CAPITAL INVESTMENT IN AGRICULTURE: THE IMPACT OF CREDIT ON FARM LEVEL RESOURCE OF SMALL SCALE FOOD PRODUCERS IN BAUCHI STATE.

By

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CERTIFICATION

This thesis entitled “capital investment in agriculture: The impact of credit on farm level resources of small-scale food producers in Bauchi State” by Yusuf M. Abarshi meets the regulations governing the award of the degree of Masters of Science (Economics) of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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DECLARATION

I hereby declare that this thesis has been written by it and me represent a record of my own research work. It has not been presented or accepted in any previous application for higher degree. All sources of information have been specifically acknowledged by means of reference.

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DEDICATION

This thesis is dedicated to the Yusuf M. Abarshi family and to my dear wife Alheri for all she has done and bore to make my dream come true. To my mother for her care, love and concern for me and to my late father who did not live long to see what I become. Above all to my heavenly father and Jesus Christ his son who intercede for me daily for this work to be a success. And to my children Victor Yusuf, Precious Yusuf and Mercy Yusuf. The Lord blesses your hearts of concern and love. Amen.

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ABSTRACT

This thesis assessed the role of the small-scale food producers in increasing food availability in the ADP zones of Bauchi state. The main objectives of this thesis are to examine the credit sources, magnitude and utilization in the study area, to asses the constraints encountered in the application of credit input in food production and to examine the possibility of success or failure of a sustained agricultural credit on farm output and resource level of farmers. Given this objective, it was hypothesized that credits add to resource of farmers. Consequently the result indicates that, formal and informal credit sources depict a remarkable influence on farmer's resource level. Other sources of credit show positive contribution to output; with this observation, it is clear that resource level of such recipients had a positive effect on output.

An economic model used to asses the impact of credit on farm level resource efficiency of credit recipients is the Cobb-Douglas functional form in the form of linear, semi log and double log functional form. The production function adopted reveal the double log as the "best" with most of its variables positive and consistent with expectations. While the other two models indicated a mix outcome and inconsistencies. Consequent to this, the double log result was subjected to a further screening (step wise process) to determine the variables having the greater influence in the study locations. An important conclusion drawn is that credit received through institutional sources has the tendency to contribute more to output than other credit sources. The constraints in utilization of credit observed especially with the institutional credit sources were in form of improper timing, insufficient credit magnitude and the proper use necessary for such impact to be realized.

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CHAPTER ONE

GENERAL INTRODUCTION

1.0 Background to the study

Agriculture remains the backbone of development in most countries of the world. It is the largest source of employment, food and fiber supply, raw materials to industries, a major contributor to the gross-domestic product and principal earner of foreign exchange in most developing countries. A strong and sustainable agricultural sector is increasingly recognized as essential to economic and social development of Nigeria. (Nwosu et al, 1998)

In the early stage of Nigeria's economic development, agriculture provided most of the country's food requirements, earned most of her foreign exchange and encouraged the establishment of a number of agro-based industries. But the Nigerian economy has been altered in a manner adverse to agricultural development since the oil boom of the 1970s. For instance, in the 1960s, the share of agriculture in the total import value was only 3% but in the 1980s it rose to 10% amounting to 1.09 billion Naira, a value 20 times what it was in 1970. The most pathetic and disturbing aspect of it all is that the list of imported items include grains (rice, maize) which Nigeria has the

local resource endowment for their production. In the year 2002, the estimated government expenditure on food import is 250 billion Naira with 60 billion spent on rice alone. Similarly the annual production of Nigeria's major cash crops viz; cocoa, rubber, cotton and groundnut fell by 43, 29, 65 and 64 percent respectively between 1970-1982 (Mijindadi, 1992).

Since the 1960s, policy makers and economic planners in Nigeria have sought for ways of dealing with the problem in the sector. Several agricultural and rural programmes and institutions have been put in place and these include the Farm-Settlements Scheme, Operation Feed the Nation (OFN), Green Revolution, National Accelerated Food Production programme (NAFPP), River Basin Development Authorities (RBDA's), and Nigerian Agricultural Development and Cooperative Bank (NACB). The recently established ones include the National Directorate of Foods, Roads and Rural Infrastructures (DFFRI), Nigerian Agricultural Land development Authority (NALDA), Better Life Programmes, Family Support Programmes as well as National Economic Empowerment Development Strategy (NEEDS) of the present regime and various other government policy actions through prices, banning of imported goods, import supply strategies and withdrawal of subsidies, David U. Essien (2000).

The poor performance of the sector has been recognized by scholars such as Nurskes (1963), Odama (1989), Nwosu (1997). More so, in a situation of about 4 per cent yearly population increase and with agriculture's contribution declining by 4.37 percent, 4.48 percent, 4.49 per cent, in the year 1990, 1991 and 1992 respectively, the implication to the sector and Nigerians is that the country is facing a difficult period with imminent food crisis. The redemption of this precarious situation depends on the small-scale producers of food (CBN 1982; Olusi, 1999, Onu, 2000).

In the same vein, development research has recognized that development requires 'the broad participation of small scale producers'. Biggs et al (1991), Olusi (1999). This is because, according to them, small and micro-enterprises (SMES) constitute a major proportion of all firms in sub-Saharan economies".

It is in recognition of the important role of the small-scale producers, in agriculture and the constraints confronting these small holders that informed the investigation into the economics of their contribution to the total food supply of the country.

Indeed in the past and even now, finance has been recognized as one of the problems of agricultural productivity (Ogunfowora et al, 1972, Olusi 1999; Amadi 2001). In view of this, credit has been recognized as the best option (Olajide 1970,

Aku, 1981; Aku, 1989, Henry, 2000). Despite this significant role that credit is expected to play, the impact is less noticed. According to Central Bank, "The impact of all existing credit schemes in terms of providing funds for meaningful and sustained development among the small scale enterprises had hardly been noticeable (CBN 1992). Both (Olayide and Lele) maintained that the small-scale farmer is 'resource poor'. In a similar analysis, Nurske (1963) saw rural poverty as a vicious circle and its effect as the chief deterrent to agricultural productivity. Nwosu and Ogunfowora (1977) describe the condition of the peasant farmer as a vicious web of low productivity, low income and low investment.

Government reform programmes in all its ramifications are targeted towards poverty reduction, or alleviation, which has the consequence of increasing rural incomes and economic activities. For over a decade the reform programmes of the Nigerian government has not lead to the realization of this noble objective of providing sufficient food for the populace yet the development in agriculture depends greatly on the adoption of appropriate farming technology, (Olusi 1999). These technologies can only be available and appropriately used by the target farmers when adequate financial resources are available to the farmers.

In the absence of a regular, sufficient, and readily available income to sustain farming and to increase investment through appropriate adoption of modern

farming technique; credit becomes the best option for the farmer to increase his farm level resource. In the word of many researchers, credit is the lifeblood of adoption among small farmers'. Dhawan and Khallon (1979), Jibowo (1980) and Jibowo and Francis (1981), Rhaman (1983), Falusi (1984), noted that credit is positively related to farmers' adoption decisions. According to them, "modern farm requirement; such as the use of fertilizers, pesticides, tractors etc makes farmers' savings inadequate to finance the different activities on their farms".

The intention of this study therefore is to determine the impact of agricultural credit on the farmer resource level and how it can engender out put and welfare of the average small-scale farmer. This is tantamount to assessing the overall effect of credit on socio-economic condition of the rural community and the nation at large.

1.1 STATEMENT OF THE PROBLEMS

Agricultural production in Nigeria is made up large of proportion of small holders (Olusi, 1999, Amadi, 2001). These categories of producers' faces constraints in their effort aimed at increasing their contribution to food supply in the country.

These constrains according to researchers is basically finance: Aku (1981), Aku (1989), Henry (2000). The existing credit source identified for the sector has

been formal and informal sources (Agbo and Phillip, 1991). Thus, the research questions are:

1. What is the magnitude and source of credit for food crop production?
2. What impact does formal and informal credit have on farm-level resources of food crop producers?
3. What are the socio-economic characteristics of food producers in the study area?
4. What other identifiable factor limit agricultural productivity of food producers?

1.2 OBJECTIVES OF THE STUDY

To examine the credit source, magnitude and utilization in the study area.

To assess the constraints encountered in the application of credit input in food production

To examine the possibility of success or failure of sustained agricultural credit on farm output and resources level of farmers

1.3 HYPOTHESIS

Given the afore-mentioned objectives, the following hypothesis has been tested:

(a) Agricultural credit add to farmers available productive resources while the alternative hypothesis is that

(b) Agricultural credit does not add to farmers productive resources

1.4 JUSTIFICATION OF THE STUDY

Agriculture policy requires information on micro and macro farm level resource availability of participating farmers and the level of investment available in the sectors. One such deterrent to investment in agriculture is the near non-availability or meagerness of resources investment. Most of the farmer in rural communities where the level of income and output in such communities are in consonant with such rural activity; which in itself is market determined and is generally low and subject to seasonal fluctuation due to market failures. As such, an externally injected form of finance is expected to impact greatly on the community's resource level thereby breaking the cycle of poverty to alleviate the poverty level of the people and their inadequacies.

Given the identified credit sources for agricultural purposes (formal and informal) the farm level resources are expected to be improved and to impact, to some extent, on productivity and welfare of the farmers.

1.5 SOURCES OF DATA

The data used in the analysis has been primary data obtained from sample survey of food producers in Bauchi State. The procedure for generating the information preceded a well-structured questionnaire, administered and collected by extension agents attached to farmers and at the ADPs Sub-Zonal Offices in the farmers' own locality.

Since the state is structured into three (3) geo-political zones and the ADP also is structured to three (3) ADP Zones-North, Western and Central Zones-information has been collected based on such Zoning and such Local Government under each Zone.

To do this, the population of such Local Government, the types of food produced (quantity, and size of farmers) and social cultural characteristic of the people were taken into cognizance in selecting the Local Government Areas. In each Local Government Area, there is a Sub-Zonal Office of the ADP and 5 questionnaires were randomly administered on 5 farmers of food crops that are credit recipients on the basis of communal recognition, familiarity/closeness to the ADP etc. A total of 200 questionnaires were distributed out of which 108 were found fit for the analysis.

1.6 SCOPE OF THE STUDY

The primary objective of this study is to evaluate the impact of credit on farm level resource use of the small scale farmers as a prerequisite or necessary but not sufficient condition for determining its impact on productivity and welfare of the farmers in Bauchi state.

Bauchi State is chosen due to its high population of subsistence small farmers. Moreover, the notable credit outlets to these categories of farmers being considered are significant enough for a measurable impact on agricultural practice.

1.6.1 LIMITATIONS OF THE STUDY

This study is limited by the fact that only sample of the farmers were interviewed and since time and resource could not permit wider coverage, there was a restriction on the result and outcome of the data. More so, this study recognizes the fact that the specified variables are not the only determinants of farm resource use in the study area.

In the same vein, the research recognizes that this study covers only rain-fed agricultural activity and as such is limited to a particular season.

On the part of the researcher, time, cost and lack of direct control on information necessary for the research imposes another constraint on the result derived. Since extension officers are the only viable link to such effort

1.7 ORGANISATION OF THE STUDY

This study contains five chapters.

Chapter One: contains the introduction. It defines the study problems, objectives, hypothesis, justification, and sources of data and organisation of the work.

Chapter Two: reviews related literature. It defines credit, the role of credit and reviews related literature on credit in Nigeria and outside Nigeria. Credit fungibility and government efforts and programme towards credit delivery.

Chapter Three: this focuses on the description of the study location, climate, soil and vegetation, farming features of the study area, and an overview of food crop production in the study area; The food need and the socio-economic characteristics of the farmers in the sampled areas.

Chapter Four: This provides the model specification for the research and the analysis of empirical results.

Chapter Five: This summarizes the work, draws conclusion from the available evidences and makes recommendation on the findings of the research.

CHAPTER TWO

2.0 THEORETICAL LITERATURE

RESOURCE AND RESOURCES USED IN AGRICULTUTURE

Traditional economic theory from time immemorial view productive resources or inputs as consisting of tree categories: Land, Labour and Capital. These form the resources of nature other wise called natural resources or gift of nature. Such resources of nature or nature's gift of course include: water, mineral resources etc or those things relative fixed in their supplies.

It has further been recognized that capital as a resource include the existing resource or it's improvement by way of investment (Todaro 1977). Not only physical capital such as factories, machine, roads, electric power generators etc. But also stocks of intermediate goods for use in final production e.g fertilizer for wheat, oil for petrol and raw cotton for textile etc.

Furthermore, the resource input 'labour' could be subdivided into skill unskilled and semi-skilled to show the in built quality of training in them.

Todaro (1977) recognizes that resources can be increased or improved upon through investment. In the same way, Keynes in his theory of investment based his idea of growth in output on increasing net investment over existing level of

investment thus, both natural resources, capital and human resource, can be subjected to improvement and perpetual increase through increase net investment.

2.01 FARM LEVEL RESOURCES

In farming, studies had shown that farm resources include capital, natural resources of land, water, air etc and labour. In a study on resources use efficiency in sole cotton production in Adamawa and Gombe states of Nigeria, J. I. Onu and E. F. Adebayo (2000) recognize the input resources to include Fertilizer, years of farming experience, family labour and hired labour, seed etc. The study confirmed that (X_3) which is farm size in hectares is the most efficient farm resource followed by family labour, and hired labour respectively. The least efficient was X_6 (Quantity of seed used).

The study finally recommended decreasing the quantity of seed used and the level of farm labour contribution for an increased level of profit. Finally, the result provided useful information on resource productivity in cotton in Adamawa and Gombe states.

A similar study on the Determinants of cotton production and Economic Efficiency in Nigeria, J. I. Onu et al (2000) identify the determinants of cotton production to include, X_1 = area under cultivation, X_2 = labour used in cotton production, X_3 = material inputs of fertilizer, pesticides and seeds; Z_1 = years of

farming experience, Z_2 = years of formed education and Z_3 = amount of credit available to the farmer.

The results of the study indicate that all the resources meet a priori expectation. And that the production of cotton was labour intensive, hence labour and all the other inputs had positive estimated coefficients. The research posited that the sources of inefficiency in cotton production in the two states are in the areas of status, farming experience, education, credit and extension.

Another research on "An Empirical study of the patterns and sources of Technical inefficiency in traditional and HYV rice cultivation in Bangladesh, Najmar. T. R. Sharif and Atul A. Dar (1996) recognize resource use in the production of rice in Bangladesh to include land in acreage, fertilizer in kilograms, family and hired labour in animal days per acre. Atul and Najmar using a stochastic frontier production model approach discovered that the distribution of farmers in terms of technical efficiency is skewed to the left in all crops, and although the HYV crop has much higher yield than the more traditional crops. Also that, while farmers are lightly distributed along a narrow band at the upper end of the technical efficiency distribution in the case of the traditional crops, the dispersion of farmers along the technical efficiency distribution is significantly larger in the HYV crop, pointing to the significant unevenness in adaptation to

successful HYV cultivation. This finding was said to be consistent with greater variability in yields in HYV cultivation. Another notable finding is that technical efficiency and not random effects appear to be the major source of yield variability in HYV cultivation, while the reverse is true for the traditional crops.

The research also discovered that education by even children is relevant in explaining farmer difference in technical efficiency in HYV cultivation. That growing experience compensates for the lack of education, and that smaller farmers are likely to be less efficient, perhaps because of their limited access to public services, credit and so on. In addition, the beneficial effects of education and experience are larger for smaller, less educated and/or less-experience farm households. These are the major qualitative findings of this study. A quantitative analysis of these effects suggest that mainly households will be below the average in terms of human capital and land endowments, stand to benefit significantly from incremental experience and/or education, particularly that of the household head or spouse. For instance, for even a small household with very little experience but with the average level of aggregate education, yield could be improved by up to 50 per cent above that of a similar household, but with no aggregate education at all. On the other hand a household with land and capital, the impact of education and/or experience is very small.

Finally that variability in HYV yield was due to technical inefficiency of the farmer and not random or uncontrollable factors. That farmers education and extension services would help in increasing HYV yield.

In another similar study on "Women Farmers, Economic Efficiency and Resource use in Rural Nigeria, Dominic M. Nkanta and Good Wilson (2000), undertook a study of two local governments in Rivers State Nigeria, namely ELGA and KELGA. The study which aimed at examining women access to land for farming and their involvement in farm operation as well as economic efficiency in the use of major production inputs adopted the use of linear relationship or functional form that provide the 'best' result i.e. linear, semi-cog, exponential and log-linear. The log linear having the highest R^2 and significant regression coefficients was used. And food output was defined as linear function of land, labour inputs, purchased variables inputs, human capital, and age. Crops under study include cassava, maize, cocoyam, melon and vegetables.

The result indicates that for the sampled women farmers, average women farmers were 46 with a mean deviation of 14 years. Majority of the women farmers were married and had, at least primary education. Most of them had household size of 5 or less. The farming experiences of the women farmers average 13 years with standard deviation of 12years, implying that many of the women farmers were new

comers in business. The research shows that over 70 percent of the women farmers had access to farm land either in free hold or lease form. In terms of physical involvement in farming operations, women farmers were found physically involved in food production and processing while land clearing and ploughing were less attractive to them.

The production function indicated positive sign for all factor variables except land. The estimate coefficient for land is negative but significantly different from zero. The coefficient for Man-days is small and not significantly different from zero. The coefficients for purchased inputs are of reasonable size and significantly different from zero. They indicate that a 10 per cent increase in Man-days of hired labour may be expected to bring about 4.1 per cent increase in the value of purchased inputs which may be expected to bring about a 4.5 percent in output of food crops.

2.1 LITERATURE ON AGRICULTURAL CREDIT

2.2 CREDIT DEFINED:

According to Suraj B. Gupta (1982), credit can be defined either broadly or narrowly. Broad definition of credit according to him is “finance made available by one party (Lender, Seller or share holder/owner) to another (borrower, buyer,

corporate or non-corporate firm". Credit narrowly defined according to Gupta is only used purely to refer to "debt finance".

The Penguin Dictionary of Economics (1998) views credit as "the use of or possession of goods or service without immediate payment." It further states that, "Credit is used to enable producers to bridge the gap between production and sale of goods to the consumer. It enables him to purchase goods of future income."

The implication here is that credit grants access to resource for use even when such resource are absent (Miller 1977) as cited in M. M. George (1999).

Freshwater tries to differentiate between grants in the form of loan and credit as a form of borrowing, in which grant as loan requires no repayment there by placing little burden on its recipient. He explained that grants provided to individuals, poor communities and small rural businesses are avenues to avoid borrowing from else where (Freshwater, 1990).

Fineness (1975) saw credit as the channel available for entrepreneurs to borrow on a promise for a future repayment.

By this, it implies that credit is given on the basis of confidence and prompt repayment terms of the agreement reached. It further implies that the lender must be a surplus spending unit while the borrower a deficit spending unit.

2.3 THE ROLE OF CREDIT IN AGRICULTURE.

Credit in Agriculture is accepted by all financial experts as necessary inputs Aku (1981), Aku (1989), (Olusi 1991). Pinscher and W Adams (1980) saw credit as an important element in development efforts in most low-income countries. Thus, it is a 'most' for growth potentials to be harnessed properly in the Sector. Olusi (1991) saw credit as the lifeblood of a nation. To him, credit if well explored, will increase the agricultural output. And that the demand for agricultural input tends to increase with every increase in development.

Both Sarah Sinha and Imran Martin (1998) saw the role of credit in agricultural production as capable of expanding household income and alleviating poverty. According to them "credit for production to the rural poor is likely to initiate a 'virtuous' cycle of increased household income through increased savings and investment. However, it was noted that credit alone will not kick-start the virtuous cycle of perpetual growth across households.

Sara's Sinha and Imran Martin (1998) summarized the role of credit for resource endowed house holds as capable of "increased credit access and may have a positive effect on their risk-bearing capacity". It may enhance fresh investments and encourage the adaptation of new technology.

Where as credit is relevant, it is also worth noting that Jayne et al (1989), Gonzalez-Vega (1986), Mellow (1985) have supported the fact that lack of credit is responsible for low agricultural productivity and failure to use effectively available technology.

2.4 EMPIRICAL LITERATURE ON CREDIT IN NIGERIA

Igwe P.A et al (1997), using raw data from World Bank and Imo State ADP's annual fund receipts, fund disbursement by sub-programmes and the deviations from source of funding, shows that the withdrawal of World Bank funding and the dwindling fund flow from state government will prove a great challenge to state ADPS.

He uses the Imo ADP to show the achievement of the ADP's and draws the implication of World Bank funding withdrawal and proposes strategies to be adopted to overcome such withdrawal.

In a related study on sustainable agricultural investment: An appraisal of small and medium scale Cottage Enterprises in South-Eastern Nigeria; Unamman et al (1999) appraised the impact of direct agricultural investment (DAI) and Non Agricultural Investment (NAI) in five states of South Eastern Nigeria. He uses a combination of structured questionnaire and oral interviews. The result revealed that there are forty-one on going small and medium scale investment in the state.

Out of this number, NAI was dominant and was followed by DAI. The research recommended a resuscitation of failed banks in the identified rural areas, as a strategy to improving the small and medium enterprises that depend on them. Also that the result of researches from research institutions be adopted by small-scale investors. That agriculture-derived investment should be encouraged.

Mbanasor J.A and A.C Nwosu (1999) in a study on Agricultural Investment in Nigeria, identified inconsistencies, lack of effective monitoring and evaluation of policies as well as poor policy formulation as critical to non-achievement of sustainable agricultural investment in Nigeria. He uses data available from 1986 - 1996 (depicting most recent information on agricultural investment in Nigeria). The data was analyzed using descriptive statistics and correlation.

The result portrays that at the inception of SAP, the total annual government investment was generally on the increase up to 1990. That physical decrease was between 1991 to 1992. Also that this increase was not commensurate to the investment in the other sectors. The growth rate of agricultural investment was initially on the increase until 1989 by 11.5%. Since 1989, the percentage investment in agriculture began a downward trend from 11.5 to 2.0 in 1995. The reasons for this trend, according to them, are policy changes of the period, which

saw government, participating in formulation and implementation of agricultural policies as well as project implementation.

Mbanasor and Nwosu reiterated that before SAP, the agricultural sector policy of the country was private sector oriented with government only playing a supportive role. The research indicated a strong relationship between government investments in agriculture to the percentage growth in agriculture.

Amadi S.N et al (2001) in study on commercial and merchant bank credit to the preferred sector of the Nigerian economy (1981-1997) uses two O L S multiple regression models on time series data of commercial loans and advances to agriculture and manufacturing sectors. The result indicated a joint significance of the explanatory variables in each model. It was therefore recommended that commercial and merchant banks should increase the volume of their loans and advances to these sectors to enhance their growth.

In another study on "an appraisal of agricultural loans disbursement and repayment in the First Bank PLC Samaru, Kaduna State, Alamu J. F and S.A. Rahman (1999), investigated the socio-economic characteristics of farmers that obtained loans from First Bank PLC Samaru branch. They also investigated the criteria of disbursement and repayment of the loans. They compared the amount applied for and the amount approved. Simple descriptive statistics were used to

analyse the primary data collected. The results show that most of the farmers were between the ages of 31 and 40 years. And that there exist 3 criteria for obtaining loans namely; minimum deposit; loan duration and repayment condition and loan supervision. In addition, there was a marked difference between the amount of money farmers applied for and what they got. According to them, the sampled farmers encountered three major problems while trying to get loan from the banks namely: high interest rate charged, delay in disbursement of loan and initial disbursement of loan to the farmers. Based on findings, recommendations were made to minimize undue delay in obtaining loan so that farmers can acquire necessary inputs that will enable them expand their farm size and productivity.

In another study on "economic evaluation of investment in pump irrigation system in Bauchi state, Baba K.M. et al (1999) under took a study of small-scale irrigation in the Western zone of Bauchi ADP. The areas covered included Dass, Tafawa Balewa and Toro. The data collected were projected over five years period (1988-1992) using the annual growth rate of the consumer price index. Discounted cash flow measures were used for analyzing profitability of the investment.

The data collected were analyzed using net farm income (NFI) model to determine the cost and returns of pump irrigation. The costs and returns formed the basis for

estimating the Net Present Value (NPV) and Internal Rate of Return (IRR) of investment in pump irrigation.

The NPV was defined as:

$$NPV = \left[\sum_{t=1}^{5} At\,(1+i)^{-c} \right] - C \text{ - - - - - 1.0}$$

While the IRR was obtained by solving the following equation for:

$$NPV = \left[\sum_{t=1}^{5} At\,(1+i)^{-1} \right] - C \text{ - - - - - 2.0}$$

The result shows that estimated variable costs for 1987/88 seasons were 3,601.76/ha. However, about 56% of this was accounted for by unpaid family labour input. Labour input accounted for 71% of the variable cost. By this result labour was identified as the single most costly input in irrigation farming. The gross return over five years computed after deducting cost gave an NPV income of all the farmers as N22, 610/ha and N70, 1218.75/ha when family labour was coasted. About 53% of the farmers obtained negative NPV when family labour was taken into consideration. This implies that more than half of the farmers produce at a loss. The average farmer obtained an NPV of ₦502.44.

Further investigation revealed that close to 69% of farmers incurring losses were in Dajin village where water shortage was most acute. The research revealed constraint arising from irrigation due to water shortage, unavailability of improved seeds and low prices of product. These, according to the researcher, depress the incomes of the farmers as such their alleviation could greatly improve returns in the area.

In a study on the "Concept of Rural Banking and credit needs of small farmers," Agbo C. I and D.O. Phillip (1991), used data assembled from primary sources to show that rural banking schemes are not doing enough to carter for farmers' need. Both Agbo and Phillip recommended that the government should device its own institution for credit service to farmers. That it is futile from experience to rely on commercial banks to satisfy credit needs of farmers, given the banks orientation.

It was finally agreed that the current rural banking programme hardly reaches the rural farmers. As such there is the need for government to either shift the burden of rural banking development to separate entities operating at state levels or help establish specialized banks for rural credit.

Aromolaran A.B. and J.K. Olayemi in a study on Efedapo Local Government area tried to discover whether resource allocation pattern generated by four behavioral processes are statistically distinct from each other or not. The result shows that the behavioral processes are different.

Their conclusion was that allocative behaviour in agriculture is different under different behavioral processes.

In another study of capital investment in farming in selected communities of Kwara state, Nigeria, Nwosu and Ogunfowora (1977) discovered a minimal effect of capital investment of 10 percent where an annual expenditure on labour was high, while hired machinery and purchases of durable goods account for only 11 percent. The research revealed the need for more investment in both durable and non-durable capital inputs. According to them these inputs are necessary but that the incomes of the farmer will not be sufficient to acquire them except there is an established source of cheap credit around in the form of cooperative.

2.5 EMPIRICAL LITERATURE ON THE IMPACT OF CREDIT OUTSIDE NIGERIA

Studies outside Nigeria on the impact of credit on agriculture exist in the literatures. A good number of them have been reviewed below:

Horiuchi and Sai (1993) piloted an investigation on the effects of credit on small-scale farmers in Korea. They compared the investment behaviour of small and medium size farms that received credit assistance between 1964 and 1988 and those that had their investments wholly free of credit. Their findings revealed that the initial years of lending were associated with increased investment for borrowers than for non-borrowers of both farm categories.

The empirical result declared an increase due to farm credit received in the areas of output, farm size, better operation expenses and productivity. This means there is a multiplier effect on the use and employment of farm credit.

However, in an evaluation of agricultural credit in Ghana and Cote'D ivoire, it was observed that the increasing loan delinquency over the years is associated with poor performance of the sector (Osuntogun, 1973). It was equally asserted in the study that access to credit provided a sustained and increased rural inequalities.

More so, a host of rural financial institutions are not financially viable to provide credit owing to the poor performance of this financial portfolio, which must have emerged from poor rate of savings mobilization.

Koo and Kwak (1984) commenting on the impact of credit programmes in less developed countries, are of the view that credit policies pursued by the government of the less developed countries are costly and guided with over-ambitious projects which often result in misallocation of resources.

Sharma (1984) in a case study illustrated how well intended policy measures have not only been inadequate but have also been incompatible with other structures in the economy of Fuji Island, particularly the land tenure system. This problem has created undesirable result in terms of the number and amount of loans financial institutions are willing to make available to small-scale farmers.

Vittas and Cho (1905) examined various agricultural programmes involving loans on preferential terms and conditions to priority sectors in both developed and under developed nations. The result of their findings proved that most of these programmes manifested distorted incentives among lenders and borrowers.

Their experience further depicts that most of the credit programmes meant to stimulate capital investment projects in the agricultural sectors suffer abuses and misuse of preferential funds on non-priority purposes.

Habib (1989) conducted a study on institutional credit and agricultural development in Pakistan. With the use of an aggregate data, it was

concluded that there is no statistical significant correlation between farm output and institutional loans. However, the relationship between credit and fertilizer was found to be statistically significant.

In a statistical study conducted by Malik, Mustaq and Gill (1991), they estimated the log of farm output and the log of institutional farm credit using a household level data in the 1985 rural credit survey of Pakistan. The investigation came with a coefficient value of 0.05, which was statistically significant at 99 percent level of confidence.

Sani T A et al carried out another study on the effect of domestic credit conditions on the agricultural sector of western Germany using data from German Bank; they adopted a four (4) variable auto regression moving averages to show that monetary aggregates are not exogenous. The research shows that for the period 1978 to December 1982, four-lag formulation is appropriate for a vector auto regressive system. It was also found out that money supply has statistically measurable impact upon agricultural sector.

Gabriel A. Fuentes (1996) in a research on the use of village agents in rural credit delivery" used a simple principal agent model to examine the incentive problems that arise when a formal financial institution (such as a rural bank) utilizes a member of the rural community to act as an agent in screening potential borrowers and collecting repayment. The model

distinguished two types of farmers; one that is good (g) because the credit risk on him is low and the other that is bad (b) because the credit risk on him is high. The loan is either repaid or not repaid by the farmer. A payment is made to the agent by the financial institution.

The research reveals agency problems in formal credit issuance and collection. And also that optimal incentive is necessary and in doing so formal institution is involved in risk sharing. The models that farmers credit repayment will depend on 'cost' and that such 'costs' need further investigation. The research further reveals how to identify separate roles for the agent.

2.6 FUNGIBILITY OF CREDIT

Von Pischke J. D and D. W. Adams (1980) saw fungibility of credit as synonymous to inter changeability of credit as in inter changeable units of money. Webster Dictionary views fungibility as of such a kind or nature that a specimen part may be used in place of another specimen or equal part… interchangeably.

Von Pischke J. D and D. W. Adams (1980) further stated that agricultural credit is fungible i.e. loans for agricultural purposes are diverted to non-agricultural uses. According to them, "at farm level, many credit projects treat loans as if they were production inputs ignoring the fact that a

unit of borrowed money is identical to other unit of money held by the borrower; even if a loan is in kind such as bags of fertilizer, the goods provided can generally be sold and converted into cash if the borrower desires. Thus, for all practical purposes, loans in kind or in cash can be used to buy any good or service available to the borrower in the market. Pischke and Adams concluded "fungibility takes place in the form of additionally, diversion or substitution of the project funds."

2.7 EFFORT AND PROGRAMMES TOWARD CREDIT DELIVERY

The main role of government in the development of the agricultural sector has been accounted for as "the provision of a national policy frame work through which it attempts to minimize the constraints facing the sector and to outline projects and programmes to be implemented for the achievement of stated policy objectives" (Balogun, 1986).

The objective of increased agricultural productivity enhancement according to Chikwendu et al (1990) is to attain:

1. Food sufficiency for the whole country.
2. Reduction in food import (Amaza, 2000)
3. Increased export earning (Nwosu, 1997)

Thus, government efforts and programmes to the sector have not been in the area of credit policies only but also in putting in place the necessary institutional framework.

2.7.1 A. NIGERIA AGRICULTURAL AND COOPERATIVE BANK

This is a development finance institution established by the FGN on November 24, 1972 as a limited liability company to foster the growth of agriculture and development of the rural economy. It commenced operations on March 6, 1973 and is wholly owned by the Federal Government of Nigeria, NACB's shares are 60 percent subscribed to by the Federal Ministry of Finance and 40 percent owned by the Central Bank of Nigeria (CBN).

NACB's objectives are to: (NACB, 1998)

(a) Promote agricultural production and rural development.

(b) Assist in the improvement of the income and quality of life of rural populations and

(c) Improve the overall growth and development of the Nigerian economy, through the provision of financial support for the production, processing and marketing of agricultural product. These objectives are being achieved primarily through the provision of various types of agricultural credit facilities to

the Nigerian farming community. The secondary role of the Bank relates to direct financial participation through equity investments in agricultural and agro-allied industries as well as the provision of guarantees for viable agro-based ventures to facilitate the raising of funds from both domestic and external sources.

2.7.2 B. Rural Support Programs.

(a) Family Economic Advancement Programme. This programme was established in 1994 by a former first lady of Nigeria. FEAP is Nigeria's newest and largest provider of credit to the rural sector. The programme began operations in November 1997 with several interrelated objectives: (Aliyu, 1998)

i. Poverty reduction through improving the standard of living of Nigerians and minimizing income disparities between the rich and the poor.

ii. Encouragement of design and manufacture of machinery and equipment locally so as to provide a solid foundation for industrialization.

iii. Encouragement of producers at ward levels to form cooperative societies.

iv. Reduction of rural-urban migration through the creation of employment opportunities at ward levels.

v. Promotion of production and development consciousness through the utilization of available local resources

vi. Promotion of industrial development at every ward in the country.

2.7.3 C. Agricultural Credit Guarantee Scheme Fund (ACGSF)

This programme was established in 1977 under CBN management with a capital base of ₦100M, funded by the FGN (60 percent) and the CBN (40 per cent). The ACGSF began operations in 1978 to encourage banks to lend to agriculture by providing some form of guarantee against risks inherent in agricultural lending. In case of default, the lending bank is expected to exhaust all legal means of recovery, including realization of any security pledged for loans, before ACGSF pays 75 per cent of guaranteed loans in default, net the amount realized by the bank from the disposal of security pledged by the farmer.

2.7.4 D. Nigerian Agricultural Insurance Corporation (NAIC)

NAIC was established in 1987 mainly to provide insurance coverage to farmers.

According to the Nigerian Agricultural Insurance Company (1998), NAIC has the following specific objectives.

(a) To induce the provision of credit by financial institutions as insurance coverage is an added collateral.

(b) To promote agricultural production by giving farmers confidence to accept new/modern innovations and inputs, and

(c) To minimize or eliminate the need for ad-hoc government assistance during agricultural disasters.

2.7.5 E. People's Bank Of Nigeria

The Federal Government of Nigeria established the People's Bank of Nigeria in October 3, 1989 to improve access to financial services for hitherto excluded economic group such as micro and small-scale enterprises in rural and urban areas and disadvantaged social groups, including women. PBN is a specialized bank, which is wholly owned by the FGN and subject to CBN regulation and supervision. However, its management is semi-autonomous, with the ability to determine most of its operating policies and procedures, except for lending and savings deposit interest rate - PBN (1999).

The main objectives for the establishment of PBN according to PBN (1991a) were: -

(a) The extension of facilities to the less privileged members of the society who cannot normally benefit from the services of the conventional banks.

(b) The acceptance of savings from customers and repayments together with any interest thereon.

(c) Provision of opportunities for self-employment for the vast unutilized and under utilized manpower resources.

(d) Complement the efforts of FBN in improving the productive based of the economy and

(e) Inculcate banking habits at the grass roots level and reduce rural-urban migration.

2.7.6 F. Rural Branch Banking

Formal credit institutions have been classified to include commercial banks, merchant banks, Nigerian Agricultural and Cooperative Bank, Family Support programmes, various community banks and peoples Banks Magbagbeola N. O., (1998). These, according to him constitute the institution for mobilizing and allocating resources to the sector of the Nigerian economy: in this wise, it has been stated that for rural resource

development and mobilization, the availability of such credit institutions are expected to significantly impact on credit availability (Agbo and Phillip, 1991).

On the contrary, Philip and Agbo had shown that failures by most banks in Nigeria to meet credit requirements of the rural dwellers and small holder farmers had informed the demand for branch banking (Philip and Agbo, 1991). J. E. Ezike 1981 made another similar interpretation of the same situation. According to him the need for branch banking arose from:

1. The growth in incomes and shift in the distribution of personal income
2. The growth and movement in population
3. The growth in government activities.

Ezike further stressed the importance of the three years National Development Plan (1970-1980) in enhancing branch banking. According to him "The plan emphasized 'balanced development' of the different sectors of the economy and the various geographical areas of the country." (Ezike J. E. 1981).

In a related explanation, Philip and Agbo attributed branch banking to the proposal for rural transformation by the financial system review committee of 1976 and the various Central Banks' overtures for banks to

establish rural branches (Philip and Agbo, 1991). Philip and Agbo cited the Akigbo Committee's proposal to include among others:

"The banks should actively facilitate the transformation of the rural environment by promoting the rapid expansion of banking facilities and services and banking habits in the rural and near rural communities – They should serve as vehicles for the creation of credit in the rural areas; this credit should take the form of equity and loans for small scale farms and enterprises."

2.7.8 Rural Financial Intermediatory Roles

Informal financial intermediation has been defined as "the mobilization of capital from savers and its simultaneous transformation and allocation to meet the needs of borrowers as performed by informal financial agents (Garry Christensen). This implies the movement and transfer of funds from those in possession to those in needs to fulfill certain roles and should be performed by certain individuals or institutions.

Aryeetey and Udry (1994) have recognized three broad types of informal finances in Africa. These are: primary saving mobilization units, with little or no lending

(a) Primarily lending units that are hardly involved in savings mobilization and

(b) Units that mobilize deposits and do a considerable amount of lending, albeit mainly to members of distinct associations or groups which may include

- Self help financial groups that include different levels of savings and credit associations, including rotating savings and credit associations (ROSCA's) and non-rotating ones.
- Commercial lenders
- Friends, family and non-commercial lenders and licensed cooperatives or unions.

In the same vein, Magbabeola N. O (1998) recognizes intermediatory roles of informal finances to consist of five. According to him, "some are overlapping and intertwined in production or marketing activities."

Another study by Akanyi O. O. (2001) Cited the Gramma Bank experience as relevant in informal credit programme.

According to her "the group concept of informal lending to the poor was relevant." "The programme was started to assist landless people in Bangladesh to obtain credit which could not be obtained through the formal commercial banks credit facilities. The programme was successful because the groups were cohesive (landless) and voluntarily formed.

CHAPTER THREE

AN OVERVIEW OF FARM LEVEL RESOURCE

3.1 DESCRIPTION OF THE STUDY AREA

Bauchi State was created in 1976. It is one of the seven (7) states created to increase the number of states in the country to nineteen by the Federal Government. It is located between latitude 9.3 degrees and 12.30 degrees North of Equator and Longitude 8.50 degrees to 11 degree east of Green Witch Meridian.

It covers a geographical area of 49,259 Km^2 or 549,260 square land mass. This is made up of 36,750Km^2 (36.75 million hectare) of cultivable area. Areas under cultivation during rainy season (rain fed) stand at 1,036 Km^2 (1.036 million hectare) (ADP manual: 2003).

Bauchi State has an estimated population of 4.5 million people. Of this, an estimated 2.5 million people are rural dwellers, and herdsmen. The state is divided into twenty (20) Local Government Areas. The state is bounded by eight (8) other states namely Adamawa, Yobe, Taraba, Plateau, Kaduna, Kano and Jigawa.

Bauchi State is sub-divided into two administrative divisions, Bauchi and Katagum. The state is one of those states in Nigeria that has large number of tribes' men. Dominant among them are, Gerawa, Miyawa,

Sayawa, Angasawa, Jarawa, Ningawa and other Tribes are interspersed in all these areas.

3.2 CLIMATE SOIL AND VEGETATION

The typical seasons of Bauchi state are dry and rainy seasons. The state experiences rainfall of about 600mm - 1,300mm. The Northern Bauchi experiences rainfall of about 700mm per annum, while the South experiences rainfall of about 1200mm per annum. The state's weather ranges from cold temperatures in the Central part of the state to mild and windy in the East to the hot and dry Northern part of Bauchi. The state also experiences 95-170 rainy days in a year (ADP manual, 2003). The state receives her yearly rainfall beginning in April and lasting until September each year while dry season commences in October and ends in March.

Bauchi State vegetation is basically Savanna and various economic trees are also available in the state.

3.3 FARMING FEATURE OF THE STUDY AREA

The state has an estimated 3,834 villages. The farm family size of Bauchi State stands at 341, 860 with 345-village cell. The average farm size per farm family is 3 hectare.

The cropping system in Bauchi State is mixed cropping with few exceptional cases in the areas of cotton, sugar cane, onions, cassava etc. The

state also practices Fadama farming or dry season farming. The Fadama land under cultivation (NFDP) is estimated at about 9628 Km^2

3.4 FOOD CROP PRODUCTION IN THE STUDY AREA

Bauchi State is noted for food crop production. The state ADP in conjunction with the state Government plays a significant role in this direction.

The Northern Zone of the ADP has assessed the towns of Katagum, Gamawa, Jamaare, Misau, Giade and Shira as large producers of millet, sorghum, groundnuts, beans etc. With significant production of maize, rice and other weed types.

The Western Zones of Tafawa-Balewa, Bogoro, Dass and Toro are noted for rice, sugar cane, beans, maize, millet, and sorghum and groundnut production. This is due to its closeness to the Plateau and its mild weather condition as compared to the harsh condition of the North.

In the Central Zone, the crops produce include, maize, rice, sugar cane, groundnut, millet and sorghum. These are found in almost all the areas consisting of Ganjuwa, Ningi, Alkaleri, Darazo, Kirfi, and Duguri Area. Thus, most crops produced are food and cash crops.

3.5 THE FOOD NEED OF NIGERIA

The Federal Ministry of Agriculture (1993) estimated that the annual supply of food crops would have to increase at an average annual rate of 5.9% to meet food demand and reduce food importation significantly (Amaza P.S and J. K. Olayemi, 2002). The necessity for food growth to be below the rate of growth of population can be traced to rising poverty in the country. It was estimated that about 72% of household expenditure was on food (CBN 1998). Further more, recent studies show that aggregate food production in Nigeria has been growing at about 2.5% per annum in recent years. But the annual rate of population growth has been as high as 3.2% (Ajibefun and Abdulkadri, 1999).

The necessity for food to outgrow population had lead the Federal Government (FGN) to undertake varied projects in an attempt to boost food production in the country. Of recent, the government has widened the Sassakawa 2000 (S.G. 2000) project and also invoked a World Bank and Food and Agricultural Organisation (FAO) project under the name of Special Programme on Food Security (SPFES). The effort is to counteract outgrowth in population explosion through increased food supply.

3.6 LIMITING FACTORS TO RURAL AGRICULTURE AND FINANCE

The economic activity of the rural dwellers provides for their sustenance: Daily needs and future needs are met through rural activity. Since the concept of rural activity is related to agriculture and related factors (Adams, 1995). The single most influential factor in rural agricultural practices is agricultural pricing, Njoku (1980). This is because good agricultural pricing affects income and savings (rural capital formation). Pricing of agricultural product has been described as "unstable" (Olatunbosun and Olayide (1974). Both Olatunbosun and Olayide viewed such inability to stabilize prices as failure 'to stabilize income.' According to them, marketing boards failed to stabilize produce prices and income because stabilization policies have invariably focused on prices, money incomes and real income. Where as, an attempt to stabilize one of these, may destabilize the other particularly where there is a rise in import prices or fluctuations in crop supplies." Bauer (1963) has argued that price fluctuations, which are caused by changes in supplies, stabilize producers' income.

But under conditions of general increase in prices and costs, the stabilization of money incomes and a fortiori of money prices result in destabilization and depression of real producer income.

Thus, by destabilizing prices, it will invariably destabilize income and rural capital formation will be affected. The absence of banks in most rural areas and the poor banking practices in Nigeria is partly responsible for poor resource mobilization and such ineptitude to banking habit and poor performance in such areas. The need for rural banking was first highlighted by the financial system Review Committee and since then, several overtures by CBN to commercial banks on issues regarding rural banking had yielded little response (Agbo and Philip, 1991). Other efforts include the 'Akigbo Committee of 1976' and the application of CBN Decree Number 4 under the banking programme of the Federal Government.

Despite this and many other efforts aimed at mobilizing idle resources at the rural level, the idea of rural banking as a source of resource mobilization and resource re-investment has left a lot to be desired. Deficient rural banking has left funds in the rural areas un-mobilized to date. The situation according to Agbo and Philip (1991) is that there is no well-articulated rural banking to ensure:

i. Rural credit which will play an important role in small farm agricultural development.

ii. That the burden of rural banking be broadly placed and not narrowed to solely metropolitan or national banks.

iii. That the rural banking policy and ACGSF should stimulate an increased flow of lending to agriculture with small farm operators benefiting.

In a nutshell, the expected role of rural savings and investment emanating from rural activity is minimal and in some cases non-existent due to absence of credit institutions. Thus, in Nigeria and in Bauchi State in particular, the significant position occupied by the traditional classification of credit institutions as in Agbo and Philip (1991) holds; that is formal and informal credit sources. And the role of this sector is relevant given its peculiarity and the performance of the same in places like India and other parts of the world.

3.7 SOCIO-ECONOMIC CHARACTERISTCS OF THE FARMERS IN THE SAMPLED AREAS:

Agricultural practices the world over are affected by multi-varied social, political and economic variables. Some of these variables are endogenous to the community and its people while others are exogenous to the community and the people.

The socioeconomic variables endogenous to the community and its people interact to determine the level, value and consistence or otherwise to farming activities. Some of these variables include age of farmers, family size and participation, land size, credit source, inputs, etc.

On the other hand exogenous variables are outside the immediate and short run influence of the farmer and as such can be treated as given. The aim in this subsection therefore, is to reveal influential factors and certain basic characteristic of the farmers resident in the sampled agricultural zones of Bauchi State.

The trend common to agricultural practices the world over is their rural setting and micro level activity. The situation in Bauchi is not different. These farmers are found actively engaged in farming activities during 'on' and 'off' season's on a small or medium scale. The outputs are either for immediate consumption or for sale (cash crops). The varied food crops produce includes - rice, maize, beans, guinea corn, millet, etc. These food crops are produced on fragmented land held either on hire, lease, purchase or inherited from past family heads.

While agriculture under rain fed is most popular and most vigorously pursued by all. Other 'off' season activities like *fadama* farming is present in areas with rivers and dams. Other activities common in such study areas include petty trading, cattle rearing, tailoring, mechanics and few white-collar jobs.

3.7.1 SEX DISTRIBUTION OF SAMPLED FARMERS

One variable significant in food production is the increasing participation of both sexes (male and female) in its production. In some of the sample areas as revealed in Table 3.3 below, there is certain percentage of female food producers. But the greater majority indicates the opposite sex (male). The proportion of men to female participation is 95.4% to 4.6% i.e. about 95.4 percent are male while only 4.6 percent are female. Thus the dominant food producers in the study area are men. Various studies has shown the low participation of women in agricultural activities (Salamatu, 1998) Oguniyi L.T. (2000) This may not be far from the fact that women still lack self-independence and encouragement towards economic empowerment that will ginger them to ward self-realization and economic independent especially in the North.

This is in spite of varied women programmes and associations put in place, aimed at improving the lots of women in the country.

Table 3.7.1: Sex Distribution of Sampled Farmers:

SEX	FREQUENCY	PERCENTAGE (%)
Male	103	95.4
Female	05	04.6
Total	**108**	**100**

Source: *Field Survey, 2002*

3.7.2 FARMERS AGE

Farmer's age is considered an important socio-economic variable capable of influencing his activity and behaviour. Age is closely related to experience and maturity. The impact of such variable should be significant. In Table 3.4 below, the age range of sample farmers is between 30 to over 70 years. Of these, 54.6 percent falls within the age bracket of 41-59 years. Those between the ages of 60-70 years, which constitute 21.3 percent, closely follow this. This indicates that a greater majority of the farmers are within the maturity age and can handle difficult situation arising from their activity. More so, the age level indicates years of experience in farming. The older groups of above 71 are few. Whereas the younger groups constitute only 18.5 percent of the sampled farmers.

Thus this also implies that in terms of credit, those within the age bracket of (41-59) constitute the elderly, and will be most preferred and relied upon.

Table 3:7.2 Sampled farmers age-distribution:

AGE	**FREQUENCY**	**PERCENTAGE (%)**
30-40	20	18.5
41-59	59	54.6
60-70	23	21.3
Above 71	6	5.6
Total	**108**	**100**

Source: *Field Survey, 2002*

3.7.3 DISTRIBUTION OF SAMPLED FARMERS ACCORDING TO LABOUR UTILIZATION

Labour input is classified as family labour, hired labour, animal traction, tractors or a combination of any two of the above. Thus from the sample data, 39.8 percent uses tractors only during ploughing while 33.3 make use of hired/family labour. Animal traction constitutes 8.3 percent of labour utilization. Similarly the sampled farmers are capable of combining tractors and animal traction. This constitutes 18.6 percent of the labour used. It can be inferred from the foregoing that the bulk of the farm work is carried out manually while only land preparation attracts the use of tractor and animal attraction. Thus, labour may not necessarily be cheap but that it is available for use.

Thus, labour usage is acquired through negotiation and is determined by the bargaining ability of the parties involved and can be influenced by the nature of the task involved and the relationship of the parties involved.

On the part of family labour, adult males and females are mostly involved in seeding, weeding, application of fertilizer, threshing and transportation. Other areas include, supervision and trimming of plants etc.

Table 3.7.3 Labour Utilization Distribution

LABOUR TYPES	FREQUENCY	PERCENTAGE (%)
Animal traction only	09	8.3
Hired labour/family labour	36	33.3
Tractors only	43	39.8
Tractors/ animal traction	20	18.6
Total	**108**	**100**

SOURCE: *Field data, 2002*

3.7.4 LAND ACQUISITION AND DISTRIBUTION OF SAMPLED FARMERS

The land acquisition of the sampled farmers indicate skew ness in favour of inherited land and outright purchase of farm land as against lease, hire and other means of farm land acquisition. The percentage of sampled farmers that inherited their farmlands is 50.9% i.e. about half of sampled size.

While those that out-rightly purchased their farmland amount to 37.0%. While the proportion of those that lease, hire or undertook other means to acquire farmland for use are 6.5%, 1.9% and 3.7% respectively. Hiring land for farm purpose constitute the least.

Land inherited for farming is likely to be large and more fertile for use in food production.

Table 3.7.4 Land acquisition distribution of sampled farmers

ACQUISITION PROCESS	FREQUENCY	PERCENTAGE (%)
Through inheritance	55	50.9
Outright purchase	40	37.0
Lease	07	6.5
Hire	02	1.9
Others	04	3.7
Total	**108**	**100**

SOURCE: ***Field data, 2002***

3.7.5 GROSS FARM OUTPUT OF RESPONDENTS

The gross yields of farm output of sampled respondents indicate variation in output across farmers. Table 3.7.5 indicates that about 14% of the farmers reaped between 41 and 49 kilogram, which constitute 12% of total output each. The assumption here is that credit to small-scale producers will increase the acquisition and utilization of farm level resources. This is born out of the fact that the resource deficient farmer can adequately put more hectares to use given the available resource. More so; fewer hectares will be better managed with more resource as inputs.

Table 3.7.5: Distribution of Output according to respondents

OUTPUT IN (KG)	FREQUENCY	PERCENTAGE (%)
Less than 32	3	2.8
32-40	13	12.0
41-49	15	13.9
50-58	10	9.3
59-67	09	8.3
68-74	03	2.8
75-83	06	5.6
84-92	03	2.8
93-101	02	1.9
111-119	03	2.8
120 and above	13	12.0
Total	**108**	**100**

Source: *Field data 2002*

3.7.6 EDUCATIONAL BACKGROUND OF SAMPLED FARMERS

A major determinant of adaptive technology and farming system is farmers' ability to understand the technique and method to be used in his activity. Thus, the level of awareness is influenced by the qualification acquired before the activity or during the activity. In this case, the education background of farmers has socio-economic importance in their productivity

effort. The sampled farmers socio-economic characteristics indicate that 34.3 percent had some form of religious education (Quoranic and Biblical training) while 22.2 percent had primary school education. Thus, only 15.7 had no formal education or religious education.

Comparatively, it can be said that majority of the farmers had one form of education or another ranging from religious education to post primary and other higher form of education. It is worth noting however, that religious education is part and parcel of the socio-cultural heritage of the people in the sampled areas and as such contribute to their well being and activity.

Table 3.7.6: Education levels of sampled farmers:

Educational Level	**Frequency**	**Percentage (%)**
Not been to school	17	15.7
Quoranic/Religious School	37	34.3
Primary School	14	13.0
Others	16	14.8
Total	**108**	**100**

Source: *Field Survey, 2002*

3.7.7 FARM CREDITS AVAILABLE TO SAMPLED RESPONDENTS

Credit for agricultural purposes according to Philip and Agbo (1991), Magbagbeola N. O. (1998) Can be classified into two (a) Institutional Credit Source and (b) Non institutional source. This classification was confirmed in the study area: While commercial bank/Agricultural Bank's credit are found to aid agricultural production in the study area with loans, the role of government and its agencies are also significantly present.

In the case of non-institutional credit, evidences from the field indicate that sampled farmers benefited from cooperative credits, credit from friends/relatives, as well as credit from businessmen/money lenders. The magnitude and sources of such credits to sampled respondents are as presented below.

3.8 INSTITUTIONAL CREDIT MAGNITUDE AND SOURCE OF THE RESPONDENTS

A- The two available source of institutional credit in the study area are commercial bank/agricultural credit bank. This source of credit is highly regulated and is influenced by the demand for collateral before they are made variable to farmers. The sampled small-scale farmers in this study area benefiting from this credit source as shown below: The distribution indicate that the magnitude of commercial/Agricultural Bank credit release to the

sampled farmers during the farming season under consideration. And the amount was in the range of between ₦300.00 – ₦10,000.00 that indicates that about 37% of the respondents received between ₦1,000 to less than ₦2,500 as credit from these categories of financial institutions. While 22.2% received between ₦5,000.00 to less than ₦10,000.00.

Those that closely follow this are those received as credit between ₦300.00 to less than ₦750 and this constitute 21.3% of the respondents. The implication here is that the magnitudes of credits released by these financial institutions are of smaller amount. While those applying for huge sums are neglected or disqualified. In the alternative lesser sum is released for farming purpose. It is likely that the interest charge and the demand for collateral may be responsible for the downsizing of such recipients credit demand by commercial and agricultural banks.

Table 3.8.A DISTRIBUTION OF COMMELRCIAL/ AGRICULTURAL BANKS CREDITS OF RESPONDENTS

VOLUME (₦)	FREQUENCY	PERCENTAGE
300-750	23	21.3
1,000-2,500	40	37.0
3,000-4,000	16	14.8
5,000-10,000	24	22.2
Above 10,000	05	04.2
Total	**108**	**100**

Source: *Field data, 2002*

B- Another available source of institutional credit is government/ADP Credit. These credit sources are made available to farmers as an incentive to boost agricultural production. The value released depends so much on government available resource. Those to benefit are those recipients, which are able to completely pay the amount disbursed to him or her during the previous farming season.

Thus, it is non-rotational but is based on prompt repayment of the principal amount including the interest. This category of credit attracted sizeable farmers and as such sizeable respondents are beneficiaries. The percentage of beneficiaries receiving between ₦25,000− ₦40,000 is 23%. This is followed closely by those receiving between ₦6,000 to less than

₦15,000, which constitute 22.2% while about 17.6% are receiving between ₦15,000 to less than ₦25,000. This suggests that the state government and its relevant agencies release a fairly encouraging volume of credit for agricultural production. This is as below:

Table 3.8. B. DISTRIBUTION OF GOVT./ADP CREDITS OF RESPONDENTS

VOLUME (₦)	**FREQUENCY**	**PERCENTAGE (%)**
500- 2,000	11	10.2
2,000 –6,000	14	18.0
N6,000 –15,000	24	22.2
15,000- 25,000	19	17.6
25,000- 40,000	25	23.0
Above 40,000	14	13.0
Total	**108**	**100**

Source: *Field Data, 2002*

3.9.0 DISTRIBUTION OF INFORMAL CREDIT ACCORDING TO MAGNITUDE/SOURCES OF SAMPLED RESPONDENTS.

An alternative credit source is the informal sourcing of farm credit.

Three types of such credit source were observed to be available to respondents. This follows the classifications made by Philip and Agbo (1991), Magbagbeola N. O. (1998).

The first of this was from businessmen/money lenders. This unofficial credit source is based on ability to pay and how close the recipient is to the credit issuer. The recipient is charged interest known as "*kudin-ruwa*" over the principal amount. This is usually high and exorbitant. The Table (3.9.0) shows that 35.2% received credit, of between ₦2,500 to less than ₦20,000 while 31.5 percent are recipients of between ₦20,000 to less than ₦50,000. The loan proportion dwindled the higher the sum requested for. The situation is a description of ineptitude to such credit source due to basically high interest charged by businessmen/money lenders.

Table 3.9.0 DISTRIFBUTION OF CREDITS FROM BUSINESSMEN/MONEY LENDERS ACCORDING TO RESPONDENTS.

Volume (₦)	**Frequency**	**Percentage (%)**
2,500- 20,000	38	35.2
20,000 –100,000	24	22.2
Above 100,000	12	11.1
Total	**108**	**100**

Source: Field data, 2002

3.9.1 FRIENDS AND RELATIVES

This is another informal credit source. This credit source depends on cordiality and harmonious relationship between friends or relations. The table 3.9.1 indicates that a large chunk of credit transaction is made to friends or relations. The range is between ₦1,000 to less than ₦20,000. And this constitutes 63.0% of such credits. This is followed by 22.2% of value of credit made, to respondents of amount within the range of ₦20,000 to less than ₦100,000. This suggests that credit by friends and relations could be more depending on relationship and amount involved.

Table 3.9.1 DISTRIBUTION OF CREDIT MADE TO RESPONDENTS FROM FRIENDS/RELATIVES

Volume (₦)	**Frequency**	**Percentage (%)**
250 –1,000	12	11.1
1,000 –20,000	68	63.0
20,000 –100,000	24	22.2
Above 100,000	04	3.7
Total	**108**	**100**

Source: Field data, 2002

3.9.2 COOPERATIVE CREDITS

The last of such informal source of credit in the study area is cooperative credit. This credit is offered to members and non-members with minimal interest charges.

The cooperative gives more to members and charges them less than to non-members. Table 3.9.2 shows that about 35 % of the respondents received between ₦20,000 and ₦50,000.While only 3.7 % received above ₦ 200,000. Thus, this credit source provides cheap and easy access to credit for farm activities. But its issuance is limited by the size of the available fund of the cooperatives. As such only few people benefited.

Table 3.9.2 DISTRIBUTION OF CREDIT FROM COOPERATIVES ACCORDING TO RESPONDENT

Volume (₦)	**Frequency**	**Percentage (%)**
Less than 2,500	1	0.9
20,000 –50,000	37	34.3
50,000 –200,000	34	31.5
Above 200,000	04	3.7
Total	**108**	**100**

Source: Field data, 2002

CHAPTER FOUR

MODEL SPECIFICATION, DATA PRESENTATION AND ANALYSIS.

4.1 INTRODUCTION:

The conceptual framework for data analysis varies across data types and the result expected. And since economics had provided little guide when it comes to the choice of functional method of data analysis, the approach in this study represents a modest attempt to experiment with a number of functional forms.

This model is based on classical Cobb-Douglas production function. Various functional forms such as the linear, double log and semi log has been used as an evaluatory tool. To effectively do this, the data attached as appendix 2A has been used for the evaluation process.

4.2 THE COBB DOUGLAS FUNCTION.

The model specification in this work is in line with Cobb-Douglas production function. This model has proved most useful in agricultural production analysis. This is because of: -

(i) Its degree of freedom, which can be applicable in small samples.

(ii) Its coefficient is a good estimate of Elasticity of inputs.

Hence, the Cobb-Douglas production function used will be in the form: -

$Y= f(AX_1^{\alpha_1}, X_2^{\alpha_2}, X_3^{\alpha_3}, X_4^{\alpha_4}, X_5^{\alpha_5}, X_6^{\alpha_6}, X_7^{\alpha_7}, \text{----------} X_{13}^{\alpha_{13}}, \mu)$--------4.0

Where

Y= output

A= efficiency parameter

X_1- X_{13} explanatory variables

μ = error term

$\alpha_1 - \alpha_{13}$ is coefficients of the explanatory variables

The linear functional form of equation 4.0

$Y=f(AX_1^{\alpha_1}, X_2^{\alpha_2}, X_3^{\alpha_3}, X_4^{\alpha_4}, \text{----------} X_{13}^{\alpha_{13}}, \mu)$----------4.1

This functional form can be transformed into input output relation; where the dependent variable is regressed against the independent variable. The regressed form is: -

$Y=A_0+\alpha_1X_1+\alpha_2X_2+\alpha_3X_3+\alpha_4X_4+\alpha_5X_5+\alpha_6X_6+\alpha_7X_7+\alpha_8X_8+\alpha_9$

$X_9+\alpha_{10}X_{10}+\alpha_{11}X_{11}+\alpha_{12}X_{12}+\alpha_{13}X_{13}+\mu e$----------4.2

Where;

Y = Output of Agricultural product.

A_0 = Efficiency Parameter

X_1 = size of farm land in hectares

X_2 = Value of Hired labor

X_3 = Value of family labor

X_4 = farming technology

X_5 = Fertilizer application

X_6 = Seedlings used

X_7 = Credit from Banks Agric Banks/Commercial Banks.

X_8 = Credit from Gov't /ADP

X_9 = Credit from Businessmen/Money lenders

X_{10} = Credit from Friends/Relation

X_{11} = Credit from Cooperative Societies

X_{12} = Farmers Education (Dummy)

X_{13} = Extension Contact (in contact days) Dummy

μ_e = Error term (representing other variables not captured above).

The estimated form of equation 4.2 can be presented as: -

$Y=A_0+\acute{\alpha}_1X_1+ \acute{\alpha}_2X_2$----------$+ \acute{\alpha}_{13}X_{13}+, \mu e$----------4.3

While the log form of equation 1.3 becomes:

Log $Y=A_0+ \acute{\alpha}_1 \log X_1+ \acute{\alpha}_2 \log X_2+$----------$+ \acute{\alpha}_{13} \log X_{13}+, \mu e$----------4.4 and its regressed form has been

Log $Y=A_0+ \acute{\alpha}_1 \log X_1+ \acute{\alpha}_2 \log X_2+$----------$+ \acute{\alpha}_{13} \log X_{13}+, \mu e$----------4.5

The hypothesis in this study can be stated thus, for the purpose of empirical testing in a relationship form as;

$Y=f(X,i,j) = H_0 = 0$: credit increase resources of farmers and as such affect productivity

$H_A \neq 0$: credit does not increase resources of farmers and as such does not affect productivity.

Where; $H_{O;}$ is the Null hypothesis and H_A; is the alternative hypothesis.

4.3 OTHER FORMS OF COBB-DOUGLAS FUNCTION EXPERIMENTED WITH

As specified in 4.1 above, other forms of the data analysis adopted for this work will follow the under listed format framed after the Cobb-Douglas functional form. That is: -

4.3.1 LINEAR REGRESSION

The linear form is expressed as

$Y = a + \alpha_1 X_1 + \alpha_2 X_2 + \text{----------} + \alpha_{13} X_{13} + u_e$ --- 4.6

a, α_1- $\alpha_{13,}$ X_1-$X_{13,}$ $u_{e,}$ are as defined in equation 4.2 above

4.3.2 DOUBLE-LOG MODEL:

The double log form is stated as:-

$\log Y = \log a + \alpha_1 \log X_1 + \alpha_2 \log X_2 + \text{-------}\alpha_{13} \log_{X13} \text{-----} u_e.$---- 4.7

where Y, a, α_1-α_{13}, X_1-X_{13} and $u_{e,}$ are as defined in 4.2 Above.

4.3.3 SEMI-LOG MODEL:

The semi-log model of the Cobb-Douglas specified function for this analysis is defined as: -

$$Y=\log a + \alpha_{1} \log X_1 + \alpha_{2} \log X_2 + \text{----------} + \alpha_{13} \log X_{13} + u_e \text{--------} 4.8$$

Where Y, a, $\alpha_{1} - \alpha_{13}$, X_1-X_{13} and $u_{e,}$ are defined as in 4.2 above

4.4 STEP-WISE REGRESSION:

To predict a dependent variable from a long list of independent variables can be difficult. Thus, in a multi-variable equation to determine the most important independent variables to be included in a model is best screened by a process. According to Mclave and Benson (1988) "the list of potentially important independent variables is extremely long and we need some objective method of screening out those that are not "important". The screening process according to Mclave and Benson are complex in such exercise and such complexity arises from the interpretation of such multi-variables interactions and higher order polynomials. Thus, the procedure suggested by both Mclave and Benson for the screening of such variables is 'step-wise procedure'. This procedure according to them will end up

producing a model containing only those terms with t–values that are significant at the specified α level.

A notable application of step-wise regression is the work of James O. Wise and Jackson Dover (1974) in which step – wise regression was used to identify a number of factors (variables) that can be used to predict rural property values. Wise and Dover obtain their result by analyzing a sample of 105 cases from seven countries in Georgia.

Following the explanation given above, step-wise techniques becomes useful in this work. The pre-identified independent variables ranging from $X_1 - X_{13}$ terms can better be screened to ascertain the most important variable with the most important impacts on the dependent variable. In other words, that can define resource use under food production in the study area. Thus, the stepwise has been applied on the lead equation in this work.

4.5 EXPECTED RESULT

Taking the stated hypothesis into consideration, it can be said that the farm level resources employed is expected to affect the level of output positively.

These resources are farming technology, land size, fertilizer, seeds, credit etc. Further more, the credit components are expected to impact

positively on output of smallholder farmers. In this case, output is expected to increase when these inputs increase and vice-versa.

4.6 PRESENTATION OF THE REGRESSION RESULTS:

From the model stated in section 4.2, the result of our equation which is a regression of output against varied Inputs (farm resource) or independent variable will be as below (for the various models adopted)

a. Linear estimate:

$$Y = \underset{}{-5199} + \underset{(-1.25)}{295}\ X_1 + \underset{(1.45)}{0.172}\ X_2 - \underset{(3.76*)}{27}\ X_3 + \underset{(-0.11)}{0.029}\ X_4 + \underset{(o.96)}{2.94}\ X_5 - \underset{(2.72*)}{34.5}\ X_6 + \underset{(-0.65)}{}$$

$$\underset{(0.01)}{0.0001}\ X_7 + \underset{(1.43)}{0.083}\ X_8 + \underset{(0.06)}{0.0043}\ X_9 + \underset{(0.61)}{0.0571}\ X_{10} - \underset{(-0.87)}{0.215}\ X_{11} - \underset{(-0.45)}{92}X_{12} + \underset{(1.69)}{104}X_{13}$$

S=8161, R-Squared = 52.9%, R– Sq (adj) = 46.3% D–W=2.065922, F = 8.11

b. Semi-log estimate:

$$Y = \underset{(-5.37)}{-72034} + \underset{(1.42)}{5365}\ X_1 + \underset{(1.84)}{3024}\ X_2 + \underset{(0.78)}{3083}\ X_3 + \underset{(1.53)}{3224}\ X_4 + \underset{(2.35*)}{7058}\ X5 + \underset{(0.70)}{7078}\ X_6$$

$$+ \underset{(0.07)}{1306}\ X_7 + \underset{(1.29)}{1281}\ X_8 + \underset{(2.10*)}{2327}\ X_9 + \underset{(1.30)}{3675}\ X_{10} + \underset{(0.88)}{1786}\ X_{11} - \underset{(-0.02)}{1971}\ X_{12} + \underset{(0.64)}{98}X_{13}$$

S= 8485 R – Square = 48.7% R – Sq (ad j) = 42.1%

F = 7.42 D – w = 1.84731

c. Double Log:

$$Y = \underset{(2.58*)}{1.11} + \underset{(1.99)}{0.236}\ X_1 + \underset{(1.93)}{0.0968}\ X_2 - \underset{(-0.20)}{0.023}\ X_3 + \underset{(1.08)}{0.0720}\ X_4 + \underset{(2.84*)}{0.273}\ X_5$$

$$+0.0970\ X_6 + 0.010\ X_7 + 0.128\ X_8 + 0.148\ X_9 + 0.0078\ X_{10} - 0.1002X_{11} -$$
$$(1.89) \qquad (0.17) \qquad (2.29^*) \qquad (3.02^*) \qquad (0.18) \qquad (-1.50)$$

$$0.0153\ X_{12} + 0.315X_{13}$$
$$(-0.02) \qquad (1.52)$$

S = 0.2610, R = 57.2%, R- Squared (ad j) = 51.8

F = 10.5 D–W = 2.13737.

INTERPRETATION OF THE MODELS

Figures in parenthesis are t-statistics

*Significant at 1% level

**Significant at 5% level

Where;

Y= agricultural output

X_1-X_{13} = Varied input variables as specified in 4.2

From the results shown above the coefficient of determination (R^2) is estimated to be 52.9%for linear equation, 48.7% for semi-log and 57.2%for the double-log respectively. The implication here is that 48.7%, 52.9% 57.2% of changes in output variables for each of the three equations (linear, semi –log and double–log) are in each case explained by all the variables specified in the equations. Thus, from the three equations, the fit for the semi-log is averagely poor as it is not up to 50 percent and as such shows no closeness of fit. Where as, in the semi-log and double log equations,

coefficient of multiple determinations (R^2) shows closeness of fit in each case. The closeness of fit for the double log proves to be the highest of them all. The remaining unexplained part of the variations in each of the three models can be associated with influences outside the model.

In the use of linear function, we observe a significant impact of hired labour and fertilizer application, farm size, farming, technology, comm./ Agric Bank credit, ADP/Gov't Agency credit, credit from friends /Relatives, cooperative credit and farmers education were both positively related to output but are not significant.

The signs of their coefficients conformed to expectations.
Family labour, seedlings, credit from businessmen/money lenders and extension contacts are all negative. It implies that increase in these inputs will tend to result in decrease in output.

In the analysis involving the use of semi-log equation, there is observed improvement in the significance of fertilizer application and credit from friends /relatives from 1% to 5% level of significance. Farm size, hired labour, family labour, farming technology seedlings, comm./agric bank credit, ADP/Gov't Agency credit, credit from businessmen / money lenders and farmers education, are all positive and related to output but insignificant. The signs of their coefficients conformed to expectation. Only farmer's

extension contact is negative and non-significant. The implication here is that increased farmers extension contacts tend to decrease output instead.

In the double log analysis, the number of input variable observed as having impact on output increased.

The variables having the greater impact on output are; fertilizer application, ADP/Gov't agency credit and then credit from friends /relatives. The level of significance varies between 1% and 5% levels respectively. Farm size, Hired labour, farming technology, fertilizer application, seedlings, comm./agric bank credit, ADP/Gov't agency credit from friends/relatives, cooperative credit and farmers education maintain their positive relationship with output. The coefficients of the double-log equation are the elasticity of the variables also. Just like in the linear, semi-log and the double log equations; fertilizer applications maintain a consistent significance to output. While hired labour found significance in the linear equation but not in the semi log and double – log equation. Mean while, whereas credit from friend /relatives was relevant in the semi log, but was not in the linear and the double log equations. It is further observed that the double log had most of its coefficients. Significant and indicated greater influence on the dependent variable. With the exception of farming

technology, Comm./agric bank credit, cooperative credit and then farmers' education.

With this analysis a conclusion can be made to the effect that the double log is a better explanatory tool in this study than those of linear and semi–log. Hence it is the lead equation for use in the prediction of this impact analysis.

TABLE 4.6.1: LINEAR, SEMI – LOG AND DOUBLE-LOG PRODUCTION REGRESSION COEFFICIENT NALYSIS

FUCTIONAL DESCRIPTION FORM	CONSTANT	Farm size	Hired labour	Family Labour	Farming Techngy	Fertilizer App	Seedling	Comm/agric Bank credit	ADP/ Gov't Agency Credit	Credit from friend/relative	Coop Credit	Credit businessmen/ Money Lenders	Extension contact	Farmers educ	N	F	D.W
(a) LINEAR	5199	295(1.45)	0.172(3.76*)	-27-(0.11)	0.0299(0.96)	2.99(2.72*)	-34.5(-0.65)	0.0001(0.01)	0.831(1.42)	0.0043(0.06)	0.0571(0.61)	-0.215(-0.87)	-92(-0.45)	1104(1.69)	108	8.11*	2.06*
(b) SEMI-LOG	.72034	5365(1.42)	3024)1.84*)	3083(0.78)	3224(1.53)	7058(2.35*)	7078(0.70)	1306(0.57)	1282(1.29)	2327(2.10*)	3675(1.30)	1786(0.88)	-1971(-0.02)	98(0.64)	108	6.84*	1.94
DOUBLE LOG	1.11	0.236 t=(1.99*)	0.0968 t=(1.93*)	-0.023 t=(-0.20)	0.0720t=(1.08)	0.273t=(2.84**)	0.0970t=(1.89*)	0.0106t=(0.17)	0.128t=(2.29**)	0.148t=(3.02**)	0.0078t=(0.18)	-0.102t=(-1.50)	-0.0153t=-0.20	0.318t=(1.52)	108	0.1088	2.14

*Significant at 1% level.

**=Significant at 5% level.

Note: t- value in parenthesis ().

The regression coefficients are presented in table 4.6.1. All the land variable coefficients for all the equations showed a positively strong relationship with output. But only the land coefficient under the double log is significant. The double log coefficient value for land is 0.236 and proved most significant at 1% level of significance.

The rest of the variables exhibited varying effects on the level of Output at varying significance. For example, the linear equation has 9 of its independent variables positive out of which two are significant. Those variables positive are farm size, Hired labour, farming technology, fertilizer application, credit from commercial /Agric Banks, credit from ADP/ Gov't Agency, credit from friends /Relatives, cooperative credit and intension contacts.

Their coefficients values are 295, 0.172, 0.0299, 2.99, 0.0001, 0.831, 0.0043, 0.0571 and 1104 respectively with output as the dependent variable. With these coefficients, the variables seem to increase output with every increase in their use. They all have positive relationship to output. Despite that all of these variables have positive coefficients; only two of the variables shows significant impact on output. These are hired labour and fertilizer application. Also, 4 of the linear equation variables show negative coefficients. These are the coefficient for family labour, seedlings, credit from businessmen /moneylenders as well as that of farmers education. The values of their coefficients are –27, -34.5, -

0.215and –92.thus, displaying negative relationship to output. The implication is that output decreases with every increased use of these inputs. In this situation, and from this equation output increases more with the use of land, Hired labour, farming technology, fertilizer, credit from comm./Agric Bank, ADP/ Gov't, Agency credit, credit from friends/ Relatives, cooperative credit as well as farmers extension contacts. And that output decreases with increase use of family labour, seedlings, credit from Businessmen/money lenders as well as farmers education attainment which are not only having negative signs but are also not significant.

When the linear coefficient result is compared with that of the semi-log, the semi log coefficient result are much bigger for all the independent variables (i.e. 5365 for land, 3024 for Hired labour, 3083 for family labour, 3224 for farming technology, 7058 for fertilizer application, 7078 for seedlings, 1306 for commercial/Agric Bank credit, 1282 for ADP/Gov't Agency credit, 2327 for credit from friends/Relatives, 3675 for cooperative credit, 1786 for credit form Businessmen /money lenders and then 98 for extension contact where as farmers education is -1971 and is negative. In this situation and in this equation, output seem to increase with the use of land, Hired labour, family labour seedlings, comm./Agric Bank credit, ADP/Gov't Agency credit, credit from friends/Relatives, cooperative credit, credit from Businessmen /money lenders and extension contact. Here, it is only from

fertilizer application and credits from Friends/Relatives that are significant. Also only farmers' education had negative coefficient and thus imply that farmers' education reduce output with every increase in its use.

The regression coefficient for the double log model all posses the expected signs with the exception of three of the variables these are family labour, credit from businessmen/money lenders and that of farmers education. These variables all have negative signs and imply that output decreases with every increased use of these inputs. Where as, land, hired labour, farming technology, fertilizer application, seedlings, credit commercial /agric banks, ADP /Gov't Agency credit, credit from friends /relatives, cooperative credit, credit from businessmen /money lenders and then extension contact are all having positive signs and as such are positively related to output. Five of these variables, representing hired labour, fertilizer, seedlings, ADP/Gov't agency credit, credit from friends/Relatives are all-significant either at 1% or 5% level of significance.

In the double log equation, the coefficients are elasticity measurement of the outputs response to inputs. Thus they show how output will respond to say 100% change in inputs. For example, the coefficient values for farm size, hired labour, family labour, family labour, farming technology, fertilizer, seedlings, credit from comm./ agric

bank, ADP/Gov't agency credit from friends/relatives, cooperative credit, farmers education and extension contacts are 0.236, 0.0908, -0.023, 0.0720, 0.273, 0.0970, 0.0106, 0.128, 0.148, 0.0078, -0.102, -0.0153 and 0.315 respectively. Such that a 100% change in these inputs, will imply that output will increase by 23.6%, 90.8%, -23%, 72.0%, 27.3%, 97.0%, 10.6%, 12.8%, 14.8%, 7.8%, -10.2%, -15.3% and 31.5% respectively.

4.6 THE LEAD EQUATION

Of all the models in table 4.6.1. (Or schedule 'a-c') of the same table, 'd' was chosen based on statistical measures of performance such as the F – statistic, R^2 (coefficient of determination). Significance of individual coefficient and the appropriation of most of the signs in the regression coefficient. The Double-log was chosen because it has more of its coefficient positive and 3 of its positive coefficients are significant at both 5% and 1% level of significance. Te equation is given as: -

$$\underset{}{\text{Log Y}} = \underset{(2,58^*)}{1.1136}\ \underset{}{\log X_1} + \underset{(1.99)}{0.0968}\ \underset{}{\log X_2} - \underset{(1.93)}{0.023}\ \underset{}{\log X_3} + \underset{(-0.20)}{0.0720}\ \underset{}{\log X_4} + \underset{(1.08)}{}$$

$$\underset{(2.84^*)}{0.273}\log X_5 + \underset{(1.89)}{0.00970}\ \log X_6 + \underset{(0.17)}{0.0101}\log X_7 + \underset{(2.29^*)}{0.128}\log X_8 + \underset{(3.02^*)}{0.148}\log X_9 +$$

$$\underset{(0.18)}{0.0078}\log X_{10} - \underset{(1.50)}{0.102}\log X_{11} - \underset{(-0.20)}{0.0153}\ \log X_{12} + \underset{(1.52)}{0.315}\log X_{13}$$

S = 0.2610
R^2 = 57.2
R = Squared (ad j) = 51.8
F = 10.5 (2.50)
D = W = 2.13737

The result above does show that some of the independent variables had coefficient that are positive and significant while some have their coefficients negative and in significant. Thus, those variables with coefficient positive are more in number (10), while those with negative are few (3). This goes to show that the input variables can be important in explaining productivity in the area.

4.7.2 INTERPRETATION OF THE LEAD EQUATION

The lead equation regression coefficients are presented in table 4.7.1 the choice of the double log equation as the lead equation follow the result obtained and analysed able 4.6.1. The outcome of the analysis concludes that the double log is a better predictive tool to the linear and semi-log technique; hence it was chosen as the lead equation and adopted for use in the interpretation of the impact of the specified inputs on the dependent variable.

In the double log regression result, there is a marked improvement on the result over the linear and semi-log results. The variables significant increase from 2 in the linear model to 3 in the semi-log model. These variables are fertilizer application (1% level of significance) Gov't Agency credit (1% level of significance), and then credit from friends/relatives (5% level of significance) also, the number of input variables positive but not significant increased as against the linear and semi-log results. Only credit from businessmen/money lenders is negative and insignificant. Thus, the implication is that this form of credit reduces output by every increase in its use. This may be associated with the high cost of its acquisition and possibly the magnitude made available to the farmers. The rest of the input variables are positively related to output signifying their influence on output. The lead equation regression coefficients are a measure of the elasticity of production to the resource

used. For example, the regression coefficient for the resource used are 0.236, 0.0968, -0.023, 0.0720, 0.273, 0.097, 0.0106, 0.128, 0.148, 0.0078, -0.102, -0.015, and 0.315 respectively. This therefore means that 100%, increased in these inputs will increase output by 23.6%, 96.8%, -2.3%, 27.3, 9.7%, 10.6%, 12.8%, 14.8%, 0.78%, -10.2%, -1.5%, and 31.5% respectively. The coefficient of determination for the double log is also the highest at 57.2%. Thus, 57.2%of variation in output is as a result of the specified input variables, while the rest of the variation is explained by non-economic variables outside the model specified. F-ratio and Durbin Watson value stands at 10.5 and 2.13737 respectively. The F-value tabulated is 2.50 therefore F-calculated is 10.5; this implies that specified resource inputs are significant in the determination of output. This is further indicated by the efficiency parameter of the double log equation, which is 1.11. This efficiency parameter is positive and significance at 5%level.

4.8 STEP-WISE REGRESSION ANALYSIS

The relationship between the dependent and the independent variable defined in equation 4.3 has been further subjected to a screening process by the way of step – wise regression so as to reveal further the most important independent variable (s) contributing to agricultural output in the study area. Thus, variables $X_1 - X_{13}$ have passed through a

screening process to produce the results in tables 4. 8.1, 4.8.2 and 4.8.3 as below: -

Tables: 4.8.1: Result of step wise multiple regression analysis of factors affecting agricultural output in the study area (equation 1)

Variables		**Coefficient**	**T-Value**
Credit from cooperatives		0.120	0.909
Credit from businessmen/money lenders		0.10	0.127
Farmers education		0.29	0.356
Extension contact		0.103	1.259
Hired labour		0.387**	4.866**
Family labour		0.103	1.245
Farming technology		0.255**	3.110**
Fertilizer applied		0.282**	3.502**
Seedlings		0.057	0.699
Agric Bank Credit		0.177*	2.207*
ADP/Gov't Agency Credit		0.256**	3.211**
Credit from friends/Relatives		0.176	1.125
R2	=	0.304	
R	=	0.297	
D - W	=	2.197*	
F - Value	=	46.267**	

**Significant at 5%
*Significant at 1%

Table 4.8.2: Result of step-wise multiple regression analysis of factors affecting agricultural output in the study area (equation 2).

Variables		**Coefficient**	**T-Value**
Credit from cooperatives		0.044	0.361
Credit from businessmen/money lenders		0.58	-0.768
Farmers education		0.12	-0.161
Extension contact		0.025	0.332
Hired labour		0.038	0.497
Family labour		0.134	1.618
Farming technology		0.250**	3.383
Fertilizer applied		0.072	0.972
Seedlings		0.102	1.350
Credit from Agric Bank		0.181*	2.386
Credit from ADP/Gov't Agency		0.089	0.623
R2	=	0.432	

R	=	0.421
D - W	=	2.193*
F - Value	=	39.936**

**Significant at 5%
*Significant at 1%

Table 4.8.3: Result of step wise multiple regression analysis of factors affecting agricultural output in the study area (equation 3).

Variables	**Coefficient**	**T-Value**
Credit from cooperatives	0.015	0.125
Credit from businessmen/money lenders	0.043	-0.601
Farmers education	0.035	-0.492
Extension contact	0.026	0.100
Hired labour	0.007	0.353
Family labour	0.132	1.881
Fertilizer Applied	0.043	1.854
Credit from Agric Bank	0.125	0.574
Credit from ADP/Gov't Agency	0.090	1.643
R2 =	0.488	
R =	0.474	
D - W =	2.193*	
F - Value =	33.08**	

**Significant at 5%
*Significant at 1%

The result in tables' 4.8.1, 4.8.2, and 4.8.3, indicate variables influencing out put in the study area. Tables 4.8.1which (summarizes equation 1) has hired labour, farming technology, fertilizer applied, credit from comm./agric banks, and then ADP/Gov't Agency credit as significant. Thus impacting greater influence on output as the dependent variable. Where as credit from cooperatives, credit from business men/money lenders, farmers education, extension contact, seedlings, credit from friends/relatives, are all positive but non significant. Hired labour,

farming technology, fertilizer applied, and ADP/Gov't agency credit influences output most.

The coefficient of multiple determination (R^2) for tables 4.8.1 has a value of 0.304 implying that 30.4% of the variation in output is due to the specified independent variables where as, the rest of the variation are as a result of variables not specified in the model. This percentage is too low for a good fit. This result may be due to inadequacy of data or multi-co linearity in the specified data. The Durbin Watson value is 2.193 while the f-value stands at 39.94 and are both significant at 1% and 5% respectively.

In tables 4.8.2 farming technology and credit from comm./ Agricultural bank are significant; with farming technology having the most influence on output. Other variables positive but not significant include credit from cooperatives, credit from businessmen/moneylenders, farmers education, extension contact, hired labour, family labour, fertilizer applied, credit from agric/comm Bank and credit from ADP/Gov't Agency. The value of the coefficient of determination (R^2) for this table is 0.432 implying that 43.2% of the variation in the value of output is explained by the specified variables while the rest is explained by variables outside the model. This is not a good fit as the result does not explain up to 50% of the variation. This may be due to multicollinearity or data inadequacy or certain variables not included but are significant in

explaining output. The Durbin Watson figure and the F- value stand at 2.193 and 39.94. Respectively both Durbin Watson and F- test are significant at 1% and 5% respectively. Variable negative and non-significant are farmers education, and credit from businessmen/ moneylenders.

Finally table 4.8.3 indicates that the variable specified as independent variables are having positive and negative signs. Variables with positive signs are credit from cooperatives, extension contact, hired labour, family labour, fertilizer-applied, credit from comm./agric banks and then credit from ADP/Gov't Agency. All variables positive in table 4.8.3, are also non significant. The variables negative are credit from businessmen /moneylenders and farmers extension contacts. These are both insignificant. The R^2 of this table is 0.488. Implying that 48.8 or 49%of variation is due to the specified variables. While the rest of the variation is due to variables outside the model. This is a better Fit as it approximately explain 50%of the variation.

4.8.4 STEP-WISE ESTIMATE ANALYSIS

The result of table 4.8.1, 4.8.2 is summarized here as equations 4.8.4 and 4.8.5 as a linear relation form of all the variables significant as

derive from the step wise screening process. The result for equation 4.8.4 is given as:-

$$Y = 724.45 + 0.387X_2 + 0.255X_4 + 0.282X_5 + 0.177X_7 + 0.256X_8 \ldots\ldots\ldots\ldots\ldots 4.8.4$$
$$\quad (6.802^{**}) \quad (4.868^{**}) \quad (3.11^{**}) \quad (3.502^{**}) \quad (2.207^{**}) \quad (3.211^{**})$$

While the equation 4.8.5 is given as: -

$$Y = 0.042 + 0.250X_4 + 0.181X_7 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.8.5$$
$$\quad (4.868)^{*} \quad (3.383)^{*} \quad (2.386)^{*}$$

A close view of the above results Show that equation 4.8.4 has more of its coefficients significant than equation 4.8.5. The variables significant are hired labour, farming technology, fertilizer application, comm/Agric Bank credit and then ADP/Gov't Agency credit. Equation 4.8.4 has all of these variables positive and significant. Where as, equation 4.8.5 has only farming technology and comm/Agric Bank credit positive and significant at 5% level of significance.

THE DETERMINANT OF OUTPUT IN THE STUDY LOCATION

Table 4.8.1 or equation 1 is the lead stepwise result and shows the most influential determinant of output from the stepwise screening process. Thus the lead equation (double log regression) result in panel 'd' of table 4.6.1 or 4.6(d) has been screened to give equations 4.8.4and 4.8.5 which specify that the following: hired labour, farming technology, fertilizer applied, comm/agric bank credit had the most influence on output. The implication here assumes land as given, while hired labour,

farming technology, fertilizer application and institutional credit source are a necessity. These are the determinant of output in the study area.

FINDINGS OF DESCRPTIVE ANALYSIS

SEX DISTRIBUTION:

1. Male farmers dominate agricultural practices in the study area. The study shows that a greater majority of the men are adult and are experience in their task of farming. Credit to this type of farmers is backed by reliability of repayment and consistency to the farm activity to meet set target.
2. The labour utilization in the area is majorly carried out by tractors and partly with use of hired labour and family labour. Thus, this provides avenue for increased input cost and the need for additional funding to cater for these costs.
3. The findings on land acquisition indicate that most farmland is inherited while few are outright purchase from those that owned land. The study reveals that inherited land constitute 50.9% percent while outright purchased land constitutes 37.0 percent. These provide a readily available ownership title as collateral for loans.
4. Farmers gross output in kilogram bags ranges between 41 and 49 bags. This indicates the size of average output per farmer and

further confirms that farmers involved are small producer. Thus, there is need for expansion and increased resource input to meet such increases.

5. **CREDIT AVAILABLE TO FARMERS ACCORDING TO SOURCES;**

There is a clear indication that commercial /agric bank loans average between ₦1, 000- ₦4000.whereas, Gov't agency /ADP loans range stand highest at between ₦25, 000- ₦40, 000. Business /moneylenders give as loan an average of between ₦2, 500- ₦20,000. While cooperative lending average ₦20, 000- ₦ 50,000. The implication here is that much funds are made available by Gov't / ADP lending institutions. Funding from cooperatives closely follows this. Commercial /agric banks loans are comparatively small. So also are loans from businessmen /moneylenders and those from friends and relatives.

While Gov't agency /ADP loans are large, its contribution to output was also significant under the double log model. Cooperative credits contribute minimally to output throughout the analysis. But maintains a positive relationship to output. Other credit forms indicate varied effect on output. However, institutional credit is large enough for a meaningful impact. But other credit sources are lower and as such have less impact on output of the recipient farmers.

6. PRODUCTION FUNCTIONS FINDINGS

The production function analysis had not depicted clearly the impact of credit on resource use, but can be said to be a reflection of the samples analysed and the farms involved. Thus, the following findings from the production function are important.

1. Out of the three functional forms analysed, The double log function posit a good fit this can be seen from the number of coefficients significant and its coefficient of multiple determination which stands out as the highest of the three models specified. The value of this coefficient of determination (R^2) is 57.2%.
2. In all the equations land remain positive and land value assume significance under the double log form of the regression. Other variables indicated different effects and significance against output.
3. The stepwise result revealed the influence of hired Labour, farming technology, fertilizer application, comm./ agric bank credit and then ADP/Gov't Agency credit in the determination of output in the area. These resources are defined as significant for output increases in the study area.

GENERAL OBSERVATION

Credit made via institutional sources has the greater tendency to contributing to resource input of target farmers. This, if done on an annual basis and at a time most appropriate, is likely to meet the resource inputs needs (given its proper utilization by the target farmers) of target farmers. This credit can be easily repaid when recipients use such credit for such food and cash crop farming. Such cash crops and food crops as groundnut, cotton, guinea corn and maize are largely produced in the area. This can be sold to repay loan collected. The reason is that these crops command good market price and consumption demand in the area.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

This thesis assess the influence of capital investment and resource used in food crop production and analysed how it affect small scale food producers in the ADP zones of Bauchi State with special reference to the credit acquisition and deployment to these category of food producers. Other specific objectives of the study are to examine success of credit and resource use at farm level of farmers, to evaluate food production and the socio-economic characteristics of the sampled farmers.

Evidences from sampled classified data reveal that much capital investment took place and credit institutions in the studied zone were involved in making credit available. Credit contributed significantly to productivity through resource deployment and the adoption of modern farming techniques as against the crude and labour intensive farming system. In line with the second objective; credit institutions (both formal and informal) released adequate funds for farming purposes. This reduced the productive resource inadequacy of the smallholder farmers and encouraged massive productivity as exemplified in table 3.7.5 of the study. Furthermore, it was revealed from the data in chapter 3 that resource inadequacy used to be a deterrent to productivity. This was verified and confirmed in Chapter 4 using different econometric testing

tools

The study further reveals that farmer's extension contacts were irrelevant in food production in the study area because farmers were experienced already or had attained suitable level of education. More so, that credit diversion were pronounced in Agricultural food production and as such required proper monitoring and supervision by the Credit Issuing Institutions to ensure strict compliance to usage and deployment.

5.2 CONCLUSION

The results of this study have shown that input resources contributed significantly to output in the study area. The result however show that hired labour, farming technology, fertilizer, credit from institution (commercial banks/agric banks and ADP/Gov't Agencies) contributed most to output increases in the study area.

The findings in this work placed hired labours' contributions fore most. This is followed by farming technology, fertilizer and then institutional credit in that order. Thus, these inputs precede the rest of the other inputs in their significance and contribution to output in the study location. In other words, those variables such as seedlings, land, family labour, credit from friends/relatives, credit from cooperatives, credit from business/money lenders, Farmers' education and extension contacts etc did not contribute positively to output in the study area either because of the impact of other confounding variables in relations to output which

ended in creating this a – theoretical situation or because the amount of other variables were not significant enough to cause an increase in out put.

Also, it would be said that productivity in the agricultural zone of Bauchi State had confirmed the null hypothesis. Thus, the different forms of the regression result had shown that productivity increase is prevalent as can be seen in the linear, semi-log, and double-log regression results. This is further supported by the stepwise lead equation results that had all of its coefficients positive. (Following the testing of the hypothesis at 5% or 1% level of significance, using F-test and the coefficient of multiple determinations (R^2), which shows that the output was influenced by varied factors). Besides, the step-wise process had further screens out the less important of the specified variables leaving the important variable influencing productivity in the zone. This shows remarkable impact of the 5 variables obtained by screening thirteen of them. Both F-test and the R^2, are significant. R^2 of the stepwise lead equation stand at 0.304 implying that for any 10% increase in the independent variables, the output will increase by 30.4%. The F-value is 46.3%.

Secondly, the study reveals that the farmers were fully involved in the use of available productive factors. This has been verified and screened by the step-wise regression. The result of the double-log and

the step-wise revealed that there exists resources use efficiency in the study area. This therefore implies that productivity increase can be achieved through increased input utilization.

Finally, the study reveals that capital utilization and disbursement for proper farming activity will ginger farmers to work hard and increase farm income and sustenance for the community.

5.3 RECOMMENDATION

From the findings in this study, the following recommendations are proffered so as to ensure sustainable agricultural production in the ADP zones of Bauchi State.

1. Since farmland are either inherited or hired, the contribution of land as well as those variables (that are) insignificant in the study can be improved by making them accessible to smallholder farmers at a cheaper price. These other inputs should be readily made accessible to farmers in large quantities and at cheaper rate. This should include access to land, seeds, non-institutional credit, education, extension contacts etc. The availability of these inputs will motivate food production and food supply in future.
2. Institutional credits contributions should be encouraged and maintained by way of increased funding of farmers activities, with less interest charged and proper monitoring and

supervision of loans this is a ‘sine qua non’ in avoiding loan diversion and checking activities of these farmers.

3. Cooperative credit and cooperative activities should be encouraged and strengthened by government as a way of reaching the farmers. Funds for Agricultural purposes should be channel through the cooperative so as to reach the target farmers in good time and in sizeable proportion to aid farming activities.
4. Farmers Education and extension services should be vigorously pursued at all levels and throughout the farming season to keep the farmers abreast with changing farming techniques and modern farming facilities and inputs.
5. Funding for food production should be enlarged and the magnitude made sufficiently available. Thus, institutions involved in agricultural financing should be encouraged to commit larger sums for this purpose; this will facilitate input purchasing, increase capital investment, adoption, and improved technical inputs into production.
6. There is need for selective input purchasing especially of the high yielding type. Improved variety should be acquired so as to encourage massive propagation and production as a strategy to enlarge and increase bumper food production and harvest.

7. The technical input and capital investment should be selective and properly monitored, supervised and controlled for effective utilization so as to ensure returns on capital invested.
8. Extension contact and farmers education should be based on needs should be based on the farm training during farm cultivation and harvesting and advice on technical inputs in the farming system should be given and improved upon. This will ensure proper weed control, chemical usage, seed choice, and proper use of pesticide, herbicides and general farm management.
9. There is need to evaluate the cultural and cross cultural factors running contrary to farm management practices so as to educate, enlightened as well as in calculate in these farmers the right farm practice and skills for achieving enhanced productivity.
10. Finally, credit for agricultural financing should be strengthened so as to achieve timely and rapidly sustained financing for food production purposes. This will enable farmers to purchase, use, employ and timely adopt the right technology, seeds and other inputs for use.
11. Chemical fertilizer should be readily available and should be in surplus supply at a lower market price for both the small farmer

and the medium scale farmer to purchase and use in both ‘off’ and ‘on ’ season farming.

12. The stake holders at ADP and community level should be properly organized, and sensitized on credit sourcing, development and repayment process for the small and medium scale food producers and the credit risk involved in the misuse and misappropriation of agricultural credit funds.

13. Bank ceilings on credit for agricultural purposes should be lifted and credit provided for small and medium scale food producers should be based only on requirements or needs of the will be beneficiaries after due assessment of the farmers need.

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