ANALYSIS OF FARMERS' EFFICIENCY IN COWPEA PRODUCTION IN KWARA STATE, NIGERIA

BY

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY ZARIA, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN AGRICULTURAL ECONOMICS

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DECLARATION

I hereby declare that this dissertation titled "**Analysis of Farmers' Efficiency in Cowpea Production in Kwara State, Nigeria"** has been written by me and it is a record of my research work. No part of this work has been presented in any previous application for another Degree or Diploma in this or any other institution. All borrowed information has beenduly acknowledged in the text and alist of references provided.

_____ _____

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CERTIFICATION

This dissertation titled**Analysis of Farmers' Efficiency in Cowpea Production in Kwara State, Nigeria",** by MuhammedJamiuABDULLAHImeets the regulations governing the award of the Degree of Master of Science, Ahmadu Bello University, Zaria, and is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated toAlmighty Allah (SWT).

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Abstract

This study focused on the analysis of farmer's efficiency in cowpea production in Kwara State.This study was carried out in three Local Government Areas in KwaraState, Nigeria between April and Julyduring the 2014 cropping season. A multistage sampling technique was usedto select the farmers for this study. The first stage was purposive selection of the three Local Governments based on predominance of cowpea production among the farmers. Secondly, nine villages were purposively selected, Three from each local government area based on their intensity of cowpea production. Finally, a simple random sampling was employed in selecting farmers from each of the villages. Ten percent of the sample frame (1680) was used as the sample size. In all, 168 farmers were randomly selected.Descriptive statistics, net farm income and stochastic frontier production function were used in analyzing the data. The study showed that 32% of the respondents fell within the age range of 30 and 39years.The majority of the farmers (49%) had no formal education. About (87%) of the farmers have household sizethat ranged from 1-10 persons while the mean was 6.About (83%)of the farmers were not members of a Cooperative Society. The parameters of the stochastic frontier production function were estimated simultaneously with those of the model of inefficiency effects. Results indicated that all the efficiency variables were significant ($P < 0.05$). The mean technical and allocative efficiencies were 75% and 68% respectively. Findings further revealed that none of the sampled cowpea farms reached the frontier threshold.However, the average economic efficiency of the cowpea farmers was 51%. Also, household size and extension contact were responsible for the variation in technical efficiency of the cowpea producers. It could be concluded that cowpea production in the study area is profitable. It was therefore recommended that extension agents should be encouraged by providing adequate incentives to enhance their services. Lastly, farmers should be enlightened on the importance of belonging to functioning co-operative association because of the importance and benefit that can be derived from it.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Agriculture in Nigeria is dominated by small-scale farmers who produce about 80% of the total food requirement (Fayinka, 2004). These farmers are characterized by strong dependence on agricultural labour market, little or no forms of savings or storage facilities and cultural practices adopted are highly labour intensive (Festus, 2005; Fakayode*et al.,* 2008). A review of the past performance of agriculture since 1970 in Nigeria clearly shows that it contributes more than 30% of the annual Gross Domestic Product (GDP), employs about about 68% of the labour force, account for over 70% of non-oil exports, and provides over 80% of the food needs of the country (Adegboye, 2004).

In Nigeria, Agricultural contribution to the GDP and exports has been low since the 1980s and food imports continued to rise in value. In terms of relative importance, food import as a percentage of total imports rose from 3.5% in 1991 to 11.8% in the year 2000 (Central Bank of Nigeria, 2000; Akosile, 2003; Nyanko, 2006). Nigeria has witnessed a considerable decline in foodproduction and a widening gap in the supply and demand brought about by population growth of about 3.5% per annum relative to food production growth of about 15% per annum (Gulati, 2000; Yai'aisheModu*etal.,* 2010). By 2014, the agricultural growth rate was 6.23% (FAO, 2014), yet this growth rate is still lower than expected. Although, opinions differ on the magnitude of Nigeria's food problem, at the national level, the main food problems are food supply deficits, poverty and uneven distribution of income in terms of ability to buy food

(Ohajianya, 2004). This brought about a distortion of the labour market and distribution effects on the production of food and cash crops in the country.

The production and socio-economic characteristics of the farmers, inconsistent government policies, the poor infrastructural base, all interact and affect the agricultural sector, resulting in low production, high price of food items, inflation, under-development and poverty. If Nigeria is ready to go back to agriculture, the problem of poverty, hunger and malnutrition could be alleviated. Adequate production of Nigeria most staple crops such as sorghum which is consumed in many parts of the country, will contribute positively to the agricultural sector.

Cowpea is a popular leguminous crop in Africa which is known as 'beans' in Nigeria and 'niebe' in francophone countries. The largest production is in the moist and dry savannah of Sub-Saharan Africa (SSA), where it is intensively grown as an intercrop with other cereal crops like millet, sorghum and maize as well as rice fallows (Ishiyaku*et al.*, 2010).

Nigeria is the world's leading cowpea (*VignaUnguiculata*), producing country, producing over 2.91 million ton of dry grain in 2008 (Food and Agricultural Organization Statistics, 2010). Countries in Africa such as Niger (1.57 million tons) Ghana, Burkina Faso, Senegal and Cameroon are significant producers. Outside Africa, the major production areas are Asia, North and South America.Cowpea is highly nutritious. The seed contains about 25% protein together with several other nutrients (Frank-petersid*eet al.*, 2002). In addition, cowpea contains bioactive antioxidants such as: vitamin C, carotenoids and phenolic compounds (Cai*et al.*,

2003; Dobaldo*et al.,* 2005). Apart from having much protein content than the cereals, cowpea is also a good source of dietary fiber and starch (Osorio – Diaz *et al.,* 2005), minerals and vitamins (Kutos*et al.,* 2002). They are staple food and low-cost source of protein in developing countries where Protein Energy Malnutrition is prevalent (Van Heerden and Schonfelft, 2004).Many reports claim that inclusion in the daily diet has many physiological benefits in controlling and preventing various metabolic diseases such as: Diabetes Mellitus, Coronary Heart Diseases and Colon Cancer (Thoronathan and Mehadenvarnma, 2003). Protein content of the leafy cowpea parts consumed annually in Africa and Asia are equivalent to 5million tones of dry cowpea seeds and this represents as much as 30% of the total food legume production in the lowland tropics (Steele *et al.,* 1985). The tender shoot tips and leaves can be consumed as the plant reach the seeding stage and immature pods and seeds can be consumed during the fruiting stage (Fery, 2002).

Cowpea has wide soil type adaptability and is considered more drought tolerant than groundnut in Niger (Fery, 2002).Tolerance to drought reduces the use of irrigation and subsequently the cost of production. It is used as a cover crop (Frank-Petersid*et al.,* 2002) and as fodder for livestock (Erkut and Congiz, 2004). Another advantage of cowpeas is the addition of nitrogen to soil through nitrogen fixation and even benefitting a succeeding cereal crop.

Cowpea production is beset by an array of pests and diseases that can cause serious devastation, thus leading to reduced yield and low profitability. Several foliage defoliators' insects, chiefly among which are: Acrididae, have been reported to cause severe defoliation of cowpea. A considerable number of Lepidoptera larvae have been

reported to feed on cowpea leaves, skeletonizing and sometimes defoliating the plant. Other major defoliators belong to the family Chrysomelidae (Allen *et al.,* 1996). NFRA (2008) revealed that the total land area cultivated by small holderfarmers and their output of cowpea in Nigeria has dropped drastically inrecent times. The low yield obtained in most cowpea producing areas of West Africa islargely due to field insect pests which feed on reproductive plant parts causing mosteconomic damage thereby necessitating appropriate control measure Karungi*et al.*,(2000).

Effective control of pest infestation on cowpea can only be achieved through the use ofconvectional insecticides. The efficacy of pesticides (which include insecticides) dependsmainly on their level of use which in turn depends on their market prices. Prices areparticularly important since most of the pesticides are imported into the country (Tijani andOshotimehin, 2007). With the low exchange rate of the Nigerian currency against majorcurrencies of the world, the prices of the pesticides are becoming comparatively high. It isexpected therefore that farmers would respond to changes in prices by adjusting the level ofuse of the resource alongside changes in its market prices. Scientist has attributed thelow output per hectare of cowpea to the attack of pest and diseases.

1.2 Problem Statement

Food is a basic human need. It's important for human survival as well as growth and good health. It enables us to be able to live decent and fulfilling lives. Kruger *et al.*, (2008) emphasised that freedom from hunger is the most fundamental human right that can be attained. This right can only be enjoyed if an individual is food secured and poverty is alleviated.

Production of cowpea in Nigeria is expected to be of high value; this flows from the fact that cowpea is low cost crop to produce because they require minimum input. Cowpea tends to have higher output to input ratio as compared to crops such as maize (Auko, 2006). This implies that cowpea should have high market value in terms of profitability.

However, little is known about the profitability of cowpea production in Nigeria and more especially on how to use it to alleviate poverty among cowpea farmers. This is because despite the great potentials, cowpea has received little attention in terms of agricultural policy thrust and economic research (Auko, 2006). Most research on the crop focused on characteristics such as yield enhancement through breeding, soil management and agronomical practices (Tenywa, 1999).

Hence, other factors concerning pulse and in particular cowpea are important such as production efficiency, market dynamics, consumer preference and indeed profitability because these factors have an influence on production. According to a study that was conducted on profitability of beans production in Honduras, some factors that are found to influence profitability are farmers characteristics, input use, land use, cost, whether the farmer produce for sale or for home consumption as well as method of production (Tschering, 2002). However, as there are no national data on food security and poverty, information on rural food security and poverty are not readily available especially in Nigeria (Omotosho, 2010). Hence, And there are limited study on how increasing farmers efficiency in cowpea production as a means of reducing poverty among farmers in Kwara state Nigeria. This study is designed to provide answers to the following research questions:

i. What are the socio economic characteristics of cowpea farmers in the study area?

ii. What are the technical, allocative and economic efficiency of cowpea production in the study area?

iii. What are the costs and return associated with cowpea production in the study area?

iv. What are the problems faced by farmers involved in the production of cowpea in the study area?

1.3 Objectives of the Study

The broad objective of the study was to analyse farmer's efficiency in cowpea production in Kwara State, while the specific objectives were to:

i. describe the socio economic characteristics of cowpea farmers in the study area

ii. determine the technical, allocative and economic efficiency of cowpea production in the study area

iii. estimate the costs and return associated with cowpea production in the study area

iv. describe the problems faced by farmers involved in the production of cowpea in the study area

1.4 Justification of the Study

This study is expected to provide valuable information on profitability and production efficiency of growing cowpea to enable farmer consider its production as a viable option. It is however important to note that the supply of an adequate protein in

human diet in both quantity and quality is one of the major reasons why farmers engaged in the production of cowpea especially in areas where animal protein is scarce either as a result of high cost of animal protein like beef, eggs, cheese, chicken and others or due to the absence of livestock farming because of drought or presence of tsetsefies resulting to trypanosomiasis syndrome especially in the forest zone, in this respect the legume grains like cowpea is a better alternative source of vegetable source protein which is capable of at least partially compensating for the deficiency in animal protein. Findings of this study on profitability and production efficiency of cowpea among small holder farmers will help to suggest solutions to major problems which cowpea farmers are facing in the study area so as to increase their efficiency. This will however also help farmers and other agencies in identifying problem areas for improvements. Similarly, the study will be useful to the government of Kwara State, as a basis for rational and empirical policy formulation for cowpea production in the state. Finally, it is hoped that this work will be of assistance to researchers who will identify other areas for further studies on cowpea farming especially if it is to be used to reduce poverty among the cowpea farmers.

1.5 Hypothesis

Hypotheses stated in the study include:

i. Cowpea production is not profitable in the study area.
ii. There is no significant relationship between inputs and output in cowpea production in the study area.

CHAPTER TWO

LITERATURE REVIEW

2.1 Global Production of Cowpea

The total world production of pulses (chick peas, lentils, lupins, pigeon peas, vetches and other minor pulses) in 2010 was 24.3 million metric tons , which was more than double that in 1980 (Muhammad and mark, 2013). It is noted that while the pulses production increased by 53% in 10 years (1980-1990), It is advanced at a slower rate (32%) from 1990 to 2010.The area under pulses cultivation increased by 23% that is 21.5 million hectares to 26.5 million hectares. However, during the 1990-2010 periods, cultivation area for pulses has not changed significantly as exhibited by only a 5.6%increase (FAO, 2011). Hence, most regions in the world have seen significant increase in production during the past three decade: Africa (45%), Asia (36%) and North, Central and South America (49%). Only Europe saw a decrease of about 35% (FAO 2011).

The total production for cowpea, worldwide, was 10.6 million metric tons in 2010 which was more than 3 times as much as compared to 1980 (Muhammad and mark, 2013). The production of cowpea globally ranged between 3.4million metric tons and 5.7million metric tons during 1980-1990. It then increased by 86% from 1990-2010. The area under cowpea cultivation experienced similar growth from 1.2million hectares in 1980 to 5.6million in 2010. The boost in cowpea world production appeared to be related mainly to the increase in cultivated area. (FAO, 2011)

Nigeria and Niger are the major cowpea producing countries worldwide, accounting for 73% of the total world production. Other Africa countries that have contributed to

the increase in cowpea production includes: Burkina Faso, Cameroon, Mali, Tanzania, Uganda, Malawi, and Congo. all accounting for more than 1.5million metric tons (FAO, 2011).

2.2 Cowpea Cropping System

In West Africa, cowpea is grown mostly in subsistence farming systems and on a small scale in the lowland dry savanna and Sahelian regions. Traditionally, cowpea is grown in association or in relay cropping with cereals such as sorghum, millet, and maize mainly in the Sahelian regions (Pedune Mark, 1999). However, cowpea cropping systems are moving towards monocropping as the crop's economic importance increases. For example, cowpea mono crop has taken off in central Mali, thanks to an integrated rural development project which supplied improved seed, fertilizer, and pesticides on credit (Coulibaly, 1987).

Cowpea monocrop is frequent in cotton producing zones and in inland valleys and the Lake Chad basin in Cameroon (Pedune Cameroon, 1999). The increase in cowpea production is linked to the use of improved technologies including high yielding varieties and improved crop protection and production practices. A key issue behind the wide use of the improved cowpea technologies is their profitability. A few studies have been carried out on the profitability of cowpea technologies (Coulibaly, 1995; Lowenberg-Deboer*et al.,* 1994; Aitchedji, 2001) and a case study in Benin is reviewed in this paper.

2.3 Economic Importance of Cowpea

Cowpea is gradually attaining economic importance in Nigeria, particularly the southern statesof Nigeria, even though the bulk of the production is done in the semi-arid zone of Nigeria (Petu-Ibikunle*et al.,* 2008). The appreciating economic importance made be due to it food value whichmade it a good supplement/complimentary, source of protein for animal source (meat, egg andfish). Cowpea contains 20 – 25% of protein and 64% carbohydrate .It therefore has a tremendous potentials to contribute to the alleviation of malnutrition specifically amongst the poor.Protein shortage is a major feature in the diets of developing countries than shortage ofcalories (energy foods) this constitutes the problems of malnutrition and pronounced spread ofhuman disease (Fleck, 1981). Nigeria being one of the developing countries of the sub SaharanAfrica is producing protein food items to meet the nutritional need of the teeming population(Nworgu, 1997) according to the food and Agriculture organization (1983) 23% of the populationof developing economic consumes 20% below the level of food intake required to sustain lifeamong other activities. This is a problem which has which has persisted to date (FAO, 2001; Okorie, 2005).

In Africa cowpea provides sources of income for women farmers who produce, make and sellsnack foods from this nutritious legume.In Nigeria the production trend of cowpea has experience d about a 44.1% increase in area plantedand 41.% increase in yield from 1961 to 1995 (Ortiz, 1998). According to (Inaizume*et.al.*, 1999)several factors account for the impressive significant advances made by International Institution ofTropical Agriculture (IITA) over the last two decade in improving cowpea productivity in Sub -Saharan Africa. Singh *et al.*,(1994) also indicated that a

number of varieties have been developedwhich combine diverse plant type, different maturity period, and resistance to several disease, insectpest and parasite as well as good agronomic traits.

Economically, cowpea has a great value in the internals trade in country because it promotes tradebetween the production area and non producing area. It also serves as a source of income formiddlemen who embark on transportation from one place to another.

It is estimated that total annual cowpea given production in the world is valued at approximately USD1.13-2.81 billion (Ishiyaku, 2012).Raising the average yield per hectare of the crop will therefore increase the annual global production and hence the revenue. Sources from yield research have indicated that the potential yield of cowpea can go up to 3,000kg /ha if most of the constraint of cowpea production such lack of seeds of potentially high yielding vacintive, insects in field, storage insect pest as well as some physiological constraint like low level of sulfur amino acids, low digestibility of unheated protein, presence of anti-nutrients, high level of phytic acids, various flatulence factors as all stated by (Alonso *et al.,* 2000; Lajolo and Genovesa2002) are addressed.

Apart from the constraint mentioned above that affect the contribution of cowpea to the gross domestic product many specialist are of the gross domestic product many specialist opinion that the potential economic impact of cowpea is yet to be fully exploited even at the current level of production. This is mainly due to the show rate of expanding the list of cowpea value added products. the lists, especially of commercial product, have for long remained unchanged and include beans pudding

(moi-moi), bean cake (akara), although research efforts into the development of new product is beginning to yield positive results. The introduction of new value added cowpea products into the market would significantly raise the revenue from cowpea (Ishiyaku, 2012).

Cowpea [*Vignaunguiculata*] is grown throughoutWest Africa in a variety of crop mixtures, but the importanceof cowpea as a component crop in farming system is greater in the savannaswhere rainfall is less and soil fertility is low. Cowpea varietieswith higher grain yield, early maturity, and resistance toseveral diseases and insect pests have been released in severalcountries. These are being grown over larger areas thanbefore, in different zones (ranging from the arid to the humidzones) and in both dry and wet seasons. Although Africa plantsthe largest area at 8.9 million of the 9.1 million ha plantedworldwide, cultivation is mainly under traditional systems and ittherefore has the lowest average yield (Ajeigbe*et al*., 2010).

In a general survey of cropping systems in West and CentralAfrica from 1988 to 1990 covering: Nigeria, Benin Republic,Niger Republic, Togo, Cameroon, and Burkina Faso, (Singh, 1994) identified 15 major cropping systems, in addition toseveral others which vary from farmer to farmer. In Guinea savanna zone of Nigeria, Kwara state inclusive, cowpea is intercropped primarilywith maize (*Zea mays*), cassava (*Manihotesculenta*crantz),yam (*Dioscorearotundata*), groundnut (*Arachishypogaea*)and soybean (*Glycine max*). In the NGS of Nigeria, especially Niger and Kwara state, cowpeais intercropped with maize, sorghum (*Sorghum bicolor*)and/or groundnut. The density of cowpea plants is very low(1000–5000 hills/ha) and the cowpea is interspersed amongthe companion crops. The system

varies from alternaterows of maize and sorghum to alternate hills of maize andsorghum or two rows of maize to one row of sorghum or viceversa, depending on the farmers' food preference and marketdemand. Soybean or groundnut may replace any of the cerealsor cowpea(Ajeigbe*et al*., 2010).Within-ridge spacing for cereals ranged from 25 to100 cm, and from 40 to 100 cm for cowpea. Groundnut andsoybean were generally planted closely, at about 20 cm withinthe ridge. Weeding was done manually with the aid of a short handled hoe and sometimes with a bullock-drawn ridger orcultivator. Weeding was done twice or three times, dependingon the weed situation and the availability of labour. Harvestingwas done when the pods/panicles were dry.

2.4 Utilization of Cowpea as a Measure of Food Security

In traditional households, dry beans (cowpea), are boiled, fried, or baked to be in soups eaten as vegetables or combined with other protein foods to make a main dish (Muhammad and mark, 2013). Hence, harvested dry seeds can be grounded into slurry to make cowpea cake (allale) or deep fried into bean balls (kosai, akara) or boiled in water and give products black in color (danwake) eaten with oil and pepper or seeds. Furthermore, it could be boiled together with rice, maize (corn) then, mixed with sauce or stew. Also the tender shoot tips and leaves of cowpea can be consumed as soon as the plants reach the seedling stage and immature pods and can be consumed during the fruiting stage (Fery, 2002). Beans and maize in blended dishes are embedded throughout Latin America cultures and transcend to other groups of people. It is due in part to the inherent complementation of amino acids resulting in a more complete protein food. Sub-Saharan Africa utilizes a wide range of dry beans and other legume crops (Muhammad and mark, 2013).

The subcontinent of India uses the greatest quality and must diversify of legume-based food. These are characteristically prepared and processed in very specialized recipes and forms (Khader and Uebersax, 1989). In many developing regions, Nigeria inclusive, women provide a central role focused on surrounding the family's food security. Traditional cooking of dry edible beans in these countries involves excessive expenditure of time and fuel.

Global food security continues to be a world–wide concern. Bean contribute significantly to world food supplies and food intake .the importance of agricultural research for crop improvement and enhanced utilization of dry beans and pulses is evident through the scale and diversity of programs.According to the consultative Group on International Agricultural Research (GIAR, 2011) on impressive gains have been made with improved common beans, developed with farmer's participation through regional network in East, central and southern Africa for instance a 30-50% yield increase from1995 - 2010. This improved cowpea (beans) production, while strengthening household food and nutrition security. Also provides women with surplus grain to sell in local markets. In the United States, the USAID (Agency for international development) has long played a role in the dry beans and pulses improvement program globally. Significant impact has been achieved through the collaborative research support program (CRSP) efforts on dry beans, cowpea and pulses. Current research are increasing pulse/beans productivity through genetic improvement, increasing pulse/beans productivity through integrated crop management, increasing pulse/beans utilization for improved nutrition and health, and strengthening pulse value chains (USAID, 2012).

To buttress this, numerous other countries through their international development agencies emphasize the support similar research programs on beans improvement. Selected agencies include the Australian agencies for international development (AUSAID), Canadian international development agencies (CIDA), the German agencies for international cooperation (GIZ), Japan international cooperation agencies (JICA) an the department for international development (DFID, United kingdom).

The total food aid provided by the United States to other was 2,643,900 metric tons in 2010. It is noted that the average US contribution of total world food aid per year was57.4%, followed by 26.7% by the European Union – EU27 (26.7%), Japan (5.8%), Canada (5.4%), and Australia (2.8%). Other countries total amounted to 2% (Hanrahan and Canada, 2011).

The United States also led world food program contributors (a 45.2% share), followed by EU-27 (28.7%) Japan (5.7%) and all other countries (20.4%) (Hanrahan and Canada, 2011), Dry beans constituted about 8% of the total US food aid with 209,200metric tone that include dry beans, lentils, and peas (USDA- FAS 2010); It is noted that most of the total food is derived from cereal grains (>50%).

2.5 Nutritional Value of Cowpea

Legumes are a good source of protein, dietary fibre and starch (Osorio-Diaz et al 2003), minerals and vitamins (Kutos*et al.,* 2002). In comparison to cereal grains, cowpea is relatively high in proteins and dietary fiber while low in fat and has relatively reduced carbohydrates (USDA, 2012).The nutritional value of cowpea is in the composition of its grain. The grain is rich in protein up to around 30% in some

varieties. In addition, the grain contains micronutrients such as iron and zincs which are necessary for healthy living (Boukar*et al.,* 2010). It is for these reasons that, societies endowed with cowpea have evolved different ways of utilizing the grain for food, perhaps the coinage of 'namantalaka' (poor man's meat) by the Hausas of west and central Africa points to the perception about the nutritional attributes of cowpea grains.

All parts of the cowpea are used for food. The leaves, green pods, green peas and the dry grains are consumed as different dishes. These parts are nutritious, providing proteins, vitamins and minerals especially micronutrients. The grains are rich in the amino acids: lysine and tryptophan making it better than cereals. This makes cowpea a good supplement for cereal; root and tuber based diets characteristics of many costal and forest communities (ishiyaku, 2012). It is the food value of the grain and cowpea pod that gives economic value to the crop.

The cowpea hay on the other hand provides good fodder that significantly supports the livestock industry especially that of dry savannas of west and central Africa. The combination of food and fodder potential of cowpea has resulted in a stable food security drive in many parts of the globe.

2.6 Hygiene and Health Significance of Cowpea

A diet high in beans can potentially reduce the risk of chronic disease (Wu *et al.*, 2004). Chronic diseases are conditions that typically take many years (10-30years) to develop and include certain types of cancers, type II diabetes mellitus, heart diseases

and other diseases of the blood system. These diseases are the most common cause of death in many parts of the world (Bennik, 2002).

In the growing phase of urbanization in developing countries, ready-to-eat foods plays a major role in the food consumption pattern ,and moreover, traditional methods of preparation are generally labour and time intensive and certainly unsuitable for urban settings where time is very often a major constraint(Njintang*et al.,* 2001).It has been discovered that the inclusion of dry beans and legumes in the daily diet has many beneficial effects in controlling and preventing various metabolic diseases such as diabetes mellitus, coronary heart disease and colon cancer (Dilis and Trichopoulou, 2009).

Recently heightened consumer awareness has led to the promotion of less saturated fat, cholesterol, sugar and salt in the diet and the preference for complex carbohydrate such as fibre. No single food outside the context of the total diet should be recommended exclusively. However, dry beans can be promoted as a healthy food, being nutrient dense and as excellent source of dietary fibre (USDA, 2012).The potential protective effects of cowpea (beans) in disease prevention, such as against cancer , may not be entirely due only to dietary fibre but also to phenolics and other non-nutritive compounds (Oomah*et al*., 2006). As polyphenols from dry beans can act as antioxidant, hindering the formation of free radicals (Boateng*et al.*, 2008).

The role of legumes as a therapeutic agent in the diet of persons suffering from metabolic disorders has also been reported by (Pittaway*et al* 2008). The large amount of water-soluble fibre is particularly effective in hindering cholesterol in the blood, whereas the water –insoluble fibre provides bulk, pushing food through the digestive

system at a faster rate. Common beans cowpea is low in sodium (Buttriss and Stokes, 2008) this could be a healthy food choice for persons on low sodium diet. Regular consumption of dry beans in developed nation like the United States where reported cases of obesity is on the rise, has been suggested to significantly improve the diet Quality (Mitchell *et al*., 2009)

2.7 Constraint to the Utilization of Cowpea

Several factors limit the utilization of leguminous crop, including the long soaking and cooking times necessary to adequately soften the beans, loss of valuable nutrient during bean preparation, low level of the sulfur amino acids, low digestibility of unheated protein, presence of antinutrients (e.glectins, trypsin inhibitors), high level of phytric acid, vorions flatulence factors, and hard shell and hard – to – cook (HTC) defect that many develop during dry beans storage (Alonso *et al.,* 2000; Lajolo and Genovese, 2002).

Typically, beans are harvested in the mature dry stage and stored until processed. Chemical changes the occur during adverse storage conditions may result in the development of HTC phenomenon. Numerous factors influence the quality of the final dry beans product. These include cultivar, seed source, agronomic conditions, handling and storage of the dry product, and processing procedure during cooking and canning quality changes in dry beans during cooking and processing are associated with their inherited physical component and chemical constituent (Vebersax*et al.*, 1991).

A comprehensive assignment strategies and procedures used for processing cowpea is a prerequisite to improved utilization of cowpea. Implementation of a given protocol can be maximized through an understanding of the physical and chemical components, and the inherent constraints and diversified processing techniques available to develop economically viable alternative and innovative products.(Vebersax*et al*., 1991).

Improved utilization of dry beans can be maximized through an understanding of how physical and chemical component function and result under given process condition. Variability in the physico-chemical component of dry beans occurs, which warrant research and quality control programs toward pounding a consistent product processing and characteristics of acceptable flavor, bright colour, alternative appearance uniform texture and high nutritional quality.

2.8 Analytical Framework

2.8.1 Profitability analysis

This involves estimation of costs and returns of production. Gomez (1975) developed a farm level model to evaluate alternative cropping mixtures and patterns. These involves as follows: (i) profitability: this is measured as the differences between value of yield and cost of production, and (ii) Net return: this involves the difference between value of yield and cost of inputs, including hired labour. In choosing economic indicators on the basis of production factors affected by potentials innovation Werner (1993) suggested the use of the following: (i) the gross margin and returns to variable cost, where only capital is affected. (ii) Yield/labour ratio, where only labour is affected, and (iii) Gross margin, return to variable costs and monetary return to labour, where capital and labour are affected.

The major problems associated with cost-return analysis as basis for profitability assessment are: (i) It does not indicate the relative importance of each of the resources in production and (ii) It is location bound and specific in applicability due to use of money as the common unit of measurement and the prevailing price for estimates. Gomez (1975) said that in spite of the limitations, cost-return analysis is a useful tool of enterprise comparison and indicating a 0profitability pattern of aggregate input use.

Profitability of Cowpea Production

Despite the fact that little is known about profitability of cowpeas production in Zambia, there are still some studies that suggest cowpea production is profitable. For example a study that was carried out on the value chain ofcowpeas in Kano State in Nigeria suggested that cowpea vending is a profitable business and greater profits could be achieved by enlarging the scale of operation (Ibro,2008). These vendors are part of the supply chain of cowpeas in kuto and they were found to be profitable, however this study did not determine the profitability of farmers who produce and supply the cowpeas. Mishili (2009) also suggested that pulses have high market value in his study on the value of pulseproduction in West Africa. (Deboer, 2004) in the CRSP report on beans and cowpeas encouraged farmers to grow these pulses one of the reasons being their high market value. These studies all suggest that cowpea production is profitable but they did not consider the factors that influence profitability of cowpeas production. 2.3 Factors that Affect Profitability There are many factors that may have an effecton profitability of any enterprise. In crop production most of the factors thataffect profitability are the production costs, farm gate price, fertilizer usage, seed variety, tillage methods, labour, land tenure, power sources, extension services, remittances and farmer characteristics. Most of these

factors have been considered in many studies on profitability (Esther, 2011). Some studies find some of these factors to have significant effect on profitability were as other studies find that these factors have insignificant on the profitability. For instance a study that was done on the profitability of sorghum in Tanzania found that the farm size, production costs, farm location, interaction between production costs and farm gate price as well as the interaction between the varieties used and fertilizer applied were significant. Surprisingly, farm size was negatively influencing the gross margin contrary to the literature. However, the interaction between Production cost and farm gate price was positive and significant while farm gate price alone was not significant. In addition, the variety used, application of fertilizer and tillage method were not significant but the interaction betweenvariety used and fertilizer application was positive and significant. (Erbaugh, 2008). In the reviewed literatures some factors were common in affecting profitability of each of these enterprises; howeversome of the factors were specific in affecting a particular crop. Thus these factors affect the profitability indifferent ways depending on the enterprise in question.

2.8.2 Stochastic Frontier Analysis

The stochastic frontier production function is a method of economic modelling. It has its starting point in the stochastic production frontier models simultaneously introduced by Ogundari (2006), Rahman and Umar (2009), Thomas (2007), Emokaro and Ekunwe (2009) and others which derived from the error model of Aigner*et al*. (1977) and Meeusen and Van den Broeek (1977). The stochastic frontier production function is specified as:

$$Y_i = f(x_i.\beta) + e_i \quad \ldots\ldots 1$$

$e_i = v_i - u_i$ 2

Where:

Y_i = quantity of output of the i^{th} farm

x_i= vector of the inputs used by the i^{th} farm

β = a vector of the parameters to be estimated

e_i = composed error term

v_i= random error outside farmer's control

u_i =technical inefficiency effects

$f(x_i, \beta)$ = a suitable function of the vector

This according to Ogundari (2006), it has been used by many empirical studies, particularly those relating to agriculture in developing countries and also that the functional form meets the requirement of being self-dual (allowing an examination of economic efficiency):

$\ln Y = \beta o + \beta_1 \ln X_1 i + \beta_2 \ln X_2 i + \beta_3 \ln X_3 i + (Vi-Ui)$ 3

where,

ln = the natural logarithm

Y = output of cowpea (ha)

βo = constant term

β_1- β_3 = regression coefficients

X_1 = quantity of seed (kg)

X_2 =quantity of fertilizer (kg)

X_3 = total labour used (man days)

X_4 = quantity of agrochemical (litres)

Vi = random variability in the production that cannot be influenced by the farmer.

U_i = deviation from maximum potential output attributable to technically inefficiency.

The inefficiency of production, U_i was modelled in terms of the factors that are assumed to affect the efficiency of production of farmers. Such factors are related to the socio-economic and management variables of the farmers. The determinant of technical inefficiency is defined by:

$U_i = \delta_0 + \delta_1 1nZ_1 + \delta_2 lnZ_2 + \delta_3 lnZ_3 + \delta_4 lnZ_4 + \delta_5 lnZ_5 + \delta_6 lnZ_6$ 4

where,

U_i = inefficiency effects

Z_1 = Age of farmer (years)

Z_2 = Household size (number)

Z_3= Education (years)

Z_4 = Amount of credit (amount of credit obtained)

Z_5 = Access to extension services (number of times have contact)

Z_6 = farm income (Naira)

δ_0 = constant

δ_1-δ_6 = Parameters to be estimated.

These variables are assumed to influence technical efficiency of the cowpea farmers. The gamma ($\gamma = \sigma^2 \mu / (\sigma 2 \mu + \sigma \nu)$ which is the ratio of the variance of U $\sigma^2 \mu$ to the sigma squared ($\sigma^{2)}$ which is a summation of variances u and v of U and V ($\sigma^2 = \sigma^2 \mu + \sigma^2 \nu$) were also determined.

On the other hand, u_i is a non negative truncated half normal random variable associated with farm- specific factors which lead to the ith farm not attaining maximum efficiency of production. U_i is associated with technical inefficiency of the farm and ranges between zero and one. $U_i$follows an independent and identical half-

normal distributed N ($0.\delta^2u$). N represents the number of the farms involved in the cross-sectional survey. According to Bakhsh (2007), stochastic frontier production function model is estimated using the maximum likelihood estimation procedure (MLE).

The stochastic frontier cost function is defined by:

$C = F(Wi, Yi; \alpha)\ expeii = 1,2\ \ldots.n$ ----------5

Where,

C = Represents the minimum cost associated with cowpea production

W= Vector of input prices

Y = cowpea output

α = Vector of parameters

ei = Composite error term

Using Sheppard's Lemma we obtain

$\frac{\partial C}{\partial Pi} = Xi\ (W, Y; \alpha)$ ---------- 6

This is a system of minimum cost input demand equations (Bravo –Ureta and Evenson, 1994; Xuand Jeffrey, (1995) and Bravo-Ureta and Pinheiro, (1997). Substituting a farm's input prices and quantity ofoutput in equation (6) yields the economically efficient input vector Xc.. With observed levels of outputgiven, the corresponding technically and economically efficient costs of production will be equal to X_{it}PandX$_{ie}$, respectively. While the actual operating input combination of the farm is Xi P. The three costmeasures can then be used to compute the technical (TE) and economic efficiency (EE) indices as follows;

$TE = (X_{it}. P) / (X_i.P)$ ----------7

$EE = (X_{ie}.P) / (X_i.P)$ ----------8

The combinations of equations (7) and (8) is used to obtain the allocative efficiency (AE) index followingFarell (1957)

$AE = EE / TE = (X_{ie}.P) / (X_i.P)$ ----------9

The efficient production is represented by an index value of 1.0 while the lower values indicate agreater degree of inefficiency. Using the method by Bravo-Ureta and Pinheiro, (1997) which was based onthe work of Jondrow*et al* (1982), efficiency can then be measured using the adjusted output as shown inequation (10)

$Y^* = f(Xi; \beta) - u$ ---------- 10

Where U can be estimated as

$$E(ui / \varepsilon i) = \frac{\sigma \lambda}{1 + \lambda^2} \left[\frac{f^*(\varepsilon i\lambda / \sigma)}{1 - f^*(\varepsilon i\lambda)} - \Sigma i\lambda \right] \quad \ldots\ldots 11$$

Where

f* (.) and f* (.) are normal density and cumulative distribution functions respectively,

$\lambda = \sigma u / \sigma v$

$\varepsilon = Vi - Ui$ and

Y* is the observed output adjusted for statistical noise

When εi, σ and λ estimates, are replaced in equations (9) and (10), it will provide estimates for U and V. Theterm V is a symmetric error, which accounts for random variations in output due to factors beyond thecontrol of the farmer e.g. weather, disease outbreaks, measurements errors, etc. The term U are non negative random

variables representing inefficiency in production relative to the stochastic frontier. The randomerror Vi is assumed to be independently and identically distributed as N(o, δv^2) random variablesindependent of the Uis which are assumed to be non-negative truncation of the N(o, δu^2) distribution (i.e.half-normal distribution) or have exponential distribution.

2.9 Related Studies on Efficiency using Non Parametric Methods

Non parametric methods of determining efficiency have been used in many countries. For instance, Helfand and Levine (2000) explored the determinants of technical efficiency and the relationship between farm size and efficiency, in the Center-West of Brazil. The efficiency measures were regressed on a set of explanatory variables which included farm size, type of land tenure, composition of output, access to institutions and indicators of technology and input usage. The relationship between farm size and efficiency was found to be non-linear. Efficiency was first falling and then started rising with farm size. The type of land tenure, access to institutions and markets, and modern inputs were found to be important determinants of the differences in efficiency across farms.

Rios and Shively (2005) also looked at the relationship between farm size and efficiency. They focused on the efficiency of smallholder coffee farms in Vietnam on which the two stage analysis approach was used. In the first step, technical and cost efficiency measures are calculated using DEA. In the second step, Tobit regression was used to identify factors correlated with technical and cost inefficiency. Results indicated that small farms were less efficient than large farms and inefficiencies observed on small farms appeared to be related, in part, to the scale of investments in

irrigation infrastructure. Shafiq and Rehman (2000) studied the extent of resource inefficiencies in cotton production in Pakistan‟s Punjab. The study identified significant levels of both technical and allocative efficiency. However both the interpretation of the farm level results generated and the projection of the results to a higher level require care because of the technical nature of the agricultural production process.

Fletschner and Zepeda (2002) determined efficiency levels at a higher level. They looked at efficiency at regional and national levels. Three regions were selected to represent distinct production system and social economic conditions. The results indicated high level of technical efficiency across the region but low levels of allocative and scale efficiency. Factors affecting efficiencies included employment opportunities, access to credit, market and extension services.

From the above literature is clear that DEA has gained considerable ground in Agricultural Economics. Most studies using non parametric methods have focused on other agricultural crops but not maize which is an important crop for most African countries. The few studies that have looked at maize only looked at technical efficiency and not allocative efficiency.

CHAPTER THREE

METHODOLOGY

3.1 The Study Area

The study was conducted in Kwara State. The State is located in the North-Central geopolitical zone of Nigeria and covers a total land area of about 32500 square kilometers with a total land size of 3,682,500 hectares 247,975 farm families with majority living in the rural areas (National Population Census, 2006). The state share boundaries with Ekiti, Oyo and Osun States in the south, Kogi State in the east and Niger State in the north. It also has international border with the Republic of Benin along the in North-Western part (KWADP, 2006).

Kwara State is stratified into four Agricultural Zones by Kwara State Agricultural Development project (KWADP). The zones are: Zone A (Baruten and Kaiama Local Government Areas); Zone B (Moro, Edu and Patigi LGAs), Zone C (Asa, Ilorin East, Ilorin West and Ilorin South LGAs) and Zone D (Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero LGAs). The state is located between latitudes 70^0 45^0N and 90^0 30^0 N and longitude 20^0 30^0 E and 60^0 25^0E with a topography that is mainly plain land slightly gentle rolling.

The vegetation which is mainly woodland Guinea Savanna is well suited for the cultivation of a wide variety of staple crops like cassava, maize, cowpea, fruits and vegetables. Rice and sorghum are significant cash crops (Fakayode, 2008). The state has a population of about 2,365,353 people in 2006 according to (NPC, 2006). This is projected in 2012 to be 2,857,420 representing 3.2% annual growth rate in population and an average density of 88 persons per square kilometer (NPC, 2006; KWADP, 2011).

3.2 Sampling Procedure and Sample Size

A multistage sampling technique was used to select respondents for this study. The first stage involved a purposive selection of three (3) local governments areas based on predominance of cowpea production among the farmers. Secondly, nine (9) villages were purposively selected, three from each of the Local Government Areas based on predominance of cowpea production. Finally, a simple random sampling was used in selecting farmers from each of the villages. Ten percent (10%) of the sample frame (1680 farmers) was used as the sample size. In all, 168 farmers was randomly selected.

Table 1: Distribution of cowpea farmers in the Study Area

LGA's	Villages	*Sample frame	Sample size (50%)
Moro	Manlete	310	31
	Bode Saadu	220	22
	Oloru	140	14
Ilorin East	OkeOyi	210	21
	Iponrin	170	17
	OkeOse	120	12
Ilorin South	Fufu	160	16
	Ganma	200	20
	Tanke	150	15
Total		1680	168

* Source: Kwara State Agricultural Development Project (KWADP), 2013

3.3 Data Collection

Primary data were used for this study. These were collected with the aid of structured questionnaire. The information collected include areas on farmer's socio-economic characteristics such as age, household size, educational status, amount of credit received, number of extension contacts, years spent on the cooperative, income; production information; level of inputs used and output in cowpea production; and constraints faced by the farmers in cowpea production.

3.4 Analytical Techniques

The tools of analysis used include: Descriptive Statistics, Net Farm Income and Stochastic Production Function

3.4.1 Descriptive Statistics.

Descriptive statistics was used to achieve objective (i) and (vi) of the study. It involves the use of measures of central tendency such as mean, frequency distribution and percentages to describe the socio-economic characteristics of cowpea farmers in the study area, that is objective (i), and the constraint confronting the cowpea production, objective (vi).

3.4.2 Net farm income

The Net Farm Income (NFI) was used to achieve objective two (iv). It was used to estimate the cost and return of cowpea production. The formula for net farm income is stated as follows.

NFI= TR-TC**…….....**12

Where

NFI= net farm income (₦)

TR= total revenue (₦)

TC= total cost of production (₦)

TC= TVC+TFC

TVC= Total Variable Cost (₦)

TFC= Total Fixed Cost (₦)

Decision Rule

RNI > 1, It implies there is profit in production.

RNI =1, the farmers is at breakeven

RNI< 1,the farmer is at loss

3.4.3 StochasticFrontierProduction Function Analysis.

The stochastic production function was used to achieve objective iii. The stochastic production function is specified as:

$Y_i = f(x_i.\beta) + e_i$……14

$e_i = v_i - u_i$……15

Where:

Y_i = quantity of output of the i^{th} farm

x_i= vector of the inputs used by the i^{th} farm

β = a vector of the parameters to be estimated

e_i = composed error term

v_i= random error outside farmer's control

u_i =technical inefficiency effects

Stochastic Frontier Model used in the study is specified as:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 i + \beta_2 \ln X_2 i + \beta_3 \ln X_3 i + \beta_4 \ln X_4 i + \beta_5 \ln X_5 i + \beta_6 \ln X_6 i + (Vi - Ui) \ldots\ldots 16$$

Where,

ln = the natural logarithm

Y = output of cowpea (kg)

β_0 = constant term

β_1- β_3 = regression coefficients

X_1 = quantity of seed (kg)

X_2 =quantity of fertilizer (kg)

X_3 = total labour used (man days)

X_4 =land

X_5 =insecticide

X_6 =herbicide

Vi = random variability in the production that cannot be influenced by the farmer.

U_i = deviation from maximum potential output attributable to technically inefficiency.

$$U_i = \delta_0 + \delta_1 1n Z_1 + \delta_2 \ln Z_2 + \delta_3 \ln Z_3 + \delta_4 \ln Z_4 + \delta_5 \ln Z_5 + \delta_6 \ln Z_6 \ldots\ldots\ldots\ldots\ldots\ldots 17$$

Where:

U_i = inefficiency effects

Z_1 = cowpea farmer experience (years)

Z_2 = household size (number of persons)

Z_3 = formal education (years)

Z_4 = amount of credit obtained (₦)

Z_5 = access to extension services (number of extension contact/period)

Z_6 = membership of cooperative society (years)

δ_0 = constant

δ_1-δ_6 = Parameters to be estimated.

Stochastic Frontier Cost Function (Allocative Efficiency) Model used in the study is specified as:

$C = F(W_i, Y_i; \alpha)$ expei i = 1,2 ….n **……18**

Where:

C = Represents the cost associated with cowpea production

W= Vector of input prices

Y = Cowpea output

α = Vector of parameters

ei = Composite error term

The explicit form of stochastic frontier cost function is specified as:

$\ln C = \beta_0 + \beta_1 \ln X_1 i + \beta_2 \ln X_2 i + \beta_3 \ln X_3 i + (Vi + Ui)$**……19**

Where,

ln = the natural logarithm

C = Total cost of output (₦)

X_1 = cost of seed (₦)

X_2 = cost of fertilizer (₦)

X_3 = cost of labour (₦)

β_0 = constant term

β_1- β_3 = regression coefficients

Vi = random variability in the production that cannot be influenced by the farmer.

U_i = deviation from maximum potential output attributable to technically inefficiency.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1.0 Socio-Economic Characteristics of Cowpea Farmers

In this section the general socio-economic characteristics of cowpea farmer's is provided. These include age, educational level, household size, extension contact, cooperative association, farming experience and amount of credit received.

4.1.1 Age distribution of cowpea farmers

Age is very important in agricultural production activities because age has a significant influence on the decision making process of farmers with respect to adoption of improved farming technologies and other production-related decisions. The result in Table 2 revealed that 32% are between the ages of 30-39 while about 26% are between the age of 40-49 years of age. This shows that about79% of the cowpea farmers are less than 50 years of age. The mean age of the farmers was 40. This implies that, the farmers are strong, agile, and active and can participate adequately in farming activities. The age distribution is expected to have positive influence on the respondent's participation in cowpea production generally, which invariably means better efficiency in production. This finding is similar to that of Adegboye (2011) which observed that youth constitute the majority of the sorghum farmers in the study area.

Table 2: Age distribution of cowpea farmers

Age (years)	Frequency	Percentage (%)
<20	5	3.0
20-29	30	17.9
30-39	54	32.1
40-49	44	26.2
50-59	22	13.1
60-69	10	6.0
≥70	3	1.8
Total	168	100
Mean	**40**	
S. E	0.929	

4.1.2 Formal educational level of cowpea farmers

The result in Table 3 show that 49% of cowpea farmers had no formal education, while51% of the respondent had one form of education or the other from primary education to tertiary education. This indicate that the farmers educational level is high which implies that farmers in the study area would be better exposed to more reliable information sources and will greatly influence the decision making in the farm production activities because educated farmers are better adopters of agricultural innovations and tend to have higher yields and income from cultivable areas. Training and education will enhance movement into more remunerative non-farm employment, increase household income and propels people out of poverty. This finding is in line with Abdulrahman*et al*. (2015),who pointed out that education has a positive and significant impact on farmers' efficiency in production. Thus, literacy level will

greatly influence the decision making an adoption of innovation by farmers, which may bring about increase in productivity.

Table 3: Distribution of cowpea farmers according to level of formal education

Education	Frequency	Percentage
No formal education	82	48.8
Primary education	43	25.3
Secondary education	27	16.1
Tertiary education	16	9.5
Total	168	100

4.1.3 Household size distribution of cowpea farmers

The result of the study in table 4 revealed that majority (87%) had between 1-10 household sizes, about 10% had between 11-20 household sizes. The mean household size was 6. The implication is that relatively large household size may likely enhance the family labour supply on the farms, hence supporting favourably, productive capacities of the farmers already enhanced by their age. This corroborate with the findings ofAdewale*et al.* (2005)that the larger the household size, the higher the likelihood of sustainable labour efficiency on farmers' farm, given the constant labour supply.According to the report ofOluwatayo*et al.* (2008),there is a positive and significant relationship between household size and farmers' efficiency in production. However, the absolute number of people in a certain family cannot be used to justify the potential for productive farm work. This is because it can be affected by some important factors namely; age, sex and health status. Essentially, it is the composition

of the household that determine labour supply for the accomplishment of farm operations.

Table 4: Distribution of cowpea farmers according to household size.

Household Size	**Frequency**	**Percentage**
1-10	146	86.9
11-20	17	10.1
21-30	4	2.4
≥30	1	0.6
Total	168	100
Mean	**6**	
S. E	0.417	

4.1.4 Extension contacts of cowpea farmers

The ultimate aim of extension services is to enhance farmers' ability to efficiently utilize resources through the adoption of new and improved methods used in cowpea production instead of using traditional methods which are inefficient, resulting to low yield.

The result in Table 5 revealed that majority (about 71%) of the respondents had no contact to extension services; about 28% had contact of between 1-3numbers of contacts while about 1% had contact of ≥ 3. The finding shows that the extension contact was very low among the respondents.This implies that extension services of the cowpea farmers' will to a certain extent affect their ability to efficiently utilize resources through the adoption of new and improved methods used in cowpea production in the study area.

Table 5: Distribution of cowpea farmers according to extension visit

Extension visit	**Frequency**	**Percentage**
No contact	119	70.8
1-3	47	28.0
4-6	2	1.2
Total	168	100
Mean	**1**	
S. E	0.068	

4.1.5 Cooperative association

The results in Table 6 revealed that majority (83%) of the cowpea farmers haveno cooperative association at all. The average years of membership of cooperative society was 2 years. The effect of this result is that most of the cowpea farmers in the study area do not enjoy the assumed benefits accrued to co-operative societies through pooling of resources together for a better expansion, efficiency and effective management of resources and for profit maximization.According toIdiong*et al*. (2007), membership of cooperative offers the farmers opportunities of sharing information on modern rice practices. This implies the cooperative society is not new among the respondents but that cowpea farmers did not have or participate in any association. Membership of clubs, association or cooperatives gives a farmer the opportunity of not only obtaining credit and agricultural inputs alone but also provides information on how to improve his farming activities.

Membership of cooperatives influences adoption of improved technologies resulting in higher productivity and poverty alleviation (Amaza*et al*. 2009). Membership of a cooperative enables farmers to interact with other farmers, share their experiences and

assist themselves. Interaction of farmers with other farmers is an avenue through which innovation diffusion can occur.

Table 6: Distribution of cowpea farmers according to years of Membership of Cooperative Association

Cooperative association	**Frequency**	**Percentage**
Non Member	149	83.3
1-5	16	9.5
6-10	7	4.2
11-15	3	1.8
16-20	2	1.2
Total	168	100
S. E	0.386	
Mean	**2**	

4.1.6 Farming Experience Distribution

Experience influences individuals' perception and understanding of the management requirements and consequently improve farm produce. Farming experience is another important socio-economic factor that can bring about increase in productivity.

From the result in table 7, it was found that about 71% of the cowpea farmers had between 1-20 years of farming experience, while about 27% had greater than 21-40 years of farming experience and jut about 1% had more than 40 years of farming experience. The mean farming experience is 17 years with a minimum 4 years of and a maximum of 41 years of farming experience. Farming experience is used as a measure of management ability, the more experience the farmer is, the more his ability to make farm decision. This result showed that most of the respondents had

long years of farming experience, implying that such farmers are likely to make decisions that would increase their output and income. This finding is in accordance withAdebayo (2006), who noted that the longer a person stays on a particular job, the better his job performance tends to be. The result suggests that job performance in cowpea production would be better under long years of experience. This finding is also in tandem with the findings of Kebbeh*et al*. (2003).

Table 7: Distribution of cowpea farmers according to farming experience

Farming Experience (years)	**Frequency**	**Percentage**
1-10	46	33.7
11-20	73	38.6
21-30	36	20.5
31-40	12	6.6
≥40	1	0.6
Total	168	100
Mean	**17**	
S. E	0.643	

4.1.7 Amount of Credit Received

Adequate funding is required by farmers to finance their production and marketing activities. The results presented in Table 8 indicate that majority (61%) of the cowpea farmersfinanced their production from personal savings which is not mostly adequate for production activities that is why they are mainly small-scale farmers which in turn reduce their level of profit efficiency, while about 38% had credit of less than 50000. The low level of credit is attributed to the fact that most of the cowpea farmers are not

in cooperative where they will be given credit so easily and also formal financial institutions don't normally grant loan easily.

Table 8: Distribution of cowpea farmers according to credit obtained

Amount (₦)	**Frequency**	**Percentage**
Personal saving	102	60.7
1-50000	63	37.5
50001-100000	3	1.8
100001-150000	0	0.0
Total	168	100
Mean	**7491.02**	
S. E	1066.86	

4.2 Costs and Returns of Cowpea Production

Summary statistics of input and output realized

The summary statistics of level of inputs used and output realized in cowpea production in the study area are reported in Table 9. The inputs that were used in cowpeaproduction include; land, seed, fertilizer, insecticides and labour. Table 9 revealed the mean farm size was 2.30 hectares. The minimum and maximum land areas were 0.1 ha and 8 ha, respectively. The average quantity of seed used by cowpea farmers was 213.24 kg/ha. The minimum and maximum seed used were 45 kg/ha and 350 kg/ha, respectively. Average fertilizer used by cowpea farmers was 186.82 kg/ha while the minimum and maximum were found to be zero and 247 kg/ha, respectively. The mean herbicides used was 3.27 L/ha while the minimum and maximum were zero and 12 L/ha respectively. The mean labour recorded was 28.33 man-days while the minimum and maximum were observed to be 8.5 mandays/ha and 107 mandays/ha,

respectively. This shows that agricultural production in the study area is of small scale and labour intensive.

Table 9: Summary of input utilized and output realized in cowpea production

Variables	Mean	Std. Dev.	Min	Max
Seed kg/ha	213.24	146.76	45.00	350.00
Fertilizer kg/ha	186.82	219.43	0.00	247.00
Insecticides l/ha	3.27	9.57	1.00	12.00
Labour man /ha	28.33	13.78	8.50	107.40
Yield kg/ha	496.70	970.82	250.00	8300.00

4.2.1 Cost of Cowpea Production

Cowpea seed used by the farmers in the study area were mainly unimproved seeds taken from the last harvest. The quantity of cowpea seed is 213.24kg/ha with an average market price of ₦120 per kg was used and this constitutes 40.6% of the total cost of production. The average quantity of fertilizer is 186.82 kg/ha with an average market price of ₦100 per kg was used and this constitutes 29.7% of the total cost of production. The quantity of herbicides is 3.27 L/hawith an average market price of ₦900/l was used and this constitutes 4.6% of the total cost of production. Labour costs consisted of cost of land preparation, planting, fertilizer and insecticides application, weeding and harvesting. The family labour was computed on the basis of opportunity cost in man-days. The wage rate varied according to farm operation performed. An average wage rate of ₦400 per man-day was used, giving the average labour cost per hectare to be ₦11332.00 and this constitutes 18% of the total cost of production, while the total cost of fixed inputs (cost of renting land and depreciation

of tools) incurred on cowpea production was ₦4,423 and this constitute 7.1% of the total fixed cost

Table 10: Average costs and returns per hectare of cowpea production

Variables	Unit price	Quantity	Values/ha (₦)	% Cost
Variable cost				
seed (kg)	120	213.24	25,588.80	31.2
fertilizer (kg)	100	186.82	18,682.00	22.8
insecticides (L)	900	3.27	2,943.00	3.6
labour (man-days)				
Land preparation	800	6.20	4,960.00	6.0
Planting	400	4.00	1,600.00	1.9
Fertilizer application	300	3.00	900.00	1.1
Insecticide application	600	2.00	1,200.00	1.5
Weeding	400	16.50	6,600.00	8.0
Harvesting	800	5.50	4400.00	5.4
Total variable cost			78205.80	
Fixed costs				
Cost of renting land			3243.00	
Depreciation of tools (hoe and cutlass)			648.00	
Total fixed cost			3891.00	
Total cost			82,096.8	100
Total Revenue	182	496.70	90,399.40	
Net Farm Income			8,302.60	
Return to Investment			1.10	

4.2.2 Returns to Investment in Cowpea Production

Results presented in Table 10 indicated that the total revenue (TR) was ₦90,399.40while the total cost (TVC + TFC) is ₦82,096.8. The net farm income is therefore ₦8,302.60. The average rate of return to investment (return per naira invested) was 1.10, indicating that for every ₦1 invested in cowpea production in the study area; a profit of 10 kobo was made. Thus, it could be concluded that cowpea production in the study area is profitable by returning 10 kobo for every naira invested.

4.2.3 Test of hypothesis I

The null hypothesis (H_o) which stated that cowpea production in the study area is not profitable was tested using t-test (Table 11). The result an average cost was ₦46546.67 and average return was ₦7098.21.The calculated t-value was 19.68 and exceeds the critical value (t-critical two tail) of 1.97, therefore $H_o$is rejected at 5% level of significance. The result of the analysis indicates that cowpea production is profitable in the study area.

Table 11: t-test result of profitability of cowpea production in the study area.

Variable	Average cost	Average return
Mean	46546.66667	7098.214
Variance	670301255.9	4742452
Observations	168	168
Pooled Variance	337521853.9	
Hypothesized Mean Difference	0	
Df	334	
t Stat	19.68	
P(T<=t) one-tail	4.30	
t Critical one-tail	1.65	
P(T<=t) two-tail	8.61	
t Critical two-tail	1.97*	

*P<0.05

4.3.0 Efficiency of Cowpea Production

4.3.1 Estimated Technical Efficiency of Cowpea Farmers

The Maximum Likelihood estimates and inefficiency determinants of the specified frontier are presented in Table 12.The study revealed that the generalized log likelihood function was-127.134.The log likelihood function implies that inefficiency exist in the data set. The log likelihood ratio value represents the value that maximizes the joint densities in the estimated model. Thus, the functional form that is, Cobb-Douglas used in this estimation is an adequate representation of the data. The value of gamma (γ) is estimated to be0.074 and it was not significant.This implies that 7.4% of random variation in the yield of the farmers was due to the farmers' inefficiency in their respective sites and not as a result of random variability. Since these factors are under the control of the farmer, reducing the influence of the effect of γ will greatly enhance the technical efficiency of the farmers and improve their yield.The value of sigma squared ($\boldsymbol{\sigma^2}$) was 0.0334 and was significant at 1% level of probability. This indicates a good fit and correctness of the specified distributional assumptions of the composite error terms while the gamma γ indicates the systematic influences that are unexplained by the production function and the dominant sources of random error. This means that the inefficiency effects make significant contribution to the technical inefficiencies of cowpea farmers.

Table 12: Results of Maximum Likelihood Estimates of Stochastic Frontier Production Function of Cowpea production

Variables	Parameters	Coefficient	Standard-error	T-value
Production function				
Constant	β_0	0.7939	0.392	2.02**
Seed	β_1	0.114	0.0265	4.29***
Fertilizer	β_2	0.0419	0.0159	2.621***
Insecticides	β 3	0.0649	0.0160	4.057***
Labour	β_4	0.2066	0.0843	2.451**
Inefficiency model				
Constant	Z_0	0.147	0.591	0.249
Age	Z_1	0.0008	0.0199	0.0490
Education	Z_4	0.0118	0.0172	0.687
Household size	Z_2	0.1482	0.0593	2.501***
Extension contact	Z_7	-0.0402	0.0211	-1.908*
Cooperative association	Z_5	-0.0803	0.1874	-0.429
Farming experience	Z_3	-0.0545	0.0397	-1.375
Amount of credit	Z_6	0.7694	0.6679	1.152
Diagnostic statistics				
Sigma-squared	(σ^2)	0.3342	0.0471	7.11***
Gamma	(γ)	0.0738	0.143	0.517
Log likelihood function	*L/f*	-127.1341		
LR test		18.8674		
Total number of observation		168		
Mean efficiency		0.7462		

****= p<0.01, **= p<0.05, and *= p<0.10*

However, the estimated coefficients of all the parameters of production function (seed, fertilizer, insecticides and labour) were positive and significant at 1% level of probability except labour that is significant at 5% level of probability and hence play a major role in cowpea production in the study area. The average technicalefficiency for the farmers was 0.75 implying that, on the average, the respondents are able to obtain 75% of potential output from a given mixture of production inputs. Thus, in a short

run, there is minimal scope (25%) of increasing the efficiency, by adopting the technology and techniques used by the best cowpea farmer.

The estimated coefficient for seed is 0.7939 which is positive and statistically significant at 1% level. The estimated 0.7939 elasticity of seed implies that increasing seed by 1% will increase cowpea output by less than 1% which means, all things being equal the output is inelastic to changes in the quantity of seed used. The significance of seed quantity is however, due to the fact that seed determines to a large extent the output obtained. If correct seed rates and quality seeds are not used, output will be low even if other inputs are in abundance.This is in consistent with the findings ofAbdurahman*et al* (2015)who observed that the estimated coefficient of seed and labour inputs were positive as expected and significant at 1% level which implies that the more seed is applied and the more labour employed the better the output of cowpea.

The production elasticity of output with respect to quantity of fertilizer is 0.0419 which is positive and statistically significant at 1% level. This implies that a 1% increase in fertilizer will increase cowpea output by 0.04%. Fertilizer is a major land augmenting input because it improves the quality of land by raising yields per hectare.This study is in tandem with the findings of Maurice (2004) and Oladiebo and Fajuyigbe (2007).

The coefficient of insecticides was 0.0649 which is positive and statistically significant at 1% level. The estimated 0.0649 of insecticides implies that increasing insecticides by 1% will increase cowpea output by 0.06% which means, all things being equal the output is elastic to changes in the quantity of insecticides used. However, this finding is in line with the findings of Shehu*et al* (2010) who observed

that the estimated coefficient of insecticidesinput was positive as expected and significant at 1% level implies that the more agrochemical is applied and the more labour employed the better the output of rice.

The coefficient of labour was 0.2068 which is positive and statistically significant at 5% level of probability. This shows that labour is an important variable in cowpea farming in the study area. This is in line with studies byUmoh (2006), which show the importance of labour in farming, particularly in developing countries where mechanization is rare on small scale farms. In the study area, human power plays a crucial role in virtually all farming activities.

The result of the inefficiency model is contained in Table 12 also. The estimated coefficients with negative signs attached indicate that they reduce technical inefficiency among the cowpea farmers, while positive signs indicate that the coefficients increase technical inefficiency or reduce technical efficiency. The results showed that age, education, household size, extension contact, cooperative association,farming experience and amount of credit were the determinants of technical inefficiency among the cowpea farmers. Extension contact and farming experience were negatively related with technical inefficiency, while the remaining inefficiency variables were positively related with technical inefficiency. Although only household size and extension contact were significant at 1% and 10% level of probability respectively.

The coefficient of Household size was 0.1482 and significant at 1% probability level.This implies as household size increases, the technical inefficiency increases thereby reducing technical efficiency of farmers. It also implies that technical efficiency of farmers can be improved without taken into consideration the household

size of the cowpea farmers. This finding agrees with Mohammed Lawal*et al*. (2009) who reported that as household size increases the technical efficiency decreases. They observed that this may be as a result of the fact that most of the household members who are still at a very young age may not be able to contribute to labour supply since they are likely to be in school during the period of agricultural production activities.

The coefficient of extension contact was -0.0402and significant at 10% probability level. This meansthat extension contact contributes towards increase in the technical efficiency of the cowpea farmers. Extension contact have more access to agricultural information, credit and other production inputs as well as more enhanced ability to adopt information. This finding is in consistent with that ofOkike (2000), Onyenweaku and Nwaru (2005) whose result showed a negative relationship extension contact and technical efficiency in cotton production in Nigeria.

4.3.2 Estimated Stochastic Frontier cost Functions for Cowpea Production

The Maximum Likelihood (ML) estimates of the stochastic frontier cost parameters for cowpea are presented in Table 13. For the cost function, the sigma (σ^2)2.12 is quite high and significant at 5% probability level while the gamma (γ) is 0.075 and not significant. The high and significant value of the sigma square (σ^2) indicate the goodness of fit and correctness of the specified assumption of the composite error terms distribution.

The results of stochastic frontier cost function for cowpea in Kwara State are shown in Table 13. The estimated coefficients of the parameters of the cost function are positive except that of fertilizer which is negative.The cost variables seed, output and

significant at 1% level of probability while an insecticide issignificant at 10% level of probability.

The coefficient of the cost of seed was 0.5601 and significant at 1% level of probability. This implies that seed are important in crop production in cowpea farms. The implication of this is that 1% increase in the cost of seed will give rise to 0.56% increase in the cost of cowpea production.

Table 13: Results of Maximum Likelihood Estimates of Frontier Cost Function for Cowpea Farmers.

Variable	**Parameters**	**Coefficient**	**Standard-error**	**T-value**
Production function				
Constant	β_0	6.0530	0.6014	10.06***
Seed	β_1	0.5601	0.0767	5.99***
Fertilizer	β_2	-0.0126	0.0117	-1.07
Insecticides	β_3	0.1510	0.0904	1.671*
Labour	β_4	0.0117	0.0083	1.41
Output	β_5	0.1631	0.0521	3.13***
Sigma-squared		2.1063	0.8821	2.38**
Gamma		0.0751	0.0576	1.30
Log likelihood function		-78.5768		
LR test		17.451		
Total number of observation		168		
Mean efficiency		0.683		

****=1%*
***=5%*
**=10%.*

The coefficient of the cost of insecticide was 0.1510 and significant at 10% level of probability. This is an indication that an increase in the cost of insecticides will result to 0.15% increase in the cost of cowpea production.

The coefficient of cowpea output was 0.1631 and significant at 1% level of probability. This implies that as the quantity of cowpea produced increases, the cost

of cowpea production increases accordingly. This shows that the cost of production is influenced by the quantity of cowpea output realized. This finding concurs with the one of Ogundari*et al.,* (2006) that reported direct effect of output on cost of production in the study on economies of scale and cost efficiency in small scale maize production in Nigeria.The inefficiency variable was not included in the stochastic frontier cost function because in reality it does not actually affect the cost of inputs.

4.3.3 Distribution of respondents according to technical efficiency of cowpea farmers in the study area.

The frequency distribution of the technical efficiency estimates for cowpea farmers in the study area as obtained from the stochastic frontier model is presented in Table 14. The study revealed that none of the cowpea farmers operate at ≤20 technical efficiency, about 56% had technical efficiency of between 0.21-0.60 and 44% of the cowpea farmers had technical efficiency (TE) of ≥0.61 and above efficiency level. The cowpea farmers with the best and least practices had technical efficiencies of 0.96 and 0.34 respectively. This implies that on the average, cowpea output fall by 4% from the maximum possible level of 1.00 due to technical inefficiencies. The result also showed a mean technical efficiency of 0.75. This means that majority of the cowpea farmers operated closer to their production frontier. Also, this implies that on the average, cowpea farmers are able to obtain 75% potential output from a given mix of productive resources.In a short-run, there is scope for increasing cowpea output by 25% by adopting the techniques and technologies employed by the best cowpea farmers.

Also, the study also revealed that for the average cowpea farmer in the study areas to become the most efficient cowpea farmer, he will need to realize about 22% [1-(0.75/0.96)*100] cost savings, while on the other hand, the least technically efficient

cowpea farmer will need about 65% [1-(0.34/0.96)*100] cost savings to become the most technically efficient cowpea farmer.

4.3.4 Frequency Distribution of Allocative Efficiency Estimates of Cowpea Farmers

The result in Table 14 shows the frequency distribution of the allocative efficiency estimates of cowpea farmers in Kwara State. The result revealed that about 28% of the cowpea farmers had allocative efficiency of less than 20, about 19% of the cowpea farmers had allocative efficiency (AE) of between 0.21-0.40 and majority (54%) of the farmers operate between 0.41-0.60 allocative efficiency levels. This implies that the greater majority of cowpea farmers were allocative efficient between 0.41-0.60as 54% of them attained efficiency level greater than in that range. In other words, the clustering of allocative efficiencies in the region of 0.41 – 0.61 efficiency range implies that the cowpea farmers are not efficient. That is, the farmers are not efficient in producing cowpea at a given level of output using the cost minimizing input ratio. The estimated allocative efficiencies differ substantially among the cowpea farmers ranging between the minimum value of 0.25 and maximum value of 0.78. The mean allocative efficiency was 0.64. The study also revealed that for the average cowpea farmer in the study areas to become the most allocative efficient cowpea farmer, he will need to realize about 13% cost saving i.e. [1-(0.68/0.78)*100] while on the other hand, the least technically efficient cowpea farmer will need about 68% [1-(0.25/0.78) x100] cost savings to become the most allocative efficient cowpea farmer.

Table 14: Frequency Distribution of Technical, Allocative and Economic Estimates from the Stochastic Frontier Model

Efficiency level	Technical efficiency		Allocative efficiency		Economic efficiency	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
≤0.20	0	0.0	47	27.9	56	33.3
0.21-0.40	41	24.4	31	18.5	65	38.7
0.41-0.60	53	31.5	90	53.6	41	24.4
0.61-0.80	59	35.1	0	0.0	6	3.6
0.81-1.00	15	8.9	0	0.0	0	0.0
Total	168	100.0	168	100.0	168	100.0
Minimum	0.343		0.253		0.221	
Maximum	0.964		0.786		0.897	
Mean	0.746		0.683		0.512	

4.3.5 Frequency Distribution of Economic Efficiency Estimates of Cowpea Farmers

The frequency distribution of the economic efficiency estimates of cowpea farmers in the study areas is contained in Table 14. The result revealed that about 33% of the cowpea farmers had economic efficiency (EE) 0f less than 20, majority (63%) of the cowpea farmers operated between 0.21-0.60 efficiency level and 4% operated at greater than 0.61. The mean economic efficiency of the cowpea farmers was 0.52. This implies that on the average, there was a fall in the cowpea output level by 48% from the maximum feasible level due to economic inefficiency. The cowpea farmer with the best and least practice had economic efficiencies of 0.89 and 0.22 respectively.

For the average cowpea farmer in the study area to achieve economic efficiency of his most efficient counterpart, he will have to realize about 42% [1-(0.52/0.89)*100] cost savings while on the other hand, the least economic efficient cowpea farmers will

have to realize about 75% [1-(0.22/0.89)*100] cost savings to become the most economic efficient cowpea farmer.

4.6.0 Constraints Faced By Cowpea Farmers

It was found that cowpea farmers in the study area faced some constraints in their attempt to produce cowpea and theseproblems were ranked according to their severity as stated by the farmers and as shown in Table 19.

It was found that 29% of the cowpea respondents ranked high cost of farm inputs as the major constraints. This is because purchasing farm inputs such as seeds, fertilizers and insecticides are being limited by a lack of capital, or by the lack of access to credit facilities that would enable farmers to use more of these inputs.This finding is in line with Ekong (2003), opined that most farmers have little or no access to improved seeds and continues to recycle seeds that have become exhausted after generations of cultivation.

19% of the respondents ranked insufficient and inadequate capital as the second constraints in the study area. It agrees with findings of Nasiru, (2010) who noted that access to micro-credit could have prospect in improving the productivity of farmers and contributing to uplifting the livelihoods of disadvantaged rural farming communities.

19% of the farmers attest to the fact that there is shortage of extension staff that is why majority (71%) had no contact to extension visits and these affects the farmer by continually producing using the traditional method instead of the modern method through the adoption of new and improved methods used in cowpea production that can efficiently utilize resources.

Farmers also lacked improved storage technology as the 4th constrains as reported by 17% of the respondents. The time interval between harvesting and storage for

subsequent use for planting next season material is about 6 - 7 months. Also prices are high during the planting period so cowpea farmers in the study area prefer to store their produce until when prices are high but there are no adequate and proper storage facilities. Due to the absence of improved storage facilities or technologies, this dream is however unrealized and are therefore, forced to sell majority part of the produce immediately after harvest when the prices are low.

It was also discovered that pest and disease and shortage of labour were ranked by 9% and7% of the respondents as fifth and sixth constraints respectively.

This finding agrees with that of Abdulrahman*et al.*,(2015); Tekana*et al.*, (2011) and Onuk*et al.*, (2010) who observed that high cost of farm inputs, inadequate capital and government interference, inadequate transportation facility inadequate storage/processing facilities and inadequate rainfall were among the constraints faced by farmers. This revealed that farmers in the study area are faced with constraints that can limit cowpea production.

Table 19: Constraints Faced by Cowpea Farmers

Constraints	**Frequency**	**Percentage**	**Rank**
High Cost of Inputs	134	29.3	1st
Inadequate/insufficient Capital	89	19.4	2nd
Shortage of extension visit	85	18.6	3rd
Improper storage facilities	78	17.0	4th
Pest and diseases	43	9.4	5th
High Cost of Labour	29	6.6	6th
Total	458*	100	

Multiple Response Allowed*

CHAPTER FIVE

SUMMARY, CONCLUSION, CONTRIBUTION TO KNOWLEDGE AND RECOMMENDATIONS

5.1 Summary

This study focused on farmers' efficiency in cowpea production and its impact on poverty among farmers in Kwara State, Nigeria. Nine villages were randomly selected from three Local Government Areas and 168 farmers were selected for the study.

Primary data were collected through the use of random of structured questionnaire. The statistical tools used to analyze the data were descriptive statistics, net farm income, stochastic production frontier function model, Foster-Greer-Thorbecke's (FGT) Weighted Poverty Index and Z-test.

The results of the socio-economic analysis shows that (79%) of the respondents fall within the age range less than 50 years, the majority of the farmers (51%) had one form of formal education or the other. About 87% of the respondents have household size of 1-10. Majority (71%) of the respondents have no extension contact. Majority of the famers, (73%) were not members of a cooperative society and 71% had farming experience of between 1-20years.

The average costs incurred and revenue obtained per hectare for cowpea were estimated to determine the profitability cowpea production in the study area. The total revenue (TR) was ₦149,010.00 while the total cost (TVC + TFC) was ₦62,968.00. The net farm income was therefore ₦86,042.00. The average rate of return on investment (return per naira invested) is 2.37, indicating that for every ₦1 invested in cowpea production in study area; a profit of ₦1.37 kobo was made. Thus, implying that cowpea production in the study area was economically viable.

The stochastic frontier production function was estimated for technical, allocative and economic efficiency. It was observed from the study that 44% of the farmers had technical efficiency (TE) of ≥0.611 while 56% of the farmers operate at between 0.21-0.60 efficiency levels. The mean technical efficiency for the 168 sampled farmers in the study area was 0.75.The farmer with the best practice has a technical efficiency of 0.96 while 0.34 was for the least efficient farmers. This implies that on the average, output fall by 4% from the maximum possible level due to inefficiency.

The mean allocative efficiency was 0.68.The result indicates that average cocoyam farmer in the state would enjoy cost saving of about 32% while allocatively inefficient farmer will have an efficiency gain of 65% to attain the level of most efficient farmer among the respondents.

The mean economic efficiency was 0.51. The farmer with the best practice has an economic efficiency of 0.89 while 0.22 was for the least efficient farmer. This implies that on the average, output fall by 11% from the maximum possible level due to inefficiency.

The degree of poverty status was determined from the poverty line of ₦184,903.29 that was established from the 2/3 mean income. Therefore, about 59% of the cowpea farmers were non poor, while about 41% were poor, which constitutes 99 and 69 of the cowpea farmers respectively. Results of FGT decomposition revealed that poverty incidence, depth and severity were0.3194, 0.2689, and 0.6435 respectively.

Finally, among the constraints identified in the study area, the majority of the respondent attested to the fact that high cost of farm inputs, inadequate/insufficient capital, and shortage of extension services were major constraints faced which were ranked 1st, 2nd and 3rd respectively.

5.2 Conclusion

Based on the findings of this study, it could be concluded that cowpea production in the study area is profitable by returning 10 kobo to every ₦1.00 spent. Cowpea is an important staple food in Nigeria, any attempt to increase its productivity would be a right step towards the resolution of food crisis in Nigeria and beyond.

The incidence of poverty could be reduced through increase in educational level, extension contact, farming experience and access to credit which is associated with improvement in productivity and income.

The implication of the study is that technical and allocative efficiency in farm production among the farmers could be increased by 32% and 49%, respectively through better use of available resources given the current state of technology. This can be achieved through improved farmer-specific factors. These results call for policies aimed at encouraging new entrants especially the youths who are agile and stronger to grow cowpea and the experienced ones to remain in farming.

5.3 Contribution of the Study to Knowledge

1. The study revealed that cowpea production in the study area is profitable with net farm income of ₦86,042 despite the problems identified.

2. The study revealed high cost of farm inputs, inadequate/insufficient capital, shortage of extension services were major constraints faced by the farmers which were ranked 1st, 2nd and 3rd respectively by about 29%, 19% and 18% respectively.

3. The study revealed that cowpea farmers in the study area achieved technical efficiency of 75 percent.

4. It was revealed that cowpea farms were economically inefficient in the study area having an economic efficiency of fifty-one (51) percent.

5.4 Recommendations

From the findings of this study, the following recommendations are made:

i. Most of the respondents complained of high cost of farm input such as fertilizers, improved seeds and agrochemical as part of the constraints they faced. The cooperative societies could link up the farmers with sources institution that will supply these inputs in subsidized rate. This will enable the groups to buy inputs at factory cost thereby helping to reduce cost of production. Also, government should ensure timely and adequate supply of fertilizer to farmers through its e-wallet programme at affordable prices in order to enhance the production of this crop.

ii. Majority of the farmers financed their production through personal savings and relatives which are mostly not adequate for appreciable production. Agricultural loan facilities should be made accessible to cowpea producers to ensure timely and adequate utilization of agricultural inputs for improvement in farm production efficiency.

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ECONOMIC ANALYSIS OF COWPEA PRODUCTION IN KWARA STATE, NIGERIA

Dear respondent,

This questionnaire will be used by a student of the Department of Agricultural economics and rural Sociology, Ahamdu Bello University, Zaria. Please fill as appropriate. All information will be treated with confidentially and strictly for the purpose of research. Thanks for your co-operation.

Village/Community……
LGA……

A. SOCIO-ECONOMICS CHARACTERISTIC

1. Name of farmer ……
2. Sex: male ( ) Female ( )
3. Age (years)……
4. Marital status: Married ( ) Single ( )
5. Highest level of education: (a) No formal Education ( ) (b) Primary school Education ( ) (c) Secondary School Education ( ) (d) Tertiary Education ( )
6. Family size (all the number of the people depending on you for living) …..

(a) No of Adult Male ( ) (b) No of Adult Female ( ) (c) Children >15yrs ( ) (d) Children <15yrs ( )

7. How long have you been in cowpea farming ? (year of experience) …..
8. Do you belong to any co-operative/Association ? Yes ( ) No ( )
9. If Yes, (Years of participation……
10. What benefit did you derive as a member ?
11. What is your major sources of capital for cowpea farming?

a. Personal savings ( ) b. credit (borrow) ( ) c. friends and family ( )
d. money lenders (borrow) ( )

12. if you borrow,what were the sources of the credit ?

a. commercial bank ( ) b. bank of agriculture ( ) c. cooperative society ( ) d. money lenders ( ) e. friends and family ( ) f. others (specify) ……

13. how much did you borrow to finance last production? (fill for the source you indicated in Q.12)

Source of loan	Amount ( )	Interest Rate (%)
Commercial bank		
Bank of agriculture		
Cooperative societies		
Money lenders		
Friends and family		
Others (specify)		

14. Have you been visited by an extension agent? Yes ( ) No ( )

15. If yes, how many times in last one year ?

16. What activities did the agent teach you ? .....

17. Of what benefit were the techniques learnt to you to the success of your farm? .....

18. Have you been trained on Cowpea farming? Yes ( ) No ( )

19. If yes, which organization conducted the training ?

20. Was the training beneficial to you ?

a. not beneficial ( ) b. somehow beneficial ( ) c. beneficial ( ) d. very beneficial ( )

B. INFORMATION ON INPUTS

(1) Farm size (Ha)

(1) How many cowpea farm plots do you have? ..... Indicate and the size in the table below.

Plot No	Plot Size (Ha)
1	
2	
3	

(ii). How did you acquire your land? (Tick below)

Plot	Plot Size (Ha)				
	(a) Inheritance	(b) Lease	© Borrowed	(d) Gift	(e) Purchased
1					
2					
3					

(iii). What does it cost to rent one Hectare of land per season in your village ?..... Naira

(II) variable inputs (Last production cycle)

(ii) Seed (kg)

Plot No	Quantity of Seek (Kg)	Cost ( )
1		
2		
3		

(iii). Fertilizer.

Plot No	Fertilizer type	Quantity (Kg)	Cost ( )
1			
2			
3			

(iv). Agrochemical.

Plot No	Agrochemical type	Quantity (litres)	Cost ( )
1			
2			
3			

(v) labour input

(a) Land preparation

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(b) Planting

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(c) Fertilizer Application

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(e) First Weeding

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(f) Second Weeding

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(g) Replacement of dead cowpea seed planted

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(h) harvesting

Plot No	Hire Labour			Family Labour		
	No of people	No of hours	Cost ( )	No of people	No of hours	Cost ( )
1						
2						
3						

(i) Information on cowpea output

Plot No	No. of output produced (kg)	Total Qty sold	Price/Unit
1			
2			
3			

21. Where do you sell your produce ?

a. farm gate ( ) b. rural market ( ) c. Urban market ( )

22. when do you sell your produce ?

a. immediately after harvesting ( ) b. few months after harvest ( ) c. off season ( )

S/N	Constraints	Ranking according to severity 1=least sever, 2=moderately sever, 3=severe, 4=more severe, 5= most severe.	Coping strategy
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

C. other welfare measures:

23. do you pay any levies to LGA or state or any other stakeholders in your area ?
24. how much do you pay …… ( ) ……. per harvest trip/weekly/monthly/yearly.
25. what benefits do you receive from paying the levies above ……
26. what type of housing unit do you have ?

Flat ( ) (ii) Room and parlour ( ) (iii) Single rooms ( ) (iv) hut ( ) others (specify)

What types of toilet facility do you have? (i) flush toilet ( ) (ii) pit toilet ( ) Bucket or pail type ( ) (iv) Bush or bare ground ( )

27. what is the quality of the construction of your house ?

Block and zinc roof ( ) (ii) mud with zinc roof ( ) (iii) mud with thatch roof ( ) others (specify)

28. is the wall of house plastered? (i) Yes ( ) (ii) No ( )
29. if Yes, what material? (i) Cement ( ) (ii) Cow dung ( ) (iii) others (specify)…….
30. How many rooms are used by your household members ?……
31. if you live in your house, how much would you have paid if it to be rented? N……/month

32. what is source of your drinking water ? (i) Well ( ) (ii) Bore hole ( ) (iii) Stream ( ) (iv) Running water ( ) (v) others (specify)…….
33. is the sources of water in your house? (a) Yes ( ) (b) No ( )
34. what is the distance between your house and the source of drinking water? ……km
35. what is source of lightening at your house? (i) Kerosene ( ) (ii) Electricity ( )
36. Lamp with shad ( ) (iv) kerosene lamp without shad ( ) (v) shea butter/palm oil lamp ( ) others (specify)…….
37. what do you use for cooking? (tick multiple if use more one for cooking)

Gas cooker ( ) (ii) Firewood/charcoal ( ) (iii) Kerosene stove ( ) (iv) others

38. where do you dispose off your waste material? (i) Riverside ( ) (ii) Designated land ( ) (iii) Public waste site ( ) (iv) others(specify)…….
39. what is the distance between your house and the public waste dumping site?…… km
40. what is your general comment about on poverty situation in your community?

THANK YOU FOR YOUR PATIENCE AND ATTENTION