AGRARIAN STRUCTURE AND RURAL DEVELOPMENT:
A SPATIAL AND ECONOMIC ANALYSIS OF AGRICULTURAL PRODUCTION UNITS IN IGALALAND, KOGI STATE, NIGERIA

JOHN ATAKPA UKOJE

A DISSERTATION SUBMITTED TO THE POSTGRADUATE SCHOOL, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN GEOGRAPHY

DEPARTMENT OF GEOGRAPHY
AHMADU BELLO UNIVERSITY ZARIA

SEPTEMBER, 2000

DECLARATION

I hereby declare that this dissertation has been written by me and that it is a record of my own research work. It has not been presented in any previous application for a higher degree.

All borrowed ideas have been duly acknowledged by means of references and quotation marks.

John A. Ukoje — Date: 26-1-2001

The above declaration is confirmed.

Prof J.A. Ariyo — Date: 26 Jan/2001
Chairman
(Supervisory Committee)

CERTIFICATION

This dissertation entitled "AGRARIAN STRUCTURE AND RURAL DEVELOPMENT: A SPATIAL AND ECONOMIC ANALYSIS OF AGRIGULTURAL PRODUCTION UNITS IN IGALALAND, KOGI STATE NIGERIA" by JOHN ATAKPA UKOJE meets the regulations governing the award of the degree of Doctor of Philosophy of Ahmadu Bello University, Zaria and is approved for its contributions to scientific knowledge and literary presentation

Prof. J.A. Ariyo
Chairman
Supervisory Committee

Prof. A.O. Ogungbile
Member
Supervisory Committee

Dr. I.A. Jaiyeoba
Member
Supervisory Committee

Dr.A.L. Bello
Head, Dept. of Geography

Prof. S.B. Ojo
Dean, Postgraduate School

AHMADU BELLO UNIVERSITY
ZARIA

DEDICATION

This dissertation is dedicated to my children Ojone, Ojochogwu and Ojodale who were very patient with me over the many years it took to complete this work.

ACKNOWLEDGEMENT

I wish to thank my major supervisor Professor . J.A. Ariyo for his guidance and very useful criticisms throughout the period of preparing this dissertation.

I wish to also to express my sincere apprecation and gratitude to Professor A.O. Ogungbile, a member of the supervisory committee, who selflessly offered his precious time and energy to make sure this work was completed. The sense of humour and father-son rapport that existed between us made this work easier for me.

I am grateful to the authority of Ahmadu Bello University, Zaria for providing a research grant used for the collection of data and the production of this dissertation.

My sincere thanks go to Mr. M.W. Shebe and Mr. Danladi Jarma for their assistance with the computer analysis.

I wish to thank my main field assistant Mr. Gabriel Monte who went through a rigorous nine weeks of field work with me. I am also grateful to other field assistants employed from all the sampled villages.

My special thanks go to my friends and relations who showed moral supports and even offered to support me financially. They include Dr. I.I. Achoba, Dr. I.A. Jaiyeoba, Mr. Samuel Ohiemi, Mr. Joseph Egwuda, Dr. S.O.S. Olorunju, Professor S.T. Lagoke, Professor O.O. Olufajo, Late Professor I.D. Erinle, Dr. J.A. Gwani, Dr. A. Agbaji, Dr. E. Oyedele, Dr. Ben Ahmed and Prof. V.A. Kolawole just to mention a few.

I am very grateful to Dr. A.L. Bello for the great concern he has shown in my work over the very short period of his headship of the Department of Geography.

I want to thank CARED CONSULTANTS Ltd. for providing special services to facilitate the production of this work on time.

I wish to express my sincere appreciation and gratitude to my wife Joy, for her financial, moral and spiritual support and especially for her patience throughout the years it took to complete this work.

I wish above all to thank God for providing everything I needed to carry out this work and for fulfilling His promise in my life.

ABSTRACT

The main aim of this study is to assess the economic efficiency of farmers in the use of agricultural production resources in southern Igalaland. In order to achieve the aim of this study, a total of 204 fields belonging 43 farmers from ten settlements were surveyed using prismatic compass, and a measuring tape to determine their sizes. Two sets of questionnaire were administered to cover soeio-eeonomie characterises of the people and their cultural practices. The Held areas were calculated. The information thus obtained was subsequently used in the analysis of factor productivity, cost and returns, and profitability of the crops cultivated'"by the farmers.

The result of the study showed that the farmers with an average family size of 16 persons cultivated an average farm size of 5.26 ha per household. They relied more on non-family labour (55.7%) for the cultivation of their fields. Sole cropping was the most dominant cropping pattern in the area because it constituted about 50 percent of the crop enterprises and accounted for about 76 per cent of the total area cultivated by sampled farmers. They also relied more on their savings, which accounted for 85 per cent of the total amount of money invested in farming.

The farmers used insignificant quantities of fertilizers, insecticides and herbicides because they were either not affordable or available or they had no knowledge of their uses.

The small-scale farmers' households were about 58 per cent of the sampled farmers, they cultivated only about 25 per cent of the area under cultivation. The small farmers had an average farm size of 2.26 ha while the large-scale farmers had 13.72 ha.

per household. The small-scale farmers were generally more efficient in the use of production resources than the medium and large-scale farmers.

Crop yields in the area were appreciable as crops like yam, maize, rice and millet had yields higher than average yields for Nigeria.

Labour was profitably used and returns to family and non-family labour were generally much higher than the wage rate for the survey year. All the selected crop enterprises were profitably cultivated. So the farmers were found to be efficient in the use of their production resources.

The results of the production function analyses for showed that seed was the most important variable that explained the variations in the yield of yam while labour was the major variable that explained the variation in the yields of maize and cassava. Both variables seed and labour, were important in explaining the variations in the yield of rice. The results further showed that the areas of production resources could be adjusted in the process *of* producing yam. maize, rice and cassava, if increase in productivity is to be sustained.

It was recommended that for improved productivity and consequently improved standard of living, the farmers in southern Igalaland should be provided with basic farm inputs like seeds, fertilizer, insecticides and herbicides; services such as tractor hiring, extension and loans; basic infrastructure including roads, clean water, and health centres. It is therefore recommended that the provision of these infrastructure, farm inputs and services in addition to regular data collection to update the information about the farmers and their socio-economic life will facilitate effective

future rural planning, for the area. Effective implementation of such laudable plans will bring about the desired rural development.

TABLE OF CONTENTS

Page

Title

Page..... i

Declaration.....ii

Certification.....iii

Dedication.....iv

Acknowledgements..... v

Abstract.....vii

Table of Contents.....x

List of Tables.....xv

List of Figures.....xviii

List Appendices.....xx

CHAPTER 1

INTRODUCTION

1.1 Introduction..... 1

1.2 The Problem Statement..... 4

1.3 Scope of the Research..... 8

1.4 Aim and Objectives..... 8

1.5 Justification for the Study..... 8

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction..... 10

2.2. Definition of Efficiency..... 11

2.3. Measurement of Efficiency..... 14

2.4. Measurement of farm size

Measurement of Input..... 15

Measurement of Output..... 16

2.4.1 Area..... 16

2.4.2 Standard Man-days..... 17

2.5 Farm Size and Productivity.....22
2.6 Farm Size and Efficiency.....24
2.7. The Definition of Rural Development.....25
2.8. The Role of Agriculture in Rural Economy.....27
2.9 Small Farmers.....28

CHAPTER 3

METHODOLOGY

3.1 Data Collection.....31
3.1.1 Sampling Procedure.....31
3.1.2 *Method of Data Collection*.....33
Primary Data.....33
Secondary Data.....33
3.2 Analytical Tools.....34
3.2.1 Descriptive Statistics.....34
3.2.2 Farm Budget Analysis.....34
3.2.3 Production Function analysis.....36
The Linear Function.....36
The Quadratic Function.....37
The Cobb –Douglas Function.....38

CHAPTER 4

THE STUDY AREA

4.1 Location of the Study Area.....40
4.2 Physical Setting.....40
4.2.1 Relief.....40
4.2.2 Climate.....45
4.2.3 Vegetation.....53
4.2.4 Soil.....55
4.3 Human Setting.....55
4.3.1 *Population*.....55

4.3.2 Social Organization.....56
4.3.3 The Economy.....57
Agriculture.....57
Agricultural Practices.....58
Livestock.....61
Fishing.....61
Forestry.....61
Hunting.....63
Labour for Agricultural Production.....63
Industry.....64
Trade.....64

CHAPTER 5

PRESENTATION OF RESULTS AND DISCUSSION

5.1. Socio- Economic Characteristics of Farmers in Study Area.....66
5.1.1 Size of household.....66
5.1.2 Age and Educational Level of sample farmers..... 67
The Age on sample farmers..... ..67
Education Level of Sample Farmers.....69
5.1.3 Land Tenure.....69
Land Ownership.....69
Land Acquisition.....70
5.1.4 Farm Size.....72
5.2 Cropping Pattern.....73
5.2.1 The Selected Crop enterprises.....73
5.2.2 Sole cropping.....78
5.2.3 Double cropping.....86
5.2.4 Relay cropping.....88

KASU

5.2.5 Mixed cropping....89
5.3 Analysis of the Resources of the Selected Crop Enterprises....94
5.3.1 Farm Land....94
5.3.2 Farm Labour....99
5.3.3 Farm Capital....99
5.3.4 Seed....100
5.3.5 Fertilizer....102
5.3.6 Herbicide....103
5.3.7 Insecticide....103
5.3.8 Costs and Returns....103
5.3.9 Sole Crop Enterprises....104
5.3.10 Two- Crop Enterprises....106
5.3.11 Three-Crop Enterprises....107
5.3.12 *Cost of Labour by Scale of Production*....108
5.4 Crop Yield....110
5.4.1 Yam....110
5.5.2 Maize....111
5.5.3 Rice....111
5.5.4 Cassava....111
5.5.5 Millet....115
5.5.6 Cowpea....115
5.5.7 Melon....115
5.6 Efficiency Measures....115
5.6.1 Value of output per input cost....119
5.6.2 Returns to labour....120
5.6.3 Returns to Labour by Scale of production....123
5.6.4 Labour productivity and profitability index for selected crop enterprises....127
5.6.5 Output required to cover cost....129
5.7 Production function analysis....130
5.7.1 Yam production....130

5.7.2 Maize production.....133
5.7.3 Rice production.....133
5.7.4 Cassava production.....134

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 Summary.....135
6.2 Conclusion.....137
6.3 Recommendations.....138

LIST OF TABLES

Page

5.1 Age Distribution of Sampled Farmers.....67

5.2 Age Distribution of Wives of the Farmers.....68

5.3 Age Distribution of Children of the farmers.....68

5.4 Age Distribution of Relations.....69

5.5 Years of Acquisition of Farmlands.....72

5.6 Area of Land Covered by the selected crop enterprises.....76

5.7 Area and Fields under Cropping System.....77

5.8 Cropping system in Southern Igalaland.....78

5.9 Area under Major Food Crops.....79

5.10 Occurrence of Crops in cropping systems.....80

5.11 Percentage Occurrence of Sole Crops in fields by villages.....81

5.12 Percentage of Households cultivating the sole Crops.....82

5.13 Percentage Occurrence of fields by villages.....83

5.14 Area under Cropping Systems by category of Farms.....84

5.15 Occurrence of fields in cropping systems by category of farms / villages.....85

5.16 Occurrence of Households in cropping systems by category of Farms.....87

5.17 Percentage Area under cropping systems.....89

5.18 Area under Different types of crop Mixtures.....90

5.19 Crops and crop Mixtures.....92

5.20 Percentage Occurrence of crop mixtures by Number of fields by villages.....93

5.21 Percentage Occurrence of crops by Households by villages.....93

5.22 Average labour used under farm operations.....97

5.23 Average Labour Expended in the Production of some selected crop Enterprises.....98

5.24 Labour Input by Scale of Production in selected crop Enterprises.....99
5.25 Source of Farm Capital.....100
5.26 Average Quantity of Seeds and planting Materials planted per household.....101
5.27 Quantity of Fertilizers, Herbicides, and Insecticides used by farmers.....102
5.28 Gross Margin Analysis of the Selected Sole crop Enterprises.....104
5.29 Cost of Labour for the Production of some selected crop Enterprises in Naira per Hectare.....105
5.30 Cost of Labour Input by Scale of Production for sole Yam, Maize, Rice and Cassava Crops in Naira per Hectare 105
5.31 Gross Margin Analysis of selected Two crop Enterprises.....106
5.32 Gross Margin Analysis of the Selected Three-crop Enterprises..... 108
5.33 Mean Cost of Labour Employed by all sampled farmers for crop Production.....109
5.34 Cost of Labour for small, Medium and Large-Scale Farmers.....109
5.35 Yields in Kilogrammes per Hectare of the Selected crop Enterprises.....110
5.36 Value of Output per Input cost 119
5.37 Value of Output of crop Enterprises per ₦100 worth of Labour Input.....120
5.38 Returns to Labour for all the selected crop Enterprises.....121
5.39 Returns to family Labour for some selected crop Enterprises.....122
5.40 Returns to Non- Family Labour for some selected crop Enterprises.....122
5.41 Cost and Return Analysis for Yam Enterprise.....123
5.42 Cost and Return analysis for Maize Enterprise.....124
5.43 Cost and Return Analysis for Rice Enterprise.....125
5.44 Cost and Return Analysis for cassava Enterprise.....126

5.45 Labour Productivity and Profitability Index for Selected crop Enterprises.....128
5.46 Labour Productivy and Profitability Index for Yam, Maize, *Rice and Cassava crops by scale of Production*.....129
5.47 Regression Estimates Derived from the Linear Production function of some crop enterprises.....131
5.48 Regression Estimates Derived from the Cobb- Douglas Function of some Crop enterprises.....132

LIST OF FIGURES

4.1 The Study Area: Sampled Villages.....41

4.2 Kogi State: The Study Area.....42

4.3 The physiographic units of the Study Area.....43

4.4 The Lithological Map of the Study Area.....44

4.5 Monthly Rainfall for Lokoja 1992 –1993.....47

4.6 Monthly Rainfall for Ayangba 1991-1993.....48

4.7 Monthly Rainfall for Ofu 1992-1993.....49

4.8 Monthly Mean Rainfall for Ayangba 1991-1993.....50

4.9 Monthly Mean Rainfall for Idah 1935-1972.....51

4.10 Five and ten year running mean for mean annual rainfall for Idah (1935 –1972).....52

4.11 Cumulative deviation from the Mean for Idah Mean annual Rainfall 1935-1972.....54

4.12 The study Area showing forest Reserves.....62

5.1 Method of Acquiring Farmland 71

5.2 Percentage of Households by category of farmers.....74

5.3 Percentage of total area under cultivation by category of farmers.....75

5.4 Total Farm Land under cultivation by sampled farmers in the sampled villages.....95

5.5 Yield of Yam in Kilogrammes per Hectare for the World. Africa, Nigeria Cameron. Solomon Is and the study area . (1991-1993).....112

5.6 Yield of Maize in Kilogrammes per Hectare for the world. Africa, Nigeria, Cameroon, the USA and the study area 1991-1993.....113

5.7 Yield of Rice in Kilogrammes per Hectare for the world. Africa, Nigeria, Australia and the study area (1991-1993).....114

5.8 Yield of Cassava in Kilogrammes per Hectare for the World, Africa, Nigeria, Cameroon, Barbados (1991- 1993).....114
5.9 Yield of Millet in Kilogrammes per Hectare for the world, Africa, Nigeria, Cameroon, Japan and the study area (1991-1993).....117
5.10 Yield of Cowpea in Kilogrammes per Hectare for the world, Africa, Nigeria, Cameroon, Libya and the study area (1991-1993)... 118

LIST OF APPENDICES

A Questionnaires.....145

B Yield of Selected Crops for the World, Africa, Nigeria and some selected Countries.....154

CHAPTER 1

INTRODUCTION

1.1 Introduction

Agriculture is a complex industry. The pattern of farming is extremely varied between one region of a country and another. According to Britton (1974 p21) "These variations are found in the size of farms, the way in which the land is used, the efficiency of production, the amount of labour and the types of equipment employed and many other respects". He further emphasized that

> *"Structural studies are concerned with the analysis of these differences and the appreciation of their significance in relation to agricultural policy and the future development of this complex industry. They concentrate mainly upon the way in which the land, crops, livestock, labour, equipment output and income are distributed among the agricultural holdings of the country, and they lay emphasis upon the fact that the structure is undergoing changes under the pressure of technical and economic circumstances".*

The ultimate aim of structural studies in agriculture is therefore, to improve the production of crops and livestock.

The production of food, fibre, and related products is the dominant economic activity which is essential to man's continual survival on earth. The primary purpose of this economic activity embraced in agricultural production is the meeting of the physiological needs of man, in spite of the fact that agricultural production in most economies involves

products that go beyond meeting these needs. Unless the basic needs for food and fibre of a society are met its economic activities are directed to little else (Sills, 1968).

Food is a basic human need but the access to food is still routinely denied to at least 800 million people, or 20 per cent of the population of developing countries (The Institute of Development Studies, 1995). Although the urban poor suffer similar fate it is mainly the rural poor who are deprived of this basic physiological need. According to F.A.O. (1994 p.7) rural poverty in 1994 meant:

> *subsistence on the meager earnings of wage labour or unreliable harvests from small plots of land. It means raising a family without safe drinking water or proper sanitation, suffering disease or injury without medical assistance. In times of unemployment or crop failure, it means living with the pangs of hunger - and the risk of death by famine.*

The majority of the world's poor are rural workers who may be wage earners, self-employed subsistence owner-occupiers or landless labourers (I.L.O., 1978). The victims of rural poverty number close to 1000 million people, or almost 20 per cent of the world's total population and this number is growing everyday. In 42 least developed countries, as many as seven in 10 of the rural population were poor (F.A.O., 1994.)

The main objective of rural development is to reduce the incidence of poverty. Thus McNamara defined poverty "as predominantly a rural problem which could be solved by raising the low productivity of the millions of small subsistence farmers" (Williams, 1981, p. 21). International Fund for Agricultural Development (IFAD) has found that while progress had been made by several developing countries in reducing the percentage of the rural population in poverty, the absolute numbers of rural poor had increased in the 1980s, sometimes significantly (F.A.O., 1994). Hence it is now becoming increasingly recognised that the improvement of the conditions of life and work of these millions of rural dwellers is in large measure dependent upon the extent to which they can be mobilised - both to help themselves and to contribute to national development (ILO, 1978). But the job of poverty

reduction in rural or even urban areas is a difficult one. Developed countries, which started the battle very much earlier, still have pockets of incidence of poverty in their rural and urban areas.

The population of Nigeria was estimated by Norbye (1983) to be 83 million in 1978. . Out of this 79 per cent were living in rural areas and about 25 million or 38 per cent of them were living in absolute poverty. Therefore, the predominant incident of poverty in Nigeria is rural poverty, which is largely caused by the very low incomes from farm enterprises. In order to reduce poverty or increase the standard of living of rural people, rural development performance must take into cognisance the low production and low efficiency in agricultural and non-agricultural enterprises collectively (Heyer, 1981; Norbye, 1983). The most effective way of reducing rural poverty, therefore is to improve on the production and productivity of potential rural resource base.

The standard strategies for reducing rural poverty have not been so successful especially in developing countries and particularly in Africa. IFAD has maintained that "standard poverty reduction strategies which regard the poor as passive beneficiaries of eventual economic success have been a striking failure" (Gallen, 1993). IFAD's report further showed that standard approaches such as structural adjustment and "trickle down" economics have been unable to stem the growth of rural poverty because resources have been generally channeled to urban areas and large producers while aid to small farmers was viewed as a costly act of charity. So structural adjustment as a path to reduce poverty focuses on the non-poor and merely provides welfare support to those most adversely affected by the inflation, devaluation and loss of subsidies that generally accompany adjustment. On the other hand, the World Bank has claimed, "a majority of its agricultural lending has been to rural development projects in which more than half of the direct benefits have accrued to the rural poor" (Williams op cit. p.21). But the Bank had singled out Africa "as the region where its projects have marked the least success in reducing poverty" (Gallen, 1993, p.39).

Governments and non-governmental organisations (NGOs) have failed to reduce poverty in many developing countries because they did not rely upon and bolster local knowledge and resources. The rural poor were not made partners in the growth process (Ibid). The rural farmers should form the main focus in any attempt to reduce poverty in rural areas. Gallen (op cit) emphasized that the key to poverty reduction is enabling small farmers to dramatically increase production of staple crops, arguing that growth based on the production of goods for export is unattainable for most of the developing world. He further reiterated that investments aimed at raising small-scale rural production can in fact "trickle up" to stimulate economic growth, citing Burundi and Cameroon as African examples.

Because food is so important to man, agriculture has for ages been the mainstay of rural economy while farming has been the main occupation of rural people. The subsistence of rural people and the development of rural areas depend to a large extent on the level of productivity of agriculture, which in turn determines the level of well being of rural farmers.

In spite of various efforts made towards reducing poverty in rural Nigeria since the 1940s, the country has not witnessed an appreciable change in living conditions of rural people. The search for the knowledge of the level of performances of rural farmers with the view to increasing their levels of productivity could be one of the ways of improving their means of livelihood and thereby moving them above poverty line.

1.2 *The Problem Statement*

The majority of the world's population is still overwhelmingly rural but more interest has been shown by social scientists in towns and town dwellers. To neglect this majority amounts to slowing down the pace of the national development process and/or grind it to a halt if not set a retrogression process in motion (Olayide, 1975).

The main occupation of this rural majority is farming. Technological advances have increased the earth's food - producing capacity several hundred folds since agriculture began. Despite these advances, hunger remains the daily lot of much of humanity (Brown, 1977). Increased agricultural productivity is essential to sustain a growing population, maximize the contribution of agriculture to national development and increase the income of small farmers (FAO, 1983). Furthermore, an econometric analysis of the relationship between agricultural growth and poverty by FAO (1988) has shown that the higher the agricultural gross domestic product (AGDP) per capita of agricultural population the lower the rural poverty. So by increasing the efficiency of the small-scale farmers, their Well-being will be improved. But this depends on the farmers' access to production resources, which they have to allocate efficiently in order to attain higher productivity. It has been observed by Williams (1981) that the efficiency of peasant producers in using resources contrasts sharply with the inefficiency of government institutions in providing those resources. This points to the fact that the main cause of inefficieney of small farmers is the government institutions' inability to provide key inputs and infrastructure like chemical fertilizers, agro-chemicals, favourable price policy and all weather motorable roads.

In Nigeria, food supply had been stable up to the fifth and sixth decades of the twentieth century. After this period production could no longer keep pace with the increasing population. In spite of this situation over 90 per cent of Nigeria's total food production came from small farms while over 60 per cent of the country's population earned their living from these farms (Worz, 1985; Olayide, 1980). According to Olayide (1980), the small farmer produces more than 98 per cent of the food consumed in Nigeria with the exception of wheat; and small farms constituted about 99 per cent of all output of most crops grown in the country.

The food scarcity of the 1970s in Nigeria brought about the urgent need for supplementary sources to fill the food gap left by the small farmers. One of the suggested

methods of filling this gap was to mobilise farmers to increase agricultural production through the Agricultural Development Projects (ADP). Under these projects, large-scale farmers were encouraged at the expense of the small-scale farmers.

The farmers in Igalaland had the opportunity of having one of such projects covering the entire area - the Ayangba Agricultural Development Project (AADP). The project was designed to provide a basic service package of crop, livestock, forestry, fishery and infrastructural development including supporting and commercial services. From the farmers' point of view, the project had failed to achieve its planned objectives within the first three years of the planned five-year World Bank management period. There were however, modest increases in farm produce. This and the overall improvements were primarily due to spontaneous responses to infrastructure and services like marketing organizations, roads and transportation, government incentives, inducements and extension service campaigns (Ukoje, 1985). During the project the farmers did not benefit much from the overall programme. Post project observations show that the situation has worsened because the established infrastructure and services could not be maintained and sustained (Omeje, 1994). The farmers at present are getting poorer and poorer in spite of opportunities to improve upon their standard of living if given the basic production resources or agricultural inputs like fertilizers and agro-chemicals. They are eagerly looking for a way out of their present situation.

Some Nigerian non-agriculturists have claimed that small-scale farming is inefficient and should therefore be replaced by large-scale farming which should be mechanised as well as being a public enterprise (Worz, Op. cit.). But Nweke and Akorhe, (1982) warned that if the policy at that time were inclined towards large-scale farms it would result in wastage of scarce resources in greater shortage of food and other agricultural products. He further observed that experiences from Nigeria's farm established as public enterprises had shown that such ventures are in fact wastage of scarce resources. It is implied therefore that small producers should be given the much-desired attention that

would motivate them to produce enough food and fibre for the country's needs.

Scarcity of imported raw materials has also forced some companies to look inwards by going into the process of producing their own raw materials locally. Wealthy individuals have taken to large-scale farming as a business enterprise. But the country has not yet felt the impact of these large farms, which are expected to bridge the gap between the demand and the supply of agricultural products.

Olayide et al (1980, p.23) asserted, "Domestic food supply may not be able to meet this demand except in the event that sufficiently large numbers of new farmers move into agriculture or the average size of farms increases substantially". He however, ruled out the possibility of new farmers moving into agriculture because of the stiff competition alternative employment opportunities would offer it under an expanding economy. So he observed that substantial increases in the average size of farms would depend on improved methods of cultivation and the country's best prospect hinged on improved technology and enhanced productivity.

Olayide (Op cit, p.23) opined that the modest increases in production of many crops in the past years had been as a result of increases in the cultivated areas rather than increases in both cultivated areas and productivity. Similarly, in his earlier study of the Kano closed settled zone, Mortimore (1965) observed that long and continued occupation by immigrant groups gave rise to increasing intensity of settlement leading to a situation where over 80 per cent of the surface area was brought under cultivation. In order to provide for a continued increase in population, he further observed that an increasing intensity of land use was the way out. This generates the question, as to what would happen to the agricultural sector of this country if agricultural land runs out as a result of increases in cultivated areas? Does the answer lie in the efficient use of the available agricultural land resources? Since land is relatively fixed and inelastic, will continuous sustenance of the people and industries depend to a greater extent on the efficient use of land and labour resources to bring about increased productivity?

Hence the main concerns of this study is to determine the efficiency of agricultural production units in Igalaland with a view to using the information obtained as a tool for assessing the level of the farmers' performance and thereby proffer a better method of improving their productivity and consequently their well-being.

1.3 *Scope of the Research*

This study cannot possibly cover all the various aspects of agricultural production for lack of fund and time. It is therefore limited to the crop enterprises of sampled households within the study area. Although initial attention is given to all the production units, emphasis will be laid on small-scale farmers in the study area.

1.4 Aim and Objectives

This study uses an economic tool of analysis to determine the level of economic efficiency in agricultural production in rural Igalaland so that effective ways of increasing agricultural productivity could be offered. Hence, the main aim of this study is to determine the economic efficiency of farmers in Igalaland with the view to using the information to measure the level of performance of rural farmers in agricultural production. This will in turn be used to proffer solutions for improving the level of agricultural productivity and well being of rural farmers.

The specific objectives of the study are:

1. to examine the socio-economic characteristics of farmers in Igalaland;
2. to examine the cropping patterns in Igalaland;
3. to determine the cost and returns of the production units;
4. to determine the factor-productivity of crop enterprises.

1.5 Justification for the Study

Nigeria's current rate of population increase stands at about 2.80 percent per annum (National Population Census, 1998) and the rate of agricultural growth is about 5.2 per cent

per annum (Ukpong, 1995). For all Nigerians to be well fed, there must be either an increase in agricultural growth rate or a decrease in the rate of population growth at a rate that is commensurate with the rate of agricultural growth. Even if serious and effective measures are now taken to control the rate of population increase, it will take many years before the effects of such measures could be felt. On the other hand, effective agricultural measures in the form of stable or increase in crop prices and adequate supply of inputs like fertilizers can motivate farmers to double their crop yields in a season. Therefore it is important to continue to increase the country's agricultural production in order to be able to feed the ever-increasing mouths and meet industrial and foreign exchange requirements. These much-desired increases in agricultural production can only come from a rapport between the researchers who study agricultural systems and produce improved varieties of crops and the farmers who translate the results of the researches into reality.

The job of feeding the nation has been virtually borne by the small-scale farmers who by the beginning of the 1970s were producing about 99 per cent of all the output of most crops grown in Nigeria (Olayide, et al 1980). They need to be encouraged to improve upon their present level of production. But the relatively recent appearance of "large-scale" farmers in the last decade, while it is welcome, deserves a close study to ensure that the original food producers who constitute at least 60 per cent of the country's population are not rapidly displaced to the detriment of their own means of livelihood and the country's economy.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

Food is one of man's basic needs. It is so important that man has tapped much of his ingenuities and energies in its domestication and production. Although he has made outstanding achievements in food production, not every community or individual has adequate fulfilment of this need. Man's initial success in food production encouraged him to produce other agricultural products and to continue to research into ways of producing more of such products in order to meet the growing needs of his increasing population.

This agricultural production "depends upon the natural growth and reproduction of plants and animals, but farmers take control of these processes and stimulate them to yield food and other commodities for human consumption" (Upton, 1976, p.3). Farmers need productive resources to effect agricultural production. These productive resources have been grouped into four parts by Upton (1976, p.3) as (i) natural resources ii) labour (iii) capital and (iv) management. Upton defined natural resources as consisting of those gifts of nature which are not the result of human effort. These gifts include land, water and local climate. Land is sometimes used to cover all the physical resources. Land is also defined as the "original and indestructible powers of the soil" (Ibid, p. 3).

Labour is, on the other hand, described as the manual or mental, skilled or unskilled "effort of human beings, including that of farmers, their families and the hired workers" (Upton, Op cit, p. 3). Labour may become more productive as a result of time and effort devoted to training and education.

Capital is seen as the resources, which are the result of past human effort. Capital covers a wide variety of "items ranging from durable capital such as buildings, dams, roads and machinery to stocks of materials like seed or fertilizer which may be used up within a

single season" (Upton, Op cit, p.3). It is understood that money is central to the procurement or production of these capital goods. Money is not regarded as wealth or capital in a modern economy but it can be exchanged for capital goods or any other kind of goods. However, an individual can consider his money as wealth. For this reason the businessman looks upon money as capital and assess the value of his stocks and assets in terms of money. The capital required by a newly formed company is stated as a sum of money. When people invest by buying shares in a new company they purchase them for money because it can be converted into real capital goods - factory buildings, machinery, raw materials, etc. (Hanson, 1977). Farmers starting the business of farming will equally need money as initial capital.

Land, labour and capital resources are organised into productive units called farms in agriculture. In economics a farm is defined as "all the resources under the control of one individual or group of individuals who take joint decisions. In this sense a farm may be made up of several separate blocks of land" (Upton, Op cit, p.4). The success of a farmer therefore depends on how efficiently he can combine these productive resources.

2.2 Definition of Efficiency

According to Johnston (1994) efficiency is the measure of work achieved relative to the energy expended. This physical concept has been appropriated for analysis of capitalist economies by relating the volume of output to input usually measured in monetary terms. The concept of efficiency is thus similar to productivity. This concept is now applied to all productive and non-productive activities within a capitalist economy as a means of evaluating performance and providing targets for its improvement.

Efficiency, to a farmer, might mean the achievement of a high output from his land and being efficient might mean generating high levels of business profit (Britton and Hill, 1975).

To an observer of the internal structure of the agricultural industry efficiency might

472684

be seen as the relationship between the value of the outputs of farms of different sizes and types to their respective production costs (Ibid).

At the national level however, efficiency of agriculture would involve measuring how effectively agriculture uses its share of the national resources of manpower, energy, land area and so on, in comparison with other sectors of the economy (Britton and Hill, 1975).

For their study Britton and Hill (1975) defined efficiency as the greatest possible product to be achieved from a given stock of resources or conversely when a minimum input of resources is used to produce a given level of output. They noted that when efficiency is at it peak it would not be possible to achieve a higher level of production by redistributing resources of land, capital, labour or management.

Similarly, "an economy can be said to be using its productive resources efficiently when no reallocation of resources can bring about an increase in production" (Solmon, 1976). According to Solmon, efficient resource use is the primary means of obtaining the goal of maximization. But this does not mean that an economic system which succeeds in allocating its resources with perfect efficiency will be assessed as being satisfactory. He therefore advocated for the need to sacrifice a certain measure of efficiency in order to gain some other value, such as stability and equity (Ibid).

According to Upton (1976) a farmer is economically efficient if he uses the least - cost combinations of resource inputs. However, the output achieved from such a combination of productive resources depends on climatic conditions and other factors beyond the farmer's control, such as the location of markets.

Efficiency is "often used synonymously with that of productivity, the most common measures of which relate output to some single input" (Lund and Hill, 1979) p. 145). They however cautioned that the "use of such measures may lead to misleading conclusions about efficiency since the various inputs into the farm production process need not be combined in fixed proportions". They on the other hand, recommended that comparisons be

made on the basis of measures, which relate output to all associated inputs when studying farm performance.

The efficiency concept is difficult to define and it is said to lose its usefulness under real world conditions of uncertainty and costly information (Pasour Jr. 1981). Thus Pasour Jr. reviewed three approaches to the definition of efficiency under real world conditions. The first approach is where no producer or market under real world conditions would be considered efficient if it is measured against the 'perfect market' norm. Hence inefficiency is an indication that a superior outcome is attainable by the decision maker and that the benefits of achieving this arrangement exceed the costs.

The second approach is where individuals are always efficient under traditional economic assumptions. "The world is efficient if the model describing it sufficiently specifies the gains and costs to make it so". That is to say that if the decision maker is assumed to maximize subject to the constraints faced, the individual is then necessarily efficient since the action selected is at least as good as any feasible alternative.

The third approach utilizes the fact that under real world conditions there is always a state of partial ignorance on the part of decision makers concerning market opportunities. With this in mind, an action is defined "as inefficient when the entrepreneur places himself in a position he views as less desirable than an equally available alternative state". So inefficiency in this case is as a result of the entrepreneur's failure to notice profit opportunities.

Efficiency is a subject with many components of which the most relevant one to this study is economic efficiency. This is defined as the maximum average output per employee, which depends on the quality of labour as well as other factors of production including capital and entrepreneurship. Farrell (1957) made a distinction between technical efficiency and allocative efficiency. Allocative or price efficiency measures a firm's success in choosing an optimal set of inputs while technical efficiency measures a firm's success in producing maximum output. The product of these technical and allocative

efficiencies describes economic efficiency (Farrell, 1957, Russell and Yong, 1983, Herdt and Mandac, 1981). It is the degree to which allocative efficiency and technical efficiency are achieved that is commonly referred to as production efficiency (Mijindadi, 1980).

2.3 Measurement of Efficiency

"The only sensible measure of efficiency upon which policy conclusions can be based is a measure which takes into account all the measures used in relation to output" (Britton and Hill, 1975, p.11). Since such sources are measured in different units (e.g. land in hectares and labour in man-days) a common unit (through valuations) would be needed to facilitate the calculation of the ratio of the output to the inputs. Since according to Pasour (1981), efficiency inevitably involves valuations, its measurement must be based on the costs and returns, which motivate the individual decision maker.

If efficiency is to be related to a farm's internal revenues and costs one could attempt to measure inter-farm variations in efficiency through the estimation of production functions (Lund and Hill, 1979).

An alternative method for measuring efficiency was outlined by Farell (1957). Lund and Hill (1979) reviewed this method and observed that it was:

> *Based on the concept that there is a 'best practice' technical efficiency frontier from firms such that whilst some firms may be operating at the frontier (i.e. at the maximum attainable technical efficiency) most firms will lie within it. On the basis of an assumption of constant returns to scale, or alternatives for firms of a given size, the method permits a firm's overall economic efficiency to be decomposed into separate technical and allocative (price) efficiencies.*

The practical value of this method is reduced by the sensitivity of its results to errors of measurement since the very small number of observations, which appear to lie on it, determines the location and shape of the efficiency frontier.

There is also the total factor productivity method, which is more widely used to measure efficiency. For instance, the efficiency of the i^{th} firm could be measured in the

form of:

$$Ei = \frac{(WLi + rKi)}{Vi}$$

Where,

$$Vi = (wiLi + riKi)$$

Li and Ki = labour and capital inputs of the i^{th} firm.

Wi and ri = actual rewards to these factors paid by the i^{th} firm.

W and r = either their particular i^{th} firm value (wi, ri), or some other (e.g. social opportunity cost) values (w*, r*).

It was observed that if the actual rewards to labour and capital are defined comprehensively so as to exhaust net output (i.e. w=wi and r=ri) the efficiency measure will equal unity for all firms.

Although neither the Farrell nor the factor productivity method made enough allowance for the dynamic nature of a firms' behaviour, subsequent modifications of these methods and some others have rendered them more flexible for applications involving many factors (see Lund and Hill, 1979; Lund 1983; Timmer, 1971; Russell and Young 1983).

2.4 Measurement of Farm Size

The most commonly used measures of business size can be broadly divided into two. The first are those calculated on input and the second those calculated on output.

Measurement of Input

These include:

(i) farm hectareage which is the input of land;

(ii) standard man-days, which is the theoretically required input of labour;

(iii) the value of capital tied up in the business; and

(iv) the value of inputs used in a year.

Measurement of Output

Among the measurements of output are:

(i) physical data such as the number of broilers produced per year on a poultry holding;

(ii) value data such as the total value of milk sold from a dairy farm.

At present official statistics concentrate on hectareage and standard labour requirements as the principal measures of farm size. These two requirements are treated below under area and standard man-days.

2.4.1 Area

Farm size was commonly taken to be synonymous with farm hectareage. But when farms are considered as business, hectareage no longer remains the most appropriate measure. This is as a result of variations in the proportion in which land and other factors of production combine together in the production process, mainly between types of farming as well as between farms of the same type. If one could be sure that all the factors of production are linked in an unvarying way with hectareage, then farm hectareage could be taken as an acceptable indicator of business size.

Hectareage could be misleading when used as a basis for comparing farms of different types. When measured in any way other than hectareage a dairy farm of say five hectares may be a much larger business than a crop enterprise of the same hectareage. Thus it has been observed that soil quality and location obviously affect the quantity of other factors used with land and also the output achieved from them. Some studies have measured the farms total land value or rental value in substitution for hectareage although this is imperfect because such values are influenced by other factors other than soil quality (Britton and Hill, 1975).

2.4.2 Standard Man-days

The standard labour requirement of a farm in standard man-days (Smds) is an alternative measure of size, which has the advantage of taking into account the intensity of land use. Standard man-days "is based on estimates of the annual requirements of manual labour 'needed on average for the production of crops and livestock with an addition for essential maintenance and other necessary tasks'. A single Smd represents 8 hours manual work for an adult male worker under average condition" (Britton and Hill, 1975,p.17).

Every farm product has its own smd requirement. The total smd requirement for a given farm enterprise is the product of the area or number per head and the unit smd equivalent. Hence the total smd equivalent for the entire farm business is the aggregate of the smd requirement of all the constituent enterprises. The total smd requirement is supposed to be very closely correlated with total farm output. However, there exist substantial inter-farm variations in both output per hectare and output per work as a result of differences between farms in soil fertility, the skill of the work force and related factors (Hill and Ingersent, 1977, pp.12-13). According to Hill and Ingersent (1977) it is assumed that inter-farm variations in output per standard man-day are smaller than variations in output per worker since smd equivalent are based on labour requirements not the labour actually employed.

In the United Kingdom (U.K.) for example, the yearly norm for full time agricultural work is 275 smds. On this basis over two-fifths of U.K. agricultural holdings are categorised as being too small to provide full-time employment even for one man.

Although standard man-days are not perfect or the sole valid measurement of business size, they are less distorting than a measure based on hectareage. They are also more closely linked to most other measures of business size, such as the annual value of output or the cost of inputs, than is hectareage. While these other measures may be preferable, they are not widely available. Standard man-days therefore form a valuable

proxy. It can only be used to make size-of-business comparisons between different time periods if standard labour requirements remain constant (Ibid, pp.17-18).

Britton and Hill (1975) used gross output per .100 total inputs measure of farm efficiency in their studies. This measure was however replaced in 1973/74 by a new and slightly different measure termed 'total farm enterprise output'. The latter was used by Lund and Hill (1979). That is Lund and Hill used farm Management Survey (FMS) data that provided performance measures for farms classified by hypothetical labour inputs (standard man-days) and not by actual output while Britton and Hill considered classifications by both smds and farm area.

According to Lund and Hill (1979) "the use of an actual input as a measure of farm size will in general tend to indicate a decline in performance with increasing output where none exists". The use of a measure based on hypothetical inputs for given output avoids this particular problem except for a single input where it ignores the different types or combinations of output. On the other hand, a corresponding bias in the other direction would occur if farm size was measured by output or smds when the prime interest lay in farm size as measured by area.

Despite these considerations Lund and Hill's (1979) conclusions about farm performance ratios were broadly in line with those of Britton and Hill (1975). Therefore performance measures across farms with differing smds or areas may be required for policy purposes.

In spite of Lund and Hill's conclusions highlighted above, Sutherland (1980) criticised their measurement of farm size in standard man-days instead of areas (hectares) claiming that this exaggerated the extent to which performance improved with size increase because of the bias introduced. According to Lund (1983), Sutherland argued that:

> *A farm which is efficient enough to use less than the 'standard' input of labour for its actual intensity of operation will be allocated to the large smd size bracket while an inefficient farm will be allocated to a size which is smaller than the size which would correspond to its*

> *actual input of labour. This systematic misclassification means that efficiency will appear to increase more rapidly when size is measured in smd than when the efficiency of the same farms is analysed in terms of area sizes.*

In his reply, Lund (1983) asserted that when efficiency is measured by a ratio of the value of a farm's total outputs to its total inputs, a comparison of efficiency with output-based measures of size will tend to suggest a more positive, or less negative relationship than comparisons with measures based on the actual use of individual inputs, and vice-versa. This, according to him is because a ratio will tend to be more positively related to component parts of its numerator than to component parts of its denominator.

In spite of the lack of a generally accepted measure of firm size in the economics literature to guide the choice in the specifically agricultural context, Lund argued that land area is a poor economic (as opposed to geographic) measure of farm size since land is so variable in its agricultural attributes and quality and farms of different types can require vastly different areas of land for the same value of output.

However, the value of output, or income in a particular year can also be misleading since both can fluctuate erratically (e.g. with localised crop successes or failures) or perversely with the volume of output (e.g. as a consequence of widespread crop successes or failures). He tried to solve this problem by offering the following possibilities:

(i) To value a farm's typical output of its various products at normalised prices or profitability. However, such a measure would still be primarily output-based and reflect differences in typical yields of, say, milk or crops.

(ii) To base the farm size measure on the farm's stockings of different types of animals or areas sown under different crops and weight these together in some appropriate way. Alternative weightings based on the typical amount of manual labour involved per animal or unit crop

area and on the typical gross margins earned yield the standard man-day and standard gross margin (sgm) measures of farm size previously and now used in the reporting and analysis of the annual FMS on which the size and efficiency studies have been based.

Lund (1983) argued that both of these are obviously 'hybrid' measures (incorporating features of pure input, output and income measures) but both probably provide more meaningful indicators of farm size than either land area or actual labour inputs. But in his conclusion he noted, "the use of smd as a measure of farm size in the analysis of the size and efficiency relationship therefore seems to be at least as valid as that of land area".

Sutherland's (1983) reply to Lund's criticisms of his 1980 paper formed the climax of their arguments on the use of smd, sgm or area as a measure of farm size, which is in turn a major input in the measurement of efficiency. He criticised Lund for ignoring the main difficulty generated by inappropriate standardisation techniques when studying efficiency by emphasizing that:

> *When standardised measures, whether of inputs or outputs, are used to rank the farms before performing the efficiency analysis, and when the standardization procedure itself involves implicitly the use of that efficiency indicator whose co-variance matrix is being examined, then any relationship apparently detected between groups of farms which have first been standardised for input (or for output) use and efficiency must suffer from the correlation between the error term and the would-be explanatory variable that has been introduced by the standardisation. The resulting bias, and increased standard errors will be greater than in cases where there is no efficiency - contaminated standardization, but instead actual inputs (or outputs) are used to rank what is intended to be the 'independent variable, i.e., the farm size. Hence the basic difficulty generated if efficiency studies involving the use of smd or sgm (or indeed standardised area, if anyone had used that) is that they all begin grouping the farms in a way, which involves implicitly making use of that very efficiency relationship which is supposed to be being estimated.*

Sutherland (1983) was however, happy over Lund's acceptance of his earlier finding

that "for the same data from any given sample of farms, efficiency will indeed appear to increase more rapidly with size measured in smds than with size measured in areas. He further reiterated that efficiency studies using smd as the size indicator could not be directly compared with studies based on area as the size variable.

He further argued that Lund's defense of 'hybrid' measures like smd was a futile effort because the smd itself had been replaced by standard gross margin on the requirement of the EEC rather than any compelling analytical reason. It is because "farms of different types can require vastly different areas of Land for same value of output" that efficiency studies begin by separating the sample farms by type and analyse them separately. This variability in quality of land account for the inclusion of imputed rent for each farm as a cost in efficiency studies.

In fact, the use of smd and sgm does not avoid the need to measure area, which is an input for both of them. Thus "the possibility that chance errors of measurement will be offsetting, and so reduce bias, applies at least as much to the use of area as a primary size indicator as it does to its use as an input to the hybrid measures.

Sutherland observed that Lund's conclusion of the more general literature on measuring the sizes of non-farm enterprises do not apply automatically to farming. So it is the total land area of farmland that sets a binding constraint on what must happen to the total number of farms if the average area per farm continues to increase. "That is why the land input per farm by farm type, is likely to continue to be relevant for agricultural policy, let alone taxation policy, in a way that factory floor space per manufacturing company would not be".

In his final defense of area as an indicator of size, Sutherland (1983) questioned whether any farmer knows or cares about his own sgm, let alone that of his neighbours and rivals, and that "sgm is basically designed to allow farms of radically different types, operating in different conditions in different countries, to be somehow aggregated and compared". Then he emphasized, "for nearly all serious purposes less information is lost if

farms of different types are analysed separately; and if differences by country are kept clearly visible. If that is done, then area remains a highly relevant, objective and useful indicator of size.

2.5. Farm Size And Productivity

Worz defined factor productivity as the ratio of one input factor to the total output achieved by all factors. Thus productivity could be measured as:

(a) Total Productivity = $\frac{\text{total value of output}}{\text{total value of inputs}}$

(b) Factor-Productivity e.g.

i) Soil Productivity = $\frac{\text{total output in value or weight}}{\text{soil input in hectares}}$

ii) Labour Productivity = $\frac{\text{total output in value or weight}}{\text{labour input in value or man-hours/month}}$

iii) Capital Productivity = $\frac{\text{total output in value}}{\text{total capital input in value}}$

Productivity in agriculture is usually measured in the form of soil productivity expressed in yield per hectare (Worz, 1985).

In industrial factory production, Stevens (1977) has shown that productivity increases with increased scale while empirical studies in agriculture has shown an inverse relation. He linked such increases in productivity with increasing scale to the greater intensity of input use and better husbandry. Thus in Japan, according to Berry and Cline (1979), productivity in small farms was higher than in large farms, but some evidence showed that with economic development and greater use of capital the large farms were becoming more intensive.

Berry and Cline (1979) also showed that in some countries like Brazil and Columbia, most rice operations, except for land cultivation, are not mechanized resulting in the ratio of labour inputs/area in padi not varying dramatically by size. Variation was only

about 20 to 25 per cent lower in the largest farm than in the smallest farm categories. They have shown that in Pakistan sugar cane and maize recorded substantial yield differential by size in favour of the larger farms.

Hsieh, (1971) recorded that Taiwan had been able to achieve high productivity with a very limited land resource and small farms through intensive land use. As far back as 1964, rice yield was 3,853 kilogrammes per hectare. This achievement required "(1) the adoption and application of indivisible technologies and factor inputs, (2) farm enterprise adjustment and multicrop combinations, (3) the substitution of capital and labour for land as a land-saving technique in farm operation and (4) the joint operation for some farming activities under individual farm-management units". Hence all the supporting services and operational technologies contributed greatly to making Taiwan's small family farm economically and structurally viable and to attain a development and productivity sufficient to meet international competition.

Olayide, et al (1980) classified Nigerian farms into three categories of: small-scale farms ranging from under 0.10 hectare to 5.99 hectares; medium-scale farms raging from 6.00 hectares to 9.99 hectares; and large-scale farms which are farms of 10 hectares and above, based on the farm holdings in the country in 1973/74. They observed that the small farms of less than 5 hectares employed the traditional hoe-cutlass/oxen-plough culture while the large farms of over 20 hectares were fully mechanized using tractors and combined plough-harrow-harvesters. Most of the small farms studied were found to yield more than large farms on calorie output per hectare and as such were described to be much more efficient. The average yield in kilogrammes per hectare of some major food crops in Nigeria between 1960 and 1971 was summarised by Olayide et al (1980) as follows: sorghum 739.31, millet 579.62, rice 1219.38, maize 901.90 beans 243.49, yam 9293.32 and cassava 8611.52. By 1982 Worz (1985) reported the productivity for some of these crops in kilogrammes per hectare to be: rice 2,000, maize 917, millet 647; sorghum 633 and cassava 9.2 metric tonnes.

2.6 Farm Size And Efficiency

There exist theoretical reasons often supported by practical experience to suppose that below a certain size, farms or firms are 'too small' to give the lowest possible cost per product unit while above another point on the size scale, farms or firms are 'too large' and use resources less economically than they would if they were smaller. If the above propositions are true of British agriculture, Briton and Hills (1975) observed that it would be worth trying to identify the critical points in question and to find out "how many farms are of 'economic' size; what proportion of total production they embrace; whether the numbers of farms operating below the 'economic' range is increasing or diminishing; and what might be the effects on the economic efficiency of agriculture as a whole if the single-structure were to change...". They asserted that if it could be established beyond reasonable doubt that small farms generally use resources less efficiently than larger farms, it would likely have important implications both for the individual farm and for the national economy to which the agricultural sector makes a significant contribution.

According to Edwards and Rogers (1974) it had long been recognised in Britain that a large number of holdings are too small and too poor in resources of land and buildings to give their occupiers a reasonable financial reward for their efforts. This is what Upton (1976) called 'minimum efficient size' below which average costs of production must exceed those of larger farms because of indivisibilities of certain inputs. This income problem was identified as a problem of scale or of the annual turnover of the business. To alleviate the small farm problem, he stated that the government "made proposals for helping some small farmers to retire or to change to other occupations, others to enlarge their farms by amalgamation and small farmers in general to obtain some of the benefits of large-scale operations by means of cooperation". They remarked that from the point of view of efficient use of national resources, it appeared that there have been substantial benefits from the enlargement of farms and enterprises, which has taken place.

From farm accounts in England and Wales in 1970/71 Edwards and Rogers (1974) showed that the efficiency ratio increased from the lowest (hectareage) groups to the highest. But they warned that at any level of farm-size within each type efficiency varies considerably between farms and that the data used above did not emphatically show that all large farms are more efficient than all small farms. But in general the level of economic efficiency reached on farms of less than 200-250 acres (80-100 hectares) was very noticeably lower than on larger farms.

In developing countries, under a labour-intensive system of agriculture, where output per unit of land area is closely and directly related to labour input, the productivity of land is largely a reflection of the degree of labour intensity. In this situation the productivity of land as reflected by crop yields, for example, will tend to be inversely related to farm size. If land is scarcer than labour, which is often the case in less developed countries (LDCs), smaller farms may utilise resources more efficiently than larger farms. In LDC content, a large farm structure may not be consistent either with efficient resource utilization or with achieving the optimum level of aggregate production (Ghatak and Ingersent, 1984, p.137)

Worz (1985) affirmed that there was sufficient evidence of both the comparatively high efficiency of small-scale farming and the professional abilities of small farmers the world over, including those in any given African country. It was estimated that an output of 7.6million kilocalorie equivalent per hectare of Nigerian small farms below 5.0 hectares was recorded as against 3.3 in the case of large farms above 20 hectares.

2.7 The Definition of Rural Development

Rural development has been extensively defined in the literature by many authors. Heyer et al (1981) defined rural development as planned change by public agencies based outside the rural areas. According to them, these agencies include national governments, which act alone, and international organizations acting in association with them. In a

similar but wider perspective. Williams (1981) saw rural development as an activity undertaken by governments and by international agencies, public and private. According to him, it takes the form of credit programmes, irrigation schemes, farm settlements, extension services, marketing cooperatives, provision of chemical fertilizers, herbicides and pesticides, and high-yielding varieties of seeds. Many of these are combined with one another. Thus the goal of this definition is to increase agricultural production and the standard of living of rural people. This is the sectoral approach to rural development that deals with the problems of rural areas one at a time. However, does it mean that without external intervention development will not take place in rural areas? Does it also mean that rural development is synonymous with agricultural development?

Rural development means much more than these definitions. From the viewpoint of the Directorate of Food, Roads and Rural Infrastructures (DFRRI), Gana (1987) saw it as the total transformation of the rural component of the nation's mode of production, which involves a transformation of not only production technology and organization but also social relationships and the social basis for coordinating the rural population. Thus viewed as socio-economic transformation, rural development means the restructuring of the Nigerian rural economy so as to lift it from being a peasant subsistence agricultural economy to a modern agro-industrial economy capable of raising and sustaining the quality of life in the rural areas. This gives a wider definition of rural development, which is the multi-sectoral or integrated approach to rural development.

According to Olayide (1975) "Rural development involves effectively tinkering with variables such as rural population employment, income, resource inputs, productivity, landscape, etc. to effect a continual maximisation of welfare". The objective of this definition is to ensure a rural growth process that will yield Pareto's positive sum benefits.

From the Chinese experience the basic objectives of rural development is:

> *To organise, develop and utilize the available resources of land, water, and manpower in such a manner that the entire rural*

> *population dependent on these resources has an equal (or at least an equitable) opportunity to meet, as a minimum, their basic needs of food, clothing, and shelter with reasonable facilities for education and health and can live together in a positive and healthy social environment (Aziz, 1978, pp.98-99).*

The F.A.O. (1986) observed that the overriding objective of development was to generate self-sustaining improvement in human capability and welfare. The achievement of this objective becomes complex especially when development investments are meant to benefit economically, socially and politically disadvantaged people in rural areas. In this light, McNicoll and Mead (1990) defined rural development as the process of sustained growth of the rural economy and improvement of well being of the rural population.

Whichever way rural development is looked at, the ultimate goal is sustained growth of its economy, which brings about improved standard of living.

2.8 The Role of Agriculture in Rural Economy

Rural economy is defined by Carver in Olayide (1975, p4) as "that branch of the science of statesmanship which deals with agriculture, other rural enterprises and rural life as factors in nation building". This definition places agriculture in the centre of economic life of rural communities. It is around this that other enterprises revolve and/or spring from. In other words agriculture is seen as the nerve centre of the rural landscape.

Agriculture is therefore the key to rural development in most developing countries. In most African countries it generates up to 50 per cent of gross domestic product (GDP), 80 per cent of employment and 90 per cent of export earnings (FAO, 1987, p.12). In Nigeria, however, it generates about 39 per cent of GDP, 50-55 per cent of the employment of the economically active labour force and 2 per cent of export earnings. It also provides over 75 per cent of the basic food needs of the population. In addition over 80 per cent of Nigeria's estimated population of about 100 million are dependent directly or indirectly on agriculture for their livelihood (CBN, 1995, p.70; Okuneye and Idowu, 1990, pp.31-32; Ojo, 1993,p.72).

Thus agricultural growth is required to stimulate all round rural development. According to F.A.O. (1988) it is in the long run a necessary condition for the reduction of rural poverty in the following ways. First the bulk of the population in developing countries depends upon agriculture for its employment and incomes. Agricultural growth also provides the conditions for increases in non-farm employment because the development of rural none-farm activities is closely linked to growth of agricultural sector. Farms provide raw materials for non-farm activities and the inputs produced are used in the production activities of the non-farm sector. FAO further asserts that higher agricultural incomes stimulate demand for consumer goods and services produced in the rural non-farm sector (FAO, 1988; 1994).

Secondly, the rate of absorption of rural labour into industry has lagged behind the rate of industrial GDP inspite of rapid rate of industrial and urban growth.

Thirdly, agriculture still constitutes the source of the major part of rural incomes. Hence increases in agricultural and food production are essential for an improved livelihood of particularly small producers.

F.A.O. (1988) finally noted that a continued decrease in income per capita of agricultural population would result in an increase in absolute poverty in the absence of radical redistribution of assets. Therefore declining agricultural performance causes cuts in wage rates and rising unemployment in rural areas.

2.9 Small Farmers

African countries and indeed Nigeria are characterised by peasant agriculture which according to Ghatak and Ingersent (1984) is typified by a small family farm and as a production unit is characterised by its small size as well as its high degree of self-sufficiency. The dominant factors of production are land and labour with few purchased inputs being employed. However, Falusi and Olayide (1980) observed that the productivity of these three major inputs of land, labour and traditional capital investment including

purchased off-farm inputs, remained very low. Although land is the most important of these traditional inputs only about 30 per cent of available arable land was under cultivation by 1980 because of the constraints of shifting cultivation. As for labour which is the second most important input on small farms, human labour accounted for about 90 per cent of all farm operations in non-mechanized systems and 50-65 per cent of all farm operations in area where mechanization is possible. Hired-labour cost constituted over 60 per cent of total cash cost of production. The typical Nigerian small farmer is known to use small amounts of fixed and operating capital. According to Falusi snd Olajide (1980).

> *"Capital investments are not great in land in the form of wells, fences, irrigation and drainage facilities, terraces and farm buildings. Most of the capital owned by small holders is of a traditional form and is generally poor. Private returns to capital are generally low at the margin. Operating capital is also low, with well over 80 percent going to payment of hired labour. Expenditure on off-farm purchased inputs like fertilizers, pesticides, improved seeds and seedlings usually constitute the minor component of the total cash expenditure on small farms".*

The small farmers in Nigeria are very efficient in the utilization of the basic productive resources. The most productive and efficiently used inputs are labour, seeds and farm equipment. "Land as a resource is properly conserved and efficiently used through the shifting cultivation practices and through other cropping systems. But the full potentials of land, capital, water and management resources are yet to be efficiently husbanded for optimum production (Olayide et al 1980, p.11).

Most of the farmers in Nigeria grow more than one crop. The number and the types are however determined mainly by ecological considerations, available resources, taste and preference of consumers in the immediate market and the families own subsistence requirements. At a higher level relevant considerations include net income potential of different crops, need to diversify production in order to reduce risks and uncertainties and to use farm inputs especially family labour fully throughout the year (Olayemi, 1980, p.24).

Therefore, progress in rural development depends on small farmers. Nigeria could be said to be a nation of small farmers as over 90 per cent of her total food production comes from small farms while at least 60 per cent of the country's population earn their living from these small farms. Although these small farms may be insignificant individually, (cultivating less than 2 hectares) they collectively form an important foundation on which the nation's economy rests (Olayemi, 1980; Okuneye and Idowu, 1990).

In spite of the fact that small farmers were found to be efficient in agricultural production in the literature reviewed above, they still form the bottom line of the poor in the country. All efforts to develop rural areas has been directed at improving their level of income through their main occupation - farming and providing social and economic infrastructure to boost their agricultural production.

This study therefore attempts to determine whether the farmers in Southern Igalaland are efficient in their use of agricultural inputs or not. If they are efficient, how then can we help them to improve upon their present level of efficiency? If, on the other hand, they are not efficient, how can they be helped to be efficient? The determination of the efficiency of these small farmers will create an avenue for the understanding of their problems in crop production and also for exploring ways of solving or ameliorating these problems.

CHAPTER 3

METHODOLOGY

3.1 Data Collection

Data collection was expensive and time consuming. The main survey was an experience of nine weeks of intensive and rigorous compass survey during the day and the administration of comprehensive questionnaires mostly at night. Research fund from the sponsor was grossly inadequate and the author had to finance the main survey. The sample size was limited by both these time and cost constraints. However, detailed and large amount of data was collected on the sampled households.

3.1.1 Sampling procedure

A map of Igalaland was divided into five-kilometer grid squares. These squares were numbered from 01 starting from the southwestern corner and moving column-wise to the end. Using a table of random numbers, four squares were selected from each of the two L.G.As. on equal basis. The list of all accessible villages in each of the selected squares was compiled and arranged in alphabetical order. They were then numbered serially. A village was randomly selected from each square using the table of random numbers. Seven villages were thus selected four from the Old Idah L.G.A. (now Idah, Ibaji and Igalamela-Odolu LGAS) and three from Ofu L.G.A. The selected villages are Imere, Iyano, Odolu and *Ujagba from the old Idah L.G.A.; and Agojeju, Ojuwocha and Umomi from Ofu* L.G.A. Although the population of old Idah L.G.A was almost twice as that of Ofu L.G.A. (112,697) (Udo and Mamman, 1993), most of the former's population resided in Idah town. Towns were not considered in the unbiased selection of the farmers as the study concentrated on the rural areas of the two L.G.As. Hence the selection of the four squares on equal basis and the selection of the villages with the old Idah L.G.A. having a slight edge of one village over Ofu L.G.A. Three other settlements were selected as a

result of the presence of large-scale farmers in them. These are Agbanaka, Idah and Ugwolawo (Fig 3.1).

Five respondents were selected from each village with the exception of Odolu where seven respondents were interviewed because of its big size and the need to cut down the cost of choosing another village. Only five respondents were chosen from each village because of the nature of the study, which required detailed information about the respondents. The reconnaissance survey showed that it would take a minimum of one day to survey the fields of a household irrespective of their locations and administer the two questionnaires. Five farmers carefully chosen will be quite representative of the type of virtually homogeneous households that exist in Villages in the study area. A respondent in this study is a farmer who is also a household head. A table of random numbers was also used to select the required number of households per village from a list of about ten medium and small-scale farmers provided by the village chief or opinion leaders and confirmed or adjusted with the help of some other members of the village. Unlike the large-scale farmers who are easy to identify in the field using Olayide's classification, the small and medium scale farmers are difficult to separate without the knowledge of their actual farm sizes. The farmers cultivating 0.10-5.99 hectares were classified as small while those with 6.00-9.99 hectares were classified as medium-scale (Olayide et al 1980, p.9).

The initial selection of six large-scale farmers was based on Olayide's classification of large-scale farmers cultivating farms of 10 hectares and above (Ibid). After the preliminary analysis, the farm sizes of two of the six farmers fell below ten hectares, the minimum size for large-scale farmers. So the number of the large-scale farmers was reduced to four. However, another large-scale farmer was identified when analysing the category of small-and medium-scale farmers to bring the total to five. In all therefore, a total of 43 respondents were selected and interviewed for this study. This number of farmers chosen was adequate for any statistical analysis.

The table of random numbers was used with caution. While selecting the villages

using these numbers, special attention was paid to spatial spread within each L.G.A. and their physical setting. For example, Iyano village is located on the alluvial plain of the Niger-Anambra river basins while Odolu's location is at the edge of the retreating Ibaji-Ojoko-Adoru forest reserve. These areas are expected to exhibit different agricultural practices from the other sampled villages.

3.1.2 Method of Data Collection

Primary data

Two sets of questionnaires were administered - A and B. (Appendix A). Questionnaire A was designed for the collection of data on the socio-economic life of farm families while questionnaire B was specifically for the collection of information on their farming activities ranging from land clearing operation to harvesting, storing and marketing of farm products.

The author on the selected household heads personally administered copies of each questionnaire.

It took about two to three hours to interview a respondent. The farmers did not find it easy answering some of the questions especially those that required keeping of records for easy references particularly from questionnaire 'B'. However, virtually all of them did their best to answer all the questions concerning their farming operations.

All the cultivated fields belonging to the sampled farming families were surveyed using prismatic compass and leveling methods. The sole aim of this survey was to obtain the area of the fields. All the fields of a farm family combined constitute a farm irrespective of location and degree of fragmentation. A total of 204 fields belonging to 43 households were surveyed.

Secondary data

Information from libraries on the yields of crops covering, the world, Africa and Nigeria were obtained from F.A.O. Yearbook production, Central Bank of Nigeria Annual

Report and Federal Office of statistics Review of the Nigerian Economy. Most of the materials reviewed under the literature review were obtained form Ahmadu Bello University Library, friends' and personal libraries.

Rainfall data were obtained from the Kogi State Agricultural Development Project and the Department of Soil Science, Ahmadu Bello University, Zaria.

The outline for the base maps of the study area was traced from the project map for the defunct Ayangba Agricultural Development Project (1979-1984).

3.2 Analytical Tools

The following are the tools used in this study: descriptive and inductive statistics, farm budget analysis or gross margin, and production function analysis.

3.2.1 Descriptive statistics

Descriptive and inductive statistics were used in objectives one and two to analyse the socio-economic charateristics of farmers and the cropping patterns in the area. In objective three gross margin analysis was used while production function analysis was used for objective four..

3.2.2 Farm Budget Analysis

The farm budget model aims at estimating the future outcome of a farm plan in quantitative terms with the main objective of increasing the financial profit. It suggests changes and cropping patterns likely to be most profitable to a farmer. Farm budgeting also evaluates the impact of the changes and cropping patterns on the development of the total economy of a nation.

The farm budget model is of the form:

$$NFI = GR - VC - FC$$

Where,

NFI = Net Farm Income

GR = Gross Revenue

VC = Total variable costs

FC = Total fixed costs

Net farm income is the difference between the total gross margin and the total overhead (fixed) costs. Gross revenue is the product of gross output and the unit price of the output. Variable costs are those costs which are specific to the activity and which vary in direct proportion to the scale of the activity such as seeds, fertilizers and labour. Fixed or overhead costs are related to items of expenditure that do not vary with output or small changes in farm organization (Hill and Ingersent, 1977, p.31). Fixed inputs generally involve items like rent, wages, interest on loans, depreciation of machinery, equipment and buildings and their maintenance. In this study, fixed costs for small-scale farmers are negligible because of the low level of technology (cutlass and hoe) involved in production.

Gross margin is the difference between this gross farm income and the total variable costs of an enterprise or activity (Hardaker, 1970).

Gross margin analysis is used for comparing the relative profitability of different activities within an enterprise and evaluating the effect of making adjustments to the balance of enterprises. It determines the measure of the contribution each enterprise makes to overhead costs and farm profit. The gross value of output is a key measure of efficiency.

Budgeting appears to be a technique of trial and error. Although it can be used to find the most profitable alternative plans, it does not guide the original choice of plans. It uses constant average costs and returns while ignoring diminishing marginal returns. In spite of all these limitations, budgeting has an additional advantage of being simple and flexible to use.

3.2.3 Production Function Analysis

Production function which was originally a concept in physical and biological science has been developed, expanded and applied to agriculture where research conducted provided information on the nature of agricultural production functions (Heady and Dillon, 1961).

The term production function is used to describe any numerical estimate of the relationship between inputs and outputs (Upton, 1976, p.6)

Its conceptual and practical difficulties notwithstanding, one could attempt to measure inter-farm variations in efficiency through the estimation of production functions (Lund and Hill, 1979, p. 146). Thus the measure of efficiency, that is technical, allocative (price) or economic "are methods of comparing the observed performance of a firm with some postulated standard, a different value and a different significance" (Farrell, 1957, p.255).

Researchers to determine how efficiently farmers manage their farms have used the following types of equations for estimating production functions.

The Linear Function

Linear function is based on the assumption that straight lines relate all the inputs and outputs. The slope of each relationship is therefore constant resulting in the marginal product being constant. The method of least squares regression is used to fit a straight line, such as:

$$Y = a + bx$$

or where least squares multiple regression is used the equation becomes:

$$Y = b_o + b_1 X_1 + b_2 X_2 + ... + b_k X_k + e$$

Where,

Y = the level of output

$X_1, X_2 ... X_k$ = level of inputs

$b_o, b_1 ... b_k$ = unknown values (regression coefficients) to be estimated

e = error term.

This equation makes no allowance for diminishing marginal returns so there can be no economic optimum. However, its use can be justified on the basis of ease of fitting it by least square regression. The curved functions by least squares regression can, however, be fitted through transformations - the most common being the quadratic in which the value of the input variables are squared and Cobb-Douglas in which the value of all variables are transformed into their logarithms.

The Quadratic Function

The quadratic function equation in the case of two variable inputs is:

$$Y = a + b_1X_1 + b_2X_2 - b_3X_1^2 - b_4X_2^2 - b_5X_1X_2$$

Where,

Y = the level of output

X_1, X_2 = the level of each of the two variable inputs

X_1^2, X_2^2, X_1X_1 = additional variables formed by squaring the values of X_1 and X_2 and by forming the products of this two. They could be labelled X_3, X_4 and X_5 respectively.

a = a constant which is the output obtained when X_1 and X_2 are both zero.

b_1, b_2 = constants which measure the direct effects of level of input and output

37 KASHIM IBRAHIM LIBRARY

b_3, b_4 = constants that measure the rate of change in the slope of the response curve.

A quadratic function can show constant, diminishing marginal returns and even negative ones. It can also show increasing marginal returns if b_4 and b_5 are positive but it can never show both increasing marginal products at low levels of input and decreasing marginal products at higher level input in the same equation (Upton, 1973).

The Cobb-Douglas Function

The general form of the equation for the Cobb-Douglas function for two variables is:

$$Y = AX_1^{b1}X_2^{b2}$$

The logarithmic transformation to facilitate the estimation of a and b coefficients using linear least squares multiple regression is:

$$\log Y = a + b_1 \text{ Log } X_1 + b_2 \text{ Log } X_2$$

Where,

Y = the level of output

X_1,X_2 = Variable inputs

a = Constant

b_1,b_2 = Transformation ratio which are direct measures of the elasticity of response for each of the input variables.

Thus the Cobb-Douglas function is sometimes known as a logarithmic function or more precisely a double-log function in order to distinguish it from other functions where only one side of the equation is transformed into logarithms.

The function can be used to estimate returns to scale, provided that all inputs have been included in the function. Then the sum of the b coefficient gives an estimate of returns to scale. It may show diminishing marginal returns and is easy to estimate. Some of the disadvantages are that it cannot show both increasing and diminishing marginal

returns in a single response curve, and at zero level of input the output is zero. The latter condition may be unacceptable in some instances, where some crop product is usually obtained even when no fertilizer is applied (Upton, 1973).

CHAPTER 4

THE STUDY AREA

4.1 Location of the Study Area

The study area covers four local government areas (LGA) out of the existing nine in Igalaland. These are Idah, Ibaji, Igalamela-Odolu, and Ofu L.G.A.s. They all lie in the southern part of Igalaland.

The area is located between latitudes 6°32'N and 7°06'E and longitudes 6°08'E and 7°06'E. It is bounded by Bassa and Dekina L.G.A.s to the north; Olamoboro L.G.A., Anambra and Enugu States to the east; Anambra State to the south; and Ajaokuta L.G.A. and Edo State to the west (Figs 4.1 and 4.2).

The four L.G.A.s were chosen as the study area because of their similarities in physical, economic and socio-cultural conditions. Politically, they both formed the former Idah L.G.A. before the split in 1981, and a further split into the present four LGAs in 1996.

4.2 Physical Setting

4.2.1 Relief

The major relief features of the study area are the Ankpa Plateau, Okpolo Plain and the flood plain with a minor projection of the Ankpa piedmonth into the northwestern section (Fig. 4.3). The Ankpa Plateau consists of plains,over 300 metres lying on sandstones heavily dissected and cut into by steeply incised streams, the headwaters of the Anambra River and its tributaries lying to the north and outside the study area. The Ankpa Piedmonth is more dissected probably representing a further stage in the erosion of the Ankpa Plateau (Hill, 1979). Okpolo plains lie over shales while the Flood plain is relatively young receiving alluvial deposits every year (Fig. 4.4).

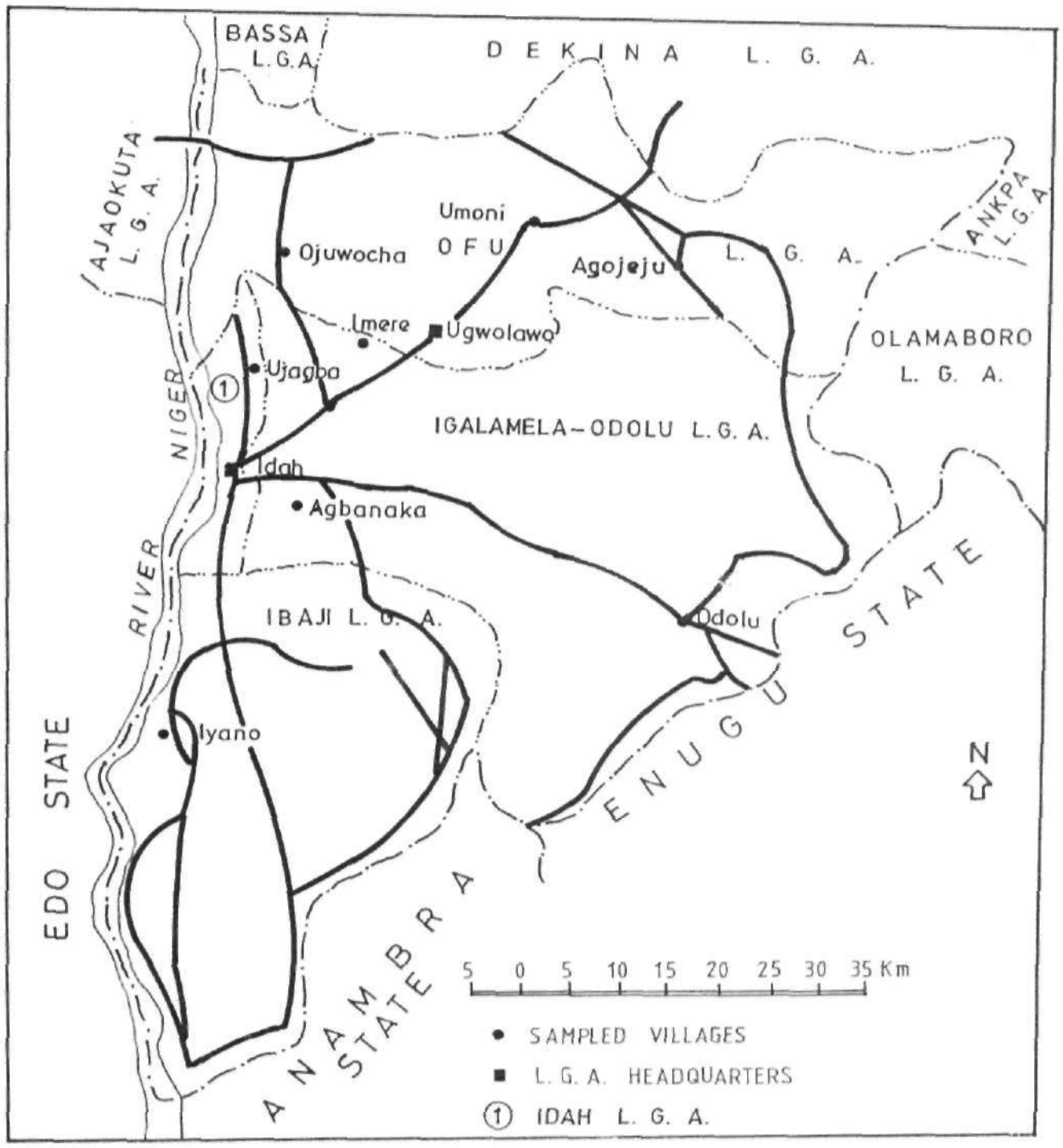


FIG.4-1 : THE STUDY AREA: SAMPLED VILLAGES

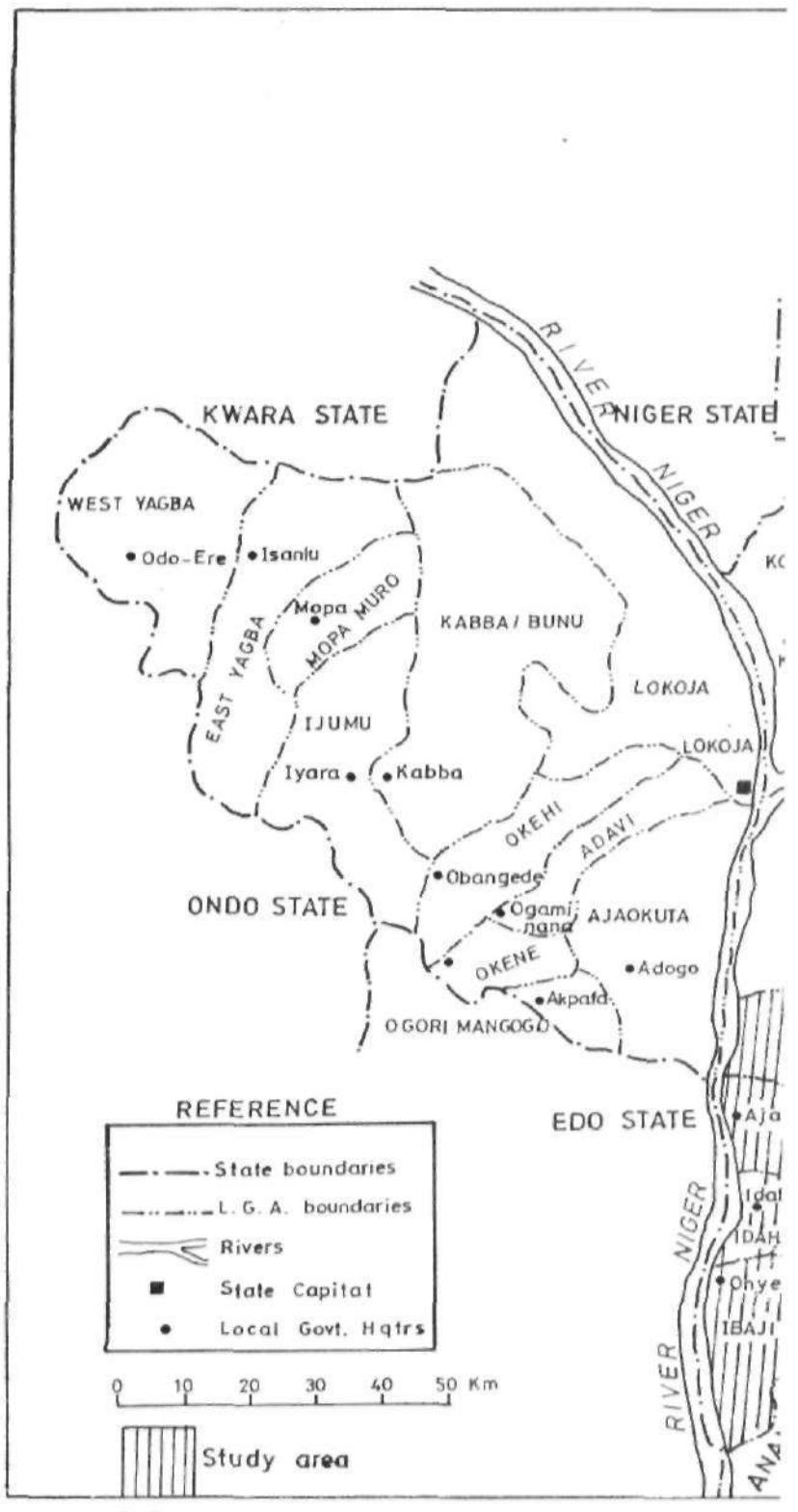


FIG. 4·2 KOGI STATE : THE STUDY AREA

KASHIM IBRAHIM LI

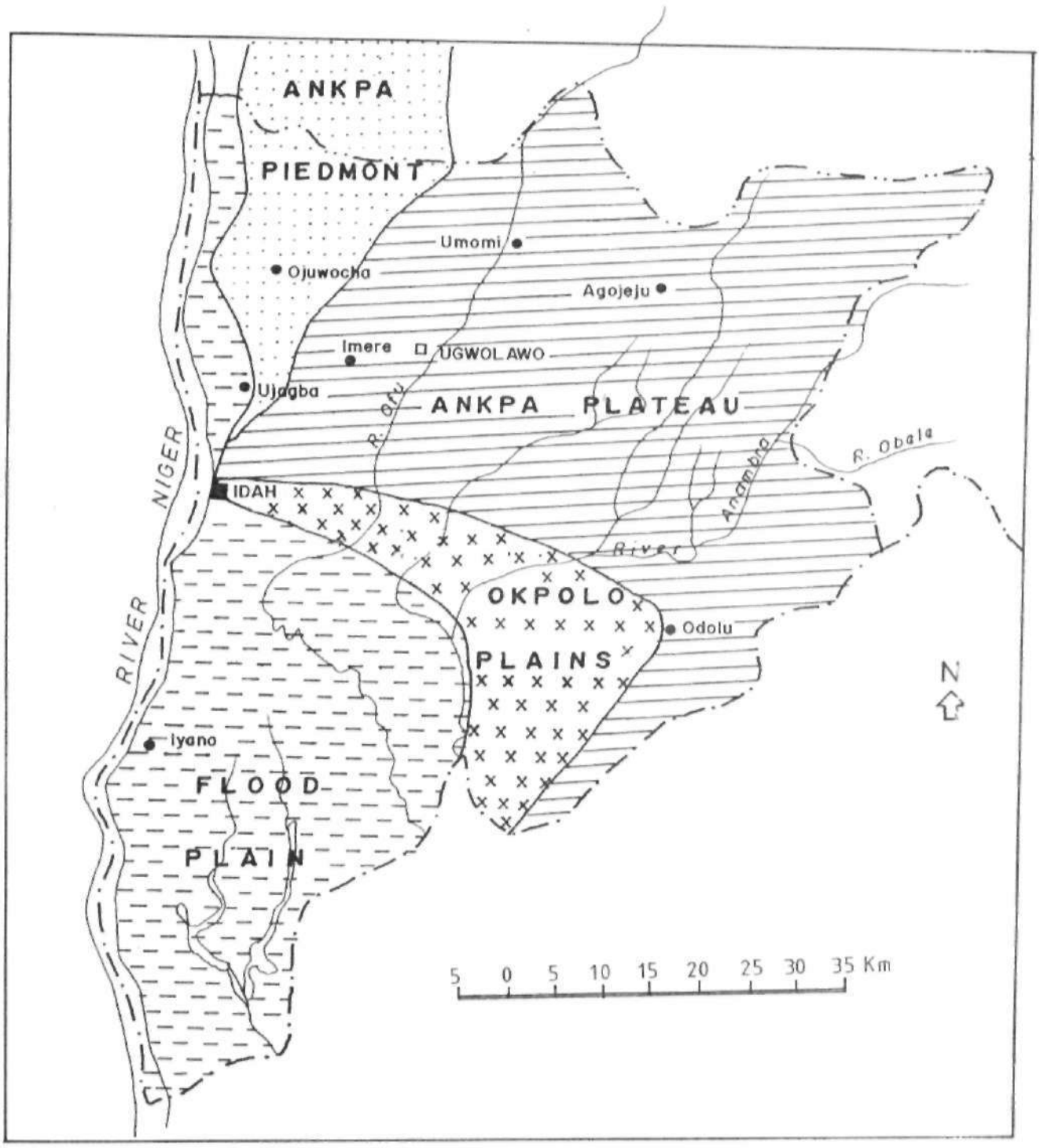


FIG. 4-3 : THE PHYSIOGRAPHIC UNITS OF THE STUDY AREA.

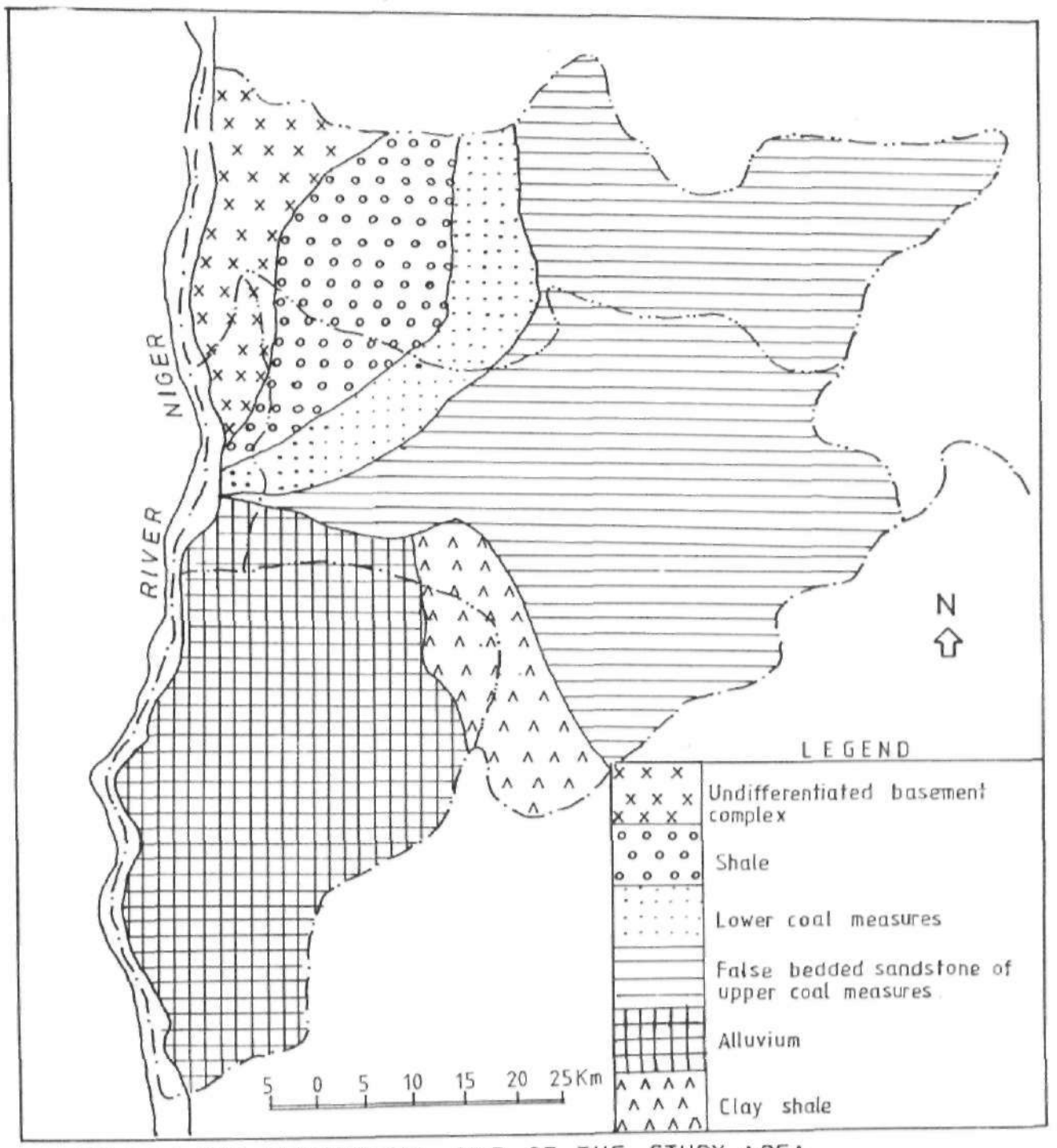


FIG.4·4 : THE LITHOLOGICAL MAP OF THE STUDY AREA.

Streams taking their sources from the Ankpa Plateau and forming the Anambra River system before draining into the Niger drain the area. The main tributaries of the Anambra are the Ofu, Okura and Obele.

4.2.2 Climate

The study area experiences the highest temperatures in February and March just before the onset of the rainy season. The maximum temperature lies between 29.7°C and 35.6°C and the minimum between 22.3°C and 25.2°C (Ibid, p. 10).

The rainfall data for the study area were not easy to come by, so the practice of grouping the whole of Igala land under Lokoja rainfall regime was adopted. Using Thiesson Polygon grouping the study area under Lokoja showed that the area has a total annual rainfall of 1311mm and rainy period of 210 days. The rainy period is considered to be a safe growing period, for crops. The rainy season, according to him, starts on April 11-20 and finishes around October 21-31 (op. cit. p. 10).

The above rainfall statistics were used among others, for the planning of the Ayangba Agricultural Development Project (AADP) by the World Bank prior to the take off of the project in 1980. The use of Lokoja rainfall in the absence of rainfall records in Igalaland then therefore appears to be reasonable. Although, for instance, the rainfall for Lokoja for 1992 and 1993 may be less in volume and distribution than those of Ayangba and Ofu LGA, the double maxima pattern is exhibited in all the three figures showing a slight decrease between June and August (Figs. 4.5, 4.6 and 4.7).

From Figures 4.5 and 4.6 it is clear that Ayangba, just a few kilometres outside the study area and Ofu LGA that is within the area have a fairly similar pattern of rainfall with the usual double maxima. Farmers take advantage of this natural break in rainfall to produce two crops in one cropping season. The rainfall bar chart for Ofu LGA for 1992 and 1993 shows that effective crop planting could take off in March. This provides a nine-month growing season that terminates in November. This long growing season permits the

cultivation of root crops and grains in addition to tree crops.

Figure 4.8 shows that the monthly mean rainfall for Ayangba decreased gradually from 1991 to 1993. The number of rainy days per year did not show a significant change. The difference between the least in 1992 and the highest in 1991 is 3 days. The effect of this difference could be significant to some crops like maize or cowpea, especially when it is heavy and well distributed over three weeks with each week having a day of heavy rainfall.

Although there are no current rainfall records for Idah, it has one of the oldest and longest rainfall records in Igala land. It was possible to obtain a rainfall record for 38 years (1935-1972). With this, one could more reliably predict the rainfall regime for Idah and also for its environs. The monthly mean rainfall for Idah for a period of 38 years shows that September recorded the highest mean rainfall followed by August and then June with a depression in July. Thus the double maxima characteristic of this region is exhibited in Figure 4.9.

Using five and ten year running means to smoothen the marked fluctuations (random noise) brings out major fluctuations that could be considered (Fig. 4.10). Fluctuations of nearly the same length have been found between 1943 and 1953 on the one hand and 1957 and 1966 on the other. Thus, the mean annual rainfall for Idah showed a depression between 1943 and 1948, and 1957 and 1961. There was also a rise between 1947-1951 and 1960-1964. In order to assess whether these fluctuations have occurred by chance or whether they are statistically significant, students 't' test analysis was used. The 't' test showed that $t = 3.32$ with 8 degrees of freedom for five year running mean for 1943-48 and 1957-61. This shows that the difference between the sample means had a probability of less than 5 per cent. In other words, it is statistically significant. However, the 5-year running mean graph for 1947-51 and 1960-64 had $t = 1.28$ with 8 degrees of freedom which is less than the t-value in the table of student's 't' distribution. Hence the difference between the sample means is not statistically significant. But a check with a ten-year

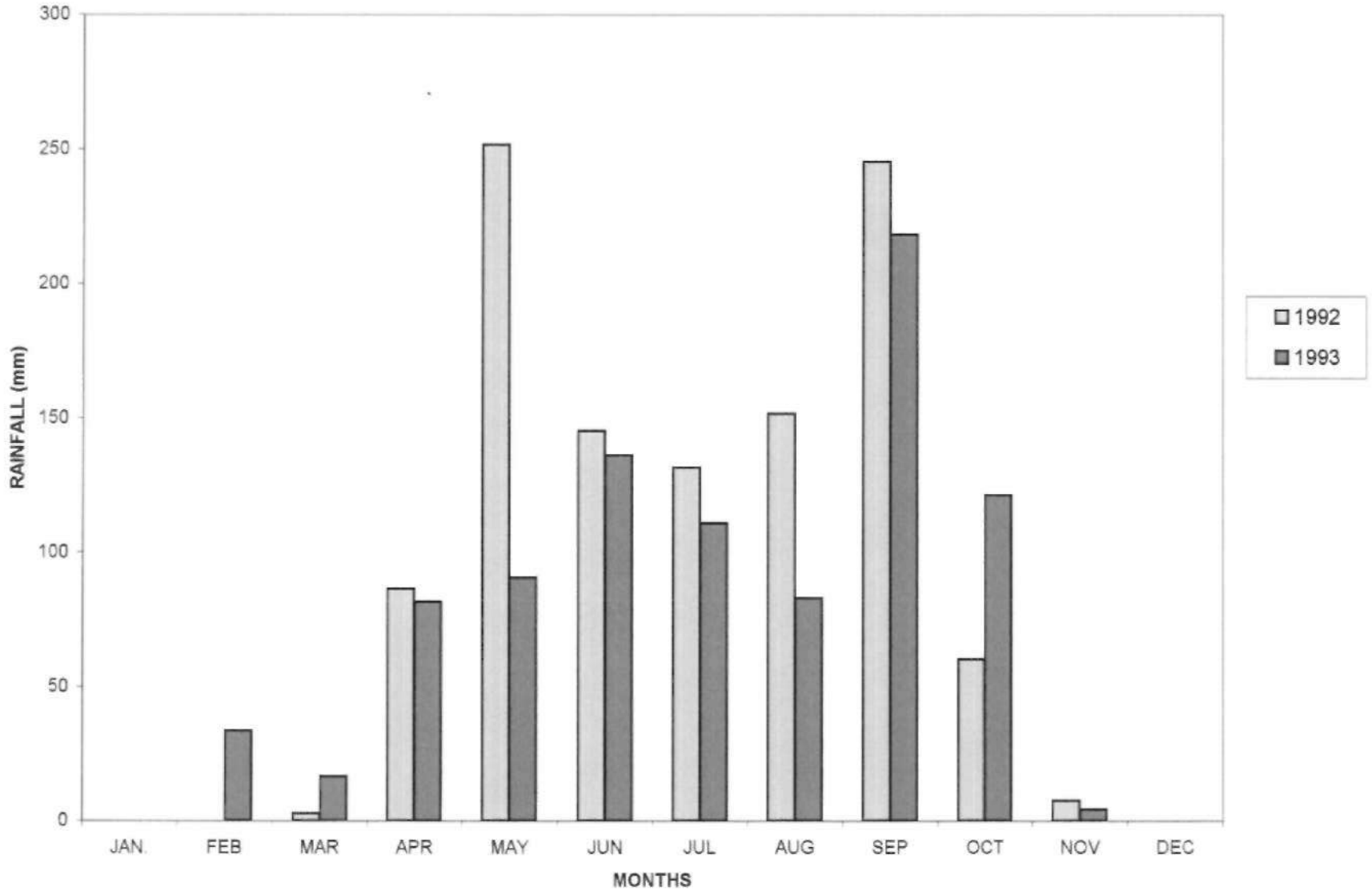


FIG. 4.5: Monthly rainfall for Lokoja 1992 - 1993

Source: Kogi State Agricultural Development Project, Lokoja

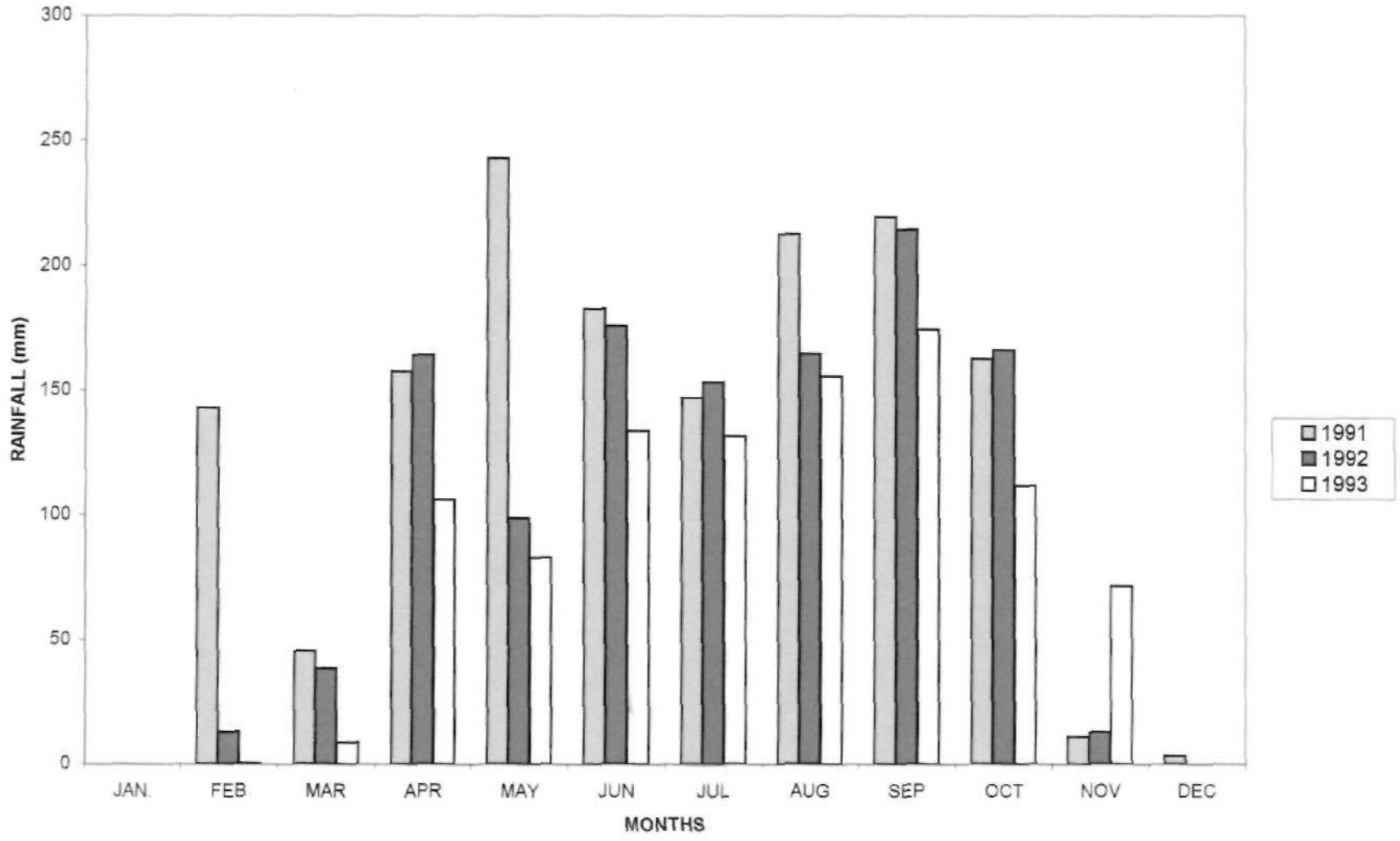


FIG. 4.6: Monthly rainfall for Ayangba 1991 - 1993

Source: Kogi State Agricultural Development Project, Zone B, Ayangba

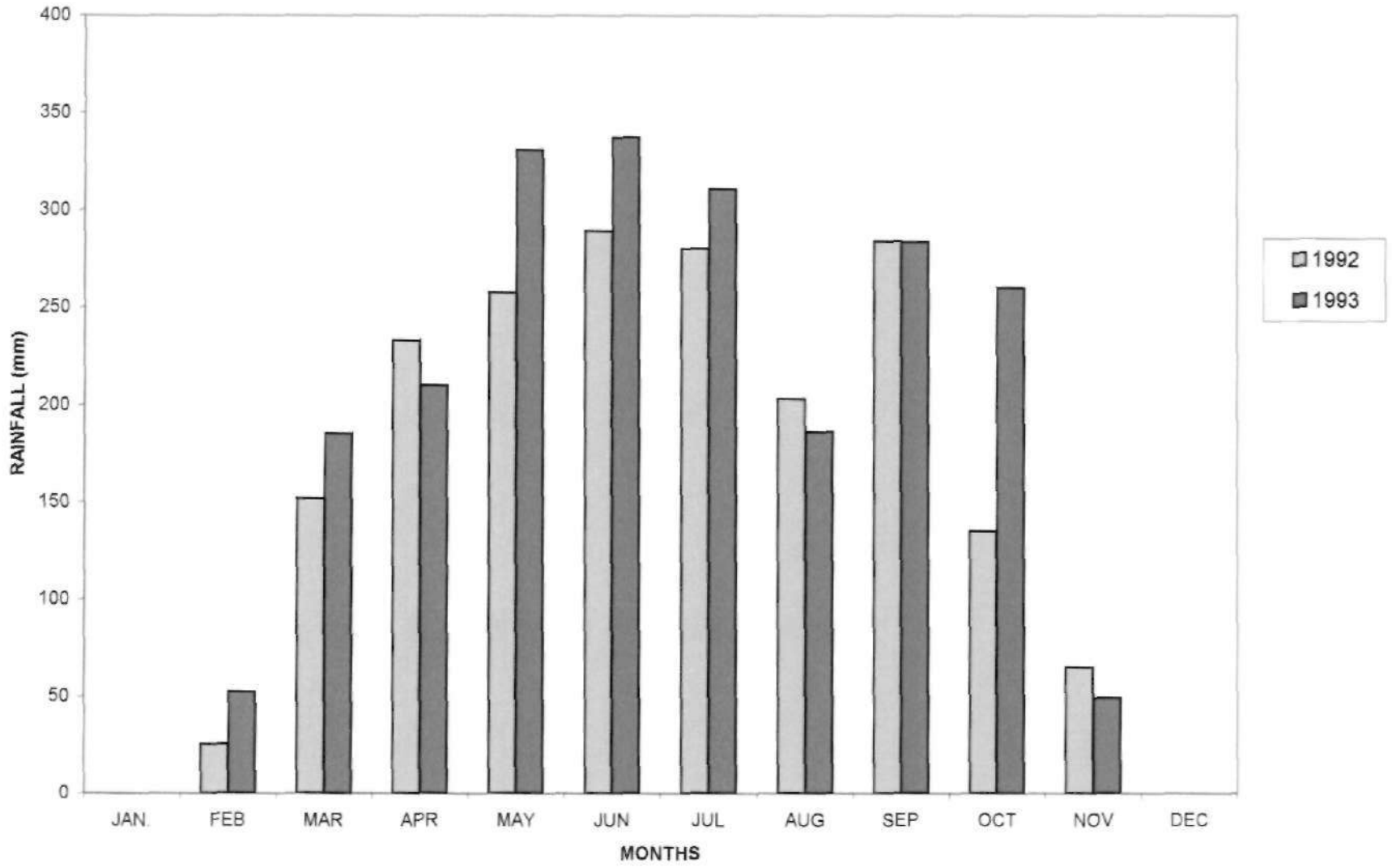


FIG. 4.7: Monthly rainfall for Ofu 1992 - 1993

Source: Kogi State Agricultural Development Project, Zone B, Ayangba

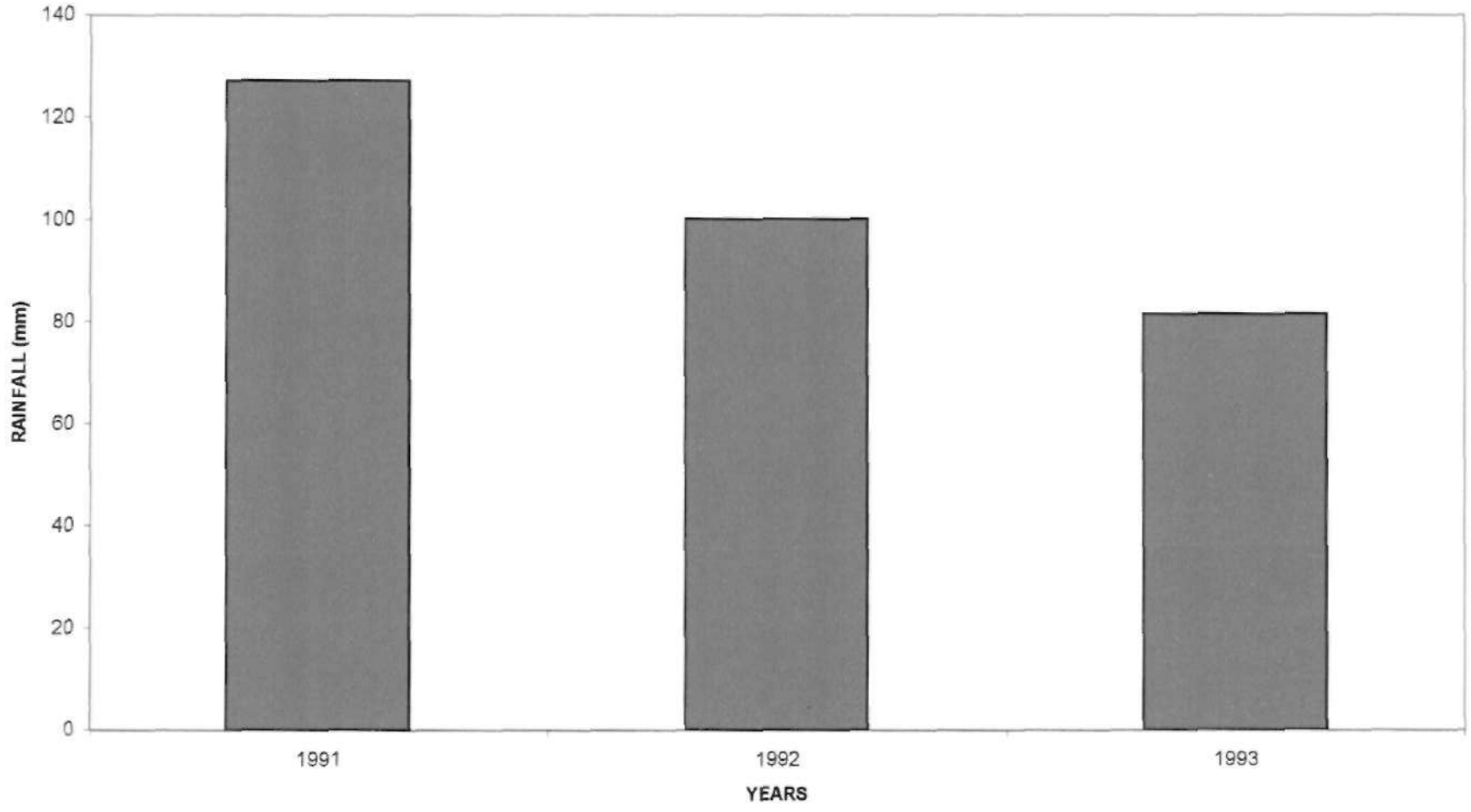


FIG. 4.8: Monthly mean rainfall for Ayangba 1991 -1993

Source: Kogi State Agricultural Development Project, Zone B, Ayangba

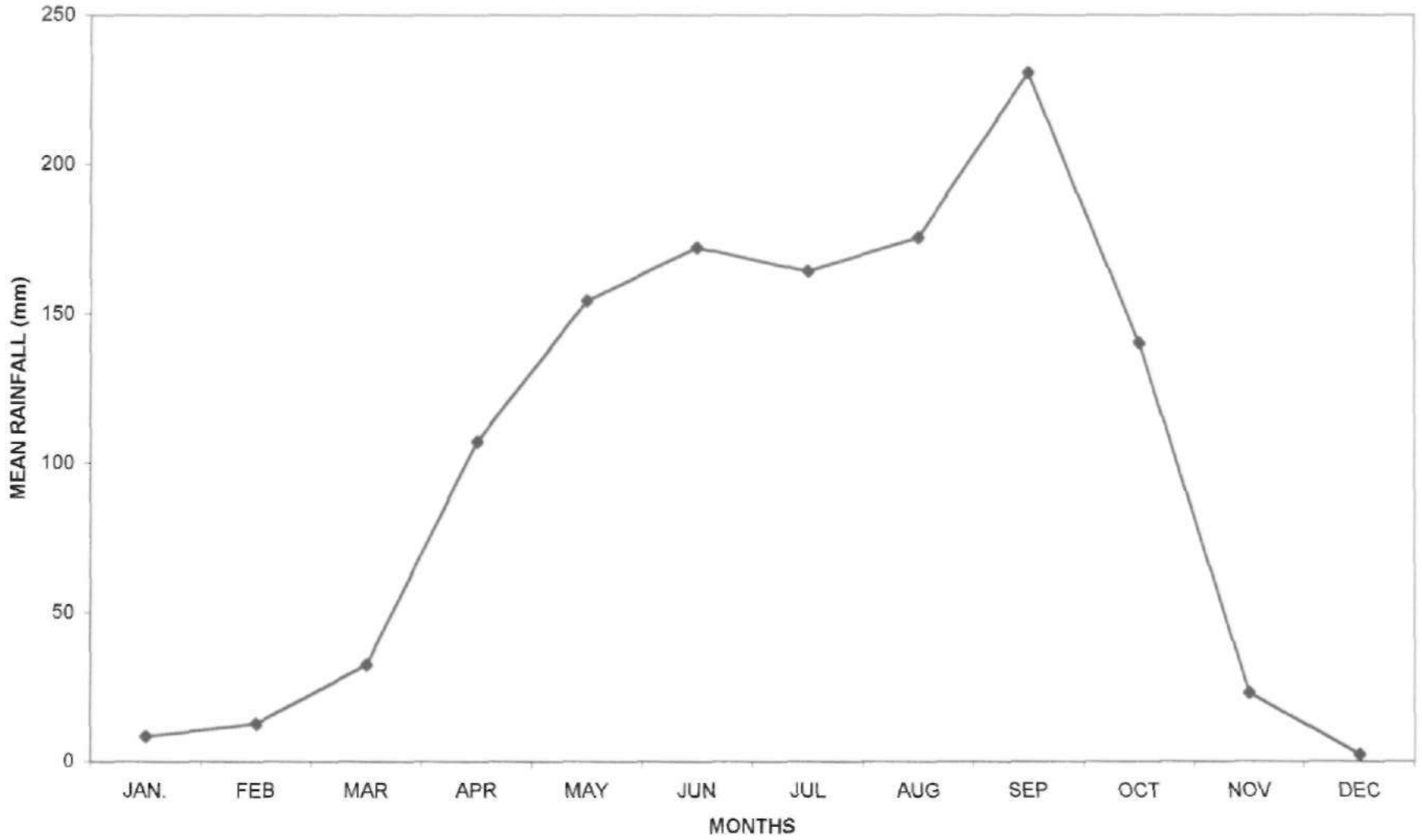


FIG. 4.9: Monthly mean rainfall for Idah hospital 1935 - 1972

Source: Meteorological Unit Department of Soil Science, Institute for Agricultural Research, Ahmadu Bello University Zaria

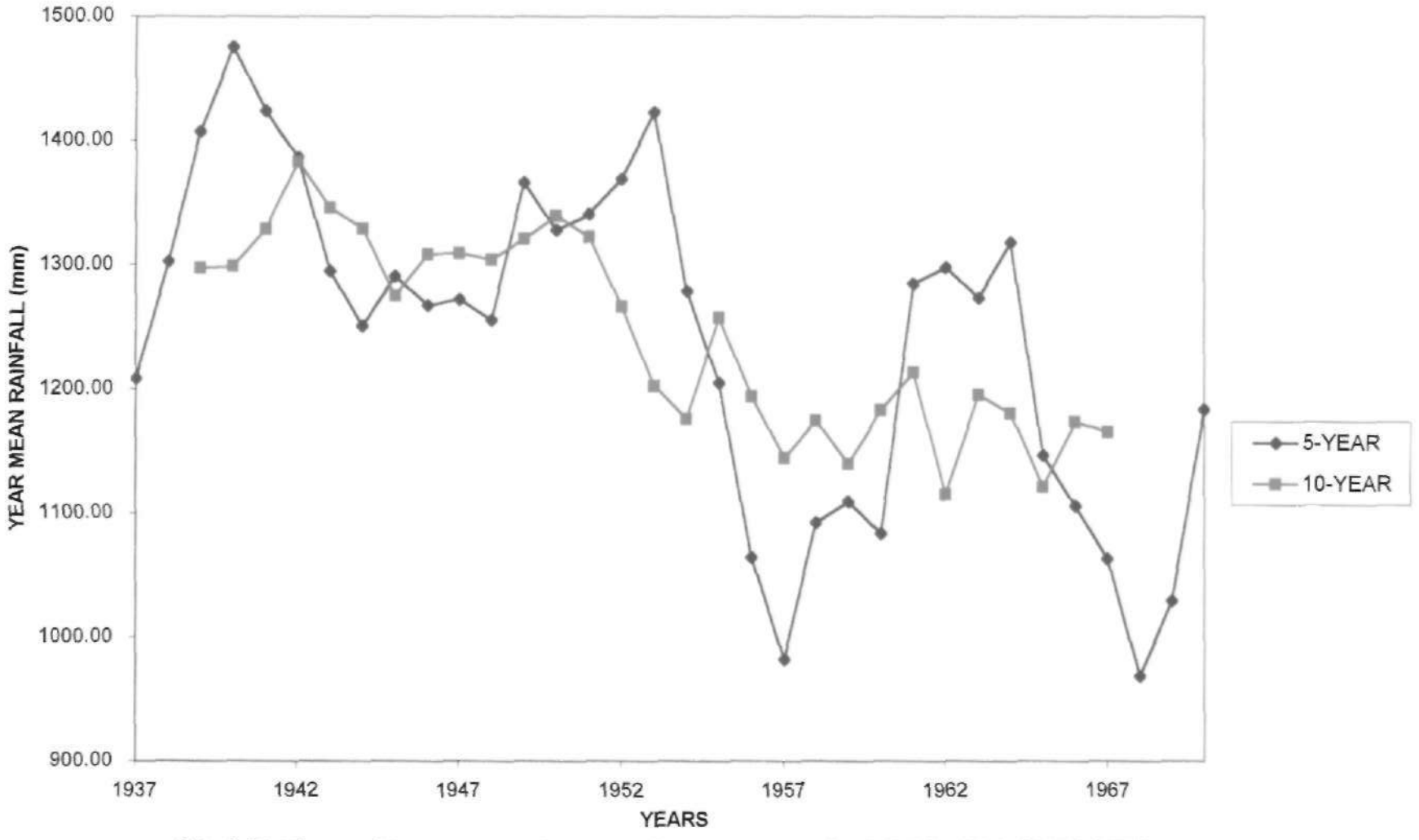


FIG. 4.10: Five and ten year running mean for mean annual rainfall for Idah (1935-1972)

Source: Meteorological Unit Department of Soil Science, Institute for Agricultural Research, Ahmadu Bello University Zaria

running mean test for 1944-53 and 1957-66 showed that t = 8.16 with 18 degrees of freedom. This from the t-distribution table is highly statistically significant with a probability of less than 1 per cent. Thus the probability of the fluctuations between 1944-53 and 1957-66 is less than one per cent.

It was not possible to indicate exactly when changes occurred in Fig. 4.10. But with Fig. 4.11, which shows cumulative deviations, form the mean of annual rainfall for Idah for a period of 38 years it is possible to identify the date at which serials of below-average conditions are replaced by a series of above-average conditions. Fig 4.11 shows clearly a period of below average rainfall before 1939 and above average rainfall after that, only mainly broken by below average rainfall between 1945-46, 1954-1959, and 1961-1962. Although this method cannot be used to project beyond the actual period of the data, it provides a useful analysis of the climate of Idah. The climate on the other hand is a pointer to the average weather conditions - including rainfall - for over 30 years.

The climate of the area is therefore suitable for the agricultural enterprises chosen for analysis. However, weather conditions vary from season to season, and year to year. This invariably is one of the factors that are beyond the control of the farmer.

The year mean rainfall for the 38 years is 1224mm which is very close to the Ayangba year mean of 1200mm for 1992, which in turn was however the lowest between 1990 and 1992. This figure dropped from 1852mm in 1990 to 1525mm in 1991 before dropping to 1200mm in 1992. The year mean for Ofu for 1992 was 1922mm. Thus the year mean for the 38 years could be a good estimate of the rainfall for the study area; as good as the 1311mm for Lokoja also used for the area.

4.2.3 Vegetation

The study area falls into one general vegetation type - forest savanna Mozaic zone -, which extends over the Ankpa Plateau, Ankpa Piedmont, the Okpolo plain and the Anambra-Niger flood plain. It contains a mosaic of high forest, which is now mostly reduced to secondary regrowth interspersed with savanna. Undisturbed high forest has

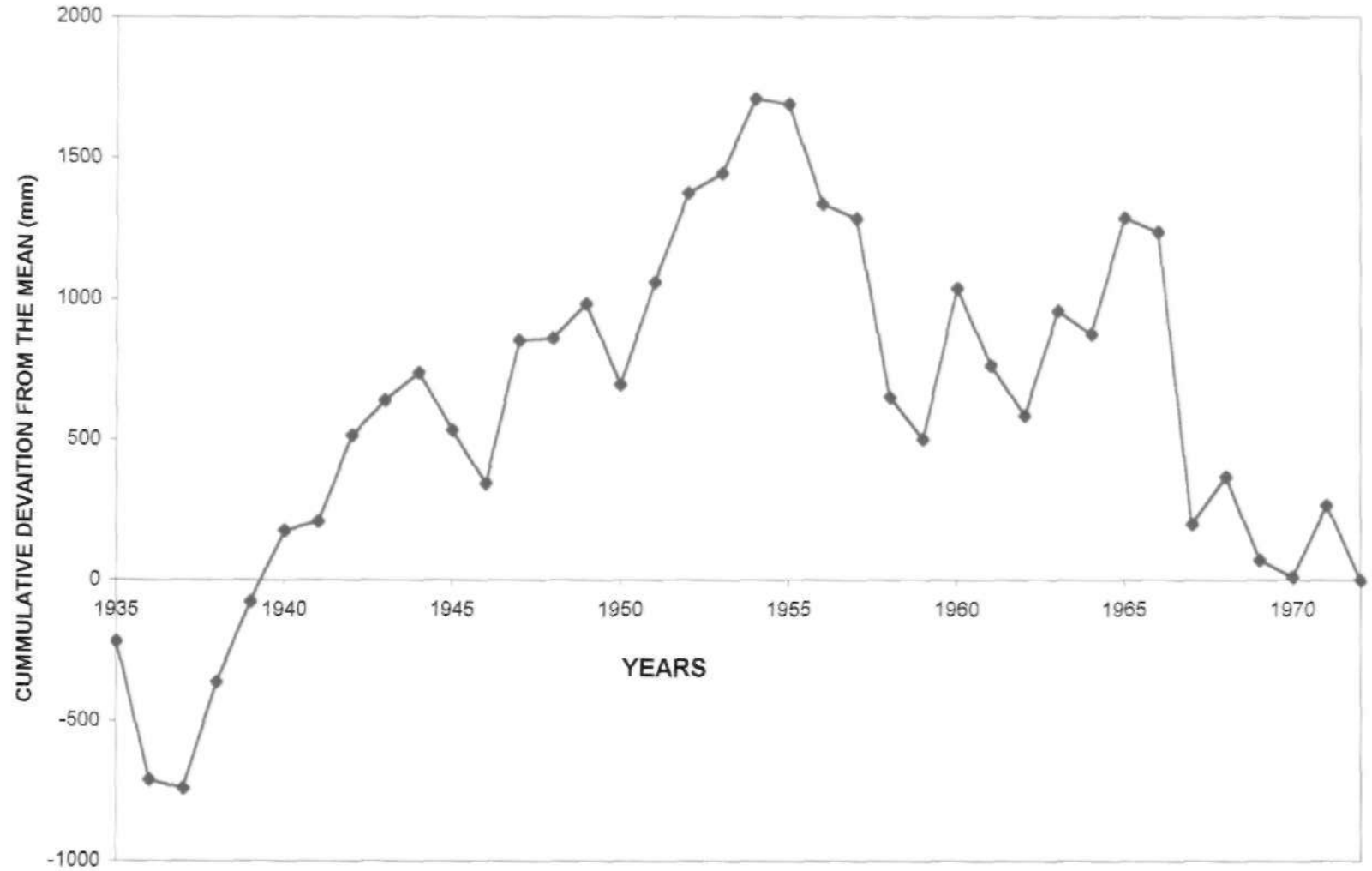


Fig 4.11 Cumulative deviation from the mean for Idah mean annual rainfall 1935 - 1972

Source: Meteorological Unit Department of Soil Science, Institute for Agricultural Research, Ahmadu Bello University Zaria

KASHIM IBRAHIM LIBRARY

many storeys and different life forms. According to Hill (1979, p. 18) the common species in the main storey are: celtic spp., Triplochiton scleroxylon, khaya grandifoliala, Afzelia Africana, and Chlorophora excelsa. When land is cleared for farming useful forest trees are preserved; examples are: Elaeis guineensis (oil palm), Irvingia gabonensis, Pentaclethera maerophylla, Daeryodes edulis, Blighia Sapida and Aubrevillea kerstingii. Secondary regrowth communities form dense thickets with the following species common: Albizia adianthyfolia, A. Zygia, the forest liana combretum racemosum, Baphia pubescens, Disalium guineemse, and Phyllanthus discoideus.

4.2.4 Soils

On the Ankpa Plateau and the Ankpa Piedmont underlain by sandstones, deep well drained soils frequently red or reddish brown in colour with sandy surface horizons occur on the crests of interfluves and on upper and middle slopes. On the lower slopes are paler coloured soils with reddish brown mottles. Grey colours predominate in areas poorly drained.

Soils occurring on the upper slopes of ridges in areas mainly underlain by shale are frequently similar to those on sandstones areas. The soils are more poorly drained with heavier textures and stronger structures on middle and lower slopes. Mottling is common.

The flood plains are occupied by complex alluvial soils of various textures and drainage classes (Ibid).

4.3 Human Setting

4.3.1 Population

The population of the four LGAS that make up the study area is 327,462 constituting 33.5 per cent of the nine LGAs in Igalaland and 15.6 per cent of the total population of the State. Majority of this population reside in the rural areas as only Idah could be regarded as an urban settlement. Semi-urban settlements include, Ugwolawo, Ejule and Odolu.

4.3.2 Social Organisation

A typical Igala village is a cluster of separate compounds or wards. The compound is an assembly of neatly arranged houses eave to eave in a pattern that leaves a rectangular space at the centre without any wall linking but instead and occasionally loose temporary fences filling the small gaps between such houses. This is a pattern common in the southern part of the study area. The northern part has less defined compounds with houses belonging to the members of the same family, although closely knit do not show a particular pattern or form. Few of them are however enclosed by walls, similar to what obtains in Hausaland and some with temporary fences similar to what obtains in the southern part of the area.

In the south houses are rectangular in shape. The round huts that dominated the morphology of houses in the north for the past centuries has been replaced considerably by rectangular types. In the town of Idah it is difficult to see a circular hut, which according to Allen were both the rich and poor man's house in about 1833. However, a visit to some villages in Igala land will show some of the houses in the light of Allen's drawings (Dautrey, 1978).

The ward is a section of the village culturally defined by groups of extended families or clans with common ancestral or historical affinity. 'Madaki' governs the ward in the northern part and Okpala in the southern section of the area. They are responsible to the 'Gago' or 'Onu' (village head) and together with the family or clan heads form the council of elders that advise the 'Onu' on matters concerning the administration of the village.

A typical village is linear in form. With development, this changes to some undefined forms depending mainly on the landscape but without losing its original linear form.

4.3.3 The Economy

Agriculture is the mainstay of the economy of the study area. It is a combination of tree and arable crops with export crops coming from the collection of fruits from wild plants especially oil palm. Rubber was also collected from wild rubber vines in the early part of this century. This practice has ceased as a result of the introduction of rubber plantations that yield far more latex than the wild plants. Livestock and fishing play important but secondary role in the economy of the villages.

Cottage industry including weaving, carving and pottery were in existence before the first half of the 19th century.

Markets for the above products were at that time well organised and trading was also important.

The study area and indeed the whole of Igalaland is an area noted for the production and supply of agricultural products to the neighbouring states. In addition the farmers in the area have been found to be receptive to new crops and new ideas (Ukoje, 1977, 1985). Thus they are generally seen to be good farmers.

Agriculture: The annual crops primarily cultivated are yam, maize, rice, cassava, millet, sorghum, cowpea, groundnut, cotton, bambaranut, pigeon pea, beniseed, and melon. The perennial crops include cassava, banana, pineapple, oil palm, coconut and citrus. The bulk of the oil palm fruits still comes from the wild plants - from forests or preserved stands on the farms. Other wild fruits collected on a lesser scale are Obo, aigele and chio. It was observed that these economic wild plants were being destroyed at an incredibly fast rate. They have been cleared in the process of expanding farmlands. With the exception of the oil palm and locust bean trees, the rest are virtually endangered species in some areas including the so-called forest reserves that have almost been completely destroyed through lumbering and farming.

Agricultural Practices: Clearing of virgin forests or forest regrowth takes place during the dry season between November and February in order to enable the vegetation cleared to dry up for easy burning. The clearing of already destumped fields that are covered mainly with grass takes place immediately before or after the first few rains. Some clearings are delayed due to pressure of work until the operations of planting or transplanting in the case of rice are to be carried out. In this case, it may not be possible to burn the weeded grass but to heap them in the form of ridges to mark the boundaries between various farm plots.

Ridging and making of mounds follow clearing at the onset of rain. Ridges are more rampant in the northern part of the study area while mounds are the main cultivation features in the south. In the south, mounds are made for yams and cassava while rice and maize are planted on flat land, which is nowadays ploughed and harrowed. Yams in the north are planted in mounds while maize and other grains are planted on ridges with the exception of rice that is planted on flat land - also ploughed and harrowed. Mounds have an advantage of free drainage around them. Hence yams that require well-drained surroundings are planted in mounds.

Planting is either done along with ridging as in the case of yams or immediately after ridging as in the case of other grains. The strenuous job of planting yams is the preoccupation of men and boys, while women could plant other grains and cassava. In planting feet, hands and sticks could be used to make appropriate holes on ridges or prepared land before dropping the required number of seeds and covering them with some soil.

Staking is an operation associated with yam only. Stakes are collected in most cases from different sites and transported to the yam fields. The yams are staked when the stems have grown up to at least a metre high. The stakes are then strengthened with a network of ropes or canes or nylon twines joining them together. Some farmers who still have the opportunity to clear virgin forests or bush under long period of fallow could leave some shrubs and young trees standing for yams to climb unto. The young trees and shrubs are

however killed with fire so that they do not have leaves that could shade the yams. However, red yams prefer some shades. So the forest undergrowth is cleared to give way for mounds to be made, and some trees are felled to provide enough sunlight for the yams. Most of the young plants, shrubs and even big trees are left to provide shades and what to climb unto.

Weeding is one of the most tedious operations. Although chemicals for killing weeds (herbicides) are available, the farmers still use the traditional method of hoeing and clearing with cutlasses or hand pulling to remove weeds. The herbicides are not within the reach of the relatively poor farmers. All agro-chemicals are either not used at all or their uses are insignificant. One of the most tedious weeding operations is in rice fields. This makes rice growing labour intensive.

Fertilizer application often closely follows weeding. In spite of the high awareness level by the farmers of the importance of chemical fertilizers, its use has been disappointingly low. Only one yam farmer out of eighteen interviewed used a bag of fertilizer (50kg) on his pure yam stands. Farmers still rely on the natural fertility of the soil as well as the natural way of maintaining soil fertility. Thus farmers are still opening virgin forests and fields under long bush fallow for yam cultivation followed by grains for a period of two or three years before moving to new sites. During the survey, farmers complained of the impeding problem of getting new forests for expansion of farmlands. These complaints were mainly from farmers encroaching into the Ibaji-Ojoko forest reserves. The other farmers far away from the forest reserves still have relatively large number of fields under long bush fallow. The length of fallow period is however on the decline to about three years from more than ten years.

There are farmers who used their fields almost every year. These farmers require chemical fertilizers, which were not readily available to them. They are however few. The last set of farmers relies on the annual replenishment of their farmland by nature through flooding. These farmers require relatively little amount of fertilizer on rice fields and on

fields located on relatively higher grounds. Hence, very few of the selected farmers used fertilizer in the survey year.

Bird scaring (even animals too) is an operation farmers who do not have many children to assist them are scared of. It takes a lot of time and energy - driving away birds or wild animals in crop fields from dawn to dusk until the crop is ripe and harvested. Bird scaring is peculiar to rice and millet. This could be extended to sorghum especially when it is planted in bird-infested areas like the southern part of the study area - Ibaji LGA.

On a lesser scale animals are also scared from destroying crops. These animals include monkeys from maize, grass cutter from yams and rice, rats from digging up planted rice and land squirrel from groundnut. Animals could be scared by using traps, fencing with traps set at points opened to ensnare them, hunters and personal visits from dawn to dusk.

Harvesting is an operation that spans from April to December starting from sweet potatoes and fresh maize, and ending with sorghum, yam, pigeon pea and cassava. Cassava harvesting is virtually a continuous process because it is best stored under ground and only uprooted when needed.

While some crops do not require threshing after harvest (yams, cassava, sweet potatoes), others especially grains require threshing. Rice is threshed and winnowed on the farm while maize, cowpea, millet, sorghum along others are threshed at home.

Crops like yam, cassava and rice may come under pressure to be hurriedly salvaged from swelling floods. This occurs in the southern part of the area, especially in Ibaji LGA. These and other crops planted in areas above flood level are harvested at the farmers' will.

Processing and storage operations come after harvesting. Only few crops are processed before storing them. Such crops include cassava and to a lesser extent, yams. Cassava could be processed into fufu (Akpu), cassava flour and gari while yams can be converted into yam flour before storage. Maize cobs may be stocked in bans and only the quantity required is shelled at a time. Other grains are threshed and stored in bags in

rooms, stores or bans.

Livestock: Goats, sheep, chickens, guinea fowl, and ducks are kept. Dwarf cattle kept up to many decades ago have virtually disappeared. It was observed that the presence of many Fulani herdsmen who permanently reside in the area must have edged out the original stock that were very few in number by the second half of this century. The livestock play an important role in the economy of the area by supplementing the protein and financial requirements of the families. There are no livestock farmers *per se* in the area.

Fishing: Fishing is limited to the riverine areas - along the Rivers Niger, Anambra and the other streams dissecting the area. The numerous ponds and lakes in Ibaji LGA are important sources of fish supply to the surrounding LGAs and states. There are natural ponds and lakes but artificial ponds dug by farmers inside valleys are an ingenious way of tapping annual natural supply of fish. Fish are attracted to the area for breeding at high flood. The fingerings are trapped in the valleys when the floodwater recedes. They later move into the ponds as the valley dry up leaving water only in the ponds. When the water in the ponds dry below the level of the valley floor it is baled out and the fish harvested. The ponds are then repaired against the next season flood.

Fishing in lakes and streams and rivers are carried out using over forty types of fishing gears. Fishing is never taken as a main occupation as its activities are seasonal with the people not willing to migrate temporarily in search of fish as a means of livelihood.

Fish is the main source of protein for the people in Ibaji LGA while meat constitutes, the main source of protein for those in the north.

Forestry: Much of the forest has been cleared for farmlands with the exception of the reserves at Adoru and Ibaji-Ojoko and the less densely populated extensive Niger flood plain areas of Ala (Fig 4.12). These reserves are not spared. There are serious encroachments through lumbering and extension of farmlands. In some areas, the forests left are those along river valleys and marshy areas. There however, exist extensive forest

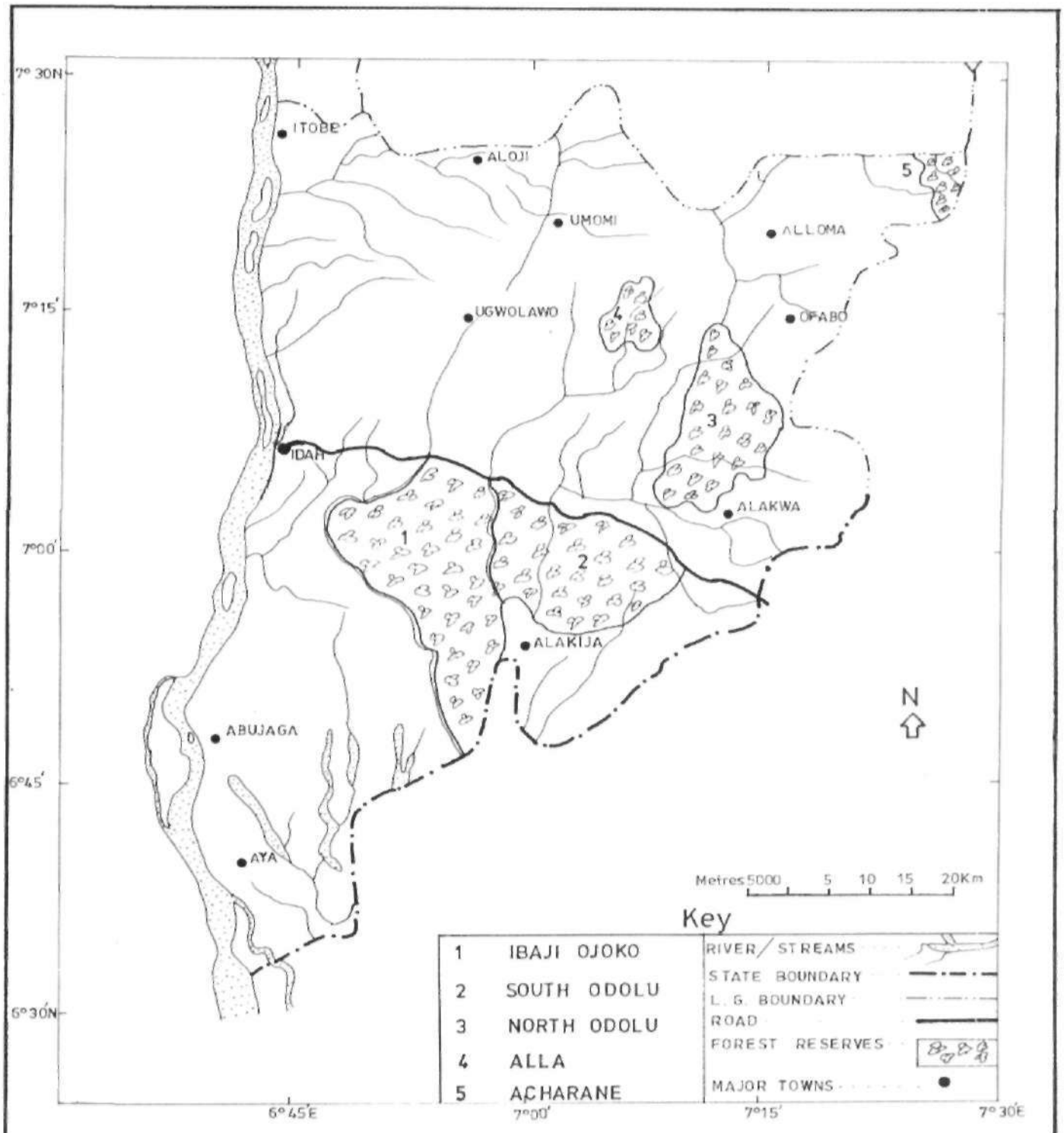


FIG. 4·12 THE STUDY AREA SHOWING FOREST RESERVES

SOURCE: LAND DEVELOPMENT DIVISION, AYANGBA AGRICULTURAL DEVELOPMENT PROJECT, MINISTRY OF AGRICULTURE, BENUE STATE, NIGERIA (1981).

KAS

regrowth (secondary forest) in most parts of the area.

Little or no effort is made in the area of afforestation with the intention of maintaining the status quo. What really obtains is the planting of economic trees in plantations. Oil palm trees dominate such plantations.

Hunting: Hunting of wild animals is always regarded as a specialised secondary occupation. Hunters carry out hunting on part-time basis. They hunt in order to supplement the proceeds from farming.

With shrinking forests and diminishing wild life, hunters are pushed to encroach into forest reserves as poachers. They are therefore a menace to endangered species of wild life. Hunting nowadays is on the decline so that fewer and fewer

people take it up as a secondary occupation.

Labour for Agricultural Production: About five types of labour used for the production of crops have been identified in the area. They are family, hired, contract, and communal and cooperative labour. Family labour involves the use of members of a family in agricultural production. The members used are all the men, and some women. Children serve as full-time farmers, or part-time especially if they are at school or engaged primarily in other occupations like trading and tailoring.

Hired labour crept into the labour market with the advent of monetised economy. This is the type of labour that requires employing a person to work on one's farm on an agreed remuneration per given period of time. The worker receives cash payment at the end of the day depending upon the number of hours he had worked. It requires strict supervision for it to be effective. This type of labour is mostly available and used in the northern part of the area.

Contract labour also requires cash payment for a piece of farm work whose cost had been previously negotiated. The labourer is either paid immediately the work is done or some time after depending on the agreement earlier reached. Contract labour is more dominant in the southern part than in the northern part.

Communal labour is the labour derived from one's community on request for reasons ranging from illness to old age and flood disaster. Members of the community that come to the farmer's aid are usually entertained with food and drinks. No cash payment is made.

Cooperative labour demands that a group of persons usually of the same sex agree to cooperatively work in each other's fields in turn with the person whose farm is visited providing just the lunch for that day. The lunch could be also, on agreement contributed by all the members. Farmers who do not have money to employ the use of hired and contract labour on their farms could effectively tap cooperative labour.

On the whole one would expect the farmers to use less of the cash demanding labour (hired and contract) and more of the non-cash requiring labour (family, communal and cooperative).

Industry: The impact of industrialization in Nigeria is yet to be felt in both the urban and rural areas of the study area. The ceramic industry at Idah went out of function almost immediately it was commissioned. The only outstanding industry is the palm oil extraction mills, which were out of function for many years. The bulking of oil palm fruits, the manufacture and marketing of the palm produce are largely the work of women.

The important industries in the area are cottage industries involving the making of soap (black soap), cloth weaving (achi), basket weaving, matting, pottery, blacksmithing, net making, carving, tailoring, carpentry and masonry.

Trade: The area had for a long time established trade links with all its surrounding neighbours especially Edo, Anambra and Enugu states. Both men and women are engaged

in trading. While women specialise in retailing of agricultural and manufactured products, the men specialise in wholesale of grains and tubers, fish products and fishing gear, and some manufactured products like textiles and petty articles.

Markets provide outlets for these products. Most markets hold every four days. Few however hold every eight or twelve days. The largest market in the area - Ejule holds every eight days. It attracts traders from the east, north and west. The main commodity exchanged is agricultural products especially grains. The sellers are mostly farmers from the surrounding settlements within a radius of at least 53 kilometres. The buyers travel hundreds of kilometres from the surrounding and distant states to the market. Hence the meeting interval of eight days is justified because it allows the farmers to carry out their main occupation of production with less disturbance and gives the buyers enough time to travel to their destinations, dispose of their purchases and travel back to the market.

There are some 'ceremonial' markets, which meet every twelve, or eight days not so much for exchange of goods but to meet as members of a village to socialise. Thus every village has a market day.

Markets of four-day periodicity appear to be more active or lively; Ajaka and Idah markets are in this category. Traders shuttle between these markets and other smaller ones in rotation.

CHAPTER 5

PRESENTATION OF RESULTS AND DISCUSSION

5.1 Socio-Economic Characteristics of Farmers in the Study Area

This section provides basic background information about the +respondents (farmers/household heads) and their families. Such information will facilitate the understanding of a more complex analysis of data concerning the population.

5.1.1 Size of Household

There is on the average about 16 persons per household. This size of the family is large by the present day standard in which the downturn in Nigeria's economy is exerting enormous pressure on available resources of families. This situation would have been considered normal in the past when large family size was synonymous with a family's wealth, as more productive labour would be made available for farm work.

Most of the farmers in the area married between one and two wives. It was observed that about 49 per cent of the household heads married only one wife and about 29 per cent married two wives while about 17 per cent married three wives. This brings the average number of wives per households' head to about two.

From the above statistics the fertility rate is expected to be fairly high. There was an average of about 12 children per household. About 49.4 per cent of the total number of children in the sampled households was male while 50.6 per cent were female. Only 21.3 per cent of these children were married and therefore had partial connection with the family.

The cultural practice of helping to bring up relations for one reason or the other is still important in the area as about 69 per cent of the households had an average of two

relations living with them. An analysis of their relationships with the household heads showed that 33.3 per cent of them were grand children while 26.4 per cent were children of their brothers and sisters, and 19.4 per cent were brothers and sisters - in-laws. Brothers and sisters (or siblings) constituted only

7 per cent while non-blood relations constituted 2.8 per cent.

5.1.2 Age and Educational Level of Sample Farmers

The Age of Sample Farmers:

The farmers sampled were 30 years and above in age. The majority of them fell between 40 and 59 years (67.7 percent) while about 26.9 per cent were 60 years of age and above. A larger proportion of the household heads consisting of farmers 50 years and above and accounting for 70.2 per cent of the respondents were on the side of the less productive population due to their advancement in age (Table 5.1). However, their wealth of experience placed them in very important positions of controlling the affairs of their households comprising very active population.

Their wives were however younger with 62 per cent of them falling between 20 and 40 years of age (Table 5.2). But quite a high proportion was fairly old as shown in Table 5.2 where 36.6 per cent were over 40 years of age. So a higher proportion of the women were of more active age than the men.

TABLE 5.1: AGE DISTRIBUTION OF SAMPLED FARMERS

Age (Years)	No. of Respondents	%
30-39	1	2.4
40-49	10	24.4
50-59	19	43.3
60-69	7	17.1
70 and Above	4	9.8
TOTAL	41	100.0

Source: Field Survey, 1993

TABLE 5.2: **AGE DISTRIBUTION OF WIVES OF THE FARMERS**

Age (Years)	No. of Respondents	%
Less than 20	1	1.4
20 - 40	44	62.0
Above 40	26	36.6
TOTAL	71	100.0

Source: Field Survey, 1993

The children's ages show that only 27.5 per cent were over 20 years old while the rest constituting 72.5 per cent were 20 years or below (Table 5.3).

Most of them were therefore below marriageable age, which explains why only 21.3 per cent of them were married. Therefore majority of the unmarried children were a burden to their parents.

TABLE 5.3: **AGE DISTRIBUTION OF CHILDREN OF THE FARMERS**

Age (Years)	No. of Children	%
Below 10	172	35.2
10-20	182	37.3
Above 20	134	27.5
TOTAL	488	100.0

Source: Field Survey, 1993

About 30 per cent of the relations living with the sampled farmers were less than ten years old and therefore made little or no contribution to the production process. The remaining 70 per cent were however actively involved in the production process (Table 5.4)

TABLE 5.4: **AGE DISTRIBUTION OF RELATIONS**

Age (Years)	**No. of Relations**	%
Below 10	22	29.7
10 - 20	38	51.4
Above 20	14	18.9
TOTAL	74	100.0

Source: Field Survey, 1993

Educational Level of Sample Farmers: The literacy rate among the farmers was 54.8 per cent. This includes those who could read and write in vernacular (Igala) or English. However the literacy level of their wives was lower because 85.7 per cent were illiterate. This might be due to the general non-challant attitude towards girl child education in the area.

The children were being educated through personal efforts of their parents. About 82.9 per cent of the children were literate while the remaining 17.1 per cent were illiterate mostly because they were under school age.

5.1.3 Land Tenure

Although Farmland is abundant in the study area, the two main land categories (upland and fadama) were not available to all the farmers. While the upland (ane ojoke) was in abundance, fadama (ane ogo or ane aruwa) were in short supply. The latter was available to only riverine communities in relatively smaller sizes.

Land Ownership: Land is owned on communal, family or individual basis. Communal land is that owned by a community that may be a whole village or a ward within a village. All the members of the community are free to cultivate any unoccupied piece of land without permission from the village or ward head that usually holds the land in trust for the people.

Family land is owned by an extended family system consisting of closely and

distinctly related members that may be very many in number.

Individually owned land is land personally acquired and cultivated in one's lifetime and could be handed over to children. No land is personally owned in the strict sense of it, as all land is strictly community land under the care of a village, ward or family (clan) head. The only exceptional case where an individual could own a piece of land in all definitions of ownership is when it is a residential or commercial plot.

Strangers living in a community which owns land (i.e. migrants from nearby or distant villages and landless members of the community) are as free as the bona fide members of the community to cultivate any portion of the communal land as long as they go through the normal channel of obtaining permission from the village, ward or family head.

Land Acquisition Method: The most common method of acquiring land in the area is through inheritance. About 61.9 per cent of the farmers got their land through this popular method. Although land is not leased out in the real sense of it, about 23.8 per cent of the farm families cultivated "leased land". The land 'leased' out was not on the grounds of legal agreement or contract but on mutual understanding between the landowner and the tenant. Payments for such leasing are mostly in kind, and often times they are free. The motive behind the payment in kind is to continuously assert ownership over the leased land and to block possible moves by the leaser to lay claims to the land in future.

Some 11.9 per cent of the farmers acquired their farmlands by being the first to clear the forest for cultivation. These lands however later become inherited land to subsequent generations of their families. (Fig 5.1)

The farmers expanded their farm size by cultivating virgin forests. However, such forests are no longer available and so they encroach into forest reserves sometimes with the connivance of forest guards. About 2.4 per cent of the farmers were found to be involved in this clearing of reserved forests while there

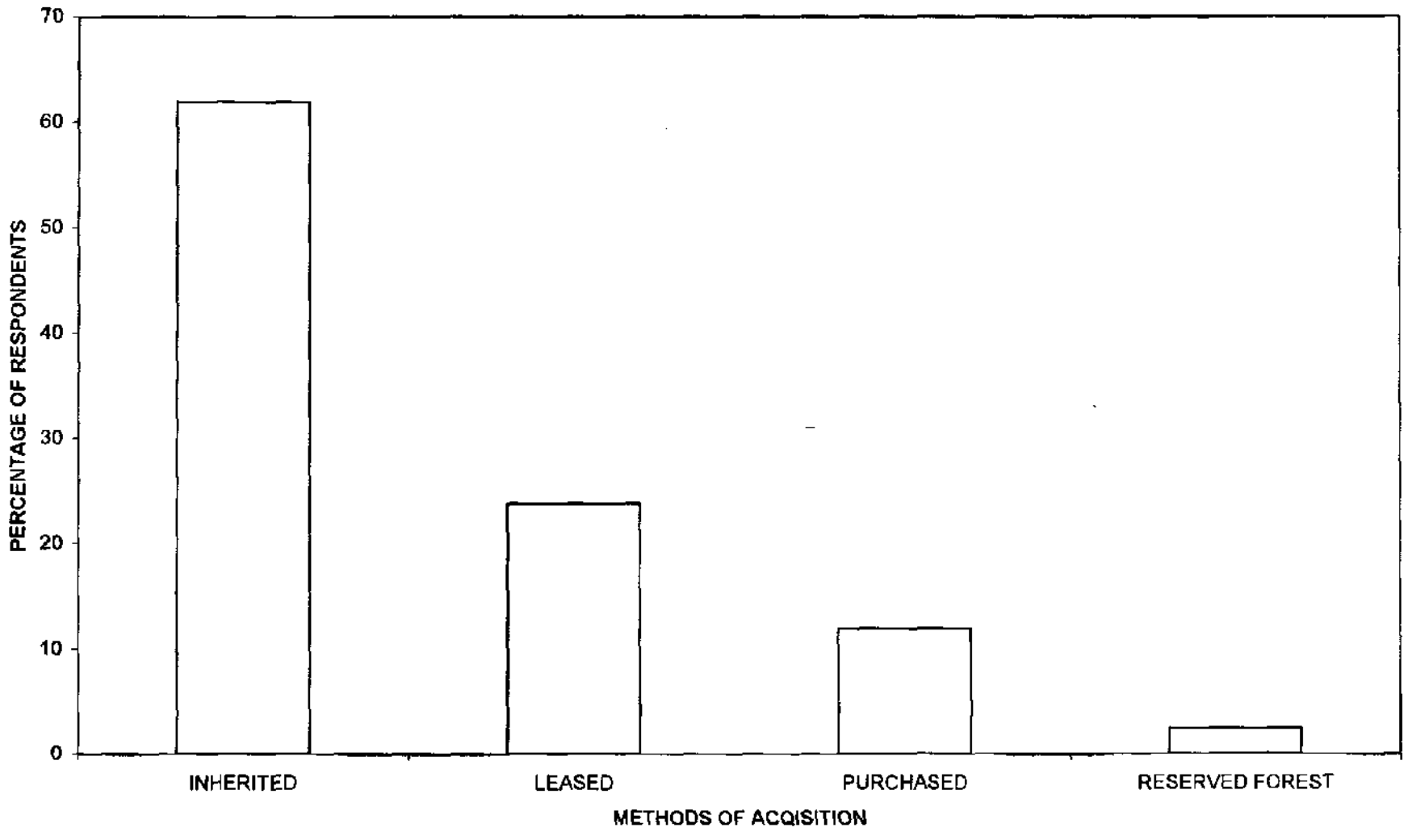


FIG. 5.1: Method of acquiring farm land

Source: Field Survey

were still large areas of uncultivated land under bush fallow.

The duration of ownership of farmlands vary from farmer to farmer (Table 5.5).

TABLE 5.5: DURATION OF OWNERSHIP OF FARMLANDS IN YEARS

Duration in years	No. of Farmers	%
1-5	11	25.6
6-10	9	20.9
11-15	8	18.6
16-20	5	11.6
Over 20	10	23.3
TOTAL	43	100.0

Source: Field Survey, 1993

The table shows that about 25.6 per cent of the farmers acquired their fields between one and five years from the survey year. While over 23 per cent of the farmers had acquired field for more than 20 years. About 51 per cent had fields that were 6 to 20 years old. This shows that the farmers in the area kept on acquiring new lands because of the practice of bush following.

5.1.4 Farm Size

An average farm size of the household in the survey year was 5.26 ha. However the small-scale households had an average size of 2.26 hectares while the medium- and large-scale households had 5.15 hectares and 13.72 hectares respectively. The small-scale farmers constituted about 58.2 per cent of the sample population, and cultivated about 24.9 per cent of the farmland surveyed. On the other hand, the large-scale farmers constituted 20.9 per cent of the sample farmers and cultivated about 54.6 per cent of the total area of land under cultivation (Figs 5.2, 5.3).

5.2 Cropping Pattern

The crops grown in a particular area are determined by the physical, social and economic conditions of the area. The effective growth of these crops requires that the physical components such as water, temperature and soil be present. But social and economic factors like taste; tradition, prices and marketing facilities give rise to cropping patterns different from those physically possible.

5.2.1 The selected Crop Enterprises

Eleven-crop enterprises were selected for detailed analysis. They were divided into three groups of crop enterprises comprising seven different crops - yam, maize, rice, cassava, millet, cowpea and melon. Although all of them can be cultivated in pure stands, they are grouped in Table 5.6 according to their importance based on total farm size.

Of these crops, maize was the most dominant covering about 23.6 per cent of the total area surveyed and 33.9 per cent of the total area of all the selected crop enterprises. Maize had an average farm size per household of about 3.0 hectares. It is cultivated on a wide scale because of the ease with which it could be processed into over thirteen types of dishes and packed food. There is no other crop in the area that can compete with maize in this respect.

Maize-rice crop mixture, which similarly covered 11.1 per cent of the total area of land and about 16.0 per cent of all the selected crop enterprises, had an average farm size per household of about 4 hectares. Although this mixture is observed to be on the decline, it is still an important and profitable way of cultivating rice.

Another important crop enterprise is sole rice crop. It covered 9.1 per cent of the total area surveyed and 13.0 per cent of the selected crop enterprises. This high percentage coverage accounted for the reason why the combination of maize and rice ranked second in the area covered by the selected crop enterprises and in fact by all the crop enterprises

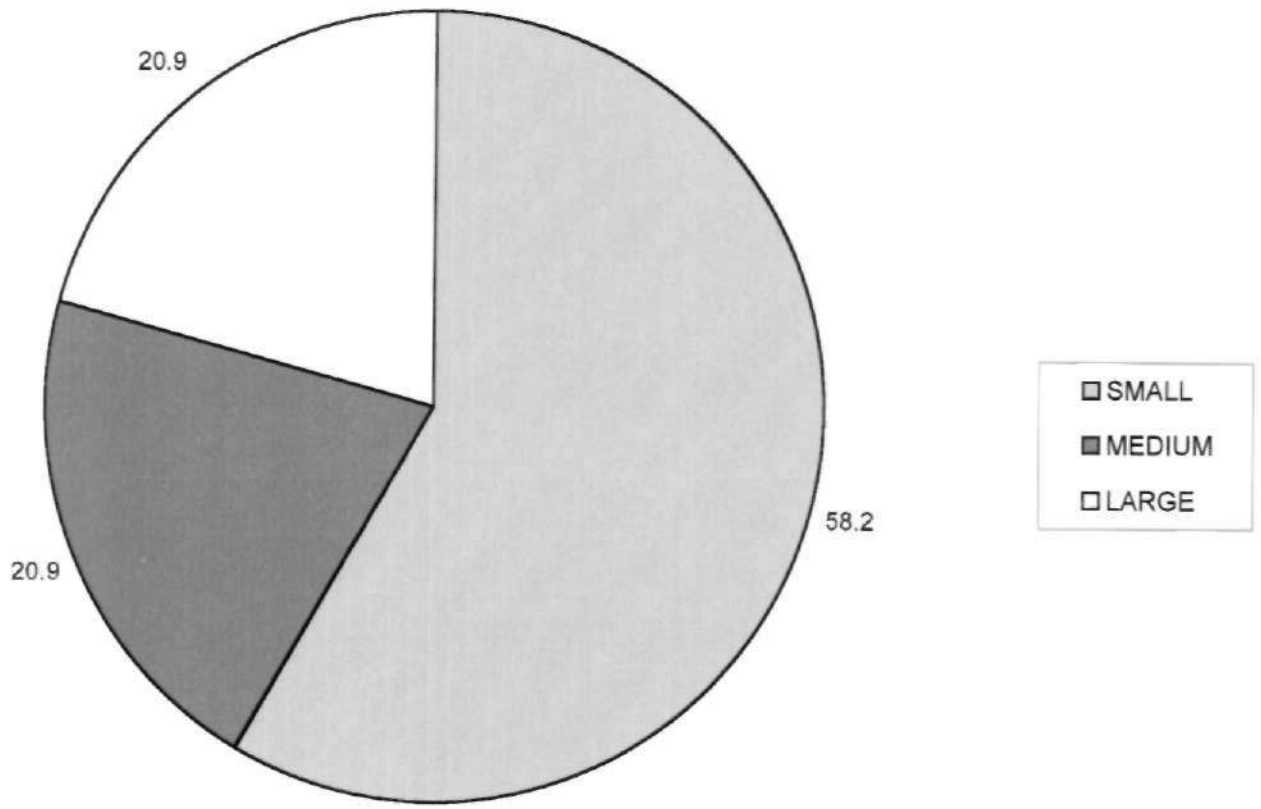


FIG. 5.2: Percentage of household per category of farmers

Source: Field Survey

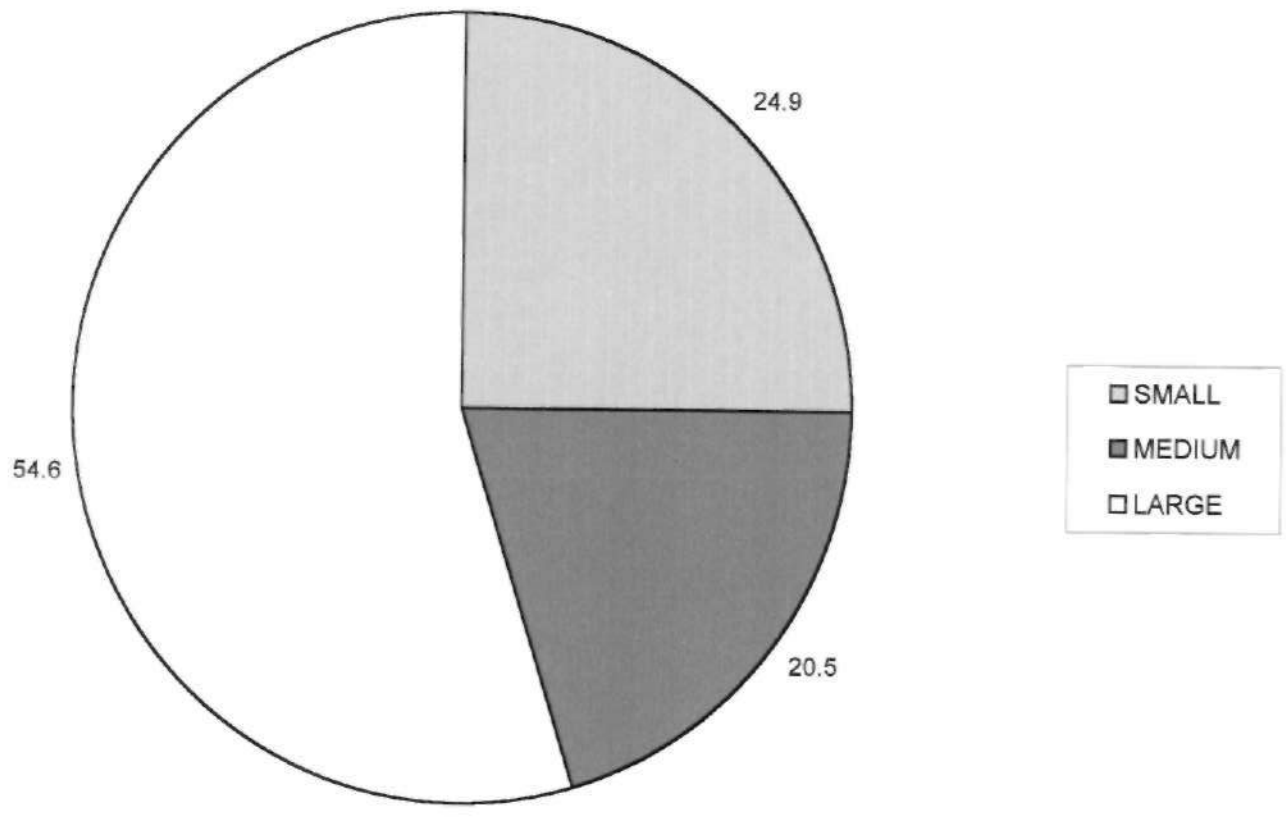


FIG. 5.3: Percentage of total area under cultivation by category of farmers

Source: Field Survey

TABLE 5.6 **AREA OF LAND COVERED BY THE SELECTED CROP ENTERPRISES**

Crop Enterprise	Size (Ha)	% Of Total cultivable area	% of Total area of Selected Crops	Average Farm Size Per Household (Ha)
Yam	9.506	4.2	6.0	0.528
Maize	53.486	23.6	33.9	2.971
Rice	20.524	9.1	13.0	1.207
Cassava	11.357	5.0	7.2	0.946
Maize-cowpea	7.988	3.5	5.1	1.141
Millet-cowpea	9.576	4.2	6.1	2.394
Maize-cassava	8.943	4.0	5.7	0.894
Maize-rice	25.149	11.1	15.9	4.192
Millet-cowpea-cassava	8.119	3.6	5.2	2.706
Maize-cowpea-Cassava	1.631	0.7	1.0	0.544
Melon-Maize-Cassava	1.425	0.6	0.9	0.713
TOTAL	157.704	69.6	100.0	18.236

Source: Field Survey, 1993

surveyed. The average farm size per household for rice was about 1.2 hectares (Table 5.6). Rice is a highly cherished food crop and is therefore regularly eaten. It is also in high demand in the neighbouring states of Edo and Anambra. Much of the rice cultivated is therefore sold to these states.

Cassava sole crop had 5.0 per cent coverage of the total land surveyed and 7.2 per cent of all the selected crop enterprises with an average farm size per household of about

0.9 hectare (Table 5.6). Cassava is fast becoming an important crop because of the rate at which its products like flour, gari and fufu are consumed.

Although yam covered a relatively small proportion of farmland surveyed, it commands the highest respect when it comes to consumption. It is the only crop that is virtually exclusively cultivated by men. It is labour intensive in most parts of the study area, hence its low average farm size per household of about 0.5 hectare (Table 5.6).

Among the three-crop mixtures, millet-cowpea-cassava was the most important with an average farm size of about 2.7 hectares per household. It occupied 3.6 per cent of the total land surveyed and 5.2 per cent of the land under the selected crop enterprises. The other two mixtures have cassava as one of their components - a pointer to the growing importance of cassava (Table 5.6).

In all the mixtures selected, maize and cassava each occurred five times, cowpea four times, millet two times and melon once. This reflects the order of importance of these crops in the diet of the people of this area.

There were forty-two different crop associations, excluding the sole crops, in the area. The commonest were the two-crop and the three-crop mixtures. However, as many as four - and five-crop mixtures were identified in the area (Table 5.7).

TABLE 5.7: CROPPING SYSTEM IN SOUTHERN IGALALAND

Crop Enterprise	Area (Ha)	% Of Total Area	No. Of Crop Enterprises	%
Sole crop	171.708	76.0	26	50
2 crop mixture	44.784	19.8	15	28.8
3 crop mixture	4.171	1.8	6	11.5
4 crop mixture	3.718	1.6	4	7.7
5 crop mixture	1.885	0.8	1	2.0
TOTAL	226.266	100.0	52	100.0

Source: Field Survey, 1993

5.2.2 Sole Cropping

Sole cropping which is the growing of one type of crop species in pure stands was the most dominant practice in the study area. It covered about 51.0 per cent of the number of fields and 52.2 per cent of the area cultivated (Table 5.8). Out of the 19 different crops grown by the farmers, sole crops constituted about 50 per cent of the crop enterprises and accounted for about 76 per cent of the total area cultivated by sampled farmers (Table 5.7).

TABLE 5.8 AREA AND FIELDS UNDER CROPPING SYSTEM

Cropping System	Area (Ha)	%	No Of Fields	%
Sole Cropping	118.209	52.2	105	51.0
Relay Cropping	47.487	21.0	16	7.8
Mixed cropping	18.358	8.1	44	21.3
Double cropping	42.212	18.7	41	19.9
TOTAL	226.266	100.0	206	100.0

Source: Field Survey, 1993

Yam, maize, rice, cassava and cowpea are important food crops, accounting for 42.9 per cent of the area cultivated by sampled farmers (Table 5.9).

However, four major sole crops - yam, maize, rice and cassava altogether covered 41.9 per cent of the total area surveyed. Almost every household cultivated these four crops.

Yam had the highest percentage occurrence of sole crops (22.5 per cent) in surveyed fields, while maize, rice and cassava were equally important crops in pure stands with 21.3, 21.3 and 15.0 per cent respectively (Table 5.10)

TABLE 5.9 **AREA UNDER MAJOR FOOD CROPS**

Crop	Area (Ha)	%*
Maize	53.486	23.6
Rice	20.524	9.1
Cowpea	2.285	1.0
Yam	9.506	4.2
Cassava	11.357	5.0
Maize-Rice	25.149	11.1
Millet-Cowpea	9.576	4.2
Millet-Cowpea-Cassava	8.119	3.6
Maize-Cassava	8.943	4.0
Maize-Cowpea	7.988	3.5
Millet-Maize-Cassava	2.137	0.9
Maize-Cowpea-Cassava	1.631	0.7
Millet-Maize	0.727	0.3
Yam-Cassava	0.285	0.1
Yam-Maize	0.047	0.02
TOTAL	161.760	71.5

* Percentage of total area of fields surveyed (226.266ha).

Source: Field Survey, 1993

TABLE 5.10: **OCCURRENCE OF CROPS IN CROPPING SYSTEMS**

Crop	Percentage Of Occurrence Of Crops In Fields			
	Sole	Relay	Mixed	Double
Yam	22.5	1.5	12.7	-
Maize	21.3	39.4	16.9	21.7
Cassava	15.0	24.2	15.5	11.6
Rice	21.3	10.6	-	-
Cowpea	3.7	-	4.2	34.8
Melon	-	10.6	5.6	8.7
Sorghum	3.7	3.0	10.0	-
Millet	-	1.6	4.2	14.5
Groundnut	5.0	3.0	2.8	3.0
Pigeon pea	2.5	6.1	7.0	-
Beniseed	-	-	2.8	4.3
Bambaranut	-	-	1.4	1.4
Others	5.0	-	16.9	-
TOTAL	100.0	100.0	100.0	100.0

Source: Field Survey, 1993

In spatial perspective, 27.8, 25.0, 22.2 and 19.4 per cent of the fields in Iyano, Agojeju, Odolu and Ojuwocha respectively were planted with yams (Table 5.11). The table also shows a fairly even percentage distribution of fields carrying pure stands of maize with Odolu, Imere and Ujagba recording 19.1, 17.6 and 17.6 per cent occurrence in their fields respectively. Cassava was highly concentrated in Ujagba while rice was more concentrated in the lowland areas of Iyano and Odolu. Other crops like cowpea, millet,

Table 5.11: **PERCENTAGE OCCURRENCE OF SOLE CROPS IN FIELDS BY VILLAGES**

Village	Maize	Cassava	Yam	Cowpea	Rice	Millet	Melon	Sorghum	Pigeon Pea
Agojeju	11.8	4.0	25.0	-	-	-	-	-	27.3
Imere	17.6	18.0	-	44.4	-	66.7	-	-	9.0
Iyano	10.3	8.0	27.8	13.9	30.4	-	5.9	-	-
Odolu	19.1	16.0	22.2	2.8	34.8	-	-	8.3	18.2
Ojuwocha	10.3	8.0	19.4	2.8	13.0	-	29.4	25.0	27.3
Ujagba	17.6	30.0	2.8	2.8	4.4	27.8	17.6	50.0	18.2
Umomi	13.3	16.0	2.8	33.3	17.4	5.5	47.1	16.7	-
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field Survey, 1993

sorghum and pigeon pea reflected micro-cultural and environmental influences in their distribution. Millet, sorghum and pigeon pea are only cultivated on the higher grounds of Idah, Igalamela-Odolu, and Ofu LGAs. Cowpea was cultivated throughout the study area, but at different periods. While it is planted in August in Idah, Igalamela-Odolu and Ofu LGAs, the planting in Ibaji LGA is delayed until November after the flood water must have receded. In this latter case, it does not need rains to germinate and grow to maturity but relies on residual moisture from the receded river flood. Table 5.11

The percentage of households cultivating sole crops (Table 5.12) shows a similar distribution pattern to Table 5.11 where with respect to maize. Only Odolu and Imere had different patterns. About 50 per cent of the households in two villages

Table 5.12: PERCENTAGE OF HOUSEHOLDS CULTIVATING THE SOLE CROPS

Village	Maize	Cassava	Yam	Cowpea	Rice	Millet	Melon	Sorghum	Pigeon Pea
Agojeju	13.9	7.1	20.8	-	-	-	-	-	30.0
Imere	11.1	17.9	-	31.1	-	55.6	-	-	10.0
Iyario	13.9	10.7	20.8	25.0	26.3	-	10.0	-	-
Odolu	19.4	25.0	29.2	6.3	36.8	-	-	10.0	10.0
Ojirwocha	13.9	10.7	20.8	6.3	15.8	-	30.0	30.0	30.0
Ujagba	13.9	17.9	4.2	6.3	5.3	33.3	20.0	40.0	20.0
Umomi	13.9	10.7	4.2	25.0	15.8	11.1	40.0	20.0	-
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field Survey, 1993

from lowland areas (Iyano and Odolu) out of the seven villages surveyed, cultivated yams. This therefore confirms the importance of yams in the lowland region of the derived savanna. Cassava like maize is a household crop. Rice is on the other hand virtually found in all the villages except in agojeju and imere. Cowpea and pigeon pea are some of the main sources of protein in the area. Virtually all the villages cultivated either cowpea or pigeon pea.

Sole cropping was therefore practiced in all the villages with Iyano and Odolu accounting for 23.9 per cent each (Table 5.13).

Spatial distribution of the hectareage under cropping systems by villages and according to the scales of production is shown in Table 5.14. The table shows that all categories of sampled farmers in the villages devoted the largest share of

Table 5.13: PERCENTAGE OCCURRENCE OF FIELDS BY VILLAGES

Village	Sole		Relay		Mixed Crop		Double Crop	
	NO.	%	NO.	%	NO.	%	NO.	%
Agojeju	7	10.4	3	10.0	3	13.0	-	-
Imere	2	3.0	2	6.7	4	17.4	11	36.7
Iyano	16	23.9	-	-	-	-	3	10.0
Odolu	16	23.9	9	30.0	5	21.7	-	-
Ojuwocha	10	14.9	2	6.7	4	17.4	3	10.0
Ujagba	6	9.0	8	26.6	7	30.5	2	6.6
Umomi	10	14.9	6	20.0	-	-	11	36.7
TOTAL	67	100.0	30	100.0	23	100.0	30	100.0

Source: Field Survey, 1993

their farmlands to sole crops - about 46.3 per cent by small scale, 34.9 per cent by medium-scale and 75.9 per cent by large-scale farmers. Under the small-scale production, Iyano village had the highest percentage of its land allocated to sole cropping. Land for sole crops was fairly equally distributed among the villages under medium-scale production except for Imere village with only about 3.4 per cent of its land under sole crops. Agbanaka and Odolu also dominated the large-scale producers as they allocated about 42.5 and 32.3 percent of their farmlands to sole crops respectively.

The occurrence of fields under small-scale farms in these cropping systems showed that 43.9 per cent of the fields under sole crop from the seven surveyed villages came from Iyano, 39.1 and 43.8 per cent under relay and mixed crops respectively came from Ujagba, and 57.1 per cent under double cropping from Umomi (Table 5.15). Under the medium scale farms Agojeju and

Table 5.14: AREA UNDER CROPPING SYSTEMS BY CATEGORY OF FARMS

Village	Small Scale							
	Sole		Relay		Mixed Crop		Double Crop	
	Ha.	%	Ha.	%	Ha.	%	Ha.	%
Agojeju	4.804	18.4	1.580	13.9	0.787	12.5	-	-
Imere	0.559	2.1	-	-	-	-	2.469	19.6
Iyano	8.441	32.3	-	-	-	-	1.393	11.0
Odolu	3.450	13.2	3.245	28.4	0.951	15.1	-	-
Ojuwocha	2.850	10.9	0.313	2.7	1.529	24.4	0.538	4.3
Ujagba	2.681	10.3	2.902	25.4	3.013	48.0	2.682	21.2
Umomi	3.350	12.8	3.372	29.6	-	-	5.537	43.9
TOTAL	26.135	100.0	11.412	100.0	6.280	100.0	12.619	100.0

	MEDIUM SCALE							
	SOLE		RELAY		MIXED CROP		DOUBLE CROP	
	Ha.	%	Ha.	%	Ha.	%	Ha.	%
Agojeju	4.790	29.6	7.562	70.3	0.276	6.5	-	-
Imere	0.551	3.4	0.903	8.4	0.483	11.3	13.886	91.5
Iyano	-	-	-	-	-	-	-	-
Odolu	5.862	36.3	2.294	21.3	0.686	16.1	-	-
Ojuwocha	4.964	30.7	-	-	2.824	66.1	1.292	8.5
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
TOTAL	16.167	100.0	10.759	100.0	4.269	100.0	15.178	100.0

	LARGE SCALE							
	SOLE		RELAY		MIXED CROP		DOUBLE CROP	
	Ha.	%	Ha.	%	Ha.	%	Ha.	%
Agojeju	-	-	-	-	-	-	-	-
Imere	-	-	-	-	6.229	79.8	10.585	73.4
Iyano	-	-	-	-	-	-	-	-
Odolu	24.495	32.3	2.653	10.5	-	-	-	-
Ojuwocha	1.130	1.5	1.024	4.0	1.580	3.830	20.2	26.6
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
Agbanaka	32.282	42.5	-	-	-	-	-	-
Idah	9.250	12.2	21.639	85.5	-	-	-	-
Ugwolawo	8.750	11.5	-	-	-	-	-	-
TOTAL	75.907	100.0	25.316	100.0	7.809	100.0	14.415	100.0

Source: Field Survey, 1993

Table 5.15: **OCCURRENCE OF FIELDS IN CROPPING SYSTEMS BY CATEGORY OF FARMS/VILLAGES**

Village	Small- Scale							
	Sole		Relay		Mixed Crop		Double Crop	
	No.	%	No.	%	No.	%	No.	%
Agojeju	4	7.0	1	4.3	3	18.7	-	-
Imere	1	1.8	-	-	-	-	2	9.5
Iyano	25	43.9	-	-	-	-	4	19.0
Odolu	6	10.5	6	26.1	4	25.0	-	-
Ojuwocha	4	7.0	1	4.3	2	12.5	1	4.9
Ujagba	6	10.5	9	39.2	7	43.8	2	9.5
Umomi	11	19.3	6	26.1	-	-	12	57.1
TOTAL	57	100.0	23	100.0	16	100.0	21	100.0
	Medium – Scale							
	Sole		**Relay**		**Mixed Crop**		**Double Crop**	
	No.	%	No.	%	No.	%	No.	%
Agojeju	6	30.0	2	33.33	1	16.7	-	-
Imere	1	5.0	2	33.33	2	33.3	10	90.9
Iyano	-	-	-	-	-	-	-	-
Odolu	7	35.0	2	33.33	1	16.7	-	-
Ojuwocha	6	30.0	-	-	2	33.3	1	9.1
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
TOTAL	20	100.0	6	100.0	6	100.0	11	100.0
	Large- Scale							
	Sole		**Relay**		**Mixed Crop**		**Double Crop**	
	No.	%	No.	%	No.	%	No.	%
Agojeju	-	-	-	-	-	-	-	-
Imere	-	-	-	-	3	75.0	4	80.0
Iyano	-	-	-	-	-	-	-	-
Odolu	6	25.0	1	25.0	-	-	-	-
Ojuwocha	2	8.3	1	25.0	1	25.0	1	20.0
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
Agbanaka	6	25.0	-	-	-	-	-	-
Idah	7	29.2	2	50.0	-	-	-	-
Ugwolawo	3	12.5	-	-	-	-	-	-
TOTAL	24	100.0	4	100.0	4	100.0	5	100.0

Source: Field Survey, 1993

KASUIM IBRA...

Odolu had higher percentage occurrences of fields under sole and relay crops. Ojuwocha also had a high rate of 30 per cent of occurrence in fields under sole crops. The three villages (Agojeju, Odolu and Ojuwocha) accounted for a total of 95 per cent of the occurrence of fields under sole crops.

Imere had a strong showing under relay, mixed and double crops. Under, large-scale farms, the only three main survey villages that had large-scale farmers are Imere, Odolu and Ojuwocha. The other three settlements (Agbanaka, Idah and Ugwolawo) were chosen because of the presence of large-scale farmers in them. They together accounted for 56.7 per cent of the fields under sole crops, (Table 5.15).

About 37 per cent of the households were involved in sole cropping under small farms (Table 5.16). A similar pattern emerged under medium and large farms where the percentage occurrence of household under sole crops were 35 per cent and 46.7 per cent respectively.

5.2.3 Double Cropping

Double cropping is the growing of two crops in sequence in such a way that the second crop is sown or transplanted after the harvest of the first. It is practised in virtually all the villages, even in areas subject to flooding where after early flooding sweet potatoes and cassava stems are removed from flood plains of the Niger and taken to relatively higher grounds for plating. Sweet potatoes which are planted in May or June are harvested between November and January. The stems are then taken back to the Niger flood plain for planting. The cassava will however be left in the ground for a minimum of one year before harvest. It is absent in Agojeju and Odolu.

Table 5.16: OCCURRENCE OF HOUSEHOLDS IN CROPPING SYSTEMS BY CATEGORY OF FARMS

Village	Small Scale							
	Sole		Relay		Mixed Crop		Double Crop	
	No.	%	No.	%	No.	%	No.	%
Agojeju	2	10.0	1	8.3	2	18.2	-	-
Imere	1	5.0	-	-	-	-	1	9.0
Iyano	5	25.0	-	-	-	-	3	27.4
Odolu	3	15.0	3	25.0	4	36.4	-	-
Ojuwocha	1	5.0	1	8.3	1	9.0	1	9.0
Ujagba	3	15.0	4	33.3	4	36.4	2	18.2
Umomi	5	25.0	3	25.0	-	-	4	36.4
TOTAL	20	100.0	12	100.0	11	100.0	11	100.0

	Medium-Scale							
	Sole		Relay		Mixed Crop		Double Crop	
	No.	%	No.	%	No.	%	No.	%
Agojeju	2	28.6	2	40.0	1	25.0	-	-
Imere	1	14.2	1	20.0	1	25.0	3	75.0
Iyano	-	-	-	-	-	-	-	-
Odolu	2	28.6	2	40.0	1	25.0	-	-
Ojuwocha	2	28.6	-	-	1	25.0	1	25.0
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
TOTAL	7	100.0	5	100.0	4	100.0	4	100.0

	Large Scale							
	Sole		Relay		Mixed Crop		Double Crop	
	No.	%	No.	%	No.	%	No.	%
Agojeju	-	-	-	-	-	-	-	-
Imere	-	-	-	-	1	50.0	1	50.0
Iyano	-	-	-	-	-	-	-	-
Odolu	2	28.6	1	25.0	-	-	-	-
Ojuwocha	1	14.3	1	25.0	1	50.0	1	50.0
Ujagba	-	-	-	-	-	-	-	-
Umomi	-	-	-	-	-	-	-	-
Agbanaka	1	14.3	-	-	-	-	-	-
Idah	2	28.6	2	50.0	-	-	-	-
Ugwolawo	1	14.3	-	-	-	-	-	-
TOTAL	7	100.0	4	100.0	2	100.0	2	100.0

Source: Field Survey, 1993

Double cropping system covered about 19.9 per cent of the number of fields and 18.7 per cent of the land cultivated (Table 5.8). It is the prevailing system in Imere (36.7 per cent) and Umomi (36.7 per cent) (Table 5.13).

The occurrence of fields under small-scale farms showed that about 57.1 per cent of the fields under double cropping came from Umomi. Imere on the other hand, accounted for 90.9 per cent and 80.0 per cent of the fields under medium and large-scale farms respectively (Table 5.15).

5.2.4 Relay cropping

Relay cropping is the growing of two or more crops in sequence in such a way that the succeeding one is sown or transplanted before the harvest of the former.

The percentage of the area under relay cropping was 19.1 (Table 5.17). Relay cropping was dominant in Odolu (30 per cent), Ujagba (26.7 per cent) and Umomi (20 per cent) (Table 5.13). Relay cropping was virtually absent in Iyano because of its location in an area subject to flooding where such practice may not be feasible. However, the area had witnessed maize-rice combinations in relay cropping which has almost completely disappeared now because of the land use practice associated with it. Maize used to be planted on a newly deforested land, and about two months later, rice would be inter-planted. Maize would then be harvested about a month or two after planting rice thus leaving the rice to complete its own life cycle.

Since there are no more virgin forests for such practices and farmers now move to relatively lower portions of the land subject to early flooding and because of impoverished soils due to continuous cultivation, without using fertilizers, conditions not favourable for the growth of maize, hence the decline of the relay cropping system.

Table 5.17: **PERCENTAGE AREA UNDER CROPPING SYSTEMS**

Village	Sole		Relay		Mixed Crop		Double Crop	
	Ha.	%	Ha.	%	Ha.	%	Ha.	%
Agojeju	9.594	19.6	9.142	35.4	1.063	5.8	-	-
Imere	1.110	2.3	0.903	3.5	6.712	36.6	26.940	63.8
Iyano	8.441	17.2	-	-	-	-	1.393	3.3
Odolu	14.807	30.3	8.192	31.7	1.637	8.9	-	-
Ojuwocha	8.944	18.3	1.337	5.2	5.933	32.3	5.660	13.4
Ujagba	2.681	5.5	2.902	11.2	3.013	16.4	2.682	6.4
Umomi	3.350	6.8	3.372	13.0	-	-	5.337	13.1
TOTAL	48.927	100.0	25.848	100.0	18.358	100.0	42.212	100.0

Source: Field Survey, 1993

Relay crops covered a minimum of 20 per cent of the total farmland under small, medium-, and large-scale production. The system was more widespread among the villages at the small-scale level than at the medium- and large-scale levels (Table 5.14). For instance, Idah alone accounted for 50 per cent of the fields under relay cropping under large farms (Table 5.15).

5.2.5 Mixed Cropping

About 27 different crop mixtures were observed in the area as shown in Table 5.18. Maize appeared in 17 mixtures (63.0 per cent), cassava in 14 (51.9 per cent) and yam in 7(25.9 per cent) (Table 5.19). It was also observed that crops that appeared in four or less number of crop mixtures were those usually found in pure stands. Thus crops such as rice, cowpea, millet, soyabean, beniseed and sweet potatoes appeared in few crop combinations.

TABLE 5.18: AREA UNDER DIFFERENT TYPES OF CROP MIXTURES

Crop Mixture	Area (Ha)	%
Maize-Rice	25.149	45.1
Maize-Cassava	8.943	16.0
Maize-Soyabean	2.922	5.2
Melon-sorghum-Cowpea-Cassava)	2.824	5.1
Maize-Melon-Cassava-Pigeon Pea)		
Maize-Groundnut	2.030	3.6
Cassava-Melon-Maize-Beniseed-Sorghum	1.885	3.4
Cassava-Melon-Maize	1.425	2.6
Maize-Groundnut-Rice	1.392	2.5
Yam-Cocoyam	1.323	2.4
Melon-Maize	1.085	1.9
Groundnut-Maize-Cassava	1.085	1.9
Melon-Cassava	0.955	1.7
Yam-Pigeon Pea	0.946	1.7
Sorghum-Cassava	0.699	1.3
Millet-Maize-Sorghum-Cassava	0.490	0.9
Maize-Okra	0.483	0.9
Maize-Sorghum	0.313	0.6
Yam-Cassava	0.285	0.5
Yam-Ulai-Cocoyam	0.276	0.5
Groundnut-Cassava	0.274	0.5
Sweet Potatoes-Maize-Sorghum-Cassava	0.267	0.5
Sweet Potatoes-Cassava	0.234	0.4
Yam-Maize-Pigeon Pea	0.171	0.3
Yam-Cocoyam-Cowpea	0.143	0.2
Millet-Maize-Beniseed-Cassava	0.137	0.2
Yam-Maize	0.047	0.1
TOTAL	55.783	100.0

Source: Field Survey, 1993

The most common pattern of cultivation after sole cropping was the 2-crop mixture, which accounted for 19.8 per cent of the total hectareage cultivated (Table 5.7). The 3-crop,

4-crop and 5-crop mixtures together accounted for 4.2 per cent indicating that more farmers depended on sole and 2-crop mixtures. Maize-rice alone accounted for 45.1 per cent of the land devoted to crop mixtures while maize-cassava accounted for only 16.0 per cent of the hectareage under mixtures (Table 5.18).

Percentage occurrence of crop mixtures in the fields is reflected in Table 5.20. Maize-cassava mixture is found in four villages of Odolu (50 per cent), Ujagba (25 per cent), Agojeju (12.5 per cent) and Imere (12.5 per cent). The other important combinations are maize-cowpea and maize-pigeon pea, which covered about 50 per cent of the village each. A similar pattern to Table 5.20 emerged in Table 5.21 for maize-cassava, maize-cowpea, maize-pigeon pea, and also for most other mixtures.

The spatial distribution of mixed cropping showed that Ujagba had the highest percentage occurrence of 30.4 and 21.7 per cent for Odolu.

Under small- scale farm. mixed cropping was most important in Ujagba and ojuwocha where about 48.0 per cent and 24.4 per cent of the area under mixed cropping in the surveyed villages came from them respectively. At the medium-scale level it was Ojuwocha and Odolu that were important. It was only Imere that was outstanding at the large-scale level (Table 5.14). Mixed cropping was virtually absent in Imere, Iyano and Umomi, but it was only insignificant in Iyano where it was limited to maize-melon and yam-maize.

Table 5.19: Crops and Crop Mixtures

Crops	No. Of Crop Mixtures	% *Of Total No. Of Crop Mixtures.
Maize	17	63.0
Cassava	14	51.9
Yam	7	25.9
Rice	2	7.4
Cowpea	2	7.4
Sorghum	6	22.2
Millet	2	7.4
Melon	5	18.5
Pigeon Pea	3	11.1
Soya Bean	1	3.7
Groundnut	4	14.8
Beniseed	2	7.4
Cocoyam	3	11.1
Sweet Potatoes	2	7.4

* Total number of crop Mixtures = 27

Source: Field Survey, 1993

Table 5.20: PERCENTAGE OCCURRENCE OF CROP MIXTURES BY NUMBER OF FIELDS BY VILLAGES

VILLAGE	SOLE	MA-CA	MA-CP	ME-CP-CA	MA-PP	YM-CCY	MA-RC	MA-CP-CA	CA-ME-MA	ML-CP	ME-CP
Agojeju	10.4	12.5	-	-	50.0	25.0	-	-	-	-	-
Imere	3.0	12.5	28.6	83.3	25.0	-	-	66.7	-	100.0	-
Iyano	23.9	-	28.6	-	-	-	-	-	-	-	-
Odolu	23.9	50.0			25.0	75.0	75.0	-	-	-	-
Ojuwocha	14.9	-	-	-	-	-	-	-	-		-
Ujagba	9.0	25.0		-	-	-	-	-	33.3		-
Umomi	14.9	-	42.8	16.7	-		25.0	33.3	66.7	-	100.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

CA= Cassava, CCY= Cocoyam, CP =Cowpea, MA= Maize, ME =Melon, ML= Millet, PP=Pigeon Pea, RC=Rice, YM=Yam

Source: Field Survey, 1993

Table 5.21: **PERCENTAGE OCCURRENCE OF CROPS BY HOUSEHOLDS BY VILLAGES**

VILLAGE	SOLE	MA-CA	MA-CP	ML-CP-CA	MA-PP	YM-CCY	MA-RC	MA-CP-CA	CA-ML-MA	ML-CP	ME-CP
Agojeju	13.8	12.5	-	-	50.0	25.0	-	-	-	-	-
Imere	7.0	12.5	28.6	66.7	25.0	-	-	66.7	-	100.0	-
Iyano	17.2	-	28.6	-	-	-	-	-	-		-
Odolu	20.7	50.0			25.0	75.0	75.0	-	-		-
Ojuwocha	13.8	-	-	-	-	-	-	-	-	-	-
Ujagba	10.3	25.0	-	-	-	-	-	-	33.3	-	-
Umomi	17.2	-	42.8	33.3	-		25.0	33.3	66.7		100.0
TOTAL	100.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

CA= Cassava; CCY = Cocoyam, CP Cowpea, MA Maize, ME Melon, ML=Millet, PP=Pigeon Pea, RC=Rice, YM= Yam

Source: Field Survey, 1993

Occurrence of fields under small-scale farms showed that 43.8 per cent came from Ujagba and 25.0 per cent from Odolu. Under medium-scale farms Ojuwocha and Imere had 33.3 per cent each while most of the fields at large-scale level came from Imere (75.0 per cent) (Table 5.15).

Only about 22.2 per cent of the households under small farms practised mixed cropping system. At the medium and large scale levels, lower percentages of households using mixed cropping system dropped to 20 and 13.3 respectively (Table 5.16).

5.3 ANALYSIS OF THE RESOURCES OF THE SELECTED CROP ENTERPRISES

5.3.1 Farm Land

Land is a very important input in crop production, but it is fixed. It is the standard unit used in calculating the size of a farm that in turn is used in standardising other computations in crop production analysis. In this study, land is incorporated in the results presented as the calculations were done in various units per hectare.

Figure 5.4 shows the average farmland under cultivation in the sampled villages by the sampled farmers. Among the randomly selected villages of Agojeju, Imere, Iyano, Odolu, Ojuwocha, Ujagba and Umomi; the sampled farmers in Imere had the highest average of 7.133 hectares of farmland. Similarly the sampled farmers in Agojeju, Odolu and Ojuwocha had averages varying between 3.519 and 4.375 hectares per village. In the remaining three villages of Iyano, Ujagba and Umomi the sampled

KASHIM IBRAHIM LIBRARY

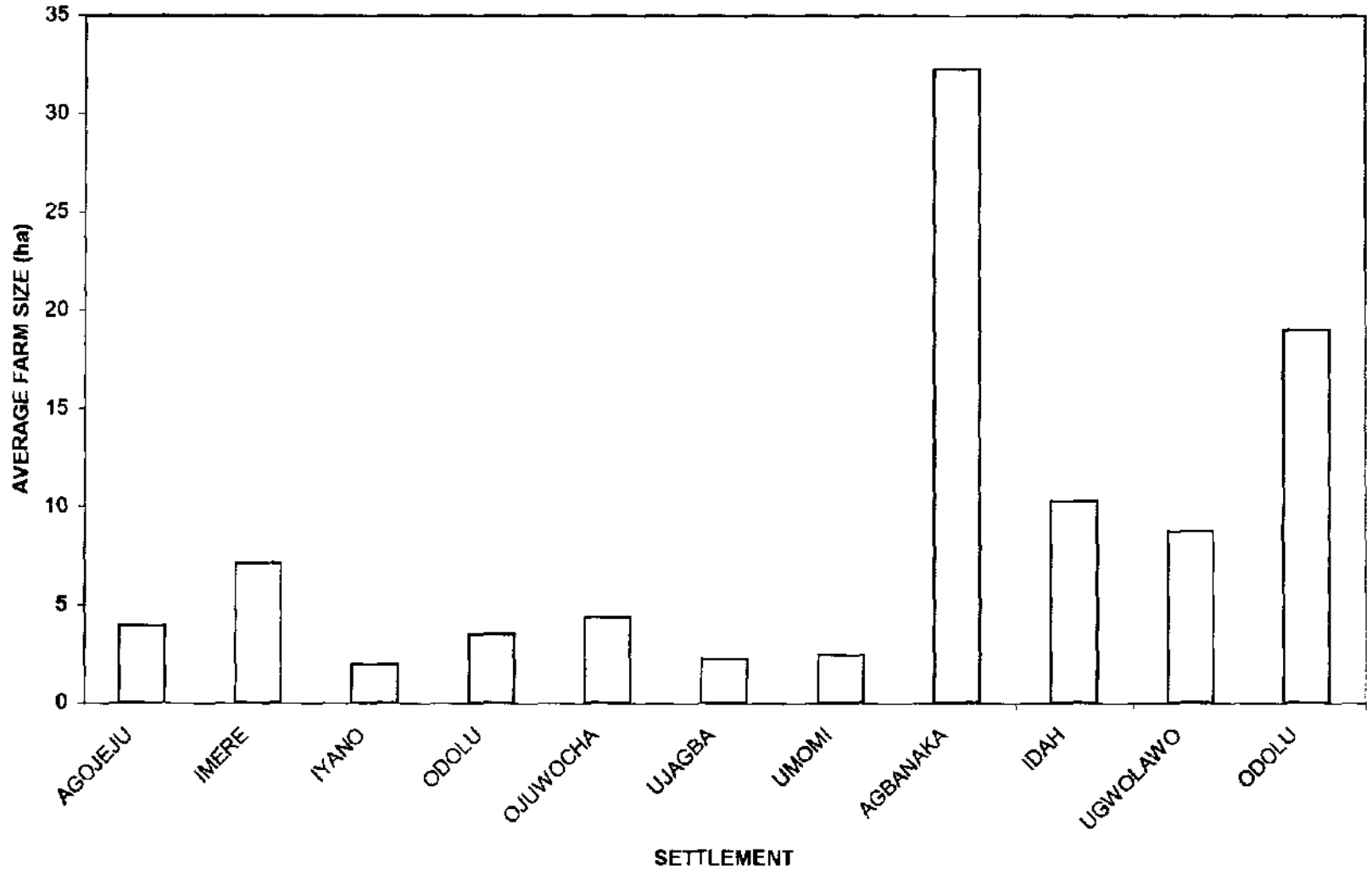


Fig. 5.4 Farmland under cultivation by sample farmers in sample villages
Source: Field Survey

farmers had between 1.967 and 2.452 hectares. The sampled farmers in Iyano had the least average hectareage. These farmers happened to have all fallen under the small-scale category. Imere with the highest average hectareage had a large-scale farmer within the sample. The other settlements - Agbanaka, Idah, Ugwolawo and Odolu - were selected on the basis of the relatively large farmers identified in them. Agbanaka with the highest hectareage under cultivation among the four had only one large-scale farmer while Idah had two, Ugwalowo and Odolu had one each.

5.3.2 Farm Labour

Labour is one of the most important factors of agricultural production. All the other production factors assembled cannot produce any reasonable output without labour playing its own important role.

Five types of labour-family, hired, contract, communal and cooperative - were used in the production of virtually all the crops. For the purpose of easy analysis these types of labour were grouped into two-family and non-family. The non-family labour thus comprises hired, contract, communal and cooperative labour.

For the computation of man-days, the total labour input in man-hours was divided by the average man-hours of 5 hours for family labour. These 5 hours was the average man-hours for Agojeju, Imere, Iyano, Odolu, Ojuwocha, Ujagba and Umomi villages.

The average household in the study area expended about 2817 man-hours per cropping season. This is about 563man-days - taking five man-hours (which is the average of the length of time spent on the farm per day excluding time spent traveling to and from fields), as an equivalent of one-man day. Although the average man-hours per household per season of 2817 is higher than 1,600 man-hours obtained by Norman for three villages in the Sokoto settled zone in 1976, it falls within Norman's range of less than 210 to more than 3,030 man-hours per household (Norman, 1976). The average amount of labour used

by all the sampled farmers was 535 man-hours per hectare (Table 5.22). Out of this the family labour expended 237 man-hr/ha constituting 44.3 per cent of the

Table 5.22: AVERAGE LABOUR USED UNDER FARM OPERATION

Farm Operations	Source Of Labour (Man-Hr/Ha.)					
	Family	%	Non-Family	%	Total	%
Clearing	28	12.0	54	18.1	82	15.3
Ridging	50	21.0	61	20.5	111	20.7
Planting	24	10.1	37	12.4	61	11.4
Weeding	56	23.6	65	21.8	121	22.6
Harvest and Processing	79	33.3	81	27.2	160	30.0
TOTAL	237	100.0	298	100.0	535	100.0

Source: Field Survey, 1993

total average labour, while the non-family labour used 298 man-hr/ha constituting 55.7 per cent. The table also shows that family labour was less important than non-family labour, which is an indication of less dependence on family labour in modern day farming in the area. It also shows that the combined operations of harvesting and processing used the highest labour. Weeding had the highest single item of cost followed by ridging. Planting operation used the least labour of 61man-hr/ha, which accounted for 11.4 per cent of the average labour.

An average labour of 608man-hr/ha was used in the production of some selected crop enterprises shown in Table 5.23. Family labour accounted for 44.2 per cent of the total average of the man-hr/ha used in the production of some selected crop enterprises while non-family labour accounted for 55.8 per cent. It could be observed that, the rate of family and non-family labour for the selected crop enterprises in Table 5.23 is a good

representation of the rate of labour for the two sources (Table 5.22). Yam enterprise was the most labour intensive followed by rice and maize-rice enterprises. Maize-cassava was, however, the least labour intensive crop enterprise (Table 5.23).

Table 5.23: Average Labour Expended In The Production Of Some Selected Crop Enterprises

CROP Enterprise	Source Of Labour (Man-Hr/Ha.)					
	Family	%	Non-Family	%	Total	%
Yam	600	27.9	797	29.4	1397	28.7
Maize	213	9.9	188	6.9	401	8.3
Rice	519	24.1	450	16.6	969	19.9
Cassava	284	13.2	107	4.0	391	8.0
Maize-Cowpea	275	12.8	200	7.4	475	9.8
Millet-Cowpea	130	6.0	184	6.8	314	6.5
Maize-Cassava	101	4.7	120	4.4	221	4.5
Maize-Rice	30	1.4	665	24.5	695	14.3
TOTAL	2152	100.0	2711	100.0	4863	100.0
AVERAGE	269	-	339	-	608	-

Source: Field Survey, 1993

Table 5.23 also shows that there were variations in the use of either family or non-family labour for the production of the various crop enterprises. For example, family labour was mainly used in the production of maize, rice, cassava and maize-cowpea, while non-family labour was used mainly in the production of yam, millet-cowpea, maize-cassava and maize-rice.

An average family labour of 325 man-hr/ha was for the production of yam, maize, rice and cassava while 297 man-hr/ha of non-family labour was used for the same crop enterprise.

Table 5.24 shows the labour input in man-hours per hectare by the scale of production for yam, maize, rice and cassava enterprises. It shows that the small-scale farmers depended more on family labour while medium and large-scale farmers depended more on non-family labour for the production of yam, maize, rice and cassava.

TABLE 5.24: LABOUR INPUT BY SCALE OF PRODUCTION IN SELECTED CROP ENTERPRISES

Type Of Labour	Scale Of Production		
	Small Man-Hr/Ha	Medium Man-Hr/Ha	Large Man-Hr/Ha
Yam Enterprise			
Family	834	661	213
Non-Family	443	1035	1148
Total	1277	1696	1361
Maize Enterprise			
Family	389	70	216
Non-Family	226	242	159
TOTAL	615	312	375
Rice Enterprise			
Family	1321	2	161
Non-family	588	972	202
TOTAL	1909	974	363
CASSAVA ENTERPRISE			
Family	898	25	188
Non-family	243	178	66
TOTAL	1141	203	254

Source: Field Survey, 1993

The small-scale farmers also used more labour per hectare, thus showing that they cultivated their fields more intensively than the medium and large-scale farmers especially in the production of maize, rice and cassava. In the case of yam, medium-and large-scale farmers used more labour per hectare than the small-scale farmers.

5.3.3 Farm capital

The farmers in this area virtually depended on their personal savings as source of credit. About 95 per cent of the sampled farmers derived their capital from savings, which accounted for 85 per cent of the total amount invested in farming. On the other hand about

16.3 per cent of the farmers used the thrift (Oja) to raise money for their farm work. Although Oja's contribution to farm work was two per cent and is less than that from the bank (10.3%), more farmers (16.3 per cent of the respondents) used Oja (Table 5.25). On a smaller scale, the farmers continued to draw financial resources from friends, relatives and children.

5.3.4 Seed

The average quantity of seeds/planting materials used varied from crop to crop and between different crop enterprises. For instance, the quantity of maize in sole, two-crop, and three

Table 5.25: **Source of Farm Capital**

Capital Source	No. Of Farmers	% Of Total Farmers	Total Amount Invested	% Of Total Amount Invested
Savings	41	95.3	281,720	85.0
Oja	7	16.3	6,555	2.0
Friends	4	9.3	4,400	1.3
Relatives	4	9.3	2,6090	0.8
Bank	2	4.7	34,000	10.3
Children	1	2.3	2,000	0.6
TOTAL	-	-	331,275	100.0

Source: Field Survey, 1993

crop enterprises were 57.5kg/ha, 24.9kg/ha and 7.9kg/ha respectively (Table 5.26).

The quantity of seeds and planting materials used in kilogrammes per hectare also varied even within the same crop and the same group of selected enterprises. For example the quantity of cowpea seeds in maize-cowpea mixture was 21.8 kg/ha while in cowpea-millet

it needed only 10.2kg/ha. This variation might have been caused by incorrect information from the farmers as a result of memory loss or variations in the spacing of the crops.

Quantity of maize seeds in maize-cowpea was 21.9kg/ha; in maize-cassava 20.7kg/ha; 33.1kg/ha in maize-rice and 22.5 kg/ha in maize-melon-cassava. This is similar to 19.3kg/ha for maize in pure stands, which shows that the other four rates above were virtually in pure stands.

TABLE 5.26: AVERAGE QUANTITY OF SEEDS AND PLANTING MATERIALS USED PER HOUSEHOLD

Crop Enterprise	Individual Crop	Quantity (Kg/Ha)
Yam	Yam	3,998.6
Maize	Maize	19.3
Rice	Rice	60.4
Cassava	Cassava	*
Maize-Cowpea	Maize	21.9
	Cowpea	21.8
Millet-cowpea	Millet	5.8
	Cowpea	10.2
Maize-cassava	Maize	20.7
	Cassava	-
Maize-Rice	Maize	23.1
	Rice	49.1
Millet-cowpea-cassava	Millet	12.0
	Cowpea	12.9
	Cassava	-
Maize-cowpea-cassava	Maize	14.6
	Cowpea	14.6
	Cassava	-
Melon-maize-cassava	Melon	12.4
	Maize	22.5
	Cassava	-

* Difficult to estimate Cassava cuttings

Source: Field Survey, 1993

RECEIVED
ZARIA NIGERIA
472684

5.3.5 Fertilizers

Fertilizers are used to replace lost nutrients in the soil. They therefore improve yield of crops if the right type and the right quantities are applied at the right time.

Table 5.27 shows that very low proportion of farmers used relatively small

TABLE 5.27: QUANTITY OF FERTILIZERS, HERBICIDES, AND INSECTICIDES USED BY FARMERS

Crop Enterprise	Fertilizers			Herbicides		Insecticides	
	No. Of Farmers	Weight Kg/Farmer	Weight Kg/Ha	No. Of Farmers	Volume L/Farmer	No. Of Farmers	Volume L/Farmer
Yam	1	150	158	4	7.5	-	-
Maize	3	283	425	2	7.5	-	-
Rice	7	150	176	2	5	-	-
Cassava	-	-	-	-	-	-	-
Millet-Cowpea	4	331	138	-	-	-	-
Maize-cowpea	1	125	349	-	-	2	1.0
Maize-cassava	4	81	155	-	-	-	-
Maize-Rice	-	-	-	-	-	-	-
Millet-Cowpea-	1	550	84	-	-	1	6.0
Cassava	2	150	212	-	-	-	-
Maize-Cowpea-	-	-	-	-	-	-	-
Cassava							
Melon-Maize-Cassava							

Source: Field Survey, 1993

quantities of fertilizers on their farms. Farmers used fertilizers in Yam, rice and maize-cowpea-cassava enterprises at an average rate of 150kg/farmer. However, in maize-cassava and millet-cowpea-cassava farmers used 81kg and 550kg/farmer respectively. These translates to 158kg/ha, 176kg/ha and 212kg/ha for yam, rice and maize-cowpea-cassava crops respectively. The quantity of fertilizer used per farmer is not similar to the actual rate used per hectare. Thus the lowest rate of 81kg/farmer translated to 155kg/ha and the highest rate of 550kg/farmer similarly translated to 84kg/ha. (Table 5.27). Hence the weight in kilogrammes per farmer measured the knowledge, understanding and the use

of available resources to the farmer while the weight in kilogrammes per hectare measured the actual rate applied to crops in the fields.

5.3.6 Herbicides

Farmers in the study area would love to have anything that would help them control weeds. They are fully aware of the fact that where crops grow well, weeds also thrive but they are handicapped on the use of the latest technology of weed control. This is one of the areas where illiteracy is a serious handicap to a farm operation (weeding). The farmers find it difficult to adopt the use of herbicides because of their inability to read the instructions on the containers and in measuring the chemicals for spraying. However, many farmers were aware of the use of herbicides but very few of them used them due to their cost and unavailability. The few farmers that used the chemicals applied them to sole stands of yam, maize and rice in order to reduce the number of weeding per season in such fields (Table 5.27).

Weeds were more prevalent in some fields than others. Yam fields had more weeds than maize and rice fields because of the wide spacing of crops. This explains why more than 50 per cent of the few farmers that used herbicides used them yam at an average rate of 7.5 litres per farmer (Table 5.27).

5.3.7 Insecticides

The use of insecticides was very low. Only three farmers used it on cowpea (Table 5.27). Although farmers in the area have problems of insect infestation they rarely used insecticide for lack of knowledge of its application, money to buy the chemicals, spraying apparatus, and their availability. Insecticides must be made available to the farmers if productivity is to be raised to its required level.

5.4 Costs and Returns

Farm lands in the study area, are free input since they are mostly farmer owned and were regarded as being fixed and this will therefore not be costed. Labour is considered

here as a variable cost item. Family and non-family labour are therefore costed at the hired labour rate of five naira per hour. Fixed cost items were not considered because they were of very low values

5.4.1 Sole Crop enterprise

Labour cost for the production of yam was N7334.86 per hectare while the cost of yam sets was N4634.14 per hectare bringing the total cost per hectare to N11969.00 (Table 5.28). This makes yam the most expensive crop to produce among eleven selected crop enterprises. It was however the most profitable crop with a gross margin of N55097.91 per hectare (Table 5.28). About 59 per cent of the cost of production of yam came from non-family labour (Table 5.29). Yam farmers at the small-scale level used mainly family labour, which accounted for 64.3 per cent of the cost of its production while the medium and large-scale farmers used more of non-family labour constituting 71.9 per cent and

Table 5.28: **Gross Margin Analysis of the Selected Sole Crop Enterprise**

Item	Crop Enterprise Per Hectare			
	Yam	Maize	Rice	Cassava
Output (kg)	19247.7	1804.5	1268.18	6358.8
Gross revenue (N)	67066.91	5101.26	9313.12	6358.83
Labour (man-hour)	1397	401	969	391.0
Labour cost (N)	7334.86	2333.25	4428.00	1929.12
Seed Cost (N)	4634.14	63.89	348.28	-
Total Cost (N)	11969.00	2396.64	4976.28	1929.12
Gross Margin (N)	55097.91	2704.62	4336.84	4429.71
Yield Required to cover cost (kg)	3989.67	871.51	677.97	1929.12

Source: Field Survey, 1993

Table 5.29 COST OF LABOUR FOR THE PRODUCTION OF SOME SELECTED CROP ENTERPRISES IN NAIRA PER HECTARE

Crop Enterprise	Type Of Labour				Total N/Ha
	Family N/Ha	%	Non-Family N/Ha	%	
Yam	3003.38	41.0	4331.48	59.0	7334.86
Maize	1087.52	46.6	1245.73	53.4	2333.25
Rice	2576.00	55.7	2052.00	44.3	4628.00
Cassava	1642.16	85.1	286.96	14.9	1929.12
Millet-cowpea	703.84	43.5	912.89	56.5	1616.73
Maize-cassava	584.81	50.6	570.06	49.4	1154.87
Maize-Cowpea	1434.64	55.2	1164.63	44.8	2599.27
Maize-Rice	148.72	4.1	3459.13	95.9	3607.85

Source: Field Survey, 1993

80.3 per cent respectively.

Similarly non-family labour component for the production of maize was 53.4 per cent of the labour cost (Tables 5.28; 5.29). Thus farmers depended more on non-family labour for the production of maize especially at the medium and large-scale levels (Table 5.30).

Table 5.30: COST OF LABOUR INPUT BY SCALE OF PRODUCTION FOR SOLE YAM, MAIZE, RICE AND CASSAVA CROPS IN NAIRA PER HECTARE

TYPE OF LABOUR	Scale Of Production					
	Small N/Ha	%	Medium N/Ha	%	Large N/Ha	%
YAM						
Family	4172.74	64.3	3303.70	28.1	1066.76	19.7
Non-family	2314.27	35.7	8465.13	71.9	4337.47	80.3
Total	6487.01	100.0	11768.83	100.0	5404.23	100.0
MAIZE						
Family	1932.91	74.3	334.67	20.4	1087.13	44.1
Non-family	667.21	25.7	1308.88	79.6	1375.41	55.9
Total	2600.12	100.0	1643.55	100.0	2462.54	100.00
RICE						
Family	6567.95	70.9	7.80	0.2	748.01	51.0
Non-family	2690.54	29.1	5087.34	99.8	719.57	49.0
Total	9258.49	100.0	5095.14	100.0	1467.58	100.0
CASSAVA						
Family	4105.38	87.5	274.64	44.6	1305.29	86.0
Non-family	585.07	12.5	341.68	55.4	213.33	14.0
Total	4690.45	100.0	616.32	100.0	1518.62	100.0

Source: Field Survey, 1993

However, rice cultivation that is labour intensive used more family labour, which was about 55.7 per cent of the total cost of labour used in its production (Tables 5.28 and 5.29). A breakdown of this statistic shows that small-scale farmers used a higher percentage of family labour (70.9%) than the large-scale, farmers with 51 per cent of the total cost of labour input for rice production (Table 5.30). The medium scale farmers however depended heavily on non-family labour.

About 85 per cent of the cost of labour used in the production of cassava was spent on family labour (Table 5.30). Hence the family labour constituted 87.5 per cent; 44.6 per cent and 86.0 per cent of the cost of labour for the production of cassava under small, medium and large-scale farms respectively (Table 5.30)

5.4.2 Two Crop enterprise

Maize-cowpea had a total production cost of 2930.41 per hectare of which 88.7 per cent was spent on labour (Table 5.31). Family labour accounted for 55.2 per cent of the

TABLE 5.31: GROSS MARGIN ANALYSIS OF SELECTED TWO-CROP ENTERPRISES

Item	Crop Enterprise Per Hectare			
	Maize-Cowpea	Millet-Cowpea	Maize-Cassava	Maize-Rice
Gross Revenue (N)	4238.02	1918.57	4086.15	6119.39
Labour (Man-Hr)	475	314	221	695
Labour Cost (N)	2599.27	1616.73	1154.87	3607.85
Seed (N)	331.14	129.22	74.50	257.47
Total cost (N)	2930.41	1745.95	1229.37	3865.32
Gross Margin (N)	1307.61	172.62	2856.78	2254.07

Source: Field Survey, 1993

total labour cost for maize-cowpea production indicating the relative importance of family labour inspite of the effects of modernization and technological advancement in agricultural production processes.

Millet-cowpea cost less to produce at N1745.95 per hectare. It depends more on non-family labour for its production as 56.5 per cent of the total cost of labour for its production was spent on this labour source (Tables, 5.29, 5.30).

Maize-cassava cost least to produce among the selected two-crop enterprises. It cost about N1229.37 with its labour component accounting for about 93.9 per cent of the total cost of maize-cassava production (Table 5.31). A further breakdown of this labour component shows that the costs of family and non-family labour were virtually equal because they were 50.6 per cent and 49.4 per cent of the total cost of labour used in producing maize-cassava respectively (Table 5.29).

Maize-rice was the most expensive mixture among the two-crop mixtures. It had a total cost of N3865.32 per hectare. Its labour component was 93.3 per cent of this total cost (Table 5.30). About 95.9 per cent of the total labour cost of this mixture was expended on non-family labour (Table 5.29).

5.4.3 Three-Crop enterprise

Maize-cowpea-cassava had the highest total cost of production of N4357.16 per hectare among the selected three crop enterprises. The total cost of labour was N4090.13 per hectare accounting for 93.9 per cent of the total cost for the production of the crop mixture (Table 5.32).

Cost of Labour for Millet-cowpea-cassava was about 94.7 per cent of the total cost of production of the crop enterprise (Table 5.32).

Melon-Maize-Cassava was the cheapest three-crop mixture to produce. Its total cost of production was N3746.01 per hectare and its labour cost was 92.5 per cent of the total cost of production.

5.4.4 Cost of Labour by Scale of Production:

The mean cost of labour (family and non-family labour) employed by all the sampled farmers for crop production was calculated by dividing the total cost of labour

TABLE 5.32: GROSS MARGIN ANALYSIS OF THE SELECTED THREE-CROP ENTERPRISES

ITEM	Crop Enterprises Per Hectare		
	Millet-Cowpea-Cassava	Maize-Cowpea-Cassava	Melon-Maize-Cassava
Gross Revenue (N)	7192.19	6704.06	14589.82
Labour (Mh)	691	661	612
Labour cost (N)	3889.95	4090.13	3466.32
Seed cost (N)	217.24	267.03	279.69
Total Cost (N)	4107.19	4357.16	3746.01
Gross Margin (N)	3085.00	2346.90	10843.81

Source: Field Survey, 1993

(family and non-family labour) by the total area of the fields surveyed.

The total mean cost of labour was therefore N2866.72 per hectare. The cost of non-family labour was greater than that of the family labour by as much as 15.2 per cent (Table 5.33).

TABLE 5.33: MEAN COST OF LABOUR EMPLOYED BY ALL SAMPLED FARMERS FOR CROP PRODUCTION

Source Of Labour	Cost (N/Ha)	%
Family	1216.73	42.4
Non-family	1649.99	57.6
TOTAL	2866.72	100.0

Source: Field Survey, 1993

Table 5.34 shows the cost of family and non-family labour at various scales of production. This was computed by dividing the total cost of labour by the total farm area

TABLE 5.34: **COST OF LABOUR FOR SMALL-, MEDIUM-, AND LARGE-SCALE FARMS**

Type Of Labour	Scale Of Production		
	Small N/Ha.	Medium N/Ha.	Large N/Ha
Family	657.32	144.46	439.53
Non-Family	381.43	341.41	860.72
TOTAL	1038.75	485.87	1300.25

Source: Field Survey, 1993

surveyed. On the average, the large-scale farms used more money per hectare for the production of crops than either small-or medium-scale farm. However, small-scale farmers reliance on family labour is clearly shown. It meant therefore that the farmers invested less physical cash in the production of their crops by using family labour that required no payment of physical cash for work done.

5.5 Crop Yields

One of the measures of efficiency in agricultural production is the yield per hectare, which is an expression of soil productivity. The yield per hectare was obtained by dividing the total weight of the output of the crop by the total area of land under the crop.

5.5.1 Yam

The average yield of 19248kg of yam per hectare is typical of the yield obtained in this area as specified in the study carried out by Nweke et al (1991, pp. 16-17) (Table 5.35).

Table 5.35: YIELDS IN KILOGRAMMES PER HECTARE OF THE SELECTED CROP ENTERPRISES

Crop Enterprise	Yam	Maize	Rice	Cassava	Millet	Cowpea	Melon
YM	19248						
MA		1773					
RC			1269				
CA				6597			
MA-CP		892				241	
ML-CP					418	69	
MA-CA		1064		929			
MA-RC		353	701				
ML-CP-CA				882	1453	191	
MA-CP-CA		1130		896		59	
ME-MA-CA		1422		655			808

YM = Yam MA = Maize RC = Rice CA = Cassava CP = Cowpea ML = Millet ME = Melon

Source: Field Survey, 1993

This average is however higher than those for Nigeria, the world and Africa in 1992. It is only superseded by the average for the Solomon Islands (219342kg/ha), which was one of the highest in the world (Appendix B, Fig. 5.5). The productivity of the area is so high because the farmers here practise one of the best methods of yam production in the whole world. The Niger flood plain of this area has one of the best soils for yam cultivation.

5.5.2 Maize

The yield for maize of 1773 kg per hectare can only be compared with that of Cameroon (1810kg/ha) and the United States of America (U.S.A.) (8247kg/ha) for the same year (Table 5.35; Appendix B; Fig 5.6). It is about 56 per cent higher than the average for Nigeria (1133kg/ha). The world average was 125 per cent higher than that of Nigeria and about twice the average for the study area while the world's highest producer - U.S.A. - had an average that was 365 per cent higher than that of the area and about five times Nigeria's average productivity (Table 5.35; Appendix B).

When maize is cultivated in combination with other crops such as rice the productivity dropped by as much as 20 per cent depending upon the nature of the combination and level of management. Thus if rice is to be planted as a relay crop with maize, maize stands will be given a much wider spacing than in pure stands.

5.5.3 Rice

The average of rice yields in the area was 1269kg/ha. This yield was far below the average for the country, Africa and the world in the survey year (Table 5.35; Fig. 5.7). The average productivity for Nigeria (1977kg/ha) Africa 1970kg/ha), world (3357kg/ha) and Australia (8418kg/ha) are 1.6, 1.6, 21.6 and 6.6 times that of the study area respectively and also accounting for 156, 155, 264 and 663 per cent of the yield for the study area respectively. Rice is mostly grown in pure stands. its only important combination is with maize in which the productivity dropped by as much as 568kg/ha giving a decrease of about 45 per cent.

5.5.4 Cassava

Cassava yield of 6597kg/ha was similarly lower than the average yield for Nigeria (10660kg/ha). This is about 62 percent lower than the Nigerian average, 17 percent lower than the African average and 45 per cent lower than the world average. Although Nigeria is world's highest producer of cassava in total quantity, its productivity is about one-third of that of Barbados (38,291kg/ha). In other words, Barbados' yield per hectare is about six

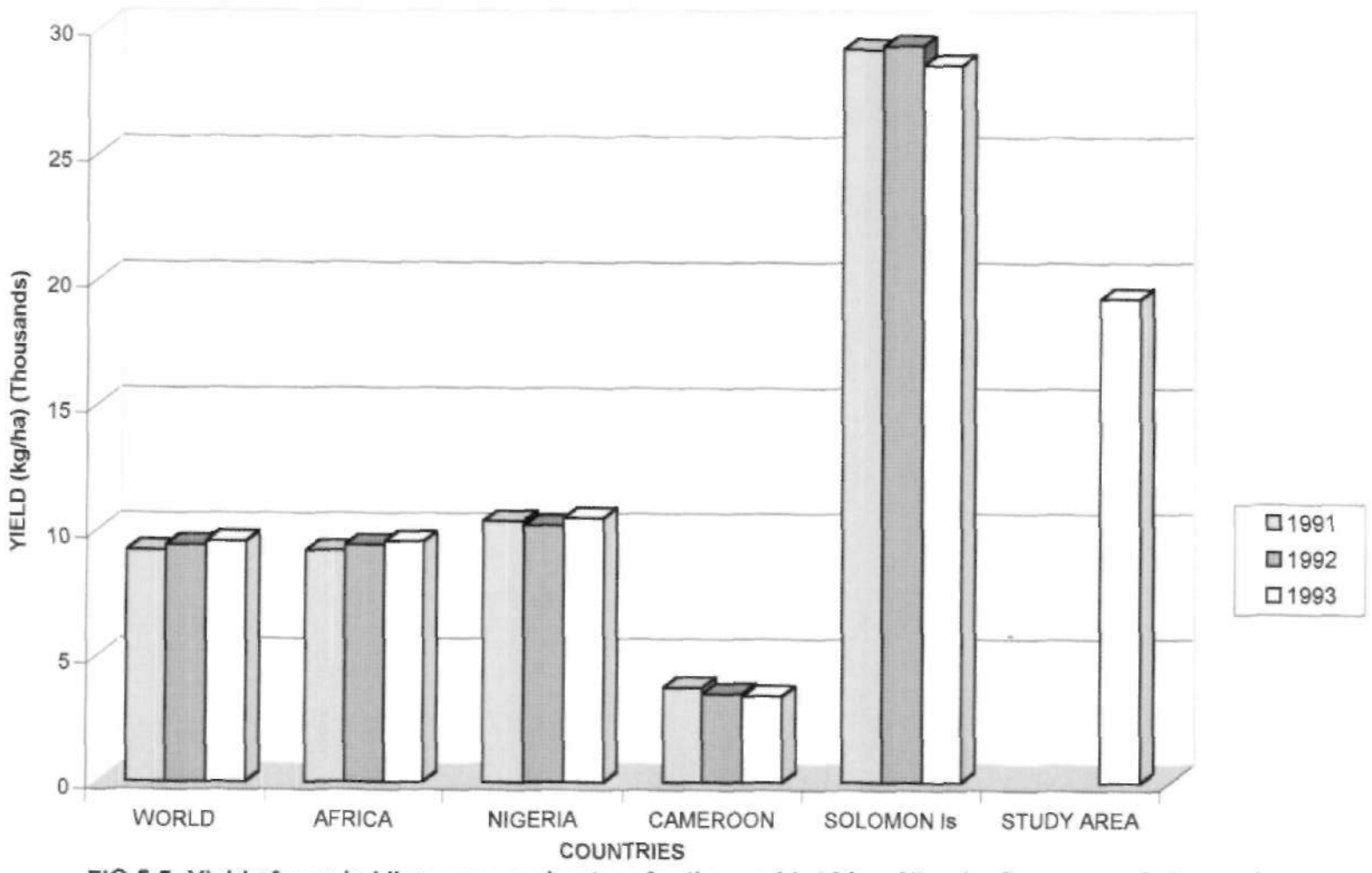


FIG 5.5: Yield of yam in kilograms per hectare for the world, Africa, Nigeria, Cameroon, Solomon Is. and the study area (1991-93)

Source: 1. Field Survey
2. F. A. O. Yearbook Production, Vol. 47, 1993

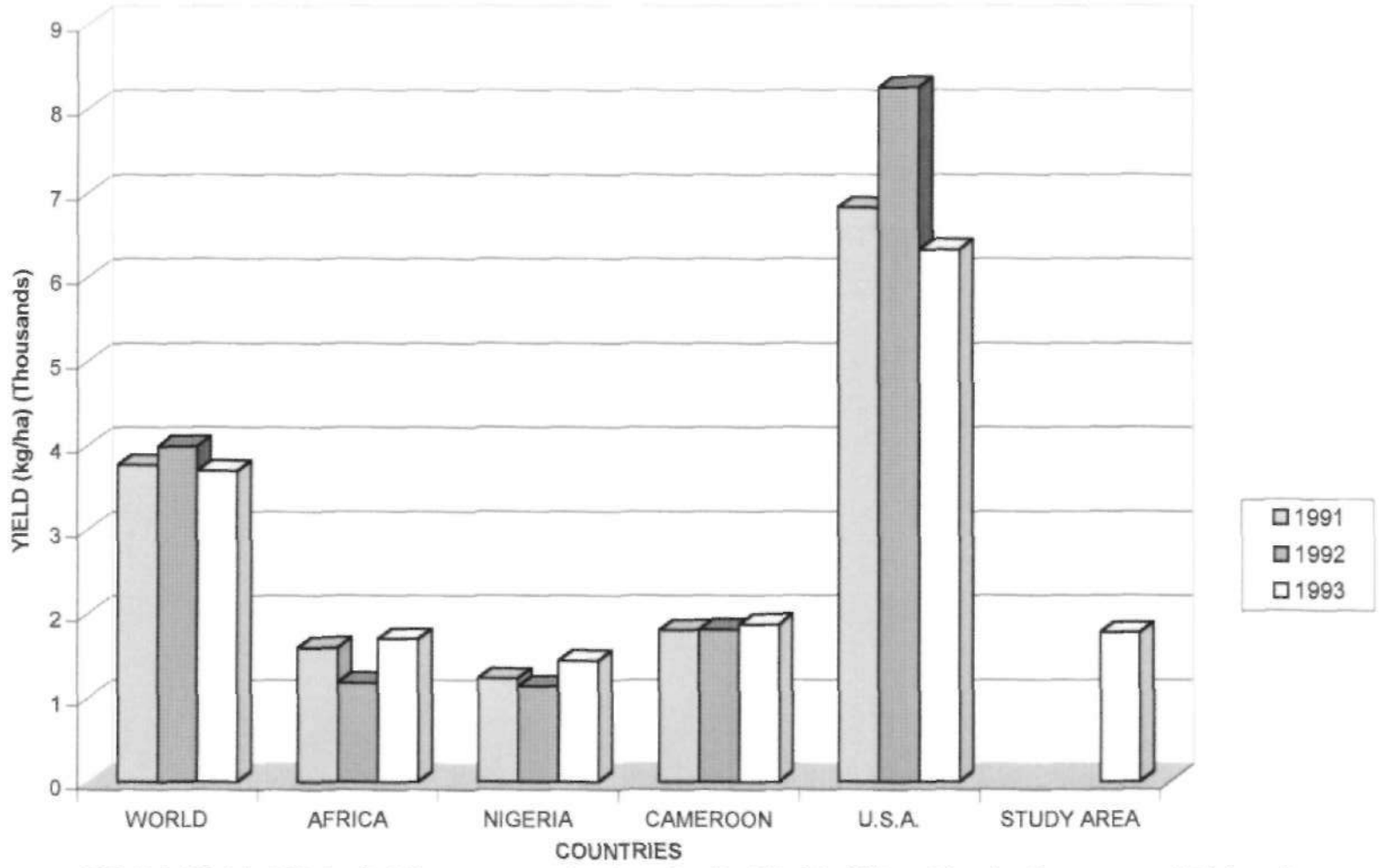


FIG 5.6: Yield of Maize in kilograms per hectare for the World, Africa, Nigeria, Cameroon, U.S.A and the study area (1991-93)

Source: 1. Field Survey

2. F. A. O. Yearbook Production, Vol. 47, 1993

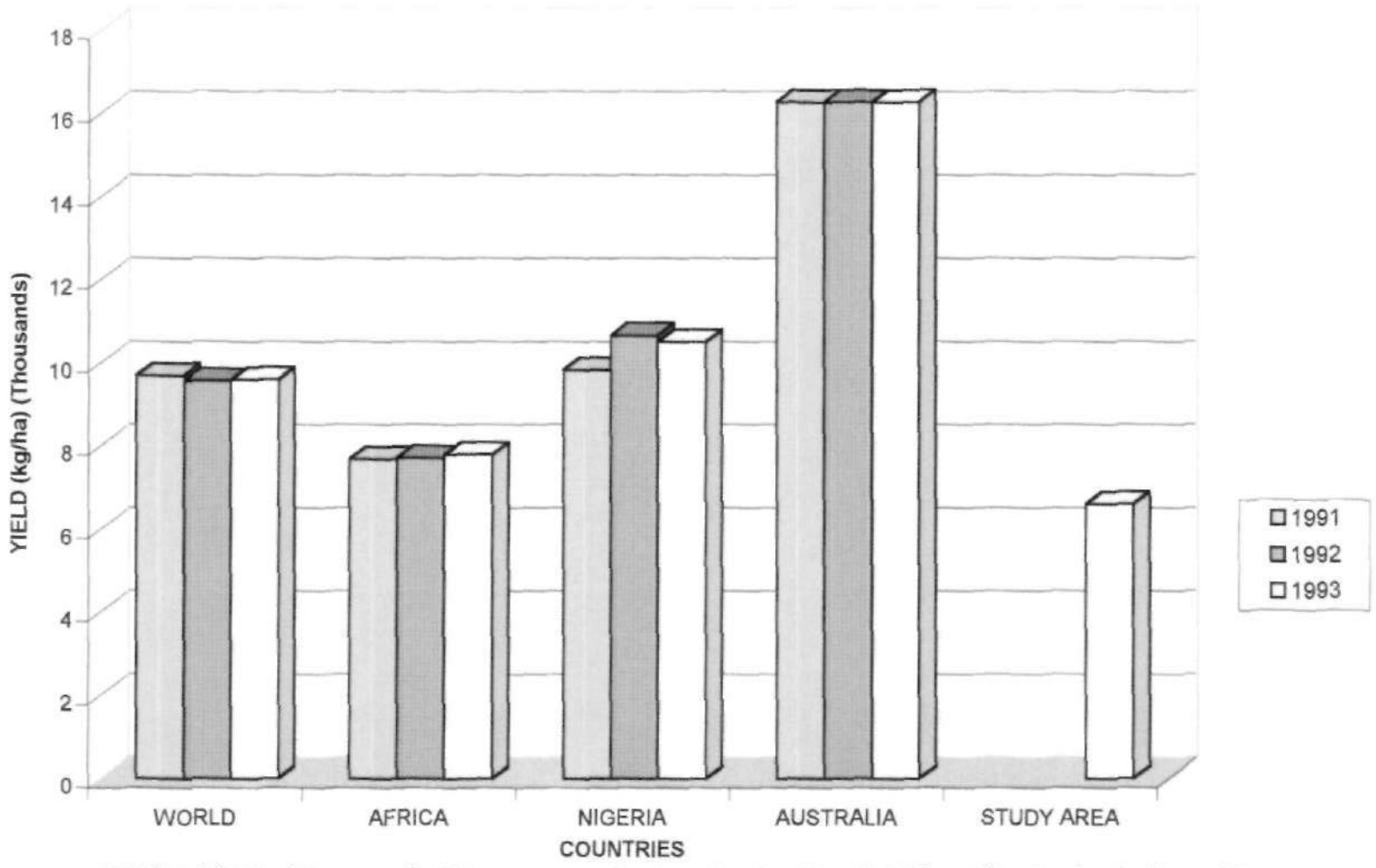


FIG 5.7: Yield of Cassava in kilograms per hectare for the World, Africa, Nigeria, Australia and the study area (1991-93)

Source: 1. Field Survey

2. F. A. O. Yearbook Production, Vol. 47, 1993

times that of the study area and about three and a half times Nigeria's average yield (Table 5.35 and Fig. 5.8). The yield of cassava per hectare dropped by about 86 to 90 per cent when cultivated in combinations with other crops like maize and millet because cassava in crop associations is planted as an "add up" crop used in demarcating fields.

5.5.5 Millet

Millet in three crop combinations had a yield of 1453kg/ha, which was higher than those of Nigeria (970kg/ha), Africa (605kg/ha) and world 775kg/ha). It was only surpassed by the world's highest yield of 1714kg/ha from Japan (Table 5.28; Appendix B and Fig. 5.9).

5.5.6 Cowpea

Cowpea's yield figure of 241kg/ha from the study area could not be compared with those of Nigeria (752kg/ha), Africa (711kg/ha) world (652kg/ha) and Cameroon (778kg/ha) let alone with Libya that had the highest yields for the three years under review of 3458kg/ha; 3600kg/ha and 3651kg/ha.(Table 5.35, Appendix B and Fig. 5.10).

5.5.7 Melon

Melon is an important soup ingredient in the area. It is highly valued, hence its appearance in one of the important three-crop mixtures. Its yield of 808kg/ha was on its own a good performance.

5.6 Efficiency Measures

Benefit-cost analyses were used to determine the indices of efficiency with the view to ascertaining efficiency of the selected crop enterprises. This section therefore lays emphasis on the application of the results to be discussed as indicators of efficiency of the crop enterprises as well as the production units of small-, medium-, and large-scale farms.

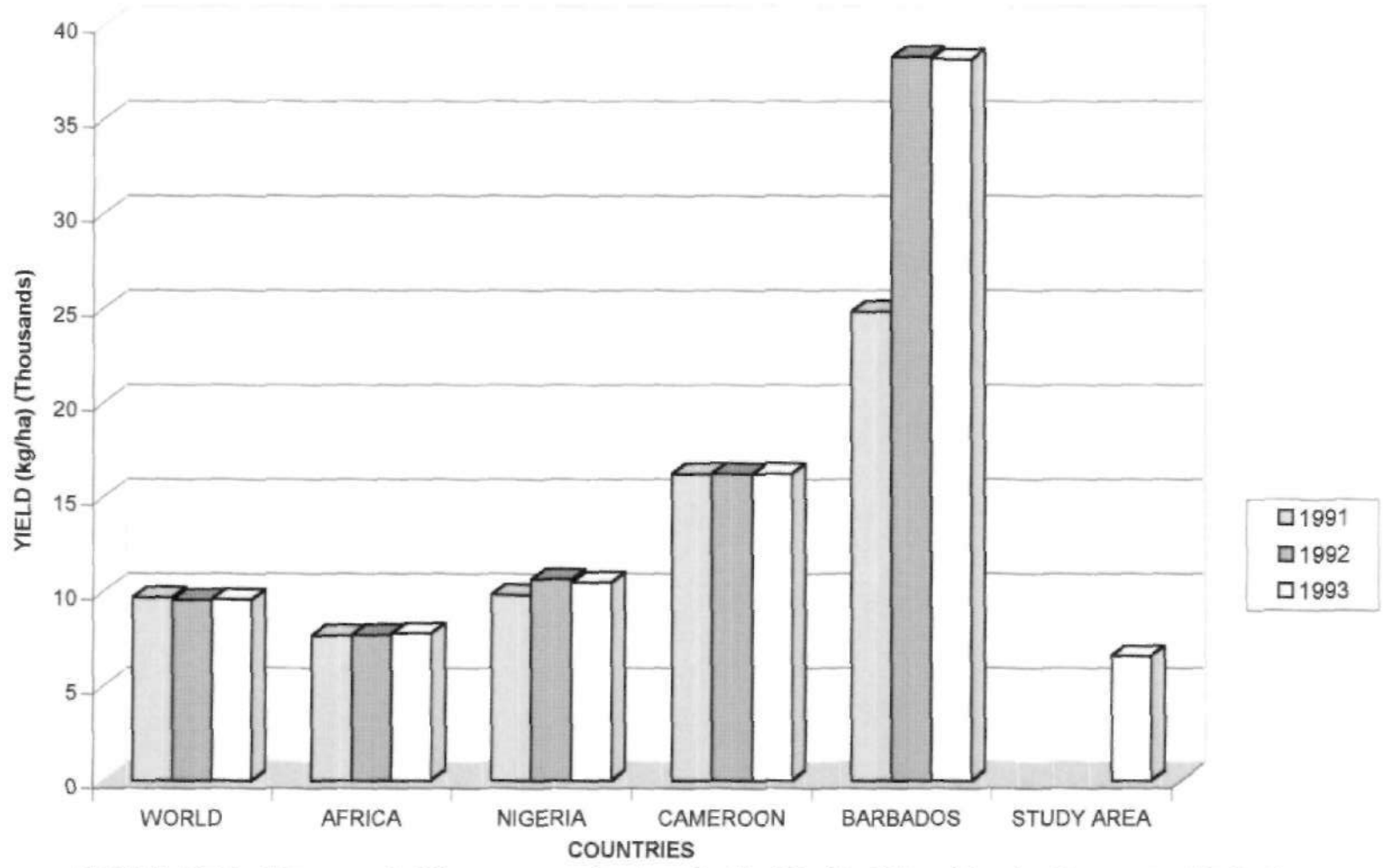


FIG 5.8: Yield of Cassava in kilograms per hectare for the World, Africa, Nigeria, Cameroon, Barbados and the study area (1991-93)

Source: 1. Field Survey

2. F. A. O. Yearbook Production, Vol. 47, 1993

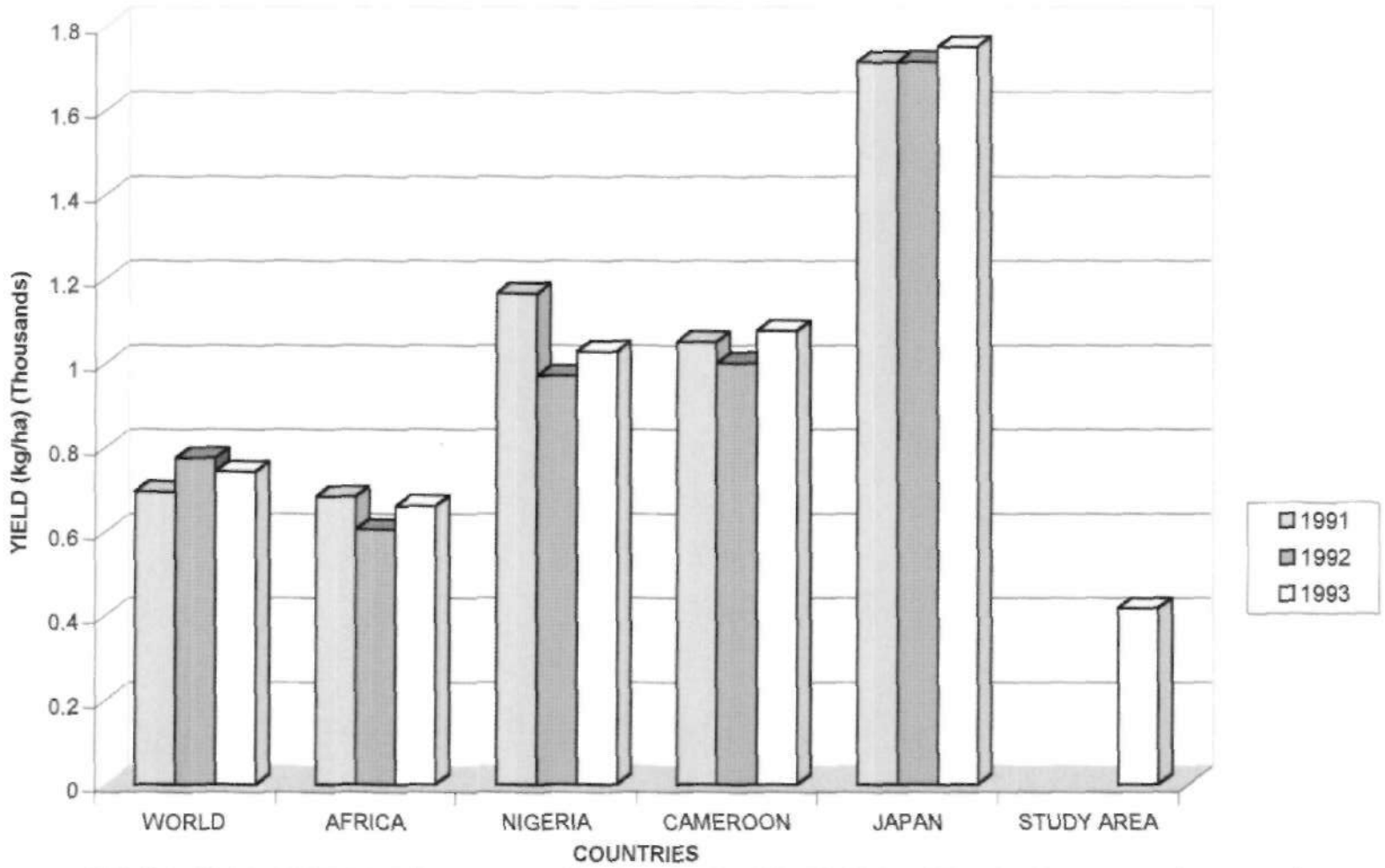


FIG 5.9: Yield of Millet in kilograms per hectare for the World, Africa, Nigeria, Cameroon, Japan and the study area (1991-93)

Source: 1. Field Survey

2. F. A. O. Yearbook Production, Vol. 47, 1993

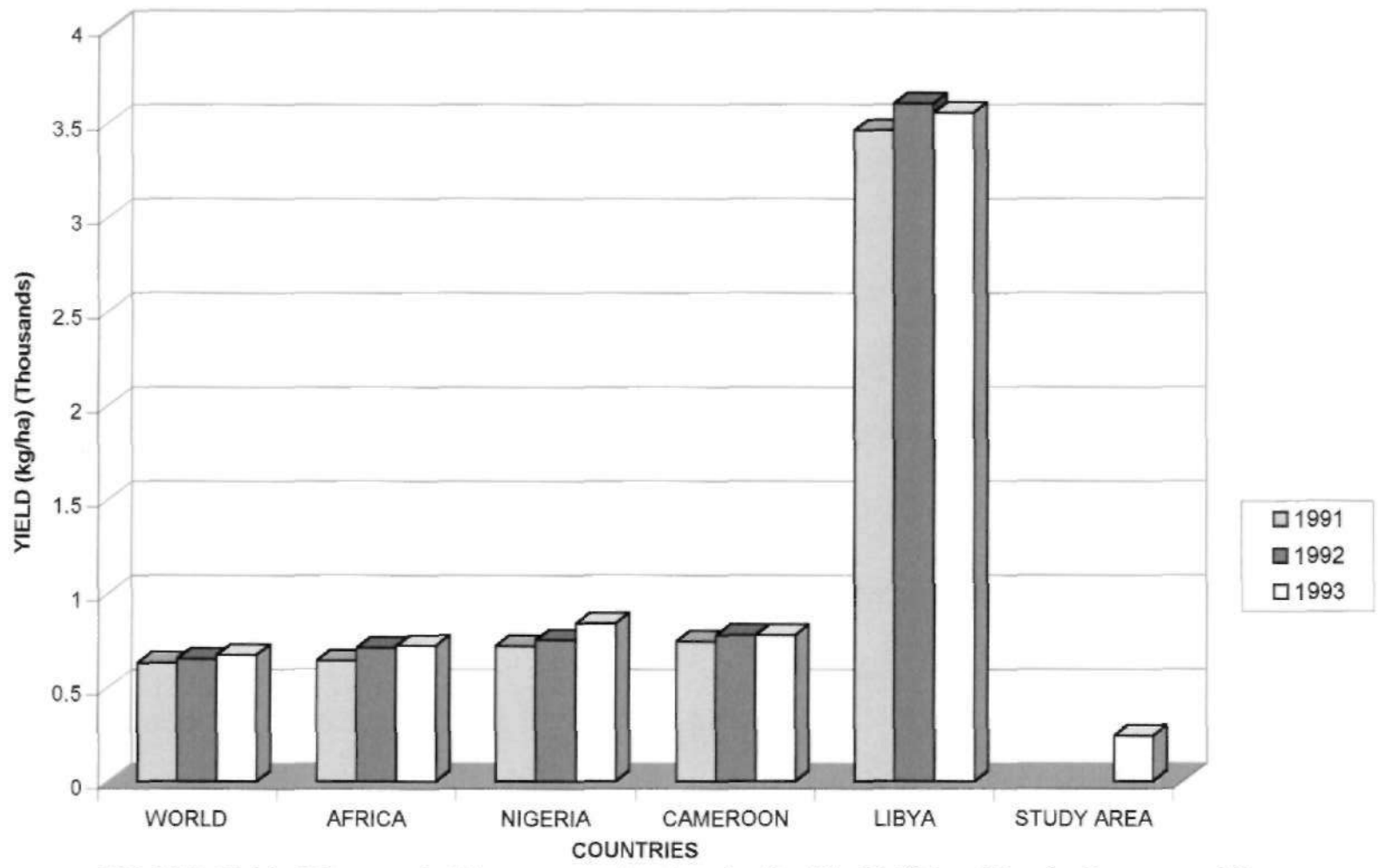


FIG 5.10: Yield of Cowpea in kilograms per hectare for the World, Africa, Nigeria, Cameroon, Libya and the study area (1991-93)

Source: 1. Field Survey

2. F. A. O. Yearbook Production, Vol. 47, 1993

5.6.1 Value of output per input cost

Table 5.36 shows the value of output of crop enterprises per N100 worth of inputs. The enterprise is profitable if the value of the output is greater than N100 and unprofitable if less than N100. The table also shows that all the selected

TABLE 5.36: Value Of Output Of Crop Enterprise Per N100 Worth Of Inputs

Crop Enterprise	Output Per N100 Worth Of Inputs
Yam	560.34
Maize	268.57
Rice	188.19
Cassava	302.56
Maize-Cowpea	144.62
Millet-cowpea	113.20
Maize-Cassava	193.56
Maize-Rice	155.66
Millet-Cowpea-Cassava	175.11
Maize-Cowpea-Cassava	153.86
Melon-Maize-Cassava	389.48

Source: Field Survey, 1993

crop enterprises had their output value per N100 input greater than N100. Hence all the selected crop enterprises were profitable. The least profitable however, was the millet-cowpea enterprise with N113.20 output per N100 input, while the most profitable enterprises were yam with N560.34 melon-maize-cassava with N389.48, cassava with N302.56 and maize with N268.57 output per N100 input. The farmers were therefore able to combine the factors of production in quite an efficient way to be able to obtain the output values in Table 5.36.

When the value of output of crop enterprises per N100 worth of labour is considered, the profitability of the enterprises was more pronounced (Table 5.37). This measures the profitability of labour. The same crop enterprises - yam, melon-maize-cassava, cassava, and maize maintained higher degree of profitability than others.

Table 5.37: **Value of Output per input cost Enterprise Per N100 Worth of Labour Input**

Crop Enterprise	**Output Per N100 Labour Input (N)**
Yam	914.86
Maize	277.85
Rice	202.44
Cassava	302.56
Maize-Cowpea	163.05
Millet-cowpea	122.54
Maize-Cassava	200.64
Maize-Rice	166.57
Millet-Cowpea-Cassava	184.89
Maize-Cowpea-Cassava	163.91
Melon-Maize-Cassava	420.90

Source: Field Survey, 1993

5.6.2 Returns to Labour

To estimate the productivity of labour, return to all labour and returns to family and non-family labour were calculated. The returns to family and non-family labour were calculated by adding the total family and non-family labour cost per hectare to the gross margin per hectare of the crop enterprise and the sum divided by the man-hour per hectare for the family and non-family labour. The return to all labour was calculated by adding the total cost of labour to the gross margin of the crop enterprise and dividing the result by the

total man-hour per hectare.

The return to labour for all the selected crop enterprises was N18.47 per hectare. This was about 369 per cent of the average labour wage of N5 per hour. (Table 5.38).

TABLE 5.38: RETURNS TO LABOUR FOR ALL THE SELECTED CROP ENTERPRISES

Crop Enterprise	Return To Labour N/Ha
Yam	44.69
Maize	12.56
Rice	9.25
Cassava	16.26
Maize-Cowpea	8.23
Millet-cowpea	5.70
Maize-Cassava	18.15
Maize-Rice	8.43
Millet-Cowpea-Cassava	10.09
Maize-Cowpea-Cassava	9.74
Melon-Maize-Cassava	23.38
All selected Sole Crops	26.22
All Selected two-crop mixtures	9.13
All selected three-crop mixtures	14.12
All Selected Crops	18.47

Source: Field Survey, 1993

Table 5.38 also shows that the returns to labour of all the selected crop enterprises were higher than the average wage rate. Yam, melon-maize-cassava, cassava, maize-cassava and millet-cowpea-cassava had relatively higher returns to labour than others.

Returns to family and non-family labour were generally much higher than the average wage rate for the year (Tables 5.39 and 5.40). These tables also indicate the profitability of the crop enterprises which however showed a high variability especially

between crop enterprises like millet–cowpea and other crop enterprises like yam, maize-rice and cassava.

TABLE 5.39: RETURNS TO FAMILY LABOUR FOR SOME SELECTED CROP ENTERPRISES

Crop Enterprise	Gross Margin (N/Ha)	Total Labour Cost (N/Ha	Man Hour Per Hectare	Returns N/Hr
Yam	55097.91	3003.38	600	96.84
Maize	2704.62	1087.52	213	17.80
Rice	4336.84	2576.00	519	13.32
Cassava	4429.71	1642.16	284	21.38
Maize-cowpea	1307.61	1434.64	275	9.97
Millet-cowpea	172.62	703.84	130	6.74
Maize-Rice	2856.78	584.81	101	34.08
Maize-Cassava	2254.07	148.72	30	80.09

Source: Field Survey, 1993

TABLE 5.40: **RETURNS TO NON-FAMILY LABOUR FOR SOME SELECTED CROP NTERPRISES**

Crop Enterprise	Gross Margin (N/Ha)	Total Labour Cost (N/Ha	Man Hour Per Hectare	Returns N/Hr
Yam	55097.91	4331.48	797	74.57
Maize	2704.62	1245.73	188	21.01
Rice	4336.84	2052.00	450	14.20
Cassava	4429.71	286.96	107	44.08
Maize-cowpea	1307.61	1164.63	200	12.36
Millet-cowpea	172.62	912.89	184	5.90
Maize-Rice	2856.78	570.06	120	28.56
Maize-Cassava	2254.07	3459.13	665	8.59

Source: Field Survey, 1993

5.6.3 Return to Labour by Scale of Production:

Tables 5.41 - 5.44 show the cost and return analyses for four crop enterprises on small-,medium, and large-scale farms. Return to all labour for yam enterprise for small-, medium-, and large scale farms were N69.07, N17.25 and N35.48 respectively. These figures showed that it was most beneficial to produce yam at the small-scale level (Table 5.41). Generally, it was also more beneficial to use family labour for the production of yams although returns to both family and non-family labour were above the wage rates for 1992 (Table 5.41).

TABLE 5.41: **COST AND RETURN ANALYSIS FOR YAM ENTERPRISE**

Cost And Returns	Scale Of Production		
	Small	**Medium**	**Large**
Return			
Output (kg/ha)	24339.1	14959.8	14827.2
Gross Revenue (N/ha)	92707.38	31416.94	54880.91
Labour Input (Man-hr/ha)			
Family	834	661	213
Non-Family	443	1035	1148
All Labour	1277	1696	1361
Labour Cost (N/ha)			
Family	4172.74	3303.70	1066.76
Non-Family	2314.27	8465.13	4337.47
All Labour	6487.01	11768.83	5404.23
Other Costs (N/ha)			
Seed	4509.57	2161.91	6589.79
Total Cost (N/ha)	10996.58	13930.74	11994.02
Gross Margin (N/ha)	81710.80	17486.20	42886.89
Return to Labour (N/ha)			
Family	102.98	31.45	206.36
Non-family	189.67	25.07	41.14
All Labour	69.07	17.25	35.48
Output Required to cover cost (kg)	2749.1	3483.7	2998.5

Source: Field Survey, 1993

TABLE 5.42:COST AND RETURN ANALYSIS FOR MAIZE ENTERPRISE

Cost And Returns	Scale Of Production		
	Small	Medium	Large
Return			
Output (kg/ha)	1561.61	944.5	2163.2
Gross Revenue (N/ha)	5145.75	2597.29	5948.67
Labour Input (Man-hr/ha)			
Family	389	70	216
Non-Family	226	242	159
All Labour	615	312	375
Labour Cost (N/ha)			
Family	1932.91	334.67	1087.13
Non-Family	667.21	1308.88	1375.41
All Labour	2600.12	1634.55	2462.54
Other Costs (N/ha)			
Seed	63.17	65.44	62.73
Total Cost (N/ha)	2668.29	1699.99	2525.27
Gross Margin (N/ha)	2482.46	897.30	3423.40
Return to Labour (N/ha)			
Family	11.35	17.60	20.88
Non-family	13.94	9.12	23.89
All Labour	8.26	8.11	15.70
Output Required to cover cost (kg)	968.5	618.2	918.3

Source: Field Survey, 1993

TABLE 5.43: *Cost And Return Analysis For Rice Enterprise*

Cost And Returns	Scale Of Production		
	Small	Medium	Large
Return			
Output (kg/ha)	1875.5	618.8	1077.0
Gross Revenue (N/ha)	13766.24	4542.28	7905.04
Labour Input (Man-hr/ha)			
Family	1321	2	161
Non-Family	588	972	202
All Labour	1909	974	363
Labour Cost (N/ha)			
Family	6567.95	7.80	748.01
Non-Family	2690.54	5087.34	719.57
All Labour	9258.49	5095.14	1467.58
Other Costs (N/ha)			
Seed	600.30	462.88	151.69
Total Cost (N/ha)	9858.79	5558.02	1619.27
Gross Margin (N/ha)	3907.45	-1015.74	6285.77
Return to Labour (N/ha)			
Family	7.93	-503.97	43.69
Non-family	11.22	4.19	34.68
All Labour	6.90	4.19	21.36
Output Required to cover cost (kg)	1343.2	757.2	220.6

Source: Field Survey, 1993

TABLE 5.44:COST AND RETURN ANALYSIS FOR CASSAVA ENTERPRISE

Cost And Returns	Scale Of Production		
	Small	Medium	Large
Return			
Output (kg/ha)	4690.0	2384.5	7318.3
Gross Revenue (N/ha)	4690.00	2384.49	7318.31
Labour Input (Man-hr/ha)			
Family	898	25	188
Non-Family	243	178	66
All Labour	1141	203	254
Labour Cost (N/ha)			
Family	4105.38	274.64	1305.29
Non-Family	585.07	341.68	213.33
All Labour	4690.45	616.32	1518.62
Other Costs (N/ha)			
Seed	-	-	-
Total Cost (N/ha)	4690.45	616.322	518.62
Gross Margin (N/ha)	-0.45	1768.17	5799.69
Return to Labour (N/ha)			
Family	4.57	81.71	37.79
Non-family	2.41	11.85	91.11
All Labour	4.11	11.75	28.81
Output Required to cover cost (kg)	4690.5	616.3	1518.6

Source: Field Survey, 1993

Similarly the return to family, non-family and all labour for maize were above the wage rates for the survey year. However, it was observed to be more beneficial to use non-family labour at the small and large-scale levels, and family labour at the medium scale

level (Table 5.42).

Returns to family, non-family and all labour for rice indicated that it was more profitable to cultivate rice at the small and large-scale levels. Rice production at the medium scale was observed to have returns lower than the average wage rate for family, non-family and all labour. Hence it was unprofitable to produce rice at this scale (Table 5.43).

Returns to labour for cassava for family, non-family and all labour were higher than the average wage rates with respect to medium and large-scale farms. On the other hand, the returns to labour for the small-scale farms were all below the average wage rates thus making it unprofitable to produce cassava under small-scale farms.

5.6.4 Labour Productivity and Profitability Index for the Selected Crop Enterprises:

Labour productivity, which is the yield per man-hour, was calculated by dividing the yield by the total labour in man-hours. Profitability index was obtained by dividing gross revenue by the total cost. An enterprise is profitable only when the index is greater than unity.

Labour productivity of yam and cassava were higher than those of maize and rice because of their bulkiness and high-level water content (Table 5.45). This pattern remained virtually the same when this labour productivity was considered at small-, medium-and large-scale levels (Table 5.46). Rice was observed to have the least productivity of labour among the four crops under consideration, while cassava had the highest overall labour productivity (Tables 5.45 and 5.46).

KASHIM IBRAHIM LIBRARY

Tables 5.45 and 5.46 also show that all the selected crop enterprises were profitable because their profitability indices were greater than unity. Yam, cassava, maize-cassava and melon-maize-cassava enterprises were highly profitable while millet-cowpea was barely profitable (Table 5.45).

Table 5.45: LABOUR PRODUCTIVITY AND PROFITABILITY INDEX FOR SELECTED CROP ENTERPRISES

Crop Enterprise	Labour Productivity	Profitability Index
Yam	13.8	5.6
Maize	4.5	2.1
Rice	1.3	1.9
Cassava	16.3	3.3
Maize-Cowpea	-	1.4
Millet-Cowpea	-	1.1
Maize-Cassava	-	3.3
Maize-Rice	-	1.6
Millet-Cowpea-Cassava	-	1.8
Maize-Cowpea-Cassava	-	1.5
Melon-Maize-Cassava	-	3.9

Source: Field Survey, 1993

TABLE 5.46: LABOUR PRODUCTIVITY AND PROFITABILITY INDEX FOR YAM, MAIZE, RICE AND CASSAVA CROPS BY SCALE OF PRODUCTION

	Scale of Production					
	Small		*Medium*		*Large*	
Crop Enter-Prise	**Labour Produc-Tivity**	**Profit-Ability Index**	**Labour Produc-Tivity**	**Profit-Ability Index**	**Labour Produc-Tivity**	**Profit-Ability Index**
Yam	19.1	8.4	8.8	2.3	10.9	4.6
Maize	2.5	1.8	3.0	1.3	5.8	3.7
Rice	1.0	1.4	0.6	0.6	3.0	7.6
Cassava	4.1	0.9	11.7	3.9	28.8	4.3

Source: Field Survey, 1993

Yam was more profitably cultivated at small-scale level than at any other level. Maize on the other hand was more profitably cultivated at the large-scale level. Similarly rice was more profitably cultivated at the large-scale level while cassava was more profitable when cultivated at medium-and large-scale levels. But rice was unprofitable under medium-scale level and cassava was equally unprofitable under small-scale level (Table 5.46). This also confirms the results in Tables 5.43 and 5.44.

5.6.5 Output Required to Cover Cost: The yield required to cover the cost of production of yam, maize, rice and cassava were generally below the output of these crop enterprises, thus indicating that they were profitably cultivated (Table 5.29).

The yield required to cover the cost of the same crop enterprises by scale of production has shown that it was unprofitable to cultivate rice at the medium-scale level and cassava at the small-scale level because their output were lower than the yields required to cover their costs of production. It was however profitable to cultivate rice at the small-,

and large-scale levels and cassava at the medium- and large-scales (Tables 5.41-5.44). The tables also showed that yam and maize crops could be cultivated profitably at small-, medium and large-scale levels.

5.7 Production Function Analysis

Data were fitted to the linear and Cobb-Douglas functions of yam, maize, rice and cassava enterprises. Each line or curve was fitted using the least square method. The data were originally fitted to the linear, quadratic and Cobb-Douglas functions but linear and Cobb-Douglas functions were selected for further analysis because they were found to fit the data better than the quadratic function.

The empirical results of the estimated Linear and Cobb-Douglas equations are given in Tables 5.47 and 5.48 respectively.

5.7.1 Yam Production

The empirical result of the estimated linear equation for yam is shown in Table 5.47. The coefficient of multiple determinations R^2, which is the percentage of variation explained by the independent variables, is 95. Seed input (X_1) is significant at one per cent level while labour input (X_2) is not. This indicates that seed was the more important variable in explaining the variation in the yield. Thus an increase of seed by one kilogram will raise the yam output by 3.87kg.

TABLE 5.47 REGRESSION ESTIMATES DERIVED FROM THE LINEAR PRODUCTION FUNCTION OF SOME CROP ENTERPRISES

Coefficient	Yam	Maize	Rice	Cassava
R	.98	.84	.88	.98
R^2	.95	.71	.77	.97
R^2	.94	.67	.74	.97
F	145.44	18.49	23.90	306.27
bo	2968.00 (0.98)	177.19 (0.56)	-974.70** (-2.04)	1522.82 (1.06)
b1	3.74* (16.87)	33.00** (2.08)	16.53* (4.34)	-
b2	.81 (0.43)	.71 (1.83)	.80* (3.14)	7.62* (17.50)

KEY

bo = constant term

b1-b2 = coefficients of seed and labour respectively

Figures in parenthesis are t-values of the coefficient

* = Significant at 1% level

** = Significant at 5% level

Source: Field Survey, 1993

The empirical result of the estimated Cobb-Douglas equation for yam is shown in Table 5.48. The regression coefficients are positive for all the variables indicating the fact that an additional unit of the resource input will raise the level of the output. For instance, if seed is increased by one per cent, the yield will be increased by 94 per cent, and if Labour

TABLE 5.48: REGRESSION ESTIMATES DERIVED FROM THE COBB-DOUGLAS FUNCTION OF SOME CROP ENTERPRISES

Coefficient	Yam	Maize	Rice	Cassava
R	.92	.87	.57	.72
R^2	.85	.76	.32	.52
R^2	.83	.73	.23	.47
F	42.73	23.45	3.35	10.71
bo	1.17 (1.00)	2.07 (1.99)	1.38 (0.63)	4.37** (3.19)
b1	.94* (8.86)	.36 (1.11)	.17 (0.47)	-
b2	.11 (0.87)	.62 (2.15)	.68** (1.77)	.68** (3.27)
bi	1.05	.98	.85	.68

KEY

bo = Constant term

b1-b2 = Coefficients of seed and labour respectively

Figures in parenthesis are t-values of the coefficient

* = Significant at 1% level

** = Significant at 5% level

bi = Sum of elastic ties

Source: Field Survey, 1993

is increased by one per cent the yield will be increased by 11 per cent. Thus 85 per cent of the variation in yield has been explained by the independent variables - seed and labour. Seed is significant at 1 per cent level while labour is not: further confirming the result

under the linear production function.

The regression coefficients of Cobb-Douglas function represent the elasticities of production in respect of the resources used. They are inelastic because the estimates are less than unity and a one per cent increase in any of the variable inputs, holding others constant, would result in less than one per cent increase in the output. The sum of these elasticities indicates the nature of the return to scale and hence the degree of responsiveness of the output when all inputs are varied. The sum of the elasticities in Table 5.48 is 1.05. This means that when all inputs are increased by one per cent, the output will increase by 1.05 per cent, indicating a tendency for an increasing return to scale.

5.7.2 Maize Production

The result of the estimated linear equation for maize is shown in Table 5.47. The overall test of goodness of fit of the regression equation shows that it is significant at one per cent level. The R^2 shows that 71 per cent of the variation in yield was explained by seed and labour inputs operating jointly.

Table 5.48 shows the result of the estimated Cobb-Douglas production function for maize enterprise. Since, from the table all the variables carry positive regression coefficients, a one per cent increase in seed or labour will raise the yield by 35 per cent or 62 per cent respectively. About 76 per cent of the variation in yield has been explained by the independent variables of seed and labour. Only labour is significant at 5 per cent level. The regression coefficients are inelastic because the sum of the estimates is less than unity. The sum of these elasticities in Table 5.48 is 0.97, which is less than unity, signifying decreasing returns to scale.

5.7.3 Rice Production

The regression estimates from linear production function for rice enterprise are shown in Table 5.47. The F-value indicates that the regression equation is significant at

one per cent level, which means that seed and labour inputs are significant in explaining the variation in the yield of rice. These independent variables however, explained 77 per cent of the variations in the yield of rice. Seed input in itself was significant at one per cent level while labour was significant at 5 per cent level. The seed was the more important variable in explaining the variation in the yield. Hence an increase of seed by one kilogram will increase the output by 16.5kg.

The result of the estimated Cobb-Douglas equation for rice is shown in Table 5.48. With all the variables carrying positive regression coefficients a one per cent increase in seed will attract 17 per cent increase in yield, while, a one per cent increase in labour raises yield by 68 per cent. The regression coefficients are inelastic and the sum of the elasticities is 0.85, which is less than unity indicating decreasing returns to scale.

5.7.4 Cassava Production

Table 5.47 also shows the result of the estimated linear equation for cassava enterprise. The F-value shows that the regression equation is significant at one per cent level. This means that the only variable-labour in the model is highly significant in explaining the variation in the yield of cassava. Since cassava is not propagated through seed but by cuttings, the labour involved in obtaining the cuttings formed part of the overall labour that produced a high R^2. This labour input is significant at one per cent level.

The result of the estimated Cobb-Douglas regression equation for cassava enterprise is shown in Table 5.48. The positive regression coefficient of the only variable - labour means that a one percent increases in man-hours will increase the yield by 67 per cent. Under this model, labour could explain only 52 per cent of the variations in yield as against 97 per cent under linear production function. Both the constant and labour coefficients are significant at 5 per cent level.

KASHIM IBRAHIM LIBRARY

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 Summary

The southern part of Igalaland has a large average family size of about 16. The average number of wives per household head was 2 while the average number of children per household was 12. On the average about 54.8 percent of the respondents were literate.

The average farm size per household was 5.26 ha. Small-scale farmers had an average size of 2.26ha; medium scale 5.15ha and large-scale 13.72ha. The small farmers formed the bulk of the sampled population (58.2 per cent) but cultivated the least amount of land (24.9 per cent). Large farmers however constituted 20.9 per cent of the population and cultivated 54.6 per cent of the total area of land under cultivation. The variation was due to the availability of inputs to these different categories of farmers.

Farm sizes varied widely among the crop enterprises. For example, the average farm size for maize was 3 ha, maize-rice 4ha, Rice 1.2ha, Cassava 0.9ha and millet-cowpea-cassava 2.7ha.

The cropping pattern of the area showed the dominance of sole cropping system (76 per cent of total area cultivated), followed by 2-crop mixture (19.8 per cent). The main crops grown are yam, maize, rice, cassava, cowpea and millet. These crops accounted for 71.5 per cent of the area cultivated by sampled farmers. They also formed the main staple food for the area.

The farmers used five sources of labour - family, hired, contract, communal and cooperative - for their farm work. These were, however, grouped into two - family and non-family - main sources of labour for the purpose of easy analysis. The study showed that family labour had an average of 37man-hour per hectare and accounted for 44.3 per cent while non-family labour's average man-hour per hectare, which was 298 hours accounted for about 55.7 per cent. Thus, non-family labour was considered to be more important in the area. An analysis of the labour used at the level of production units showed that small-scale farmers depended more on family labour than any other source while medium and large-scale farmers depended more on non-family labour. On the average, the small-scale farmers expended more labour per hectare than medium and large-scale farmers.

Farmers depended virtually on personal savings. About 95 per cent of the sampled farmers reported investing 85 per cent of their savings in farming. Since the farmers' saving were low, the per capita amount saved and later invested was equally low.

Land is mainly communally owned with about 61.9 per cent of the respondents acquiring it through inheritance. Land resource was observed to be the easiest productive resource to acquire by the farmers.

Very low proportion of farmers used fertilizers. Herbicides and insecticides were not widely used in spite of the fact that they were needed in order to improve productivity. The farmers could not afford to buy fertilizers, herbicides and insecticides at the prices they were being sold. Inadequate supply of fertilizers had been the main obstacle in the way of the very few that had money to buy.

The productivity of the major food crops was fairly high. While yam, maize and millet had productivity higher than the Nigerian average; the average yields of rice, cassava

and cowpea were below the Nigerian average. In spite of this achievement there is still much room for increased crop productivity.

Farm budget and cost and returns analysis showed that all the selected crop enterprises had positive net returns. Labour and other inputs were profitably used. Return to labour by scale of production however, showed that it was more profitable to use family labour at small-scale level to produce yam and at small and large-scale levels to produce maize and rice. Cassava was however more profitable to produce at medium and large-scale levels.

The yield required to cover the cost of production of yam, maize, rice and cassava were all below the output of these crop enterprises. Hence they were profitably cultivated.

Labour productivity and profitability indices indicated that all the selected crop enterprises were profitable. Yam was the most expensive crop to produce among the eleven crop enterprises.

Labour as an input, was found to be more important in explaining the variation in the yields of the selected crop enterprises with the exception of yam where the seedlings accounted for the most part of the variations in yields.

6.2 CONCLUSION

In spite of inadequate supply of farm inputs, it has been observed that productivity in terms of labour use and crop production had been quit high.

This is where sustainability in agriculture and consequently in well being lie. Any effort with the view to improving the quality of life in this area would require increasing crop productivity above the present levels to levels commensurate with or above the country's production averages. To help the farmers to attain higher levels of productivity would require an improvement in the supply of farm inputs at affordable prices in addition

to assisting them to procure such inputs through soft loans. Such loans could be given out and retrieved more easily to more effective farmers' cooperatives or cooperative organizations than the ones established during the years of the Ayangba Agricultural Development Project. Such farmers' cooperatives were presently virtually non-existent.

The farmers' well being will very much depend upon the provision and maintenance of basic infrastructure like roads, farm input supply centres and farmers' organizations. These are capital-intensive projects that can be sponsored by the federal, state and local governments. What the various communities require is the attraction of these government functionaries to themselves by initiating self-help projects and organizing themselves into viable and effective cooperative societies. Having done these, they could then apply for assistance from their local or state governments.

However, further research is needed to examine in greater detail the dynamics of the results of this "snap shot" research over a period of at least three to five years. This will provide more reliable data that could be used for planning future development in the rural area.

6.3 RECOMMENDATIONS

1. The farmers suffered from lack of sustainability in the area of introduction of agricultural innovations, adequate supply of basic inputs and maintenance of basic infrastructure like roads and input distribution centres. The farmers relatively had a better level of supply of these production resources during the defunct Ayangba Agricultural Development Project. This supply had been discontinued since the World Bank withdrew from the ADP . The farmers of this area therefore need a

consistent policy of farm input supply and provision and maintenance of rural basic infrastructure geared towards improving the living standards of the people.

2. The farmers were also found to depend heavily on their meager savings and money realised from various contributions for investment in farming. For increased production and productivity, the farmers would need assitance, in the form of soft loans, from other sources. These sources are mainly the local, state, and federal governments and banks. In order to attract loans from this hierarchy of governments and banks, the farmers would need to organize themselves into viable production groups or cooperative societies. The government would find it easier to deal with groups of people than individuals. Other major inputs discussed above should also be channeled through the farmers' organizations.

3. Socio-economic surveys of the area should be carried out at regular intervals in the future in order to keep abreast of changes in the life of the people in the area. Such studies should be extended to other parts of Igalaland. The areas of such study could be broken down into smaller units than has been covered in this study. Studies on smaller areas will cost less in terms of time and money and therefore attract more financial assistance from local and foreign bodies. Such studies will make rural development planning for the area more appropriate and people oriented, thus paving way to implementations that could bring improved standard of leaving to the rural people.

BIBLIOGRAPHY

Aziz, .S. (1978). Rural Development: Learning from China. Macmillan, London.

Berry, R.A. and Cline, W.R. (1979). Agrarian Structure and Productivity in Developing Countries. The Johns Hopkins University Press, London.

Britton, D.K. (1974). The Structure of Agriculture In: Edwards, A. and Rogers, A. (Eds.). Agricultural Resources: An Introduction to the Farming of the United Kingdom. Faber and Faber Ltd., London.

Britton, D.K. and Hill, B. (1975). Size and Efficiency in farming. Saxon House. Westmead.

Britton, L.R (1977). "Population and Affluence: Growing Pressure on world food Resources", in R.D. Stevens (1977). Tradition and Dynamics in Small-Farm Agriculture. Iowa State University Press, Ames.

Brown, L.R (1977). "Population and Affluence: Growing Pressure on Wored food Resource", in R.D. Stevens. (1977). Tradition and Dynamics in Small-Farm Agriculture. Iowa State University Press, Ames.

CBN. (1995). Annual Report and Statement of Accounts for the year ended 31st December 1994. Central Bank of Nigeria, 20th April 1995.

Dawtrey, B. (Ed. 1978). A Journal of Igalaland. Vol 1 No. 1. AADP. Ayangba.

Edwards, A. and Rogers, A. (1974). Agricultural Resources: An Introduction to the Farming of the United Kingdom. Faber and Faber Ltd., London.

Falusi, A.O. and Olayide, S.O. (1980). Agricultural Inputs and the small Farmers in Nigeria. In: Olayide, S.O. Eweka, J.A., and Bello-Osagie, V.E. (Eds.) Nigerian small Farmers: Problem and Prospects in Integrated Rural Development. Centre for Agricultural Rural and Development, Ibadan, Nigeria. Pp. 67-86.

F.A.O. (1983). The F.A.O Farm Analysis Package. A General Introduction. F.A.O. of U.N., Rome. Italy.

F.A.O. (1986). Inter-Country Comparisons of Agricultural Production Aggregate. F.A.O. of U.N., Rome. Italy.

F.A.O. (1987). Rural Communities, the key to African Forest Renewal. In: Rural Development, No. 8, January-June 1987,: F.A.O. of the U.N; Rome Italy.

F.A.O. (1988). Rural Poverty Report: Major Findings. In: Rural Development, (special Issue), February, 1988. F.A.O. of the U.N., Rome Italy.

F.A.O. (1994). Rural Development, January 1994, F.A.O. of the U.N., Rome Italy.

Farrel, M.J. 91957). The Measurement of Productive Efficieney. Journal of the Royal Statistical Society, 120, 253-281.

Gallen, K. (1993). Africa's Rural Poor: Partners in Growth. African Farmer, October, 1993 pp.34-37.

Gana, J.A. (1987). A strategy for integrated Rural Development in Nigeria Paper Presented at the National Workshop on Integrated Rural Development for Local Government Chairman and State Directors of Rural Development, at Durba Hotel, Lagos, Nigeria, January, 1987.

Ghatak, S. and Ingersent, K. (1984). Agriculture and Economic Development. Wheatsheaf Books Ltd., Great Britain

Hanson, J.L. (1977). A Textbook of Economics Macdonald and Evans Ltd., London.

Hardaker, J.B, et al (1970). Farm Management and Agricultural Economics. Angus and Robertson Ltd. London.

Heady, E.O. and Dillon, J.L. (1961). Agricultural Production Functions. Iowa State University Press, Ames.

Herdt, R.W. and Mandac, A.M. (1981). Modern Technology and Economic Efficiency of Philippine Rice Farmers. Economic Development and Cultural Change, 29:375-399.

Heyer, Judith et al (1981). Rural Development. In: Heyer, Judith et al: Rural Development in Tropical Africa, The Macmillan Press Ltd., London, England pp.1-13.

Hill, I.D. (1979). Land Resources of Central Nigeria: Agricultural Development Possibilities. The Benue Valley, vol. 4B, Ministry of Overseas Development, Tolworth, Tower.

Hill, B.E. and Ingersent, K.A. (1977). An Economic Analysis of Agriculture. Heinemann Educational Books, London.

Hsieh, S.C. (1971). Taiwan's Model of Agricultural Progress. In: Jackson, W.A.D. (Ed). Agrarian Policies and Problems in Communist and Non-Communist countries. University of Washington Press, Seattle.

The Institute of Development Studies (1995). IDS Bulletin. 26 (4). October, 1995.

I.L.O. (1978). Structure and Functions of Rural Workers' Organizations. A workers Educational Manual. International Labour organization. Geneva.

Johnston, R.J. (194). The Dictionary of Human Geography. Blackwell, Oxford.

Lund, P.J. (1983). The use of Alternative Measures of Farm size in Analysing the size and Efficiency Relationship. Journal of Agricultural Economics, 34:187-189.

Lund, P.J. and Hill, P.G. (1979). Farm size, Efficiency and Economies of size. Journal of Agricultural Economics 30:145-157.

Mc Nicoll, G. and Mead, C. (1990). Rural Development and Population Institutions and Policy. Oxford University Press, New York.

_____ Meteorological Unit, Department of Soil Science. I.A.R., A.B.U., Zaria.

Myindadi, N.B. (1980): Production Efficiency on Farms in Northern Nigeria Unpublished Ph.D. Dissertation.

Mortimore, M.J. and Wilson, J. (1965). Land and People in the Kano Close-settled zone. Occasional Paper No1. March Department of geography, Ahmadu Bello university, Zaria, Nigeria.

National Population Commission (1998). 1991 Population Census of the Federal Republic of Nigeria. National Population Commission, Abuja, Nigeria.

Norbye, O.D.K. (1983). Mass Poverty and International Income Transfer. In: Parkinson, J.R. (Ed). Poverty and Aid. St Martin's Press, New York.

Norman, D.W. et al (1976). A Socio-economic Study of three villages in the Sokoto Close-Settled Zone. Input-output Study Vol. I Text. Samaru Miscellaneous Paper 64. Institute for Agricultural Research, Ahmadu Bello University, Zaria, Nigeria.

Nweke, F.I and Akorhe, J.A. (1982). Rice Farming In Nigeria: In Praise of the small Holder. Food Policy, 17. Nov. 1982. 336-339.

Nweke, F.I et al (1991). Production costs in the Yam-Based Cropping systems of Southeastern Nigeria. RCMP Research Monograph No. 6, IITA, Ibadan, Nigeria.

Ojo, M.O. et al (1993). Sustaining Agricultural Production in a Deregulated Economy. Central Bank of Nigeria Economic and Financial Review, 31 (2):

Okuneye, P.A. and Idowu, I.A. (1990). Rural Development strategies in Nigeria: Past Experiences and some Lessons. Journal of Rural Cooperation, 18 (1): 31-48.

Olayemi, J.K. (1980). *Food crop Production by small Farmers in Nigeria.* In: Olayide, S.O. et al (Eds.) Nigerian small Farmers: Problems and Prospects in Integrated Rural Development. Centre for Agricultural, Rural and Development, Ibadan, Nigeria.

Olayide, S.O. (1975). Stimulating Integrated Rural Development Through Research Nigerian Rural Development Study, Rural Development Paper No. 18, Department of Agricultural Economics and Extension, University of Ibadan, Ibadan, Nigeria.

Olayide, S.O. et al (1980). (Eds.). Nigerian small Farmers: Problems and Prospects in Integrated Rural Development. Centre for Agricultural Rural and Development, Ibadan, Nigeria.

Omeje, O.R. (1994). The problem of Transportation and Agricultural Development in Dekina Local Government Area in Kogi State, Nigeria Unpublished B.Sc. Dissertation. Ahmadu Bello University, Zaria, Nigeria.

Pasour, E.C. Jr. (1981). A Further Note on the Measurement of Efficiency and Economics of Farm size. Journal of Agricultural Economics, 32:135-145.

Russell, N.P. and Young, T. (1983). Frontier Production Functions and the Measurement of Technical Efficiency. Journal of Agricultural Economics 34: 139-149.

Sills, D.L. (1968). International Encyclopedia of the social Sciences. Vol 1. The Macmillan Company and the Free Press, U.S.A.

Solmon, L.C. (1976). Economics. Addison Wesley Publishing Company Inc., Reading, Massachusetts.

Stevens, R.D. (1977) (Ed). Tradition and Dynamics in small-Farm Agricultural: Economic Studies in Asia, Africa and Latin America. The Iowa State University Press, Ames.

Sutherland, A. (1980). Capital Transfer Tax and Farming. Fiscal Studies, March. 51-65.

Sutherland, A. (1983). Farm size: A Reply. Journal of Agricultural Economics, 34: 191-195.

Timmer, C.P (1971). Using a Probabilistic Frontier Production Function to Measure Technical Efficiency. Journal of Political Economy, 79: 776-794.

Udo, R.K and Mamman, A.B. (Eds. 1993). NIGERIA: Giant in the Tropics Vol 2. Gabumo Publishing Co. Ltd: Lagos.

Ukoje, J.A. (1977). Rice marketing Channels and Marketing Costs in Ibaji District. Benue State, Nigeria. Unpublished B.A. Dissertation, Ahmadu Bello University, Zaria, Nigeria.

Ukoje, J.A. (1985). Integrated Rural Development: An Appraisal of the Ayangba Agricultural Development Project, Benue State, Nigeria Unpublished M.A. Thesis. Ahmadu Bello University, Zaria, Nigeria.

Ukpong, G.E. (1995). Agribusiness, the Environment and Sustainable Economic Growth in Nigeria. In: CBN, BULLION, Publication of Central Bank of Nigeria, 19(4). October/December, 1995.

Upton, M. (1973). Farm Management in Africa, The Principles of Production and Planning. Oxford University Press, London.

Upton, M. (1976). Agricultural Production Economics and Resource-Use. Oxford University Press, London.

Williams, G. (1981). The World Bank and the Peasant Problem. In: Heyer, et al (ed) Rural Development in Tropical Africa. The Macmillan Press Ltd., London.

Worz, J. (1985). Problems of Rural Productivity Development in Nigeria. Economic. A biannual collection of recent German contributions to the field of economic science, 31: 97-125.

APPENDIX A:: QUESTIONNAIRES

QUESTIONNAIRE A

FARMING DATA

1. Farmer's Code | | | |

2. Name of Interviewer:----------
3. Date of Visit:----------
4. Village:----------
5. L.G.A:----------
6. Respondent's Village:----------
7. Respondent's State of Origin:----------
8. Sex: 1. Male ( ) 2. Female ( )
9. Age:----------
10. Marital Status:
    1. Single ( )
    2. Married ( )
    3. Divorced ( )
    4. Widowed ( )
11. Literacy Level:
    1. illiterate ( )
    2. Informal education( )
    3. Primary level (Primary…) ( )
    4. Secondary level (Secondary ..) ( )
    5. Post secondary level (specify)----------

12. Family Data: Wives

CATEGORY	AGE	LITERACY LEVEL	FULL FARM WORK	PARTIAL FARM WORK	NO FARM-WORK
Wife 1					
Wife 2					
Wife 3					
Wife 4					

13. FAMILY DATA: CHILDREN

Category	Sex	Age	Marital Status	Literacy Level	Full Farm Work	Partial Farm Work	No Farm Work	Previous Occupation	Place Worked	Year Left Home	Year Back Home	Present Occupation
Child 1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

14. FAMILY DATA: OTHER RELATIONS

Category	Sex	Age	Marital Status	Literacy Level	Full Farm Work	Partial Farm Work	No Farm Work	Previous Occupation	Place Worked	Year Left Home	Year Back Home	Present Occupation
Child 1												
2												
3												
4												
5												

15. Off-farm activities:

ACTIVTIES	INCOME DERIVED
Handicrafts	
Fishing	
Hunting	
Trading	
Blacksmithing	
Others (specify)	

16. How many plots of farmland have you? ----------

17. Frequency of cultivation of the plots.

PLOT	LOCATION	YEARS AND CROPS CULTIVATED 1992	1991	1990
1				
2				
3				
4				
5				
6				

18. Agricultural Inputs used (1992)

Inputs Used	Total No.	Price Per Unit	Date First Purchased	Current Date Condition
Hoe				

KASHIM IBRAHIM LIBRARY

Cutlas

Axe

Tractor

---

19. Problems of Inputs.

Inputs	Plots Per Unit	Price Quantity	Total Used	Date First Used
Tractor services				
Fertilizer				
Household manure				
Insecticide				
Herbicide				
Storage Chemicals				
Hired labour				
Contract labour				
Communal labour				
Family labour				
Others 9specify)				

20. Storage facilities:

Crop	Place of Storage	Duration Before Sale (Months)
1		
2		
3		
4		
5		
6		
7		
8		

21. Sale of Crops

Crop	Sold	Distance	Market PRICE 1992	1991	1990
1					
2					
3					
4					
5					
6					
7					
8					

22. Sources of Income for Farmwork:

Source	Amount (N)	Interest (N)
Savings		
Friends		
Relatives		
Bank		
Agric. Cooperatives		
Government		
Individual local money lenders		
Contribution groups		
Others (specify)----------		

---

23. Did you witness rise in income in the past three years?

1. Yes ( ) 2. No ( )

24. What brought bout the rise or fall in income during this period/

---

25. What outstanding things did you do with the money?

---

26. In what ways did the village benefit from the effect of this rise in income? (Community projects executed and other social functions performed)?

QUESTIONNAIRE B

FARM PRODUCER SURVEY

1. Farmer's Code Number
2. Plot Number
3. Date of Survey
4. Village: ----------
5. Location of the pilot:
   1. Fadama
   2. Upland
6. Distance of the plot from the village:----------
7. How was the plot acquired?----------
8. Which year was the plot acquired?----------
9. If rented, how much do you pay annually?----------
10. Method of cultivation in 1992:----------

CATEGORY	Plot	1-Hoe 2-Cutlass Tractor Herbi- Other 3-Axe 4-Stick Services cides Tools N N (specify)
Clearing		
Tilling		
Ridging		
Planting		
Transplanting		
Weeding		
Harvesting		
Threshing		

KASHIM IBRAHIM LIBRARY

11. Farm size survey

BEARING	Distance (Metres)	Increase or Decrease		
		Bearing	Distance	Date
A-B				
B-C				
C-D				
D-E				
E-F				
F-G				
G-H				

12. How is the plot drained?

13. Other information (specify)

14. Crop Coverage 1992

Plot No.	Plot Size in Ha	Sole Crops In	Crop s Grown in 1992 Season						
			Mixed Cropping			Relay Cropping		Double Cropping	
			1st Crop	2nd Crop	3rd Crop	1st Crop	2nd Crop	1st Crop	2nd Crop
Total									

15. Source of Labour *Inputs 1992 Season*

Plot No		Family			Cooperative Communal						Contract			Hired		
		No of Pers	Hrs	Cost N	No of Pers	Hrs	Cos N	No of Pers	Hrs	Cost N	No of Pers	Hrs	Cost N	No of Pers	Hrs	Cost N

16(a) Farm Inputs Used 1992 Season QB.5 (a)

Plot No	Code Of Crop Grown	Seed				Manure			Fertilizer Compound			Urea			SSP		
		Improved or Traditional	Units Used	No of units	Cost N	Units Used	No of units	Cost N	Units Used	No of units	Cost N	Units Used	No of units	Cost N	Units Used	No of units	Cost N

16. (b) Farm Inputs Used 1992 Season QB.5 (b)

Plot No.	Code of Crop Grown	HERBICIDES				INSECTICIDES			
		Name of Herbicides	Unit Used	No. of Units	Cost N	Name of Insecticides	Units Used	No. of Units	Cost N

APPENDIX B: YIELD OF SELECTED CROPS FOR THE WORLD, AFRICA, NIGERIA AND SOME SELECTED COUNTRIES

CROP	COUNTRY	KILOGRAM PER HECTARE		
		1991	1992	1993
Yam	World	9225	9453	9589
	Africa	9215	9442	9573
	Nigeria	10402	10278	10526
	Cameroon	3782	3538	3444
	Solomon Is.	29200	29342	28571
Maize	World	3765	3983	3694
	Africa	1595	1177	1700
	Nigeria	1226	1133	1438
	Cameroon	1800	1810	1870
	U.S.A.	6815	8247	6321
Rice	World	3500	3557	3575
	Africa	1951	1970	2072
	Nigeria	1940	1977	1943
	Australia	8320	8418	8062
Cassava	World	9692	9571	9601
	Africa	7689	7712	7793
	Nigeria	9833	10660	10500
	Cameroon	16250	16250	16250
	Barbados	24840	38291	38182
Millet	World	695	775	743
	Africa	683	605	661
	Nigeria	1166	970	1027
	Cameroon	1050	1000	1077
	Japan	1714	1714	1750
Cowpea	World	631	652	673
	Africa	643	711	722
	Nigeria	721*	752*	840
	Cameroon	744	778	778
	Libya	3458	3600	3651

Sources: Field Survey 1993; F.A.O. YearBook Production Vol. 47, 1993

* CBN (1995). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year Ended 31st December, 1994. Table 5.5 pp, 72.

FOS (1997). Federal Office of Statistics Review of thNigeria. Economy. 1996. 50th Statistical Information for the Nation Anniversary 1947-1997. Federal Republic of Nigeria. Abuja. Table 27.