ECONOMIC ANALYSIS OF MAIZE PRODUCTION IN KADUNA STATE, NIGERIA.

BY

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(MSC/AGRIC/22012/1999 – 2000)

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DECLARATION

I hereby declare that this thesis was written by me and that it is a record of my own research work. It has not been presented before in any previous application for a higher degree. The works of other researchers that were referred to, have been duly acknowledged.

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The above declaration is confirmed.

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CERTIFICATION

This thesis entitled "Economic Analysis of Maize Production in Kaduna State, Nigeria" by Buba, Tabitha Jummai meets the regulations governing the award of the Degree of Master of Science Agricultural Economics of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This Thesis is dedicated to my late Parents, Pa Timothy Gaba Sidi and Madam Ramatu Ayashe Timothy, who with the help of the Almighty God successfully laid the foundation of what I am today. To them, I will for ever remain grateful.

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ABSTRACT

The objectives of this study were to; described the socio-economic characteristics of maize farmers estimated costs and returns, determine the inputs and output levels and examine the impact of input prices (seed, fertilizer and herbicides) on maize production in Kaduna State.

This study utilized data collected from the large farm inputs - output survey conducted in 2000/2001 cropping season by the International Institute for Tropical Agriculture (IITA), Ibadan in collaboration with Kaduna State Agricultural Development Project (KADP). The survey was conducted in 13 local government areas of Kaduna state. The data on prices and output of maize were collected from KADP for a period of 15 years (1990 - 2004). Other sources of secondary data were Premier Seed, Kaduna state Farmers Supply Company (FASCOM), and SARO Agrochemicals. The analytical tools used include descriptive statistics, farm budgeting technique and Multiple Regression Analysis.

The result of the socio-economic analysis shows that 44% of the farmers were between the ages of 41 and 50 years, but the average age was 46 years. While 41% had no formal education, 14% of the educated ones was through vocational schools. Average household size was 10 people and only 14% of the farmers belonged to farmers' cooperative societies.
The average level of seed, fertilizer and herbicides used were below the recommended rates, seed was 13kg/ha, fertilizer was 4 bags/ha, while herbicide was 0.15 L/ha. Maize yield was also lower than expected (1.1 ton/ha). The economic analysis showed that Gross Margin per hectare from sole maize crop was ₦13,943.60. Fertilizer was the most prominent cost item, accounting for 59% of the total cost of production. The results of the regression analysis indicated that out of the three input prices included in the model, the prices of herbicide and

seeds had an inverse relationship with maize yield while fertilizer price had positive effect. However, only the effects of prices of fertilizer and herbicides were statistically significant at 5% level of probability. All the prices of the specified inputs have negative but insignificant relationship with the maize yield suggesting that inverses and their prices lead to reduction in maize output because farmers would tend to buy less of them.

The study concluded that through maize production in the state is profitable, increasing prices of seed input may result in decrease in output.

The study recommended that input subsidy, training of farmers, and credit facilities to boost sustainable maize production system in Kaduna State.

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CHAPTER ONE

INTRODUCTION

1.0

One of the major tasks facing Nigerian agriculture is the provision of an adequate and well-stable food supply to meet the requirements of a growing population. One of such food crops is maize. The significance of maize to the modern society is first and foremost clearly reflected in the importance of the crop in the diet of man and animals throughout the world (Onwueme and Sinha, 1991). Abubakar (1999), ranked maize as the third most important cereal after wheat and rice globally.

In Nigeria, maize is produced across the country right from the mangrove region in the south to the Sahel Savannah in the North (Edache, 1999; Tauna, 1999; Olukosi and Raphael, 1997). Maize production in Nigeria has also been on the increase both in terms of hectarage and production. A seven-fold increase in production occurred between 1984 and 1994. Similarly production increased from 6,515,000.0 to 7,019,500.0 tonnes (7.75%) between 1999 and 2003 respectively (CBN Annual Report 2003).

In recent years however, production of maize in Nigeria has been declining due to low input usage. For example, in 2000 production was 6491MT as compared to 6515MT in 1999. Rapid population growth and increased pressure on land have led to a reduction in fallow periods to below the threshold needed for sustainability (FAO, 1985; Conways, 1997). To compound the situation, essential inputs such as fertilizer, herbicides and pesticides were often scarce and costly at a time when economic reforms have compelled reductions in farm inputs subsidies. Maize is a heavy feeder that requires sustainable amount of nutrients uptake. In the Savannah region, the enormous potentials for maize production can be realised only with the use of high levels of fertilizer, improved seeds, hectarage expansion and adequate weed control. With adequate supply of these inputs and the provision of adequate storage facilities, the rapid expansion of maize could be sustained.

Since the 1970s, the federal government made it a policy to increase the agricultural production through the increased use of fertilizer. This led to the decision by the Federal Government to establish local fertilizer plants as against relying entirely on fertilizer importation as the case was prior to 1976. The effectiveness and sustainability of these plans varies with government. For maize farmers, access to fertilizer is an important input considered in the production decision. This have direct effect on the level of productivity, thus increased productivity contributed to economic development and policies for effective mobilization of the resources for transforming self-sufficient oriented maize farmers to commercial and market oriented agriculture (Nyako, 1999).

The total area under maize cropping in Nigeria was estimated to be 3.0 million hectare (Lamarde, 1994). Traditionally, production ranged from 0.4 – 1.7 tonnes per hectare, but with improved methods and improved inputs, the yield could be up to 4 – 5 tonnes per hectare (Lamarde, 1994). Maize is the most important cereal in Nigeria and is grown either as a vegetable at the backyard or on the farm (Kehinde, 1997).
Throughout Nigeria, the selling of roasted and boiled maize is a thriving business that provides employment for hundreds of thousand of young girls and women. Though

the nature of employment is part time and seasonal, it nonetheless provides an important source of livelihood for the hawkers. Maize is also widely processed into a variety of food drinks such as pap and "Kunu".

In addition, maize is used in making cakes such as 'masa'. However, the predominant use of maize in Northern Nigeria is for making 'tuwo'. It is also the main source of energy in livestock and poultry feeds. The growing plant can be cut and made into silage or hay for the feeding of cattle and other ruminants. Thus, maize production gives employment to people and provides food and drinks for man and feeds for poultry and livestock.

1.1 STATEMENT OF THE PROBLEM.

The year 2000 was set as a target date for the attainment of food self sufficiency by all African countries in the action plan agreed upon in Lagos, Nigeria (Salih, 1994). However, roughly 5 years after the deadline, little or nothing had been achieved. This failure is evident by the excess capacity in the agro industrial sector; rapid increase in food prices and the gradual resort to food importation among others.

Rapid growth in agriculture is essential for broad based economic growth, but acceleration in agricultural growth requires sound use of science and technology embodied in improved seed, fertilizer, agrochemical and other agronomic practices. However without an efficient and cost effective supply of these inputs at the farm gate, science based growth in agricultural productivity cannot be achieved. Furthermore, with the phased withdrawal of subsidies and privatisation, the input markets remained underdeveloped and fragmented and farmers do not receive good quality inputs and pay unreasonable high prices despite the fact that the private sector in Nigeria has a potential to supply agricultural inputs in a cost effective manner (IFDC, 2001).

One of the problems cited as constraining the production of maize in Nigeria is stagnant production technology among Nigerian farming community, majority of who are small-scale producers. The reason for this could be attributed to resource productivity as studies have confirmed inefficiency in resource utilisation in both food and cash crops in Nigeria (Olagoke, 1999 and Olayide, 1979).

Furthermore, the extent to which inputs supply and productivity relates to a shortfall in food demand and supply in Nigeria is not clearly understood. At the same time, the impact of factors such as the policy environment, and the availability of markets for the disposal of farm outputs is not often considered despite the fact that such factors make farmers to work harder and thus, produce higher outputs.

This study attempts to analyse the productivity of agricultural inputs in food crop production by taking the maize crop as a case study. It is against this background that the following research questions were formulated.

1. What are the socio economic characteristics of maize farmers in Kaduna State?
2. What are the inputs – outputs levels in maize production?
3. What are the costs and returns in maize production?
4. To what extent do the prices of Agricultural inputs affect Maize output?

1.2 OBJECTIVE OF THE STUDY.

The general objective of this study was to assess the effects of inputs as well as the impact of input prices on maize production in Kaduna State, Nigeria.

The specific objectives were to:-

1. Describe the socio-economic characteristics of maize farmers in Kaduna state.
2. Estimate the inputs-output levels in maize production in Kaduna state.
3. Determine the costs and returns and hence profitability of maize production in Kaduna State.
4. Determine the effects of input prices on maize production in Kaduna state.

1.3 JUSTIFICATION OF THE STUDY.

Policy makers have been making frantic efforts to attract people into farming. This study is expected to provide valuable benchmark information to these new entrants on resource productivity and profitability in maize production so as to enable them consider its production as a viable option. As for farmers who are already cultivating the crop, the study will go a long way in providing information on ways of boosting production. In order to increase the production of maize, sound micro and macroeconomic farm policies are needed. These require prior to their formulation, an understanding of the input prices and output relationship in maize production. This will obviously go a long way in generating employment opportunities for thousands of Nigerians, improve the food security status of Nigerians and most importantly, improve export and generate additional foreign exchange for the country.

1.4 **HYPOTHESIS**.

The following hypotheses were tested;

I. Maize production in the state is not profitable (i.e GM=0), where GM= gross margin from the production

II. The input prices have no effect on the level of maize production in the state (i.e $b_i \neq 0$), where b is the regression co-efficient of the input variable.

CHAPTER TWO

LITERATURE REVIEW

2.1 OVERVIEW OF THE FEDERAL GOVERNMENT POLICY ENVIRONMENT ON AGRICULTURE.

The Federal Government of Nigeria formulated its first comprehensive agricultural policy in 1985. The policy instruments, which were to remain valid for the next 15 years, were composed of macro-economic, policies, agricultural sector policies, and policies for support services. The macro-economic policies included pricing, trade, exchange rate and agricultural land policies. The sector – specific policies included food production, input supply and subsidy policies. The primary objective of these policies was to reinforce agriculture's contribution to food security, employment, and provision of raw materials and foreign exchange in the Nigerian Economy (IFDC, 2001).

2.1.1 FERTILIZER POLICY OVERVIEW

Prior to 1976, the state governments were responsible for the procurement and distribution of fertilizer until the federal government established the Fertilizer Procurement and Distribution Division (FPDD) within the Federal Ministry of Agriculture. However realising that an efficient and sustainable agricultural input supply system could be achieved through the participation of the private sector, the Government started reforming the fertilizer sector in 1994 and adopted a fertilizer liberalization policy in 1996.

The Federal Government completely withdrew from procurement and distribution activities and discontinued the subsidization of fertilizer. To give relief to farmers, it reduced the import tariff on fertilizers from 10% in 1996 to 5% in 1999 and zero percent in 2000. It also abolished the value – added tax (VAT) and excise duty (IFDC, 2001).

A historical review of Nigerian fertilizer policy by Nagy and Edum (2002) reveals an inconsistency of government fertilizer policy over the years. Policies kept changing almost year by year in order to check the problems of availability, leakages and arbitrage. However none of these policies succeeded.

The federal government did not follow through on the liberalisation process started in 1997 by ensuring that the preconditions for a transition to a privatised fertilizer sector were implemented. The federal government withdrew from fertilizer procurement and subsidy policies, leaving the industry stranded.

2.1.2 SEED POLICY OVERVIEW.

A national seed policy formulated in 1992 provides guidelines for the development of the seed sector. The National agency responsible for co-ordinating development, monitoring policy and implementing quality control in the national seed system is National Seed Service (NSS) of the Federal Ministry of Agriculture. A decree was also enacted (Decree No 72, 1992) to regulate the various aspects of seed production, marketing and quality control. The policy also makes provision for the withdrawal of the public sector in favour of the private sector or private seed companies. These seed companies produce and market open pollinated certified seeds of maize and hybrid maize. Other types of seeds handled by the companies include rice, sorghum, wheat, millet, cowpea and different vegetables (IFDC, 2001).

2.1.3 AGRO-CHEMICAL POLICY REVIEW:

Government strategy on agro-chemicals supply is to encourage the establishment of plants to manufacture or process agro-chemicals in Nigeria. For imported agro-chemicals, the government's strategy is to ensure the timely supply in adequate quantities by providing the necessary assistance for their importation. There is currently no manufacturer of Agro-chemical in the country although some companies have formulation and packaging plants. For agrochemical unlike fertilizer it has more or less always remained private sector driven.

2.2 THE PLACE OF MAIZE IN THE NIGERIAN ECONOMY.

Maize is an important crop in the world, it ranks second followed by wheat in the world production of cereals. The total area devoted to maize in 1948 and 1989 was 88 and 129 million hectare respectively. Thus, indicating an increase of about 47% (Onwueme and Sinha, 1991).

In Nigeria, maize is one of the most important crops for food and cash. Its dual role of feeding a fast increasing population and supporting a potentially buoyant agricultural industrialisation is well recognised (Fajemisin, 1978). He further noted that by 1975 there was a projected demand of over one million metric tons against a supply of 931,239 tons. The deficit was met by importation of maize. With the expansion of the economy, particularly the poultry industry, the deficit has increased even more. However, maize production in Nigeria has been on the increase both in terms of hectarage and production (Ajala and Kling, 1999). Recent statistics have shown that maize production for the past five years (1999 – 2003) have been on the increase except for year 2000 which had a slight decline from the previous year (CBN, 2003). Apart from maize being a major food item in many parts of the country, Kassam (1977), asserted that it is a main component of most animal feeds on which increased livestock production depends. In addition, Tauna (1999) in his study shows that maize is an important raw material for a number of agro – based industries, which are rapidly increasing in number and scope in the country. It is therefore necessary to tackle the problem of maize production with bolder measures.

2.3 STATUS OF MAIZE FARMERS IN NIGERIA.

Maize (Zea Mays L) was introduced in Nigeria in the fifteenth century. It has risen from being grown as a compound crop in a few scattered villages to the status of widespread and large and its production is still increasing (Obilana, et al, 1978).

Maize is important in the cropping system of the small scale Nigerian farmer whereby it is frequently found grown in mixture with other crops such as legumes or even cereals under traditional practice. Apart from early millet, it is the earliest grain that is harvested in any given season, hence giving relieve to the usual food scarcity being experienced at such periods of the year. Secondly surplus early harvested maize is sold off by farmers and the revenue realized is used for buying farm inputs e.g. fertilizer for application on other crops or even late planted maize, or for hiring additional labour outside the family source.

Maize farming in Nigeria involves millions of small-scale farmers whose level of income, quantity of production, hectarage expansion, market outlets and financial dependence keep them subservient to economic decision and operating constraints

(F.A.O. 1985). Therefore research findings have discovered that the large maize farms were more economically efficient than the small farms, Ahmed (1985).

Abalu (1984), in his study found that small scale farmers in Nigeria constitute the most significant population of those engaged in farming production. He also identified small-scale peasant farmers as the most effective means of meeting the food needs of the country.

Onucheyo (1998), asserted that the small-scale farmers hold the key to increased food production in Nigeria. It is therefore the responsibility of research scientists, government and extension agents to improve the status of maize production in Nigeria.

2.4 INPUT AVAILABILITY AND PRODUCTIVITY

It had been reported that Nigeria's inability to produce sufficient food to feed its population like most countries was due to inadequate input supply (FAO, 1985). Almost all the food output comes from an expansion of about 2% per year in the land area of crop grown, not from increases in yield (IITA, 1991). Ogunfowora, et al (1986) showed that the situation of abundant land area with little or non – availability of productive inputs prevail in Nigeria. It is doubtful if the situation has changed much even now.

In agriculture just like in any other industry, inputs are used to produce output from which income is derived. Thus, non – input availability leads to a vicious circle of poverty where low input leads to low output and low income. Kupfuma (1993) shows that access to require inputs will affect the level of output, both in quality and quantity. He also revealed that farmers with good access to markets, better farm equipment and who use credit are most likely to use fertilizer to boost their production.

Onwueme & Sinha (1991) showed that maize has a high demand for nitrogen. The statement of "No fertilizer, no maize" is a common saying of maize farmers in the savannah region of Nigeria which stems from practical experience whereby farmers harvest little or nothing if nitrogenous fertilizer is not applied on maize. Nyako (1999) in his study revealed that there is soil fertility depletion which needs to be regenerated through the use of chemical fertilizers to increase the amount of nutrient up take by plants. Ingawa (1999), further opined that fertilizer is second to labour in terms of the total cost of production. Bayene (1993), observed that the use of fertilizer by peasant farmers is generally less than their demand, despite the knowledge that it is the key input especially in the production of maize. He added that in Nigeria, upward adjustments in foreign exchange have resulted to dramatic increase in the prices of farm inputs such as fertilizer and other agro chemicals. Thus, to enhance effective agricultural production, agricultural policies must focus on the effort to make farm inputs available to farmers at the right time and at subsidised rate.

2.5 INPUT USE EFFICIENCY

Technical efficiency is defined as the ability of a firm to produce as much output as possible with a given level of inputs, given the existing technology. Therefore, there is the need for quantitative analysis of the contribution of the inputs and the efficiency of their use by the farmer (Esoghue and Ekong 1991). Because the general welfare of the population e.g the supply of basic food, both for farm and non – farm families depends on the efficiency of the subsistence sector of agriculture, determining the efficiency status of farmers is very important for policy purposes. Efficiency measurement is very important because it is a factor of productivity growth (Bedassa and Krishnamoorthy, 1997). Hence it is very important for policy purpose (Habibullah and Ismaíl, 1994).

Estimates on the extent of inefficiency can help decide whether to improve efficiency or develop new technologies to raise agricultural productivity (Habibullah and Ismail, 1994). They further added that the main concern of any economic activity is to achieve the maximum possible efficiency by transforming a set of given inputs to products. Commenting on the importance of measuring efficiency, Makinde (2000) holds that it is the first step in a process that might lead to substantial resource savings, which have important implications for welfare and food security. Because efficient farmers are more likely to generate higher output and income and they will have a better chance of surviving period of food stress.

Farm operators, like any other businessmen, must have some income (profit) incentive to increase production. Any constraint imposed by society that increases costs without a compensating increase in efficiency of higher prices will probably result in decreasing production (National Academy of Sciences, Washington DC. 1975).

A study in the state of Tamil Nadu, India by Tadesse and Krishnamoorthy (1977), showed that 90% of variation in output among paddy (IR – 20) farms is due to differences in technical efficiency. It was found that land, animal power and fertilizers have significant influence on the level of paddy production.

Zeeuw and Van de meer (1995), held the view that technical efficiency is not necessarily a major criterion in agricultural production by farmers, but rather that more often, farmers strive for maximum labour productivity or other economic objectives. Their conduct is ruled by price incentives, which often are distorted by premiums and subsidies. They further stated that risks and uncertainties will lure them to apply more inputs than is needed in a balanced supply. Fuel and machinery cost per unit output are lowest at maximum yield, which is most probably above the optimum for the primary production factors. In short, the technically optimum production situation is not necessarily also the economically optimum one according to Zeeuw and Van de Meer, in Zoebl (1995).

Llewlyn and Williams (1996), sited Fara et al and cautioned that efficiency by a firm in inputs does not imply that the firm is necessarily efficient in outputs. Technical, allocative, and other efficiency measures of outputs cannot be determined from corresponding efficiency measures of inputs or vice versa because output and inputs efficiencies focus on different aspects of production.

2.6 COSTS AND RETURNS IN MAIZE PRODUCTION.

For producing a crop, costs and return are important factors which dominate the decision making process of the farmers. The farmer producing maize had to incur cost of different inputs. Harvey, (1977) stated that the firm making the largest profit is the one whose costs of productive inputs are lowest. This indicates that it will have an incentive to expand production and, if necessary can afford to pay more factors of production. Returns not only indicate that consumers want more of a good; they are also the inducement to firms to produce this good. Akinwumi (1971), investigated the costs and returns of both early and late maize under semi – mechanised levels of technology and observed a decline in mechanisation cost with increase hectarage for early maize and suggests that farmers should reduce cost through hectarage expansion.

Aderibigbe, (1973) opines that profit level is influenced by the size of the operation in relation to the inputs cost of the business. Pillany, (1977) states that operating cost in small-scale farms can be reduced by the use of family labour, but that for proper cost allocation, the opportunity cost of family labour should be determined. Obayemi and Oni (1971), assert that other factors like labour, land and other inputs such as fertilizer, improved seeds etc besides cost consideration, determine the size of the farm holdings.

2.7 EMPIRICAL STUDIES ON INPUTS PRODUCTIVITY IN MAIZE PRODUCTION.

The agricultural system of the sub-Saharan Africa characterized by slashes and burn system for the restoration of natural soil fertility can no longer be sustained in the region. This is due to the rapid population growth resulting to increase pressure on land (Chianu, 2000). In Nigeria this is more so with crop such as maize, which is a heavy feeder of nutrients. Murithi and Shiluli (1993), showed that fertilizer use is an important input in enhancing agricultural production.

Onucheyo, (1998) further indicated that the greatest needs of small scale farmer is capital for modernising and expanding their farm operations. He further emphasised on this because farmer may have the land and some family labour but lack of capital to meet the increasing production costs such as fertilizer, seeds, etc through inflation, and economic imbalances affect the inputs available for production.

Studies on the relationship between access to agricultural inputs on farm productivity indicated that fertilizer has often been a limiting factor in the production of maize due to inadequate availability or high price (Beyene, 1993; Kupfuma, 1993; Dlamini, 1993), in their separate studies found that for most farmers, fertilizer is a determining factor of whether to produce maize at all and the total area to put under maize cultivation. CIMMYT SSADC/ICRISAT (1993) found that maize yield was lowest on farms where there is little or no fertilizer. Geurts (1999) in his study on fertilizer and maize price in Nigeria found that maize output depends on productive inputs especially fertilizer. In the study area the normal behaviour of farmers is that they shift from producing maize to other less fertilizer demanding crops such as Soya bean, Cowpea, other legumes and pepper in the years that fertilizer prices were very high. Therefore, farmers growing maize should have access to fertilizer and other productive inputs in order to increase the yield so as to meet the needs of the growing population.

CHAPTER THREE

METHODOLOGY

3.1 STUDY AREA

The study was conducted in Kaduna State. The State occupies part of the central portion of the northern part of Nigeria and shares common borders with Zamfara, Kastina, Niger, Kano, Bauchi, Nasarawa and Plateau state. To the south – west, the state shares border with the Federal Capital Territory (FCT). The state lie between Longitudes 6^0 and 09^0 between Latitudes 9^0E and between latitudes 9^0 and 11^0 30'N. The State occupies an area of approximately 48,473.2 square kilometers and has an estimated population of approximately 5,055,684 people (NPC, 1991).

The location of Kaduna State gives rise to a variety of climatic conditions which favour the growth of a number of agricultural crops such as cereals, fruits, vegetables, roots and tubers, providing both small and large industries with raw materials.

The entire land structure consists of an undulating plateau with scattered hills as one moves to the southern part of the State. The major rivers in the State include River Kaduna, River Wonderful in Kafanchan, River Kogom, River Gurara and River Galma. There are two marked seasons in the State, the dry and rainy seasons. The rainy season is usually from April, to October with less rain as you move northwards. On the average, the state enjoys a rainy season of about five months. Rainfall ranges from 800mm to 1500mm from North to South respectively.

The State is within the tropical grassland known as guinea savannah in the south and the Sudan savannah in the north. The grassland is a vast region covering the southern part of the State to about latitude 11^0 north of the equator. The prevailing vegetation of tall grasses and big trees are of economic importance during both the wet and dry seasons.

About 80 percent of the State's population is engaged in peasant farming producing both food and cash crops. The crops produced in the State include cotton, groundnut, tobacco, maize, beans, guinea corn, millet, rice, ginger, cassava, yam and potatoes. During the dry season a considerable number of people in the State are engaged, in irrigation farming along some major rivers and dams. Low lying fertile land with a lot of alluvial deposit known as the "Fadama" is particularly important for irrigation farming in Kaduna State. The total "fadama" area in Kaduna state is estimated to be 80,000 ha out of this only 11,000 ha have been put under cultivation. The crops cultivated are mainly vegetables and to some extent wheat and maize.

Another important aspect of agriculture engaged by the people is the rearing of cattle, sheep, goats, pigs and poultry farming. Kaduna State occupies a very strategic position in terms of its historical role, contemporary political development and economic activities. Kaduna State has 23 local government councils.

3.2 THE DATA/METHOD OF DATA COLLECTION.

For this study, secondary data were utilised. The data consisted of those that were extracted from a large farm input – output survey conducted by the International Institute for Tropical Agriculture (IITA) which was one of their regular surveys in collaboration with Kaduna State Agricultural Development Project (KADP) in 2000/2001 cropping season. The study was conducted in 13 local government areas of Kaduna State namely Giwa, Ikara, Kubau, Makarfi, Sabon Gari, Soba, Jama'a, Kagarko, Kaura, Zangon Kataf, Chikun, Kauru and Lere.

The LGAs were randomly selected from the list of all the local government areas in the state. 77 villages were also randomly selected from the LGAs. While a total of 400 farming households were sampled, out of which 337 are maize farmers and were purposively considered for this study. Also data on output and prices of maize in Kaduna state were collected from the records of KADP for a period of 15 years (1990 – 2004). Data on prices of Agricultural inputs (fertilizers, seed and herbicide) for 15 years (1990 – 2004) were collected also from Kaduna State Farmers Supply Company (FASCOM), SARO Agrochemicals and Premier Seed Company.

3.3 ANALYTICAL TECHNIQUES.

In order to achieve the objectives of this study, the following tools of analysis were employed.

(1) Descriptive statistics.

(2) Farm budgeting analysis.

(3) Multiple Regression Analysis.

3.3.1 Descriptive Statistics.

Descriptive statistics was used to satisfy objectives one and two. This tool was employed to have summary description of the data collected. It involved the use of percentages, figures, means and frequency distribution to group the farmers into a number of classes with respect to socio economic characteristics, yield and factors of production such as type of labour, seed, fertilizer and herbicide used for maize production. Arithmetic mean were used to determine the mean value of the available inputs used and output obtained.

3.3.2 Farm Budgeting Techniques

This is one of the most common analytical tools used in farm management investigations to derive performance standard of the farm enterprise. It was used to satisfy objective three. Barnard and Nix (1976), describeed budgeting as the detailed quantitative statement of a farm plan and a forecast of its financial result. Olukosi and Erhabor (1988) defined a farm budget as a detailed physical and financial plan for the operation of the farm for a certain period of time. Farm budgeting was used in this study to determine the level of costs, returns and net revenue that accrue to maize production based on the inputs used. The budgeting tool that was used in the study is the Gross Margin Analysis. Gross Margin (GM) is measured as the difference between the Gross Returns (GR) and the Total Variable Cost (TVC). The fixed cost component of the total cost of production is assumed to be negligible. The Gross Returns (GR) is the total output multiplied by the unit price of maize. This gives a measure of the value of the enterprise.

The total variable cost measures those costs that vary more or less in direct proportion to the level of production. The component involves costs of such inputs as seeds, fertilizers, labour and transportation costs.

The Model is expressed as follows: -

$GM = GR – TVC$

Where GM = Gross Margin (Naira/ha)

GR = Gross Returns (Naira/ha)

TVC = Total Variable Cost (Naira/ha).

3.3.3 Multiple Regression Analysis

This was used to satisfy objective 4 of the study. A linear, Cobb Douglas and Semi – log functional forms were fitted to the on maize output level and input prices covering 1990 to 2004 data. The data were obtained from the records of KADP and FASCOM respectively. The explicit supply model was specified as;

$Yt = f(X_{1t}\ X_{2t}\ X_{3t}\ U_t)$

Where:-

Y_t = Total output of maize supplied in $year_t$ (Kg)

X_{1t} = Price of NPK fertilizer in $year_t$ (Naira/50kg bag)

X_{2t} = Price of maize seed in $year_t$ (Naira/2Kg bag)

X_{3t} = Price of herbicide in $year_t$ (Naira/Litre)

t = 1 – 15 years (i.e. 1990 – 2004).

The apriori expectations about the independent variables are as follows:-

X_1 (Fertilizer Price): This was expected to have an inverse or negative relationship with maize output.

X_2 (Price of Maize Seed): This was expected to have an inverse or negative relationship with maize output.

X_3 (Price of herbicide): This was expected to have an inverse or negative relationship with maize output.

The Regression analysis was expected to show the effects of the specified input prices on the maize supply over the last 15 years. Labour wage data was not readily available like those used because it is highly varied between farmers and therefore not included in the model.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION.

4.1 Socio-economic characteristics of maize farmers.

4.1.1 *Age Distribution of Maize Farmers*.

Table 4.1 shows that 44% of the farmers interviewed fell within the age range of 41 to 50 years. While 18% were aged between 31 to 40 years, 4% were aged between 21 and 30 years. The above implies that a large proportion of the farmers producing maize are within the active age of 21 to 50years. The average age of the farmers was 46 years. The age factor is important especially in the adoption of innovations and the ability to cope with the drudgery associated with crop production in general. The result here is an indication that maize production will be sustained in the years ahead in the state. However, the set back is that ownership of factors of production such as land and capital is usually limited for young farmers.

Table 4.1 Age Distribution of Maize Farmers.

Age (Years). Range	No of farmers	Percentage (%)
21 – 30	14	4.26
31 – 40	64	18.55
41 – 50	154	44.61
51 – 60	84	25.00
>60	25	7.52
Total	**337**	**100.0**

Source: Survey Data.

4.1.2 **Educational Level**

The educational levels of the farmers are shown in Table 4.2. The table shows that 40% of the maize farmers interviewed had no formal education, 29% had primary education and 11% had secondary education, only 4.3% had post secondary education. The education level of farmers is a key factor in the comprehension of extension guides and the adoption of improved farming techniques. The low educational level of farmers may have affected their ability to read extension guides, and this could have contributed to low yield of maize.

Table 4.2. Distribution of Farmers according to Educational level.

Level of Education	No of farmers	Percentage (%)
No formal education	135	40.51
Non formal vocational education.	46	13.87
1 – 6 year of Primary	100	29.87
1 – 6 year of secondary	39	11.65
Post Secondary	17	4.3
Total	**337**	**100**

Source: Survey Data.

4.1.3 **Household Sizes**.

The household size is shown in Table 4.3. Among the maize farmers, 49% had more than 12 people in the household, while about 22% had between 5 and 8 people in their household. Only 3 percent had between 1 and 4 people in their household. The average household size was 10, this could mean that there was a reasonable supply of family labour for farm operations in the study area.

Table 4.3 Distribution of Respondents According to Household Size

Household size	No of people	Percentage (%)
1 – 4	12	3.54
5 – 8	77	22.73
9 – 12	82	24.49
> 12	166	49.24
Total	**337**	**100**

Source: Survey Data.

4.1.4 Farming Experience.

The farming experience of the farmer is an indication of his expertise in farming. Table 4.4 indicates that majority of the farmers (53%) have been producing maize for upwards of 25 years. About 15% had 21 to 25 years experience in maize production, while 4 percent had 1 to 5 years experience in maize production. There is high level of experience in maize production among the farmers which suggests that their managerial ability in terms of managing farm risks and uncertainties such as price fluctuations, disease outbreaks and pest infestation in maize. Their farming experience made up for their lack of education. This is very important for participatory extension method in which the experience of farmers count so much.

Table 4.4 Distribution of Farmers Based on their Farming Experience.

Years of Experience in Maize Production	Frequency	Percentage (%)
0	9	2.58
1 – 5	4	1.03
6 – 10	23	6.70
11 – 15	61	18.04
16 – 20	52	15.46
21 – 25	10	3.09
>25	178	53.09
Total	**337**	**100**

Source: Survey Data.

4.1.5 Membership of Cooperative Associations.

The membership of clubs, associations or cooperatives could avail farmers the opportunity to obtain credit, receive inputs and obtain information on important and recent information concerning their farming activities. However Table 4.5 shows that only 14 percent of the maize farmers interviewed belong to an association, while 86% did not belong to any group.

Table 4.5 Distribution of Farmers Based on Membership of Cooperatives and Associations

Membership of Farmers Associations	Frequency	Percentage (%)
Yes	46	13.89
No	291	86.11
Total	**337**	**100**

Source: Survey Data.

4.1.6 Access to Bank Credit.

Capital is an important factor of production. Timely supply of capital in form of credit to farmers will go a long way in ensuring that inputs are purchased in good time for the current season's operations on the farm. Table 4.6 indicates that 60% of the sampled farmers did not obtain bank credit, while 40% percent were able to get. Late applications for loans by farmers and the bureaucratic bottle necks were responsible for this problem. The above scenario impact negatively on maize production in the state as the inability to obtain credit in good time lead to delay in performing farm operations such as planting and fertilizer procurement and application. Small scale farmers normally have limited capital for purchasing chemical fertilizer all though they often have resources such as land and family labour. Credit from informal sources usually has higher rate of interest and will increase production cost.

Table 4.6 Distribution of Farmers Based On Their Access To Bank Credit.

Bank Credit	No of farmers	Percentage (%)
Farmer with access	134	39.62
Farmers with no access	203	60.38
Total	**337**	**100**

Source: Survey Data.

4.2 INPUTS AND OUTPUT LEVELS IN MAIZE PRODUCTION.

The inputs utilized in maize production in the study area are land, seeds, fertilizer, herbicides and labour. Table 4.8 gives the levels of input used as well as the output in maize production.

4.2.1 Land

Land is one of the limiting resources for maize production in the study area. A total of 478.9 hectares of land were put into maize production giving an average of 1.6 hectares of land per farmer. The small size of land cultivated shows that the farmers were small scale in nature.

4.2.2 Seed

Most of the farmers utilized hybrid seeds. An average of 13kg of seed per hectare was utilized by the farmers. The average quantity of seed used was below the recommended rate of 17 – 20kg per hectare (KADP, 2001). The effect of the low rate is low plant population which can result in low competition with weeds, high pest infestation and subsequently low yield.

4.2.3 Fertilizer

Although, fertilizers were used, the amount used was limited by the high price of the commodity. The total quantity used was 104786 kg. The average quantity used per hectare was 218.8 kg (4.0 bags). This is far below the recommended quantity of 400 kg – 500kg (8 – 10 bags) per hectare depending on the level of Nitrogen content in the soil (KADP, 2001). The effect of this finding is that output obtained would be low, because maize is a high fertilizer demanding crop.

4.2.4 Herbicide.

Herbicides were used to control weeds to give the maize crop a luxurious growth. The total quantity of herbicide used was 75 litres giving an average of 0.15 litres per hectare wage. The low level of herbicide use is not unconnected with the high price of the input in the market. In addition, weeding was mostly used. Only 28% of the farmers used herbicides on their farms. Since herbicides were used below the recommended rates, weed control was done manually and at higher cost. These practises obviously result in lower yield of maize in the study area.

4.2.5 Labour

In the study area, labour is obtained from both the family and hired farmers. It was observed that farmers used a combination of family and hired labour for their farm operations. The total labour hour used was 24,478 man-hours. About 60% of the labour force was from family source. Hired labour was mainly used for land preparation, weeding and harvesting to compliment the family labour.

4.2.6 Maize Output (supply level)

The total output of maize for the sampled farmers was 8000720.8 kg which is on the average, 1127 kg per hectare. This is far lower than the average yield of 2 tons/ha recorded in the state for the year 2001(KADP, 2001). This result is, however not surprising since all the inputs used (seed, fertilizer and herbicides) were under utilized.

Table 4.7 **Levels Of Inputs Used And Output Obtained from Maize Farms in Kaduna State, in 2001.**

input	Maximum amount used	Minimum amount used	Average usage	Standard Deviation
Land (Ha)	8.00	0.10	1.61	1.14
Seed (kg)	240	8,2	13.23	11.7
Herbicide(Lt)	75	0.00	0.15	3.10
Fertilizer (Kg)	750	200	218.8	763.02
Total Labour (Mn/hrs)	78	38	51	21.7
Maize yield (Kg)	8321	672	1127	121.2

4.3 COSTS, RETURNS AND PROFITABILITY ANALYSIS

The costs, returns and profitability analysis are presented on Table 4.9. The following items were considered in estimating the costs and returns, Gross Revenue cost of seed, fertilizer, labour and herbicides.

4.3.1 Gross Return

The gross return was computed by multiplying the total yields from the sampled farmers by the average price of maize at the time of data collection. The average price was varied considerably over the time. For instance, the prices dropped from ₦3100 per 100kg bag before harvest to ₦2700 at harvest time. The average price of ₦2900/bag (i.e. N29/kg) was computed and used to determine return. The gross return was therefore ₦32,683.00 per hectare.

4.3.2 **Cost of Production**

In estimating the total cost of production, only the variable costs components were considered. This is because the fixed costs are negligible in small scale crop production. Farmer on the average did not use fixed assets. The variable inputs used were seeds, fertilizer, labour and agro-chemicals.

4.3.2.1 **Cost of Seed**

Maize seeds were obtained from different sources like the seed companies and open markets. The average market price for seed was ₦65 per Kg. The total cost of maize seed for all the farmers was ₦411,871:2 or ₦860 per hectare.

4.3.2.2 **Cost of Fertilizer**

The cost of fertilizer in the study area ranged from ₦2700 to N2600 per 50 kg bag. The average price was ₦2,650. The total cost of fertilizer for all the farmers was ₦5,553,658.00 and this gave an average price of ₦11,59 per hectare.

4.3.2.3: **Labour Costs**.

The labour cost includes the cost of land preparation, fertilizer application, planting and harvesting. The wage rate varied depending on the operation that was performed. The average wage rate was ₦120 per man-hour while the total cost of labour was ₦29, 37360 which gave a cost of N6, 133 per hectare.

4.3.2.4 **Total Variable Cost.**

The total variable cost of production consist of the costs of fertilizers, seeds, agrochemicals and labour. Table 4.9 shows that the total variable cost was

₦18696.35 per hectare. The high cost of production could be said to be responsible for the under utilisation of the inputs by farmers.

4.3.3 Gross Margin.

The gross margin represents the difference between the total returns (Gross returns) and the total variable cost. Table 4.9 reveals that maize farmers earned a gross margin of ₦13,944.00 per hectare, implying that maize production is profitable in Kaduna state. The average rate of return i.e. the gross return divided by the total variable cost was found to be ₦0.74, implying that a profit of 74 Kobo was realised for every naira invested in maize production in the state.

Table 4.8 Gross Margin Per Hectare of Maize Production in Kaduna State

Item	Average quantity	Unit Price (₦)	Total Value (₦/Ha)
1. Gross Returns			
(a) Average Yield (Kg/ha)	1127	29	32,683
2. Variable Costs.			
(a) Seeds (Kg)	13.23	65	860.0
(b) Fertilizer (Kg)	218.8	53	11596.4
(c) Labour (Man/hrs.)	51	120	6133
(d) Herbicide (Lt)	0.15	1000	150
Total Variable Cost			18739.4
Gross Margin			13,943.60

Source: Computed from Survey Data.

4.3.3.1 Yield required to cover cost of production

This was defined as the output needed to settle all the expenses incurred during production. It was obtained by dividing the total cost of production with the unit price of maize. The yield required to cover the cost of production was 646kg/ha. Since the average yield was 1.1 tonne per ha, it means farmers were producing at profit.

4.4 EFFECTS OF INPUT PRICES ON OUTPUT OF MAIZE

This section discusses the trend in maize input prices, the effect on maize output level and the correlation between the prices of the inputs and the maize output over the 15 years.

4.4.1 Trend in Input Prices and Output.

The trend in input prices is presented in figures. The figure revealed that the price of maize seeds remained fairly stable over the period under study with a small increase between 2003 and 2004 the price was over ₦200/kg. This period coincides with the time seed companies increased their prices to offset the increasing operating costs. The price of herbicides on the other hand has been experiencing a gradual increase since 1992, rising from under ₦200 to over ₦1000/L. This was due to the structure of the agrochemical marketing system which is dominated by very few wholesalers. The market is rather monopolistic thereby giving room for regular price increases. Furthermore, the unstable exchange rate for naira has also affected the cost of importation. The cost of naira is on the use and for importers to make gain; the nominal prices of the herbicide must be increased.

The most worrisome variation is that of fertilizer price. The increases commenced in 1995/96 when fertilizer subsidy was removed. The price increased more sharply from 1997 to 2004 as a result of increasing demand

and the deregulation of the fertilizer market which removed the subsidy level considerably.

The production level for maize over the 15 year period was shown on figure 2. The trend was unstable, showing low production alternating with high production. The trend shows a general increase up to 1999 and subsequently, a decline in total production. The decline was more in 2003 to 2004 when input prices were highest. This was relatively high market prices for maize during the period with the peak in 2001 and 2002. Subsequently there was a drop and the farmers are struggling to keep pace with the rise in the production cost (figure 3).

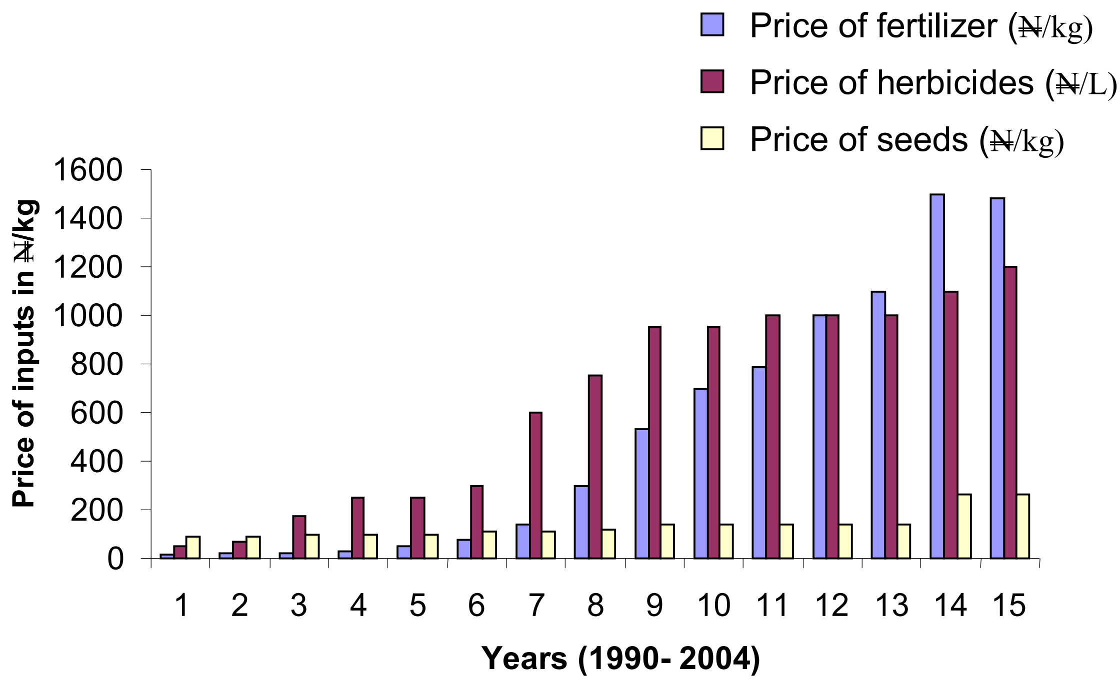

Fig 1: Trend in Average Annual Price of Farm Inputs in Kaduna State, 1990- 2004

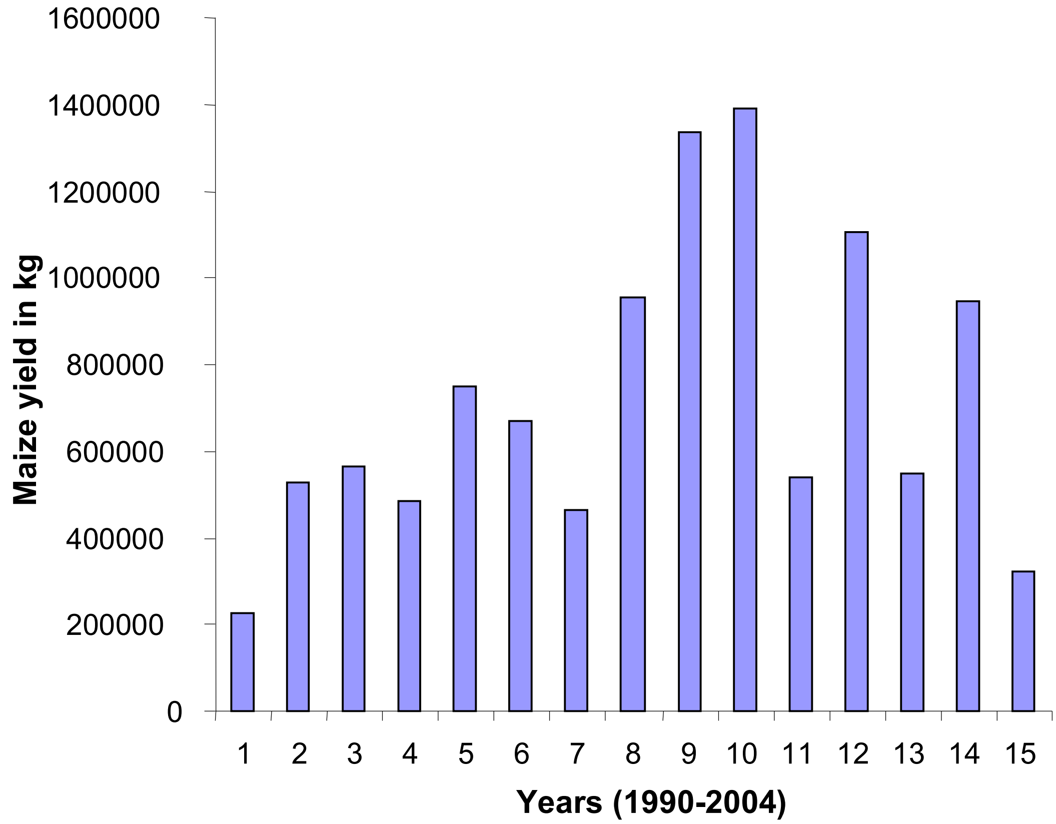

Fig 2: Trend in annual supply of Maize in Kaduna State, 1990-2004

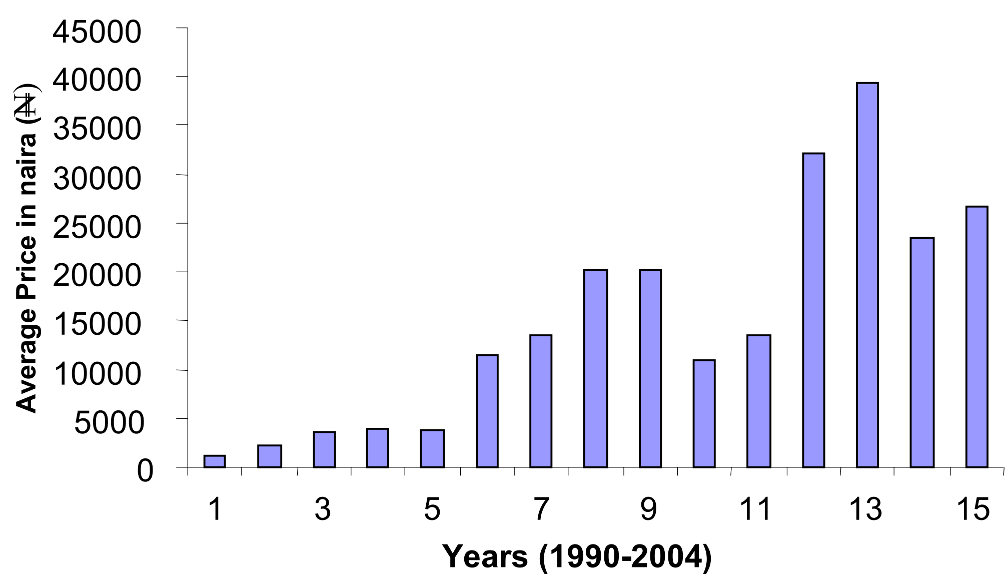

Fig 3: Trend in Average Annual Market Price of Maize in Kaduna State, 1990-2004

4.4.2 The Effects of Input Prices on Maize Output (Supply)

The linear form of the specified regression model had the best fit based on the adjusted coefficient of multiple determinations (R^{-2}), T – Statistics and the signs of the regression coefficients. The results in Table 4.10 show that the independent variables (price of fertilizer, price of maize seed, and price of herbicides) accounted for about 59% of the variability in the maize output ($\overline{R}^2 = 0.59$) The F – value was significant at 5% level of probability meaning that the model was well specified. The predicted regression equation is given by:

$Y = 34043 + 32.68X_1 - 21.8X_2 - 308.5X_3$.

The sign for fertilizer (x_1) was positive, implying that as price of fertilizer increases, maize production will increase contrary to the apriori expectation. The reasons for the observed behaviour may be due to the distortion in the fertilizer market whereby the government subsidized prices is not what most farmers are paying for. Therefore, they must efficiently utilize the fertilizers by increasing the per unit yield as the price increases.

The price of maize seed has an inverse relationship with maize output, implying that the quantity of seed demanded will decline as price of maize seed increases in the market. If this happens, production level will fall. The effect of the price of seed was however not significant probably because of the fairly stable nature of the prices of seed over the last 15 years. Another reason may be because most of the small scale farmers often use seed from their previous harvest without buying from the market.

The price of herbicides was inversely related to maize output. This was because as the price goes up, less farmers can afford to use it. Less is used and there will be more weeds to compete with the crop, leading to low output.

The results of other functional forms are reported in the appendices.

Table 4.9: Results of the Linear Regression model

Variable	Regression Coefficients	Standard Error	T - Value
Constant	34043	12014.43	0.056**
Fertilizer Price (x_1)	32.671	11.11	2.94**
Price of Seed (x_2)	-21.88	12.62	-1.73^{NS}
Herbicide Price (x_3)	-308.49	131.60	-2.34**

n = 15 years
R^{-2} = 59.4%

F – value = 4.414 **
DW = 2.52
** = Significant at 5%
NS = Not Significant

4.4.3 **Pearson Correlation Analysis between input prices and maize output**

The Correlation analysis was ran to show the exact nature of the relationship between the input prices and maize output. The result show (table 4.11) show that all the inputs prices have inverse relationship with maize output level. However, the result shows that the relationships were not statistically significant. It may be attributed to the small sample (n=15) used for the study.

However, it was observed that the 3 variables have very strong, positive relationship with one another. This suggests the complimentary nature of the inputs used in the crop production process.

Table 4.10: Pearson Correlation Coefficients, showing the relationship between the output and the input prices

	Y	**X_1**	**X_2**	**X_3**
Y	1.00000	-0.09293	-0.32945	-0.23553
	P = 0.00	P = 0.7419	P = 0.2305	P = 0.3981
X_1	-0.09293	1.00000	0.87357	0.89962
	P = 0.7419	P = 0.0	P = 0.0001	P = 0.0001
X_2	-0.32945	0.87357	1.00000	0.71347
	P = 0.2305	P = 0.0001	P = 0.0	P = 0.0028
X_3	-0.23553	0.89962	0.71347	1.00000
	P = 0.3981	P = 0.0001	P = 0.0028	P = 0.0

Sample size = 15 years
Y = Maize production
P = Probability Level
X_1 = Fertilizer price
X_2 = Price of Seed
X_3 = Price of Herbicide

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

The broad objective of this study was to carry out an economic analysis of maize production enterprise in the state. The specific objectives were to describe socio-economic characteristics of maize farmers, determine the input – output levels, estimate costs and returns in maize production as well as the effects of input prices on maize output.

The result of the socio-economic analysis showed that 44% of the farmers were between the ages of 41 and 50 years. The average was 46 years while 40% had no formal education. The average household size was 10 people while about 53% of the farmers have been producing maize for over 25 years. Membership of Co-operative Societies was poor as only 14% of the farmers belonged to farmers Co-operative Societies. Access to bank credits was very poor with only 40% of the farmers being able to obtain bank credit.

Furthermore, it was observed that most of the farmers did not receive training on input use and application as was reflected by low percentage of people receiving training. The average inputs level wages were below recommended rates. The results of Gross Margin analysis showed that it was ₦13,944/ha. Fertilizer was the most prominent cost item, and it accounted for 59% of the total cost of production in the state.

In determining the effects of the input prices on maize output in the state, the linear regression model gave the best fit to the data. The result indicates that about 59% of the variations in maize output was accounted for by the prices of input included in the model. The prices of fertilizers and herbicides had significant effects (P= 0.05) on maize output which suggests that they are important determinants of maize output. The prior of seeds and herbicides were negative, suggesting that they have inverse effects on output while the price of fertilizer was positive, suggesting positive effect on output. However, the correlation result showed that all the prices have negative relationship with the output.

5.2 CONCLUSION

This study concluded that maize production in the state was profitable even though inputs levels were below the recommended rates. The input prices generally had been on the increase and this has shown weak inverse relationship with the output.

5.3 RECOMMENDATIONS

Based on the findings of the study the following recommendations were made.

1. to overcome the low participation of farmers in co-operative societies and avail themselves of the opportunities therein, farmers need to be encouraged especially now that most of the State Agricultural Programme are implemented through co-operative societies.
2. The low input utilization by farmers may have risen from low level of education and lack of trainings on input utilisation. There is need for more training of farmer by the extension workers who need to be given greater attention by government.
3. The percentage of farmers using credit requires that farmers should be assisted to obtain bank credit by reducing the administrative bottlenecks associated with bank loans.
4. Government at all levels should subsidise agricultural inputs, particularly fertilizers and herbicides to enable farmers to use optimum amount. To ensure

that farmers benefit from such subsidy, government should device means for effective fertilizer distribution to reduce the negative activities of middle men.

REFERENCES

Abubakar, H. (1999): "Maize as source of starch for food and pharmaceutical": In Valencia J. A., Falaki, A.M, Miko, S and Ado, S.G (eds.) Sustainable Maize Production in Nigeria: The Challenge in the Coming Millennium. Proceedings of the SG/2000/IAR/FMARD/ADPs, National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria. Pp 152 – 158.

Aderibigbe, S. O. (1973): "Sustaining Agricultural Production in a Deregulated Economy". Economic and Financial Review CBN, Lagos.

Ahmed B. (1985): "Scale Economies In Maize Production: A Case Study of Daudawa Farms in Kaduna State". Unpublished MSc thesis Dept. of Agric. Economics and Rural sociology, A.B.U Zaria

Ajala, S. O. & Kling, J. G.(1999) "Fertility requirements of open – pollinated and hybrid maize Genotype". In Valencia J. A., Falaki, A.M, Miko, S and Ade, S.G (eds). Sustainable Maize Production in Nigeria: The challenge in the coming Millennium. Proceedings of the SG/2000/ IAR/FMARD/ADPs. National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria. Pp 87.

Akinwumi, N. B. (1971): "Production efficiency on farms in Northern Nigeria", Unpublished Ph D. Thesis, Cornell University, U. S. A.

Ali, F. (2004): "We deserve a better deregulation" New Nigerian, Thursday, July 8, 2004 Perspective Pp. 17

Barnard, C. S and Nix J. C. (1976): Farm planning and control, Cambridge University Press, UK.

Bedassa, R. and Krishnamoorthy S. (1977): Raising and sustaining productivity of Small Holder Farming Systems in theTtropics. Agbe Publishing, Singapore.

Beyene H. (1993): The Input Supply System and Technology Adoption Constraints for Wheat Production in the Holetta red Soil Zone of Ethiopia.

CBN (2003): Annual Report and Statement of Accounts.

Chianu, C. K. (2000): Maize in the third World. West View Press, Inc. Pp. 268

CIMMYT . (1993): "Cereal Grain Policy Analysis in the National Agricultural Research System of Eastern and Southern Africa": SADC/ICRISA Addis Ababa, Ethiopia.

Cornway, G. (1997): "The doubly green Revolution" in Chianu J. N. (2000) Unpublished Ph. D Thesis, Dept. of Agric. Economics University of Ibadan.

Dlamini Sam M. (1993): Factors Associated with the Adoption of based fertilizers among Swanhi Nation Land (SNL) farmers.

Edache, O. A. (1999): "Agric. Policy in Relation to sustainable maize production in Nigeria". In Valencia J. A., Falaki, A.M, Miko, S and Ade, S.G (eds). Sustainable Maize Production in Nigeria: The challenge in the coming Millennium, Proceedings of the SG/2000/IAR/FMARD/ADPs. National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria. Pp 24.

Esoghue, O. A. and Ekong, S. M. (1991): "Technology Transfer System for Improve Management Lessons for Future", In J. R. Andersen (ed) Agricultural Technology Policy Issues *A. B*. International U.K.

Fajemisin, J. M. (1978): "Optimum Combination of Food crop Enterprises in Nigeria". Journal of Rural Economics and Development. 12 (1): 44 – 54.

FAO (1985): Changes in Shifting Cultivation in Africa: Seven Case Studies. FAO Forestry paper 50/1 Rome, Italy in Chianu J. N. (2000).

FAO, (2001): The Economics of Soil Productivity in Sub-Saharan Africa. Food and Agricultural Organisation, Rome, Italy

Geurts, P. M. H. (1999): Fertilizer and Maize Price Trends in Nigeria: In Valencia J.A., Falaki, A.M, Miko, S and Ade, S.G (eds). Sustainable Maize Production in Nigeria: The challenge in the coming Millennium Proceedings of the SG/2000/IAR/FMARD/ADPs. National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria. Pp 76.

Habibullah M. S. and Isma'il M. M., (1994): "Production Frontier and Technical Efficiency: the Case for Bee Keeping Farms in Malaysia". Bangladesh J. Agric.Econs. XVIII, I and 2 (1994): Pp.31 – 34

Harvey, S. (1977): An Agricultural Atlas of the Northern States of Nigeria with Explanatory Notes A. B. U. Press Samaru, Zaria, Nigeria.

I.I.T.A. (1991): "Sustainable Food Production in Sub Saharan African". IITA's Contribution IITA. Ibadan.

Idachaba, F.S (1998): "Instability of National Agricultural Research System in Sub-Saharan Africa: Lessons from Nigeria" ISNAR Research Report No.13. The Netherlands in Chianu J. N. (2000)

IFDC (2001): "Agric. Input Marketing in Nigeria: An Assessment of Strategy for Development" A paper series Pp.23.

Ingawa, S. A. (1999): "Socio-Economic Considerations in Maize Production in Nigeria". In Valencia J. A., Falaki, A.M, Miko, S and Ade, S.G (eds). Sustainable Maize Production in Nigeria: the Challenge in the coming Millennium Proceedings of the SG/2000/IAR/FMARD/ADPs. National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria. Pp71

KADP Crop Area and Yield Surveys 1990 – 2004

KADP Market Prices Surveys Data 1990 – 2004

KADP, (2001): "Package of Crop Recommendations for Extension Staff Based on Research Recommendations by KADP, the Institute for Agriculture Research ABU Zaria, and other National/International Agric Research Institutes in the Country".

Kang, B. T. L. Reynolds, and A, N, Atta-Krah (1990): "Alley Farming" Advances on Agronomy 43:315-359 in Chianu J. N. (2000)

Kassam, M. (1977): Raising and Sustaining Productivity of Small – Holder Farming System in the Tropics Singapore: Agbe Publishing.

Kehinde, J. K. (1997): "Maize Development at National Cereals Research Institute" Valecia, J. A. Falaki, A. M., Miko, S., Abubakar, I. U, Jaryum, J. and Ado S. G. (eds) Sustainable Maize Production in Nigeria: the Challenge in the coming Millennium Maize Production and Utilization in Nigeria Prospects and Constraints Proceedings of the SG2000/IAR/FACU/ADPS. National Maize Workshop July 22nd 1996 and August 15th, 1997. Pp 75.

Kupfuma, H. B. (1993): Fertilizer Use in the Semi-Arid Communal Area of Zimbabwe.

Kyiogwom U.B. (1997): "The Impact of Improved Maize Technology On Resource Use and Farm Income in the Northern Guinea Savannah of Nigeria". Unpublished PhD Thesis, Dept of Agric. Economics and Rural Sociology, Ahmadu Bello University, Zaria.

Lamarde, A. G. (1994): "Cereals, Legumes, Livestock, Poultry and Fish. Work Document": National Seminar on Economic Recovery – Private Sector Led, Kaduna Zone, 23 – 25 November 1994, Pp 1 & 2 in Tauna (1994)

Llewlyn R. V. and Williams J. R., (1996): Nonparametric Analysis of Technical, Pure Technical, and Scale Efficiencies for Food Crop Production in East Java, Indonesia. Agricultural Economic 15 (1996) 113 – 126.

Maikaba, M (2004): "On Deregulated Debate Over Deregulation" New Nigerian Tuesday, July 20th 2004. Pp. 16.

Makinde, O. K. (2000): Determinants of Food Security in Bauchi Area of Northern Guinea Savannah of Nigeria: PhD Thesis Faculty of Agric. and Forestry University of Ibadan.

Murithi F. M. & Shiluli M. C. (1993): Effects of the Liberalization of Fertilizer Markets on the Distribution and Use of Fertilizer on Food Crop Production: A study on Embu and Meru districts of Kenya, National Academy of Sciences Washington DC.

Nagy, J.G. and Edun, O. (2002): “Assessment of Nigerian Government Fertilizer Policy and Suggested Alternative Market Friendly Policies”: Damina Project Papers.

NPC (1991): National Population Commission, 1991 Census Results.

Nweke, F. I. and Winch F. E. (1980): “Bases for Farm Resources Allocation in the Small Holder Cropping System of Southern Nigeria. A Case Study of Awka and Abakaliki Villages”. Discussion Paper No.4/80

Nyako, (1999): “Sustainability of Soil Fertility and Water Management for Higher Maize Production from Farmers Experience”: Valencia J. A., Falaki, A.M, Miko, S and Ade, S.G (eds). Sustainable Maize Production in Nigeria: The Challenge in the Coming Millennium. Proceedings of the National Maize Production Workshop 22nd to 24th July 1999 held at ABU Zaria Pp.14

Obayemi, O. A. and Oni, R. I. (1971): “Recent Accomplishments of the National Agricultural Research Institutes”. Agricultural Science Department, Federal Ministry of Agriculture and Rural Development, Abuja.

Obilana, M. O, Kalu, B. A, Olukosi, J. O (1978): Appropriate Agricultural Technologies for Resource Poor Farmers.

Ogunfowora, O. Essang, S.M. and Olayide, S. O. (1986): “Resource Productivity in Traditional Agriculture Ä Case Study of 4 Agricultural Divisions in Kwara State Nigeria”. Journal of Rural Economics and Development 9 (2): 119 – 130, Department of Agricultural Economics University of Ibadan, Nigeria.

Ogungbile A.O. and Olukosi, J.O. (1990): “An Overview of the Problems of the resource poor farmers in Nigerian Agriculutre” Olukosi J.O. and Ogungbile A.O. (eds) Appropriate Agric. Technologies for Resource Poor Farmers. The Nigerian National Farming Systems Research Network, Zaria Pp.311

Oladunni O., (1991): “Farm Family and Hired Labour Productivities in Tobacco Production”. (eds) Olukosi, J. O., Ogungbile, A. O. and Kalu, B.A. Appropriate Agricultural Technologies for Resource – Poor Farmers. National Farming systems Research Network.

Olayide D. O. & Heady E. (1982): Introduction to Agricultural Production Economics, University of Ibadan Press, Ibadan, Nigeria.

Olayide, S.O. (1979): Nigerian Small Farmers: Problems and Prospects in Integrated Rural Development (CARD) University of Ibadan.

Olukosi J. O, Ogungbile A. O., Kalu B. A. and Olagoke, M.A (1991): “Efficiency of Resource Use in Rice Production Systems in Anambra State, Nigeria” in Issues in African Rural Development. Winrock International, Arthington (USA)

Olukosi, J. O and Erhabor, P. O. (1988): Introduction to Farm Management Economics: Principles and Applications. AG II AB publishers Ltd. Zaria, Nigeria.

Olukosi, J. O, Ogungbile, A. O. and Kalu, B. A. (1990): "Promotion of Maize Technology Transfer in the Savanna Ecology of Nigeria". WECA Annual Report of Project.

Olukosi, J. O. and Raphel O. (1997): "Maize Based Cropping Systems" Valencia, J. A., Falaki, A.M., Miko, S., Abubakar, I.U., Jaryum, J. and Ado, S.G. (eds). Maize Production and Utilization in Nigeria Prospects and Constraints. Proceeding of the SG/2000/IAR/FACU/ADPs National Maize Workshop 15th August, held at Hassan Usman Katsina House, Kaduna Pp. 42

Onucheyo, E. (1998): Political decision in the Nigerian Agricultural industry.

Onwueme, I. C. and Sinha T. D. (1991): Field Crop Production in Tropical Africa. Published by CTA (eds), The Letherlands.

Pillany, S. V. (1977): Tree and Field Crops of the Wetter Regions of the Tropics. ITAS. London Long man.

Salih, M. A. (ed) (1994): Inducing Food Security in Eastern and Southern Africa. Nordiscia African Institute: Upsalla. Maize Production workshop. 22 to 24 July 1999.

Tadesse, B. and Krishnamoorthy, S. (1997): "Technical Efficiency in Paddy Farms of Tamil Nadu: an Analysis Based on Farm Size And Ecological Zone". Agricultural Economics 16 (1997) Pp. 185 – 192.

Tauna, A. H. (1999): "Contributions of Women in Maize Production, Prospects and Constraints" Valencia, J. A., Falaki, A.M., Miko, S., Abubakar, I.U.,, Jaryum, J and Ado, S. G. (eds). Proceeding of the SG/2000/IAR/FACU/ADPs National Maize Workshop 15th August, held at Hassan Usman Katsina House, Kaduna Pp. 62

World Bank, (1987): Ethiopia. Recent Economic Development And Prospects for Recovery and Growth. Report No.5929. Addis Ababa

Zeeuwn, V. M. in Zobel, D. (1995): "Comment Controversies Around Resource Use Efficiency in Agriculture: Shadow or Substance?" Agricultural system 50 (1996) Pp.415 – 424.

APPENDICES

Appendix I: Results of the Semi – Log Function

Variables	Coefficients	Standard Error	T – Value.
Constant	39822	16307.31	0.032
Price of Fertilizer	7701.48	3059.15	0.028**
Price of Herbicides	-11033	3835.80	0.014 **
Price of Seeds	-10758	8132.35	0.2127 ^{NS}

R^{-2} = -0.36
F Value = 3.68**
DW = 2.014

Appendix II: Results of the Double Log Function

Variables	Regression coefficients	Standard Error	T – Value.
Constant	6.62	2.45	0.02
Price of Fertilizer	0.66	0.46	0.17 ^{NS}
Price of Herbicides	-1.05	0.57	0.09**
Price of Seeds	-0.88	1.22	0.48 ^{NS}

R^{-2} = 0.08
F – Value = 1.43 ^{NS}
DW = 2.02