EFFECTS OF MICROCREDIT ON AGRICULTURAL PRODUCTION AMONG SMALL SCALE FARMERS IN MAKARFI LOCAL GOVERNMENT AREA OF KADUNA STATE

BY

MRS. F. I. JUMARE B.Sc. (ABU 1984), M.Sc. (ABU 1989)

Reg. No. M.Sc./Sci/47762/2005-2006

A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN RURAL DEVELOPMENT

DEPARTMENT OF GEOGRAPHY, FACULTY OF SCIENCE, AHMADU BELLO UNIVERSITY, SAMARU, ZARIA

OCTOBER, 2006

DECLARATION

I hereby declare that this work was carried out and written by me. It has not been presented in any previous application for a higher degree. All sources of information are duly acknowledged by means of references.

…… …….

F. I. Jumare (Mrs.) Date

CERTIFICATION

This thesis titled “Effects of Microcredit on Agricultural Production Among Small Scale Farmers in Makarfi Local Government Area of Kaduna State” by F. I. Jumare (Mrs.) meets the regulations governing the award of the degree of Master of Science (Rural Development) of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge.

…….. ……..

Prof. J. A. Ariyo Date

Chairman, Supervisory Committee

…….. ……..

Dr. J. A. Ukoje Date

Member, Supervisory Committee

…….. ……..

Dr E. O. Iguisi Date

Head of Department

…….. ……..

External Examiner Date

…….. ……..

Prof. J. U. Umoh Date

Dean, Postgraduate School

DEDICATION

To Almighty Allah, without whose will nothing would have been possible, to my late husband who always encouraged me to seek more knowledge, to my children for their unconditional love, and for year 2005 the "International Year of Microcredit".

ACKNOWLEDGEMENT

My profound gratitude goes to my supervisor, Professor J. A. Ariyo, for his encouragement, patience, helpfulness and guidance throughout the course of this thesis. I will indeed remain forever indebted to him for never giving up on me, and making time even when he was too busy, to guide me every step of the way.

My special thanks also go to Mr B. A. Sawa and Mr O. F. Ati, both of the Department of Geography. While Mr Sawa helped with materials and advice, Mr Ati assisted with statistical analysis of my data. Their constructive criticism went a long way in helping towards a successful research work.

I am grateful to the farmers who constituted the study population because without them the research would not have been possible; and to Mallam Salisu, the Cooperative Officer of Makarfi Local Government Area, who greatly helped with the administration and retrieval of the questionnaires.

I also wish to acknowledge the immense contributions of my colleagues at the Development Finance Office, Central Bank of Nigeria, Kaduna, especially Alhaji S. O. Abdulsalami and Abdulrahman Hassan-Tom, who encouraged me. I must however single out Abdulrahman Hassan-Tom, who left no stone unturned to ensure that I got all the materials I needed to aid my work.

Finally, I am grateful to my family and friends, for their patience during the period.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Lack of capital has been identified as one of the constraints faced by small scale farmers. The aim of the project was to assess the impact of credit on agricultural production with specific objectives to determine its effect on farm size, cost of labour, cost of production, quantity of inputs as well as output among small scale farmers in Makarfi Local Government Area of Kaduna State, and also to determine any significant difference, if any between borrowers and non-borrowers. Structured questionnaires were administered to borrowers and non-borrowers, who had been selected using the stratified random sampling technique, and the data obtained were summarized into percentages. The Analysis of Means technique was used to determine if there were statistically significant differences between the two groups. The Cobb-Douglas Production Function Analysis was also used to test the relationship between key independent variables such as loan amount, farm size, inputs and farm output as the dependent variable. Results showed a significant difference between borrowers and non-borrowers in farm size, quantity of inputs used (except labour), cost of production, farm output, and income over the five year period (1999 – 2003). The independent variables; loan amount, farm size, and inputs reasonably explained the variation in the total value of output of the farmers. The study shows therefore, that access to microcredit over a long period of time impacts positively on agricultural production. Government and the organised private sector should regular and timely credit to farmers.

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND TO THE PROBLEM

In Nigeria today most of the population lives in the rural areas, majority of whom are engaged in agriculture, the mainstay of the rural economy. This percentage consists mainly of poor, deprived, illiterate people whose income level is generally very low. The United Nations Development Programme (UNDP) views the empowerment of the poor as a key strategic approach to the abolition of poverty. It is worth noting that one third of the world's poor live in rural areas and depends primarily on agriculture. According to the International Fund for Agricultural Development (IFAD), Official Development Aid (ODA) to this sector has been steadily declining since 1988 and today, only 8 percent of this aid goes to rural development. The Food and Agricultural Organisation, FAO (2000), states that rural people need credit to allow investment in their farms and small businesses. This is because lack of credit has plagued poor farmers and rural dwellers for many years. Towards this end the United Nations Organisation (UNO) advocates the granting of micro-credit, particularly to the rural poor. And to emphasise the importance of micro-credit to the rural populace, in 2000 it declared 2005 "International Year for Microcredit".

According to Mora (1994) the rural economy in Nigeria is characterised by a vicious cycle of low productivity, low income, low savings and low investments. He further stated that this vicious cycle in the rural areas has been identified as one of the major factors impeding rapid economic development. The importance of credit in rural development can, therefore,

not be overemphasised as a farmer who wants to improve his economic condition needs money for investment. Adetunji (1999) has also described access to credit by over 45 percent of the population living below the poverty line as a veritable tool for rural empowerment and poverty alleviation. Credit will help the cause of sustainable development of low income people in a country like Nigeria where a large proportion of the population depends largely on primary production (Aiyedun, 1996). As Poyi (2005) puts it, the agricultural sector is the largest single contributor to the GDP. But according to Tarauni (1996), agricultural production is declining, because in 1964 the contribution of agriculture to the GDP was 64 percent. Poyi (2005) stated further that since over 70 percent of the populace is engaged in this sector in one way or the other, it needs financial intermediation to further stimulate it's growth and development. Ijere (1998) had implied the same thing by saying that credit can be considered from its ability to energise or motivate other factors of production, thus acting as a catalyst that activates the engine of growth, enabling it to mobilise its inherent potentials and to advance in the planned or expected direction.

Although sources of credit in rural areas cover the Banks and Financial Institutions, Credit Unions, Non-Governmental Organisations, Self-Help Groups and private lenders, the fortunes of small-scale entrepreneurs within rural settings have been constrained by (a) lack of/poor accessibility to credit from formal lending institutions, (b) exploitative lending conditions of local money lenders, (c) widespread poverty occasioning low purchasing power and (d) unfavourable macro-economic environment. Even the traditional credit delivery systems such as the "adashi" and the cooperative

societies have been hamstrung by limited funding and the inability to expand loan portfolios. This is despite the fact that various policy measures have been instituted by government to boost production capacities in agriculture and small-scale processing enterprises in the rural communities.

The federal government of Nigeria has since the 1970s embarked on substantial capital investment programmes in agriculture. These programmes include the Agricultural Development Projects (ADPs), Operation Feed the Nation (OFN) which was launched in 1976, the Green Revolution programme inaugurated in 1980, and subsequently the setting up of the Agricultural Credit Guarantee Scheme (ACGS) in 1978. The Nigerian Agricultural and Cooperative Bank (NACB) was created in 1973, and in 2000 became Nigerian Agricultural, Cooperative and Rural Development Bank, (NACRDB, after it was merged with Peoples' Bank), and the Nigerian Agricultural Insurance Company (NAIC) subsequently followed in 1993. In the late 1992 the National Agricultural Land Development Authority (NALDA) was also created, all in a bid to promote agricultural development.

Even International Agencies such as the United State Agency for International Development (USAID) have come in to contribute their own quota to agricultural development. Since 1999 this agency of the United States Government has provided substantial assistance to, among other things, stimulate agricultural production in Nigeria. During the year 2000, USAID negotiated an agreement with the federal government to implement an expansive agricultural programme. Already, according to USAID, farmer access to the agricultural technology targeted at the small holder producers

is improving. There are reports of the adoption of new technologies among the target population; such as farmers producing maize, millet, cassava, sorghum and cowpea. USAID believes that the continued adoption of these new technologies will help increase production which will positively impact on farmers' income.

However, despite these efforts at improving agricultural production, Ojo (1998) puts it aptly when he asked the question: Why has the agricultural sector performed so poorly despite these huge government investment programmes in it? The answer might lie in Ojo and Akanji's (1983) assertion that these credit schemes, which have been articulated by government as part of their contributions to agricultural development and the commercial banks' lending programmes, tend to sidetrack the small scale farmer. However according to Kyari (2000), this could be attributed to the complications of agricultural lending. He asserted that Nigerian banks have had to be coerced, forced, begged and encouraged to lend to agriculture. This, he said, is because agricultural finance offers less than the average return when compared with other investment opportunities.

There is thus the need to critically examine the role of credit in agricultural production with a view to highlighting areas of its strengths and weaknesses and making recommendations that will go a long way towards encouraging lending to the sector, since as we have observed, access to credit is critical to lifting small scale farmers above the subsistence level.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Agriculture plays a critical role in the country's economy. Since the oil boom of the mid 1970s, however, agricultural production in the country has suffered a setback, due in part to the lack of financial support for the small-scale farmer. Improvement of the economic condition of the farmer to be self-sufficient and self reliant in food production is therefore necessary by providing support to them, especially in the procurement of inputs (Edordu, 1981).

Successive governments have come up with numerous programmes to address the inability of agricultural output to keep pace with the country's demand for agricultural products. Credit institutions have over the years shied away from lending to the small-scale farmers who form the larger part of the farming population, citing reasons such as high default rates, difficulty in monitoring numerous individuals whose loans do not provide much return on investment, as well as not being cost effective. Here in Nigeria only a few empirical studies have been carried out to quantify the effects credit has in stimulating agricultural output and productivity in order to provide a sound basis for a micro credit advocacy as a strategy for rural development. These include studies by Idah (1986), Tarauni (1996) in Kano, and Aiyedun (1996) in Kwara state.

This study sets out to fill this important information gap, especially by comparing those who have access to micro-credit with those who do not in arears such as input use, agricultural output and income. It is hoped that using those who have no access to credit as a control group in the study will

show clearly whether credit makes or does not make a difference to agricultural output among small scale farmers.

1.3 RESEARCH QUESTIONS

The research problem can be reformulated into two broad research questions as follows:

1. Does credit to small-scale farmers impact on their farm size, ability to purchase inputs and their production level or output?
2. When compared with the non-borrowing farmers is there a marked difference in farm size, input use and production level?

1.4 STUDY AIM AND OBJECTIVES

The general aim of the study is to examine the effect of credit facilities on the production level of small-scale farmers in Makarfi L.G.A. of Kaduna State, with a view to making suggestions that would go towards the enhanced and sustained provision of credit to small scale farmers. Specifically, the study pursued the following objectives:-

1. To quantify the effect of credit on the farmers' farm size, input use and volume of output.
2. To compare borrowing and non-borrowing farmers with a view to determining differences , if any, in farm size, levels of input use and volume of output between the two groups.
3. To identify problems and constraints to small scale farmers in the study area with regards to access to credit.

1.5 HYPOTHESIS

The following hypotheses were drawn from the research questions of the study: -

1. Credit made available to the small-scale farmers has no impact on their farm size, use of inputs and output levels.
2. There is no difference in the farm size and levels of inputs used between farmers who benefit from credit and those who did not.
3. There is no difference between volume of output achieved between small scale farmers who benefited from credit facilities and those who did not.

1.6 JUSTIFICATION

In Nigeria the larger population is engaged in agricultural production, which has been bedevilled with financial problems over the past two decades. Government has made several efforts to address these problems; it has come up with numerous policies over the years as well as created financial institutions such as the Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) and guarantee schemes such as the Agricultural Credit Guarantee Scheme (ACGS) just to provide credit to farmers and guarantee their loans respectively. It is necessary to find out if lending to small scale farmers increases their productivity.

This study was carried out to examine if lending to small-scale farmers in Makarfi Local Government Area of Kaduna State increased input use and increased production levels of such farmers. It is hoped that recommendations from this and other credit impact studies would contribute towards policy changes by government where it would pinpoint and rectify

areas of weakness in its credit policies, which would subsequently lead to the uplifting of agriculture in the country.

Kaduna State, and specifically Makarfi Local Government Area was chosen for this study because of the following reasons:-

(i) The researcher works with an organisation that manages the Agricultural Credit Guarantee Scheme (ACGS). As such, she has been monitoring agricultural projects within Kaduna state for over ten years now and is familiar with the socio-cultural environment, especially in Makarfi area where a large number of the loans the organisation guarantees are located.

(ii) There are at least two lending institutions within the local government area, making access to credit easier for the local populace.

(iii) Financial cost is reduced for the researcher because of the proximity to and familiarity with the study area.

1.7 SCOPE OF THE STUDY

The study is limited to Makarfi Local Government Area. Here, apart from the fact that the populace is actively engaged in farming there are at least two financial institutions, the Makarfi Community Bank and Habib Nigeria Bank Limited.

1.8 DEFINITION OF TERMS

Microcredit: A small amount of money loaned by a bank or other institution to an individual which can often be without any collateral.

Inputs: Materials (fertilizer, tools, pesticides, herbicides, and seeds) used by respondents for their farming activities during one production year.

Output: Yield derived from respondents' farming activities in terms of number of bags (100kg) harvested or the total number of units harvested from a specific field (or simply the total production from a farm unit).

Income: revenue generated from the sale of the produce harvested from a respondent's farm unit.

Total cost of production: Cost of inputs as well as labour that go towards crop production in a farming season.

Borrowers: Farmers who have obtained loans from banks or other institutions, between 1999 and 2003 for their farming activities.

Non-borrowers: Farmers who have not obtained loans from any source for their farming activities between 1999 and 2003.

CHAPTER TWO
LITERATURE REVIEW

2.1 THE CONCEPT OF MICROCREDIT

Microcredit often gets mistaken for microfinance. Srinivas (1997) stated that the definition adopted at the Microcredit Summit in 1997 described microcredit as "programmes that extend small loans to very poor people for self employment projects that generate income, allowing them to care for themselves and their families. Yunus (2004) stated that people use the term microcredit to mean different types of credit such as agricultural or rural credit, cooperative consumer credit, credit from the savings and loans association or from moneylenders. He suggests a broad classification of credit to include both traditional informal microcredit as well as rural credit through specialised banks.

The Food and Agricultural Organisation in 2000 described microcredit as "small loans targeting the poor, and intended to help them escape poverty by investing in their own businesses or farms." It tries to overcome some of the problems of delivering rural credit to the poor by offering collateral-free loans at near market interest rates. In Nigeria microcredit has been described to mean small loan packages provided to the poor to enhance their capacity to engage in productive activities for the improvement of their livelihoods (Egwuatu, 2004).

2.2 THE ROLE OF CREDIT IN AGRICULTURAL AND RURAL DEVELOPMENT

The small farmer, especially in developing countries, is poor and does not have the capital to purchase inputs as well as expand his farm. As such, it is believed that his economic condition will improve only when his access to credit is ensured. There is no gainsaying then that credit plays a very important role in agricultural development. Also, microcredit programmes can play an extremely important role in development because they give small farmers and traders the possibility of increasing their earnings and improving their standard of living. With this realisation, government initiated the establishment of various agricultural credit institutions such as the Western Nigeria Agricultural Credit Cooperative founded in 1962, the Eastern Nigeria Fund for Agricultural and Industrial Development (1963) and the Mid-Western Nigerian Agricultural Credit Cooperative set up in 1964. Later on the Nigerian Agricultural and Cooperative Bank (NACB) and the Agricultural Credit Guarantee Scheme (ACGS) were established in the late 1970s.

Lack of credit has been seen by various researchers to be a major constraint to increasing agricultural production by the small scale farmer. As far back as the 1950s Galbraith (1952) saw the lack of credit and scarcity of savings as one of the major constraints limiting agricultural development in developing countries, stating further that at a certain stage in agricultural production credit becomes a force to reckon with because it eliminates one of the block on the farmers' path to improvement. While reviewing some studies conducted by the Food and Agricultural Organisation, Blase (1971) pointed out that all the studies emphasised that long and medium term

credits are essential to continued growth and development in agriculture and Brenner (1971) concurred by adding that credit plays an important role in the development of agricultural production and that the demand for credit grows as development progresses.

According to Idah (1996), credit plays an important function in the agricultural development process by

1. providing an incentive for the adoption of new technology which will increase production. Such technologies would otherwise be slowly adopted, or not at all.
2. forming an integral part of commercialising agriculture which can lead to an increase in rural savings
3. helping farmers become owners of land.
4. helping in acquiring capital items in form of better seeds and machinery among others.

More specifically, Mosher (1965) emphasised that where conditions already exist, well managed production credit can give agricultural development a strong boost by accelerating the rate of adoption of new technologies. He also stated that most methods of increasing farm productivity involve the use of purchased inputs. Subsistence farmers produce little cash income out of which inputs can be bought.

Ajakaiye (1986) highlighted some ways in which farmers can improve net farm income by the use of credit. These are:

1. Creating and maintaining adequate farm size, exhibiting decreasing costs as the size of the business increases and as they begin to enjoy

economies of scale, since the farmer can now acquire capital assets such as machinery and equipment. This is needed to expand the business and maintain a high volume of output through the purchase of operating inputs such as feeds, better seeds, fertilizers, pesticides, and the like.

2. Adjusting to changing economic conditions: New technological development or changing market conditions may require major adjustments. The change may require some capital out-lay which can be secured through credit.
3. Increasing efficiency: The use of credit may make it possible to substitute one resource for another. For example, machinery can be substituted for labour as a means of reducing cost and improving timeliness of operations.
4. Protection against adverse conditions: It is not easy to eliminate all risks in farming. However, credit can play a major role in protecting the business from financial failure or liquidation when adverse conditions occur.
5. Providing continuity: The transfer of an on-going business from one operator to another may involve large amounts of money. Without credit many operations would have to be liquidated during transfer process because non-farm heirs frequently want their share in cash rather than ownership interest in farm real estate or other assets.

2.3 CREDIT IMPACT STUDIES IN OTHER COUNTRIES

Many studies have been carried out on the impact of credit in different parts of the world. They have also, using different analytical tools, come up with results about the impact of credit on the adoption of modern technologies, income, input use as well as productivity.

In studying the effect of borrowing and the small farmer credit programme in Utterpradesh India, Baker and Baghava (1974) used the multiple period linear programming for analysis. Whitaker and Loidan (1973) also used the same model to analyse the impact of a credit programme in Colombia. They observed that lack of capital was a constraint to the adoption of new technology. Nassan (1975) also used the same type of model to analyse the effect of government policies on agricultural growth through the use of credit in Punjab, Pakistan. He concluded that with credit, farmers would shift to high value crops and to the use of improved technology. They also observed that credit had an impact on profit and technological change. White (1975) also observed that borrowing capacity had an impact on the adoption of technology made available to farmers. Mohan and Singh (1977) studying the impact of loans on small-scale farm income, used the regression coefficient to measure the impact of loan on productivity. Their findings revealed that credit was positively correlated with increased production.

With regards to savings, Stickley (1975) studying the effect of short-term loans at harvest time observed that provided the farms were large enough, credit was capable of increasing productivity, and the potential for savings also existed. In a study to analyse how self-help credit and saving groups can relieve maize farmers of the constraint of inadequate production credit in Kenya, Owuor *et al* (2001) used 37 groups and 90 farmers to study the groups' credit impact on input use and maize production. These farmers were found to have no access to formal credit, while more than 90 percent of them consider credit shortage the major constraint to improved input use. They discovered also that those that benefited from group loans used

significantly more fertilizer than non-borrowers. Group credit also had a positive and significant impact on the use of improved inputs such as improved maize seed and fertilizer, and that yields from borrowers were significantly higher than that of non-borrowers.

2.4 CREDIT IMPACT STUDIES IN NIGERIA

2.4.1 Impact of Credit on Input Use

Generally, most of the studies reviewed showed a positive relationship between credit and input use. Tarauni (1996) studying the impact of the NACRDB small-holder loans in Kura town of Kano State administered questionnaires on forty borrowers and forty non-borrowers to compare their production activities. He observed that beneficiaries had higher operating and fixed costs. Using regression analysis he was able to determine that credit made a significant impact on input use. Further analysis however showed that loan volumes given the borrowers were small in relation to their input use. With his analysis, he accepted the hypothesis that borrowers had higher operating costs. Also using descriptive statistics, correlation analysis and analysis of variance, Idah (1996) showed that the adoption of modern technologies such as the use of fertilizers, herbicides, insecticides and improved seeds were positively correlated to the use of the loan. The demand for a particular type of input by a borrower has also been established to depend partly or wholly on borrowed funds amongst other variables. Jongur (1993) showed that a reasonable percentage (68.2) of the variation in the net farm income was jointly explained by all the observed variables (value of credit, farm size, family labour input, cost of hired labour, cost of chemicals, cost of capital equipment, cost of seeds and managerial ability). His results further showed that farm size, family labour,

inputs and cost of capital equipment were important in explaining net farm income. But farm size had a negative and insignificant effect.

Aiyedun (1996) in his own study on the impact of Kwara Agricultural Development Project on farmers' income and productivity, from 1988 before the programme's implementation up to 1995, used such analytical tools as simple descriptive statistics, production function analysis, gross margin analysis and welfare measure analysis. He observed that whereas before implementation, herbicides had the lowest influence on crop output, after implementation, pesticides had the lowest influence. He observed further that the pattern of resource use showed the inputs to be mainly under-utilised and therefore suggested that the use of inputs needs to be increased in order to, in turn, increase crop output. He made this deduction from the results showing increasing returns to scale which meant that more inputs can continue to be added to production for the purpose of increasing crop output.

2.4.2 Impact of Credit on Productivity

As far back as the 1960s, Takes (1963), studying the impact of credit on agricultural production in Okigwe division of the then Eastern Region found that lack of credit impeded farmers expansion of land holdings as well as agricultural production in general. He observed that farmers that benefited from government loans made considerable gains, though the amount per farmer and the number that benefited was small. Jongur (1993) in a study to analyse the performance of agricultural cooperative societies which had access to credit and non-co-operators, in Gongola State made the following observations:

(i) Co-operators had significantly larger farm sizes.

(ii) Co-operators used more labour

(iii) Co-operators had significantly higher farm incomes than non-co-operators.

Findings on farmers' elasticities of production by Tarauni (1996) showed that the fertilizer variable was the only, and the most efficiently utilised resource among the sampled farmers in the study area. The labour and land resources were found to be under-utilised. Net farm income was found to be higher among the borrowers, implying greater profitability among the borrowers than non-borrowers. Ilebanmi (1983) in Ondo State concluded that (a) borrowers had larger farms and (b) borrowers had higher operating expenses and investment per hectare. In Kwara state, Mobayo (1987) studying the impact of credit on small farmers' income in Oyi Local Government Area used regression models to compare borrowers and non-borrowers and found that credit had a positive effect on farmers' income. Idah (1996) also observed farm income to be positively correlated to credit. Aiyedun's (1996) results showed that the farmers' gross and net farm income were greater after the implementation of the programme than before and the difference between the two groups was significant. His results further showed that labour had the most positive effect on crop output, both before and after implementation.

Other studies have however shown and highlighted that certain other factors influence input use and productivity apart from credit. Auchan (1986), analysing the impact of institutional agricultural credit on the farm size, output and adoption of new technology by farmers in Funtua Local Government Area of Katsina State observed that apart from being

influenced by credit, farm input is influenced by factors such as years of formal education, non-farm income, farm size, value of assets and the gross farm income in the preceding year. Fabiyi and Ositimehin (1984) studying the impact of credit on rice production in Oyo and Ondo States also observed that factors such as farm size, amount of credit and farming experience influence farmers' output. Idah (1996) also discovered in his own study, that respondents' socio-economic characteristics influenced their use of credit where he observed that the older borrowers honoured their loan obligations more than the younger ones, while the younger and more educated farmers adopted more modern inputs.

There is still the need for further research in Credit Impact Studies. According to International Fund for Agricultural Development (IFAD) in 2000, the primary aim of microcredit programmes is to alleviate poverty by increasing borrowers' earnings. In the process however there may be other impacts such as schooling and family planning decisions. As such IFAD states, it is difficult to determine the precise impact of microcredit because of the fungibility of loans. Tarauni (1996) had also earlier stated that one thing that is lacking in credit impact studies is research on farmers with the same type of resource base. He opined that if non-borrowers with higher resource base are sampled there would not be much difference in their input use and productivity, which could lead to inconclusive results.

This study is thus focussing on maize farmers with the same resource base, that is both borrowers and non borrowers. The choice of farmers with the same resource base was informed by need to get a clear picture of the actual effect of credit on the production output of the farmers. It is believed that in

assessing farmers with different resource base, output may not necessarily be affected by credit alone.

CHAPTER THREE
THE STUDY AREA AND METHODOLOGY

3.1 THE STUDY AREA

3.1.1. Location

The study area is Makarfi Local Government Area of Kaduna State. The state is bound by Niger, Katsina, Kano, Nassarawa, Bauchi, Zamfara and Plateau states as well as the Federal Capital Territory. Makarfi Local Government Area lies between latitude 7^0 25^1 E and longitude 11^0 0 N^1 and covers an area of about 7,627.2 square kilometres. It is located in the northern part of the state bordering Kano state and Katsina states. It is also bound by kudan, Ikara and Soba Local Government Areas.

3.1.2 The Physical Conditions

Makarfi LGA is located on a gently undulating plain that is part of the central Hausa plain of Nigeria. The vegetation is northern Guinea savanna that consists of expansive grassland interspersed with grown trees. The vegetation has been greatly modified by human activities, especially farming. Virtually every piece of land is cultivated. This area, just like other parts of the country has a distinct dry and wet season. However, here the rainy season starts fully from around May and lasts for about five months till around October. The only trees that abound are the economic fruit trees that have been left to stand on farmlands. During the rainy season the vegetation is lush green, but during the dry spell all vegetation except the trees die off. This is subsequently followed by a period of dry, dusty cold weather called the Harmattan. After that sets in a very hot period for about two to three months, until the commencement of the next rainy season.

The soil of the study area is loamy and fertile.

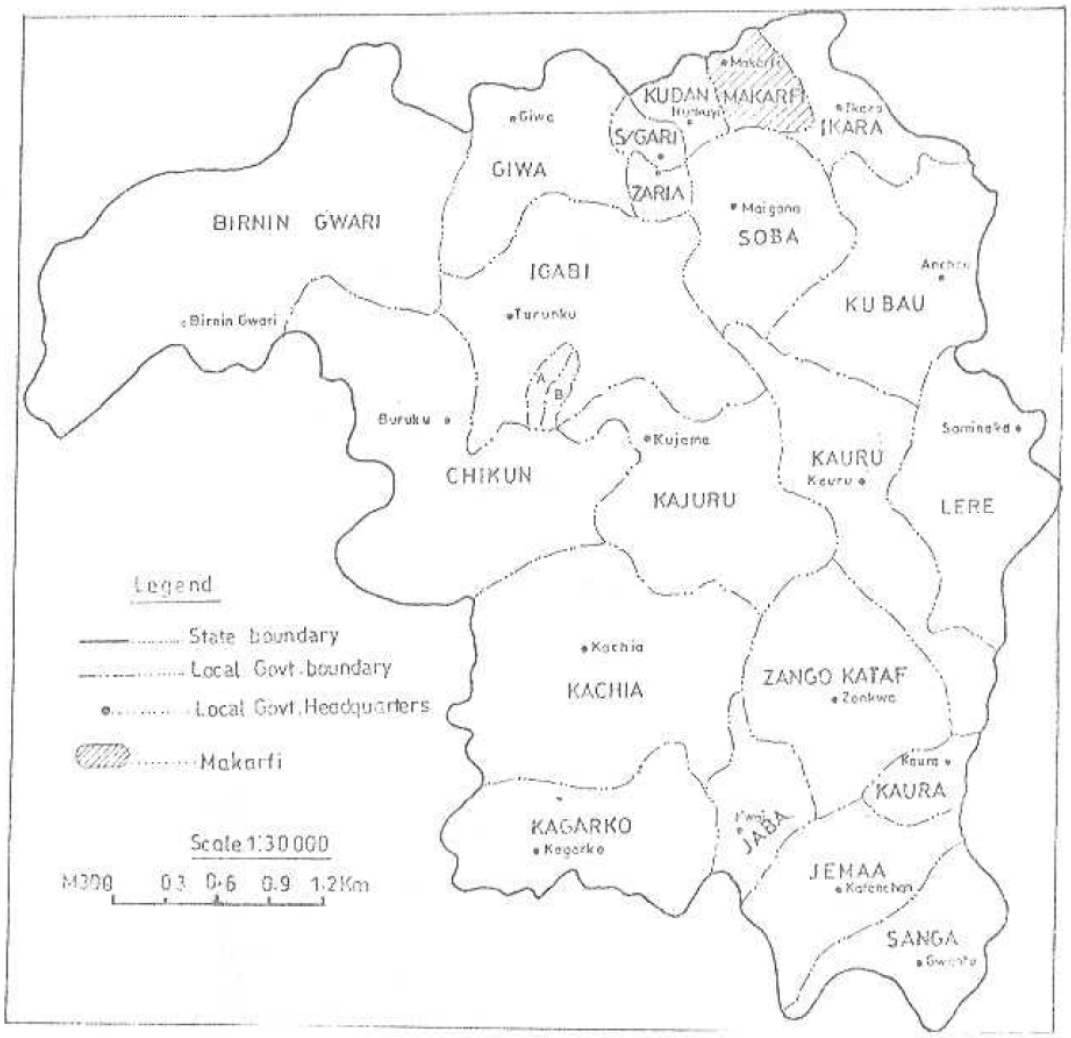
3.1.3. Population and Economy

Makarfi Local government Area has a population of 108,455 citizens, of which 52,399 are female while 56056 are male, and a total household of 19,871 families.

The people of Makarfi Local Government area are actively engaged in agriculture, which is their major economic activity. They engage in both crop production and animal husbandry, especially cattle fattening. With regards to crop production the local populace is actively engaged in the production of mainly grains such as maize, sorghum and millet. However, the area is also well known for sugarcane production and the cultivation of tomatoes.

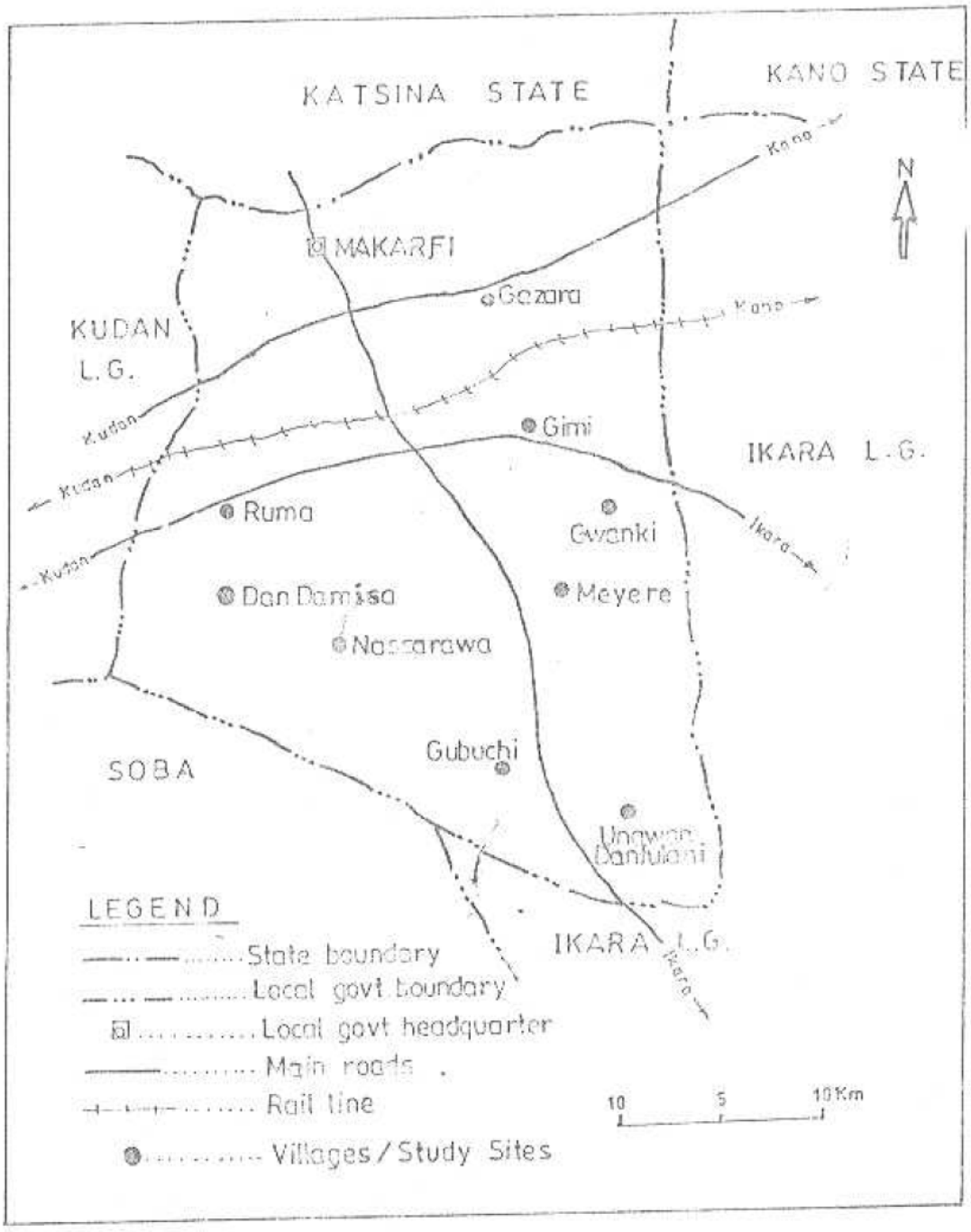
Although there are no industries, there are two financial institutions. There is also a nationally recognised market that holds every Wednesday. The market is centrally located and easily accessible via a well tarred road that leads to Makarfi town. All this stimulates a vibrant local economy

Figure 3.1 Map of Kaduna State showing local government areas



Source: Geology Department, ABU Zaria

Figure 3.2 Map of Makarfi Local Government Area showing study sites



Source: Geology Department, ABU Zaria

3.2 METHODOLOGY

3.2.1. Sources of Data

The principal type of data used in the study is primary data generated through the administration of structured questionnaires to both the borrowers and non-borrowers alike (Appendix 1). The issues on which data were collected from both borrowers and non-borrowers for a period of five years, (1999 to 2003) are as follows:

(a) Characteristics of respondents, which covered information on age, sex, educational background, family size and farming experience.

(b) Respondents' farming activities. This focussed on size of area under cultivation, cost and quantity of labour, cost and quantity of inputs used. Data were also obtained on quantity of crop produced and income generated from it.

(c) Finance: Information was collected on loan volume obtained and disbursed as well as mode of disbursement.

Secondary data were also obtained to support the study. These include information from journals, theses, conferences workshops and seminar papers as well as text books and newspapers.

3.2.2. Sample Size/Sampling Procedure

Sixty borrowers and sixty non-borrowers were selected for the study. The stratified random sampling method was used. The study area was stratified based on the present number of wards, and then samples were taken from each of the wards. The random sampling technique was used to select ten major villages which are Nassarwan Doya, Gazara, Dan Damisa, Makarfi, Anguwan Fulani, Gubuchi, Gimi, Meyere, Gwanki, Ruma. Subsequently,

from each of these villages six borrowers and six non-borrowers were selected. However, 59 borrowers and 57 non-borrowers responded.

3.2.3 Questionnaire Administration

Some of the questionnaires were administered by the researcher together with field assistants (who usually work with the cooperative office of Makarfi Local Government Area), while some were administered by the field assistants themselves. The use of field assistants was necessary as most of the respondents are illiterate. Sample questionnaires were first administered in a trial before the actual survey commenced.

3.2.4 Methods of Data Analysis

In analysing the data obtained from the administered structured questionnaires both descriptive and inferential statistics were used.

Descriptive Statistics

Here, frequency distribution tables were used to summarise the information on respondent's age, educational background, family size, farming experience, farm size and loan.

Inferential Statistics

(i) *Analysis of Means:*

This technique was used to compare borrowers and non- borrowers. It was used to test the null hypothesis of no difference between borrowers and non-borrowers with regards to labour cost, quantity of input, farm output, income and cost of production. The test statistics is given by the formulae

(i) Standard Deviation of the sampling distribution of the means $S_{\bar{x}_1-\bar{x}_2}$:

$$S_{\bar{x}_1-\bar{x}_2} = \sqrt{\left(\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}\right)}$$

(ii) Test of Significance $t = \frac{\bar{X}_1 - \bar{X}_2}{S_1 - S_2}$

Where: S = Sample variance

$\bar{X}_1$ = Mean of sample 1

$\bar{X}_2$ = Mean of sample 2

N_1 = Size of sample 1

N_2 = Size of sample 2

1t1 = Table 't'

t = Calculated 't'

The calculated 't' values were compared with the table 't' values at 2(n-1) degrees of freedom, and where the table t-value was less than the calculated 't' value the null hypothesis H_o was rejected.

(ii) *Production Function Analysis:*

According to Aiyedun (1996) in the estimation of the agricultural production process in a situation where more than one resource interacts in the production process, the contribution of individual resources can only be estimated from a Production Function Analysis. Jongur (1993) also described the production function analysis as "the mathematical way of

describing the relationship between the production of a given output and the factors affecting the production process," while Tarauni (1996) called production function "the functional relationship existing between an input and an output. The Production Function Analysis was used to estimate the contribution of loan amount, farm size as well as quantity of inputs in production. In other words it was used to determine the extent to which the important factor (credit) explains the variability of output.

There are various methods of the Production Function Analysis. These include Quadratic, Linear, Square root, Spillman and Cobb-Douglas methods. However, for this study the Cobb-Douglas Function was used. According to Tarauni (1996) it is (i) convenient in interpreting elasticity of production (ii) a method that requires less degrees of freedom in estimating parameters than other algebraic forms which allow increasing and decreasing returns to scale, and (iii) easy to compute.

The Cobb-Douglas method uses the formula:

$$Y = a + bx^b + e$$

Where

Y = quantity of output

x = quantity of input

a = constant

b = regression co-efficient

e = error term

This is a measure of the percentage change in output that is brought about by a percentage change in input.

In the Cobb-Douglas Production Function Analysis the amount of loan was compared with output. This is in consideration of the fact that the research work focuses on the effect of credit on the farmers' production levels. In the analysis loan amount, farm size, quantity of inputs (seeds, fertilizer, pesticides, herbicides) were related to output.

3.5 Specification of the Regression Models

The model used to explain the effectiveness and efficiency of credit and other factors, which might influence crop output is

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_{6+} e$$

Where:

Y = Output

X_1 = Loan amount (₦)

X_2 = Farm size (ha)

X_3 = Seeds (kg)

X_4 = Fertilizer (bags)

X_5 = Pesticides (ltr)

X_6 = Herbicide (ltr)

a = Constant

b = Regression coefficient

e = Error term

CHAPTER FOUR
PRESENTATION AND ANALYSIS OF DATA

4.1 INTRODUCTION

This chapter presents a summary of the data obtained from the structured questionnaire that had been administered to both borrowers and non-borrowers in the study area. The chapter is organised around the issues covered in the questionnaire. The summary tables of the data on the issues are presented preceded by a discussion of the results obtained. The presentation was done in three parts:

(1) A description of the characteristics of respondents in terms of age distribution, educational background, family size, farming experience, farm size as well as loan distribution was first given and discussed.

(2) In the second part the difference between borrowers and non-borrowers was determined by analysing the means of their farm size, labour cost, quantity of inputs used, output, income as well as cost of production.

(3) The third is devoted to the result of the Production Function Analysis by which the effect of credit on borrowers' farm size, quantity of inputs used as well as volume of output was analysed and discussed.

4.2 CHARACTERISTICS OF THE RESPONDENTS

4.2.1 Age Distribution

Table 4.1. shows the age distribution of borrowers and non-borrowers. It can be seen that a large percentage of respondents are between the ages of 41 and 50 years. In general most of the respondents fall within the most economically active age of 31 to 50 years of age; that is 64.41 percent for borrowers and 57.9 percent for non-borrowers. The fact that only one borrower and one non-borrower fall within the age range of 30 years and below, together forming only approximately 1.72 percent of all respondents, could be attributed to shift away from farming as a business for youth of the area. Most of them could be involved in marketing of agricultural commodities instead of farming, as it generates more profit, and at a faster rate.

Table 4.1 Age distribution of respondents

Age distribution (years)	Borrowers		Non-borrowers		Total	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
30 and below	1	1.70	1	1.75	2	1.72
31 – 40	12	20.34	15	26.32	27	23.28
41 – 50	26	44.07	18	31.58	44	37.93
51 – 60	12	20.34	9	15.79	21	18.10
> 60	8	13.57	14	24.56	22	18.97
Total	59	100.00	57	100.00	116	100.00

Source: Field Survey, 2004

4.2.2 Education

It is noteworthy that about four percent of the respondents (5 people out of 116) went to any form of higher institution. The study area is a

predominantly Muslim/Hausa rural setting. One demographic characteristic shown by the above statistics is the level of illiteracy in terms of western education that characterises this part of the country. Hence about 75 percent of respondents had only Quranic or primary education (Table 4.2)

Table 4.2 Educational background of respondents

Category of school	Borrowers		Non-borrowers		Total	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
Quranic	37	62.71	37	64.91	74	63.79
Primary	6	10.17	10	17.54	16	13.79
Secondary	14	23.73	7	12.28	21	18.10
Post secondary	2	3.39	3	5.26	5	4.31
Total	59	100	57	100	116	100

Source: Field Survey, 2004

4.2.3 Family Size

The number of persons per family amongst the respondents is depicted in Table 4.3. Majority of respondents have family sizes ranging from 6 to 10 persons in a household. For borrowers respondents that fall within that range accounted for 30.50 percent of the total, while for non-borrowers they accounted for 40.40 percent. Approximately 27 percent of borrowers and 32 percent of non-borrowers had a family size of 11 to 15 people. The resultt supports the general notion of large families as a characteristic of rural Hausaland.

Table 4.3 Family size of respondents

No. of persons family	Borrowers		Non-borrowers		Total	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
1 – 5	14	23.70	13	22.80	27	23.27
6 – 10	18	30.50	23	40.40	41	35.35
11 – 15	16	27.10	18	31.60	34	29.31
16 – 20	6	10.20	1	1.80	7	6.03
21 – 25	4	6.80	2	3.50	6	5.17
26 – 30	1	1.70	0.0	0.0	1	0.86
Total	59	100	57	100	116	100

Source: Field Survey, 2004

4.2.4 Farming Experience

Just like what obtains in most rural areas in the northern part of Nigeria, most people in Makarfi Local Government Area are full-time farmers. Table 4.4 shows the farming experience of respondents. While the majority of borrowers (37.29%) have been in farming for between 21 and 30 years, for non-borrowers the majority (29.82%) have been farmers for between 31 to 40 years. The results show then that nearly 60 percent have been in farming for between 21 to 40 years. Considering that about 61 percent of respondents are in the economically active age of between 31 to 50 years, it can thus be deduced that most of the respondents have been in farming for most of their adult life. This further shows that many of the farmers are of the older generation, the younger ones now going into other forms of businesses which a considered more profitable than farming. Four borrowers and six non-borrowers (representing 8.62% of those sampled) have been farmers for over 50 years. Results also showed that one

respondent, a borrower, who represents 0.86 percent of respondents, indicated that he had been farming for between 61 and 70 years.

Table 4.4 Farming experience of respondents

No. of years	Borrowers		Non-borrowers		Total	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
10 and below	5	6.78	2	3.51	6	5.17
11 – 20	4	8.48	12	21.05	17	14.66
21 – 30	22	37.29	12	21.05	34	29.31
31 – 40	15	24.42	17	29.82	32	27.59
41 – 50	8	13.56	8	14.04	16	13.79
51 – 60	4	6.78	6	10.53	10	8.62
61 - 70	1	1.70	0.0	0.0	1	0.86
Total	59	100	57	100	116	100

Source: Field Survey, 2004

4.2.5. Farm Size

The farm size of respondents is shown in Table 4.5. Of those borrowers sampled, 24 (or 40.68%) have farm sizes ranging from three to four hectares. On the other hand 27 non-borrowers (47.37%) had farms in that category. The results also showed that for both borrowers and non-borrowers the three to four hectares farm size category of respondents is in the majority (43.97% of the total). About 23% of respondents have between five to six hectares of farmland (that is 27.11% of borrowers and 19.30% of non-borrowers). Six borrowers and two non-borrowers had from seven to eight hectares of farmland. This is 6.89% of all respondents sampled. Those respondents whose farm size range from one to two hectares form 18.1% of the total. In this, seven borrowers and fourteen non-borrowers fall within

that group. As earlier stated, majority of the rural populace is into small scale subsistence agriculture.

Table 4.5 Distribution of the respondents by farm size category

Farm size (hectares)	Borrowers		Non-borrowers		Total	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
1 – 2	7	11.87	14	24.56	21	18.11
3 – 4	24	40.68	27	47.37	51	43.97
5 – 6	16	27.11	11	19.30	27	23.27
7 – 8	6	10.17	2	3.51	8	6.89
9 - 10	6	10.17	3	5.26	9	7.76
Total	59	100	57	100	116	100

Source: Field Survey, 2004

4.2.6 Borrowers' Loan Amount

Table 4.6 shows that of those farmers that benefited from credit during the five years under the study 45 (76.27%) borrowed on average between ₦1,000 to ₦10,000 per annum. This was followed by eight borrowers who, on average borrowed between ₦10,001 to ₦20,000 per year during the five years. Two farmers each borrowed between ₦20,001 and ₦30,000 and ₦40,001 and ₦50,000 respectively. There was no borrower in the N30,001 to N40,000 range. As earlier stated, majority of the populace are into subsistence farming, with average farm sizes of mainly 3-4 hectares (table 4.5). Income level here is low and most farmers do not have collateral for large loans.

Table 4.6 Distribution of the respondents by loan size category

Amount of loan (₦)	No. of respondents	%
1 – 10,000	45	76.27
10,001– 20,000	8	13.56
20,001 – 30,000	2	3.39
30,001– 40,000	0	0
40,001 – 50,000	2	3.39
No response	2	3.39
Total	59	100%

Source: Field Survey, 2004

4.3. BORROWERS' AND NON BORROWERS' LABOUR COST, QUANTITY OF INPUTS, OUTPUT, INCOME AND COST OF PRODUCTION

The results of the analysis of means test used to compare the borrowers and non-borrowers average (i) farm size, (ii) labour cost, (iii) quantity of inputs used, (iv) output, (v) income and (vi) cost of production are presented and discussed below.

4.3.1 Farm Size

A significant difference was noted between borrowers and non-borrowers in the average number of hectares cultivated (Table 4.7) suggesting that borrowers had significantly larger farms than those farmers that did not borrow. As such, the null hypothesis of no significant difference between means is rejected. It is seen that while over 47% of borrowers cultivated between 5 to 10 hectares, over 38% of non-borrowers cultivated the same hectarage. This result indicates that credit made available to borrowers enabled more of them cultivate larger farm sizes. The results also agree with Ilebanmi (1983) whose study showed that borrowers had larger farm sizes

than non-borrowers, but contradicts that of Tarauni (1996) who found no significant difference between the two groups.

Table 4.7 Farm size

Borrowers				Non-borrowers			
Farm size (ha)	Frequency	x - μ	$(x - \mu)^2$	No. of hectares	Frequency	x - μ	$(x - \mu)^2$
1	1	3.86	14.90	1	2	2.89	8.35
2	6	2.86	8.18	2	12	1.89	3.57
3	12	1.86	3.46	3	15	0.89	0.79
4	12	0.86	0.74	4	12	-0.11	0.01
5	9	-0.14	0.02	5	7	-1,11	1.23
6	7	-1.14	1.30	6	4	-2.11	4.45
7	5	-2.14	4.58	7	2	-3.11	9.67
8	1	-3.14	9.86	10	3	-6.11	37.33
10	6	-5.14	26.42				
Total farm size (ha)	**287**			**222**			**t = 2.43****
x	**4.86**			**3.89**			
σ	**2.31**			**2.00**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.3.2 Labour Cost

Results in Table 4.8 show that there was no significant difference between borrowers and non-borrowers in terms of cost of labour for all operations which include land clearing, ridging, planting, fertilizer application, weeding, spraying as well as harvesting. When the cost of labour for the different operations was pooled together to compare the total labour cost between borrowers and non-borrowers for all the five years, no significant difference was also found between the means of the two groups. We have to accept the null hypothesis that there is no statistically significant difference

in labour cost between borrowers and non-borrowers. This suggests that most of the farmers (both borrowers and non-borrowers) depend on family labour, which is often not costed.

Table 4.8 Labour cost

Operation	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
Land clearing	59	1240.68	1550213.25	57	1191.23	1840010.86	0.20
Ridging	59	3164.41	9586814.84	57	2815.79	7575728.33	0.64
Planting	59	1305.09	2239025.32	57	871.93	1404465.80	1.73
Fert. application	59	761.02	511557.57	57	660.53	715780.13	0.69
Weeding	59	3780.51	11922501.15	57	2804.39	8524489.26	1.65
Spraying	59	211.02	194661.01	57	107.02	195664.14	1.27
Harvesting	59	2809.34	7759168.19	57	1985.96	6475246.17	1.66
Total labour cost	**13272.05**			**10436.84**			**0.82**
Mean	**1896.01**			**1490.98**			
σ	**1247.88**			**866.05**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.3.3 Quantity of Inputs Used

Table 4.9 compares borrowers' and non-borrowers' use of inputs in terms of quantities of seeds, fertilizer, pesticides and herbicides used over the period under review (1999 to 2003). This was done to determine if any significant difference exists between the means of the two groups, in the use of inputs.

No significant difference was noted in quantity of seeds used by borrowers and non-borrowers from 1999 to 2003 (table 4.9A), which shows that very often most farmers in subsistence agriculture (both borrowers and non-borrowers) use seeds they have kept for the purpose from the previous farming season. They purchase seeds only to augment what they have.

However, when all five years were pooled together to assess the amount of seeds used, the table ‘t’ value in the Analysis of Means test was lower than the calculated value, showing a significant difference between the two groups. This suggests that consistent availability of credit to the farmers results in a cumulative increase in input use.

The same trend was observed with regards to fertilizer use, where a table ‘t’ value of 3.76 was lower than the calculated ‘t’ value, indicating that borrowers used a significantly higher amount than non-borrowers when the total amount used for all the five years together was assessed (table 4.9B). Assessing the years individually showed no significant difference between the two groups. Cost of fertilizer is considered too high to and as such might not make a significant difference in a single year. This further confirms the assertion that credit given over time increases input use.

Access to credit by borrowers enabled them use more pesticides than non-borrowers in the years 1999 to 2001. But borrowers’ access to credit made no difference in 2002 and 2003 (table 4.9C). In the long term however results show borrowers using significantly more pesticides than non-borrowers. Here too, long term credit has proven useful in increasing use of inputs.

Herbicides’ use by borrowers compared to that of non-borrowers was significantly different only in 2003 as shown by the result. For 1999, 2000, 2001 and 2002 borrowers did not use significantly higher amounts of herbicides. Borrowers also used a higher amount of herbicides over the long term. This is depicted by the significant difference observed between the

means of borrowers and that of non-borrowers with regards to total amount of herbicides used from 1999 to 2003 (table 4.9D).

The significant difference between borrowers and non-borrowers with regards to all the inputs observed (except labour cost) led to the rejection of the null hypothesis of no difference between the two groups regarding all the inputs assessed. This also concurs with both Idah (1986) and Owuor *et al* (2001) who noticed a positive correlation between credit and the various inputs' use, that is seeds, fertilizer, herbicide and insecticide thus resulting in higher yields.

Generally the results confirm the notion that sustained credit to farmers impacts positively on their input use and thereby their output.

It is worth noting that with no obvious pattern, quantities of the various inputs used show significant differences between borrowers and non-borrowers in some years while there is none in others. But when total amount of the different inputs used (that is from 1999 to 2003) was analysed, borrowers and non-borrowers show a significant difference in respect of each input except labour cost, suggesting that in the long term microcredit impacts positively on input use. This is in line with Blasé (1971) who reviewed some studies conducted by the Food and Agricultural Organisation (FAO); all the studies emphasized that long and medium term credit was essential to growth and development.

Table 4.9 Quantity of inputs used

(A) SEEDS							
Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	2.53	5.52	57	1.68	5.36	0.83
2000	59	2.49	5.45	57	1.77	5.85	0.69
2001	59	2.59	5.93	57	1.86	6.37	0.64
2002	59	3.24	6.22	57	1.95	6.45	1.09
2003	59	3.15	5.93	57	1.51	4.31	1.71
Total seeds	**14.00**			**8.77**			**6.54****
x	**2.80**			**1.75**			
σ	**0.33**			**0.15**			
(B) FERTILIZER							
Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	12.39	8.48	57	10.53	8.02	1.22
2000	59	12.37	8.86	57	9.88	7.52	1.64
2001	59	12.25	11.96	57	9.42	7.28	1.55
2002	59	10.59	8.23	57	8.63	6.62	1.41
2003	59	10.02	8.44	57	8.53	8.34	0.96
Total ferrt.	**57.63**			**46.98**			**3.76****
x	**11.53**			**9.4**			
σ	**1.01**			**0.76**			
(C) PESTICIDE							
Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	1.12	3.82	57	0.00	0.00	2.24**
2000	59	1.00	3.52	57	0.00	0.00	2.17**
2001	59	0.81	3.11	57	0.00	0.00	2.03**
2002	59	0.93	3.61	57	0.04	0.26	1.24
2003	59	1.00	27.39	57	0.04	0.26	0.27
Total pest.	**4.86**			**0.07**			**20.85****
x	**0.97**			**0.01**			
σ	**0.10**			**0.02**			
(D) HERBICIDE							
Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	0.24	1.18	57	0.00	0.00	1.70
2000	59	0.14	0.82	57	0.00	0.00	1.36
2001	59	0.15	0.94	57	0.00	0.00	1.09
2002	59	0.64	2.37	57	0.00	0.00	1.37
2003	59	0.85	2.52	57	0.00	0.00	2.56**
Total herb.	**2.02**			**0.00**			**3.12****
x	**0.40**			**0.00**			
σ	**0.29**			**0.00**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.3.4. Output

The number of bags of maize harvested by borrowers and non-borrowers was used to assess significant differences if any, between borrowers and non-borrowers. Taking the years individually, results in Table 4.10 show no significant difference between borrowers and non-borrowers, with calculated 't' values ranging from 1.02 to 1.08, and being lower than the table values. Thus for individual years the null hypothesis of no difference between the two groups was accepted. However total output, which is for all five years together (1999 to 2003) shows that just like with input use, microcredit made a significant difference for borrowers, impacting on their output positively. The table 't' value was in this case greater than the calculated value of 4.64. Here the null hypothesis of no difference between the two goups does not hold true, and thus it is rejected. It thus suggests that sustained credit to farmers impacts positively on their agricultural production.

Table 4.10 Output of maize (Number of bags)

Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	607.17	17729436.16	57	46.93	939.39	1.02
2000	59	598.10	17296337.75	57	45.05	856.48	1.02
2001	59	399.56	7017849.49	57	41.74	681.30	1.04
2002	59	93.08	95207.80	57	37.75	580.38	1.08
2003	59	432.68	8542904.81	57	32.74	381.58	1.05
Total labour cost	**2130.59**			**204.23**			**4.64****
Mean	**426.12**			**40.85**			
σ	**186.56**			**5.11**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.3.5. Income

Testing the hypothesis in the case of income also led to a rejection of the null hypothesis because when borrowers income was compared to that of non-borrowers, in table 4.3.5 a significant difference between the two groups for each of the years except 1999 was found. Total income generated also showed that microcredit has a significant impact on borrowers' output (see Table 4.11). This agrees with studies such as Nassan (1975) and Aiyedun (1996) who observed increased farm income resulting from access to credit.

Table 4.11 Income

Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	104058.64	6899271258	57	80092.98	2939355355	1.85
2000	59	98180.34	9893284236	57	69374.21	2321066014	2.00**
2001	59	110064.07	28378815399.61	57	60309.65	1885137312	2.19**
2002	59	78522.03	123725578.24	57	44871.05	815469922.80	8.83**
2003	59	85611.86	11678692624	57	49327.19	1010960179	2.47**
Total labour cost	**476436.93**			**303975.07**			**5.03****
Mean	**95287.39**			**60795.01**			
σ	**11647.73**			**9961.55**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.3.6 Cost of Production

When the analysis of means was carried out on the cost of production a significant difference between borrowers and non-borrowers in all the years except 2003 was found. Borrowers spent a significantly higher amount of money on their farming operations than non-borrowers in all the years as can be seen from the results on Table 4.12 The assumption that no

difference would be observed between the means of the two groups is therefore discarded. This is not surprising, as access to credit also led to a significant increase in farm size as seen in Table 4.5**,** which is naturally expected to translate into a higher cost of production. Both Ilebanmi (1983) and Tarauni (1996) also observed higher operating and fixed costs with beneficiaries of loans.

Table 4.12 Total cost of production (₦)

Year	Borrowers			Non-borrowers			t
	n	x	σ	n	x	σ	
1999	59	48618	1379440287	57	34415.35	612114508	2.43**
2000	59	52724.58	2348481412	57	34973.68	576895788	2.51**
2001	59	51882.03	2127211488	57	34041.93	597123081	2.62**
2002	59	54736.10	2165078403	57	34645.09	603382432.1	2.92**
2003	59	80327.37	33039209570.95	57	39670.35	779786636.1	1.70*
Total labour cost	**288288.05**			**177746.40**			**4.23****
Mean	**57657.61**			**35549.28**			
σ	**11505.31**			**2082.79**			

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.4. ESTIMATING THE CONTRIBUTION OF INPUTS TO OUTPUT

In the Production Function Analysis, the simple and multiple regression analyses were used to determine the extent to which some key factors explain the variability of the output, that is, the differential strength of each of them as independent variables.

The analysis was done in two ways:

(i) Loan amount taken as an explanatory (independent) variable was related to farm size, quantity of input, and the actual output in separate analysis (simple regression), holding other variables constant (Table 4.13).

(ii) loan amount, farm size, and quantity of inputs were related to output together using the multiple linear regression analysis and the percentage contribution of each input to the output was also discussed (Table 4. 14).

4.4.1 Effect of loan on borrowers' farm size, input use and output

Results of the regression analysis show that a 1 percent increase in loan amount resulted in 0.341 percent, 0.33 percent, 0.153 percent, 0.108 percent and 0.479 percent increase in farm size, quantity of fertilizer, seeds, herbicides and output respectively (table 4.13) A negative effect was observed for pesticides (with a regression coefficient of –0.020). The R^2 value of 0.116 indicates that loan amount explained on average 11.6 percent of the variation in the farm size of the borrowers. For fertilizer, seeds, pesticides and herbicide loan amount explained on average 0.1 percent, 2.3 percent, 0 percent, 1.2 percent and 22.9 percent of the variations of those dependent variables respectively. Results of the t test indicate that effect of loan amount is significant at 5 percent significance level for farm size and output.

Table 4.13: Effect of loan amount on borrowers' farm size, quantity of inputs and output

Dependent variable	Regression coefficient	Standard error	R^2	F-value	t-value
Farm size	0.341	0.000	0.116	7.238**	2.690**
Fertilizer	0.033	0.000	0.001	0.061	0.246
Seeds	0.153	0.000	0.023	1.312	1.145
Pesticides	-0.020	0.000	0.000	0.022	-0.150
Herbicides	0.108	0.000	0.012	0.643	0.802
Output	0.479	0.001	0.229	16.350**	4.044**

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.4.2. Effect of loan, farm size, and quantity of inputs to borrowers' output

In Table 4.14 it can be seen that the R^2 value of 0.592 means the independent variables taken together explained on average 59.20% of the variation in the output of the borrowers, which is a reasonable contribution. An increase of 1 percent in loan amount led to a 38 percent increase in output. Furthermore a 1 percent increase in farm size, fertilizer, seeds, pesticides and herbicides used respectively led to 13.2 percent, 33.4 percent, 10.4 percent, 6.6 percent and 22.4 percent increase in output. The F value shows that the effect of all independent variables was significant at 5 percent significance level. Results of the t test indicates that the effect of both loan amount and fertilizer are significant at 5% level of significance showing them to be the most important of the independent variables to explain the variations in output. The unexplained part of the variability is possibly due to other inputs not specified in the model, and which are unquantifiable, such as management, etc.

Table 4.14: Effects of loan amount, farm size, and quantity of inputs on borrowers' output

Variable	Regression coefficient	Standard error	t-value
Loan amount	0.384	0.000	3.733**
Farm size	0.132	2.413	0.990
Fertilizer	0.334	0.729	2.394**
Seeds	0.104	1.036	1.040
Pesticides	0.066	3.244	0.413
Herbicides	0.224	4.921	1.478
R^2	0.592		
F-Value	12.090**		

** = Significant at 5% level of significance

Source: Field Survey, 2004

4.5 CONSTRAINTS TO BORROWING FROM FINANCIAL INSTITUTIONS

The table below (table 4.15) depicts reasons given by the non-borrowers for not borrowing. About 34% of the borrowers have not considered borrowing seriously. This could be attributed to their religious beliefs or simply the fear of owing. People of the Makarfi area predominantly adhere to the religion of Islam, in which many believe the charging of interest is unlawful. Majority of borrowers however (approximately 66%) would have wanted to borrow but for some constraints which include lack of credit and high interest rates. As stated earlier majority of the farmers in the study area are poor and in small scale subsistence agriculture. Their farming activities do not generate enough revenue to enable them purchase fixed assets that they could use as collateral. Again, profit earned is not enough, especially when economies of scale is put into consideration, and as such it is assumed that most of it would be swallowed up by the interest charged. It is

noteworthy that only one respondent (representing 1.4% of the total) considered distance to the lending institutions as a constraint. This result is not surprising, considering the fact that there are two financial institutions, a commercial bank and a community bank in the area.

Table 4.15 Distribution of non-borrowers by reason for not borrowing

Reason for not borrowing	No. of respondents	%
Never heard of it	2	2.81
Do not like to borrow	10	14.08
Do not need to borrow	12	16.90
Application procedures complicated	3	4.22
Bank is far away	1	1.4
High interest rate	15	21.13
No collateral	20	28.20
Approval not on time	6	8.4
Amount too small	2	2.8
Total	71	100

Source: Field Survey, 2004

CHAPTER FIVE
CONCLUSION

5.1 SUMMARY OF MAJOR FINDINGS

The purpose of the study was to compare borrowers and non borrowers in Makarfi Local Government Area of Kaduna State with a view to assessing the effect of credit on farm size, labour cost, input use (that is; seeds, fertilizer, pesticides and herbicides), output, income and cost of production.

Results of the study showed that the majority of the farmers (61%) fall within the most economically active age of 31 to 50 years. Only two respondents out of the 116 were younger than 31 years of age while twenty-two were above the age of 60 years. Most respondents did not have any formal education (about 64%) while only five of them (a little over 4%) had any form of post-secondary education. This is to be expected, the study area been predominantly muslim/Hausa and in a rural setting. The same holds true for results when farming experience of respondents was analysed. Nearly 60% of respondents have been in farming for between 21 to 40 years, and very few (5 respondents or about 5% of the sample) had been farming for less than ten years; most of the populace of Makarfi Local Government Area have farming as their means of livelihood, usually starting at a very young age. More than half of the respondents (about 59%) were shown to have a family size of between 1 and 10 people per household. Only five respondents out of 116 (or approximately 6% of the total) had over 20 members in their households. Results show that 85% of the respondents, which is the majority, have farm sizes that range from 1 to 6 hectares. This is because most are peasant and subsistence farmers, with

little produce left over for sale in order to generate enough income to increase their farm size.

With regards to farm size results of our analysis showed that borrowers had significantly larger farms than non-borrowers. There was no significant difference between the two groups in terms of labour cost, indicating that both borrowers and non-borrowers paid about the same amount of money for labour or more likely, that they all depend more on family labour which is often not costed. For all inputs assessed, which include seeds, fertilizer, pesticides and herbicides a significant difference was noted between the two groups for the five years together, with borrowers using more. The result suggested that access to credit over time enabled borrowers to use more quantities of all the inputs assessed. The same results were obtained for output, income and cost of production. It is worth noting that there was a significant difference between the two groups in all the variables observed when the average of each variable for the five years was considered. The two groups were also found to be significantly different in their use of inputs in all the years, except 1999. This observation suggests that, with the exception credit had a positive effect on agricultural production in the long term.

The Production Function Analysis was carried out to determine the extent to which some factors considered in this study explain the variability of farmers' output. The results obtained indicated that in the first simple regression analysis the independent variable (loan amount) only had a significant effect on farm size and output but had no significant effect on other variables. In the linear multiple regression analysis the independent

variables, namely loan amount, farm size, fertilizer, seeds, pesticides and herbicides reasonably explain (59.20%) of the variation in the total value of output from the farms.

An analysis of non-borrowers indicates that majority (49.33%) consider the lack of collateral as well as high interest rates as the biggest constraints to their accessing credit. 30.98% also did not need to or did not want to borrow. Only (2.8%) of respondents thought amounts disbursed are too small.

In general the findings revealed that with the exception of labour cost, when the five years were pooled together for each variable, borrowers had larger farm sizes, used more quantity of inputs (seeds, fertilizer, pesticide and herbicide), had higher output from their farms, generated more income, but also had higher cost of production. However, when analysed individually, results from some years revealed significant difference in the means of borrowers and non-borrowers while it was not so for other years. Results further revealed a reasonable contribution of the inputs such as loan amount, farm size and inputs (seeds, fertilizer, pesticides, and herbicides) to the variability of the output. Majority of the non-borrowers have seriously considered borrowing but could not because of some constraints such as the lack of collateral.

In conclusion, this study thus shows that microcredit has the long term potential to boost agricultural production. However, it has to be regular and sustained, while such constraints as the lack of collateral and high interest rates have to be tackled.

5.2 RECOMMENDATIONS

The Federal Government as well as other credit delivery institutions should focus on the provision of regular and sustained financial support for the peasant farmer in order to improve his economic activities. This will in turn go a long way towards ensuring increased production level and a boost in agriculture over a long period of time.

The following recommendations are made based on findings in this research, as well as the focus of the Federal Government on development programmes such as the National Economic Empowerment and Development Strategy (NEEDS):

(i) Considering the importance of agriculture to the Nigerian economy, Government and the Organised Private Sector should provide regular, timely and sustained credit delivery to farmers. This study shows that continued provision of credit to farmers impacts positively on their levels of production over time.

(ii) The Federal Government should ensure the implementation of its micro finance policy, as well as the mandate given to state and local governments to set aside one percent of their annual budgets for on-lending through microfinance banks. This is to ensure smooth microfinance delivery in the country.

5.3 SUGGESTIONS FOR FURTHER RESEARCH

(i) The present study focussed on a small area. To test the validity of its findings, it is necessary to broaden its area of coverage and select borrowers and non-borrowers with equal resource base for sampling. This is because non-borrowers who have a higher resource base can

produce results that are equal to or better than borrowers with a low resource base, when they are sampled together. A larger study will reveal just how generalisable the result of the present study is.

(ii) It is also suggested that in subsequent researches sampling should be carried out on farmers using the same farming methods; it is necessary to differentiate between farmers that use mixed cropping and those that cultivate only one crop, as this may affect output.

(ii) The effect of loan size on agricultural production should also be assessed to determine from the threshold where credit begins to make an impact on farm output.

REFERENCES

Adetunji, O. (1999) 'Microfinance Market in Nigeria'. ***Microfinance Update***. 1 (1) Pp 5-6

Aiyedun, J.O. (1996) ***Impact of Agricultural Development Project on Farmers'Income and Productivity. A Case Study of Five Local Government Areas***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University.

Ajakaiye, M.B. (1986) 'Credit as an Instrument for Livestock Development In Nigeria'. Paper Delivered at the National Seminar on the 2nd Livestock Development Project, 9th – 10th December, 1986

Auchan, (1986) ***An Empirical Study of the Impact of Agricultural Credit at Farm Level in Funtua Local Government Area of Kaduna State, Nigeria***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University.

Baker, C.B., Barghava, V.K. (1974) 'Financing Small Farm Development' ***India Australian Journal of Agricultural Economics***. 18, (2) Pp 101 - 117

Blasé, M.G. (1971) ***Role of Institutions in Agricultural Development. Institution for Agricultural Development***. (Blasé M.G. ed.). Pp169. Iowa. Iowa University Press, Ames,

Brenner, (1971) ***Agriculture and the Economic Development of Low Income Countries***. Netherlands Institution of Social Studies, The Hague. Monton And Company Paperback Series. No.2 Pp 40 – 43

Edordu, C.C. (1981) 'The Role of Farmers' Co-operatives Under the Agricultural Guarantee Scheme', in ***Agricultural Credit and Finance in Nigeria. Problems and Prospects,*** Proceedings of Seminar Organised by Central Bank of Nigeria.

Egwuatu, B.S.C. (2004) 'Voices of Microfinance'. ***Microfinance Matters***. A publication of UNCDF. Issue 1 January - February 2004.

Fabiyi, Y.L. and Ositimenhin, K.O. (1984) 'An Analysis of the Impact of Credit on Rice Production: A Case Study of Ondo and Oyo States of Nigeria'. ***Savings and Development***, 4, (6), Pp. 353 – 360

FAO (2000) Micro credit: Effects on Rural Poverty and the Environment. In ***The State of Food and Agriculture***. Publication of the Economic and Social Development, FAO

Galbraith, J.K. (1952) 'The Supply of Capital for Underdeveloped Areas'. (Banes, E. K ed.), Proceedings of the International Conference on Agricultural Cooperative Credit. Berkely, Carlifornia, August 4th- October 2nd, 1952

Idah, M.L. (1996) ***An Evaluation of the Impact of NACBs Direct Investment Loan Scheme***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics, Ahmadu Bello University.

Ijere, M.O. (1998) 'Agricultural and Economic Development'. In ***Readings in Agricultural Finance***' (Ijere, M.O. and Okorie, A. eds.) Longman Nig. Plc.

Ilebanmi, B.C. (1983) ***Impact of Credit on Small Scale Food Producing Farmers of Akoko South and Akoko North***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics, Ahmadu Bello University.

Jongur, A.U. (1993) ***Analysis of the Performance of Agricultural Cooperative Societies in Gongola State. A Case Study of Michika Local Government Area***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics, Ahmadu Bello University.

Kyari, A. (2000) 'Banks and Successful Agricultural Credit Guarantee Scheme'. Papers Presented at the 19th annual conference of agricultural credit officers, Abuja, Nigeria, October 31st to November 3rd, 2000,.

Mobayo, W.T. (1987) ***Impact of Public Agricultural Credit Programmes on the Incomes of Small Farmers: a Case Study of Oyi Local Government of Kwara State***. Unpublished M.Sc. Dissertation. Zaria: Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University.

Mohan, D. and Singh, G. (1977): 'Cost and Productivity of Institutional Credit to the Farmers Financed by SFDA in Punjab. ***Savings and Development***. No. 1.

Mora, A.A. (1994): ***An Analysis of Allied Bank of Nigeria Plc.'s Rural Banking Programme. A Case Study of Saminaka and Gwantu Branches (1989-1993)***. Unpublished M.Sc. Dissertation. Zaria: Department of Business Administration, Ahmadu Bello University.

Mosher, A.T. (1965): ***Getting Agriculture Moving: Essentials for Development and Modernisation***. New York: A. D.C., Frederick A. Praeger.

Nassan, M. (1975) 'Credit Availability and Growth of Small Farmer in the Pakistan Punjab. Food Research Institutes' Studies. Some Household Perspectives'. ***Savings and Development***, 2 (6) pp. 169-180

Ojo, M.O. (1998) 'Some Implications of Government Economic Policies for the Financing and Development of Agriculture in Nigeria'. In ***Reading in Agricultural Finance***. (M.O. Ijere and A.Okorie eds.) (Vol.2) Longman Nig. Plc.

Ojo, M.O. and Akanji, O.O. (1983): 'A preliminary Assessment of the Agricultural Credit Guarantee Scheme in Nigeria'. ***Economic and Financial Review***, 21 (3) Lagos, Central Bank of Nigeria.

Owuor G., De Groote H., Wangia M. (2001) **'**Impact of Self Help Groups Credit on Input Use In Maize Production In Siaya, Kenya', Pp 407 – 412.7th Eastern and Southern Africa Regional Maize Conference 11th – 15th February, 2001.

Poyi, B. (2005) 'Financial Intermediation in Large Scale Arable Farming Development', This Day Newspaper, January 3rd, 2005.

Srinivas, H. (1997) 'So, What *is* "microcredit"??', The Global Development Research Centre. 1997

Stickley, T. (1975) 'The Agricultural System in Tunisia: Some Observations and Recommendations' Publication of the Department of

Agricultural and Applied Economics, University of Minnesota, July 1976 Pp 15.

Takes, (1963) 'Socio-Economic Factors Affecting Productivity of Agriculture in Okigwe Division of Eastern Nigeria', Preliminary Report, Nigeria Institute for Social and Economic Research, Ibadan, Nigeria.

Tarauni, H.M. (1996) ***Impact of NACB Small Holder Loans on Beneficiaries in Kura Local Government Area of Kano State.*** Unpublished M.Sc. dissertation. Zaria: Department of Agricultural Economics and Rural Sociology, Ahmadu bello University.

Whitaker, M. and Loidan,(1973) 'Supervised Credit'. No.8 Sector Analysis Division, Bureau for Latin American Aid, Washington, March, 1973.

White, T.K. (1975) 'Credit and Agricultural Development'. An International Bank for Reconstruction and Development (IBRD) Paper. Rural Development Series.

Yunus, M. (2004) 'What is Microcredit?', Publication by the Grameen Bank of Bangladesh. 2004

APPENDIX I

THE EFFECT OF MICROCREDIT ON AGRICULTURAL PRODUCTION AMONG SMALL SCALE FARMERS IN MAKARFI LOCAL GOVERNMENT AREA

Please complete this form as accurately as possible. The information obtained will be used to write a M.Sc. thesis on Effects of Microcredit on Agricultural Production Among Small Scale Farmers in Makarfi Local Government Area of Kaduna State.

SECTION A: PERSONAL CHARACTERISTICS]

(To be filled by all respondents)

1. Name of Farmer……

2. Age of Farmer……

3. Education Received (tick)……

   (a) Koranic
   (b) Primary
   (c) Secondary
   (d) Post-secondary (specify)…….
   ……
   (e) Others……
   ……

4. Number of years in Farming……

5. Number of dependents……

SECTION B: FARMING ACTIVITIES

(To be filled by all respondents)

1. How many hectares or acres of land did you cultivate in the 2003 cropping season? (Please clearly whether acres or hectares)……

2. Did you hire labour? (Please tick)

Yes…… No…….

If yes, fill in the table.

Type of Operation	No. of workers	Hours of work/day	Wage rate per day (N)	Total wage (N)
Land clearing				
Ridging				
Planting				
Fertilizer application				
Weeding				
Spraying				
Harvesting				
Others				

3. Did you use family labour? (Please tick)

Yes…… No……

If yes, fill this table below.

Type of operation	No. of Men	Hrs. of work per day	No. of women	Hrs. of work per day	No. of children	Hrs. of work per day	Total Hrs. of work	Total imputed wage
Land clearing								
Ridging								
Planting								
Fertilizer application								
Weeding								
Spraying								
Harvesting								
Others (Specify)								

4. Did you use any of the following variable inputs? (Please tick)

Input	1999		2000		2001		2002		2003	
	Yes	no	yes	no	yes	no	Yes	no	yes	no
Improved seeds										
Fertilizer										
Pesticides										
Herbicides										

5. If yes, how much of each did you use per hectare and at what cost?

	1999		2000		2001		2002		2003	
Input	Quantity / Ha	Cost [N]	Quantity /Ha	Cost [N]	Quantity / Ha	Cost [N]	Quantity / Ha	Cost [N]	Quantity /Ha	Cost [N]
Inproved seeds [Kg]										
Fertilizer [Kg]										
Pesticides [Litres]										
Herbicides [Litres]										
Others [Specify]										
Total cost										

6. Did you use any of the following fixed inputs? If yes, fill the following table. If not, go to next section.

	1999				2000				2001				2002				2003			
	Total cost of purchasing [N]	Cost of repairs [N]	Cost Of Maintenance [N]	Total cost	Total cost of purchasing [N]	Cost of repairs [N]	Cost Of Maintenance [N]	Total cost [N]	Total cost of purchasing [N]	Cost of repairs [N]	Cost Of Maintenance [N]	Total cost [N]	Total cost of purchasing [N]	Cost of repairs [N]	Cost Of Maintenance [N]	Total cost [N]	Total cost of purchasing [N]	Cost of repairs [N]	Cost Of Maintenance [N]	Total cost [N]
Hoes/Cutlasses																				
Animal Traction																				
Tractor																				
Sprayers																				
Others (Specify)																				

SECTION C: INFORMATION ON CREDIT

(To be filled by borrowers only)

(a) Name of credit institution ……

(b) Amount of loan received [N] over five years
1999……..
2000……..
2001……..
2002……...
2003……...

(c) Number of installments under which the loan was advanced……..

(d) Rate or amount of interest paid ……

(e) Security offered……..…...

(f) Purpose of loan……..…...

(g) When are you expected to repay the loan?
In……..months time

In…….years time

(h) Location of farm……..

(i) Estimated cost of transportation to the farm from home (N) ……

(j) Cost of travelling to the credit institution to secure loan (N) …….

SECTION D: (To be filled by non-borrowers only)

What are the factors stopping you from borrowing for your farming activities? (Tick)

I. Never heard of it.

II. Do not like to borrow.

III. Do not need to borrow.

IV. Application procedures are complicated.

V. Bank is far away.

VI. High interest rate

VII. No collateral

VIII. Other reasons (Specify) ……..

……

SECTION E: DATA ON OUTPUT AND INCOME

(To be filled by all respondents)

	1999	2000	2001	2002	2003
No. of acres/hectares cultivated					
Yield (in number of 100 kg bags)					
Cost of transporting (N)					
Unit price per bag (N)					

SECTION F: SUMMARY OF OPERATING COST PER HECTARE

(To be filled by all respondents)

	1999	2000	2001	2002	2003
Land Preparation					
Seeds					
Fertilizer					
Herbicide					
Pesticide					
Planting					
Fertilizer application					
Weeding					
Harvesting					
Threshing and Bagging					
Cost of bags					
Cost of transporting produce (to nearest period market)					

Others	Harvesting	Spraying	Weeding	Fert. Appl.	Ridging	Land		
							No. of Men	1999
							Hrs. of work per day	
							No. of women	
							Hrs. of work per day	
							No. of children	
							Hrs. of work per day	
							Total Hrs. of work	
							Total imputed wage	
							No. of Men	2000
							Hrs. of work per day	
							No. of women	
							Hrs. of work per day	
							No. of children	
							Hrs. of work per day	
							Total Hrs. of work	
							Total imputed wage	
							No. of Men	2001
							Hrs. of work per day	
							No. of women	
							Hrs. of work per day	
							No. of children	
							Hrs. of work per day	
							Total Hrs. of work	
							Total imputed wage	
							No. of Men	2002
							Hrs. of work per day	
							No. of women	
							Hrs. of work per day	
							No. of children	
							Hrs. of work per day	
							Total Hrs. of work	
							Total imputed wage	
							No. of Men	2003
							Hrs. of work per day	
							No. of women	
							Hrs. of work per day	
							No. of children	
							Hrs. of work per day	
							Total Hrs. of work	
							Total imputed wage	

Type of operation	1999				2000				2001				2002				2003			
	N0. of workers	Hours of work/day	Wage rate per day (₦)	Total wage (₦)	No. of workers	Hours of work/day	Wage rate per day (₦)	Total wage (₦)	No. of workers	Hours of work/day	Wage rate per day (₦)	Total wage (₦)	No. of workers	Hours of work/day	Wage rate per day (₦)	Total wage (₦)	No. of workers	Hours of work/day	Wage rate per day (₦)	Total wage (₦)
Land clearing																				
Ridging																				
Fertilizer application																				
Weeding																				
Spraying																				
Harvesting																				
Others																				

APPENDIX II

FARM SIZE

$$S_{x_1-x_2} = \sqrt{\frac{5.34}{59} + \frac{4.02}{57}} = 0.40 \qquad t = \frac{4.86 - 3.89}{0.40} = 2.43$$

APPENDIX III

COST OF LABOUR

(i) Land clearing

$$S_{x_1-x_2} = \sqrt{\frac{1550213.25}{59} + \frac{1840010.8}{57}} = 242 \qquad t = \frac{1240.68 - 1191.23}{242} = 0.20$$

(ii) Ridging

$$S_{x_1-x_2} = \sqrt{\frac{9586814.84}{59} + \frac{7575728.33}{57}} = 543.50 \qquad t = \frac{3164.41 - 2815.79}{543.50} = 0.64$$

(iii) Planting

$$S_{x_1-x_2} = \sqrt{\frac{2239025.32}{59} + \frac{1404465.80}{57}} = 250.17 \qquad t = \frac{3164.41 - 2815.79}{250.17} = 1.73$$

(iv) Fertilizer application

$$S_{x_1-x_2} = \sqrt{\frac{511557.57}{59} + \frac{715780}{57}} = 145.70$$

$$t = \frac{761.0169 - 660.5263}{145.70} = 0.69$$

(v) Weeding

$$S_{x_1-x_2} = \sqrt{\frac{11922501.15}{59} + \frac{8524489.26}{57}} = 592.98$$

$$t = \frac{3780.5085 - 2804.3860}{592.98} = 1.65$$

(vi) Spraying

$$S_{x_1-x_2} = \sqrt{\frac{194661.01}{59} + \frac{195664.14}{57}} = 82.05$$

$$t = \frac{211.0169 - 107.0175}{82.05} = 1.27$$

(vii) Harvesting

$$S_{x_1-x_2} = \sqrt{\frac{7759168.19}{59} + \frac{6475246.17}{57}} = 495.09$$

$$t = \frac{2809.3390 - 1985.9649}{495.09} = 1.66$$

(viii) Total Cost of Labour

$$S_{x_1-x_2} = \sqrt{\frac{1557204.40}{7} + \frac{750042.60}{7}} = 493.85$$

$$t = \frac{1896.0007 - 1490.98}{493.85} = 0.80$$

APPENDIX IV

QUANTITY OF INPUTS

Quantity of Inputs in 1999:

(vix) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{30.43}{59} + \frac{28.72}{57}} = 1.01 \qquad t = \frac{2.5254 - 1.6842}{1.01} = 0.83$$

(x) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{71.83}{59} + \frac{64.25}{57}} = 1.53 \qquad t = \frac{12.3898 - 10.5263}{1.53} = 1.22$$

(xi) Pesticide

$$S_{x_1-x_2} = \sqrt{\frac{14.62}{59} + \frac{0.00}{57}} = 0.05 \qquad t = \frac{1.1186 - 0.0000}{0.05} = 2.24$$

(xii) Herbicide

$$S_{x_1-x_2} = \sqrt{\frac{1.39}{59} + \frac{0.00}{57}} = 0.14 \qquad t = \frac{0.2373 - 0.0000}{0.14} = 1.70$$

Quantity of Inputs in 2000

(xiii) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{29.70}{59} + \frac{34.22}{57}} = 1.05 \qquad t = \frac{2.4915 - 1.7719}{1.05} = 0.69$$

(xiv) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{78.58}{59} + \frac{56.57}{57}} = 1.52 \qquad t = \frac{12.3729 - 9.8772}{1.52}$$

$$= 1.64$$

(xv) Pesticide

$$S_{x_1-x_2} = \sqrt{\frac{12.38}{59} + \frac{0.00}{57}} = 0.46 \qquad t = \frac{1.0000 - 0.0000}{0.46}$$

$$= 2.17$$

(xvi) Herbicide

$$S_{x_1-x_2} = \sqrt{\frac{0.67}{59} + \frac{0.00}{57}} = 0.10 \qquad t = \frac{0.1356 - 0.0000}{0.10}$$

$$= 1.36$$

Quantity of Inputs in 2001

(xvii) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{35.14}{59} + \frac{40.59}{57}} = 1.14 \qquad t = \frac{2.5932 - 1.8596}{1.14}$$

$$= 0.64$$

(xviii) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{143.02}{59} + \frac{53.07}{57}} = 1.83 \qquad t = \frac{12.2542 - 9.4211}{1.83}$$

$$= 1.55$$

(xix) Pesticide

$$S_{x_1-x_2} = \sqrt{\frac{9.67}{59} + \frac{0.00}{57}} = 0.4 \qquad t = \frac{0.8136 - 0.0000}{0.4}$$

$$= 2.03$$

(xx) Herbicide

$$S_{x_1-x_2} = \sqrt{\frac{0.89}{59} + \frac{0.00}{57}} = 0.14 \qquad t = \frac{0.1525 - 0.0000}{0.14}$$

$$= 1.09$$

Quantity of Inputs in 2002

(xxi) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{38.63}{59} + \frac{41.59}{57}} = 1.18 \qquad t = \frac{3.2373 - 1.9474}{1.18}$$

$$= 1.09$$

(xxii) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{67.80}{59} + \frac{43.84}{57}} = 1.39 \qquad t = \frac{12.2542 - 9.4211}{1.39}$$

$$= 1.41$$

(xxiii) Pesticide

$$S_{x_1-x_2} = \sqrt{\frac{13.00}{59} + \frac{0.07}{57}} = 0.47 \qquad t = \frac{0.9322 - 0.3509}{0.47} = 1.24$$

(xxiv) Herbicide

$$S_{x_1-x_2} = \sqrt{\frac{5.61}{59} + \frac{0.00}{57}} = 0.32 \qquad t = \frac{0.6441 - 0.0000}{0.32} = 1.37$$

Quantity of Inputs in 2003

(xxv) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{35.20}{59} + \frac{18.58}{57}} = 0.96 \qquad t = \frac{3.1525 - 1.5088}{0.96}$$

$$= 1.70$$

(xxvi) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{71.24}{59} + \frac{69.50}{57}} = 1.559 \qquad t = \frac{12.2542 - 9.4211}{1.559}$$

$$= 0.96$$

(xxvii) Pesticide

$$S_{x_1-x_2} = \sqrt{\frac{750}{59} + \frac{0.07}{57}} = 3.57 \qquad t = \frac{1.0000 - 0.03509}{3.57}$$

$$= 0.27$$

(xxviii) Herbicide

$$S_{x_1-x_2} = \sqrt{\frac{6.34}{59} + \frac{0.00}{57}} = 0.33 \qquad t = \frac{0.8475 - 0.0000}{0.33}$$

$$= 2.56$$

Total Quantity of Inputs

(xxix) Seeds

$$S_{x_1-x_2} = \sqrt{\frac{0.1056}{5} + \frac{0.0228}{5}} = 0.16 \qquad t = \frac{2.800 - 1.754}{0.16}$$

$$= 6.54$$

(xxx) Fertilizer

$$S_{x_1-x_2} = \sqrt{\frac{1.0282}{5} + \frac{0.5700}{5}} = 0.565 \qquad t = \frac{11.525 - 9.40}{0.565} = 3.76$$

(xxxi) Pesticides

$$S_{x_1-x_2} = \sqrt{\frac{0.01}{5} + \frac{0.0004}{5}} = 0.046 \qquad t = \frac{0.973 - 0.014}{0.046} = 20.85$$

(xxxii) Herbicides

$$S_{x_1-x_2} = \sqrt{\frac{0.0841}{5} + \frac{0.0000}{5}} = 0.13 \qquad t = \frac{0.403 - 0.0000}{0.1297} = 3.12$$

APPENDIX V

OUTPUT (number of bags)

(xxxiii) Output in 1999

$$S_{x_1-x_2} = \sqrt{\frac{17729436.16}{59} + \frac{939.39}{57}} = 548.19 \qquad t = \frac{607.1695 - 46.9298}{548.19} = 1.02$$

(xxxiv) Output in 2000

$$S_{x_1-x_2} = \sqrt{\frac{17296337.75}{59} + \frac{856.48}{57}} = 541.46 \qquad t = \frac{598.1017 - 45.0526}{541.46} = 1.02$$

(xxxv) Output in 2002

$$S_{x_1-x_2} = \sqrt{\frac{7017849.49}{59} + \frac{681.30}{57}} = 344.90$$

$$t = \frac{399.5593 - 41.7368}{344.90}$$

$$= 1.04$$

(xxxvi) Output in 2003

$$S_{x_1-x_2} = \sqrt{\frac{95207.80}{59} + \frac{580.38}{57}} = 51.30$$

$$t = \frac{93.0847 - 37.7544}{51.30}$$

$$= 1.08$$

(xxxvii) Total output

$$S_{x_1-x_2} = \sqrt{\frac{34910.306}{5} + \frac{26.112}{5}} = 83.59$$

$$t = \frac{426.12 - 40.85}{83.59}$$

$$= 4.64$$

APPENDIX VI

INCOME

(xxxviii) Income (1999)

$$S_{x_1-x_2} = \sqrt{\frac{6899271258}{59} + \frac{2939355355}{57}} = 12980.93$$

$$t = \frac{104058.64 - 80092.98}{12980.93} = 1.85$$

(xxxvix) Income (2000)

$$S_{x_1-x_2} = \sqrt{\frac{9893284236}{59} + \frac{2321066014}{57}} = 14436.18$$

$$t = \frac{98180.34 - 69374.21}{14436.18} = 2.00$$

(xL) Income (2001)

$$S_{x_1-x_2} = \sqrt{\frac{28378815399.61}{59} + \frac{1885137312}{57}} = 22673.10 \qquad t = \frac{110064.07 - 60309.65}{22673.10}$$

$$= 2.19$$

(xLi) Income (2002)

$$S_{x_1-x_2} = \sqrt{\frac{123725578.24}{59} + \frac{815469922.8}{57}} = 3810.02 \qquad t = \frac{78522.034 - 44871.053}{3810.02} = 8.83$$

(xLii) Income (2003)

$$S_{x_1-x_2} = \sqrt{\frac{11678692624}{59} + \frac{1010960179}{57}} = 14686.0507 \qquad t = \frac{85611.864 - 49327.193}{14686.0507} =$$

$$= 2.47$$

(xLiii) Total Income

$$S_{x_1-x_2} = \sqrt{\frac{135669614.15}{5} + \frac{99232478}{5}} = 6854.23 \qquad t = \frac{95287.386 - 60795.014}{6854.23}$$

$$= 5.03$$

APPENDIX VII

COST OF PRODUCTION

(xLiv) Cost of Production (1999)

$$S_{x_1-x_2} = \sqrt{\frac{1379440287}{59} + \frac{61211450}{57}} = 5841.16 \qquad t = \frac{48617.966 - 34415.351}{5841.16} = 2.43$$

(xLv) Cost of Production (2000)

$$S_{x_1-x_2} = \sqrt{\frac{2348481412}{59} + \frac{576895788}{57}} = 7065.82 \qquad t = \frac{52724.58 - 34973.68}{7065.82}$$

$$= 2.51$$

(xLvi) Cost of Production (2001)

$$S_{x_1-x_2} = \sqrt{\frac{2127211488}{59} + \frac{597123081}{57}} = 6821.31 \qquad t = \frac{51882.034 - 34041.93}{6821.31}$$

$$= 2.62$$

(xLvii) Cost of Production (2002)

$$S_{x_1-x_2} = \sqrt{\frac{2165078403}{59} + \frac{603382432.1}{57}} = 6876.18 \qquad t = \frac{51882.034 - 34041.93}{6876.18}$$

$$= 2.92$$

(xLviii) Cost of Production (2003)

$$S_{x_1-x_2} = \sqrt{\frac{33039209570.95}{59} + \frac{779786636.1}{57}} = 23951.35 \qquad t = \frac{80327.37 - 39670.35}{23951.35}$$

$$= 1.70$$

(L) Total Cost of Production

$$S_{x_1-x_2} = \sqrt{\frac{132372158.196}{5} + \frac{4338014.1}{5}} = 5228.96 \qquad t = \frac{57657.610 - 35549.281}{5228.96}$$

$$= 4.23$$

APPENDIX VIII

Borrowers loan amount, farm size, cost of inputs and quantity of outputs:

S/No	LOAN AMOUNT (₦)	FARM SIZE (ha)	QUANTITY OF INPUTS				QUANTITY OF OUTPUT (No. of bags)
			Seeds (kg)	Fertilizer (kg)	Pesticide (ltr)	Herbicide (ltr)	
1	5800	6	------	11.2	------	------	37.4
2	2000	4	12.5	8.4	------	------	35.8
3	4800	5	------	7.6	------	------	37.8
4	3000	4	------	9.2	------	------	36.6
5	-------	7	------	17.4	------	------	53.8
6	8000	7	------	4.6	------	------	60.4
7	5400	5	------	12.2	------	------	18.6
8	12400	7	------	11.6	------	------	38.8
9	16400	4	------	8	------	------	35.8
10	3600	5	------	21	------	------	64.8
11	6400	4	------	10	------	------	49.4
12	800	3	------	2.4	------	------	20.4
13	8200	4	------	10	------	------	17.8
14	3400	3	------	4.8	------	------	28.8
15	5800	10	------	22	------	------	72.8
16	5800	10	------	27	------	------	85
17	3000	2	10	4.6	------	------	24.4
18	26000	6	3	15.1	------	------	161
19	15200	5	8	22.4	------	------	36.8
20	3600	5	1	5.4	------	------	65.4
21	3200	2	10	3.8	------	------	19.2
22	49000	5	8	7	------	------	110.8
23	8600	8	21.4	30.6	------	------	127
24	-------	3	4	8.8	------	------	37.2
25	4800	4	------	2	------	------	43.4
26	5000	1	3	2.4	------	------	12.2
27	3800	3	------	5.8	------	------	28
28	3400	2	------	4	------	------	16.2
29	5200	4	------	5.6	------	------	32.6
30	4000	6	------	25.8	------	------	78
31	5200	3	------	8.4	------	------	13.4
32	6000	3	------	8.5	------	------	28.4
33	3000	4	------	3.2	------	------	34.8
34	4400	2	------	3	------	------	15.6
35	3600	2	------	5	------	------	23
36	11000	3	------	8.4	------	------	28.2
37	17400	10	------	20.8	4	------	92.8
38	2800	4	------	5.4	------	------	25.4
39	18400	4	------	8	------	------	31.4
40	8400	6	------	13.2	------	------	45.2
41	5800	7	------	15	------	------	59.8
42	22000	10	------	12	0.4	0.8	45.8
43	5800	6	------	10	------	------	43.4
44	44000	10	4	7	------	3.2	200.4
45	9400	3	------	3.8	1.2	------	36.6
46	7400	5	10	15.2	------	------	56.8
47	2600	4	------	5.8	0.8	2.4	------
48	3000	3	------	5.2	------	------	37
49	15400	3	------	7.4	2	------	32
50	5800	10	------	20	------	------	82.2
51	13000	3	------	7.2	------	------	24.4
52	6000	6	4	25	6	6	75.4
53	6000	6	3	34.8	------	------	156
54	6000	7	3.5	29.2	12.2	6.6	136
55	3600	5	------	4	------	------	39.6
56	6000	2	2.5	10	4	2.7	162
5	6000	3	4.8	17	6	0.6	102
58	3600	5	------	4.2	------	------	38.8
59	7200	4	------	3.8	------	------	76.6