FACTORS AFFECTING TECHNICAL EFFICENCY OF MAIZE PRODUCTION IN CASE OF BURE DISTRICT WEST GOJJAM ZONE AMHARA REGION ETHIOPIA

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ABRIVATION

ANOVA	Analysis of Variance
FAO	Food Assessment Organization
GDP	Gross Domestic Product
Ha	Hectare
IFPRI	International Food Policy Research
Kg	Kilogram
NALEP	National Agriculture and Livestock Extension Program
OLS	Ordinary list square
Qt	Quintal
USDA	United States Department of Agriculture
WFP	World Food Program
WMO	World Meteorological Organization
IPCC	Intergovernmental Panel on Climate Change
FAOSTAT	Food and Agriculture Organization Statistics Database

ABSTRACT

The research will be conducted under the title determining the factors that affect technical efficiency of maize production in Bure woreda of west gojjam zone Amhara region Ethiopia. The main objective of the study will be to assess the factors affecting technical efficiency of maize and more specifically; to assess the inputs those are available in maize production and to identify factors that can affect the quantity of maize production in Shakuwa kebele. Seven types of factors were selected to proceed this research (labor force, number of oxen, fertilizer; improved seed, income, family size, land size).The selected design to conduct this research was not experimental or laboratory research design rather it was survey. Both primary and secondary sources were used to gather the data. The primary data were structured interview and questionnaire for 50 respondents'. These methods were helpful in collecting information from farmers (households). The secondary data had been collected from different thesis, and bureau of extension agents. Purposive simple random sampling technique was selected to select kebele. The data gathered during this study have both qualitative and quantitative nature, and it was analyzed by using descriptive statistics like percentage and frequency and econometric model (multiple linear regression models).Based on collected data, the researcher identified the factors affecting technical efficiency of maize production and the most serious factors in the study were: capital and fertilizer. In order minimize and alleviate the existed problems, some policy implications are recommended.

1. INTRODUCTION

1.1. Background of the Study

Maize was domesticated in Central America some 6,000 to 10,000 years ago. It spread to the rest of the world in the 16th through18th centuries. World-wide more than 400 million people, primarily in sub-Saharan Africa and Central America, white maize plays a major role in the diet (Morris, 2004). Development of technology, including hybrid technology; increased water availability through government-funded infrastructural projects; and the supply and use of inorganic fertilizer and other farm chemicals are important factors contributing to maize production growth.

In Australia, maize production is recognized as a high yield crop provided optimum crop management used. Yield potential of maize is essentially dependent on amount of intercepted solar radiation, water and nitrogen supply moderated by factors that limit physiological processes. The industry is subject to continuing challenges from use of economic and market forces and expectations of the broader community, especially in resource use efficiency and environmental management and needs to maintain a dynamic research and development program to undergo production practices in the long term (Martin et al, 2004). A study on Maize in India by Joshi et al, (2005) on Production Systems, Constraints, and Research Priorities- found that major biotic production constraints were Echinocloa, Cynodon dactylon, rats, and termites, which reduced maize production levels by more than 50%. Other important a biotic and biotic stresses listed in descending order of importance were caterpillars, water stress, stem borers, weevils, zinc deficiency, rust, seed/seedling blight,

In Africa perspective, Maize cultivation in Nigeria had suffered various problems, rural-urban migration, low yield, pest and diseases, climate change, poor shortage facilities, shortage of key inputs and shortage of irrigation water. Nigeria has experience shortages in maize production in the past. Prices of maize and other product derived from maize boosts up during low production seasons and falls drastically when

there is a surplus production, however, due to inadequate marketing facilities in the control, farmers loses some of the product. Since farmers do not know future of maize, production and prices while deciding to cultivate this and other crops. There is need to forecast cultivation area, yield and production of maize in Nigeria. (Akande, 2007)

According to Doyer et al. (2007) the deregulation of the South African agricultural sector commenced in the 1980s and gradually changed the structure and responsibilities of the actors in the sector. This process of deregulation and liberalization exposed farmers and agribusiness alike to international forces. In Zimbabwe generally, communal and smallholder farmers occupy areas of lower natural potential for agriculture in terms of rainfall, soils and water for irrigation. In addition, these areas are of lower economic potential because of the distances from markets and poor communication and social infrastructure. Until recently, the other group comprised roughly 4,000 large-scale farmers with very sophisticated production systems and occupies about 11 million hectares of land, primarily located in the areas of high agricultural and economic potential. Government of Zimbabwe imports of agricultural products is limited mainly to wheat and maize in drought years.

Regionally Eastern African countries have taken maize production as a crucial aspect of development. According to Kaliba (2008) in the study on adoption of maize production technologies in Central Tanzania where several issues require closer attention from research, extension, and policy makers. Research and extension efforts need to be linked and strengthened to increase the flow of information to farmers. In developing improved maize varieties, researchers must consider yield as well as other important traits: drought resistance/tolerance, resistance to storage pests, shelling quality, and taste. For this to occur, farmers must participate in the research process. The formal credit system needs to be altered to address the credit problems faced by small-scale farmers. A more efficient marketing system for inputs and outputs would benefit farmers by providing higher maize prices and reducing fertilizer costs. Such a system would require supporting policies from the government.

In a study conducted in Ethiopia on Enhancing the Contribution of Maize to Food Security in Ethiopia, the increment of production in the 1990s indicates a green

revolution for food self-sufficiency in Ethiopia. However, the availability of quality seed with necessary inputs at the right time and place with a reasonable price is crucial. Unavailability of improved infrastructure and maize grain marketing represents major limiting factors for maize production. Wise utilization and conservation of natural resources will also have a significant impact on maize grain production. (Nigussie, 2006)

1.2 Statement of the Problem

Agriculture is a backbone for developing world both in household consumption and to increase the national GDP. Maze is one of the important crops to cover this aspect. But the declining trends on quantities of maize produced has been evident at the global and regional level with a majority of the world producers of maize recording significant declines in the quantities of maize exported (Pingali, 2001). Importation of maize leads to lack of market to maize farmers regionally and locally which discourages farmers to continue farming this product (Mutunga et al., 2003).

Farmers have not adopted the use of the modern technologies through government agencies and have not received some training on maize production through programs such as the NALEP program. So, declines in maize production have persisted. Agricultural markets are characterized by the following constraints among others: long chains of transactions between the farm-gate and consumers; poor access to appropriate and timely information; small volumes of products of highly varied quality offered by individual smallholder farmers; and poor structured and poor markets (Mude, et al, 2006).

Constraints to credit access have been identified as some of the barriers to adoption and use of sufficient and improved agricultural inputs in developing countries The demand for improved seeds was also relatively low, due mainly to poor promotion and marketing efforts, high prices, and the inability of farmers to purchase complementary inputs, especially fertilizer. Other factors that affect maize production are: - Soil acidity is one of the factors limiting maize production. Farmers lack storage facilities thus maize gets destroyed due to humid, theft and exposure to unworthy conditions. Maize

production also affected due to the decrease in land since population increase is on the rise thus land for cultivation is being encroached (Farm Management Handbook,2007). So, the above authors investigate these factors that affect maize production, the researcher of this study also checked these and other hidden factors that affect maize production in the study area.

1.3 Objective of the Study

1.3.1 General Objective

- The overall objective of this study was to analyses the factors affecting technical efficiency of maize production in Dega-Damot Bure *Woreda,* West GoJjam zone of Amhara region.

1.3.2 Specific Objectives

- To assess the inputs that is available in maize production in the study area.
- To identify factors that can affect the quantity of maize production in the study area.

1.4 Research Questions

- What are the types of inputs that are available for maize production in the study area?
- What factors are affecting the production of maize in the study area?

1.5 Scope of the study

The study delimited itself to the factors affecting maize production within the boundaries of bure district in order to avoid interference from factors affecting maize production in other regions. The study, specifically delimited itself to Shakuwa kebele because of the ability of the kebele to produce maize in large quantities owing to the

availability of the factors production in the region and good climate that favors the maize crop.

1.6 Significance of the Study

The study is important to a number of stakeholders that include: farmers, researchers, extension agent, policy makers etc. Farmers know reasons why they are not able to maximize maize production; they would be in a position to know the causes and factors that affect maize production; they would learn best farming practices to enhance sufficient collection of maize quantities.

2. LITERATURE REVIEW

2.1. Theoretical Literature Review

2.2. Definition of maize

Maize (*Zea mays* L.) is an exhaustive cereal crop. It is a multipurpose crop that provides food for human, feed for animals especially poultry and livestock and raw material for the industries (Khaliq *et al*., 2004). It is the third most important cereal crop after wheat and rice.

Operational definition of terms

Income: A factor of production that is not wanted for itself but for its ability to help in producing other goods (Martinez, 2000). In this study the term income will be used to refer to the monetary requirement in the maize production process.

Production: it is the quantity (value) of agricultural output per unit quantity (value) of input(s) used in production (OECD, 2001).

Input: Insertion of all the necessities production cycle to bring forth agricultural output in terms of seeds, fertilizers, pesticides, implements, capital, human labor, weeding, harvesting, threshing, all management operations and method of cultivation.

2.3 Factors of maize production

Factors that influence productivity of a particular producer may be classified into three. These are:-

A. The quantity and quality of inputs used including land, labor and capital, fertilizer, seeds farm and farmer characteristics and external factors such as government policy (Wiebe, 2006).

B. Capital inputs among others include seed, fertilizer, and farm equipment.

C. Farm and farmer characteristics on the other hand include factors such as size and topography of area cultivated, location of the farm with respect to input and output markets, age, gender, education level, household size, access to extension services, and access credit (Michele, 2007).

The amount of land that can be sown and harvested is, clearly, tied to available and affordable labor supply. Planting and harvesting are both activities that require far more labor than the rest of the agricultural cycle. In communities where these activities are shared, productivity on individual plots may be greater than if families had to provide all the labor that they could not afford to hire. Communal farming, although no longer common, provides some of the same advantages (Morris, 2004). High labor costs may discourage extra hand cultivation and marginally lower outputs. But low agricultural wages discourage participation in the agricultural economy, where industrial or other opportunities exist Scarcity of labor more than land is also a major constraint on production in much of Africa, where larger land areas since colonial times have experienced labor bottle necks, as men were drawn off to work in the mines or to do other waged work and left women to clear, plant, and weed, with peak agricultural labor demands during the hungry season (Richards 2009). In such contexts, the problem of hunger is linked to underproduction in a vicious cycle.

2.4 Market demand factor on maize production

The maize market in general is characterized by a variety of marketing arrangements. Since the liberalization of the marketing system, several private sector entrepreneurs have joined the various parts of the maize supply chain. These entrepreneurs include companies that are active in regional maize grain trading, informal cross border traders, produce agents, small and medium millers, transporters, wholesalers and retail stores. Virtually all the domestic transactions made by these players are spot market and cash based. They sell the maize grain in l00kg bags without any grading and premiums prices for quality produce. However, for milled maize, there are three major grades. The flour is sold in kilograms and prices differ by grade (Jones, 2007).

A typical maize supply chain was noted to have the following shortcomings: This supply chain has too many participants with many speculative traders and agents who make the movement of maize time consuming. There is normally over supply of maize during the harvest season as farmers and traders have no stores. Participants' competition reduces as one goes up the chain. No clear flow of market information. Transactions are 'on spot' market and cash based. The markets are thin and volatile in terms of prices, trading volumes and liquidity. The marketing arrangement is not well developed leading to inadequate market outlets, high transaction costs and minimal value addition (Anderson, 2002). According to Minten, (2010), maize farming in Africa has faced serious challenges that have led to the overall declines of the quantities of maize produced. Denk, (2011) however explains that Africa is a suitable region for maize farming given the suitability of the climatic conditions of the area but the lack of knowledge on the right practices of maize farming has led to the practice decline trends especially in the quantities of maize produced.

Rural livelihoods in many areas depend on the viability of maize production as a commercial crop. On the other hand, the food security of the growing urban population and many rural households who are buyers of maize depends on keeping maize prices at tolerable levels. For many years, policy makers have attempted to strike a balance between these two competing objectives how to ensure adequate returns for domestic maize production while keeping costs as low as possible for consumers. Maize marketing and trade policy has been at the centre stage of debates over this food price dilemma, including discussions over the appropriateness of trade barriers and the role of government in ensuring adequate returns to maize production, (Ministry of Trade and Industry, 2010).

2.5 factors that affect technical efficiency of maize production

Efficiency/inefficiency studies have been conducted in Ethiopia and other countries. For instance bamlaku et al. has analyzed technical efficiency of farmers in three ecological zones in Ethiopia. . Access to credit, literacy, proximity to market, and livestock are found to have positive and significant effect, while age, sex, extension service, and off-farm activities are found to have insignificant effect on technical

efficiency of farmers. Moreover, Endrias et al. Have examined technical efficiency of maize farmers in Ethiopia. Based on their estimation, agro-ecology, oxen holding, farm size, and use of improved maize variety are found to be significant, whereas age, education, family size, and access to credit are found to be insignificant determinants of technical efficiency.

The expected influences of each of the hypothesized variables that affect technical inefficiency are discussed below.

- ✓ **Age of the household** Age of household head The age of household was expected to have a negative influence on technical inefficiency of red pepper production. This means that older farmers are expected to have greater access to labor, land and relevant tacit knowledge on productivity enhancing technology than younger farmers.
- ✓ **Education status.** The educational background of the sample household heads is believed to be an important feature that determines the readiness of household head to accept new ideas and innovations. More educated farmers are expected to adopt new technologies to increase their land and labor productivities. A study conducted by Aye and Mungatana (2010) who found that education level has a positive influence on technical efficiency of maize production. Hence, education was expected to influence technical inefficiency negatively.
- ✓ **Family size** (adult equivalent) The number of members of household head affects efficiency of maize producer farmers positively through its direct influence on availability of labor supply to undertake farm operation on time. A study done by Shumet (2011) found that family size was negatively affecting technical inefficiency of maize production. Hence, a household with large family size was hypothesized to be less technical inefficient than household with less family size.
- ✓ **Land size** Land is one of the most important and scarce resources in agricultural production. The size of land holding hypothesized to have positive

impact on the technical inefficiencies of maize production. Small land size is expected to be more efficient than large farm because of its simplicity in management and transaction cost. A study conducted by sisay (2016) found that land size was negatively affecting technical efficiency of maize production. Hence a household with large land size was hypothesized to be more technical inefficient than households with less land size.

- ✓ **Tropical livestock unit** it is refers to the number of livestock owned by household and measured by tropical livestock unit. Livestock ownership is perceived as the accumulation of wealth status, use for draft power, manure, income from sale of butter and livestock in times of risk to buy improved agricultural technologies such as seed, pesticides, etc. households having large size of livestock can have better chance to earn more income from livestock.

- ✓ **Slope of the farm land** this is measured as discrete variable. Slope of the land may affect level of production. For instance, steep plots are usually subject to water erosion. As a result, they are likely to be of lower productivity. Since steep plots are vulnerable to erosion damage and they are likely infertile compared to plain plots, slopes of plot were found to be related negatively to technical efficiency (Alemayehu 2010). . Hence, it was hypothesized that households who owns steeper farm land expected to be technically inefficient.
- ✓ **Distance to development center** Distance to development center is used as proxy for assessing the accessibility of extension services to farmer in maize production. Proximity to development center has advantage of obtaining technical supports form extension workers related to the utilization of technologies in maize production. Hence, distance from the development center is likely to have a positive effect on technical inefficiency of maize production.

- ✓ **Extension service** Farmers who have better extension service are expected to be more efficient than others. The more contact the farmer has with extension service, the more will be the information/knowledge she/he has and the better will be the use of agricultural inputs. Therefore, it is assumed that farmers who have better extension service are more likely to demand agricultural inputs due to to the increased awarı ss (Dawit 2012). Hence, it was expected to affect the technical inefficiency negatively.
- ✓ **Access to credit** it was used to capture the effect of credit on the production efficiency level of farmers. The availability of credit will be loosen the constraints of production, therefore facilitating the acquisition of inputs on a timely basis, and hence it is supposed to increase the level of efficiency of the farmers. Farmers who receive credit were assumed to overcome liquidity constraints, purchase more production inputs or a new technological package such as high-yielding seeds since this can be regarded as access to funds (Daniel 2009; Bekele 2013). Therefore, it was hypothesized that households who have used credit expected to be less technical inefficient than others.

2.5. Empirical literature

2.5.1 Maize production globally

According to (Meyer et al., 2006). Maize production in the global arena can be categorized into white maize production and yellow maize production. White maize is biologically and genetically very similar to yellow maize, although there is a difference in appearance due to the absence of carotid oil pigments in the kernel which otherwise cause the yellow color of the grain. Production conditions and cultivation methods are largely identical (Martinez, 2004).

According to (Lopez, 2006).World production of white maize is currently estimated at around 65-70 million tons, representing 12-13 percent of the annual world output of all maize. Over 90 percent of the white maize is produced in the developing countries, where it accounts for around one quarter of total maize output and just under two-fifths of the total maize area. In the developing world, a larger area is planted to white than to yellow maize in the tropical highland and sub-tropical/mid-altitude environments, and it occupies about 40 percent of the lowland tropical maize area.

Maize is widely cultivated throughout the world, and a greater weight of maize is produced each year than any other grain. The United States produces 40% of the world's harvest; other top producing countries include China, Brazil, Mexico, Indonesia, India, France and Argentina. FAO. (2010) FAOSTAT shows that in 2008, North America recorded the largest production of maize with about 38.8% of the global output. This is followed by Asia (28.5%); South America (11.2%); Europe (11.1%); Africa (6.9%); Central America (3.4%); and Oceania (0.07%). Argentina, Brazil and China account for over 60 percent of total maize output in the developing world, China alone for 45 percent. When these countries are excluded from consideration, white maize constitutes over 60 percent of the maize area in developing countries, and just under 60 percent of total maize output in those countries. By contrast, white maize is a product of much lower importance for the developed world. In the United States, for example, by far the world's largest producer of maize, white maize cultivation accounts for less than one percent of the total domestic maize output, produced to a large extent under contract farming due to the relatively limited market (Martinez, 2000).

Two other significant areas of white maize production are, firstly, Central America excluding the Caribbean sub-region, where it represents about 90 percent of total maize output of the region, and, secondly, the northern part of South America Colombia and Venezuela. Among the main producers in Asia China, Indonesia and the Philippines. Yellow maize is considerably more important in their total cereal production than white maize. White maize tends, however, to be a main staple food in certain areas of these countries (Morris, 2004).

2.5.2. Maize production in Africa

Introduced into Africa by the Portuguese in the 16th to 18th century, maize has become Africa's most staple food and feed system. In 2005, the top exporters of maize in sub-Saharan Africa were South Africa, Tanzania, Uganda, Zambia and Swaziland, with the top importers of maize Zimbabwe (a maize exporter until the late 1990s), Angola, Ghana, Kenya and Mozambique facing a growing population, several studies (Pingali, 2004) (World Bank, 2007) note that it is critical for Kenya and other African countries to increase maize production in order to feed their people. According to FAO/WFP 2004/2005 crop and food supply assessment, the production of the country’s staple food, maize was on a long term decline, dropping by 70% over a period of five years in most areas. This was due to non-cultivation of the arable lands due to delayed rainfall and the high risk of making loss from agriculture as well as shortage of seeds for alternative crops among others.

According to reports of IPCC (2007), factors such as endemic poverty, bureaucracy, lack of physical and financial capital, frequent social unrest and ecosystem degradation contribute to

Africa's vulnerability to climate variability. Despite progress made in national and international policies since the first world Conference on women in the International Assessment of Agriculture Knowledge, Science and Technology Development (IAASTD, 2009) reported urgent action is still necessary to implement gender and social equity in policies and practices in order to better address gender issues as integral to the development process especially for maize production.

Most of the maize produced and consumed in Africa comes from smallholder rural farms. Production takes place under difficult conditions characterized inter alia, by poor soils; low-yielding varieties; inadequate access to yield-enhancing inputs such as fertilizers and improved seeds; inadequate access to finance by producers, suppliers and buyers; and variable climatic and environmental conditions. There are also heavy post-harvest losses due to poor storage and processing facilities and technologies. The entire maize value chain, from input supply through production to marketing and consumption, suffers from constraints that could be removed if known technologies and policy and marketing innovations could be harnessed effectively and efficiently (FAOSTAT, 2007). Traditionally Clay-lined maize grain silos are used for storage in Africa. In each instance, Subsistence farmers and agribusiness alike must take into account the difficulties of storing maize at optimal conditions and balance humidity, the moisture content of the kernels, and the potential for pest infestations

2.5.3. Quantity of maize produced on Shakuwa

Maize production in shakuwa has been a source of nutrition to many households providing carbohydrates which is a vital ingredient to human health. Another very important aspect with effect of maize production is it supports efforts of the government to make food secure country and alleviate hunger to its citizens. Improving the productivity of maize-based farming could significantly reduce hunger, enhance food security and alleviate poverty through increasing the purchasing power of the farmers. Increases in agricultural productivity lead also to agricultural growth and can help to alleviate poverty in poor and developing countries, where agriculture often employs the greatest portion of the population. As farms become more productive, the wages earned by those who work in agriculture increases. At the same time, food prices decrease and food supplies become more stable. Laborers therefore have more money to spend on food as well as other products… However, it is not only the people employed in agriculture who benefit from increases in agricultural productivity. Those employed in other sectors also enjoy lower food prices and a more stable food supply. Their wages may also increase. Agricultural productivity is becoming increasingly important as the world population continues to grow a productive farm is one that provides most of the resources necessary for the farmer's family to live, such as food, etc. It is a farm which ensures food security as well as a way to sustain the well-being of a community.

3. RESEARCH METHODOLOGY

3.1. Description of the study area

Bure is one of the Woredas in the west gojjam zone of the Amhara Region of Ethiopia. Part of the Mirab Gojjam Zone, Bure is bordered on the south by the abay river. Which separates it from the oromia region, on the west by wemberma, on the northwest by the agew awi zone, on the north by sekela, on the east by jabi tehnan, and on the southeast by dembecha and the misraq gojjam zone.Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 143,132, of whom 71,208 are men and 71,924 women ; 25,975 or 18.15% are urban inhabitants. The majority of inhabitants practiced Ethiopian orthodox christianity , with 98.34% reporting that as their religion, while 1.01% were muslim.

In west gojjam zone cereals took up 78.01% of the grain crop area and 87.77% of the production. Maize, teff and finger millet were planted to 27.42%, 25.08% and 14.23% of the zonal grain crop area resulting in 50.71%, 15.69% and 11.12% of the grain production in the same order.

3.2. Type and source of data collection

In order to collect reliable data, both primary and secondary data were used for the researcher. To achieve the purpose of this study, the primary data such as what factor affect maize production in the selected kebeles was collected through questionnaire, and interview. Secondary data was also gathered from different published and unpublished documents, books, electronic sources, magazines, written documents & reports of agricultural offices about the maize production.

3.3. Methods of data collection

The researcher used the following instruments: questionnaire and interview as methods of data collection.

Questionnaire

The researcher constructed close-ended and open-ended questions, which were administered to the farmers of Shakuwa kebele. The researcher used questionnaire because of its low cost.

Interviews Schedules

An interview is a conversation between two or more people where questions are asked by the interviewer to elicit facts and statements from the interviewee. This method is flexible, more explanatory in nature; firsthand information is collected to ensure the research achieves its objectivity (Weiss, 1994).

3.4 sampling techniques

The population of respondents that constitute the bulk of the population in the Shakuwa kebele was picked in order to evaluate how factors affecting maize production and their effects on the production quantities that target population includes the maize farmers, in the kebele. The study employed simple random sampling technique to select farmers from each ward in Shakuwa kebele.

According to the statics of Shakuwa office (2012) the total numbers of maize farmers in the kebele are 300 and from this the study targets were 50 farmers. The farmers were selected because they are the group of farmers who know the factors of production as the farming is mainly done for commercial purposes.

3.5. Sample size determination

The sample size plays a crucial role in those cases of statistical studies where the statistical studies like sample survey, experiments, observational studies, etc. are involved, and the sample size to be employed for the identified target population is scientifically computed. However, due to lack of budget and time, the heaviness of the population to interview, the researcher selected 50 respondents to gather the relevant information.

The formula that was used by the researcher to determine class interval for determination of scientifically acceptable sample size, is the following formula.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = statistically acceptable sample size

N = Total size of target population

e = level of precision (error level) at 95% confidence level (0.05).

Using this formula, the statistically acceptable sample size from the given population with maintaining a 95% confidence level is 175 maize producers.

$$n = \frac{300}{1 + 300(0.05)^2} = 175$$

The researcher acquired a permit from the district offices to conduct the research. The permit was used to get permission from the Front line Extension Agricultural Officers within to administer the questionnaires to the farmers. Primary data includes data that was collected during the actual field study. This method was used so as to obtain specific and current data needed in the study which was not available in previous studies, obtained from the field by use of questionnaires and interviews. Data was collected by the researcher with assistants who administer the questionnaire to the respondents. Secondary data was collected in order to provide the necessary support to the primary data accumulated. Secondary data also gives information that cannot be obtained from primary data. It was mainly gathered from existing literature reports, seminar papers, books, research journals, magazines, publication among others, the internet and past research information.

3.6 Data Analysis

In this research, the researcher analyzed the collected data using both descriptive statistics and econometric analysis.

3.6.1. Descriptive statistics

Descriptive statistical uses to describe coefficient of variation, variance, standard deviation, standard error etc. Therefore, the researcher will use the descriptive statistics to explore what is going on in the data and to present the quantitative description of the maize production i.e. producer, retailers and consumer. Hence, for descriptive statistical analysis, percentage, average and t-statistics will be used to the quantitative data number.

describe how much a variation occurs within the data collected related to maize production. It could also employ to describe variance using t- tests or ANOVA and to describe the standard error of the parameters of the econometric model, which is essential to assess how closely our sample related to the population. i will use the descriptive statistical analysis simply to describe And also the determining factor affecting maize production.

3.6.2. Econometric Analysis

To analyze the determining factor affecting maize production multiple linear regression model of OLS (ordinary least square) estimation was used. It could be an essential method of econometric analysis to recognize and realize patterns of the influencing factors. The most important variables that determine maize production include family size, income, land size, labor, fertilizer, oxen and improved seed.

Definition of dependent variables

Production Quantity (Q): It is a continuous variable representing dependent variable. It is the amount of maize produce by the household and measured in quintal. It is the quantity (value) of agricultural output per unit quantity (value) of input(s) used in production (OECD, 2007).It is affected by different factors, like family size, labor force, inputs...Etc.

The Independent variables are:

Family size– this is the total number of family members that can be taken as a proxy for maize production. This continuous variable was expected to influence production of maize positively. That means as the family size increases the production increases,

Labor force– this is a continuous variable representing the availability of economically active labor force in the household (male and female). It was expected to take positive effect. An increase in economically active labor force to increase the farmer's participation in the maize farming.

Income: is continuous variable for a factor of production and it was important for its ability to help in producing other goods (Martinez, 2000). In this study the term capital was used to refer to the monetary requirement in the maize production process. It was expected to affect the maize production positively because, when farmers have enough capital, they can produce enough quantity of maize. Because they can perform the farming system at the require time.

Land size: The total land used for maize production was measured in terms of number of hectares the household owns and it was expected to affect the household level maize production positively because, a farmer who owns a large area of land for maize production than a farmer who own less area of land and under the same input utilization condition can produce more.

Fertilizer: Is any material of natural and synthetic origin that applied to soils or plant tissues to supply one more plant nutrient essential to the growth of plants. Fertilizer would artificial or natural (compost).This important is one of the most inputs which increase the quantity of maize.

Oxen: It was a number of bulls or castrated bull, used for pulling heavy loads. It is a source of power. it was expected to affect the household level maize production positively because when the number of oxen increase. the productivity of maize also increases.

Model Specification

Multiple Linear Regression Analysis

Linear regression is a method of estimating or predicting a value on some dependent variable given the values of one or more independent variables. Like correlations, statistical regression examines the association or relationship between variables. Unlike correlations, however, the primary purpose of regression is prediction (Geoffrey M. et al., 2005:224-225). In this study multiple regressions was employed. Multiple regression analysis takes into account the inter-correlations among all variables involved. This method also takes into account the correlations among the predictor scores (John Adams, et al., 2007:198). They added multiple regression analysis, which means more than one predictor is jointly regressed against the criterion variable. This method is used to determine if the independent variables will explain the variance in dependent variable.

Regression Functions

The equation of regressions on this study was generally built around two sets of variables, namely dependent variable (quantity of maize) and independent variables (capital, family size, availability of improved seed, land size, labor, number of oxen, fertilizer). The basic objective of using regression equation on this study was to make the study more effective at describing, understanding and predicting the stated variables.

Regress Performance on Selected Variables

$$Yi = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3\ X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + \mu i$$

Where: Y is the response or dependent variable- performance

$\beta 0$, is the intercept term- constant which would be equal to the mean if all slope coefficients are 0.

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$, $\beta 5$, $\beta 6$, $\beta 7$, and $\beta 8$ are the coefficients associated with each independent variable which measures the change in the mean value of Y, per unit change in their respective independent variables.

X_1 = family size, X_2 =capital, X_3 =land size, X_4= labor cost, X5= fertilizer, X6=oxen, X7=improved seed, U=Error term/omitted variable.

4. WORKING PLAN

No	Activity	Time
1	Information survey	August, 2022
2	Questionnaire development	August, 2022
3	Formal survey	August, 2022
4	Data summarization	August, 2022
5	Data coding and entry	September,2022
6	Data analysis	September,2022
7	Writing the first draft report	September,2022
8	Revising the draft report	September,2022
9	Writing the final report	September,2022
10	Presenting the report	September, 2022

Table 1.wokiing plan

5. BUDGET/ LOGISTICS

Item	Unit	Unit price	Amount of required	Total price
Paper	Packet	150	1	150
Pen	Number	10	4	40
Flash(16GB)	Number	250	1	250
Printing	Page	2.5	27	67.5
Transport				
Card for researcher	Number	10	3	30
Total				537.5

Table 2.budget plan

6 REFERENCES

Akande, S.O., 2004. “Comparative Cost and Return in Maize Production in Nigeria”. NISER Individual Research Project Report, NISER, Ibadan, pp: 1- 35.

Anderson, S. & Baland, J. (2002). "The economics of ROSCAs and intra household resource allocation. 117(3) 963-995. Oxford University Press

Cooper, D., & schindler, p.s.(2003). Business Research Methods (8th ed). new Delhi: tat McGraw-Hill publishing company. India.

Doyer, O. T., D'Haese, M. F., Kirsten, J. F., & vanRooyen, C. J. (2007). Strategic focus areas and emerging trade arrangement in the South African agricultural industry since the dimese of the marketing board. Agrekon , 46 (4), 494-513

FAOSTAT. (2010) Food and Agricultural Organization of the United Nations (FAO), FAO Statistical Database, 2010, from http://faostat.fao.org

FAOSTAT. (2010) Food and Agricultural Organization of the United Nations (FAO), FAO Statistical Database, 2010, from http://faostat.fao.org

International Assessment of Agricultural Knowledge, Science and Technology for Development. (2009). Agriculture at a Crossroads. Washington, D.C.: Island Pres

IPCC., (2007). New Assessment Methods and the Characterisation of Future Conditions: In Climate change 2007: Impacts, adaptation and vulnerability,pp: 976. Contribution of working group II to the fourth assessment report of the Intergovernmental panel on climate change. Cambridge university press, Cambridge, UK

Jones, M. Mukumbu, and S. Jiriyengwa. (2007). "Maize Marketing and Price Policy in Eastern and Southern Africa." In D. Byerlee and C.K. Eicher (eds.), Africa's Emerging Maize Revolution. Boulder, Colorado: Lynne Rienner Publishers.

Joshi, P.K., N.P. Singh, N.N. Singh, R.V. Gerpacio,and P.L. Pingali. 2005. Maize in India: Production Systems, Constraints, and Research Priorities. Mexico, D.F.: CIMMYT.

Kombo and Tromp (2006). Sample determination, New analysis procedures ISBN 32/32 2 Nairobi University publishers: Nairobi

López-Pereira, M.A., and Morris, M.L., (2007). Impacts of International Maize

Martin,I.F.,et al(2005).maize breeding for four Australian environments.pp77-80

Martinez, A.(2000). Fertilizer Use Statistics and Crop Yields.

Martinez, A.(2004). Fertilizer Use Statistics and Crop Yields. Muscle Shoals, Alabama: IFDC.

Meyer, F. H. (2010). Model closure and price formation under switching grain market regimes in South Africa. University of Pretoria. Pretoria: Published Phd thesis

Michele. B, (2007). Linkages between FAO Agroclimatic Data Resources and the Development of GIS Models for Control of Vector-borne Diseases. Acta Tropica 79, pp.21–34

Ministry of Agriculture. (2010). Strategic Plan 2008-2012. Nairobi: Kenya Ministry of Agriculture.

Morris, M. (2004). Assessing the benefits of international maize breeding research: An overview of the global maize impacts study. Part II of the CIMMYT 1999-2000 world maize facts and trends

Mude, A., Kumar, P., (2006). Estimating the welfare impacts of maize price policy in Kenya. Study presented at the World Bank Workshop on Poverty and Economic Growth, Washington, DC.

Nairobi Kenya Mutunga, N. and James. O.,(2003). Kenya: July 2002 – 2003 Annual Harvest Assessment. FEWS NET,November 52: 112-126. (2003).

Nigussie, M., Tanner, D. and Twumasi-Afriyie S. (eds.). 2002. Enhancing the Contribution of Maize to Food Security in Ethiopia: Proceedings of the Second National Maize Workshop of Ethiopia, 12-16 November 2001, Addis Ababa, Ethiopia

OECD (2006). Putting the Young in Business: Policy Challenges for Youth Entrepreneurship, the LEED Programme, Territorial Development Division, Paris

Pingali, P.L., (Ed.), 2004. CIMMYT 2002-2005 World maize facts and trends:Policies Review,2006. Rome.

Pingali, P.L., (Ed.), 2004. CIMMYT 1999-2000 World maize facts and trends: Meeting world maize needs: Technological Opportunities and Priorities for the Public Sector, CIMMYT, D.F, Mexico

Russell K. Schutt,(2006). Sample design techniques and methods of planning analysis

Wiebe, K.D., Soule, M.J. and Schimmelpfennig, D., 2006. Agricultural Productivity for Sustainable Food Security in Sub-Saharan Africa. In Zepeda L (ed), Agricultural Investment and Productivity in Developing Countries, FAO, Rome.