UNIVERSITI PUTRA MALAYSIA

IMPACT OF MICROFINANCE ON THE EFFICIENCY OF MAIZE PRODUCERS IN NORTH EASTERN NIGERIA

AHMED MUHAMMAD AUWAL

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By

AHMED MUHAMMAD AUWAL

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

February 2017

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DEDICATION

To

My father: Alhaji Ahmadu Bello Nguroje

My mother: Maryam Muhammad Laido

The good people of Nguroje Town

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

IMPACT OF MICROFINANCE ON THE EFFICIENCY OF MAIZE PRODUCERS IN NORTH EASTERN NIGERIA

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February 2017

Chairman : Professor Zainal Abidin Mohamed, PhD
Faculty : Agriculture

Access to credit is vital in agricultural production due to low income from both farming and non-farm undertakings and this impedes investing in production inputs especially among smallholder farmers. These farmers produced about 90% of the total food supply, but the production has been declining over the last few years due to lack of funding, a situation that subjects them to low efficiency, low output and income which aggravates poverty in the country. Microfinance as an alternative means of providing financial services to the poor, have the potential to increase their income which if well spend on farm inputs could eventually increase their well-being.

The main objective of the study was to determine the impact of microfinance credit towards efficiency and net income improvement as well as the well-being of the beneficiaries. To examine the impact precisely, a group of non-credit beneficiaries was also studied. The impact was determined by comparing two groups of maize producers namely, credit beneficiaries (CB) and non-credit beneficiaries (NCB). The study also analyzed the socio-economic and maize farm related factors influencing technical inefficiency in the farming practices. Data were collected from 600 respondents using stratified random sampling technique in four states which include; Adamawa, Bauchi, Gombe and Taraba based on their prominence in maize production activities. A well-designed questionnaire was used as an instrument to gather information and data. Descriptive and inferential statistics such as slacks-based measure of efficiency model, slacks-based super efficiency model, fractional regression model, T-test analysis, net income analysis and Cobb-Douglass production function model were used to achieve the stated objectives.

The results indicated that there is a significant difference among the production inputs used by CB and NCB at 1% and 5% levels of probability. Besides, CB have higher maize yield (772.55kg/ha), higher net farm income ($174.47) and a higher technical efficiency scores than their NCB counterparts. The mean technical efficiency of both

CB and NCB were 79% and 69% respectively, which implied that the farmers can still improve their respective efficiency levels by about 21% and 31% with the existing technology. The results also indicated that CB received an average daily income of $3.60, while NCB received only $1.34 per day. This implied that the daily income of CB have increased from less than $1.25 per day to about $3.55 per day as a result of microfinance credit.

According to the study, about 38 (CB) and 22 (NCB) farmers were super-efficient. The super-efficiency scores describe those farmers that applied inputs in an appropriate quantities during the production process and hence, were well represented by high input-output ratios. Super-efficiency scores of greater than one distinguish the best performing farmers from the worst and these farmers represent the most important ones that are extremely efficient. Microfinance credit, household size, years of farming experience, extension contact and education increased technical efficiency, while off-farm activities, drought and age decreased technical efficiency in maize farming. Costs of labour, cost of seeds, cost of agrochemicals and cost of fertilizer were found to have negative effect on net income of the farmers.

Based on the findings, it can be concluded that the higher technical efficiency, higher output and net farm income levels achieved by CB was due to the presence of microfinance credit which enabled them to purchase more production inputs at the appropriate time than their NCB counterparts. There is need for the extension workers to organize training and workshops in order to disseminate information that can encourage farmers (NCB) to collect microfinance credit in order to expand their scale of operations since it is evident that credit has positive impact on the technical efficiency, net farm income and the well-being of borrowers. Thus, government in collaboration with research institutes and universities should educate farmers on the recommended amount of inputs to apply on their farm lands. This can help them to reduce inputs wastage and production costs thereby increasing their income. It is also very important for government to drill boreholes for the rural farmers in their farm centers so that they can explore avenues for irrigational farming system instead of relying on rainfall for production. This can avert the impact of drought on crops and widens their opportunities to plant at least four times per annum and even diversify to other farming enterprises.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

IMPAK MIKROKEWANGAN KE ATAS KECEKAPAN PENGELUAR JAGUNG DI UTARA TIMUR NIGERIA

Oleh

AHMED MUHAMMAD AUWAL

Februari 2017

Pengerusi : Profesor Zainal Abidin Mohamed, PhD
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Akses pada kredit penting bagi pengeluaran pertanian disebabkan pendapatan yang rendah dari kedua-dua pengusaha perladangan dan bukan perladangan dan ini menghalang pelaburan dalam input pengeluaran, terutama dalam kalangan pekebun kecil yang menghasilkan lebih kurang 90% dari keseluruhan penawaran makanan. Hasil telah merosot sejak tahun kebelakangan akibat kekurangan dana, suatu situasi yang mengakibatkan kecekapan mereka rendah, output dan pendapatan rendah yang menambah lagi kemiskinan dalam negara tersebut. Mikrokewangan sebagai medium alternatif bagi menyediakan perkhidmatan kewangan kepada mereka yang miskin, mempunyai potensi untuk meningkatkan pendapatan mereka yang sekiranya dibelanjakan sewajarnya ke atas input ladang akhirnya akan meningkatkan kesejahteraan hidup mereka.

Objektif utama kajian ini adalah untuk menentukan impak kredit mikrokewangan terhadap kecekapan dan peningkatan pendapatan bersih di samping kesejahteraan hidup benefisiari. Untuk meneliti impak tersebut dengan tepat, sekumpulan benefisiari bukan kredit juga dikaji. Impak tersebut telah ditentukan dengan membandingkan dua kumpulan pengeluar jagung, iaitu benefisiari kredit (CB) dan benefisiari bukan kredit (NCB). Kajian ini juga menganalisis sosioekonomi dan faktor berkaitan ladang jagung yang mempengaruhi kecekapan amalan perladangan. Data telah dikumpul daripada 600 responden menggunakan teknik persampelan rawak berlapis di empat buah negeri, iaitu; Adamawa, Bauchi, Gombe dan Taraba berdasarkan kepentingan mereka dalam aktiviti pengeluaran jagung. Soal selidik yang direka sebaiknya telah digunakan sebagai instrumen bagi mengumpul maklumat dan data. Statistik deskriptif dan inferensi, seperti pengukuran berdasarkan kendur bagi model kecekapan, model superkecekapan berdasarkan kendur, model regresi fraksional , analisis Ujian T, analisis pendapatan bersih dan model fungsi pengeluaran Cobb-Douglass telah digunakan bagi mencapai objekjtif yang telah dinyatakan.

Dapatan kajian menunjukkan bahawa terdapat perbezaan yang signifikan antara hasil pengeluaran yang digunakan oleh CB dan NCB pada 1% dan 5% tahap kebarangkalian. Lebih-lebih lagi, CB mempunyai hasil jagung yang tinggi (772.55kg/ha), pendapatan bersih ladang yang tinggi ($174.47) dan skor kecekapan teknikal yang lebih tinggi daripada rakan peladang lain mereka, iaitu NCB. Min kecekapan teknikal bagi kedua-dua CB dan NCB ialah masing-masing 79% dan 69%, yang memperlihatkan bahawa peladang masih boleh memperbaiki tahap kecekapan mereka lebih kurang 21% dan 31% dengan teknologi yang sedia ada. Dapatan kajian juga menunjukkan bahawa CB menerima purata pendapatan harian sebanyak $3.60, manakala NCB menerima hanya $1.32 sehari. Hal ini menandakan bahawa pendapatan harian CB telah meningkat daripada kurang daripada $1.25 sehari kepada lebih kurang $3.60 sehari disebabkan kredit mikrokewangan.

Menurut kajian tersebut, lebih kurang 38 peladang (CB) dan 22 peladang (NCB) ialah supercekap. Skor superkecekapan memperlihatkan bahawa peladang tersebut yang mengaplikasikan input dalam jumlah yang sesuai semasa proses pengeluaran dan oleh itu, adalah lebih diwakili dengan ratio input-output yang tinggi. Skor superkecekapan yang lebih tinggi daripada satu membezakan prestasi yang paling baik daripada yang buruk dan peladang tersebut mewakili mereka yang paling penting dan yang sangat cemerlang. Mikrokewangan, saiz isi rumah, tempoh pengalaman perladangan, kontrak pengembangan dan pendidikan meningkatkan kecekapan teknikal, manakala aktiviti di luar ladang, kemarau dan umur menurunkan kecekapan teknikal dalam perladangan jagung. Kos buruh, kos benih, kos agrokimia dan kos baja didapati mempunyai kesan yang negatif ke atas pendapatan bersih peladang.

Berdasarkan dapatan kajian, dapatlah disimpulkan bahawa lebih tinggi kecekapan teknikal , lebih tinggi output dan tahap pendapatan bersih yang diperoleh CB disebabkan oleh kewujudan kredit mikrokewangan yang membolehkan mereka membeli lebih banyak input pengeluaran pada masa yang sesuai daripada rakan peladang lain. Walau bagaimanapun, terdapat keperluan untuk pekerja pengembangan bagi melaksanakan latihan dan bengkel bagi menyebarkan maklumat yang dapat menggalakkan peladang (NCB) supaya mengambil kredit mikrokewangan bagi mengembangkan skala operasi mereka kerana telah terbukti bahawa kredit mempunyai impak yang positif ke atas kecekapan teknikal, pendapatan bersih ladang dan kesejahteraan hidup peminjam. Oleh sebab itu, kerajaan melalaui kolaborasi dengan institut penyelidikan dan universiti harus mendidik peladang mengenai jumlah input bagi diaplikasikan ke atas ladang mereka. Hal ini dapat membantu peladang mengurangkan sisa input dan kos pengeluaran, dengan itu meningkatkan pendapatan mereka. Peladang harus meneroka avenu untuk sistem perladangan pengairan dan tidak bergantung pada hujan bagi pengeluaran. Hal ini dapat mengalihkan impak kemarau ke atas tanaman dan melebarkan peluang mereka untuk menanam sekurang-kurangnya empat kali setahun dan mungkin mempelbagaikannya kepada perusahaan perladangan lain.

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Lastly, my profound gratitude goes to my beloved friends and colleagues for their incessant encouragement and prayers throughout the period of study.

I certify that a Thesis Examination Committee has met on 20 February 2017 to conduct the final examination of Ahmed Muhammad Auwal on his thesis entitled "Impact of Microfinance on the Efficiency of Maize Producers in North Eastern Nigeria" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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Name of Chairman of Supervisory Committee: Professor Dr. Zainal Abidin Mohamed

Signature: _____
Name of Member of Supervisory Committee: Dr. Nolila Mohd Nawi

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ACGSF	Agricultural Credit Guarantee Scheme Fund
ADB	Asian Development Bank
ADBP	Agricultural Development Bank of Pakistan
ADP	Agricultural Development Project
AEO	Association of Enterprises Opportunity
AIM	Amanah Ikhtiar Malaysia
BRAC	Bangladesh Rural Advancement Committee
BRDB	Bangladesh Rural Development Board
CB	Credit Beneficiaries
CBN	Central Bank of Nigeria
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMUs	Decision Making Units
ELES	Extended Linear Expenditure System
FAO	Food and Agriculture Organization
FCF	Full Circle Fund
FRM	Fractional Regression Model
GDP	Gross Domestic Product
GF	Grameen Foundation
GFF	Good Faith Fund
GI	Gross Income
GM	Gross Margin
ICDDR	International Center for Diarrheal Disease Research
IFAD	International Fund for Agricultural Development

IFPRI	International Food Policy Research Institutes
IITA	International Institute for Tropical Agriculture
IRDP	Integrated Rural Development Programme
KG	Kilogram
LGAs	Local Government Areas
MSMEs	Micro, Small and Medium Enterprises
₦	Nigerian Currency Naira
NACB	Nigeria Agricultural and Cooperative Bank
NAFDAC	National Agency for Food and Drugs Administration and Control
NAPEP	National Poverty Eradication Program
NBCI	Nigeria Bank for Commerce and Industry
NBS	National Bureau of Statistics
NCB	Non-Credit Beneficiaries
NDE	National Directorate of Employment
NERF	National Economic Reconstruction Fund
NFI	Net Farm Income
NGOs	Non-Governmental Organizations
NIDB	Nigeria Industrial Development Bank
NPC	National Population Commission
OLS	Ordinary Least Square
PDF	Parametric Distance Functions
PPS	Production Possibility Set
RDP	Rural Development Program
RRBs	Regional Rural Banks

SBM	Slacks-Based Measure
SESE	Slacks based super-efficiency
SFA	Stochastic Frontier Analysis
SMEDAN	Small and Medium Enterprise Development Agency of Nigeria
SMEs	Small and Medium Enterprises
SSA	Sub-Saharan Africa
TFC	Total Fixed Costs
TR	Total Revenue
TVC	Total Variable Cost
UNDP	United Nations Development Program
USD	United States Dollar
VEF	Village Enterprise Fund
VRS	Variable Returns to Scale
WSEP	Women Self Employment Project

CHAPTER 1

INTRODUCTION

This chapter presents in details the background of the study, problem statement, objectives of the study and the significance of the study is discussed as well.

1.1 Background of the Study

Agriculture plays a vital role in the Nigeria's economic growth and development where the sector employs about 90% of the rural dwellers that constitutes 70% of the total population. This category is strictly affected by lack of funding for productive and useful commitment in viable farming, a position that has led them to low efficiency, low returns, low investment and prevalent malicious cycle of poverty. The significance of agricultural sector to Nigeria's economy includes provision of food, employment opportunities, provision of raw materials for agro-allied industries, contribution to the GDP growth and generation of foreign earnings. The sector averagely contributes 22.39% to the real GDP from 2010 – 2014, while industry and services contributed 25.84% and 51.77% (Table 1.1) respectively (National Bureau of Statistics (NBS), 2015).

Table 1.1 : Contribution of Various Sectors to Nigeria's GDP from 2010 – 2014

	Growth Rates (%)		
Year	Agriculture	Industry	Services
2010	23.96	25.81	50.22
2011	22.80	27.37	49.35
2012	22.36	26.22	50.91
2013	21.97	25.03	52.26
2014	22.39	25.84	51.77

Source: NBS (2015).

1.1.1 Origin and Distribution of Maize

Maize (*Zea mays* L) is a cereal crop which belongs to the grass family called Gramineae. Maize originated in America about 6,000 to 7,000 years ago and was found in southern Mexico around 4,000Bc. It spread slowly through the rest of Latin America, the Caribbean, the United States and Canada and was later conveyed to Europe by the European seamen, Africa and Asia (IITA, 2007). About 50 forms of maize exist and entail diverse colors, textures, grain shapes and sizes. Yellow, red and white are the common varieties preferred by many people depending on the region.

Today, maize is cultivated extensively all over the world in a series of agro-ecological environments occupying over 160 million hectares worldwide. The reported worldwide maize production reached approximately 1.022 billion tons in 2014 as indicated in Table 1.2, which recorded a slight increase by 0.09% as compared to the previous year 2013. America single-handedly produced about 51.51% of the total world maize production in the year 2014. This is followed by Asia (29.76%), Europe (11.03%), Africa (7.57%) and others produced (0.13%) respectively (FAO, 2015).

Maize has high contents of essential minerals, vitamins and 9% protein. It is also rich in dietary fiber and calories which are a good source of energy. It is mainly used as livestock feed and as a source of raw material for industrial products particularly in developed countries. In the United States for example, only 2.5% of the annual production is used for human food (IITA/NAFDAC, 2013).

Table 1.2 : World Maize Production by Continent (tons)

Continent	Years				
	2010	2011	2012	2013	2014
America	445,255,294	438,125,271	421,416,985	522,612,281	526,449,943
Africa	66,270,962	66,239,695	69,636,430	70,647,471	77,371,185
Asia	254,293,976	271,206,245	288,359,138	304,182,832	304,144,363
Australia	328,000	356,943	450,535	506,725	390,000
Europe	84,920,585	110,958,021	95,219,230	119,368,487	112,738,458
Oceania	532,893	584,574	675,870	725,784	644,635
New Zealand	188,812	210,175	211,231	201,659	237,165
Total	**851,790,522**	**682,714,374**	**657,246,711**	**1,018,245,239**	**1,021,975,750**

Source: FAO (2015)

1.1.2 Maize Production in Africa

Maize is the greatest essential crop in Sub-Saharan Africa (SSA) with over 50% of all countries allocating more than 50% of their cereal crop production area to it. The crop is a significant staple food for more than 1.2 billion individuals in Sub-Saharan Africa, Latin America and a key feed crop in Asia. More than 116 million tons of maize is consumed globally (FAO, 2015), Lesotho has the highest per capita consumption with about 174kg per year. Eastern and Southern Africa uses 85% of its output as food, while the entire Africa uses 95% of its output and imports 28% from other continents. Maize accounts for about 30-50% of low income domestic expenditure in eastern and Southern Africa.

In terms of region, East Africa is the largest producer of maize (31.720 million tons) which accounted for about 40.86% of the total maize produced in the year 2014, followed by West Africa (19.527 million tons) which is equivalent to 25.15%. Other regions that play a vital role in maize production comprises of South Africa (19.64%),

North Africa (7.70%) and lastly Central Africa being the least producer with only 6.66% (Table 1.3).

Table 1.3 : Maize Production by African Regions (tons)

Africa regions	Years				
	2010	2011	2012	2013	2014
East Africa	26,195,794	27,878,009	27,715,501	27,772,639	31,720,698
Central Africa	4,302,599	4,401,980	4,138,736	5,183,562	5,169,779
Northern Africa	7,358,508	7,143,206	8,188,522	8,078,851	5,974,540
South Africa	13,103,470	10,597,830	12,023,999	12,734,715	15,246,623
West Africa	15,310,591	16,218,670	17,569,672	16,877,704	19,527,545
Regional Total	**66,270,962**	**66,239,695**	**69,636,430**	**70,647,471**	**77,639,185**

Source: FAO (2015)

1.1.3 Maize Production in Some West African Countries

According to FAO (2015), Nigeria is the leading maize producer in West Africa with about 49.90% and 55.26% of the total output in 2013 and 2014 respectively. This is followed by Ghana with about 10.45% and 9.02%; Mali recorded 8.91% and 8.93%, Burkina Faso (9.40% and 7.34%) and others (21.34% and 19.45%) respectively (Table 1.4).

Table 1.4 : Maize Production in West African Countries (tons)

West African Countries	Years			
	2013	Percent	2014	Percent
Nigeria	8,422,670	49.90	10,790,600	55.26
Ghana	1,764,477	10.45	1,762,000	9.02
Mali	1,502,717	8.91	1,744,026	8.93
Burkina Faso	1,585,418	9.40	1,433,085	7.34
Others	3,602,422	21.34	3,797,834	19.45
Total	**16,877,704**	**100.0**	**19,527,545**	**100.0**

Source: FAO (2015)

1.1.4 Production Trends of Maize and other Cereal Crops in Nigeria

Nigeria is the largest Africa's maize producer with over 8 million tons, followed by South Africa. Maize is the most important cereal crop grown in the country followed by sorghum and millet and the third after wheat and rice in the world (Figure 1.1). The crop occupies about 50% of the land area under cultivation and constitutes about 55.26% of the maize grown in West Africa.

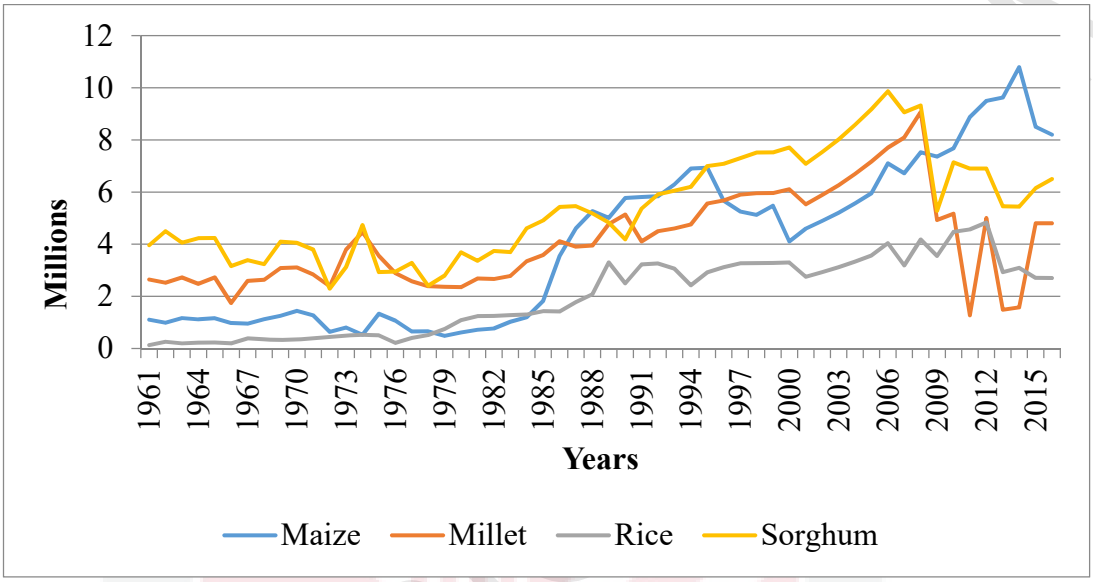

Figure 1.1 : Production Trends of Major Cereal Crops in Nigeria
(Source: FAO (2015))

Maize has now become a viable crop which several agro-allied industries depend on as a source of raw material. Maize averagely decreases poverty by about 3% in Nigeria which corresponds to 1.2 million people per year (IITA, 2005). Maize is high yielding, easy to process, readily digested and relatively cheaper than other cereals. It is a crop that can grow across various agro-ecological zones (Ogunbodede and Olakojo, 2001). Unlike other cereals, maize is produced in virtually all the states in Nigeria, though some states produced more than others.

During the periods of 1961 to 1985, Nigeria experienced a slight fluctuation in maize production with an average output of 1.1 million tons. The total output of maize declined from 7 million tons in 1995 to about 4.1 million tons in the year 2000. The decline was attributed to less interest developed in farming especially by young people who are the smallholder farmers that produced 70% of the country's total output migrate from rural areas to urban centers in search of wide collar jobs. Others were floods, prolonged drought, declining soil fertility, late delivery of fertilizer to farmers and at exorbitant rates, weed related yield losses, diseases such as stem borers, grain moths and root worms, lack of high quality seeds, low investment in research and extension services (NBS, 2013). The observed yield per hectare stood at 2.0 metric tons which is lower than the estimated average of 5.1 metric tons per hectare (Ibrahim

et al., 2014). The production has failed to keep pace with the consumption demand (Figure 1.2) which leads to the importation of about 812,000 tons of maize amounting to USD1.1 Million (FAO, 2015; NBS, 2015).

The low level of output was also attributed to low use of farm inputs and production system where over 90% of Nigeria's farms belong to smallholders with low capital base and financial outlays on research, use of local seed varieties, manual labour, have less than 5 hectares of land and involved the use of basic farm tools (hoes and cutlasses), a situation which leads to technical inefficiency at the farm level. While the production has been declining, maize consumption is still increasing there by widening the demand and supply gap (Figure 1.2).

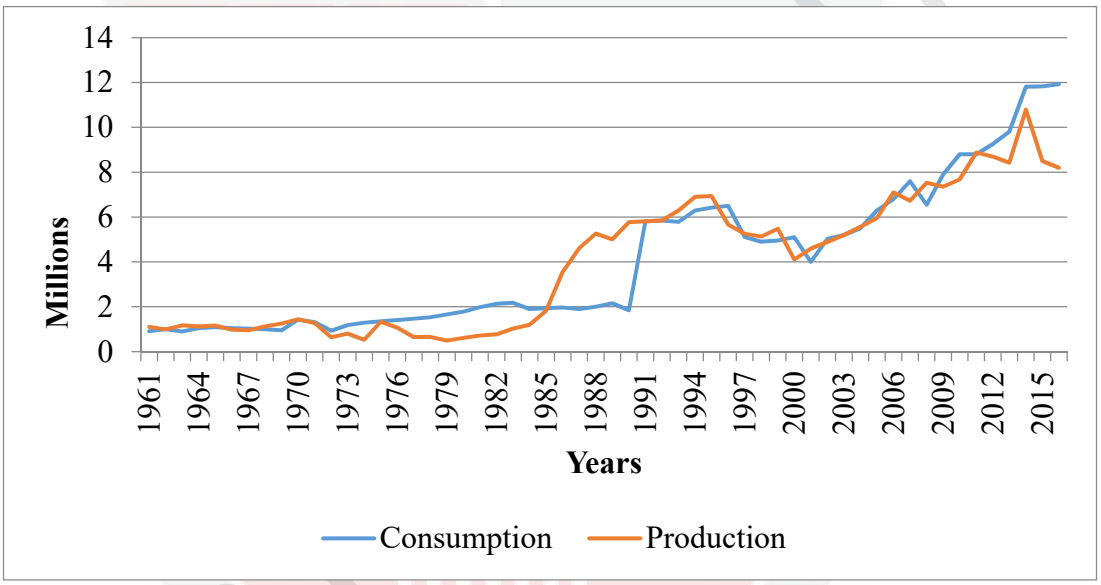

Figure 1.2 : Production and Consumption Trends of Maize in Nigeria
(Source: FAO (2015), NBS (2015))

1.1.5 Recommended Inputs used in Maize Production

Increasing output involves improving both the quality and quantity of inputs, which include the use of agrochemicals such as fertilizer, herbicides, pesticides, insecticides and irrigation in areas where rainfall is insufficient. Fertilizer is a basic input in maize production which farmers depend on for better yield, aside other variables like high quality seed, technique and farm management capacity and mechanization of agricultural practices. However, fertilizer use in Nigeria especially in north east has remained low since its introduction in the 1940s, despite it positive impacts on yields (Oseni and Winters, 2009). The estimated quantity of fertilizer used in Nigeria translates to approximately 30 kg per hectare of arable land which is far below the recommended amount of 200kg on maize crop in north eastern Nigeria and also, still lower than 150 kg presently used in Asia and Latin America (Liverpool-Tasie & Takeshima, 2013).

This means that the potential of applying more fertilizer is huge in order to get the optimum output and it holds true that there is a connection between its usage and crop yield. The more fertilizer applied in maize crop, the higher the yield, other things being equal (Liverpool-Tasie & Takeshima, 2013). Domestic supply of the product is affected by high transport costs to various destinations, Inconsistent policies, poor distribution structure and absence of capital for private-sector participation in distribution (Heisey & Mwangi, 1996; Nagy & Edun, 2002). Table 1.5 presents the the data available on fertilizer input supply and demand in Nigeira from 2002 to 2013.

Table 1.5 : Fertilizer Supply and Demand in Nigeria over a Period of 13 Years

Years	Supply	Demand
2002	628,349	556,205
2003	201,209	333,116
2004	452,298	321,509
2005	1,204,310	891,732
2006	1,446,904	1,226,475
2007	617,668	560,719
2008	844,729	797,855
2009	519,821	539,742
2010	1,763,569	1,324,183
2011	1,043,726	719,806
2012	1,799,489	1,264,987
2013	2,716,014	1,954,578
Total	**13,238,086**	**10,490,907**

Source: FAO (2015)

An important criterion for good maize crop production is the availability of good quality seeds of high yielding varieties preferred by the farmers. Seeds quality alone is known to increase efficiency by at least 10–15%. To achieve an optimum level of output in maize production, a recommended seeding rate of 20 kg/ha is appropriate (Ajeigbe et al., 2008). Pesticides, herbicides and insecticides are vital inputs used to safeguard maize crop as well. These are substances meant to prevent, destroy, repel or control any disease caused by microorganisms and unwanted weeds. Researchers indicate that a recommended dosage of 3 – 5 liters of herbicides per hectare is appropriate for weed control in maize crop depending on the soil type and the brand applied. Insecticides are chemical substances used for killing insects in different crops particularly maize and a recommended quantity of 1 - 3 liters per hectare should be used based on the brand choice (Boland et al., 2004; Onyibe et al., 2006; Dugje et al., 2009).All the inputs mentioned have the potential to boost efficiency if properly utilized, but vast majority of farmers in north eastern Nigeria often cannot meet the expense of these investments due to inadequate resources and high rate of poverty (Table 1.6).

Table 1.6 : Nigeria Poverty Rate by Geo-Political Zones (USD/Day)

Regions	Poor (%)	Non-poor (%)
National	53.60	46.40
Urban	40.11	59.89
Rural	60.58	39.42
South-South	55.90	44.10
South East	58.70	41.30
South West	49.80	50.20
North Central	59.50	40.50
North East	70.00	30.00
North West	69.00	31.10

Source: Kale (2012)

Since improved efficiency and output levels will be realized through the appropriate used of various production inputs such as land, labour, agrochemicals, fertilizer and the introduction of new production technology, microfinance is a prerequisite to gain access to such inputs particularly for the smallholder maize producers in north eastern Nigeria with little or no capital base of their own. These inputs are meant to facilitate and increase output and efficiency. Thus, the argument in the literature as reported by many empirical studies (Girabi & Mwakaje, 2013; Nosiru, 2010; Khandker & Faruquee, 2003; Asanoy, 2004) has been very consistent in terms of using microfinance to increase crop production and the living standard of credit beneficiaries probably because the credit beneficiaries were better off in assessing farm inputs, markets for their produce and adoption of enhanced farming techniques than those without credit.

According to Miller (2011), microfinance is perceived as feasible alternative in reaching out to the farmers in rural communities who largely depend on smallholder farming. Therefore, the adoption of microfinance in crop production is very critical in increasing efficiency and output as well as impacting the well-being of farmers (Meyer, 2007). Moreover, the emerging literatures on the impact of microfinance on maize production suggests that access to credit could lead to improved farmers' productivity and higher income in form of revenue and profit which could have positive impact on their well-being (Effa & Hering, 2007; Morvant-Roux, 2008; Adams & Bartholomew, 2010; Ashaolu et al., 2011; Nuhu et al., 2014).

1.2 Microfinance Activities in Other Parts of the World

Microfinance is increasingly being used to assist farmers in rural and urban centers in recent times (Miller, 2011). The introduction of microfinance has produced large theoretical literatures to address the specific problems that poor farmers experienced in gaining access to financial services at a reasonable price, particularly as a result of lack of collateral. Different types of institutions offer credit services among which are:

microfinance banks, credit unions, community banks, self-help groups, commercial banks, Non-governmental Organizations (NGOs), cooperative unions and sectors of government banks. Reports show that microfinance institutions meet the credit demand of over 200 million clients all over the world (IFAD, 2011).

Microfinance is accountable for creating and supporting new income generating activities in poor areas usually reliant on subsistence farming (CBN, 2005). One of the famous and successful microfinance programmes is Grameen bank introduced by Muhammed Yunus in 1976, with the aim of supporting the destitute and low income earners (Khan and Rehman, 2007). Today, Grameen bank is the largest microfinance programme which is based on individual-banking joint liability and has about 2.03 million debtors followed by BRAC all in Bangladesh, are possibly the top recognized instance of these small scale invention credit programs for the less privilege. It engages in rural development program (RDP) which covers about 68,000 villages within the country with the purpose of eradicating poverty and empowering the rural under privileged (Zaman, 2001). Many features have differentiated microfinance from other financial institutions. These include the small loans advanced or savings, absence of collaterals, ease of operations, others are its target as the marginalized group of debtors, and it's general employment of a group lending approach (Igbinedeon and Igbatayo, 2006; Kimotha, 2007).

According to Seibel (2005), different countries have taken various paths in microfinance. For instance, Microfinance in Germany has existed for more than two centuries and has been one of the biggest microfinance sectors. It is divided in to two; community savings funds which is known as savings banks and member-owned cooperative associations also known as cooperative banks. The spectacular success of microfinance in Germany, which pushed money lenders out of business could not be dissociated with self-help and self-reliance based on the dynamic growth of savings and local outreach with lasting house-banking relationships among others.

1.3 Microfinance Activities in Nigeria

Microfinance institutions and credit cooperatives have existed in Nigeria since decades and are the main providers of credit facilities in both rural and urban centers and these programs includes; Nigeria Industrial Development Bank (NIDB) established in 1964 with the purpose of ensuring that credit facilities were provided for medium and large scale enterprises. The bank could lend loans ranging from a minimum of 50,000 naira to a maximum of 15 million naira or 15% of NIDB's equity base but not more than 75% of the fixed assets of the project being sponsored. It was also responsible for funding small scale businesses with a total amount of not more than 750,000.00 naira (Otiti, 2007). Nigeria Bank for Commerce and Industry (NBCI) was established in 1973, on condition of supplying financial facilities such as equity investment and issuing of loans and guarantees to local enterprise such as commercial and industrial activities. Also, government established National Economic Reconstruction Fund (NERF) in 1990, with the aim of facilitating access to low cost long-term finance to small and medium scale enterprises (SMEs) and to enable SMEs to have access to funds from international lending agencies.

Nigeria Agricultural and Cooperative Bank (NACB), was established in 1975 to provide loan to agricultural sector via cooperative societies as a means of loan payment. NACB granted loans to 2,446 agricultural projects in 1990 to 6,286 in 1994 which accounted for 157% growth in the number of loans approved by the bank in five years. Also, the Nigerian government established National Directorate of Employment (NDE) in 1986 with the objective of promoting SMEs in Nigeria so as to reduce the serious problem of unemployment which was prevalent. Through the directorate, programs such as Vocational Skill Development Program, Special Public Workers Program, Small Scale Enterprises Program and Rural Employment program emerged to reduced unemployment and better the SMEs.

People's Bank was established in 1989 with the responsibility of taking deposits and lending to the poor followed by the introduction of Community Banks in 1990 for the purpose of providing non-sophisticated loans to the rural populace. Small and Medium Enterprise Development Agency of Nigeria (SMEDAN) was established by the SMEDAN Act, 2003 to accelerate the growth of Micro, Small and Medium Enterprises (MSMEs). It was meant to motivate, supervise and coordinate the growth of MSMEs sector and to serve as an instrument for job creation and improved livelihood among others. National Poverty Eradication Program (NAPEP) introduced in 2001 to provide micro-credits to the poor and to focus on means for providing skills acquisition, agricultural and extension services to rural inhabitants. In the year 2005, government launched microfinance policy, regulatory and supervisory framework. Other providers of credit facilities are the Community Banks and Esusu/Itutu/Adashi which are possessed and managed by local communities such as community development associations, cooperative societies, farmers' group, social clubs and town unions to provide financial services to the particular communities. They are endowed with the responsibilities of promoting rural and economic development at the grassroots levels (Kanayo, et al., 2013).

Agricultural Credit Guarantee Scheme Fund (ACGSF) introduced by CBN in 1977 in order to guarantee the loans granted by commercial and microfinance banks for agricultural purposes with the aim of aggravating the level of credit to the sector and to ensure incessant production. The scheme pays 75% of any unpaid default balance to the bank after the security pledges has been understood. About 97% of the loans guaranteed by ACGSF were mostly to smallholder farmers from rural areas in various Nigerian states. The total loans guaranteed from inception in 1977 to 2014 are 886,703 valued at 75.926 billion naira (CBN, 2014). Under the ACGSF, it was revealed that Microfinance Banks granted a total of 3,883 loans which was valued at 547.485 million naira, while Commercial Banks granted a total of 928 loans valued at 449.600 million naira (CBN, 2014). Central Bank of Nigeria (CBN) report (2015) indicated that the total assets and liabilities of all the microfinance banks have increased by 62.4% which represents 122.8 billion naira in 2015. Their funded up wealth improved by 152.7% given rise to 28.8 billion naira, while their depositors fund increased by 69.7% which amounted to 37 billion naira. The total assets of the microfinance banks were about 77.87 billion naira and total liabilities amounted to 39.57 billion naira (CBN, 2015). Table 1.7 presents the summary of credit intitutions and programmes based on existing and non-existing ones from 1964 to date.

Table 1.7 : Types of Credit Institutions/Programmes in Nigeria since 1964 to Date

Programmes	Years	Existing	Not Existing
NIDB	1964		-
NBCI	1973	✓	-
ADP	1974	✓	
NACB	1975		-
ACGSF	1977	✓	-
NDE	1986		-
People's Bank	1989		-
NERF	1990		-
Community Bank	1990		-
NAPEP	2001	✓	
SMEDAN	2003	✓	
Microfinance Banks	2005	✓	
Co-Operative Unions	-	✓	
Adashi/Esusu/Itutu	-	✓	
Commercial Banks	-	✓	

Source: Kanayo et al. (2013)

To improve agricultural productivity in Nigeria particularly in the rural areas, huge injection of credit is needed but unfortunately, this appeared to be the most limiting factor (Okeke & Iponmwosa, 2012). Among several factors hindering capital availability is low income arising from farm and non-farm activities, loan acquisition process, farming experience, high interest rate charges which have the capacity to affect the repayment process and climate change factor. Others are lack of guarantor, membership of a cooperative union, lack of bank accounts and lack of information about the availability of credit restricts smallholder farmers from accessing credit from formal financial institutions (Edache, 2006; Okojie et al., 2010; Ololade & Olagunju, 2012; Asogwa et al., 2014). Furthermore, reports in Nigeria indicated that only 33.33% of the rural dwellers are aware of the existence of agricultural credit schemes and microfinance banks whereas 66.67% are unaware and only 3.33% of the rural dwellers accessed loan from microfinance banks because the banks are located in the urban centers instead of rural area and this serves as one of the major deterrent to servicing their legal mandate (Ayegba and Ikani, 2013).

1.3.1 Features of Microfinance Beneficiaries in Nigeria

Microfinance beneficiaries in Nigeria, include low-income recipients households, the un-banked and under-served people especially, vulnerable individuals such as women, disabled, youths, SMSs, informal sector workers, and smallholder farmers in urban and rural areas. The loans are issued on the basis of the candidate's personality and the collective cash flow of the occupation and households. First loan disbursement starts at least four weeks after enrolment as a client or member of a solidarity group.

First repayment installment begins at about 15 days of disbursement. The repayment period is usually within six months (6) and a maximum of 12 months. However, in a case of special projects, longer period of twenty-four (24) months is acceptable. The loans may also combine a number of guarantees of single or several people. The repayment may be daily, weekly, and on monthly basis except for agricultural loans or in accordance with repayment agenda in the loan agreement (Sanusi, 2012).

In view of the importance of microfinance banks to agricultural productivity and the importance of maize production as a staple food crop and a source of calories for the poorer proportion of consumers in Nigeria where it production dominates the farming system with more than 50% of households assigning over 50% of their cereal area to it, this study collected the sample of maize farmers who are microfinance credit beneficiaries and those that are non-credit beneficiaries with the expectation that credit beneficiaries will be more efficient since increase output is directly related to improved farm techniques arising from capital accessibility, production efficiency and consequently optimum profit.

1.4 Problem Statement

Despite the importance of maize and efforts made by the government to enhance its production by strengthening of on-farm research, increasing land area under cultivation to 5.9 million hectares and provide fertilizer at a subsidy of 25%, its output continue to decline from 8.9 million tons in 2011 to about 7.2 million tons in 2016. The yield per hectare remained at 2.0 metric tons which is lower than the estimated national average of 5.1 metric tons per hectare in Nigeria. The production has failed to bridge the ever increasing demand-supply gap (Figure 1.2)

Smallholders in Nigeria produced about 70% of the country's maize output, but unfortunately they are confronted with immediate production problems associated with traditional methods of farming, shortage and high prices of farm inputs, outbreak of diseases, small farm size and shortage of capital due to low income. Thses has translated in to vicious cycle of low efficiency, low output and profit, low savings and high poverty level (Table 1.6) which eventually leads to low standard of living. This presents a challenge to the growing population of Nigeria.

The argument in the empirical literatures has been very consistent in terms of using microfinance credit to increase crop production and the living standard of farmers because credit makes it possible for them to access farm inputs and adopt enhanced farming techniques. Thus, microfinance banks enabled farmers to access free collateral credit for the procurements of farm inputs and payment of wages for their farm operations. However, some farmers could not access credit due to lack of adequate information about the formalities for gaining access to the credits from the banks, location of the lending banks from farmers' rural settlements, credit disbursement and repayment plans, lack of guarantor to guarantee the loan, marital status of the farmers, lack of membership of cooperative union, high interest rate which reduce return on investment and affect the loan repayment ability of the farmers.

In order for maize industry to continue to play a vital role in meeting the increasing cereal demand arising from rapid population growth, this subsector certainly need to develop through the assessment of technical efficiency and its determinants as well as the impact of microfinance on the efficiency of credit borrowers. This could offer valuable insight of the farmers' performance without which, management policies that can guaranty sustainability cannot be framed. Besides, literatures have shown that technical efficiency is a strong indicator of production performance and can be used as a tool for formulating effective maize production policy. The study therefore, answered the following questions;

1. What is the level of production efficiency of credit and non-credit beneficiaries?
2. What are the factors influencing inefficiency in maize farming practices?
3. What are the opinions of credit beneficiaries on microfinance in improving their well-being?
4. What is the net income level of credit and non-credit beneficiaries?
5. What are the factors affecting net income accruing to both credit and non-credit beneficiaries?

1.5 Objectives of the Study

The general objective of the study was to determine the impact of microfinance on the efficiency of maize producers in North Eastern Nigeria. The specific objectives were;

1. To determine the level of production efficiency among credit and non-credit beneficiaries,
2. To analyze the factors that influence inefficiency in the farming practices,
3. To analyze the opinions of credit benefiaries on microfinance in improving their well-being,
4. To determine and compare the net income level of credit and non-credit beneficiaries, and
5. To identify the factors affecting net income accruing to both credit and non-credit beneficiaries

1.6 Significance of the Study

Selection of the study area for research is based on it prominence in maize production and the presence of microfinance institutions. The standard of living of the people is low; signifying low income generation from both farming and non-farm undertakings and the entire output is also low owing to inadequate capital base. Investigation of resource use efficiency is required at the farm level in order to improve maize production. Where resources are inefficiently utilized, readjusting input quantities to an optimum level will improve efficiency and output. Thus, this study would increase the output level of the producers especially in meeting the growing demand of maize product. It would also generate employment opportunities, produce foreign exchange earnings, increase farmers' income and reduce poverty among the producers.

To ensure sustainability of any industry, information regarding the required quantity of inputs used during production process is very important. Therefore, this study would assist the farmers in understanding their efficiency level and the factors responsible for inefficiency in their farming practices. It also enabled the farmers to identify inputs that are over utilized and the possible adjustment.

Increase in maize production as a result of efficient use of resources would lead to decrease in costs incurred during production process and increases self-sufficiency of the producers. This study served as a pioneering work that creates awareness on the significance of microfinance credits in expanding farmers' efficiency, output, profit and well-being. This is the first study on cereal crop especially maize to apply slacks-based measure of efficiency model, slacks-based super efficiency model and fractional regression model to analyze the stated objectives. These contribute to the existing literatures on efficiency as well as maize production and serve as a guide to extension workers, researchers and students carrying out further studies.

1.7 Summary of the Chapter

Chapter one deals with the background of the study and specifically, focused on problem statement, objectives of the study and the significance of the study. The contribution of agriculture to Nigeria's development, origin and distribution of maize and it production in Nigeria were also viewed and discussed.

1.8 Organization of the Thesis

The thesis is organized into five chapters. The remaining part of the thesis is presented as follows. Chapter two begins with the concept of efficiency as it relates to production. This was followed by measures of production efficiency, methods of efficiency measurement and empirical literatures on technical efficiency were reviewed. Chapter three deals with the description of the conceptual framework, the study area, sources of data and method of sampling, the definition of variables and units of measurement, analytical techniques and empirical models were explained exhaustively. Chapter four presents the results of the data obtained from maize producers in the study area. Finally, summary of the major findings, conclusion, policy recommendations and limitations of the study were presented in chapter five.

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