household heads are males whereas only 9.2 percent are females. About 13 percent of the respondents have neither had formal nor non-formal education. More than one-half of the number of respondents have had basic education. The mean number of years of education is approximately about 9.

The age distribution of the respondent farmers is as follows: below 31 years (14.1 percent), 31-40 years (26 percent), 41-50 years (27.5 percent), 51-60 years (17.5 percent), more than 61 years (2.5 percent). This shows that only 20 percent of the respondents are above 50 years. Over 53 percent are between 31 and 50 years. About 84.2 percent of the respondents are married. The farmers spend 65 percent of their time on maize farming. They have had slightly more than 17 years

experience in maize farming. On the average, the farm size in this district is 7.48 acres. On the average, the distance to maize market in the district is 9.2 kilometers.

**Table 2. Characteristics of Maize Farm Households**

| | AGE | GENDER | MASTATUS | MKTDIST | FARMSIZE |
|---|---|---|---|---|---|
| **Mean** | 41.83333 | 0.908333 | 0.883333 | 9.204167 | 7.483333 |
| **Median** | 42 | 1 | 1 | 2 | 5 |
| **Maximum** | 77 | 1 | 1 | 250 | 44 |
| **Minimum** | 23 | 0 | 0 | 0 | 1 |
| **Std. Dev.** | 11.27527 | 0.289765 | 0.322369 | 28.79298 | 6.203121 |
| **Skewness** | 0.590486 | -2.81838 | -2.378229 | 6.204086 | 2.275162 |
| **Kurtosis** | 3.152707 | 8.934925 | 6.647642 | 46.802 | 11.56264 |
| **Jarque-Bera** | 7.090062 | 334.9818 | 179.6459 | 10362.89 | 470.1216 |
| **Probability** | 0.028868 | 0 | 0 | 0 | 0 |
| **Observations** | 120 | 120 | 120 | 120 | 120 |

| | LEVED5 | LEVEDU4 | LEVEDU3 | LEVEDU2 | LEVEDU1 |
|---|---|---|---|---|---|
| **Mean** | 0.016667 | 0.183333 | 0.041667 | 0.516667 | 0.108333 |
| **Median** | 0 | 0 | 0 | 1 | 0 |
| **Maximum** | 1 | 1 | 1 | 1 | 1 |
| **Minimum** | 0 | 0 | 0 | 0 | 0 |
| **Std. Dev.** | 0.128556 | 0.388562 | 0.200664 | 0.501817 | 0.312104 |
| **Skewness** | 7.519429 | 1.629942 | 4.568163 | -0.066425 | 2.509846 |
| **Kurtosis** | 57.53347 | 3.648377 | 21.85978 | 0.996079 | 7.290996 |
| **Jarque-Bera** | 16000.34 | 55.23616 | 2195.819 | 20.16674 | 218.0498 |
| **Probability** | 0 | 0 | 0 | 0.000042 | 0 |
| **Observations** | 120 | 120 | 120 | 120 | 120 |

| | FAMSYS5 | FAMSYS4 | FAMSYS3 | FAMSYS2 | FAMSYS1 |
|---|---|---|---|---|---|
| **Mean** | 0.116667 | 0.15 | 0.05 | 0.783333 | 0.2 |
| **Median** | 0 | 0 | 0 | 1 | 0 |
| **Maximum** | 1 | 1 | 1 | 1 | 1 |
| **Minimum** | 0 | 0 | 0 | 0 | 0 |
| **Std. Dev.** | 0.322369 | 0.358569 | 0.218859 | 0.413701 | 0.401677 |
| **Skewness** | 2.378229 | 1.952207 | 4.112241 | -1.36975 | 1.493737 |
| **Kurtosis** | 6.647642 | 4.802778 | 17.90219 | 2.867881 | 3.222917 |
| **Jarque-Bera** | 179.6459 | 92.47226 | 1448.587 | 37.61155 | 44.87346 |
| **Probability** | 0 | 0 | 0 | 0 | 0 |
| **Observations** | 120 | 120 | 120 | 120 | 120 |

| | FAMPROP3 | FAMPROP2 | FAMPRPROP1 | FAMASIS3 | FAMASIS2 | FAMASIS1 |
|---|---|---|---|---|---|---|
| **Mean** | 14.96667 | 22.55 | 14.78333 | 0.958333 | 0.758333 | 1.058333 |
| **Median** | 0 | 20 | 0 | 0 | 1 | 0 |
| **Maximum** | 80 | 90 | 90 | 6 | 4 | 8 |
| **Minimum** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Std. Dev.** | 19.41711 | 23.05705 | 21.22001 | 1.374411 | 0.766919 | 1.666758 |
| **Skewness** | 1.123062 | 0.758181 | 1.217216 | 1.628411 | 1.330856 | 1.693458 |
| **Kurtosis** | 3.346795 | 2.783012 | 3.472334 | 5.017299 | 5.857186 | 5.394669 |
| **Jarque-Bera** | 25.82669 | 11.73218 | 30.74781 | 73.38194 | 76.24112 | 86.02817 |
| **Probability** | 0.000002 | 0.002834 | 0 | 0 | 0 | 0 |
| **Observations** | 120 | 120 | 120 | 120 | 120 | 120 |

| | EXPINFAM | DISHEAL2 | DISHEAL3 | DISHEAL4 | EDUC | TIMEFARM | VEHICLE |
|---|---|---|---|---|---|---|---|
| **Mean** | 17.15 | 0.966667 | 0.016667 | 0.025 | 8.775 | 64.63333 | 0.5 |
| **Median** | 15 | 1 | 0 | 0 | 10 | 70 | 0.5 |
| **Maximum** | 60 | 1 | 1 | 1 | 18 | 94 | 1 |
| **Minimum** | 1 | 0 | 0 | 0 | 0 | 15 | 0 |
| **Std. Dev.** | 11.41255 | 0.180258 | 0.128556 | 0.15678 | 4.703767 | 22.22798 | 0.502096 |
| **Skewness** | 1.293287 | -5.17776 | 7.519429 | 6.059463 | 0.650685 | -0.57512 | 0 |
| **Kurtosis** | 4.741199 | 27.80086 | 57.53347 | 37.70876 | 2.745439 | 2.294099 | 0.991667 |
| **Jarque-Bera** | 48.61068 | 3611.598 | 16000.34 | 6757.832 | 8.791602 | 9.106651 | 20.16701 |
| **Probability** | 0 | 0 | 0 | 0 | 0.012329 | 0.010532 | 0.000042 |
| **Observations** | 120 | 120 | 120 | 120 | 120 | 120 | 120 |

| | AMTOWN | AMINFCRE | AMFORCRE | ROAD1 | ROAD2 | ROAD3 |
|---|---|---|---|---|---|---|
| **Mean** | 706291.7 | 26666.67 | 137500 | 0.325 | 0.283333 | 0.175 |
| **Median** | 500000 | 0 | 0 | 0 | 0 | 0 |
| **Maximum** | 5000000 | 1500000 | 5000000 | 1 | 1 | 1 |
| **Minimum** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Std. Dev.** | 835412.5 | 167399 | 613306.6 | 0.470339 | 0.452506 | 0.38156 |
| **Skewness** | 2.958885 | 7.43247 | 5.698562 | 0.744145 | 0.95763 | 1.703532 |
| **Kurtosis** | 12.88087 | 60.10951 | 39.11242 | 1.545418 | 1.908721 | 3.893687 |
| **Jarque-Bera** | 663.2578 | 17412.31 | 7170.005 | 21.65407 | 24.29554 | 62.03379 |
| **Probability** | 0 | 0 | 0 | 0.00002 | 0.000005 | 0 |
| **Observations** | 120 | 120 | 120 | 120 | 120 | 120 |

See Table 3 on page 41 for the definitions of the variables.

**Source: Author's Computations Based on Survey Data.**

**Table 3. Definitions of the Variables**

| VARIABLE | DEFINITION |
|---|---|
| AGE | age of head of farm household in years. |
| MASTATUS | marital status of head of farm household (married=1; 0. otherwise). |
| GENDER | gender of head of farm household (male= 1; female= 0). |
| TIMEFARM | proportion of time head of farm household allocates to maize farming (in percentage). |
| FAMSYS 1 | farming system **pure stand** of maize. |
| FAMSYS 2 | farming system: **maize + cassava mixture**. |
| FAMSYS 3 | farming system: **maize + yam mixture**. |
| FAMSYS 4 | farming system: **maize + plantain mixture**. |
| FAMSYS5 | farming system: **maize + cocoyam mixture**. |
| EXPINFAM | number of years head of farm household has been planting maize. |
| FAMASIS 1 | number of adult males of the family assisting in maize farming. |
| FAMASIS 2 | number of adult females of the family assisting in maize farming. |
| FAMASIS 3 | number of children of the family assisting in maize farming. |
| FAMPROP 1 | proportion of time adult male in family allocates to maize farming (in percentage). |
| FAMPROP 2 | proportion of time adult female in family allocates to maize farming (in percentage). |
| FAMPROP 3 | proportion of time child in family allocates to maize farming (in percentage). |
| FARMSIZE | total area of head of farm household's land in acres cultivated to maize. |
| EDUC | number of years for which head of farm household has had formal education. |
| LEVEDU 1 | highest level of education of head of farm household is **primary school** (primary school =1; 0 otherwise). |
| LEVEDU 2 | highest level of education of head of farm household is **middle school** (middle school =1; 0 otherwise. |
| LEVEDU 3 | highest level of education of head of farm household is **junior Secondary School (JSS** =1; 0 otherwise**).** |
| LEVEDU 4 | highest level of education of head of farm household is **secondary school** (secondary school =1; 0 otherwise). |
| LEVEDU 5 | highest level of education of head of farm household is **tertiary** (tertiary =1; 0 otherwise). |
| ROAD 1 | road link between market and farmer's village is a **feeder** road (feeder road =1; 0 otherwise). |
| ROAD 2 | road link between market and farmer's village is a **link** road (link road =1; 0 otherwise). |
| ROAD 3 | road link between market and farmer's village is a **highway** (highway road =1; 0 otherwise). |
| VEHICLE | farmer has access to vehicles for conveying product to market. |
| MKTDIST | distance between the farmer's village and the nearest maize market in kilometers. |

| | |
|---|---|
| DISHEAL 1 | farmer access to a **health post** (health post =1; 0 otherwise). |
| DISHEAL 2 | farmer access to a **clinic** (clinic =1; 0 otherwise). |
| DISHEAL 3 | farmer access to a **polyclinic** (polyclinic =1; 0 otherwise). |
| DISHEAL 4 | farmer access to a **hospital** (hospital =1; 0 otherwise). |
| AMTOWN | amount of farmer's own funds (farmer's equity) in cedis (farmer's equity =1; 0 otherwise). |
| AMFORCRE | amount of formal credit in cedis used by farmer (formal credit =1; 0 otherwise). |
| AMINFCRE | amount of informal credit in cedis used by farmer (informal credit =1; 0 otherwise). |

Road 1 = Road 2 = Road 3 = 0 denotes access to a footpath.
Famsys1 = Famsys 2 = Famsys 3 = Famsys 4 = Famsys 5 = 0 denotes farming system with the mixture of maize + cassava + yam + plantain + cocoyam.
Disheal 1= Disheal 2 = Disheal 3 = Disheal 4 = 0 denotes farmer has access to no health facilities.
Levedu 1 =Levedu 2 = Levedu 3 = Levedu 4 = Levedu 5 = 0 denotes household head has no formal education.

**Source: Author's Compilation.**

### 4.2. Differences Between the Characteristics of Commercial and Non-Commercial Maize Farmers: Continuous Variables

In Table 4 and Table 5, the results of tests of significance of the differences between the means of commercial and non-commercial farmers in respect of several socio-economic characteristics of farm households in the East Akyem District are detailed. The mean age of commercial farmers is 41.84 years whereas that of non-commercial farmers is 41.60 years. The t-ratio for testing for the significance of the difference between these means is 0.129 (Table 5). This is less than the critical value of 1.658 at the 10 percent level of significance. It is therefore inferred that the mean age of commercial farmers in the district is not significantly different from that of non-commercial farmers even at the 10 percent level.

For the number of years a farmer has been planting maize, the mean experience of commercial farmers is 17.32 years whereas that of non-commercial farmers is 13.20 years with a t-ratio of 6.725 (Table 5). Since the computed t-ratio is greater than the critical value of 2.617 at the 1 percent level of significance, it is implied that the commercial farmers are significantly more experienced than the non-commercial farmers.

The mean proportions (percentages) of time the entire household of commercial farmers allocate to maize farming, are as follows: adult males is 32.56, adult females is 25.43 and children is 15.44; and their respective ratios are greater than the critical value of 2.617 at the 1 percent level of significance. The mean proportions (percentages) of time non-commercial farmers allocate to maize farming are as follows: adult males 6.00, adult females is 14.00 and children is 4.00, implying that the assistance provided by members of the households of commercial farmers tends to be greater than that of non- commercial farmers in the district.

Furthermore, the mean size of land cultivated by commercial maize farmers is 7.27 acres and that of non-commercial farmers is 7.34 acres. The t-ratio is -0.125 (Table 5). It is less than the critical value of 1.658 at the 10 percent level. It is therefore inferred that commercial farmers do not cultivate larger land areas; indeed area cultivated by commercial and non-commercial farmers are not significantly different.

The distance from farmers' village to maize market rejects the null hypothesis of equality of market distance for commercial and non-commercial

farmers. This is because there is a significant difference between the mean market distance for commercial farmers (9.53 km) and non-commercial farmers (3.20 km). The relevant t-ratio here is 17.108, which is greater than the critical value of 2.617 at the 1 percent level (Table 5).

**Table 4. Means and Standard Deviations of the Characteristics of Commercial and Non-Commercial Maize Farmers: Continuous Variables**

| VARIABLE | MEAN | | STANDARD DEVIATION | |
|---|---|---|---|---|
| | COMMERCIAL FARMERS | NON-COMMERCIAL FARMERS | COMMERCIAL FARMERS | NON-COMMERCIAL FARMERS |
| **AGE** | 41.84 | 41.60 | 6.46 | 6.44 |
| **EXPINFAM** | 17.32 | 13.20 | 4.16 | 3.63 |
| **FAMPROP 1** | 32.56 | 6.00 | 5.7 | 2.4 |
| **FAMPROP 2** | 25.43 | 14.00 | 5.04 | 3.74 |
| **FAMPROP 3** | 15.44 | 4.00 | 3.92 | 2 |
| **FARMSIZE** | 7.27 | 7.34 | 2.69 | 2.7 |
| **MKTDIST** | 9.53 | 3.20 | 3.08 | 1.78 |
| **AMTOWN** | 705695.65 | 640000.00 | 840.05 | 800 |
| **AMFORCRE** | 143478 | 0.00 | 378.78 | 0.00 |
| **AMINFCRE** | 27826.09 | 0.00 | 166.8 | 0.00 |
| **TIMEFARM** | 64.7 | 60 | 8.04 | 7.74 |
| **EDUC** | 8.77 | 1.57 | 4.54 | 1.25 |
| **FAMASIS 1** | 3.02 | 1.00 | 1.73 | 1 |
| **FAMASIS 2** | 2.16 | 0.00 | 1.46 | 0.00 |
| **FAMASIS 3** | 1.11 | 0.00 | 1.05 | 0.00 |

Degrees of freedom = 118

Please see Table 3 on page 41 for the definitions of the variables.

**Source: Author's Computations Based on Survey Data.**

**Table 5. Differences Between the Characteristics of the Commercial and Non-Commercial Maize Farmers: Continuous Variables**

| VARIABLE | MEAN | | COMPUTED t-RATIO |
|---|---|---|---|
| | COMMERCIAL | NON-COMMERCIAL | |
| AGE | 41.84 | 41.60 | 0.129 |
| EXPINFAM | 17.32 | 13.20 | 6.725 *** |
| FAMPROP 1 | 32.56 | 6.00 | 106.24 *** |
| FAMPROP 2 | 25.43 | 14.00 | 14.65 *** |
| FAMPROP 3 | 15.44 | 4.00 | 26.60 *** |
| FARMSIZE | 7.27 | 7.34 | -0.125 |
| MKTDIST | 9.53 | 3.20 | 17.108 *** |
| AMTOWN | 705695.65 | 640000.00 | 392.68*** |
| AMFORCRE | 143478 | 0.00 | 43610.3 *** |
| AMINFCRE | 27826.09 | 0.00 | 19190.4 *** |
| TIMEFARM | 64.7 | 60 | 2.93 *** |
| EDUC | 8.77 | 1.57 | 68.28 *** |
| FAMASIS 1 | 3.02 | 1.00 | 9.619 *** |
| FAMASIS 2 | 2.16 | 0.00 | 216 *** |
| FAMASIS 3 | 1.11 | 0.00 | 0.12 |

Degrees of freedom = 118
Two tailed t-Critical Value at the 1 percent significance level = 2.617 ***
Two tailed t-Critical Value at the 5 percent significance level = 1.980 **
Two tailed t-Critical Value at the 10 percent significance level = 1.658*
t-ratio refers to the Student's t-test for difference between commercial and non-commercial farmers.

See Table 3 on page 41 for the definitions of the variables.

**Source: Author's Computations Based on Survey Data**

For farmer access to funds, the t-ratio for difference between the means of farmer (own) equity funds is 392.68, the corresponding t-ratio for formal credit is 43610.3, and that of informal credit is 19190.4. Each t-ratio is greater than the critical value of 2.617 at the 1 percent level (Table 5). The mean access to funds of commercial farmers is greater than that of non-commercial farmers. Therefore, commercial farmers tend to have better access to funds than the non-commercial farmers in the district.

In the case of the proportion of time heads of farm households allocate to maize farming, the null hypothesis is rejected, because the computed t-ratio of 2.93 is greater than the critical value of 2.617 at the 1 percent level. The corresponding t-ratio implies significance at the 1 percent level. Moreover, the mean education level of commercial farmers is 8.77 years, whereas that of non-commercial farmers is 1.57 years. The computed t-ratio for the difference between these two means is 68.28 and it is greater than the critical value of 2.617 at the 1 percent level. The computed t-ratio is significant at the 1 percent level. It is inferred that commercial farmers tend to be better educated.

Finally, for the number of adult males and females in the family assisting in maize farming the null hypothesis of equality between the relevant means is rejected. The computed t-ratio of 9.619 for adult males and 216 for adult females are greater than the critical value of 2.617 at the 1 percent significance level. The number of children in the family assisting in maize farming has a t-ratio of 0.12, which is less than the critical value of 1.658 even at the 10 percent level; this t-ratio is therefore not significant even at the 10 percent level. These results imply that assistance provided by adult males in the family to the head of the household concerning maize farming tend to stimulate commercialisation. Hence, opportunities should be created for adult males in the family or farm household to offer their labour services to the family's maize production enterprise in the district, as this is likely to stimulate higher levels of commercialisation.

### 4.3. Differences Between the Characteristics of the Commercial and Non-Commercial Maize Farmers: Discrete Variables

In Table 6, as far as commercial farmers are concerned, farmers who are married are more than those who are not married, and those who are male are more than those who are female. Commercial farmers who plant a mixture of maize and cassava constitute the majority (75.8 percent). Those who plant maize and yam are less in number than those who operate other farming systems. The commercial farmers who have access to feeder roads are more than those having access to other types of roads. Those who have access to goods vehicles are more than those who do not have access to goods vehicle.

**Table 6. Differences Between the Characteristics of the Commercial and Non- Commercial Maize Farmers: Discrete Variables**

| VARIABLES | TOTAL NUMBER | NUMBER OF COMMERCIAL FARMERS | PERCENTAGE OF COMMERCIAL FARMERS | PERCENTAGE OF NON-COMMERCIAL FARMERS |
|---|---|---|---|---|
| **MASTATUS** | **120** | **115** | **95.80** | **4.20** |
| MARIED | 101 | 101 | 84.14 | 100 |
| NOT MARRIED | 14 | 14 | 11.66 | 0 |
| **GENDER** | **120** | **115** | **95.80** | **4.20** |
| MALE | 109 | 104 | 86.60 | 100 |
| FEMALE | 11 | 11 | 9.20 | 0 |
| **FAMSYS 1** | **120** | **115** | **95.80** | **4.20** |
| MAIZE PURE | 24 | 21 | 17.50 | 60 |
| OTHERWISE | 96 | 94 | 78.30 | 40 |
| **FAMSYS 2** | **120** | **115** | **95.80** | **4.20** |
| MAIZE + CASSAVA | 94 | 91 | 75.80 | 60 |
| OTHERWISE | 26 | 24 | 20.00 | 40 |
| **FAMSYS 3** | **120** | **115** | **95.80** | **4.20** |
| MAIZE + YAM | 6 | 6 | 5.00 | 0 |
| OTHERWISE | 114 | 109 | 90.80 | 100 |
| **FAMSYS 4** | **120** | **115** | **95.80** | **4.20** |
| MAIZE + PLANTAIN | 18 | 18 | 15.00 | 0 |
| OTHERWISE | 102 | 97 | 80.80 | 100 |
| **FAMSYS 5** | **120** | **115** | **95.80** | **4.20** |
| MAIZE + COCOYAM | 14 | 14 | 11.60 | 0 |
| OTHERWISE | 106 | 101 | 84.20 | 100 |

| | | | | |
|---|---|---|---|---|
| **ROAD 1** | **120** | **115** | **95.80** | **4.20** |
| FEEDER ROAD | 39 | 37 | 30.80 | 40 |
| OTHERWISE | 81 | 78 | 65.00 | 60 |
| **ROAD 2** | **120** | **115** | **95.80** | **4.20** |
| ACCESS TO LINK ROAD | 34 | 34 | 28.30 | 0 |
| OTHERWISE | 86 | 81 | 67.50 | 100 |
| **ROAD 3** | **120** | **115** | **95.80** | **4.20** |
| HIGHWAY | 21 | 18 | 15.00 | 60 |
| OTHERWISE | 99 | 97 | 80.80 | 40 |
| **VEHICLE** | **120** | **115** | **95.8** | **4.20** |
| GOODS VEHICLE | 60 | 58 | 48.3 | 40 |
| OTHERWISE | 60 | 57 | 47.5 | 60 |
| **DISHEAL 1** | **120** | **115** | **95.8** | **4.20** |
| HEALTHPOST | 1 | 1 | 0.8 | 0 |
| OTHERWISE | 119 | 114 | 95.0 | 100 |
| **DISHEAL 2** | **120** | **115** | **95.8** | **4.20** |
| CLINIC | 115 | 115 | 95.8 | 0 |
| OTHERWISE | 5 | 0 | 0 | 100 |
| **DISHEAL 3** | **120** | **115** | **95.8** | **4.20** |
| POLYCLINIC | 3 | 3 | 2.5 | 0 |
| OTHERWISE | 117 | 112 | 93.3 | 100 |
| **DISHEAL 4** | **120** | **115** | **95.8** | **4.20** |
| HOSPITAL | 3 | 3 | 2.5 | 0 |
| OTHERWISE | 117 | 112 | 93.3 | 100 |
| **LEVEDU 1** | **120** | **115** | **95.8** | **4.20** |
| PRIMARY | 13 | 12 | 10.0 | 20 |
| OTHERWISE | 107 | 103 | 85.8 | 80 |
| **LEVEDU 2** | **120** | **115** | **95.8** | **4.20** |
| MIDDLE | 62 | 59 | 49.2 | 60 |
| OTHERWISE | 58 | 56 | 46.6 | 40 |
| **LEVEDU 3** | **120** | **115** | **95.8** | **4.20** |
| JSS | 5 | 5 | 4.2 | 0 |
| OTHERWISE | 115 | 110 | 91.6 | 100 |
| **LEVEDU 4** | **120** | **115** | **95.8** | **4.20** |
| SECONDARY | 22 | 22 | 18.3 | 0 |
| OTHERWISE | 98 | 93 | 77.5 | 100 |
| **LEVEDU 5** | **120** | **115** | **95.8** | **4.20** |
| TERTIARY | 2 | 2 | 1.7 | 0 |
| OTHERWISE | 118 | 113 | 94.1 | 100 |

See Table 3 on page 41 for the definitions of the variables.
**Source: Author's Computations Based on Survey Data**

Regarding health facilities, almost all the commercial farmers have access to a clinic rather than other health facilities. Middle school appears to be the educational level that has a larger number of commercial farmers than the other levels of education.

### 4.4. Empirical Results of Tobit Analysis of Commercialisation Behaviour

In Table 7, the determinants which are significant at the 1 percent level are marital status of head of farm household (MASTATUS), the proportion of time farmer allocates to maize farming in percentage (TIMEFARM), the number of adult males of the family assisting in maize farming (FAMASIS1), the total area of farmer's land in acres cultivated to maize (FARMSIZE), farmer's accessibility to vehicles for conveying products to market (VEHICLE), and the amount of informal credit in cedis (AMINFCRE).

The determinants which are significant at the 5 percent level are farmer accessibility to a hospital (DISHEAL4) and the amount of farmer's own funds in cedis (AMTOWN). The determinants which are significant at the 10 percent level are farming system with a mixture of maize and plantain (FAMSYS4), the proportion of time children in the family allocate to maize farming (FAMPROP3), farmer accessibility to a health post (DISHEAL1) and the amount of formal credit in cedis used (AMFORCRE).

The determinants which are not significant even at the 10 percent level are the age of head of farm household (AGE), the gender of head of farm household (GENDER), the farming systems which are maize pure stand, maize mixed with cassava, maize mixed with yam and maize mixed with cocoyam (FAMSYS1, FAMSYS2, FAMSYS3, FAMSYS5), the number of years farmer has been planting maize (EXPINFAM), the number of adult females and children of the family assisting in maize farming (FAMASIS2, FAMASIS3), the proportion of

time adult males and females allocate to maize farming (FAMPROP1, FAMPROP2),

**Table 7. Empirical Results of the Effects of the Determinants of Commercialisation of Maize Production in the East Akyem District: Tobit Results**

Included observations: 118
Left censoring (value) at zero

| VARIABLE | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| C | 158.0235 | 906.9425 | 0.174238 | 0.8617 |
| AGE | 7.739001 | 15.61502 | 0.495613 | 0.6202 |
| MASTATUS*** | 1105.780 | 366.8803 | 3.014009 | 0.0026 |
| GENDER | 348.4513 | 503.5327 | 0.692013 | 0.4889 |
| TIMEFARM*** | -17.45417 | 5.844852 | -2.986247 | 0.0028 |
| FAMSYS1 | -483.4642 | 407.4882 | -1.186450 | 0.2354 |
| FAMSYS2 | -23.93221 | 354.7671 | -0.067459 | 0.9462 |
| FAMSYS3 | 236.7377 | 558.8819 | 0.423592 | 0.6719 |
| FAMSYS4 | -629.7358 | 367.2309 | -1.714822 | 0.0864 |
| FAMSYS5 | -1.219580 | 12.55660 | -0.097127 | 0.9226 |
| EXPINFAM | -14.71245 | 15.55692 | -0.945717 | 0.3443 |
| FAMASIS1*** | 354.9160 | 78.45119 | 4.524036 | 0.0000 |
| FAMASIS2 | -48.54327 | 193.4239 | -0.250968 | 0.8018 |
| FAMASIS3 | 58.01198 | 125.8388 | 0.461002 | 0.6448 |
| FAMPROP1 | -0.474537 | 0.628160 | -0.755439 | 0.4500 |
| FAMPROP2 | -0.938802 | 3.913214 | -0.239906 | 0.8104 |
| FAMPROP3* | 13.87445 | 8.351643 | 1.661284 | 0.0967 |
| FARMSIZE*** | 52.35364 | 20.03628 | 2.612942 | 0.0090 |
| ROAD1 | -345.8084 | 389.3891 | -0.888079 | 0.3745 |
| ROAD2 | -527.5370 | 436.5331 | -1.208470 | 0.2269 |
| ROAD3 | 382.2163 | 432.7682 | 0.883190 | 0.3771 |
| VEHICLE*** | 851.8873 | 288.3833 | 2.954011 | 0.0031 |
| MKTDIST | 0.468682 | 4.654453 | 0.100695 | 0.9198 |
| DISHEAL1* | 2013.793 | 1153.183 | 1.746291 | 0.0808 |
| DISHEAL2 | -80.92507 | 83.14249 | -0.973330 | 0.3304 |
| DISHEAL3 | -6.060765 | 9.810975 | -0.617754 | 0.5367 |
| DISHEAL4** | -184.3786 | 73.13725 | -2.520994 | 0.0117 |
| AMTOWN** | 0.000358 | 0.000177 | 2.020696 | 0.0433 |
| AMFORCRE* | 0.000356 | 0.000213 | 1.672789 | 0.0944 |
| AMINFCRE*** | 0.002193 | 0.000747 | 2.936126 | 0.0033 |
| LEVEDU1 | -563.4742 | 428.0751 | -1.316297 | 0.1881 |
| LEVEDU2 | 225.6614 | 319.5090 | 0.706276 | 0.4800 |
| LEVEDU3 | 198.2396 | 610.9213 | 0.324493 | 0.7456 |
| LEVEDU4 | -78.95631 | 280.2718 | -0.281713 | 0.7782 |
| LEVEDU5 | -1223.702 | 914.1233 | -1.338662 | 0.1807 |
| Error Distribution | | | | |
| SCALE: C (36) | 1078.499 | 70.63164 | 15.26935 | 0.0000 |

**Significance levels: *** = 1%; ** = 5%; * = 10%**

See Table 3 on page 41 for the definitions of the variables.
**Source: Author's Computations Based on Survey Data.**

the road link between farmer's village viz., whether feeder, link or highway (ROAD1, ROAD2, ROAD3), the distance between farmer's village and the nearest maize market (MKTDIST), farmer accessibility to a clinic (DISHEAL2), farmer accessibility to a polyclinic (DISHEAL3), and all the levels of farmer's education viz., primary, middle, junior secondary, senior secondary, and tertiary (LEVEDU1, LEVEDU2, LEVEDU3, LEVEDU4 and LEVEDU5).

The determinants which have significant expected positive effects are the marital status of farmer (MASTATUS), the number of adult males of the family assisting in maize farming (FAMASIS1), the proportion of time children of the family allocate to maize farming (FAMPROP3), the total area of farmer's land in acres (FARMSIZE), farmer's accessibility to vehicle for conveying products to market (VEHICLE), farmer's accessibility to a health post (DISHEAL1), the amount of farmer's own funds in cedis (AMTOWN), the amount of formal credit in cedis (AMFORCRE), and the amount of informal credit (AMINFCRE).

Those which have significant expected negative effects are the proportion of time farmer allocate to maize farming (TIMEFARM), the farming system with the mixture of maize and plantain (FAMSYS4) and the farmer accessibility to a hospital (DISHEAL4). From the onset, the computations of the effects of the variables listed below were difficult to accomplish. The software automatically rejected those variables because they displayed a singular matrix problem. The variables are first, access to extension services. This variable takes care of educating farmers on the proper use of fertiliser, improved seeds and agrochemicals. Second, access to new technology which covers the application of

fertiliser, improved seed, mechanization and agrochemical use. Third, access to storage facilities which also handles the preservation of farm produce and productivity variable which captures the level of farm output.

The proportion of time the children of the family allocate to maize farming (FAMPROP3) exerts a positive influence on commercialisation. This implies that, while the adults use part of their maize production time on other activities in the farm, the children are left to continue on activities related to maize production. The total area of land (FARMSIZE) exerts a positive influence on commercialization, notably, the mean size of land cultivated is 7.27 acres which is greater than the recommended minimum size of land for commercialisation of 3.5 acres. Thus, farm size increases the probability and the level of commercialisation.

The amount of farm household own funds in cedis influences commercialisation positively, implying that if farmers' own funds increase then the probability and level of commercialisation increase. Similarly, the amount of credit procured exerts a positive effect on commercialisation.

The proportion of time head of farm household allocates to maize farming influences commercialisation positively but does not show the expected sign (Table 7). This could be because the farmer engages in other activities such as hunting, preparing materials for basket weaving within the maize production period. The marital status of farmer exerts a positive influence on commercialisation. From the study, about 88 percent of the farm population are married. The probability of getting assistance from both wives and other family

members justifies the effective influence. Farmer accessibility to vehicles for conveying products to market positively influences commercialisation. Once there are good road links to the farmer's village, the availability of vehicle is certain. This thus increases commercialisation.

The farming systems with pure stand of maize, maize mixed with yam and maize mixed with cocoyam variables have negative effects on commercialisation. This seems to imply that farmers do not grow these crops for commercial purposes. Future studies should examine in detail why this is the case.

The number of adult males of the family assisting in maize farming exerts a positive influence on commercialisation. This implies that adult males in a given farm household play a significant role in commercialisation of maize production in the district therefore, they should be encouraged to join in maize production in order to increase the probability and level of commercialisation.

The number of years head of farm household has been planting maize exerts negative influence on commercialisation. The non-significance of this effect even at the 10 percent level could be farmers' failure to apply new technology in addition to the experience gained that can boost production to increase commercialisation.

The distance between a farmer's village and the nearest maize market exerts a negative influence and has the expected sign. This implies that a farmer might not have enough money to transport products to the market as the mean distance to maize market increases, and this tends to discourage commercialisation.

Age of farmer exerts a negative influence with the expected sign. However, it is not significant even at the 10 percent level. This implies that young farmers do not tend to commercialise maize production more than old farmers. Finally, the variable which captures the farming system with a mixture of maize and cassava is not significant even at the 10 percent level. This could mean that farmers produce them for subsistence use only.

# CHAPTER 5

# SUMMARY AND RECOMMENDATIONS

## 5.1. Summary

This study has analysed the effects of the determinants of commercialisation of maize production in the East Akyem District. Maize is one of the most important food and cash crops with multiple uses in various parts of Ghana. The review of literature has identified several factors, which could influence the commercialisation of maize production.

A Tobit econometric model has been specified to quantify the effects of the determinants of commercialisation of maize production in the East Akyem District. The present study observes that marital status of farmer, the proportion of time farmer allocates to maize production, the number of adult males in the family assisting in maize farming, the total area of farmer's land in acres cultivated to maize, farmer access to vehicles for conveying maize to the market, the amount of informal credit procured, farmer access to a hospital, the amount of farmer's own funds in cedis, operating a farming system with a mixture of maize and plantain, the proportion of time children in the family allocate to maize farming, farmer access to a health post, the amount of formal credit in cedis are the statistically significant determinants of commercialisation of maize production in the district.

In addition, the effects of gender of head of farm household, farming system with a mixture of maize and yam, road link between market and farmer's village which is a highway, distance between farmer's village and the nearest

market, the level of farmer's education that is, middle school and junior secondary school bear the expected signs, but are not statistically significant even at the 10 percent level.

The variables which exert expected significant positive effects on commercialisation of maize production in the district are marital status of farmer, the number of adult males in the farm household assisting in maize farming, the proportion of time children in the family allocate to maize farming, total area of farmer's land in acres cultivated to maize, farmer access to vehicles for conveying products to market, farmer access to a health post, amount of farmer's own funds in cedis, the amount of formal credit and the amount of informal credit. These econometric results suggest important policy recommendations.

## 5.2. Policy Recommendations

Policy implications of the findings of this study are outlined in this section. In order to increase the degree of commercialisation of maize production in the East Akyem District, a number of policy recommendations are hereby made, based on the results of the present study.

First, credit facilities should be made available to farmers in the form of inputs. Micro finance approaches that are applicable to each locality should be introduced to stimulate farmers to repay their debts in such a way that they might not suffer from debt payment. It could be an effective strategy of increasing farm level investment and commercialisation of maize production in the district.

Second, farmers' health should be fully secured by establishing a good number of quality health posts in the rural areas in the district. This will enable farmers to have access to quality medical care, for health is life. This will stimulate higher levels of labour productivity and commercialisation of maize production, ceteris paribus.

Third, the empirical research reveals that higher level of equity funds stimulate higher level of commercialisation. In order to encourage farmers to earn more income, the private sector and the public sector should be encouraged to establish more agro-based industries that will curb the problem of spoilage in raw agricultural products. This will also stimulate the sustainability of agriculture and enable farmers to amass adequate own funds to finance investments which will lead to higher levels of production and commercialisation.

Fourth, the government should create an environment for commercial goods vehicles to ply the district to convey farm produce from farm gate to the nearest maize market. This could be accomplished by establishing a good road network throughout the district to enable more goods vehicle to reach the farms in the district which will stimulate higher levels of commercialisation.

Fifth, it is recommended that a policy which increases access to maize land should be coupled with a policy which stimulates increased levels of use of pieces of improved technology in maize production which stimulate higher productivity. This is likely to stimulate commercialization of maize production.

Finally, the farming system with maize and plantain stimulates higher level of commercialisation so continuous research work should be undertaken on

maize and plantain. This will enable farmers to get more improved varieties of maize seeds for cultivation, and ultimately stimulate a higher level of commercialisation. A policy should be introduced to encourage more and more people to use the farming system with maize and plantain mixture in the district.

## 5.3. Limitations of the Study and Suggestions for Future Research

The present study is limited to the determinants of commercialisation of maize production in the East Akyem District of Ghana. The study does not examine other aspects of maize production. Other aspects of maize production such as cultivation, marketing, to mention a few, could be investigated in future research, since continuous improvement in the incomes of maize farmers has been the primary focus of many organisations as well as the Government of Ghana.

Commercialisation is defined in this study as absolute volume of maize output sold. One could also define it as the proportion of total output that is sold. Future research should rigorously analyse the effects of the determinants of this proportion.

The present study was unable to capture and estimate the non-farm income of farmers, and was unable to analyse the effects of other potential determinants of maize production. Therefore, these could be investigated in future research.

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## APPENDIX 1

DETERMINANTS OF COMMERCIALISATION OF MAIZE PRODUCTION IN THE EAST AKYEM DISTRICT OF GHANA.

### QUESTIONNAIRE

1. Farm serial number.....
2. Location of farm (village).....
3. Head of Farm house (name).....
4. Age of head of farm household (years).....
5. Marital status: .....
6. Gender: Male ( ) Female ( )
7. What proportion (%) of time do you allocate to maize farming?.....
8. Type of farming system.....
9. How long have you been planting maize?.....
10. How many of the members of your family assist in your maize farming?

    Adult Males ( ) Adult Females ( ) Children ( ).
11. What proportion (%) of time does each category of family member allocate to maize farming?

    Adult Males..... Adult Females..... Children.....
12. Size of farmland (Acres).....
13. Size of maize farm (Acres).....
14. Number of years of formal education of head of farm household.....

15. Educational level of head of farm household.

No Education ( ) Primary ( ) Middle ( ) J.S.S. ( ) Secondary ( ) Tertiary ( ).

16. What type of road links your village to the maize market?

Foot path ( ) Feeder Road ( ) Link Road ( ) Highway ( )

Others (please specify) .....

17. Do you get vehicles to convey your products to the nearest maize market?

Yes ( ) No ( )

18. How far is the distance (km) from your village to the nearest maize market? .....

19. Do you have any storage facility for your products? Yes ( ) No ( )

20. Where is (are) the storage facility (facilities) located? On-farm ( ) off-farm ( )

21. What is the total capacity of each of your storage facilities? .....

22. How often do you meet an extension staff during the maize season to discuss the use of improved technology? .....

23. What are the sources of capital (and the amount) for your maize production operations?

| | OWN CAPITAL | FORMAL CREDIT | INFORMAL CREDIT |
|---|---|---|---|
| AMOUNT (CEDIS) | | | |
| INTEREST (%) | | | |

24. How were you able to acquire land?

a. Leased ( ) b. Rented ( ) c. Purchased d. Family Owned ( ) Others (specify) .....

25. What problems did you encounter in getting the land for maize production? .....

26. If the land was leased, rented or purchased, how much did you pay for?

a. if through leasing, what is the duration (years) ..... and cost .....

b. if through renting what is the duration (years) ..... and cost .....

c. if purchased, what was the cost? .....

27. Do you use any of these inputs: fertilizer, improved maize seed, agrochemicals, mechanization and irrigation? Yes ( ) No ( )

a. Fertiliser: what quantity (kg) ..... How often? .....

b. Improved seed: what quantify (kg) ..... How often? .....

c. Agro chemicals: what quantify (kg) ..... How often? .....

d. Mechanisation: how often? .....

e. Irrigation? How often? .....

28. Do you sell some of your output at all ? Yes ( ) No ( )

29. What part of the total output is sold? Below one-half part ( ), one-half part and above ( )

a. How many bags of maize did you sell during the previous season?..... bags: average weight (kg) per bag

b. How much was a bag of maize sold? .....

c. What was the total output in number of bags? .....

d. What quantity of your output did you consume at home? .....

average weight (kg per bag? .....

e. What quantity did you give out as gifts? .....

average weight (kg per bag) .....

f. What quantity went bad? (post harvest loss) Bags: average weight (kg per bag).....

30. What is the distance (km) from your village to the nearest?

a. health post b. clinic c. polyclinic d. hospital

31. What problems do you face in maize farming? Explain

.....

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.....

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32. What are the solutions to these problems?

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.....

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# EASTERN REGION