EFFECTS OF FADAMA III AND SONGHAI PROJECTS ON AGRICULTURAL OUTPUT AND POVERTY REDUCTION IN CROSS RIVER STATE, NIGERIA

BY

CHRISTOPHER EYO OJIKPONG
(P16SSEC9015)

A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF THE DOCTOR OF PHILOSOPHY IN ECONOMICS

DEPARTMENT OF ECONOMICS
FACULTY OF SOCIAL SCIENCES
AHMADU BELLO UNIVERSITY,
ZARIA, NIGERIA

NOVEMBER, 2018

DECLARATION

I declare that this Thesis represents my original work, except those cases when explicit references were made to other sources of literature. Consequently, I confirm that no part of this Thesis has been submitted for award of any degree either at Ahmadu Bello University, Zaria or anywhere else.

…….. ….....

C. E. OJIKPONG DATE

CERTIFICATION

This Thesis entitled "Effects of Fadama III and Songhai Projects on Agricultural Output and Poverty Reduction in Cross River State, Nigeria" by Christopher Eyo Ojikpong, meets the requirements governing the award of the degree of Doctor of Philosophy (Ph.D) in Economics of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

…….. …….

PROFESSOR PETER P. NJIFORTI DATE

(Chairman, Supervisory Committee)

……. …….

PROFESSOR MIKE C. DURU DATE

(Member, Supervisory Committee)

…… ……

DR ISHAYA A. AUDU DATE

(Member, Supervisory Committe)

…….. ……

DR. ALIYU RAFINDADI SANUSI DATE

(Head, Department of Economics)

…… ……..……

PROFESSOR SADIQ Z. ABUBAKAR DATE

(Dean, School of Postgraduate Studies)

DEDICATION

To GOD, "King of the whole earth."

To the Ojikpongs,' by birth and by marriage; past, present and future generations.

To the unsung heroes - the Nigerian farmers, who toil under rain and sun to feed the nation and grow the economy yet, live in abject poverty and impoverished conditions.

To the development agencies, public and private organizations: for realizing the need to collaborate towards improving agriculture, enhancing farmers' income and wellbeing.

ACKNOLEDGEMENT

I am short of better words to express my deep appreciation to the wonderful children of God who I have had the privilege to be under their guidance on the course of this study. In particular, I appreciate in no small measure, Professor Peter Njiforti (Chairman, supervisory committee), Professor Mike C. Duru (Member, supervisory committee) and DR Ishaya A. Audu (Member, supervisory committee) for their invaluable contributions, in very many ways, to the successful completion of this study. No word on earth can adequately convey my gratitude to you for the painstaking effort towards the successful completion of this study. For sure, I shall remain eternally grateful to you. May God bless you and your dear families. However, I take responsibility for any error that may exist in the work.

I equally appreciate and thank my internal examiners – DR (Mrs) I. Isah, DR Sanusi and DR M. Shuaibu for the very kind and helpful contributions which surely added great value to this study.

I have indeed been so privileged to study not just in one of the foremost, renowned and branded universities around the world but, also in one of the best departments (of Economics) any university can boast of. The rich content, in terms of quality of staff and other resources is indeed a pride to behold. Therefore, while thanking God for the rare privilege to be mentored in the department of Economics, Ahmadu Bello University, Zaria, beginning from my undergraduate studies, I very deeply appreciate the energetic, vibrant, enterprising and incisive academic staff of the department, individually and collectively, for all that I have gained from their very rich reservoir of knowledge. God bless you all. Your lives and careers shall, by the grace of God, blossom beyond your imaginations. I am also grateful to the non academic staff for their supportive roles while in this university.

I wish to appreciate the external examiner for the sacrifices made, by the grace of God, to examine this study. The value of your time given for the purpose of examining this study cannot be quantified. May God grant you journey mercies to Zaria and back to your base.

Finally, my profound gratitude to my wife Patricia and children (Ochuwe-Boriye, Ntelochuwe and Ntoh-Ochuwe, Osarr-Ochuwe, Lituom-Ochuwe). Your enormous sacrifices during the many tortuous years I spent working on this degree shall never be forgotten.

I really do not know what to say to Tpl Ben Ejue Ojikpong (Ph.D), Chief Tom Ogon Ojikpong (Ph.D, Associate Professor), Engr. David and Mrs Ann Okwality Abang, Chief Patrick E. Agida, Chief (Com.) Akpeh Edung Ogon and Mr Emmanuel "Kato" Otu, because to say "thank you" is surely an understatement. However, for lack of a better term, accept my THANK YOU, please. May God bless and replenish you and your dear families several folds. Let me also place on record my appreciation to: Mr Joe Odu Kamgba, Amb Akpang Obi-Odu, Chief (Dr.) James Bassey Ejue, Chief Frank Bazo Bullem (Ph.D), Mrs Fond Udoh, Chief Paddy Agbe, Mr Monday Ajie, Mr Alex Atem, Mr Emma Anoh, Bro. David and the brethren in Afrike, Dr Mark Atabi, Pst. Dom and Mrs Mary Dom Awor, Mrs Mary Ogwuche, Job A. Opue, Madam Philo Obegu, Hon. Tom Egbang, my class mates particularly Dr Abarshi Yusuf and Dr Dom Agba that vowed that I will not sleep until am

done with this work and, my ‘landlord’ Innocent Mgbe (a friend and ‘brother’ of over two decades), and many others. God bless and replenish you and your beloved families.

I specially appreciate the very kind support of my uncle and ‘father’ HRM Butro (MAJ.) Godwin D. Odu (RTD. KSM), Butro Idum IV and Paramount Ruler, Ogoja Local Government Area, Cross River State. May you, by the grace of God, reign peacefully long on the throne.

Above all, I acknowledge the hand of GOD in my life!

ABSTRACT

The study essentially evaluates the effects of the Cross River Fadama III and Songhai projects on output and poverty reduction in Cross River State. The thesis specifically analyses the various agricultural innovations introduced by the projects, the extent of adoptions, the impact of adoptions of those innovations on agricultural output, income and profitability, income diversification and poverty reduction among the participants. To achieve these objectives, the study employed counterfactual (Beneficiaries and Non-Beneficiaries) approach, and the data generation process was through survey research method and carefully designed structured questionnaires to collect cross sectional data from Fadama III and Songhai project participants as well as non-projects participants within the project areas in Cross River State. The tools of analysis used in this study included; descriptive statistics, Probit model, Cobb-Douglas production function, the Gross Margin, Double Difference analysis, Diversification Index and, the Foster and Greer Thorbeck (FGT) Index as well as the Multi-Poverty Index (MPI). Study found that major innovations introduced by the two programmes included; capacity building support, advisory services, productive inputs support, and, small-scale community-owned infrastructure for Fadama III beneficiaries and capacity enhancement through training on various agricultural innovations for the Cross River Songhai beneficiaries. The study found that socio-economic background of the beneficiaries such as education, marital status, farming experience, income level are more likely to influence the level of adoption at the 5% level of probability. The study found an average production efficiency of 1.672 and 1.453 for Fadama III beneficiaries and non beneficiaries, and, 1.883 and 0.703 for Songhai beneficiaries and non beneficiaries respectively indicating production efficiency advantage in favour of projects' beneficiaries. In comparison with non-project participants, average farm income profit margin was N23, 329.44 in favour of Fadama III participants, while Songhai project participants recorded average profit margin advantage of N47, 937.37 over the non project participants, after project implementation. Double Difference Analysis revealed average income difference between participants and non-participants of N-10,821.5 before project and N-88,270.89 after project and, average difference before project of N10, 185.24 and N8, 415.48 after project, in favour of Fadama III and Songhai participants respectively. The average percentage difference by time (before and after project) for Fadama III participants was 65.74% and 7.59% for non-participants, while Songhai project participants recorded 25.38% and 4.68% for non-participants. Diversification index analysis revealed average income difference between Fadama III participants and non-participants of N3, 921.56 and N39, 925.27 before and after project participation respectively, , and,N 0000.00 and N44, 303.03 before and after project for Songhai project participants and non-participants respectively, in favour of participants for the five categories. The poverty analysis shows a group difference of 1.3% and -50.0% , 0.06% and -0.46%, and, 0.07% and 0.33% for the HCI, PGI and SPGI before and after project between Fadama III participants and non-participants respectively. For Songhai project, the group difference was 6.0% and 20.0%, 0.04% and -0, 01%, 0.04% and -0.01% between Songhai participants and non-participants, before and after project respectively. Study found that participants had comparative significant advantage over non participants after project application. Study also found a more significant impact on poverty among the Fadama III participants than the Songhai project participants, which may be due to the productive input support to Fadama III participants, leading to the conclusion that the Fadama III partnership collaboration may be more beneficial to the farmer than the Songhai type of collaboration. Consequently, study recommends among others, necessary strengthening and continued application of the Fadama III programme and a review of the Songhai programme framework in order to strengthen the project's post training funding/productive input support to participants.

TABLE OF CONTENTS

Title Page - - - - - - - - - - i

Declaration - - - - - - - - - - iii

Certification - - - - - - - - - - iv

Dedication - - - - - - - - - - v

Acknowledgement - - - - - - - - - vi

Abstract - - - - - - - - - viii

CHAPTER ONE: General Introduction

1.0 Background to the Study - - - - - - - - - 1

1.1 Statement of Research Problem - - - - - - - 5

1.2 Research Questions - - - - - - - - - 10

1.3 Objectives of the Study - - - - - - - - - 10

1.4 Research Hypothesis - - - - - - - - - 11

1.5 Justification for the Study - - - - - - - - 11

1.6 Scope of the Study - - - - - - - - 15

1.7 Limitations of the Study - - - - - - - - 15

1.8 Outline of Chapters - - - - - - - - 16

CHAPTER TWO: Literature Review

2.0 Introduction - - - - - - - - - 17

2.1 Conceptual Literature - - - - - - - - 17

2.1.1 Concept of Fadama - - - - - - - - 17

2.1.2 Development of Fadama Phases I and II - - - - - - 18

2.1.2.1 National Fadama Development Project Phase I - - - - 18

2.1.2.2 National Fadama Devlopment Project Phase II - - - - 19

2.1.3 National Fadama Devlopment Project Phase III - - - - 20

2.1.4 Rationale for the Fadama III Scheme - - - - - - 27

2.1.5 Songhai Initiative - - - - - - - - 28

2.1.5.1 Songhai System of Development - - - - - - 29

2.1.6 Songhai Cross River Initiative - - - - - - - 30
2.1..6.1 Partnership Obligation in the Cross River Songhai System - - - 31
2.1.7 Expected Gains of the Songhai initiative - - - - - 32
2.1.7.1 Value of the Songhai initiative to the Cross River State Government - 33
2.1.7.2 Value of the Songhai initiative to the Local Governments - - - 33
2.1.7.3 Value of the Songhai initiative to host and neighbouring communities - 33
2.1.8 Rationale for the Cross River Songhai initiative - - - - 34
2.1.9 Concept of Income Diversification - - - - - - 34
2.1.9.1 Framework for Diversification and Sustainable Livelihood - - - 36
2.1.10 Agricultural Development - - - - - - - 40
2.1.11 Overview of the Agricultural Sector in Nigeria - - - - 40
2.1.11.1 Overview of the Agricultural Development Strategies in Nigeria - - 44
2.1.11.2 Key Agriculture Reform Eras in Nigeria - - - - - 47
2.1.11.3 Key Challenges of the Agricultural Sector Reform Policies and Programmes 51
2.1.12 Agricultural Innovations and Adoption - - - - - 52
2.1.12.1 Agricultural Innovations - - - - - - - 52
2.1.12.2 Adoption of Agricultural Innovations - - - - - 53
2.1.13 Concept and Measurement of Poverty - - - - - 54
2.1.14 Conceptualization of Public Private Partnership (PPP) - - - 60
2.1.14.1 Contribution of "Public" and "Private" stakeholders in PPPs- - - 70
2.1.15 Public Private Partnership in Cross River State - - - - 71
2.2 Theoretical Literature - - - - - - - - 72
2.2.1 Agricultural Innovation System (AIS) - - - - - - 72
2.2.2 Integrated Rural Development (IRD) Model - - - - - 72
2.2.3 Theoretical Foundation of Public Private Partnership - - - - 73
2.2.3.1 Thrusts of Public Private Partnership in Agriculture - - - - 73
2.2.3.2 Public Private Partnership and the new Development Agenda - - 76
2.2.3.2.1 Sustainable Development Goals (SDG) - - - - - 76
2.2.3.2.2 Means of Implementation of the Development Agenda - - - 78

2.2.4 Models of Public Private Partnerships - - - - - - 82
2.2.4.1 Operational models of PPP in Fadama III and Songhai schemes - - 83
2.2.5 Impact Assessment Models in Public Private Partnership - - - 86
2.2.5.1 Classical Effect Evaluation - - - - - - - 86
2.2.5.2 Realistic Approach - - - - - - - - 87
2.2.5.3 Participatory Approach - - - - - - - 87
2.2.5.4 Integrated Approach - - - - - - - - 88
2.2.6 Approaches to Measurement of Efficiency - - - - - 89
2.2.6.1 Data Envelopment Analysis (DEA) - - - - - - 90
2.2.6.2 Parametric Approaches to Measurement of Efficiency - - - 91
2.2.6.3 Average Production Function Approach - - - - - 91
2.2.6.4 Stochastic Frontier Analysis - - - - - - - 91
2.2.6.5 Fixed Effects Model - - - - - - - - 92
2.3 Empirical Literature - - - - - - - 92
2.3.1 Cross Country Case Studies - - - - - - - 92
2.3.2 Nigeria Case Studies - - - - - - - - 96
2.4 Gap(s) in the Literature - - - - - - - - 104
CHAPTER THREE: Methodology
3.1 Study Area - - - - - - - - - 105
3.1.2 Agricultural Development Programmes in Cross River State - - - 106
3.2 Theoretical Framework - - - - - - - - 108
3.3 Model Specification and Estimation Techniques - - - - - 110
3.3.1 Binary Logistic Regression Model - - - - - - 110
3.3.2 Production Function (Input-Output) Model - - - - - 112
3.3.3 Farm Profit Model - - - - - - - - 114
3.3.4 Double Difference Model - - - - - - - 114
3.3.5 Foster- Greer-Therbecke (FGT) Poverty Models - - - - - 118
3.4 Description of Key Variables - - - - - - - 118
3.5 The Osgoods Semantic Differential Scale - - - - - 120

3.6 Sample and Sampling Techniques - - - - - - 121

37 Survey Procedure - - - - - - - - - 122

3.7 Sources of Data - - - - - - - - - 123

CHAPTER FOUR: Data Presentation and Analysis

4.0 Introduction - - - - - - - - - 124

4.1 Socio-Demographic Characteristics of Respondents - - - - 125

4.1.1 Socio-Demographic Characteristics of Fadama III Beneficiaries and Non Beneficiaries - - - - - - - - - 125

4.1.2 Socio-Demographic Characteristics of Songhai Beneficiaries and Non Beneficiaries 128

4.2 Effects of Fadama III and Songhai Projects on Agricultural Output - - 130

4.2.1 Farming Innovations introduced by the project - - - - 130

4.2.2 Innovations of Fadama III project - - - - - - 130

4.2.2.1 Extent of adoption of farming innovations under Cross River Fadama III - 134

4.2.3 Innovations of Cross River Songhai Project - - - - - 140

4.2.3.1 Extent of adoption of farming innovations under Cross River Songhai scheme 142

4.3 Binary Logistic Regression Analysis of Adoption of Farming Innovations - 145

4.3.1 Analysis of factors affecting adoption of farming innovations by Fadama III - farmers - - - - - - - - - 145

4.3.2 Analysis of factors affecting adoption of farming innovations by Songhai farmers 148

4.4 Production Function Analysis Estimates - - - - - - 150

4.4.1 Estimated Production Functions for Cassava, Rice and Yam for Fadama III Beneficiaries and Non Beneficiaries - - - - - 150

4.4.2 Estimated Production Functions for Cassava, Rice and Yam for Songhai Beneficiaries Non Beneficiaries - - - - - - 154

4.5 Profitability Analysis - - - - - - - - 158

4.5.1 Profitability Analysis for Fadama III Beneficiaries and Non Beneficiaries - 158

4.5.2 Profitability Analysis for Songhai Beneficiaries and Non Beneficiaries - 160

4.6 Double Difference Analysis - - - - - - - 162

4.6.1 Analysis of Double Difference in income of Fadama III beneficiaries and non-beneficiaries before and after project implementation - - - 162

4.6.2 Analysis of Double Difference in income of Songhai beneficiaries and non-beneficiaries before and after project implementation - - - 163

4.7 Analysis of Income Diversification - - - - - - 165

4.7.1 Off-farm activity and income diversification under Cross River Fadama III scheme 165

4.7.1.1 Off-farm Enterprise Activity under Fadama III - - - - 165

4.7.1.2 Off-farm Income Diversity under Fadama III - - - - 166

4.7.2 Off-farm activity and income diversity under Cross River Songhai scheme - 168

4.7.2.1 Off-farm Enterprise Activity under Songhai scheme - - - - 168

4.7.2.2 Off-farm income diversity under Songhai scheme - - - - 169

4.8 Impact of Cross River Fadama III and Songhai Projects on Poverty Status of Beneficiaries - - - - - - - - 171

4.8.1 FGT Poverty Analysis under Fadama III - - - - - 172

4.8.2 FGT Poverty Analysis under Songhai - - - - - - 174

4.9 Selected Multi-Dimensional Poverty Indices - - - - - 175

4.9.1 Analysis of Multi-Dimensional Poverty Indices under Fadama III - - 175

4.9.2 Analysis of Multi-Dimensional Poverty Indices under Songhai - - 177

4.10 Constraints - - - - - - - - - 178

CHAPTER FIVE: Summary of Major Findings, Conclusion and Recommendations

5.0 Introduction - - - - - - - - - 179

5.1 Summary of Major findings - - - - - - - 179

5.2 Conclusion - - - - - - - - - 183

5.3 Recommendations - - - - - - - - - 184

References - - - - - - - - - - 188

LIST OF TABLES

2.1 Fadama III Components and cost distribution (National) 21
2.2 (a) Project cost (Financial Plan) (National Figures) 23
2.2 (b) Cross River State Distribution (State figures) 23
2.2(c) Funds Disbursement as at 2013 (Cross River State) 23
2.3 Levels of Public Private Partnerships in Agriculture 68
2.4 Framework of PPP according to purpose to be achieved 69
2.5 Countries-Case Studies of PPP in Agricultural Development 78
2.6 Range of Public Private Partnership (PPP) Models 83
3.1 Matrix of the Double Difference (DD) in income across time and across groups 115
3.2 Matrix of the Double Difference in income across diversified products and across groups 115
3.3 Project profile through semantic differential scale 120
3.4 Population and sample selected for study 122
4.1 Breakdown of Class of Respondents 124
4.2 Selected Socio-Demographic Characteristics of Fadama III Beneficiaries and Non-Beneficiaries 127
4.3 Selected Socio-Demographic Characteristics of Songhai Beneficiaries and Non-Beneficiaries 130
4.4 Farming innovations for Fadama III beneficiaries 132
4.5 Adoption of Farming Innovations: FADAMA III Beneficiaries and Non-Beneficiaries 137
4.6 Farming Innovations for Songhai Beneficiaries 141
4.7 Adoption of Farming Innovations: Songhai Beneficiaries 144
4.8 Maximum Likelihood Estimates of Binary Logistic Model for FADAMA III Farmers' Odds Ratio Exp (B) 147
4.10 (a) Estimated Production Functions for Cassava, Rice and Yam under FADAMA III (Beneficiaries) 151
4.10 (b) Estimated Production Functions for Cassava, Rice and Yam under FADAMA III (Non- Beneficiaries) 153
4.11 (a) Estimated Production Functions for Cassava, Rice and Yam under Songhai (Beneficiaries) 154
4.11 (b) Estimated Production Functions for Cassava, Rice and Yam under Songhai (Non- Beneficiaries) 156
4.12 Gross Margin Analysis for Fadama III Beneficiary and Non-Beneficiary Farmers (Cassava, Rice and Yam) 159
4.13 Gross Margin Analysis for Songhai Beneficiary and Non-Beneficiary Farmers (Cassava, Rice and Yam) 161
4.14 (a) Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Cassava Farmers 163
4.14 (b) Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Rice Farmers 163
4.14 (c) Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Yam Farmers 163

4.15 (a) Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Cassava Farmers 164

4.15 (b) Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Rice Farmers 164

4.15 (c) Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Yam Farmers 164

4.16 Distribution of Fadama III beneficiary and non-beneficiary farmers according to Off-farm enterprise before and after programme implementation 166

4.17(a) Double Difference in Average Income across time and across groups for Petty Trading, Fadama III Beneficiaries and Non-Beneficiaries 167

4.17 (b) Double Difference in Average Income across time and across groups for Processing, Fadama III Beneficiaries and Non-Beneficiaries 167

4.17 (c) Double Difference in Average Income across time and across groups for Storage, Fadama III Beneficiaries and Non-Beneficiaries 167

4.17 (d) Double Difference in average Income across time and across groups for Consultancy, Fadama III Beneficiaries and Non-Beneficiaries 168

4.17 (e) Double Difference in Average Income across time and across groups for "Others", Fadama III Beneficiaries and Non-Beneficiaries 168

4.18 Distribution of Songhai Beneficiary and Non-Beneficiary Farmers according to Off-farm activity before and after programme implementation 169

4.19 (a) Double Difference in Average Income across time and across groups for Petty Trading Songhai Beneficiaries and Non-Beneficiaries 170

4.19 (b) Double Difference in Average Income across time and across groups for Processing, Songhai Beneficiaries and Non-Beneficiaries 170

4.19 (c) Double Difference in Average Income across time and across groups for Storage, Songhai Beneficiaries and Non-Beneficiaries 171

4.19 (d) Double Difference in Average Income across time and across groups for Consultancy, Songhai Beneficiaries and Non-Beneficiaries 171

4.19 (e) Double Difference in Average income across time and across groups for "Others", Songhai Beneficiaries and Non-Beneficiaries 171

4.20 Poverty Status Among Fadama III Beneficiaries and Non-Beneficiaries with Relative Poverty Line of N66, 802. 20 173

4.21 Poverty Status among Songhai Beneficiaries and Non-Beneficiaries with Relative Poverty Line of N66, 802. 20 175

4.22 Selected MPI Analysis For Fadama III Beneficiaries and Non-Beneficiaries With Relative Poverty Line of N66, 802. 20 176

4.23 Selected MPI analysis for Songhai beneficiaries and non-beneficiaries With Relative Poverty Line of N66, 802. 20 177

LIST OF APPENDICES

APPENDIX I: Questionnaire administered to Cross River Fadama III and Songhai Projects Beneficiaries and non Beneficiaries 201

APPENDIX II: Constraints of the Fadama III project in Cross River State 210

APPENDIX III: Constraints of the Songhai Project in Cross River State 211

LIST OF FIGURES

2.1 Fadama III Operational Framework 24

2.2: Diversification-Sustainability Nexus 38

2.3 Nigerian Small Holder Cycle 42

2.4 Conceptual Framework of Public-Private Partnership 62

2.5 Conceptual Model of Public Private Partnership in Agricultural Development and Poverty Reduction 78

2.6 Procedure for Implementing Advisory Service Activity 84

2.7 Fadama III – Funds Flow for Assets Acquisition 85

3.1 Map of Cross River State 108

CHAPTER ONE

GENERAL INTRODUCTION

1.0 Background to the Study

Evidently, Nigeria is currently grappling with key challenges in the agricultural sector leading to an inability to meet domestic food requirements and it associated vice of poverty particularly among the agricultural sector practitioners. This results from an input system and farming model that has become obsolete and inefficient. It is in apparent recognition of this, and as a go-forward, that the Nigerian federal government, in recognition of many years of neglect, recently began to reform the agricultural sector through the much celebrated Agricultural Transformation Agenda (ATA) with the claim to "re-introduce the Nigerian economy to sustainable agriculture centered on business-like attitude driven by the private sector," thus; recognizing the private sector role in agricultural development and poverty reduction.

Recently, the present federal administration in Nigeria launched the Agricultural Promotion Policy (2016-2020) which cardinal design principle, similar to the ATA principle, envisages "a government-enabled, private sector-led engagement as the main growth driver of the (agricultural) sector." Furthermore, the Agricultural Promotion Policy (APP) seeks to encourage "participation and inclusiveness; focusing instruments on measures to maximize the full participation of stakeholders including farmers' associations, cooperatives and other groups, as well as Non Governmental Organizations (NGOs), Community-Based Organizations (CBOs), Civil Society Organizations (CSOs), development partners and the private sector." According to FMARD (2016), this places a premium "on the role of these organizations as agents of change in the (particularly) agricultural economy" of Nigeria. Like the ATA, the APP set a number of specific objectives for the period 2016-2020, to among others, "restore Nigeria (Agriculture) to where she was in the 1960s and 70s. Thus; both the ATA and APP acknowledged the challenges in the Nigerian agricultural sector and the need for stakeholder-partnership as a viable go-forward option in the sector.

The prominence given to the agricultural sector through the Agricultural Transformation Agenda and the Agricultural Promotion Policy (APP) by the respective federal administrations are perhaps, indicative of the concerns in the sector as well it strategic placement in the economy of Nigeria.

Given the linkages between a dwindling agriculture and poverty ((Nchuchuwe and Adejuwon, 2012)), it is therefore, not surprising that Nigeria, with an approximate population of over 175 Million, according to a United Nations' report (Ujumadu 2016), is one of the poorest with over 80 Million (or about 64 percent) of the population living below the poverty line and the situation seem to be getting worst, according to the report by Ujumadu (2016), "poverty and hunger have remained high in the rural areas" and "cut across the six geo-political zones" of the country.

However, agriculture remains the most enduring platform of empowerment "for implementation of policy initiatives and actions aimed at resolving the endemic challenges of poverty and underdevelopment", Ogbe (2016). Evidently, agriculture can be a sure way for a country like Nigeria to banish hunger and poverty in the society and promote industrial revolution. According to Sadiku (2015) as reported by Fadare, (2015) Agriculture, unlike crude oil, is a renewable asset that can be used for the benefit of the people; create job opportunities, provide food and raw materials and enhance the economy sustainably. Therefore, "agriculture should be taken as a serious business (and) not something we return to when other areas fail us" Fadare, (2015). Unfortunately, "agriculture has regrettably been seen to be synonymous with poverty", with low levels of mechanization and funding which limit farmers' ability to expand and perform operations timely (Ogbe 2016 in; Babatunde 2016).

Emphasis on the agricultural sector is based on the evidence from literature (such as Bhajan, Helena, and Peter, 2012) which concludes that the potential to make a significant contribution to poverty reduction is related to the composition of, and growth in key economic sectors and, in particular, growth in agriculture is beneficial for poverty reduction particularly in the rural areas which consist of over 75 per cent of the poor who are engaged in the agricultural sector.

Meanwhile, there are indications of increasing concerns for the development of agriculture and rural development sectors and the roughly 80 per cent of the population who depend mainly on agriculture for their livelihoods. This concern is justified by the high correlation that exists between the population engaged in agriculture and poverty (Nchuchuwe, and Adejuwon, 2012). According to Mohammed (2007), a high share of rural communities and especially the rural poor are directly or indirectly dependent on agriculture through farming, food processing, fishing, forestry and trade.

Various agricultural intervention programmes, such as the Agricultural Development Programmes (ADPs); River Basins Developpment Authorities (RBDAs), among a plethora of others, have been initiated and/or implemented towards agricultural development and poverty reduction in Nigeria. This was in recognition of the role of agriculture as a means to achieving poverty reduction, food security and the Millennium Development Goals (MDGs), now Sustainable Development Goals (SDGs) (World Bank 2008). However, Abimboye (2009), reports Idachaba (2009) thus; "the programmes were abandoned because they were not achieving the objectives for which they were set up and, the benefits flowed to unintended beneficiaries with unintended consequences and had no bases for sustainability", consequently leading to high food importation bill, (Ewepu, 2016).

According to Nchuchuwe and Adejuwon,(2012), despite the strategies adopted by various governments in Nigeria to address the agriculture and rural underdevelopment problems, the sector is still underdeveloped with high incidence of poverty thereby constituting a threat to Nigeria's vision of becoming one of the twenty strongest economies in the world by the year 2020 (vision 20: 2020). For instance, the growth of the agricultural sector which remained at 5.8 percent between 1990 – 1993 actually declined to 3.5 percent, 2.5 percent and 1.8 percent within 1993 – 2001 periods, even with it high potentials (Ekpo 2004).While Kale (2012), has shown that poverty incidence rose considerably in Nigeria from 27.2 per cent to 69.0 percent between 1980 and 2010 and the food poor, by zone, ranged from 25.4 per cent for the South-West to 51.8 per cent for the North-West in 2010. The South-South region recorded 35.5 per cent food poor within the same period with 55.9 per cent and 63.8 per cent of absolute and relative poor in the region, respectively. Cross River State is therefore, not immune to these challenges particularly considering the fact that agriculture in Nigeria is placed on the concurrent legislative list. The major setback for all the poverty reduction programmes especially within the poor farming population includes; lack of sustainability and lack/or poor public and private sector coordination/or collaboration to address the agricultural sector challenges in view of sectoral constraints, etc (Daramola 2012; FMARD 2016). In the view of Obansanjo (2016), reported by Ojo (2016) "agriculture cannot be practiced without government support by way of good policy and incentives" but, "government as a direct producer has never worked and will never work in agriculture", thus, highlighting the need for sectoral collaboration. This has necessitated a paradigm shift of the development strategies to incorporate both public and private efforts towards the development of the agricultural sector, hence poverty reduction.

Public-Private Partnership is a framework that while engaging the private sector, acknowledges and structures an important role for government in ensuring that social obligations are met and successful sector reforms achieved (PDSSP 2008). This is achieved through mobilizing complementary and scarce resources in the public and private sectors for projects involving the development of infrastructure, communities and agriculture. According to Daramola (2012), each entity contributes human, physical and financial resources, the generation and diffusion of innovations, new forms of techniques and knowledge to redress gaps in the development, production, processing and marketing of improved agricultural products.

Partnerships enable sustainable outcomes that no single party could successfully achieve alone and, help give voice to the communities as well as promote the principles of transparency and accountability in planning and management of public investment, PIM (2009). Emphasis on PPP for agricultural development and poverty reduction is driven by genuine interest in seeking new inter-organisational arrangements to address poverty reduction and deliver development services effectively to those who need them (Brinkerhoff and Brinkerhoff, 2004). Suleiman (2009) sums up thus; "access to appropriate technology, technical support and new crop varieties could be available to small scale agriculture enterprises via PPPs". There is therefore, the growing realization of the value of Public Private Partnership in agriculture and particularly for projects that benefit farmers, Ferroni and Castle (2011).

The Cross River Fadama III and Songhai projects have, therefore, been conceived to take advantage of the growing realization of the value of Public private Partnership to agricultural development and consequent poverty reduction

Though Fadama III is a federal government of Nigeria agricultural development initiative for participating states, the Cross River Songhai Initiative is a wholly Cross River government/Songhai Port Novo partnership initiative for the development of the agricultural sector and poverty reduction in Cross River State.

As evidenced from the literature, agricultural development often drives diversification of employment in the agricultural-based rural economies into non-agricultural activities. According to Loriente (2015), "a prospering agricultural sector can unleash economic growth, generating on-farm and off-farm employment and creating opportunities to get into

other economic activities". This linkage provides rural households with livelihood diversification opportunities, which is critical for livelihood sustainability.

According to Mbanasor and Nwachukwu (2012), the increased focus of the Public-Private Partnership on agriculture and agribusiness is hinged on the dominance of the agricultural sector on all other sectors of the Nigerian economy. This view is indeed, reflective of the economy of Cross River State with the dominance of the agricultural sector over all other sectors, prompting the Federal Government of Nigeria to propose the declaration of the state "as Staple Crops Processing Zone (SCPZ)". The state has large expanse of land for targeted staple crops like maize, rice, oil palm, cocoa and cassava covering a vast agrarian belt of more than 200 kilometers and measuring far in excess of 500,000 hectares of land across the state, Eguzozie (2014).

However, key staples in the state include; Cassava, Rice and Yam. These constitute the most cultivated and most widely consumed food crops in the state. This study is therefore, hinged on the strategic dominance and potential impact of the agricultural sector to the economy and people of Cross River State.

1.1 Statement of Research Problem

There is a correlation between a dwindling agriculture and poverty, Loriente, (2015). Therefore, an adverse agricultural sector performance poses serious livelihood challenges that require close and urgent attention by all stakeholders including scholars to resolve. Meanwhile, Nigeria has had an adverse agricultural sector performance over the years consequent upon the less attention the sector has received following large scale discovery and exploration of oil in Nigeria. The cumulative effect of this neglect was that the agricultural sector failed to perform its traditional functions of providing adequate food and raw materials.

Agricultural sector has been plagued by many constraints. For instance, Obasanjo (2016) reported by Ojo, (2016) identified lack of continuity and consistency in government policies as the greatest bane of agriculture in the country. Furthermore, government policies were not (or poorly) co-ordinated within federal departments or between federal and state governments, also identified include; corruption, poor infrastructure, weak enforcement of contracts and high cost of finance and failures in the extension system (FMARD 2016; NEEDS 2004). Meanwhile, farmers were limited by access to improved crop varieties, credit

and relevant information and knowledge (Masiyiwa, 2016). FMARD (2016) indicates that Nigeria is burdened with "an aging population of farmers who do not have enough seeds, fertilizers, irrigation, crop production and related support to be successful". In an attempt to address the consequent crisis, federal and state governments formulated several policies and embarked on a variety of agricultural programmes aimed at improving the sector's capacity (Chukwuemeka and Nzewi, 2011).

However, evidence from the huge resources spent on basic food imports suggest that little was achieved from the policies and programmes implemented over the years and Nigeria is therefore, not food secure. For instance, FMARD (2016) reports that Nigeria "still imports about USD 22 Billion worth of food annually" and Abubakar (2016) reports Elebeke (2016) that the country still spends about 356 Billion Naira on rice (a common staple in Nigeria) imports alone. Though 74 mha (or 75 per cent) of Nigeria's 98 mha of land "is good for farming, but less than half is put to use", even as farmers are reported to have limited capacity and use techniques that adversely affect soil fertility.

Therefore, it is not surprising though worrisome, to note that over 53.6 million of the entire population of about 150 million (currently estimated at 180 million) Nigerians went to bed hungry and almost 100 million Nigerians live on less than 1 US Dollar a day, Omokhunu(2012). Indicators from the National Bureau of Statistics (NBS), reported in "The New Telegraph" (2014) reveal that about 67 per cent of the entire Nigerian population live below the poverty line. The "Nigeria Economic Report" (May 2013) of the World Bank, according to "The New Telegraph" (2014) confirmed that poverty rates remain high in Nigeria. Recently, Osinbajo, as reported by Taiwo-Obatonye (2016), said 110 million Nigerians were poor and about one tenth lived in extreme poverty, a marginal improvement from Ojo (2013) which indicated that, more than 65 per cent of 160 million Nigerians were food insecure sequel to lack of stable supply and skyrocketing prices of food items in the market, thus, underscoring the precarious situation in the sector.

However, Eboh (2011) argued that agricultural poverty is over and above national poverty, despite the agriculture sector's contribution of 75 per cent to economic growth in the last decade. As at 2004, for instance, agriculture and forestry poverty incidence was 68 per cent, while the national poverty incidence was 55 per cent.

In Nigeria, agricultural research and development is a primary responsibility of the federal government constitutionally placed on the concurrent legislation list (FMARD 2016).

Therefore, that Cross River State, with a predominantly agrarian economy, is equally faced with the problems of underdevelopment, food insecurity and poverty consequent upon the challenges of the agricultural sector can be understandable. Cross River State however, has its own share of micro projects and policies but, according to Adie (2005), poor agricultural practices have led to enormous pressure on available agricultural infrastructure with its attendant consequences. To this end, the CRS government has attempted without much success to reduce hunger, combat rural poverty, promote economic growth and protect the environment (Adenikin and Adebowale (2012).

Perhaps, a glimpse of certain critical indicators will enable a better understanding of the situation on the ground. These indicators are interrelated thus; as observed by Ajumobi (2015) "illiteracy, hunger and diseases are associated evils that go hand in hand with poverty",

According to CR- SEEDS (2005-2007) Poverty is endemic in Cross River State with over 75 per cent of the population living on less than one US Dollar a day and the economy of the state is characterized, among others, by increasing incidence of poverty, hunger and diseases. For instance, the CR- SEEDS (2005-2007) document indicates that, Infant Mortality Rate (IMR) is 140 per 1000 live births against a 2003 national average of 100 per 1000 live births. Maternal Mortality Rate (MMR) is estimated at between 1,500 and 2,000 maternal deaths per 100,000 live births (perhaps the highest in the South-South region) against the national average of 704 per 100,000 live births as at 2003. Edu (2016) as reported by Inyang (2016) revealed that, at the end of the implementation of the Millennium Development Goals (MDGs), instead of improving, some of the indices rather pointed to a decline in quality of life, meaning increased poverty. For instance, at the end of the MDGs, maternal mortality rate moved from 545 deaths per 100,000 live births to 575 deaths per 100,000 live births. This situation, as reported by Inyang (2016), "is not so different in Cross River State", as there had been, for instance, "an upsurge of women delivering in churches, delivering in Traditional Birth Attendants' (TBA) homes and, dying there". The diet structure in most communities of the state is monotonous and deficient with 80 per cent being carbohydrate. Household vegetables and fruits consumption is low leading to high prevalence of micro nutrient deficiency especially in rural communities as well as high prevalence of malnutrition during hunger gap. Consequently, the prevalence of anemic conditions, low birth weights, and, stunting and wasting was considered worse than the national averages of 8 per cent, 12 per cent, 33.5 per cent and 15 per cent respectively. Also, 30 per cent of children were

malnourished. To tackle these development and poverty challenges, there is the need, therefore, to understand the challenges the poor (mostly engaged in the agricultural sector) face. According to "The New Telegraph" (2014), measures to eradicate poverty include improvement in health care and food production, as well as employment and entrepreneurial development.

Indeed, the state keyed into some ad-hoc national programmes and strategies, especially between 1976 and 2015, to address the agricultural sector crises and consequent poverty challenges. Prominent among these include; River Basin Development Authority (RBDA), Operation Feed the Nation (OFN), Green Revolution (GR), Directorate for Foods, Roads and Rural Infrastructure (DFRRI), National Economic Empowerment and Development Strategy (NEEDS), Agricultural Transformation Agenda (ATA), among a plethora of other localized programmes. Evidently, not much was achieved or were not sustainable, Newswatch (2009). In fact, the reality (in Nigeria, as in Cross River State) is that;

> *"Currently, 70 per cent of Nigerians live on less than US1D per day. Too few Nigerians are able to obtain enough food to live healthy and productive lives, so it is no surprise Nigeria is ranked the 14th most hungry nation out of 119 countries and 152nd out of 187 on the 2015 UNDP Human Development Index (HDI).*
>
> *With a Global Hunger Index (GHI) score of 32.8 per cent, which is only a marginal improvement over the last decade, Nigeria has steadily plunged in it GHI scores since 1990. The severity of hunger in the country remains serious….*
>
> *Nigerians are rated as 'seriously' hungry by the 2015 GHI because of low scores in the four most crucial indicators of undernourishment, child stunting, child wasting and child mortality…… Exacerbated by poverty, the effects of hunger are reflected in high rates of diseases and mortality, limited neurological development and low productivity.*
>
> *Hunger, poverty and diseases are interlinked, with each contributing to the presence and persistence of the other. Hunger is a major constraint to the country's development ……."* Vanguard (Editorial, 2016).

In Cross River State in particular, the key development challenges according to CR-SEEDS (2005-2007) include; the implementation of programmes that could harness the huge agricultural and marine resources endowments of the state to ensure not only food sufficiency and food security for the state but also to produce surplus food to earn extra income, and, the implementation of programmes that could lift the over 75 per cent of the population living in

poverty, from poverty. The question then is, what implementation strategy could best deliver on these development challenges?

According to Uniamikogbo (2006), attempts at private sector- led initiatives as witnessed during the Structural Adjustment Programme (SAP) years were unsuccessful. And, the economic crises of the 1980's and 1990's exposed the structural weakness in government – controlled financial system which led to the implementation of the programme of liberalisation accompanied by structural and institutional sector reforms. Reasons for the failure may not be far fetched. Pallon and Macartney (2012) for instance, argued that, 80 per cent of the world's extension services were publicly funded and delivered by civil servants while 5 per cent were private and, "public extension services are often centralized, hierarchical and unresponsive to the different needs of farmers." Thus, highlighting the isolated sectoral challenges hampering the development of the agricultural sector and hence, poverty reduction.

Since isolated approaches, according to Ferroni and Castle (2011), have been unable to cope with current challenges notably the achievement of the Millennium Development Goals (MDGs), Uniamikogbo (2006), therefore, recommended some form of intervention (partnership) to improve access to services for small scale enterprises and small holder farmers that constitute important sectors of the economy.

According to FMARD (2016) the constraints of the agricultural sector in Nigeria include: "Poor and irregular funding for agricultural research and extension; Research output not demand-driven; Research-extension linkage system is weak so the technologies or innovations generated are not effectively delivered to farmers or commercialized for the benefit of end-users." Consequently, the Cross River Fadama III and Songhai projects which are demand-driven (a key feature of fadama III), and research and technology-oriented, encompassing all the relevant farm stake-holders, were conceived as a response to these challenges, and more.

From the foregoing scenario therefore, can the emerging approach of PPP as reflected in the Cross River Fadama III and Songhai projects help to resolve these challenges in the agricultural sector and it associated consequences of poverty in Nigeria and Cross River State in particular? This needs to be investigated. As Lund-Thomsen (2007) aptly indicated, "impact assessments are seen as necessary for guiding policy makers, stakeholders, and PPP

analysts in determining whether a PPP is indeed always an appropriate solution, under what conditions such partnership shines and in which areas they failed."

In order to effectively ascertain the effect of the Fadama III and Songhai Programmes on output and poverty reduction among programme participants, it is necessary to identify the project innovations as well as the extent of adoption of the innovations by the participants as these have direct bearing on farmer output.

The issue of farm and off-farm income diversification (that is, multiple sources of income) is necessary as a prelude to ascertaining effect of projects on poverty reduction because, income diversification (that is, diversifying income sources) is one of the key objectives of the Fadama III and Songhai projects, as a way of ensuring sustainability in wellbeing as indicated by the level of poverty reduction among participants. Income diversification in this sense, is therefore, a proxy for income sustainability.

1.2 Research Questions

Arising from the foregoing, the following pertinent questions were addressed in this study;

1. What are the agricultural innovations introduced by the Cross River Fadama III and Songhai programmes for beneficiary farmers in the study area?
2. To what extent were the innovations adopted by the beneficiary farmers in the study area?
3. What is the impact of Fadama III and Songhai programmes on output of the beneficiary farmers in the study area?
4. What is the effect of Fadama III and Songhai programmes on farm profitability of the beneficiary farmers in the study area?
5. What is the effect of Fadama III and Songhai Programmes on level of income diversification (in terms of farm and off-farm income generating activities) among the beneficiary farmers in the study area
6. What is the effect of Fadama III and Songhai programmes on income and poverty reduction among beneficiary farmers in the study area?

1.3 Objectives of the Study

The main objective of the study is to analyze the effects of the Cross River Fadama III and Songhai programmes on agricultural output and poverty status of beneficiaries in Cross River State. This main objective shall be achieved through the following sub-objectives:

1. To identify the agricultural innovations introduced by the Cross River Fadama III and Songhai programmes for beneficiary farmers in the study area.
2. To assess the extent of adoption of innovations by the beneficiary farmers in the study area
3. To analyze the impact of Cross River Fadama III and Songhai programmes on output of the beneficiary farmers in the study area
4. To analyze the effect of Cross River Fadama III and Songhai Programmes on farm profitability of the beneficiary farmers in the study area
5. To analyze the effect of Cross River Fadama III and Songhai programmes on level of income diversification (in terms of farm and off-farm income generating activities) among beneficiary farmers in the study area.
6. To analyze the effect of Cross River Fadama III and Songhai programmes on income and poverty reduction among beneficiary farmers in the study area.

1.4 Research hypothesis

In line with the objectives of the study, four key hypotheses were tested. Accordingly, the hypotheses, specified in null form, are as follows:

H_{01}: Cross River Fadama III and Songhai programmes have no significant impact on output of beneficiary farmers in the study area.

H_{02}: Cross River Fadama III and Songhai programmes have no significant effect on farm profitability of beneficiary farmers in the study area.

H_{03}: Cross River Fadama III and Songhai programmes have not encouraged diversification of income (in terms of off-farm income generating activities) among beneficiary farmers in the study area.

H_{04}: Cross River Fadama III and Songhai programmes have no significant effect on income and poverty reduction among beneficiary farmers in the study area.

1.5 Justification for the study

Generally, the study is justified by the renewed interest in agricultural development and poverty issues globally and Nigeria in particular. A key significance of this was the signing (in year 2000) of the Millennium Development Goals' (MDGs') targets, by 189 nations of the world (including Nigeria) to reduce, among others, global hunger, poverty and diseases by 2015, which has now been renewed through the Sustainable Development Goals (SDGs). The agricultural sector is potentially critical in meeting these goals and targets. As observed by Thirlwal (1994), the impact of investing in agriculture is potentially transformative since the sector employs more than two third of the population in developing countries, and, investment in agriculture can help producers and farmers to get out of poverty and provide communities and families with sustainable employment and income. Moreover, smallholders produce a large share of the food consumed in developing countries. Their ability to earn incomes from farming and in turn pay for inputs, consumer goods, and, (for instance) school fees for their children, also affects general development prospects and economic transformation (Ferroni and Castle 2011).

The African Union (AU) and the New Partnership for Africa Development (NEPAD) through 'GrowAfrica', a body created in 2011, brought the necessity of PPPs in agriculture to the door step of African governments as it sought a partnership which "aims to accelerate investment and growth in African agriculture through PPP collaboration and, ensure to deliver sustainable and inclusive growth". The GrowAfrica platform "seeks collaboration between governments, international and domestic agricultural companies (organisations) and small holder farmers in order to lower the risks and cost of investing in agriculture" (www.growafrica.com). The growing popularity of varieties of Public-Private Partnerships in agriculture is therefore, understandable, hence, the need for research of this nature.

The study by Khanom (2011) has explained a key feature of Public Private Partnerships as involving cooperative relationships between public and private organizations. According to Khanom (2011), Public Private Partnerships (PPPs), particularly for poverty reduction should ideally include a variety of actors with complementary interest (and roles). Thus, local governments, national governments, not-for-profit organizations and foreign donors come together in PPPs with the common objective of poverty reduction. Each partner brings particular skills and resources to the PPP that complement those of the other stakeholders. The stakeholders in PPP sometime go beyond national boundaries. International

organizations can be involved in pro-poor PPPs. According to Jutting (1999), basic roles in PPPs in developing countries include; provision, financing, regulation and monitoring. Provision in this regard involves providing the desired services. Financing involves the provision of financing which can be carried out in different ways, "such as by a single stakeholder or multiple stakeholders." Accordingly, contemporary literature now focuses on Public Private Partnership (PPP) to fill the gap created by the weakness of the government (public sector) research and extension system. This is expected to lead to increased agricultural productivity and hence, reduce food insecurity and poverty through output marketing (FMARD, 2016), "if output is enhanced, income will be enhanced leading to enhancement of welfare and improved quality of life" (Agba, 2014).

Therefore, this study is apt due to the current interest in targeted interventions through public-private partnership as an alternative strategy for agricultural development and poverty reduction. As revealed in Khanom (2011), many donors around the world are vigorously promoting the idea of PPPs for agricultural development and poverty reduction on the premise that they will provide better results. However, unlike infrastructure, PPPs in agricultural development (hence, poverty reduction), are relatively recent arrangement (as the case in Nigeria). Following calls (World Bank, 1999; ADBI, 2000) for further research and analysis of these partnerships by researchers and practitioners, therefore, "the theoretical case in favour of PPPs needs to be proven and/or literature further expanded and updated."

Recently, Nigerian government has been advocating for "targeted interventions at both policy and practical levels, to address extreme poverty and combat illiteracy, hunger and diseases" and the creation of "viable partnerships that bring together national, regional and global actors with shared objectives" and particularly, the creation of an "enabling environment by developing relevant frameworks for working with different types of partners and constituencies that recognize the contributions of civil society, private sector, academia and most importantly governments" (FMARD 2016;Ajumobi 2015). Moreover, studies have shown a positive relationship between poverty and hunger. As observed by Loriente (2015), Hunger is a symptom of poverty and poverty commonly leads to food insecurity challenges". Also, FAO (2004) reveals that "agricultural growth's impact on poverty reduction could be as much as five times greater than general growth in low income developing countries", thus, reflecting the close linkage between hunger and poverty".

The study further seeks to draw attention to the critical role of agriculture in the Nigerian economy, as Ojo (2016) reports Obasanjo (2016) thus; "the present economic quagmire and the low prices of oil would wake us up to the reality of agriculture as the mainstay of our economy and as a renewable system of production compared with oil and gas which are depleted". This study is an addition to the wake-up call.

The need for adequate food and balanced diet, among other basic necessities of life, cannot be overemphasized. Therefore, this study has been undertaken as a further concern to improve the welfare of the masses in Cross River State who are majorly involved in agriculture and live in impoverished conditions. This study is further justified since, "it is very difficult to generalize the findings of case studies due to the diverse nature of the topics, types of partnerships, research questions and geographical area covered", Lund-Thomsen (2007). There is need therefore, for this particular study that is unique to the state and necessary at this time to fill these knowledge gaps as set out in the study.

In further justification of studies of this nature, ADB (2011) observed that, a systematic and rigorous assessment of project/programme outcome through impact evaluation supports evidence - based decision-making which helps to guide the design of more effective interventions and contributes to the efficient allocation of scarce resources. Also, "Although the number of impact evaluation studies is large and has been growing, there is still a need for more studies to fill-in the knowledge gaps in the effectiveness of various development interventions and contexts where these interventions work", ADB (2011). According to Hussain and Hanjira (2004), Impact studies differ in terms of geographic coverage, scale of analyses and approach adopted in measuring impacts. Spielman and Grebmer (2006), observed that, "the methods available for the study of partnerships are still very premature". Poulton and Macartney (2012) stressed that "the effectiveness of PPPs to leverage private investment in Africa (with poor functioning agricultural value chains) and the impact of such interventions on small holder producers is still limited". According to DANIDA (2007) the issue of the actual impact of PPPs on development has been largely ignored, therefore, "in academic terms, our knowledge of the potentials, limitations and actual impact of partnerships is still limited". Accordingly, Lund-Thomsen (2007) called for more resources to be made available to "facilitate applied research work in other to improve the systematic understanding of where, when and under what circumstances partnerships are likely to deliver." Brinkerhoff and Brinkerhoff (2011) argued that literature on PPPs "remains confused and inconclusive, and there are still questions about how to design, manage and

assess PPPs". In other words, much still needs to be done in this regard. As succinctly observed in the Vanguard (2016) editorial thus;

> *"……..The way forward is clear. Investment is essential for agricultural research and rural development in partnership with the private sector and civil society……*

According to FMARD (2016), agricultural research is recognized as a critical enabler of economic growth, thus; the importance of agricultural research towards national food security cannot be over-emphasised. "To this end, the federal government will engage institutions and bodies at different locations in the country, to conduct research for increased agricultural productivity, to make the research results available to farmers and other actors in the agricultural development of the states."

This study therefore, is a timely response to this need and is intended among others, to fill the knowledge gaps by assessing the potential of the Public-Private Partnership driven agricultural schemes as strategy to increase farmer agricultural output and income hence, increase resilience and contribute to poverty reduction particularly among the farming households in Cross River State, using as case study, the Cross River Fadama III and Songhai schemes.

The study concentrates on the three crop farms of Cassava, Rice and Yam due to the dominance and economic importance of the crops to majority of farming households and entire economy and people of Cross River State.

1.6 Scope of the study

This study focuses on the contribution of Public-Private Partnership driven agricultural development programmes (Cross River Fadama III and Songhai schemes) in enhancing agricultural development and poverty reduction in Cross River State. It takes as case study the Cross River Fadama III and Songhai programmes. These are massive agricultural development programmes involving high investment of public funds. The study covers four (4) selected local government areas in the state comprising three local government areas for Fadama III programme and one local government area for the Songhai Cross River Initiative (SCRI). Three (3) crops were selected for the purpose of this study viz; Cassava, Rice and Yam. These are the main staples and most strategic food crops in the economy of Cross River State. The study captures the effect of the Fadama III and Songhai programmes on crop output, income and poverty status of programme beneficiaries, in comparison with non

programme beneficiaries, respectively. Agricultural development is proxied by level of (crop) output while poverty is proxied by level of income. Income sustainability and hence, level of vulnerability is measured by level of diversification of income sources. The study derives its conclusions mainly from the perspective of the programme beneficiaries in the study area.

1.7 Limitations of the Study

The limitation of the study arises from the difficulty of getting the targeted respondents to respond to the structured questionnaire administered on them, timely. Strenuous effort was required to follow-up on the respondents in order to generate the information sought. Poor record keeping on output, income and other activities of the respondents was a challenge in generating data required. Strenuous effort was therefore, required to fill in this gap through direct observation, Focus Group Discussions (FGD) and other relevant sources. Eliciting official information concerning the Fadama III and Songhai programmes from government officials was a great challenge as they were not too willing to open up on 'official information' and sometime insisting on clearance from higher quarters before such information could be provided. This was time consuming. The study was also limited in scope by financial challenges.

1.8 Outline of Chapters

The dissertation has been sectioned into five chapters. Chapter One contains General Introduction including; background to the study, Statement of Research Problem/Research Questions, Research Objectives, Hypotheses, Justification for the Study, Scope and Limitations as well as Organisation of the Study. Chapter Two comprises of Literature Review which includes; Conceptual, Theoretical and Empirical Literature on the key issues in this study. Chapter Three contains the methodology of study and model Specification and estimation techniques. Chapter four consists of data presentation and analysis of results obtained from the various analytical models specified. Finally, Chapter five comprises of Summary of findings, Conclusion and Recommendations of the study.

CHAPTER TWO

CONCEPTUAL, THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.0 Introduction

The essence of literature review is to highlight the views of earlier studies on a chosen research interest. Conceptual literature, therefore, will help to explain key concepts of the study which will then reveal the direction of the study while the theoretical literature provides the theoretical underpinnings for the study. Empirical literature reviewed reveals earlier studies on the issues under consideration. Accordingly, literature cited is organized to reflect the interest of this present study.

2.1 Conceptual Literature

2.1.1 Concept of Fadama

As a local concept, Fadama refers to wetlands. These are low lying flood plains with easily accessible shallow underground water. Though during dry seasons the surfaces of these flood plains become dry, appreciable quantity of water can be tapped from shallow aquifers that abound around the plains (leading to the development of tube wells by drilling). Thus, the water obtained from these tube wells is used for the development of small-scale irrigation schemes to boost dry season crops production. The building blocks of the concept of Fadama development project were conceived to ensure an all-year all-season agricultural production in Fadama areas of the country. Fadama areas are composed of deposited sediments and contain exploitable aquifers (water tables). It involves preparation of low lying areas and flood plains for crops, agro forestry and livestock production, Ajayi (2010). Overtime however, the Fadama concept has attained wider coverage in applicability.

In its modern usage, the concept of Fadama has emerged in one of the World Bank assisted-development programmes following the launching of the National Fadama Development Project (NFDP) in the early 1990s. Specifically, the National Fadama facility (NFF) was established under the NFDP loan No.3541 UNI. The NFDP was then approved for funding in 1992 (Ajayi,*et al* 2010).

Though Fadama is in its third phase of operation in most states in Nigeria, it is however, in its first phase in Cross River State. The state only keyed into the programme in phase III and

thus, became one of the first to commence the implementation of the third phase of the programme which is the focus of this present study.

2.1.2 Development of Fadama Phases I and II

Prior to the implementation of phase III of Fadama programme in Cross River State, the scheme had undergone the first two phases in some other states of Nigeria. It is therefore, necessary to review, in summary, the key features of the first two phases of the programme. The review will help reveal the key distinguishing features of Fadama III from the earlier phases (I and II).

2.1.2.1 National Fadama Development Project (NFDP) Phase 1

The first phase of the NFDP was executed between 1993 and 1999. The NFDP I was necessitated by the need to build on some of the successes of the Agricultural Development Projects (ADPs) that had been in operation since the 1970s, to develop small scale irrigation through extraction of shallow ground water using low cost petrol-driven pumps. It was intended to raise farmers' incomes and contribute to food security and poverty reduction.

The main objectives of the NFDP 1 included;

i. Install shallow tube wells in the Fadama lands for small-scale irrigation
ii. Simplify drilling technology for the tube wells
iii. Construct Fadama infrastructure
iv. Organise farmers for irrigation services
v. Carry out aquifer services
vi. Monitor and upgrade irrigation technologies; and
vii. Complete a full assessment of the environmental and social impacts of Fadama development (Ajayi and Nwalieji 2010).

The major focus of NFDP I was the promotion of simple low-cost irrigation technologies to increase food production. The NFDP I was however, not socially – inclusive of all interest groups. It did not take into consideration farmers involved in other areas of agriculture such as Livestock and Fisheries. This engendered conflicts between the users of Fadama lands. Benefits were also restricted to only farmers involved in crop production. Moreover, down stream activities such as Processing, Conservation and rural infrastructure meant to ensure the evacuation of farm produce to markets were neglected (Adegbite, et al 2008).

At completion of phase one of NFDP, government in Nigeria adopted new rural development strategies to address most of the identified flaws and implementation constraints. The new plan "stressed the need for consistency, sustainability and greater equity in the access to benefits of land resources in Fadama areas of the country". Consequently, the NFDP II was mainstreamed "not only as a follow up to phase I but also to expand it in scope and size" (Adegbite, et al 2008).The NFDP I was operated in only five states in Nigeria. Cross River State did not participate.

2.1.2.2 National Fadama Development Project (NFDP) Phase II

The NFDP II became disbursement effective in 2004. Phase II incorporated a Community Driven Development (CDD) approach. Through this approach, the various Fadama users operating through their respective Fadama User Groups (FUGs) and Fadama Community Associations (FCAs) could reach a consensus on the use of common resources to their mutual benefits. Communities decided on the advisory services and infrastructure they needed to attain developmental goals based on their own efforts (Adegbite, et al 2008). Investment activities were outlined in a Local Development Plan (LDP). NFDP II adopted a socially-inclusive and participatory approach involving all stakeholders; women, marginalized and vulnerable groups and adopted the Community Driven Development (CDD) approach through participation in preparation of LDP and its implementation. The main target of the NFDP II was the development of small scale irrigation especially low-lying alluvial plains of Fadama (Fadama resource manual 2003).The NFDP II was intended to increase productivity, income, living standards and development capacities of the economically active rural communities while increasing efficiency in the delivery of implementation services to rural beneficiary households. The NFDP II had five main components;

a. Capacity building and advisory services
b. Investment in community – owned rural infrastructure
c. Pilot capital asset acquisition support
d. Demand-Driven (DD) advisory services
e. Project management, monitoring and evaluation

The key goals and Project Development Objectives (PDOs) of the NFDP II included;

a. Stimulate poverty reducing growth in the Fadama areas

b. Empower local communities to play an active role in their own development and take charge of their own development agenda
c. Sustainably increase the incomes of Fadama users
d. Reduce conflicts between Fadama user groups. The NFDP II covered 12 states (Cross River State not inclusive) in Nigeria (PCU-NFDO 2005).

2.1.3 National Fadama Development Project (NFDP) Phase III: Key Features

As contained in the Cross River Fadama III Project Implementation Manual (PIM, 2009), Fadama III is a follow-up to the NFDP II and covers the 36 states of Nigeria and the Federal Capital. Fadama III is a comprehensive five year action programme developed by the Federal Ministry of Agriculture and Water Resources (FMAWR) in close collaboration with the Federal Ministry of Environment (FME) and other Federal and State Government Ministries, Local Governments and key stakeholders (donors, private operators and NGOs).

Fadama III, unlike Fadama I, though similar to Fadama II has shifted focus from flood plains and shallow aquifers found along major river systems in Nigeria, "to cover diverse range of agro-ecosystems, productive activities and land uses, among others."

The main Project Development Objective (PDO) of the scheme is to increase the incomes of land and water resources (Fadama) users on a sustainable basis, empowerment of local community groups, improve productivity and land quality (World Bank, 2008). The project specifically targets the rural poor (farmers, pastoralists, fisher folks ,traders, processors, interest groups), disadvantaged groups, widows, the handicapped, unemployed youths, People Living with HIV/AIDS, service providers, public and private operators and professional/ semi-professional associations operating in the project area. By increasing incomes of users, the project is expected to help reduce rural poverty, increase food security and contribute to the achievement of the key MDGs on hunger and poverty reduction (PIM 2009).

The scheme will support more diversified form of income generating activities in order to have a broader pro-poor impact. Fadama (III) is more of agricultural diversification programme providing financing for the diverse livelihood activities involving the beneficiaries themselves with appropriate facilitation support

According to Bukar (2011), Fadama (III) will support government strategic objectives by increasing food security, reducing poverty, creating employment opportunities as well as

improving the standard of living of rural areas. The project aims at sustainably increasing the incomes of Fadama resource users by directly delivering resources to the beneficiary rural communities "efficiently and effectively" and empowering them to collectively decide on how resources are allocated and managed for their livelihood activities and to participate in the design and execution of their sub-projects. According to project sources (CRSMAWR, 2009), the paradigm shift of Fadama (III) is based on;

a) Change from the supply driven to demand driven approach, and

b) Move from subsistence to commercial agriculture.

The strategic objectives of Fadama III include;

i. Enhance growth in sectors other than oil, and achieve increase in food security.
ii. Reduce poverty and create employment in the rural areas and
iii. Increase opportunities for rural economic development.

Fadama III project consists of six components as summarised in table 2.1

Table 2.1 Fadama III Components and cost distribution (National)

	Component	Aim	Project Cost (USD)	% of Total Cost	IDA Support (USD)	% of IDA support
1.	Advisory services and Input support	To finance a) advisory services; b) input support: adoption of new technology to enhance capacity to purchase inputs (seeds, fertilizers, agro chemicals) and to build incremental earnings for future purchase.	39.5m	8.78	24.6m	9.84
2.	Asset acquisition for individual FUGs/EIGs	Provision of matching grant to empower small holder and poor farmers to acquire capital assets to generate income and improve access to markets	150.0m	33.33	105.0m	42.0

Table 2.1 Continued

3.	Capacity building, Communication and Information support	a) capacity building support for community organizations; b) capacity building support to local governments; c) communication and information support	87.5m	19.44	28.2m	11.28
4.	Small Scale Community owned (rural) Infrastructure	To improve existent low level infrastructure and services through allocation of grant resources to FCA	US$73.57M	16.67	6.07M	27.00
5.	Support to ADPs, sponsored research and on-farm demonstrations	To enable; a) support to advisory services providers; b) quality assurance of advisory services; c) training of facilitators, sponsored research and on-farm demonstrations; d) training of extension staff	37.43m	8.11	6.43m	2.20
6.	Project management, monitoring and evaluation	To ensure compliance and realization of project objectives	59.30m	13.07	17.50m	6.60
	Project preparation facility		2.70	0.60	2.70	1.08
	Total Project Cost		450.0	100.0	250.0	100.0

Source: Organized from Fadama resource materials.

According to Eshiet (2011), the major achievement recorded in the implementation of Fadama III was the Community-Driven Demand (CDD) approach to project identification and execution. The overall project funding consists of International Development Association (IDA) credit, counterpart funds from the three tiers of government and contributions from local communities including the private sector and civil societies.

Tables 2.2 (a) and 2.2 (b) show the total project cost (financial plan) of USD 450.0 as well as the National and CRS distributions, respectively; while 2.2 (c) show Funds disbursements

Table 2.2 (a): Project cost (Financial Plan) (National Figures)

Sector	Amount USD (M)	Percentage
World Bank	250.0	55.6
Federal Government	23.0	5.1
State Governments	77.0	17.1
Local Governments (LGs)	40.0	8.9
Communities	60.0	13.3
Total	**450.0**	**100**

Source: CRSMAWR (2009)

Table 2.2 (b): Cross River State Distribution (State figures)

Sector	Amount (M)	Duration (years)
State share of Fund	USD 7.8	5
Counterpart contribution	N 56.5	5
LG counterpart contribution	N 2.0 (annually)	5

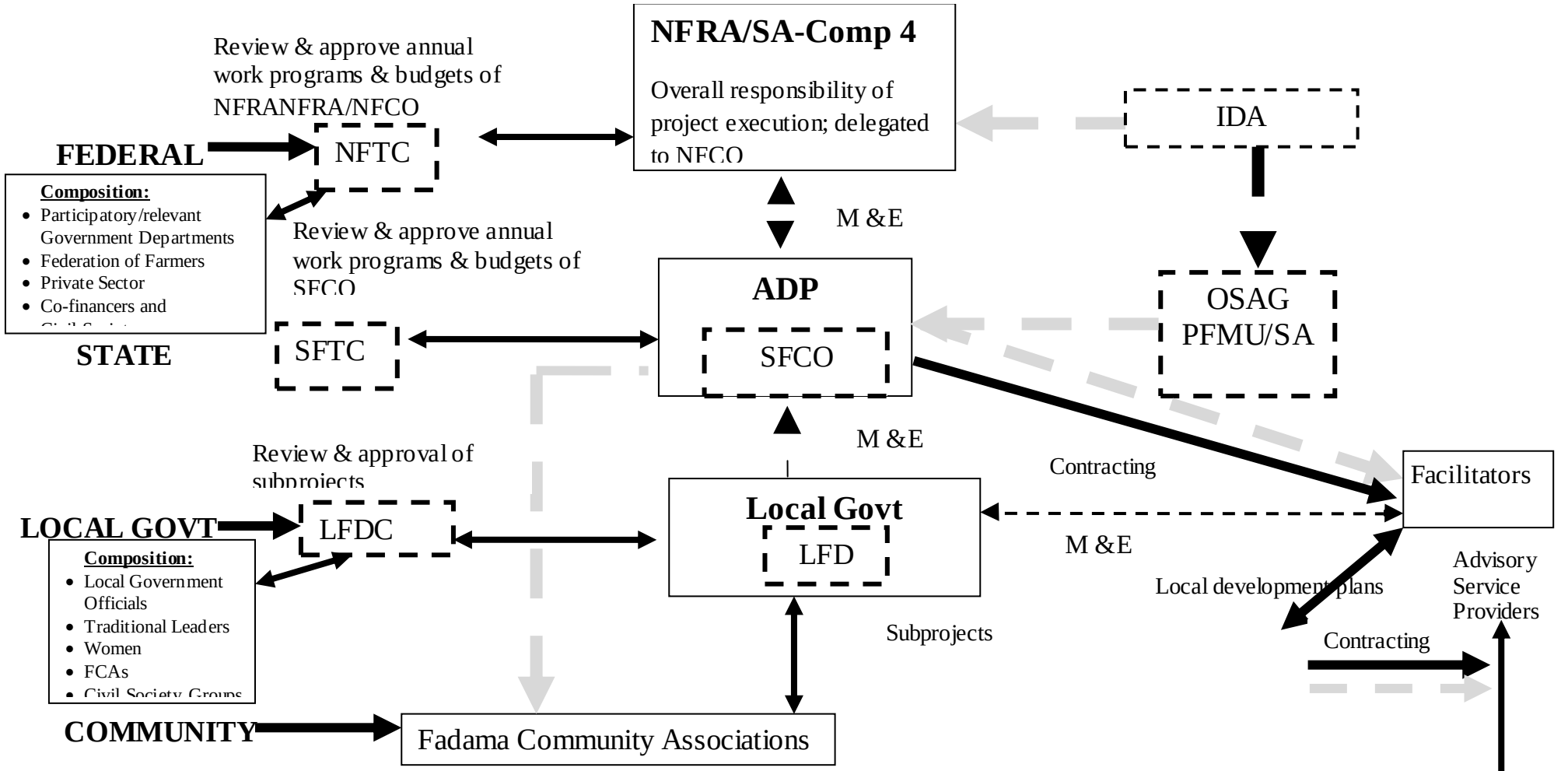
Source: CRSMAWR (2009)

Table 2.2 (c): Funds Disbursement as at 2013 (Cross River State)

Component	Amount Disbursed (₦M)
Capacity building	27.4
Small scale community owned rural infrastructure	106.59
Asset acquisition to FUG/EIG	384.95
Input support to FUG	124.18
Advisory services conducted alongside input support	671.48

Source: Elemi (2013) Fadama III Project, Cross River State World Bank/ Federal Government of Nigeria Supervision Mission Report, Calabar

Fig 2.1: Fadama III Operational Framework



LFDC: Local Fadama Development Committee
LFD: Local Fadama Desk
NFCO: National Fadama Coordination Office
NFTC: National Fadama Technical Committee
OSAG: Office of the State Accountant General

NFRA: National Food Reserve Agency
Federal Ministry of Agriculture
PFMU: Project Financial management Unit
SA-A: Special Account NFCO
SA-Comp 4: Special Account NFRANFRA
SFTC: State Fadama Technical Committee
SFCO: State Fadama Coordination Office

Dotted gray lines represent flow of funds

Adapted from Project Implementation Manual (2009)

a) Federal Level: As demonstrated in fig 2.1, the Federal Ministry of Agriculture and Water Resources (FMAWR) through the National Food Reserve Agency (NFRA), the department that coordinates implementation of all agricultural sector projects including those that are externally funded, have the overall responsibility for project execution. However, the NFRA delegates the functions and responsibilities of day-to-day programme implementation to the National Fadama Coordinating Office (NFCO) which, operating through the NFTC, oversees federal level coordination and responsible for project oversight, overall policy guidance, coordination with other projects, and, strategic direction and review and appraisal of the annual work programme and budget of NFCO. Membership of the NFTC includes; representatives from the participating/relevant government departments, federations of farmers, private sector, co-financiers and civil society.

b) State Level: Project activities are coordinated by the SFCO. This is responsible for executing a communications strategy, recruiting and organizing training of facilitators, all relevant stakeholders, tracking financial and physical progress of subprojects implemented by the FCAs.

The SFCO has the responsibility for the supervision and monitoring of the facilitators, recruitment of consultants to design and implement the training programmes for the facilitators and communities. It facilitates linkages of the FCAs with, and other support agencies including local banks.

c) Local Government Level: Local Fadama Development Committee (LFDC) acting through the Local Fadama Desk (LFD) coordinates activities at this level. Specifically, the LFDC is responsible for local level review of subprojects and screening of Local Development Plans (LDPs) to ensure they meet a set of criteria. The LFDC also reviews and approves subprojects and advisory service activity proposals. The LFDC monitors community mobilization efforts and ensures that the needs and priorities of Fadama resource users are reflected in the LDPs.

Membership of the LFDC includes Local Government officials, traditional leaders, women (up to one third of membership), FCAs, civil society and private sector groups.

d) Community Level: Critical decisions at the community level take place within the Fadama Community Associations (FCAs) and the Economic Interest Groups (EIGs) that constitute them:

d (i). **FCAs:** these are the apex organizations of EIGs which derive their livelihoods from Fadama resources. The number of FCAs in a LGA depends on the size of the Fadama area, population of the area and the number of FUGs.

FCAs identify, prepare, implement, operate and maintain their subprojects, assisted by facilitators and contracted technical specialists. The FCAs link FUGs with the project resources to facilitate capacity building, advisory services and investment financing of their development activities. Through the LFDC, subproject agreements are signed between the SFCO and FCAs spelling out conditions and terms for the funding, execution, ownership, operation and maintenance of the approved subprojects.

d (ii.) FUGs: Members of FUGs are the primary beneficiaries of the scheme. The members define a user group. Membership of FUGs ranges between 10 and 20 households (comprising of about 150 to 300 individuals). Within the Fadama context, FUGs may be organized according to economic activities thus; Fadama Users Associations (FUAs), Pastoralists, Hunters, Fishermen, Gatherers of edible and non edible plants, Crop production, Food and crop processing, marketing and distribution, other interest groups (that is, land management, agro forestry, charcoal production, etc.)

d (iii). Facilitators: These are hired by and report to the SFCO on performance contracts, for monitoring and reporting. The facilitators provide technical assistance to FUGs to constitute an FCA and in community needs assessments and rural participatory appraisal and also help in linkage of FUGs with markets where produce can be sold at prevailing market prices.

e). Service Providers: -To promote partnerships in rural development, the scheme promotes the contracting of professional public/private support services required for implementing demand-driven productive and income generating sub-projects and advisory services activities.

Service providers under the Fadama III scheme include;

e (i). Public: Agricultural Development Projects, Universities, Training institutes, National Livestock Projects Division, etc.

e (ii) Private: Individual consultants, Artisans, Private entrepreneurs (such as input suppliers), Community groups, Non-Governmental Organisations and qualified civil associations.

Consultants are contracted to carry out specific duties such as; Research, Training, Distribution, and Monitoring services. The consultants are selected through request for expression of interest and short-list.

f). Fadama User's Equity Fund (FUEF)

The FUEF is a further demonstration of partnership in the Fadama III programme. According to Fadama (III) manual (No.9, 2009), the FUEF is owned and operated by the Fadama User's Groups (FUGs) themselves. The funds for the FUEF are withheld from sales of produce/products of FUGs from their economic activities:

i) From the economically active FUGs:

FUGs are to set aside at least 10 per cent of their asset replacement cost per productive cycle. This charge comes from member user fee as well as the user fee charged from non FUG members. These shall form part of the FUEF and normally deposited in a bank account.

2.1.4 Rationale for the Fadama III Scheme

With a population of about 165 million (NPC 2011), Nigeria has consistently been listed by FAO among countries that are "technically unable to meet their food needs at low level inputs" (Kudi *et al* 2008). Even the practice of agriculture in Nigeria has rather become a constraint to poverty reduction. These constraints result from the behaviour of farmers and in the environment in which farmers operate; the technology available to them, the incentives for production and investment(availability and price of inputs); provision of irrigation facilities, climate, inadequate infrastructure, weak advisory services, post-harvest losses, poor access to markets and lack of finance, among others (World Bank 2009)

Nigeria is therefore, faced with the challenge of providing adequate food supply for its teeming population and addressing the income poverty among farmers and its associated consequences. According to Adebayo (2012) as reported by Eshiet (2012), government plan to boost food production is under threat due to rise in cost of farmland, consequently, "average farmland values have continued to rise by as much as 100 per cent. Kudi *et al* (2008) adds that, the rapid growth in food demand coupled with seasonal variations, unpredictability and unreliability that have characterized the patterns of rainfall in the dry sub-humid and semi-arid agro – ecological zones of Nigeria have necessitated the supplementation of rain fed agriculture with irrigation. There is the new realization that, self

sufficiency in food production based only on rain fed agriculture is difficult to achieve or sustain. Therefore, for food sufficiency, employment generation and poverty reduction, "there is need to extend the farming season beyond the raining season through irrigated agriculture", (Ajayi and Nwalieji 2010). To realize the dream of increased food production (including employment and income generation), the federal government of Nigeria, "identified small scale, low cost managed irrigation pilot scheme of the Agricultural Development Projects (ADPs) as the most efficient technique that can accelerate the pace of food production in the country" (Ezeh and Mbanasor 2004).To involve more farmers in the project, the government sought and received the assistance of the World Bank loan for the NFDP with wider coverage in its applicability.

The federal government is coordinating the financing of Fadama scheme to assist in the provision of Fadama resources and better access to credit marketing and other services with the believe that the provision of these facilities should boost agricultural production and enhance the income of beneficiaries and lift them out of poverty (Adeolu and Taiwo 2004). This proactive measure is necessary, as observed by Ogbe (2016) reported by Olasupo (2016), "Nigeria can continue to produce (adequate) food because if we don't, our population is ballooning towards 450 million by 2050, we may face serious problem with food production".

2.1.5 Songhai Initiative

The Songhai initiative was established as a Non Governmental Organisation (NGO) in Port-Novo, Benin Republic in 1985. The idea to establish the NGO was necessitated by the miserable situation of Africa in terms of development (including food insufficiency, subsistence agriculture, among others).

The concept of Songhai farm takes a holistic (Integrated) view of agricultural production; from production to processing, marketing and training (Yusuf, V. et. al. 2016). It is also modeled as a research and development center for agro skill acquisition for youths, for a sustainable agriculture. Through the resources of Songhai's own productions and contributions of the various technical partners, the initiative is able to invest most of it resources in financing production activities.

The overall objective of the initiative is to improve the living standards of African people for a sustainable socio-economic development. In particular, the scheme seek to develop human,

technical, infrastructural and organizational capacity in order to improve and scale up production, and provide services and training to young agro-entrepreneurs in Cross River state on a sustainable basis.

The concept of spread effect is a key principle in the philosophy of Songhai Integrated farms. As explained in the Cross River Songhai document, "Dynamics of Rural Growth", the concept means starting a development activity in a relatively small area while engaging efforts (extension, marketing, research, training, etc) to achieve maximum socio-economic effect. The concentration of such production factors to achieve high quality results "could constitute the basis and spring board for expansion, affecting the whole region". Therefore, the concept encourages "development projects to be designed and implemented in such a manner as to create spread effects' (with emphasis on) the quality of the implementing human resource".

2.1.5.1 Songhai system of Development

The Songhai integrated development system has four unique components.

i. Technology Park; this is where new ideas and techniques are developed and contextualized.
ii. Industrial Park/Production Center; through the park /center, the techniques and ideas developed, are transformed into enterprises and many different types of production activities;
iii. Incubation/Training/Human Resource Development Center. 'Space' is provided for the incubation of new ideas and competences. The Songhai graduates are brought into logic of production since Songhai is a production, research and service center. The philosophy is that of teachers being "barefoot researchers who are continually searching for new ideas and techniques to improve their productivity and efficiency".
iv. Songhai as a service center; after the initial period of formation, such services as marketing, input procurement, networking, financial/advisory services are provided to help the young entrepreneurs become self sustainable.

The Songhai Cross River Initiative is expected to take advantage of Songhai's know-how and expertise including its multi-partnership developed with various institutions such as Economic Commission of West African States (ECOWAS), Universities, New Partnership

for African Development (NEPAD) and a host of other United Nations (UN) development agencies.

A key driver for the Songhai initiative is the enablement of a multi-functional agriculture that is sustainable, viable and competitive. Arising from this, therefore, the Songhai Cross River Initiative was set to serve as a trigger element in an integrated development environment to, among others; provide food in sufficient quantity to assist in disease prevention, healthy living and healthy aging.

The believe here was that, this new Cross River State agriculture initiative could become a weapon for the development of a broad based and inclusive socio-economic growth to effectively fight poverty and lead many to prosperity.

In Nigeria, the Songhai model of agricultural development seem to have gained national acceptance, as reported by Una (2018), "Songhai model has been adopted by the Federal Government in its integrated farming scheme to boost food production (particularly) in Akwa Ibom and Cross River States." According to the report, "the integrated farming scheme is to revive agriculture through cost-effective means in collaboration between communities and government to boost food production in Nigeria and create employment for youths."

2.1.6 Songhai Cross River Initiative (SCRI)

The assertion by Sadiku (2015) reported by Fadare (2015) thus, "if for instance, we have a system that will provide a small cottage industry in all the places, whereas our fruits are rotten away every season such as mangoes, oranges, tomatoes. If we have processing factories at only one per Local Government Area (LGA) at these places where these fruits are available, the multiplier effect will not only produce food security but also discourage importation", seem to justify the philosophy of the Songhai project.

Information from the desk office of the supervising ministry for the SCRI indicates that the Cross River State Government signed a Memorandum of Understanding (MOU) with the Songhai regional center in Port Novo to build an integrated world class center for agribusiness and entrepreneurship in Cross River State. The center is to commence in one local government area and will serve as a center of excellence for the training, production, research, demonstration and development of sustainable agricultural practices.

The (SCRI) desk office document further indicates that the center will help the state in its effort to transform the agricultural sector and help in the reduction of poverty through the provision of employment opportunities for youths while providing the requisite skills needed by farmers in the state. The scheme commenced with the training of One Hundred (100) youths in Songhai (Port Novo) farm on the requisite farming skills in line with Songhai philosophy. As designed, the Songhai project is said to have huge potentials for agro-allied production in the state and beyond. The targeted beneficiaries of the Songhai scheme are; unemployed youths, men and women already in agribusiness and those that plan to make agriculture their profession.

2.1.6.1 Partnership Obligations in the Cross River Songhai Scheme:

The Memorandum of Understand (MoU) between the Songhai Regional Centre and the Cross River State Government, have specified the partnership obligations between the parties in the partnership. Thus;

a) Songhai Regional Centre (Private Partner), Central to the scope of work of the Songhai centre included; the training of Cross River Youths at Songhai Regional Centre for a specified period of time in relevant disciplines who will later train other interested individual groups in the state to enable them establish and run individual integrated farms of the SCRI type. The training outline was specified in both theoretical and practical content.

The Songhai centre was required to establish a technology park for applied research and an industrial park comprising of primary production (crop, agro-forestry and tree crops production) and animal (cows, goats, chicken, etc) production. The scope included the establishment of structural development, all aimed at domesticating the Songhai activities in cross river state.

At the conclusion of the agreement, the Songhai centre was expected to provide advisory services to the SCRI project on a consultancy basis while the scope and costs of such services provided shall be agreed upon by both parties.

b) Cross River State Government (Public Partner)

According to the partnership agreement, the government of Cross River State provided the financing and ensured prompt payment of total project sum to Songhai Regional Centre in accordance with milestone payment plan described each year.

In terms of fiscal provisions for the partnership, it was provided that;

i. The total project sum of Two billion, Five hundred million, One hundred and fifty seven thousand, three hundred and sixty nine million, eight hundred and twenty four thousand and seven naira (N2.500.157.340) only for the project implementation in Cross River State, and, One hundred and thirty million, three hundred and thirty three thousand, three hundred and thirty three naira (N130.333.333) only for the training programme in Benin Republic involving One hundred (100) participants.
ii. The average cost for each trainee of one million, three hundred and three thousand, three hundred and thirty three naira (N1.303.333) only, for the six month period. The cost will however, be adjusted accordingly if the number of trainees change.
iii. The total project sum payable to Songhai Regional Centre in twelve equal quarterly installments over the three year duration of the agreement
iv. A first yearly total payment of Four hundred and ninety nine million, nine hundred and forty four thousand, seven hundred and forty eight naira (N499.944.748) only including investment, running costs and Songhai corporate/indirect costs.
v. The second year total payment of One billion, three hundred and ninety five million, one hundred and twenty six thousand, eight hundred and forty naira (N499.944.748) only was including investment, running costs and Songhai indirect costs.
vi. Third year total payment of Six hundred and five million, eighty five thousand, seven hundred and fifty three naira (N605.085.753) only, was including investment, running costs and Songhai indirect costs.

2.1.7 Expected Gains of the Initiative: according to Songhai programme sources, the gains of the initiative, particularly for the intended beneficiaries, included;

i. Poverty reduction through sustainable agribusiness
ii. Rural youth empowerment
iii. Reduction of vulnerability and increase in the adaptive capacity of rural youths.

In terms of human development, one hundred youths received training on farming system and technical and economic management skills necessary in the (farm) production system.

The Songhai Cross River Initiative was designed to express, in a decisive manner, the state government's determination to create an enabling environment for the generation of appropriate socio-economic, technical and organizational solutions to the challenges of food insecurity and poverty. The overarching mission of the SCRI is to make agriculture in Cross River State to be both sustainable and competitive as well as become a driver in rural growth as an necessary pathway to a viable, broad-based and inclusive economy.

The significance of the SCRI derives from the expected value to the stake holders. The expected value, however, varies. In particular;

2.1.7.1 Value for the Cross River State Government

i. Increased economic activities
ii. Youth and women self-employment
iii. Optimisation of natural resources management, food and social security. The initiative is expected to produce more than One thousand farm managers and socio-economic entrepreneurs who, after three years will constitute the core socio-economic leadership groups in the state. This leadership group will then become the back bone of a dynamic private sector in the state.

2.1.7.2 Value for the Local Governments

At the local government level, the initiative will help in;

i. Lowering financial dependency on the state government and optimization of locally available natural resources.
ii. The improvement of operating environment characterized by diversification of income generating activities and jobs creation.

2.1.7.3 Value for the Host and Neighboring Communities

For the host and neighboring communities, the initiative will help in many ways including;

i. Improved agricultural production in yields and techniques, economic empowerment resulting from an all year cropping using effective water management/irrigation including marketing, and benefit from amenities arising from the establishment of the project, this is the pathway to transforming subsistence farms into economically viable farms.

2.1.8 Rationale for the Cross River Songhai Initiative

Given the predominance of small holder farming which lack capacity and still employ numerous traditional farm practices (Loriente 2014) that have failed to improve food production and address the challenge of poverty among farming households and food insecurity, the government of Cross River State is coordinating the Cross River Songhai scheme to develop human, technical, infrastructural and organizational capacity of beneficiary in order to improve and scale up agricultural production thereby "enhance the income of farmers and lift them out of poverty" (Adeolu and Taiwo 2004).

2.1.9 Concept of Income Diversification under Fadama III and Songhai Projects

Though the concept of diversification has been defined and used in different contexts, it is however a key feature of livelihood strategies. Thus, diversification is a process by which rural families construct a diverse portfolio of activities and support capabilities in order to survive and to improve their standard of living. In this process, households attempt to widen their income base by adopting new economic activities (Elis 2000).

Income diversification, closely defined, could refer to the number of income sources or the balance among the different sources. Thus a household with, say two income sources would be more diversified than a household with one income source and a household with two income sources each contributing half of the total would be more diversified than a household with two sources, one of which accounts for 90 percent of the total income, (Joshiet *et al* 2002; Minot, *et al* 2006).

For agricultural households, income diversification includes diversification from subsistence into commercial activities; Minot *et al* (2006) however, argued that farm diversification as an object in African small holder agriculture should refer primarily to the part of farm household output undertaken specifically for cash generation. Diversification therefore, can be considered thus;

a) Agricultural diversification (that is, producing a wider variety of crops or livestock or their products). This can be seen as a process of switching from low value crop production to higher value crops, livestock and non-farm activities. High value crops here refer to crops that generate high economic returns per unit of labour or land (Minot *et al* 2006). This definition is important because it focuses on diversification as a source of income growth and a potential means for poverty reduction.

b) Diversification from agriculture into non-farm activities. Income diversification has been used to describe expansion in the importance of non-crops or non-farm income. Non-farm income includes both off farm wage labour and non-farm employment (Minot *et al*2006).

According to Hasnip *et al* (2001), one dimension of a sustainable livelihood is adequate and stable flows of income and consumption round the year as against seasonality which is known to cause trough and peaks in labour utilization leading to food insecurity "due to the mismatch between uneven farm income streams and continuous requirements". In this regard, diversification can play a vital role of reducing the arising adverse effects through labour utilization and generating alternative sources of income during off-peak periods, Hasnip, *et al* (2001).

Livelihood diversification minimizes the risk of losing all income sources simultaneously, like in an emergency (Elis 2000). This implies trading a higher but more risky income for a lower but diversified and less variable income especially when households cannot or have difficulty in exploiting complementarities between their asset endowment and varying demand and returns in both product and labour markets.

According to Hasnip, *et al* (2001) cash resources obtained from diversification can be invested or can improve the quality of livelihood. If credit access for instance, is limited, this may be critical in say, sending children to school (which is investment) or buying irrigation (or farm) equipment which can be used to enhance future income generating opportunities.

Diversification may be by "necessity or choice". According to Elis (2000) coping strategies are "ex-post" responses to shocks or unanticipated livelihood failure, a demonstration that diversification can thus be either a means of survival without much to poverty reduction or a means to sustainably improve living standards through exploitation of new opportunities. "Livelihood diversification is a progressive and positive strategy of adaptation which can lead to accumulation by rural producers".

There are two approaches to the motivation for income diversification;

a) "Pull Factors": This approach links the desire to increase income by households on the need to become "more food-secure, upgrade housing, educate children, accumulate assets or otherwise improve the household's standard of living". When successful, income diversification creates an upward spiral of increased household

incomes and re-investment in higher value activities. Such spiral would be growth-promoting and poverty-reducing (Eshetu *et al* 2010).

b) "Push Factors": This approach considers the motivation for income diversification "as a response to severe shocks and stresses especially when members of poor farming households are forced to sell their assets because their crop failed or they face a sudden need for extra income (Eshetu *et al* 2010). Income diversification based on push factors (that is last resort measure) "is more likely to undermine than build household resilience". Activities adopted in this push circumstances usually have low returns and high costs and can therefore, not build the resilience of the poor.

According to Peacock et al (2007) Diversification refers to the adjustment of the (farm) enterprise pattern, exploiting new market opportunities or existing market niches to increase farm or reduce income variability. However, diversification as a strategy, rather than intensification, may be a more viable option especially in areas where the natural resources that underpin agriculture are becoming scarce or degraded, in which case, it will be more important to explore how income diversification can reduce dependence on agriculture. Thus, income diversification "may help in meeting the basic livelihood needs of poor households and reduce their vulnerability, however, Eshetu, (2010) further observed that, equity concerns in interventions to support diversification must be taken into consideration because such interventions "will deepen inequality if there benefit the better-off more than the poor.

2.1.9.1 Framework for Diversification and Sustainable Livelihood

Within the sustainability framework adopted for this study (fig 2.6), sustainability would refer to ability of household to diversify or expand income base through diversification hence able to respond to immediate and future shocks. A distinction is normally made between crop (farm) diversification and enterprise or income diversification. According to JBICI (2007), crop (farm) diversification means growing of multiple or several crops, example rice and non-rice cereals, fruits, vegetables and other food crops (OFCs) over the course of the production season or agricultural year.

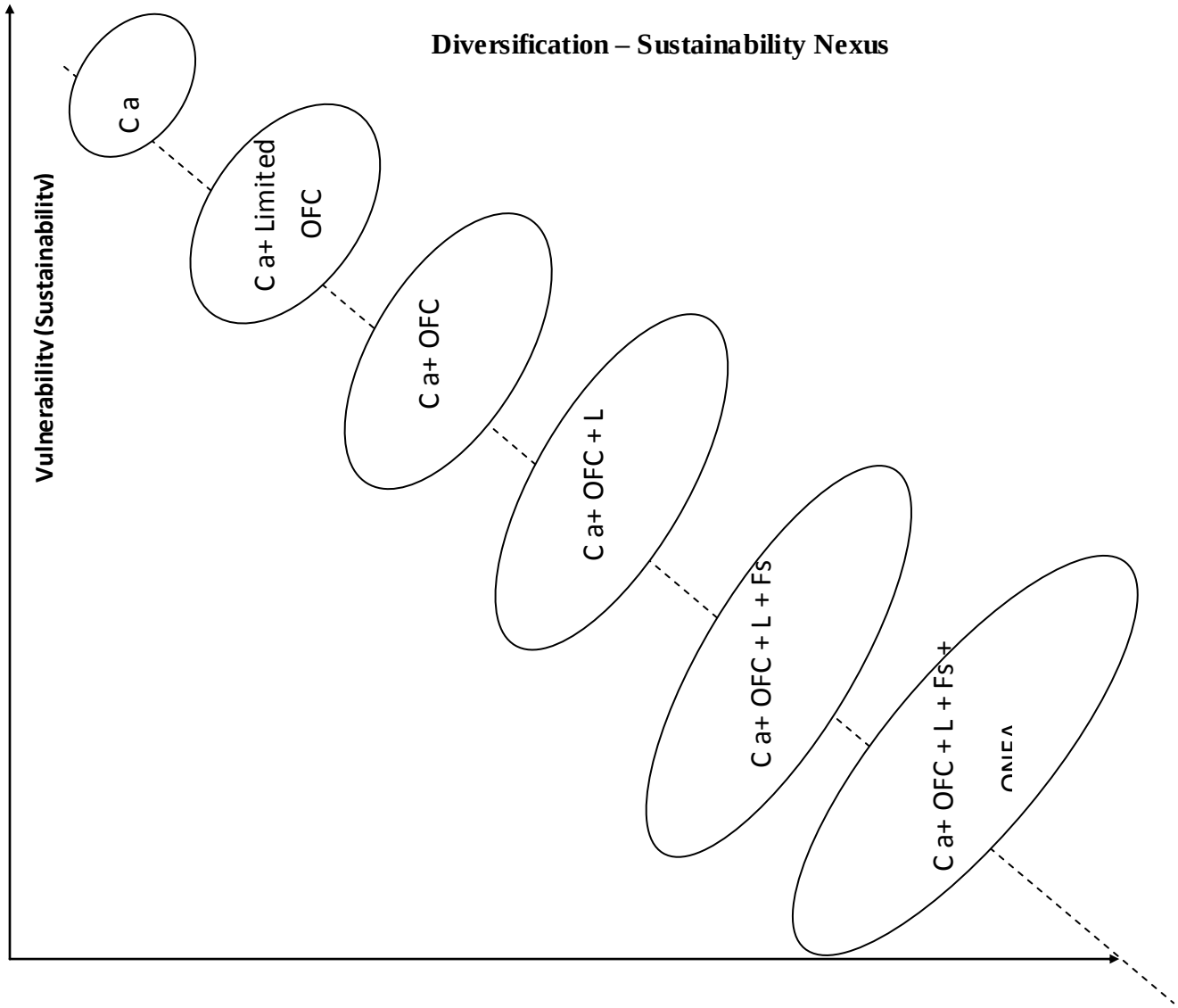
On the other hand, enterprise or income diversification refers to addition of income generating activities at the farm-household level, which will include crops, livestock, agricultural enterprise and, in- farm and off-farm pursuits (JBICI 2007). Households adoption of alternative income generating activities provide the possibility to generate a portfolio of income from activities with different degrees of risk, expected returns, liquidity and

seasonality, as well as adjust their output mix accordingly, Elis(2000); Evans and Nagu (1991), and, Delgado and Simawala (1997) cited in JBICI (2007). Diversification therefore, implies the allocation of household productive assets which includes land, labour, capital and water resources, among different income generating activities so as to generate maximum income to minimize risks, increase resilience and sustainability (JBICI 2007).

The JBICI (2007) study suggests that the structure of household income is indicative of both income diversification and risk and therefore, welfare. A household deriving income from multiple sources such that the percentage share of each income stream is smaller, the degree of implied income diversification is higher. As income sources get more diversified, risk (a function of income variability) to household income is minimized, increasing household resilience and sustainability. According to JBICI (2007), one way to measure income diversification can be by analyzing the percentage share of crop incomes which is a good proxy for the degree of diversification of agricultural incomes while the percentage share of non-agricultural incomes is a good proxy for the overall degree of income diversification.

Fig 2.2

Diversification – Sustainability Nexus



Source: Adapted From JBICI (2007)

KEY

Ca = Cassava

OFC = Other Food Crops

L = Livestock

Fs = Fisheries

ONFA = Other Non Farm Activities

Inverse relationship exists between vulnerability/poverty and crop/enterprise diversification. Household with a broader income spectrum is more able to respond to challenges more sustainably.

Reardon (1997) has shown that income diversification increases with total household income in Africa's rural households. This could be due to the ability of households to "hurdle investment barriers to non-farm activities, and following Engels' Law, because there is increased demand for non-farm goods and services generated by the greater wealth in the local economy. Therefore, if income growth continues, then, so is diversification expected to increase. If there is expansion in market access, this should induce a shift from traditional goods production (to satisfy local rural demand) (Barret and Reardon, 2000), to modern goods for urban and foreign markets thereby stimulating diversification (Stewart and Ranis, 1994 in Barret and Reardon, 2000). Again, long term trends in infrastructure improvement, among others, leads to the development of the rural non-farm sector (Anderson and Leiserson 1980 cited in Barret and Reardon 2000). These factors are the "pull factors" of income diversification. The "push factors" are normally associated with risk factors.

A household's scale of preference is determined by it priorities which determine a household's use of any additional income gained from diversification. Eshetu *et al* (2010) have established that those earning only small amounts of income, "meeting basic household needs for food and other expenses such as healthcare is usually the priority", but, with higher income "households often make improvements in their standard of living by upgrading their dwelling in quality or size, "these may include, constructing a new roof or a new building, better quality food or investing in labour – saving equipment or livestock. These are likely to improve households overall health and welfare. "Households may also invest in livestock as a key asset for further insurance and income generation (Income sustainability). According to Reardon et al (2006), Education for household members is often an important priority of households' income and expenditure profile. Education leads to better paying jobs and raised standard of living, "investment in children's education can be seen as a form of income diversification by parents as children once employed, may be expected to send remittances". Increased income (from diversification) may be invested in productive activities (for instance, purchase of land, equipment or other inputs like fertilizers, particularly where credit markets are lacking). Thus, Elis (2000) states that diversification "can be a means to support a more productive and lucrative agricultural livelihoods.

There are two broad methods for analyzing household income diversification strategies, these are:

a) Income based approach, which look at household participation in different income earning activities of the rural economy and focuses mainly on; i) the number of income sources, and, ii) the share of off-farm in total income.
b) Asset based approach, which bases its analysis of income diversification by direct examination of the households' asset endowment.

Specifically, the analysis of income diversification in this study shall follow Minot, *et al* (2006) that views income diversification as multiple sources of income.

2.1.10 Agricultural Development

As a concept, the term agriculture refers to the cultivation of plants and animal husbandry (farming; ranching; aquaculture; horticulture; animal husbandry) including, but not limited to the care and raising of livestock, poultry, husbandry and the production of poultry products; dairy products; production of field crops, fruits, vegetables, nursery stocks, ornamental trees, flowers, timber; pasturage; any combination of the foregoing; and processing, drying, storage and marketing of agricultural products, etc.(Nchuchuwe and Adejuwon, 2012).

According to Nchuchuwe and Adejuwon (2012), agricultural development is a subset of economic development. Agricultural development implies a sustained increase in the level of production and productivity over a reasonable length of time leading to subsequent improved wellbeing of the farming population as manifested in their higher per capita income and standard of living.

2.1.11 Overview of the Agricultural Sector in Nigeria

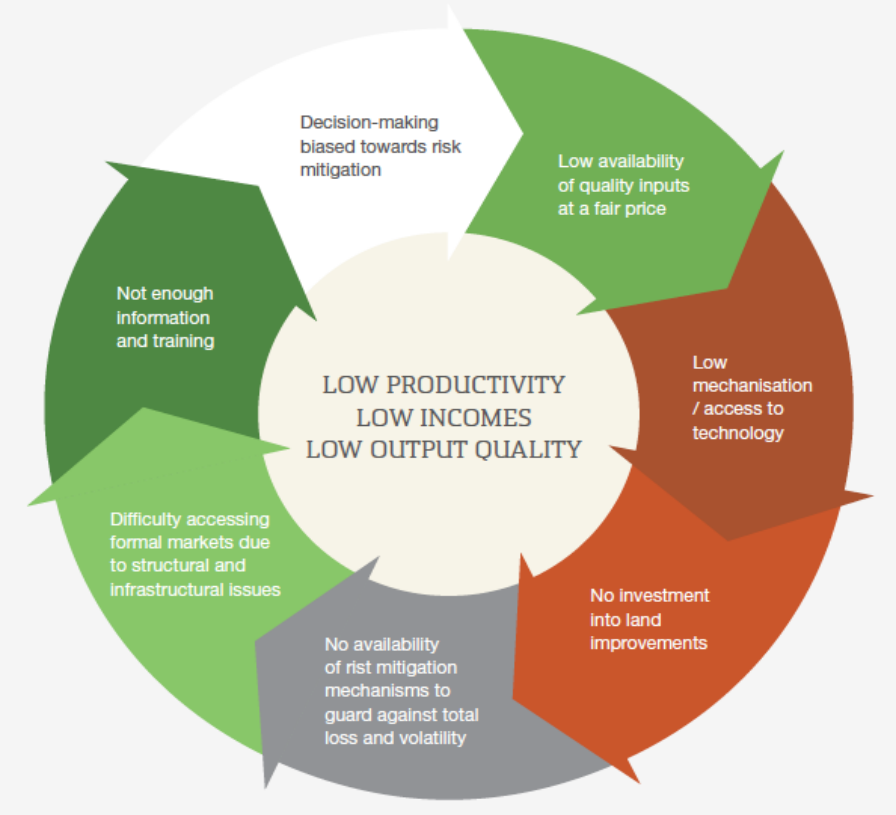
Nigeria is hugely endowed with vast expanse of fertile agricultural land (most of which is arable), rivers, forests and grassland, as well as a large active population that sustain a highly productive and profitable agricultural sector. Despite these endowments, the sector has continued to stagnate or decline as a result of diminishing productivity. However, the agricultural sector, despite its weaknesses, constitutes the dominant sector of the Nigerian economy, contributing on the average about 55 per cent of the Gross Domestic Product (GDP) in 1960-1970 and above 35 per cent thereafter. A relatively small modern sub-sector relying on the use of hybrid seed/seedlings, exotic breed of livestock and mechanization has emerged in the last two decades.

The major characteristic of Nigerian agriculture evolved over the years mainly in response to the resource endowment of the country and the cultural practices prevalent in the various communities among others. Variations in climate, topography and soil types from region to region have encouraged ecological specialization in agricultural enterprise combinations and farming systems. The large population engaged in agricultural production and existing institutional arrangements, especially the land tenure system, to a large extent, determine the land use pattern such that over the years, there has been excessive demand pressure on land with resultant fragmentation into small holdings. For instance, the estimated land area per capita declined from 1.858 ha in 1961 to 1.090 ha in 1998, while the available cultivable land area per capita declined from 1.391 ha to 1.068 ha between 1961 and 1998 respectively.

The dualistic structure of the agricultural sector in Nigeria reflects the existence of peasant (subsistence) farmers and large scale commercial cultivators. The peasant farmers use mostly traditional methods while the commercial cultivators employ modern inputs and management to optimize profit. About 5 per cent of total agricultural output in Nigeria is produced by the modern sub-sector. However, peasant agriculture predominates, accounting for about 95 per cent of the output as well as employment in the sector.

Nigeria is divided basically into five ecological zones, including; mangrove swamp, rain forest, forest savanna, guinea savanna and sudan savanna. The various ecological zones are determined by climatic conditions which in turn determine the type of crops planted and the efficiency of cultivation methods used in the area. The mangrove swamp which covers among others, Cross River State, supports the production of fruits, vegetables, swamp rice, maize, legumes, poultry and fisheries. The rain forest of Cross River State, among other states in Nigeria, facilitates the production of tree-crops, root-crops and tubers, nuts, legumes, poultry, fisheries and piggery. However, the farming and ecological structure have been dynamic as a result of changing climatic, economic and technological conditions. For instance, the establishment of River Basin Development Authorities (RBDA) and the intensive use of inorganic fertilizer significantly affected the types of crops produced in the various states. Also, the advent of crude oil has affected the ecological balance of some states as a result of environmental degradation arising from oil spillage and gas flaring.

Fig. 2.3: Nigerian Small Holder Cycle



Source: Adapted from Loreinte, M.L (2015) cited from GrowAfrica, (2014) www.weforum.org/docs/ip/2014/CA/WEF - GrowAfrica-Annual Report 2014.

As fig. 2.7 Illustrates, The small holder farming system which predominates, still uses numerous indigenous practices which increase the problem of land fragmentation, environmental degradation and soil infertility. Consequently, the smallholder farmers seem trapped in the "Low Productivity-Low-Incomes-Low Output Quality Trap".

Notable among the farming systems practiced over the years by farmers in Nigeria include;

a) Shifting Cultivation or Bush Rotation: This system was intensively practiced. The bush rotation system was practiced such that the fields were cleared of their original vegetation cover, cultivated briefly for a year or two and then allowed to fallow for a given period depending on land availability. The main determinant of this shifting cultivation system was the ratio between the length of time the soil will sustain cultivation with satisfactory results and the period required for restoration of fertility. The maintenance of soil fertility through this system was less effective given increasing population and urbanization. This situation led to the shortening of fallow periods which resulted in land degradation and reduced yields/output. The system has been found to be unsustainable hence the reduction in its intensity.

b) Crop Rotation: This system involves the sequencing of various types of crops on permanent holdings to maintain soil nutrient balance. It was predominant in the northern zones of the country and sustained by the use of organic manure. The system is still practiced and even spreading down south of Nigeria, relying on inorganic fertilizers.

c) Terrace Farming: This involves farming in hilly areas and requires careful land preparation to avoid erosion. This practice is predominant in the north-eastern states. This system was sustained through the use of organic wastes in the past but currently being sustained through the use of inorganic fertilizers.

d) Mixed Farming: This is a practice of raising livestock in combination with crop cultivation. It has the added advantage of using livestock waste as organic manure, while the crops residue is used as feed. This practice is common in the northern part of Nigeria where the livestock population is concentrated.

e) Irrigated Farming: This farming system is practiced mainly in the arid zone where unfavourable environment and location of farm lands in relation to available water resources necessitates reliance on irrigation. Crops such as sugarcane and various vegetables, for instance, were grown in seasonally flooded riverine or fadama lands of the northern states. In recent times, especially with the establishment of River Basins Development Authorities, the development of modernized irrigation system has enhanced year-round agricultural production.

f) Cropping Systems: There are numerous types of cropping systems depending on the ecological setting and the soil conditions. These include;

   i. Mixed Cropping: this is a cropping system where the farmer plants one major crop and two or more supplementary crops. It is commonly practiced throughout Nigeria. The socio-economic reasons for mixed cropping include; enhanced food production, increased farm incomes and insurance against risks and uncertainties in farming. This basic form of cropping has remained as it is quite acceptable to the land tenure structure in Nigeria. Other variants of mixed cropping are double cropping, multiple cropping and inter-cropping.

   ii. Sole Cropping: this is a system whereby farmlands are planted with only one crop, such as yams or maize. This cropping pattern is common with large-scale farmers as it lends itself to mechanization. In the south of

Nigeria, sole cropping is mainly in respect of tree crops while in the north of the country, it is predominantly food crops and fibers.

2.1.11.1 Overview of the Agricultural Development Strategies in Nigeria

Following Olayemi (1998) cited in Ugwu and Kanu (2012), the agricultural development strategies that have been adopted in Nigeria over the years can be categorized into four key strategies thus;

(a) Exploitative Strategy: this strategy was adopted during the colonial era up to the early years of political independence in Nigeria. This strategy was influenced by the Myint (1958) vent-for-surplus theory which categorized the economy into the modern (industrial) sector and the subsistence (agricultural) sector. The subsistence sector was perceived to be unproductive and full of underutilized resources which were expected to feed the modern sector.

In the view of Adubi (2004), this theory formed the basis of the agricultural strategy in the 1950s and 1960s in Nigeria. During this period government levied export crops which provided the revenue for government to develop the modern sector. The strategy entailed the establishment of marketing boards to boost revenue generation effort through taxing of peasant farmers that produce export crops such as cocoa, groundnut, palm produce, cotton, etc.

(b) Agricultural Project Strategy: this agricultural strategy was up to the period 1968. This period witnessed minimal government intervention in agriculture; rather small scale farmers bore the greater burden of agricultural development efforts (Egwu and Akubuilo, 2007).

According to Ugwu and Kanu (2012) this period witnessed the regionalization of agriculture with the establishment of extension fields and research institutes. Investments in agricultural activities were during this period funded by the regional public funds. New schemes such as farm settlements as well as tree crop plantations, smaller farm settlement schemes and agricultural development cooperatives were established with the aim of encouraging development of tree crops.

(c) Direct Government Production Strategy: the implementation of this strategy commenced in 1970 coinciding with the oil boom period in Nigeria. This period witnessed a deepening of the process of direct government intervention and investment in agriculture (Olayemi 1998).

Accordingly, there was massive intervention and investment in agriculture by the federal government aided by the oil boom funds. As recorded by Ugwu and Kanu (2012) the private sector at the time had low capacity as a consequence of the Nigerian civil war of 1967-1970. Moreover, ideological imperatives around the world at the time favoured government direct involvement in directing investment in agricultural business and allied activities (Adubi 2004).

It was during this period of direct government involvement in investment in agricultural production activities that witnessed the establishment of agricultural schemes and research institutes such as the National Accelerated Food Production Project (NAFPP), Nigeria Agricultural Co Operative Bank, etc (Ugwu and Kanu 2012).

(d) Integrated Rural Development Strategy: following the realization by the government within the mid-1970s that government direct involvement in agricultural production activities was not yielding the desired results, there was a gradual shift to an agricultural development approach which involved the adoption of an integrated rural development strategy (Olayemi 1998).

Under the integrated strategy, rural development was re-conceptualised as holistic perspective, which viewed agricultural development problems as being only a part of a larger rural development concern. This re-conceptualization, according to Ugwu and Kanu (2012), led to the establishment of both policy-based and agency-based multipurpose rural development intervention programmes and implementing intitutions. Prominent among the policy-based intervention programmes included;

i) Operation Feed the Nation (OFN). This policy intervention programme was launched in 1976 to, among others; address the problem of rising food crises, rural-urban migration, and escalating food import bills. The OFN operational strategies included: a subsidized production inputs; increased bank credits to farmers; establishment of commodity boards; and fixing of attractive prices for agricultural products.

ii) Green Revolution (GR).The GR programme was launched in 1979. Through this programme, large, medium and small scale farmers received a number of incentives to boost their level of production. Livestock and crop components were also incorporated into the programme.

Among the prominent agency-based intervention initiatives were:

i) River Basin Development Authorities (RBDAs). This scheme was prompted by the existence of abundant water resources and its potentials for increasing agricultural production in Nigeria.

ii) Agricultural Development Programme (ADP). The ADP which was first launched in 1972 is an off-shoot of the concept of Integrated Agricultural and Rural Development (IARD). However, between the late 1970s and 1984, the scheme had spread to all the states and Local Governments in Nigeria. The ADP concept involved the provision of infrastructural facilities (such as roads, schools, appropriate and adequate water supply to rural farmers). In fact, a key feature of the ADP was its reliance on small scale farmers as the central focus for increased food production in Nigeria (Auta and Dafwang 2010). Specifically, the activities of the ADPs in Nigeria spread over three key thematic areas; Provision of rural infrastructural facilities, conducting worthwhile trainings on improved agricultural techniques, and appropriate supply of farm inputs.

   The scheme operated on joint state-federal responsibility both in project formulation and especially implementation arrangement which has grassroots agricultural programming as a primary state responsibility (Auta and Dafwang 2010).

   The ADP projects were accordingly funded under a tripartite arrangement involving the World Bank (66 per cent), Federal Government (20 per cent) and State Governments (14 per cent) in addition to payment of salaries of local staff.

iii) Directorate for Food, Roads and Rural Infrastructure (DFRRI). This intervention programme was established in 1987 with the aim of opening up the rural areas through the construction of rural (feeder) roads, and provision of basic amenities of modern living in the rural areas. As emphasized in Daniel (2011), the concept of DFRRI was based on the realization of the fact that the economic future of Nigeria depends on the development of the rural areas.

These agricultural development strategies coincided with key eras of Nigeria's economic development strategies. The effects of these agricultural reform policies and programmes on the agricultural sector also differ according to the reform era.

2.1.11.2 Key Agricultural Reform Eras in Nigeria

These, according to Ugwu and Kanu (2012) include:

(a): Period of Minimum Government Intervention (1960-1969); within this period of minimum government intervention, key effort of government was geared towards policy setting and creating institutions for agricultural research, extension and export crops marketing and pricing. This period of regionalization of agriculture in Nigeria, saw the regional governments executing government ad hoc policies, programmes and projects. During this period, there was visible decline in export crops production and mild food shortage (Ugwu and Kanu 20212).

According to Sanya and Babu (2010), this period witnessed an increase in food supply shortfalls and rise in retail food prices. Furthermore, the agricultural share of Gross Domestic Product (GDP) witnessed a decline from 66 per cent in 1959 to 50 per cent in 1970 resulting to greater importation of food with adverse effects on the country's Balance Of Payment (BOP) during the late 1960s (Kwanashie, Ajilima and Garba, 1998). Agricultural production also tended towards cash crop based production.

(b): Period of More Government Intervention (1970-1985); this period also coincided with the oil boom era which encouraged and enabled greater government involvement in key development issues of the economy including agriculture. Consequent upon the increased government involvement, buoyed by rise in (petro-dollar) oil revenue, many agricultural policies and programmes were enunciated. Prominent among these, according to Ugwu and Kanu (2012) included:

i) Substantial increase in budgetary allocation to agriculture to accommodate capital and recurrent expenditures
ii) Pursuance of income tax reliefs on incomes from new agricultural enterprises
iii) Unified wage structure for all public sector workers in Nigeria
iv) Granting of concessionary agricultural loans

v) The establishment of specialized schemes and institutions to facilitate the granting of credits to farmers such as, the Nigerian Agricultural and Co operative Bank (NACB), established in1973

vi) There were also the rural banking and agricultural credit guarantee schemes established in 1979 to ensure agricultural sector credits.

According to Egwu and Akubilo (2007), the expenditure of state governments in Nigeria followed similar pattern with that of the federal government within the period.

Consequently, large budget deficits were recorded and there was a decline of the capital expenditure on agriculture from 6.2 per cent of total capital expenditure by the federal government in 1973 to 4.0 per cent in 1985.

Other key microeconomic policies of this economic regime included:

a) Creation of national seed service by government, to produce and multiply improved seeds (such as rice, maize, wheat and cassava)
b) Establishment of a department of agricultural co operatives (in 1979) within the Federal Ministry of Agriculture, Water Resources and Rural Development (FMAW&RD) to actualize the policy aimed at encouraging farmers to form co operatives to be used for the distribution of farm inputs and imported food commodities
c) Water resources and irrigation policy that led to the establishment of River Basin Development Authorities (RBDAs) in 1977 charged with the responsibility of developing the country's land and water resources.

However, even with this effort the performance of the agricultural sector was poor in terms of its growth, export value, contribution to GDP and its share in the country's total export earnings. For instance, food imports as a share of total imports increased from 7.6 per cent in 1970 to 10.26 per cent in 1979 (Osemeobo 1992).

There was also rapid decline in agricultural production which led to large food supply gaps (Sanya and Babu 2010).

(c): Period of Structural Adjustment Programme (SAP) and Post SAP (1985-1990): in the view of Adubi (2004), the introduction of SAP in 1986 signaled government's admittance of the failure of past policies and programmes to bring about significant improvement in the economy and reverse the decline in the agricultural sector. The agricultural sector was critical to the achievement of the SAP objectives and it's far reaching reforms on diversification of exports and adjustment of the production and consumption structure of the economy.

Key objectives of the SAP included; Restructuring and diversifying the productive base of the economy to reduce dependence on the oil sector. These objectives were to be achieved through a number of policies which included measures to stimulate domestic production and broaden the supply base of the economy (Sonya and Babu 2010).

The Integrated Rural Development (IRD) strategy was adopted during the SAP era though with significant changes in institutional design, intensity of activities and even the mode of operation.

According to Ikpi (1995), the SAP era was anchored on the agricultural policy initiated by the Federal Ministry of Water Resources and Rural Development produced in 1988. The policies embodied in the document included;

a) Agricultural sector policies and strategies on food crops, livestock and fish production, industrial raw materials (crop and by-products) production, and forest products and wildlife.
b) Policies on support services such as agricultural extension, technological development and transfer, agricultural credit; agricultural insurance; agricultural mechanization; water resources development; rural infrastructure; agricultural statistics and data bank; agricultural investment and management advisory services, and agricultural manpower development and training.
c) Assignment of roles and responsibilities to the three tiers of government (Federal, States and Local Governments) in Nigeria.

Even in the SAP era, evidence show that the agricultural sector failed to register significant overall growth. There was lower agricultural and economic growth with high rates of unemployment. Consequently, there was an increase in food prices from 2.6 per cent in 1970/1979 period to almost 20 per cent between 1980/1989 periods (Ugwu and Kanu 2012). Several reasons accounted for the dismal performance of the agricultural sector during this period. Kwanashie, Ajilima and Garba (1998) for instance, observed that, SAP had greater impact on farm incomes distribution than on agricultural growth and productivity.

(d): Era of the 'New Millennium' Agricultural Policies (1990-2009): this era witnessed the introduction of several institutional changes aimed at realizing the agricultural sector's key objectives and according to Omolola (1998) in line with its believe that agriculture was critical for improved economic recovery.

The New Millennium policies seek to attain self-sustaining growth in the agricultural sub-sectors and the structural transformation necessary for the country's overall socio-economic development and general improvement of living standards of Nigerians. This objective, according to the FMARD (2003), reflects the current policy recognition of agriculture as a vital sector under the poverty reduction programme.

As recorded in Ugwu and Kanu (2012), through the New Millennium era policies, government in Nigeria also sought to pursue key specific objectives including:

i) Attainment of self-sufficiency in basic food commodities and in particular those that consume a considerable share of Nigeria's foreign exchange reserves and for which the country has comparative advantage in local production
ii) Increase in local production of agricultural raw materials to meet the growth of an expanding industrial sector
iii) Modernisation of agricultural production, processing, storage and distribution through the infusion of improved technologies and management to make agriculture more responsive to the demands of other sectors of the economy
iv) Creation of agricultural and rural employment opportunities to increase income of farmers and rural dwellers and productively absorb the increasing labour in Nigeria
v) Increase in production and processing of exportable commodities, to further diversify the export base and hence, foreign exchange sources for Nigeria.

Other on-going initiatives to step-up agricultural production and ensure food security include, the Special Programme on Food Security (SPFS), National Fadama Project (NFP), South-South co operation initiative, among others (Ugwu and Kanu 2012).

A remarkable feature in this policy era was the emergence of Public Private Partnership (PPP) as a strategy in the development of agricultural marketing as well as the promotion of Integrated Rural Development (IRD).

Noteworthy in this phase, as reflected in Ugwu and Kanu (2012) is the drastic reduction in food imports from 14.5 per cent to 5 per cent of total imports within the period. Furthermore, the agricultural sector recorded growth rates averaging 7.4, 7.2 and 6.5 per cents in 2006, 2007 and 2008, respectively. Between 2003 and 2007, for instance, the agricultural sector's average share of the national real Gross Domestic Product (GDP) was 41.5 per cent. Of this

growth, the crop, livestock, fishery and fishery sub-sectors contributed 90 per cent, 6 per cent, 3 per cent and 1 per cent, respectively. Major crops grown in Nigeria (such as Yam, Cassava, Sorghum, Millet, Rice, Maize, Beans, Groundnut, Cocoyam and Sweet Potatoes) accounted for about 75 per cent of total crop sales in 2004 with an increase of about 81,276 tons in 2004 to 95,556 tons in 2007.

The performance of the agricultural sector during this phase may thus; justify the current interest in the efficacy of the Public Private Partnership as a credible option in the development of the agricultural sector as well as the promotion of the Integrated Rural Development Model for the overall development of the rural sector and for poverty alleviation.

2.1.11.3 Key challenges of the Agricultural Sector Reform Policies and Programmes

Certain literature have argued that previous reforms, policies and programmes in the agricultural sector within Nigeria have only yielded minimal positive impacts (Garba 1998) as evidenced from the decaying rural infrastructure, declining value of total credit to agriculture and declining domestic and foreign investment in agriculture.

According to Nwafor (2008), a critical examination of these reforms/policies and their implementation over the years show that policy instability, policy inconsistency, lack of policy transparency, poor coordination of policies as well as poor implementation and mismanagement of policy instruments constitute major obstacles to the implementation and achievement of the goals and objectives of these policies while food security remains a major concern due to the subsistence nature of agriculture in Nigeria.

Adebayo (2009) attributes the failures of most of the past strategies used in attempt to improve agricultural growth to lack of participation in the design, formulation, implementation and evaluation of policies as well as limited implementation capacity within the sectoral ministries coupled with a poor understanding of the details and specifics of policies by the implementing agencies/authorities. The new Nigerian Agriculture Policy (NAP 2001) identifies the common factors responsible for the ineffectiveness of these policies and regulations, especially on the downstream segment of agriculture to include; lack of adequate processing facilities, instability in the political climate, and insecurity of investment, among others. To Daniel (2011), the issues included top-down approach in project design and implementation, bureaucratic bottlenecks, and lack of sustainability.

Perhaps what appears to be an official confirmation of the failure of the previous isolated approaches (in agricultural development) in Nigeria is the recent report by Elebeke and Udofia (2016) that traced the lingering farming sector crises in Nigeria to the Structural Adjustment Programme (SAP) of 1986, and that "the situation in Nigeria (farming sector) at present did not start today." Obasanjo (2016), reported by Ojo, O. (2016), views "lack of continuity and consistency in government policies as the greatest bane of agriculture in the country" asserting that, "government as a direct producer has never worked and will never work in agriculture". Therefore, a new (agricultural) development order became necessary. That new development order emphasizes the role of Partnership including the Public-Private Partnership in ending hunger and poverty.

2.1.12 Agricultural Innovation and Adoption

2.1.12.1 Agricultural Innovations

Innovative technologies in agriculture, according to Jain and Raju (2009), include "all kinds of improved techniques and practices which affect the growth of agricultural output." Common areas of technology development and promotion include "new crop varieties and management regimes, soil as well as soil fertility management, weed and pest management, irrigation and water management (Loevinson, Sumberg and Diagne, 2012). According to Lavinson (2013), technology "is the knowledge/information that permits some tasks to be accomplished more easily, some services to be rendered or the manufacture of a product."

Agricultural innovations and technology are, according to Mwangi and Kariuki (2015), seen as an important route of poverty in most developing countries. This is sequel to the close relationship between agriculture and poverty reduction.

Meanwhile literature show that majority of smallholder farmers in most developing countries such as Nigeria rely on traditional farming methods which has lowered the level of production and productivity. The farmers generally obtain very low crop yields as a result of the low potential yield of the traditional local varieties used by the farmers. Most crops are grown under rain-fed conditions and irrigation is used only in limited areas, while little or no fertilizers are used and pest control is low (Mwangi and Kariuki, 2015).

However, given improved input/output relationships, new technology tends to raise output while reducing average cost of production "which in turn results in substantial gains in farm income" (Challa 2013).

2.1.12.2 Adoption of Agricultural Innovations

According to Bonabana-Wabi (2002), agricultural innovations involve the integration of new technology into existing practice, usually preceded a period of trial and some degree of adaptation. "It is a mental process an individual passes from first hearing about an innovation to final utilization of it."

Studies have shown that adopters of improved technologies witness increase productions leading to socio-economic development. According to Kasirye (2010), adoption of improved agricultural technologies ahs been associated with "higher earnings and lower poverty; increased employment opportunities and earnings for landless laborers." As buttressed by Jain, Arora and Raju (2009), "Non-adoptors can hardly maintain their marginal livelihood, leading to deprivation."

In defining agricultural technology adoption by farmers, the first thing to consider, as explained by Doss (2003), "is a discreet state with binary response variables or not." According to Challa (2013), this implies that a definition of adoption depends on whether the farmer is an adoptor of the innovation or non-adoptor taking the values of zero and one or the response is continuous variable, however, the appropriateness of each approach would depend on the particular context.

Efforts have often been made towards agricultural innovations in Nigeria, for instance, Emenyeonu (1987), indicates that the first of such innovations was the introduction "of large scale mixed farming which involved the use of ploughs and manure to effect an increase in the production of raw materials for British agro-industries", in the 1920s by the colonial government. According to Emenyeonu (1987), the innovations resulted in remarkable increases in productivity. For instance, cotton yield rose from 3,500 tons 15,000 tons per annum within a 5 year period. Evidently, this results from the relationship between key socio-economic variables and adoption.

A preponderance of findings have dwelt on the relationship between variables such as education, social status, age, income, farm size, etc., and adoption. Voh (1982), for instance, found that education had a significant association with adoption of innovation among some farmers in Northern Nigeria.

Level of adoption of agricultural innovations may be determined by several factors. Among the factors, as categorized by McNamara, Wetzstein and Douce (1991), include; farmer

characteristics, farm structure, institutional characteristics and managerial structure. The factors can also be considered broadly under; Econmic factors, Institutional factors ans Household-specific factors.

Thus, according to McNamara (1991), economic factors determining adoption include;

Farm size and Off-farm income (which has been shown to have a positive impact on adoption).

Institutional factors such as membership of social group which enhances social capital, allowing trust, ideas and information exchange. Acquisition of information about a new technology or innovation determines adoption as it enables farmers to learn about the existence as well as the effective use technology which facilitates its adoption.

Access to extension services is also a key aspect of technology adoption. Also, Mohammed and Temu (2008), adds show that, access to credit stimulates innovation.

Household-specific factors determining adoption include; Farmer's education, age, gender, household size, etc.

2.1.13 Concept and Measurement of Poverty

The concept of poverty refers to a multifaceted condition and thus, reflective in it multifaceted conceptualization. For instance, in what seems to be the official conceptualization of poverty by the government of Nigeria, the vision 2010 document explains poverty as a condition in which a person is unable to meet minimum requirements of basic needs of food, health, housing, education and clothing (Ojikpong, 2006). The encyclopedia Britannica (Encarta 2004) conceptualizes poverty in terms of both income and material deprivation thus; people are poor when they lack the means to satisfy their basic needs. Therefore, "people without access to education or health services should be considered poor even if they had adequate food".

The United Nations Development Programme (UNDP) conceptualization of poverty focuses on Human Development Index (HDI). In its view, poverty is hunger, lack of shelter, being sick and not able to see a doctor, not having access to school and not knowing how to read, not having a job, fear for the future, living one day at a time, being ill by not having access to clean water. The concept of poverty has further been broadened to include wider socio-

political issues. World Bank (Wilson 2001) views that "poverty is powerlessness, lack of representation and freedom".

The conceptualization of poverty in Peacock (2007) reveals broad components of poverty divided into income poverty and non-income poverty, noting that "people who are income poor tend to be also poor in other respects". This view therefore, places more emphasis on income poverty as the most critical to wellbeing.

In line with Peacock (2007), the stress in this present study therefore, is mainly on income poverty. This is also in line with the Millennium Development Goals' (MDGs') conceptualization of poverty which considers poverty in terms of income threshold rather than the other aspects of material deprivation or lack of access to services.

Poverty has also been classified into conjectural or transient poverty which is said to be temporal or short term. Its causes are more transitory (such as short term disaster, temporal loss of job, etc.) and thus have more possibility for reverse within a short term. On the other hand, chronic poverty is long term and persistent and its causes include factors such as limited productive resources, lack of skills and locational disadvantage and endemic socio-cultural factors (Obadan 1997). Other causes, according to Obadan (1997) include inadequate physical assets such as land and capital and minimal access by the poor to credit; inadequate access to the means of supporting rural development in poor regions and lack of participation of the poor in development programmes. Following this conceptualization, the stress here is on chronic poverty which calls for long term measures for the support of the poor in terms of the means of supporting rural development, participation of the poor in development programmes, etc, as a means of addressing the poverty challenge.

Various ways have been suggested to address the problem of poverty. However, an effective poverty reduction measure can originate from the type of poverty identified. For instance, when dealing with concentrated, wide spread poverty as observed within the rural farm-economy, amelioration effort includes "introducing improved agricultural methods and raising level of skills (capacity)", and according to Awe (1996) "needs a multi-sectored approach".

Scoones' (2003) classification of the rural economy as constituting the farm-poor and non farm-poor encourages potentials for diversification outside the agricultural sector, "at least encouraging income generation which adds value to locally produced agricultural products"

for poverty amelioration. According to Ohiorhenuan (2003), the World Bank and IMF poverty reduction strategies now insists on "nationally owned poverty reduction strategies" which can improve the poverty impact of expenditures financed by external partners and the effectiveness of technical advice by increasing country-ownership and shifting policy to more result-oriented approach with the objective of reducing poverty in low-income countries. In particular, the World Bank /IMF poverty reduction strategy papers (PRSP) propose that, poverty reduction strategies should, among other issues be;

a. Country-Driven; involving broad-based participation by civil society and the private sector

b. Results-Oriented; focusing on outcomes that benefit the poor

c. Partnership-Oriented; involving co-ordinated participation of development partners (bilateral, multilateral and non-governmental organizations) based on a long term perspective for poverty reduction.

Therefore, the conceptualization of poverty reduction in this study focuses on income enhancement strategies, Peacock (2007), which takes into consideration the proposals in the World Bank/IMF PRSP (Ohiorhenuan 2003). As argued in Peacock (2007), reducing income poverty enables households to achieve food security, accumulates assets, reduce vulnerability to shocks and provide for the future. It is further argued that reduction to income poverty often also enables access to education, health services and clean water.

The literature on poverty has identified a number of models designed to measure poverty which are broadly categorized into absolute and relative poverty measures.

Absolute measures of poverty refer exclusively to the wellbeing of those categorized as poor rather than the wellbeing of the overall society. Emphasis therefore is on the poor.

Among the absolute poverty measures include: Headcount ratios/incidence of poverty, poverty gap/income shortfall, and composite poverty measures, among others (Anyanwu, 1997).

i) The headcount ratio or incidence of poverty is the simplest and best known poverty measure/index and it is a measure of the ratio of poor individuals to total number of individuals in the population. That is, percentage of the population that falls below the poverty line.

Headcount index helps in tracking changes in the percentage of population living in poverty. It however, fails to show the dept or severity of poverty, that is, how poor the poor are.

ii) The poverty gap/income shortfall refers to the difference between the poverty line and the mean income of the poor, expressed as a ratio of the poverty line. This results to the average depth of poverty and shows the amount of money needed to raise income of average poor person to the poverty line. This provides information on the level of income transfer to the poor individuals to bring their income up to the poverty line.

The poverty gap/income shortfall is given as:

$$I = \frac{z - ya}{z} \text{ where;}$$

ya = average income of the poor

z = poverty line

Incorporating both H and I yields the numbers of the poor and the dept of their poverty thus:

$$P_1 = H1 = \frac{q}{n} - \frac{z - ya}{z}$$

P_1 however, is only sensitive to the average poor but less sensitive to the poorest of the poor and fails to capture the severity of poverty.

iii) Disparity of income distribution

This is an absolute poverty measure that has to do with the distribution of income among the poor in the population. These measures include the Lorenz curve and the Gini coefficient.

Lorenz curve is a graphical representation that expresses the relationship cumulative income shares (horizontal axis) and cumulative percentage of the population (vertical axis).

If the Lorenz curve of one income distribution, X, lies entirely above the Lorenz curve of another income distribution Y, (that is all points on X lie closer to the 45^o line than the corresponding points on curve Y) means income distribution x dominates income distribution Y, that is, income distribution of the poor represented by curve X is less unequal than the income distribution represented by curve Y. however, if Lorenz curve cross, means one curve cannot be taken as superior to another or being more equal.

Gini coefficient (G) on the other hand, measures income inequality as based on the Lorenz curve. Gini is symbolically, the ratio of the area bounded by the Lorenz curve and the 45^o line to the total area between the 45^o reference line and the horizontal axis symbolically, G is defined as:

$$G = \frac{Area\ \ between\ \ the\ Lorenz\ \ curve\ \ and\ \ the\ diagonal\ \ line}{Total\ \ area\ \ between\ \ the\ diagonal\ \ line\ \ and\ \ the\ horiz\ ontal\ \ axis}$$

Where: $O \leq G \geq 1$

Larger coefficient values indicate greater degrees of inequality. A zero coefficient value shows an egalitarian income distribution.

Gini coefficient, like the Lorenz curve, only provides partial ranking of income distribution indicating neither the number of people who fall below the poverty line nor extent of impoverishment.

iv) Composite Poverty Measures

a) Sen Index

Sen (1976) index reflects the number of the poor as well as the extent of poverty and income distribution among the poor. It incorporates the headcount index, the income gap, and the Gini coefficient. The Sen index is based on three axioms viz; focus axiom, monotonicity axiom and the weak transfer axiom.

Focus axiom requires that the poverty measure be dependent only on the incomes of the poor, hence, incomes of the non-poor and any charges therein are irrelevant.

Monotonicity axiom stipulates that the poverty index increases when the incomes of the poor increase (an axiom that both the headcount ratio and Gini fail to satisfy though income gap ratio does.

The weak transfer axiom stipulates that the poverty measure be sensitive to changes in the income distribution of the poor. Income gap ratio and headcount index do not satisfy this axiom but, Gini does.

Symbolically, Sen Poverty index (S) is given as:

$$S = H\,[1 + (1\text{-}I)\,G1] \text{ where}$$

$$I = \sum_{i=1}^{qi} \left[\frac{z - yi}{q^z}\right] \text{ where}$$

I = average income shortfall as a percentage of the poverty line

yi = income of the ith poor household

z = poverty line

q^z = number of households with incomes < z

H = q/n; headcount ratio

n = total number of households

GP = Gini coefficient among the poor = $O \leq GP \leq 1$

The drawback of the Sen Index is that, the index is more responsive to improvements in the headcount than it is to reductions in the income gap or improvements in the distribution of income among the poor. That is, reduction in poverty is more efficient by helping the least needy first and the most needy last.

b) P_a Class of Poverty Measure

This is a class of additively decomposable measures proposed by Foster, Greer and Thorbecke (1984). The poverty gap while providing a distributionally sensitive measure through the choice of a poverty aversion parameter a: the larger a is, the greater the weight given by the index to the severity of poverty. These parametric poverty measures satisfy Sen's three axioms and include factors that are sensitive to changes in inequality, income gap, and changes in the number of the poor.

The FGT Class of measures treats poverty as dependent on the poverty gap ratio, the parameter, a, entering as a power of that ratio:

$$P_a = \frac{1}{n} \sum_{i=1}^{qi} \left(\frac{gi}{z}\right)^a$$

$$= \frac{1}{n} \sum_{i=1}^{q} \left(\frac{z - yi}{z}\right)^a$$

$a = \geq 0$

n = total number of household

gi = poverty gap of the ith household

q = number of households below the poverty line

$\frac{gi}{z}$ = poverty gap ratio

FGT measures of headcount ratio

$$P_a = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{gi}{z}\right)^o = \frac{q}{n} = H$$

FGT poverty measures for GH: P_a is the headcount times the average income shortfall:

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{gi}{z}\right) = HI$$

This is the average poverty gap in the population, expressed as a proportion of the poverty line.

This measure takes into relevance the number of poor and the extent of their poverty but, does not take into relevance, the distribution of income among the poor.

However, the FGT poverty measure for $a \geq z$ is sensitive to the distribution of income among the poor and satisfies the main axioms for a desirable poverty measures including Sen's transfer axiom which requires that when a transfer is made from a poor person to a poorer person, the measure indicates a decrease in aggregate poverty.

Thus, the income gap ratios of poorer households weigh more importantly in the calculation of P_a than the income gap ratios of less poor households. This FGT measure is a preferable measure because "it has desirable properties and exhibits some consistency between the values that underline the measure and the values of the policy maker".

2.1.14 Conceptualization of Public – Private Partnership (PPP)

Public-Private Partnerships (PPPs) have often been analyzed from varied approaches by different fields of analysis. However, Spielman and Grebmer (2006) appropriately located PPPs within the realm of economics field of study thus; "in institutional economics, PPPs are

examined as a governance strategy designed to minimize the costs associated with contracting".

The scope of the term Public-Private Partnership (PPP) is often more specifically defined by specific legislations on PPPs within certain jurisdictions. However, certain elements are key to the concept. As explained by Dupre, Fallesi and Liveri (2011), PPP involves "an organized relationship between public and private organizations (which can involve partners at a national or international level), which establishes common scope and objectives, and uses defined roles and work methodology to achieve shared goals". In generic terms, PPPs according to the European Investment Bank (Kong 2004), explains the relationships formed between the private sector and public bodies often with the aim of introducing private sector resources and/or expertise to help provide and deliver public sector assets and services. Thus, the term PPP is used to describe a wide variety of working arrangements from loose, informal and strategic partnerships to Design Build, Finance and Operate (DBFO) type, Service Contracts and formal joint venture companies.

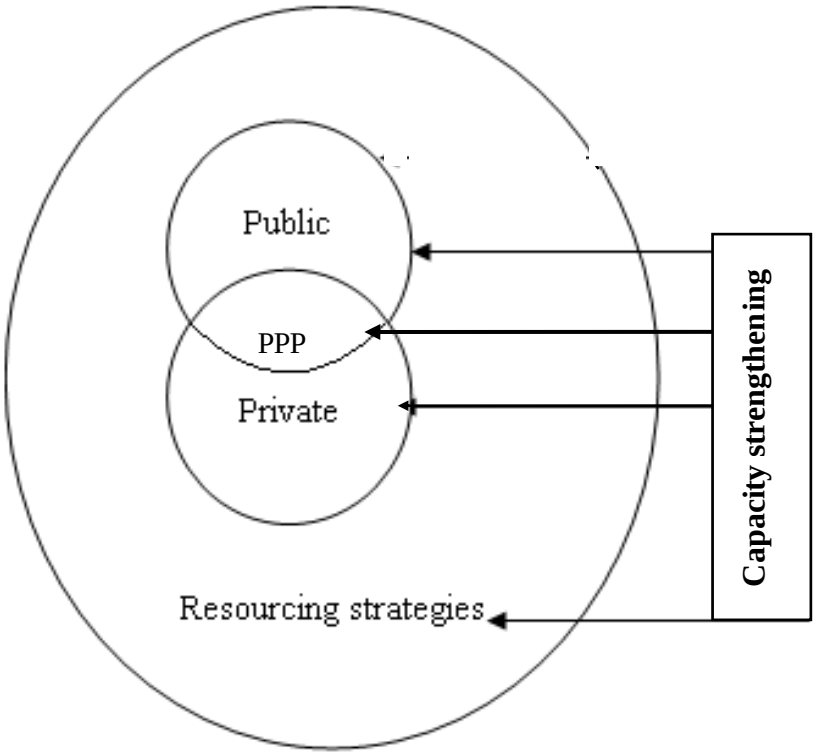
Lawther (2002), explains Public-Private Partnerships (PPP) as "relationships among government agencies and private or non profit contractors that should be formed when dealing with services or products of highest complexity in comparison to traditional contractor – customer relationships". The Asian Development Bank Institute (ADBI 2000) explains PPP as collaborative activities among interested groups, based on a mutual recognition of respective strengths and weaknesses, working towards common agreed objectives developed through effective and timely communication.

In its definition, the World Bank (1999) defined PPP as joint initiatives of the public sector in conjunction with the private (for-profit and not-for-profit) sectors, also referred to as the government, business and civic sectors. Each of the actors in the partnerships contributes resources (financial, human, technical and intangibles such as information or political support) and participates in the decision-making process.

Public Private Partnerships may be multi-national and/or multi-sectoral in scope. For instance, Dupre, Fallesi and Liveri, (2011) stated that, "a PPP can involve partners at a national or international (multilateral donor institutions) level and its focus may be thematic, sectoral or cross-sectoral." This is similar to Grimsey and Lewis (2007) that view PPP as "a risk sharing relationship based on a shared aspiration between the public sector and one or more partners from the private sector and/or voluntary sectors to deliver a publicly agreed

outcome and/or public service". In general, the term refers to forms of cooperation between public authorities and the world of business which aim to ensure funding, construction, renovation, management and maintenance of an infrastructure or the provision of a service (Lund-Thomsen 2007).

Fig. 2.4: Conceptual Framework of Public-Private Partnership



Source: Adapted from IFPRI (2007) Building Public-private partnership for agricultural innovation in Latin America: Lessons from capacity strengthening. IFPRI Washington DC, www.ifpri.org.

As demonstrated in fig 2.2, the (public and private) partners collaborate in partnership while operating within the space of innovation or resourcing strategies that give room for the adoption of the operational strategies that the partnership may best deliver on it objective(s). As further explained by IFPRI (2007), capacity strengthening, unlike capacity development or capacity building, implies the existence of some relevant capacity that can be strengthened.

At individual (Public or Private) level are the skills, competencies and resources of the individual partners. At entity level, an individual organisation's structures and working mechanisms, its relationship with other relevant organizations and the management of relationships among the distinct organizations and sectors (public, private and community). At the strategy or systems level, regulatory framework and enabling regional and national policies including institutional development and legal frameworks and modification of legal and regulatory mechanisms to enable organizations, institutions and agencies at all levels and in all sectors to enhance their capacities.

In the view of Ferroni and Castle (2011), public-private partnerships can take a variety of forms and are not limited to bilateral collaborations between a government agency and a private corporation. In particular, Ferrroni and Castle (2011) explained that public-private partnership for sustainable agricultural development can also include, for instance, multi-partner structures that bring together private companies with entities such as Non-Governmental Organizations, Universities/Research Institutes and foundations. Accordingly, the conceptualization of public-private partnership in agricultural development in this study takes this broad view and many other possible combinations.

The goals of the international donor agencies according to the IFPRI (2008) document, is to contribute to the economic and social development of developing countries which emphasis the mitigation of poverty. Also of importance is the fact that, most of the international organisations have, of recent began to introduce private sector development policies that stress the private sector's role in complementing public sector investment.

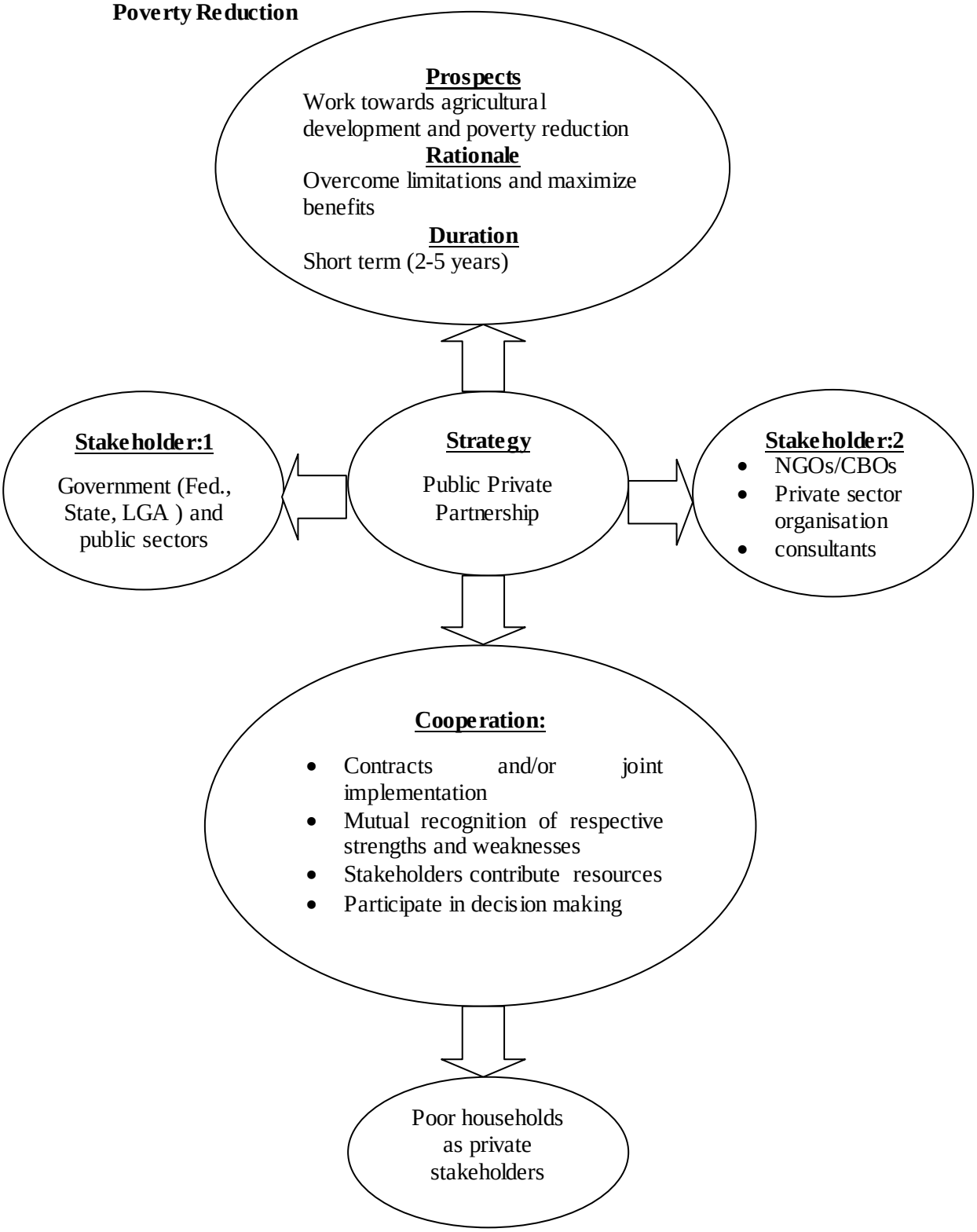
Public-Private Partnership incorporates both formal and informal relationships. According to Warner, et al (2008) a more expansive definition of PPP is one involving 'the idea of the informal "pooling" of financial and in-kind resources, of sharing risk (rather than transferring risk) and of achieving mutual "win-win" benefits'. In this regard, the World Economic Forum views the core concept of PPP "as one involving business and/or not-for-profit civil society organisations working in partnership with government agencies, including official development institutions and entails reciprocal obligations and mutual accountability, voluntary or contractual relationships, the sharing of investment and reputational risks and joint responsibility for design and execution.

The more informal PPPs aim at finding the optimal combinations of the respective strengths of addressing specific or persistent challenges to sustainable development. These take many

forms including combinations of private (for-profit and not-for-profit) and public parties (public services or public companies) as well as international donors and the philanthropic arms of multinational corporations, based on voluntary or contractual agreements. In the manner adopted by the World Bank Public Private Infrastructure Advisory Facility (PPIAF) international donors (both those which lend or make grants to governments, and the bilateral and multilateral development finance institutions such as the international finance corporations) has been included in the term "public sector" Warner, et al (2008).

However, Warner, et al, (2008) view the informal Public-Private Partnerships as most relevant to agricultural development where the not-for-profit element (farmers cooperatives) are incorporated in the project to improve access and affordability for smallholder farmers either through improved design or less risky operations. These concepts in particular, reveal the flexible structural arrangement that PPPs can take to achieve agreed outcome.

Fig 2.5 Conceptual Model of Public Private Partnership in Agricultural Development and Poverty Reduction



Adapted from Khanon (2011): Partnership for Development: Alternative approaches to poverty alleviation in Bangladesh.

According to Tamrakar (2008), modalities for PPPs may be different depending upon the nature of the services and sectoral requirements. PPP in agricultural development will require specific

considerations different from other sectors and activities. PPP in agriculture aims to achieve agricultural development approach through private sector driven development strategy.

The emergence of PPPs in agricultural development came on the heels of growing fiscal constraints and limited public sector capacity as well as the complexity and heterogeneity scenarios arising from both sectors (Tamrakar 2008). Therefore, according to Mbanasor and Nwachukwu, (2012), the PPP model is anticipated to improve efficiency in the polity, reduce public capital investment, and entrench risk sharing and delivery of quality projects and the result of PPP collaborations suggests that such collaborations are an important step towards achieving the Millennium Development Goals (MDGs) (currently, Sustainable Development Goals, SDGs), "particularly the goals of eradicating extreme poverty and hunger and developing a global partnership for development".

The sectoral involvement in Fadama is justified by PDSSP (2008), which explains that, partners in a PPP are government entities including ministries, departments, municipalities or state-owned enterprises. The private partners can be local or international and may include private businesses, Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs). According to De Vries et al (2005), the private sector includes farmers and all entities involved in crop, livestock and fish production and marketing and in post harvest activities and food processing and in supply chains for goods, services and information used in the process.

Thus, "PPPs in agricultural development can include multi-stakeholders that bring together public entities with private companies, Non Governmental Organisations (NGOs), University Research Institutes or foundations" (Loriente, 2015). In other words, what constitute PPP is defined mainly by the contract between the partners involved (in this case, public and private partners). As pointed out by Brinkerhoff and Brinkerhoff (2011), in the development of PPPs in agriculture "International donors are a major source of support, and partnerships can take the form of loose knowledge networks, organizational twinning, Memorandum of Understanding (MOUs), or formal contract."

In Nigeria, the idea of Public Private Partnership-driven agricultural development as a preferred alternative framework for agricultural development is also gaining popularity. For instance, Lalong (2016) reported by NAN (2016) declared that "government was leveraging on the benefits of public and private sector investments through partnership to achieve the goal of diversifying its economy to agriculture".

In particular, the key areas of Public Private Partnership intervention in agriculture include;

i. Research and Extension Services; Evidence abound in the literature showing that research is essential for the improvement of agricultural production and sustainability while building capacity. The acquisition of skills for inputs use, for instance, has the capacity to stimulate demand for inputs and consequently unleash a private sector inputs market (Kelly et al. 2003).

   Exchange of knowledge, that is; establishment of links between agricultural and agribusiness specialists, consumers and producers and, between farmers' needs and local conditions and researchers is encouraged (IEG 2011).

   Assistance through farm-extension services offered through extension agents helps in training farmers in areas like soil and crop management, use of inputs, skills and knowledge for best practices, etc. which can help to "expand the social capital within and between institutions and communities in the food supply chain" (Foresight 2011). According to IEG (2011) "investment in research, extension services and (road) infrastructure has some of the largest returns to agricultural growth and poverty reduction" and, the "public and private sectors have complementary roles that need to be co-ordinated".

ii. Provision of markets and agribusiness: these are essentially integral to the success of agricultural and rural development initiatives. These enables "farmers to get connected to inputs/output markets and economic opportunities" (Loriente, 2015).

iii. Supports creation of producer organizations: the development of co-operative enterprises and Non-Governmental Organisations (NGOs), associations, private limited companies or informal network of producers made possible through the PPP initiative, can empower small scale producers and enables costs and risks sharing, access to better market information and enhance collective negotiations and bargains (of say, agricultural inputs, insurances, fee collection, etc.) for the farmers.

iv. Enhance Rural Infrastructure and Public Services: physical infrastructure and services such as roads, storage facilities, irrigation systems, Information and Communication Technology (ICT) systems, among others, are essential to the development of agricultural sector. Even the local population, according to Loriente (2015), "needs basic services such as child care, schools, health centers, clean water" and sanitation, etc.

Oxfam (2014) has categorized three basic levels of public private partnership in agriculture as demonstrated in Table 2.3., in terms of scale, typical aims and key examples.

Table 2.3 Levels of Public Private Partnerships in Agriculture

Scale	Typical Aims	Examples
Mega or macro level	Changes in economic, legal and regulatory policies to ensure that conditions exist for the private sector to develop increases in domestic and FDI improvements in agricultural productivity/job creation	Growth corridor model of agricultural development.
Meso level	Making markets work for the poor, providing grants or non recourse loans to further business ideas that could have a true impact on poor people	Integrating farmers into local, national or international value chains.
Micro level	Reducing risk for small holder farmers and improving livelihood options. Transferring technology to farmers	Micro finance arrangements. Micro insurance. Women's economic empowerment activities to link women to credits and markets.

Source: OXFAM (2014) adapted from S. Kinomay and F. Reily-King (2013) "Investing in the business of development: Bilateral Donor Approaches to engaging the private sector, North-south institute and the Canadian Could for International Cooperation.

There is no common definition of Public Private Partnership in Agriculture – they differ in scale, aim and the actors involved and structural arrangements. In general, public private partnerships are usually defined in terms of joint planning, joint execution and the sharing of costs, risks and benefits between partners in a particular project. Sometimes they are defined to include any collaboration arrangement between public, private not for profit actors or institutions to address a specific developmental issue.

Typically, PPP is tailored to meet desired purpose(s) or objective(s). Table 2.4 illustrates, for instance, the desired purpose and framework for purpose achievement through PPPs

Table 2.4: Framework of PPP according to purpose to be achieved

DESIRED PURPOSE	FRAMEWORK FOR ACHIEVEMENT
Infrastructure	Bring together governments and the private sector to finance, build and operate Infrastructure such as Ports, Highways, Telecommunications, Electric power generation.
Capacity Building	This focuses on helping to develop the skills, systems and capabilities that allow organizations targeted for assistance to help themselves.
Economic Development	Involving cross-sectoral collaborations that promote economic growth and poverty reduction
Service Delivery	Places responsibility on governments for financing and payment, while sub-contract service provision to the private and/or non profit sectors.
Policy	To design, advocate for, co-ordinate or monitor public policy.

Organised from Brinkerhoff and Brinkerhoff (2011).

As observed by Khanom (2011), Public Private Partnerships (PPPs) for poverty reduction can be initiated at any level by different stakeholders "including central governments, local governments, private actors, business organizations, NGOs and even community groups." According to Khanom (2011), PPPs can also be initiated by private organizations or International organizations, stressing that international organizations also play crucial roles in initiating pro-poor PPPs.

2.1.14.1 Contribution of ("Public" and "Private") Stakeholders in Public-Private Partnerships

The categorization of what constitute public and private sector contributions in this study follows mainly the pattern of IFPRI (2008). Hence;

a) Private Sector Contributions:

These are contributions by private companies and service providers, Individual producers and farmers, and other associations. Majorly, farming practices are considered as private activities. According to Loriente (2015), "farmers and small holders have a role as entrepreneurs, and as such, could be considered as private sector". Private sector, as further explained by Loriente (2015), is comprised of "many different stakeholders with different profiles" including "self-employed people, micro-businesses, Small and Medium Enterprises (SMEs), large Multinational Companies (MCs), co-operatives, and other social economy business, financial institutions, employees and their trade unions and Non-Governmental Organisations (NGOs) collaborating in private projects". The participation and contribution of private sector from donor countries in developing activities in the recipient countries could be by the provision of services and equipment.

b) Public Sector Contributions: these are funds contributed by the different levels of government (Federal, State, Provincial or Municipal). Also, following Warner, Kahan and Lehel (2008), International Donors, both those which lend or make grants to governments and the bilateral and multilateral Development Finance Institutions (DFIs) such as the International Finance Corporations (IFCs) are included in the term "public sector".

According to the IFPRI (2008), public funding is generally assigned to ministries and departments responsible for agricultural development. The funding can also be assigned to parastatals, organisations, public research institutes and universities. The use of the funds is however, subject to government oversight and accountability rules, especially with employee salaries and infrastructure maintenance in government institutions. Similarly, the IFPRI (2008) document further states that, multilateral donor institutions (such as the World Bank, European Union) channel development funds through specifically-developed government programmes involving state agencies and ministries. Funds are also said to be obtained

through bilateral development co-operative agencies which target specific development problems prioritized by the agencies.

2.1.15 Public-Private Partnership in Cross River State

According to the Cross River State Government policy document on PPP, the state government needs to invest in the development of physical and social infrastructure of the state so as to promote the social and economic wellbeing of its citizens and to support a diversified and sustainable economy.

However, in common with the Federal and other state governments of Nigeria, as stated in the state policy document, the poor quality and unreliable nature of public services impose higher costs on businesses and households in the state. This reduces the potential for economic growth estimated at 2 per cent yearly, according to Word Bank (2009) cited in the policy document. Most recently, the exit of the state as an oil producing state has had an immediate negative impact on the revenue inflows of the state thereby, creating a huge funding gap.

The PPP transaction in Cross River State is not operated in isolation. According to the state PPP policy document, the state has ensured that there is a consistency of approach between federal and state PPP policies as they evolve.

The setting up, by law (Law No.6, 2010), of the Cross River State PPP council to coordinate PPP initiatives in the state is perhaps, a strong indication of the growing importance of this development strategy. According to the law, there is established for the state a partnership initiative between the public sector and private partners for the planning, financing, developing, constructing, providing, operating and maintaining of infrastructure and supply of goods, services and facilities in the state.

The government of Cross River State has accordingly conceptualized Public-Private Partnership as a form of contracting for public works or services where a private supplier is responsible for providing series of service outputs to a defined standard, rather than simply designing and constructing the underlying asset.

The PPP programme in Cross River State shall among others, focus on the following key objectives, as contained in the state PPP law (Law No.6, 2010) and policy document;

a) Facilitate private sector investment in the provision of new and rehabilitated infrastructure and other public assets;
b) Enhance the employment generation potential and diversity of the state economy;
c) Act as a catalyst for the implementation of the state economic blueprint, the state vision 2020 document and subsequent socio-economic initiatives;
d) Develop more reliable public services by deploying private sector skills in project financing, risk management, project planning and the use of new technologies and thus ensure greater value for money in the provision of public infrastructure and services
e) Release financial resources for investment in necessary social services;
f) Strengthen institutional governance in the state by improving public sector management skills and accountability in the construction, rehabilitation and provision of infrastructure and services in the state and;
g) Provide a clear, transparent, and well defined legal/regulatory and institutional framework for enhancing investment by, and transferring project risk in providing infrastructure and services in the state to the private sector.

2.2 Theoretical Literature

2.2.1 Agricultural Innovation System (AIS) Model

The Agricultural Innovation System (AIS) approach of the World Bank (World Bank 2012) gingered greater interest on modern innovation and technological advancements in agricultural development. This (AIS) approach as explained in Xing (2015), view Innovation and Technology (I&T) in agriculture as "essential to reducing poverty, fostering development and stimulating economic growth in many developing countries".

2.2.2 Integrated Rural Development (IRD) Model

The IRD model is contained in the Comprehensive Development Approach (CDA), (World Bank, 1981; 1989). The IRD as a concept pre-supposes that actions must be taken on various fronts at the same time towards the eradication of rural poverty and underdevelopment (Girigiri 2000). The IRD model, as a strategy has gained wide appeal in the developing countries and it is widely upheld and favoured by International Development Agencies (IDA) and donors (such as World Bank, UNDP). The integrated approach of the IRD Model seeks to develop all sectors of the rural economy and effectively link them to the urban economy. The strategy seeks to promote linkages not only between formal and informal sectors but also

farm and none—farm activities. This development strategy therefore, seeks to integrate the rural sector into the economic mainstream.

2.2.3 Theoretical Foundation of Public – Private Partnership

The theoretical foundation of the concept of PPP is traceable to Leibensten (1966) theory of X-efficiency (Hammani 2006).The key idea behind the theory is that, public institutions or enterprises cannot fail as long as official financial and monetary policies are expansionary enough to bail them out or at least limit their probability of failure. Given that inefficiencies in public institutions result from both distortionary government interventions as well as highly bureaucratic state organizational structures, PPPs are necessary to reduce the X-efficiency in public organizations and allow them to respond to market forces and become more competitive. These inefficiencies in the public sector led to the emergence of the "New Public Management" (NPM) in the early 1980s (Hammani et al 2006).

A key goal of the NPM innovation was to introduce into public administration the functioning principles of private firms. Hence governments have over the years come to view PPPs as alternative or complementary ways to finance and manage complex infrastructure projects. According to Khanom (2011), the idea of NPM (begun by some developed countries particularly Britain in the Thatcher years) was a rethinking of the role of the state in development. This new thinking encouraged the introduction of market principles into government and promoted private sector practices as the new development paradigm for governments. This idea has spread around the world and has had tremendous impact in terms of encouraging new thinking by governments around the world to the role and operation of governments in services provision.

2.2.3.1 Thrusts of Public-Private Partnership in Agricultural Development and Poverty Reduction

Literature mostly relates Public-Private Partnerships (PPPs) to large scale infrastructural projects. However, modern application of PPPs now transcends the traditional boundaries of infrastructural projects (Loriente, 2015). Modern examples of PPPs do not only include; infrastructure, tertiary education, road management, etc. but, according to Ferroni and Castle (2011) there is also growing realization of the value of PPP in agriculture and particularly for projects that benefit poor farmers in developing countries. Henson (2011), puts it thus; "PPPs

are presented as 'win-win' initiatives that can achieve desired objectives more effectively than established and/or alternative means in the scope of agribusiness".

The New Partnership for African Development (NEPAD) aptly set the stage for the recent increasing interest in the new policy thrust (partnership) for agricultural sector development and poverty reduction based on the premise that agricultural partnership could act as a catalyst for broader rural development; creating jobs outside of farming in both service and production sectors (EIU 2013).

NEPAD was set up in 2001 by the African Union (AU) to, among others; find new African-led approaches to growth, development and co-operation in the agricultural sub-sector. The first sign of change in this regard came through the AU pan-African agricultural strategy of 2003.

According to the EIU (2013) the AUs Comprehensive African Agricultural Development Programme (CAADP) aimed to get signatory African countries to commit to increasing public investment in agriculture to 10 per cent of their national budgets and to raise agricultural production by 6 per cent a year. It was however, realized that this was not going to raise productivity, bring food security or take rural people out of poverty. It thus became clear that governments alone could not solve the problem of the agricultural sector, leading to the declaration, at the time, that "governments are rethinking what the public and private sectors can do best and what role aid organisations can best play".

The role of donor organisations and Non-Governmental Organisations (NGOs) within these partnerships is also shifting. The role of aid is being redefined. For instance, one key role that has emerged in the GrowAfrica project, which is a platform set up in 2012 by NEPAD, the AU and the World Economic Forum to facilitate Public-Private Partnership in agriculture within the framework of CAADP, as cited in the EIU (2013), is the provision of "catalytic finance" to overcome the lack of financing for scaling up successful agricultural schemes.

The agricultural sector in Nigeria and most other developing countries often remains far below it potential. Many reasons account for this. For instance, Ferroni and Castle (2011) observed thus:

i) Farmers lack access to technology, adequate extension services and proper market integration;

ii) Traditionally, the public and private sectors have attempted to provide solutions independently from each other;

iii) Public sector initiatives have (partially) crowded out private initiatives and thus resulted in a general neglect of tailor-made solutions for farmers;

iv) Isolated approaches are therefore, unable to cope with the challenges of the 21st century, notably the achievement of the farming-related Millennium Development Goals (MDGs), now Sustainable Development Goals (SDGs).

Hence the need for public and private sectors' collaboration to overcome these challenges and enhance the economy. According to Bulbula (2012), as a way of addressing rural advisory services problems, government and donors, have in the recent past put a lot of emphasis on research. But that most of these research outcomes were not transferred to farmers because of poor link between researchers and farmers, a gap intended to be bridged by the application of PPP strategies.

According to the report by Bulbula (2012), the recent past also showed that it is very difficult to concentrate all agricultural issues on one single national organization; hence the thinking now is more towards pluralistic systems which involve as many types of services as possible such as the private sector, Non Governmental Organisations (NGOs), and associations. As summarized by Eshetu (2012), the global trend has now changed towards PPP and pluralistic approaches in agricultural development. Partnerships need to raise funding, pool expertise and to have an impact.

According to the EIU (2013) the past few years have seen policy makers, donors and businesses groping towards unusual but potentially revolutionary partnerships intended to create efficient end-to-end supply chains which embrace subsistence farmers rather than exclude them. There is thus, a mechanism for businesses to start getting involved in the development of agriculture. As argued by Spielman and Grebmer (2004), when structured appropriately, these partnerships can generate significant benefits for private firms and public institutions while also serving the interests of resource-poor or vulnerable households in developing countries. The starting point is recognition of the contribution that each sector can bring to the partnership.

These new (partnership) approaches to agricultural development and poverty reduction are varied. In Tanzania for instance, the Southern Agricultural Growth Corridor (SAGCOT) combines the Tanzanian government and farmer organisations with dozens of international

and domestic companies and development organizations to invest in agriculture, create rural jobs and produce enough food to export to the regions and even around the world (EIU 2013).

According to Mbanasor and Nwachukwu (2012), food insecurity is a critical challenge in Nigeria's development effort, and, the role of PPP in agricultural development cannot be under estimated. In a similar view the World Bank (2009), posits that, there are ways in which the public and private sectors can collaborate to complement each other in helping to eradicate hunger and poverty and meet the Millennium Development Goals targets and to improve agricultural sector outcomes and, "enable multi-stakeholder partnerships and expand knowledge of best practices", GrowAfrica, (2012).

2.2.3.2 Public Private Partnership and the New Development Agenda

2.2.3.2.1 Sustainable Development Goals (SDGs)

The SDGs (www.sustainabledevelopment.un.org) contained in the new agenda for sustainable development, provides a framework for the execution of the agenda. The SDGs seek to build on the Millennium Development Goals (MDGs) and complete what was not achieved by the MDGs, however, the SDGs' framework is far beyond the MDGs in scope. Though continuing with (agricultural) development priorities such as food security and nutrition, as well as poverty eradication, the SDGs sets out a wide range of economic, social and environmental objectives, and, most essentially, defined means of implementation reflecting the integrated approach of the agenda.

Key issues in the new agenda highlight the concern of world leaders on the threat posed by the challenges of hunger and poverty and the development thrust to address these concerns. In particular, the new agenda is a commitment to;

a. Ending poverty in all its forms and dimensions, including by eradicating extreme poverty by 2030. Through the agenda, world leaders commit to "devote resources to developing rural areas and sustainable agriculture and fisheries, supporting small holder farmers in developing countries."
b. Determination to end hunger and, as a matter of priority, achieve food security and end all forms of malnutrition
c. Adopt policies which increase, among others, sustainable agriculture, pastoralist and fisheries development

d. A commitment to making fundamental changes in the way society produces and consumes goods and services. In this regard, governments, International organizations, the business sector and other non-state actors must contribute, including through the mobilization, from all sources, of financial and technical assistance to strengthen developing countries capacities to move towards more sustainability in patterns of consumption and production.

It is pertinent to note that, the first two of the SDGs and targets concerns poverty and, hunger and promotion of sustainable agriculture, thus confirming the underlying nature of these issues in contemporary human development. Key among the goals includes, to;

i. End poverty in all it forms everywhere
ii. End hunger, achieve food security and improved nutrition and promote sustainable agriculture, other goals and include;
iii. Ensure healthy lives and promote wellbeing for all ages
iv. Ensure sustainable consumption and production patterns
v. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

Following from goal 17 of the SDGs that stresses partnership as an implementation strategy, the agenda thus; further elaborates multi-stakeholder partnership and particularly the agenda aims to;

a. enhance global partnership for sustainable development, complemented by multi-stakeholder partnerships for the mobilization and sharing of knowledge, expertise, technical and financial resources to support the achievement of SDGs particularly in developing countries
b. encourage and promote effective Public, Public-Private and civil society partnerships, building from the experience and strengths of partnerships

Thus, the revitalized global partnership will "bring together Governments, Civil Society, and the Private Sector, the United Nations (UN) system and other actors and mobilizing all available resources."

In mainstreaming the SDGs, world leaders recognized the fact that "eradicating poverty in all it dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development". The plan called for "collaborative

partnership" of all countries and all stakeholders for its implementation. The resolve in the SDGs is, "between now and 2030, to end poverty and hunger everywhere." (www.sustainabledevelopment.un.org)

2.2.3.2.2 Means of Implementation of the New Development Agenda

The means of implementation of the agenda of the SDGs underscores the emerging global importance and reliance on partnership as a development strategy. In particular;

i. The scale and ambition of the new agenda, requires a revitalized global partnership to ensure implementation. The partnership will facilitate an intensive global engagement that brings together governments, the private sector, civil society, the United Nations system and other actors and mobilizing all available resources.
ii. The agenda highlights the important role of International public finance in complementing the efforts of countries to mobilize public resources domestically, especially in the poorest and most vulnerable countries with limited domestic resources. "An important use of International public finance, including Official Development Assistance (ODA), is to catalyze additional resources mobilization from other sources, public and private."
iii. According to the plan, the call for action (on the journey to 2030), for the realization of the objectives of the SDGs "will involve governments, United Nations system and other International Institutions, local authorities, Indigenous peoples', civil society, business and the private sector, the scientific and academic community."

Table 2.5: Country-Case Studies of PPP in Agricultural Development

Country	Ghana
PPP Typology	Value chain/subsector development
Subsector and commodity	Oil Palm
Partnership duration	2006 – 2011
Overall objective	Improve the oil palm industry
Investment	Public: USD 1.6m; Private: In kind
Public partners	Ministry of Food and Agriculture (MOFA) Role: Guarantee fund; program design; M & E. National Investment Bank; Agence Francaise de Development (AFD); Kreditanstolt fur wiederanfban (KFW) Role: Finance National Development Bank Role: Management of guarantee fund
Private partners	Twifo oil palm plantation limited.

Table 2.5 Continued

	Role: Provide seedlings and training
Beneficiaries	928 farmers
Main driver	MOFA
Activities	Development of oil palm cultivation, provisions of loans and training on agronomic practices.
Results	Improved farmers' standard of living. Reinforced the use of tenera variety.

Country	Ghana
PPP Typology	Value chain/sub-sector development
Subsector and commodity	Rubber
Partnership duration	2010 -
Overall objective	Rehabilitate the distressed rubber estates
Investment	Public: USD 37m; Private: in-kind
Public partners	Ministry of food and Agriculture (MOFA) Agricultural Development Bank of Ghana (ADB) Role: select partners; provide loans; educate and inform farmers on their debit situation; ensure the follow up of the loans; monitor debt situation AFD; KFW Role: Finance
Private partners	Ghana Rubber Estate Limited Role: Technical Assistance; Inputs Supply; Buy farmers' product; Administrative functions; Extension services; Training; Conduct inspections; Hold meetings. Rubber Farmers Association Role: Transform the farmers into a major stakeholder in the rubber industry; promote the economic and social interests of its members, set up services for its members.
Beneficiaries	1,750 farmers
Main driver of PPP	MOFA
Activities	Development of rubber trees plantation; Provision of loans and training to farmers.
Results/Impacts	Improved farmers' standards of living (farmers are able to send children to school, build decent houses, afford good medical care, and access extra credit from banks). Farmers training. Improved profitability by 30 per cent.

Table 2.5 Continued

Country	Kenya
PPP Typology	Value chain/subsector development
Subsector and commodity	Mango processing
Partnership duration	2006 – 2008
Overall objective	Promotion of Mango marketing and value addition/sector development
Investment	Total: USD 233, 411m (Public: 46 per cent; others: 8 per cent)
Public partners	Ministry of Agriculture Role: Harvesting, post harvest handling and marketing training German Technical Co-operation (GTC) Role: Fund Training, equipment, packaging materials, collection centre and personnel. Kenya Federation of Agricultural producers (NFAP) Role: Organize farmers into farmers' groups and associations; training; assist farmers drawing up business plans; networking farmer groups with other stakeholders.
Beneficiaries	Small scale mango farmers
Main driver	GTZ
Activities	Implementation of fruit value addition activities; Development of mango value chain intervention strategy (for domestic, regional and overseas markets).
Results/Impacts	Increased farmers' income by an average of 42 per cent.

Country	Uganda
PPP Typology	Value chain/sub-sector development
Sub sector and commodity	Sunflower
Partnership Duration	2007-
Overall Objective	Increase productivity and profitability of sunflower production through farmer organizations and linking farmers to markets
Investments	Total: USD 12m (Public: 3 per cent; Private 77 per cent; others: In-kind)
Public Partners	National Agricultural Advisory Services (WAADS). Role: Extension Services; M & E.
Private Partners	Mukwano Group of Companies
Beneficiaries	Small scale farmers
Main Driver of the PPP	Government of Uganda; Mukwano Group of Companies
Activities	Support farmers access to better technologies (such as improved seed varieties, farm machinery, etc); Provision of

Table 2.5 Continued

	training to farmers.
Results/Impacts	250 farmers trained; Increased output; Increased farmers income
Nigeria:	
Country	Nigeria – Enugu State Government
PPP Typology	Innovation and Technology transfer
Sub-sector and Commodity	Sustainable Integrated Farming
Partnership Duration	2009-
Overall Objective	Increased food security; train young agribusiness entrepreneur, develop local infrastructures, provide employment for rural people and offer improved and sustainable agriculture.
Investment	Total: USD 1m.
Public Partners	Enugu State Government Role: Fund training; Enabling environment; Offer land; Equipment and Services; credit guarantee; M & E. Food and Agricultural Organization (FAO) of the UN International Fund for Agricultural Development (IFAD); International Labour Organization (ILO); United Nations Development Programme (UNDP); United Nations Industrial Development Organization (UNIDO); Role: Advisory Services; Technical Support. World Bank Role: Provide soft loans and grants
Private Partners	Songhai Centre Role: Facilitate and support the establishment of a regional centre of excellence for agribusiness and entrepreneurship development in Africa; Technical assistance; Equipment and Services.
Beneficiaries	Young Rural Farmers
Main driver of PPP	FAO, IFAD, ILO, UNDP, UNIDO, Enugu State Government, Songhai Centre.
Activities	Establishment of a regional centre of excellence for agribusiness and entrepreneurship development in Africa; provision of training courses for young entrepreneurs.
Results/Impacts	Increased productivity; Increased food supply; Improved employment-intensive revenue yielding capacity.

Organised from: FAO (2013) Agribusiness and Public Private Partnership (PPP)-Country case studies, Africa. Rome.

2.2.4 Models of Public-Private Partnership (PPP)

Literature on Public-Private Partnerships (PPPs) is still diverse on the different forms that PPPs can take. However, "Which model and type of partnership developed will depend on the partners, specific contexts and needs", Loriente (2015).

As stated in Feroni and Castle (2011), PPPs are not limited to a bilateral collaboration between a government agency and a private corporation. Rather a wide spectrum of models has emerged and indeed continues to emerge in the PPP literature. UNESCAP (2011) indicate that these models vary mainly by:

a) Ownership of capital assets;
b) Responsibility for investment;
c) Assumption of risks; and
d) Duration of contract.

The range of selected Public-Private Partnership models can be summarized as contained in table 2.5. It is worthy of note that each of these categories has many variants. However, many PPP projects of recent times are of combination type involving more than one variant.

Table 2.6: Range of Public Private Partnership (PPP) Models

PPP Type	Key Features
Design-Build (DB) or "Turnkey" contract	The private sector designs and build infrastructure to meet public sector performance specifications often for a fixed price, so the risk of cost overruns is transferred to the private sector.
Service contract (example, specific customer services)	A private operator, under contract, operates a publicly-owned asset or provides a service such as equipment procurement for a specified term.
Management Contract	A private entity contracts to management, a government-owned entity and manages the marketing and provision of a service.
Lease and Operate Contract	A private operator contracts to lease and assume all management and operation of a government-owned facility and associated services and may invest further in developing the service and provide the service for a fixed term.
Concessions	Gives the private operator full responsibility for both operation and asset maintenance as well as financing and managing investment over a long period of time (25-30 years). However, final ownership of assets rests with the public authority (Government) and full rights of the assets reverts to the public authority at the end of the contract period.
Design-Build-Finance-Operate (DBFO)	The private sector designs, finances and constructs a new facility under a long-term lease, and operates the facility during the term of the lease. The private partner transfers the new facility to the public sector at the end of the lease term.
Build-Operate-Transfer (BOT)	A private entity receives a franchise to finance, design, build and operate a facility (and to charge user fees) for a specified period of time after which ownership is transferred back to the public sector.
Buy- Build-Operate (BBO)	Transfer of a public asset to a private or quasi-public entity usually under contract that the assets are to be upgraded and operated for a specified period of time. Public control is exercised through the contract at the time of transfer.
Build-Own-Operate (BOO)	The private sector finances, builds, own and operate a facility or service in perpetuity. The public constraints are stated in the original agreement and through on-going regulatory obligation.
Finance Only	A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as long-term lease.

Source: Canadian Council for PPP

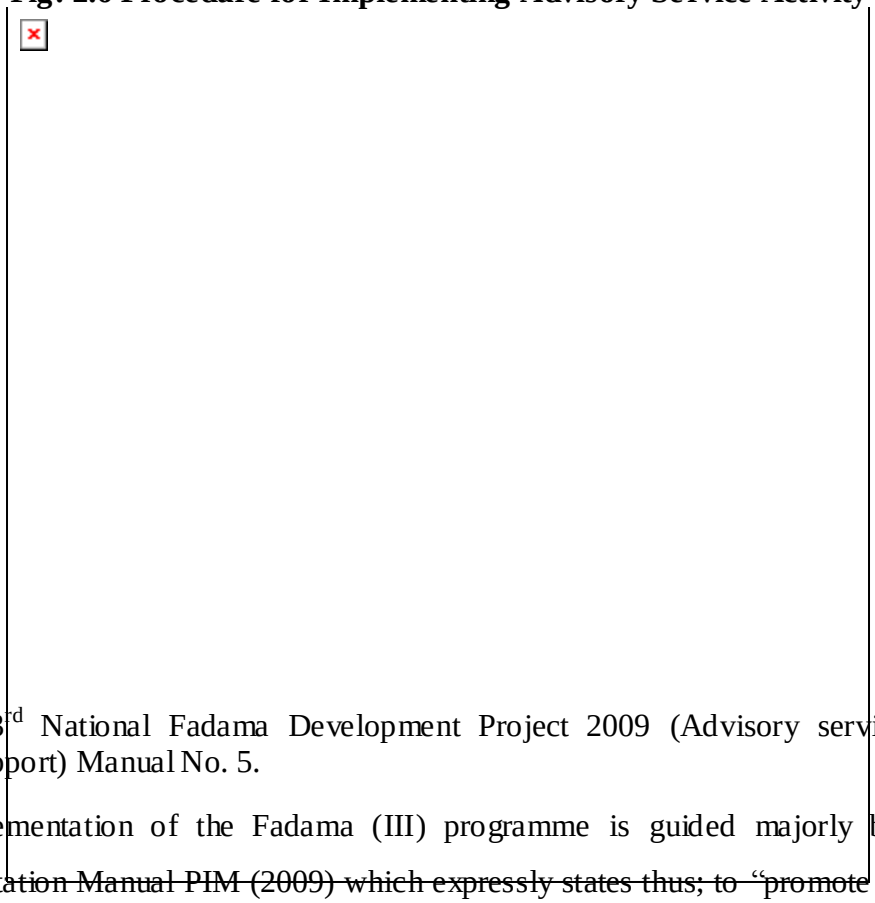
2.2.4.1 Operational Models of Public-Private Partnership in Fadama III and Songhai Schemes

(a): Operational model of PPP in Fadama III scheme

From the literature, it is obvious that the Service Contract (a variant of Management Contract) model best explains the operational PPP framework under the Cross River Fadama III scheme. According to Spielman and Grebmer (2004), Management (or Service) contract

allows private sector skills to be brought into service design and delivery (including capacity building), operational control, labour management and equipment procurement. The public sector retains ownership of the facility and equipment. The private sector is paid a fee to manage and operate services. Normally, payment of such fees is performance-based. The contract period is short, typically 2-5 years. This is also in line with Brinkerhoff and Brinkerhoff (2011) that explains Service (Management) Contract as, specific services provided by the private sector to the public utility, while the public sector retains overall operational (it can be management support) responsibility. Variants of management contract include; Supply or service contract, maintenance management, and, operational management.

Fig: 2.6 Procedure for Implementing Advisory Service Activity



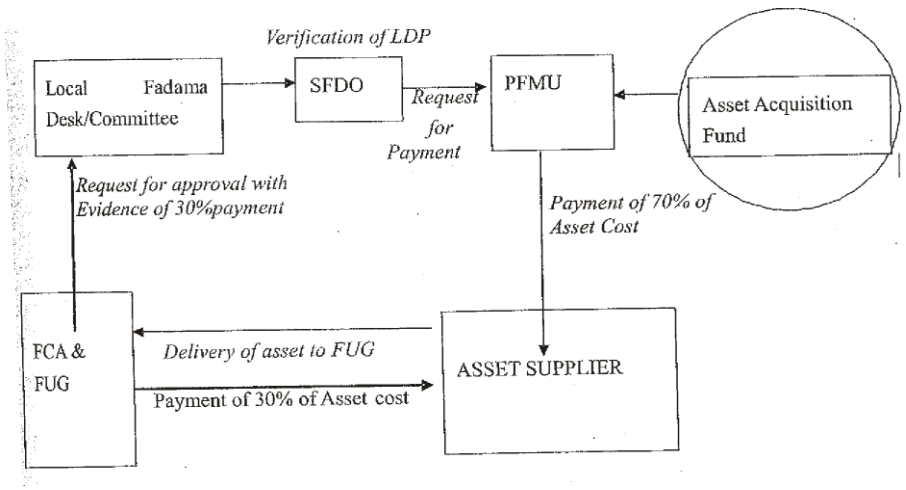
Source: 3rd National Fadama Development Project 2009 (Advisory services and input support) Manual No. 5.

The implementation of the Fadama (III) programme is guided majorly by the Project Implementation Manual PIM (2009) which expressly states thus; to "promote partnerships in rural development, the (Fadama III) project will enhance the contracting of professional public and private support services required for implementing demand – driven productive and income generating sub-projects and advisory services and activities". Thus, the partnership arrangement is by contracting system. "The private sector is contracted in the areas of Research, Consultancy and Facilitation, and, as Service Providers." As observed by De Vries et al (2005), Public-Private Partnership arrangement by definition is a contract

between a public client and a private service provider which, according to the Fadama III Project Information Document, (PID 2009), would permit the poor to access improved productive infrastructure, capital assets and appropriate financial services. Patrinos (2009), explains contracting as a process whereby "a government procures needed services of a defined quality and quantity at an agreed price from a specific provider. The agreement between the funder and service provider is recorded in a contract and is valid for a specified period of time."

Indeed, the partnership design involved in Fadama III follows from IFPRI (2014) thus; "PPPs in agricultural innovation in developing countries often include agricultural research institutes, extension agencies, universities, producer organizations, farmer associations, co-operatives, local governments, as well as many other entities"

Fig 2.7: Fadama III – Funds Flow for Assets Acquisition



Source: 3rd National Fadama Development Project (Asset Acquisition) Manual NO. 8

The World Bank (2003) states that, services can be provided to poor people most successfully when citizens, service providers and governments are accountable to each other. Contracts can improve service delivery by clearly assigning responsibilities among these actors, identifying objectives and outputs, and gathering information on the performance and progress of the contractor and ensuring the enforceability of the provisions of the contract.

(b): Operational Model of Public Private Partnership in Songhai Cross River Initiative

In theory, the Design Build or "Turnkey" contract best captures the PPP design for the Cross River Songhai Initiative. In this arrangement, the private sector designs and build infrastructure to meet public sector performance specifications often for a fixed price. In practice, however, it is common to find elements of other partnership types in Songhai operation. For instance, the Songhai contract has a provision for post-delivery consultancy which is an element of service contract. From the literature therefore, contracting is key in Public-Private Partnership arrangements.

2.2.5 Impact Assessment Models in Public Private Partnership

In the view of DANIDA (2007), partnerships between the private sector and public/ non profit institutions are portrayed as having measurable benefits and results accruing to all partners involved and in the "principle of additionality"; partnership leads to poverty reduction and sustainable development. An important question for consideration therefore, is the actual impact of partnerships (between the Public and Private sectors) on agricultural development.

The OECD (Lund-Thomsen 2007) has defined impact assessment as "an assessment of the positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended." Plummer (2002) has stressed the need for impact assessment as necessary for guiding policy makers, stakeholders and PPP analyst in determining whether a PPP strategy is indeed always an appropriate solution, under which condition such partnerships are successful and in which areas they have failed. According to Plummer (2002), it is very difficult to generalize the findings of case studies due to the diverse nature of the topics, types of partnerships, research questions and the geographical area(s) covered.

The assessment methods differ and include;

2.2.5.1 Classical Effect Evaluation

These use quasi-experimental survey design in order to provide an objective explanation of the relationship between intervention and effect. According to Folke and Nielson (2006), the premise of "all things being equal" is frequently used to analytically isolate the effect of the intervention. This approach is often advanced by the World Bank which also views that, a

quality impact evaluation needs to, among others, establish a set of indicators that can meaningfully measure project inputs, implementation processes, outputs, outcomes and counterfactual. Secondly, develop a logically sound counterfactual (Bamberger 2006) that involves the use of a pre-test control group in order to establish what would have happened if the project population had not been influenced by the intervention. Thirdly, to determine statistically whether a project has benefited a significant proportion of the target population and reached the intended objectives and that, it is also possible to determine their sustainability over time. However, Folke and Nielson (2006) have observed that, while this approach gives priority to coverage and quantitative aspects, it may be rather superficial.

2.2.5.2 Realistic Approaches

As stated in Pawson and Tilley (1997), this approach shares the need to formulate a theory on what work for whom and in what circumstances in a given intervention. Such theory should be based upon an understanding of the interactions of the context in which partnership takes place, various mechanisms and different outcome patterns. The realist approach does not rely upon a single research design but is open to a variety of quantitative and qualitative approaches as well as data collection methods (such as quantitative and qualitative data, documentary evidence, official records, surveys, interviews, observations, focus groups, tests, etc.)

The advantage of the realistic approaches is in their emphasis on the need to acquire an in-depth understanding of the context in which PPPs are implemented. On the other hand, the shortcomings of the approach as observed by Witte and Reinicke (2005), is their in-ability to generalize findings about the impact of PPPs across a variety of national settings.

2.2.5.3 Participatory Approaches

The participatory approaches emphasize the need to include the poor and vulnerable groups in deciding the priorities and identification of strategies as well as undertaking impact assessment processes (Mayoux and Mosedale, 2005). Central in this approach is the fact that the poor have an equal say in the design, monitoring, evaluation and impact assessment of the interventions that they are supposed to be beneficiaries. That is, the participatory approaches focus on the views of the intended beneficiaries who, to an extent are in the best possible situation to determine whether a given intervention has benefited them or not. This view forms one of the key pillars guiding the analysis of this study.

2.2.5.4 Integrated Approaches

The integrated approach seeks to combine the strengths of each of the Classical, Realists and Participatory approaches in relation to assessing the impacts of PPPs.

Following the (OECD 2006) principles for evaluation of development assistance, which provides useful reference for partnerships evaluation, "particularly partnership with a strong development component", five standard criteria have been suggested to assess aid projects. These include;

i. Relevance Criterion: This relates to evaluating whether clear objectives have been established for a given PPP and whether these objectives are also in line with those of partner organisations and the intended beneficiaries. The criterion is necessary not only to ensure that the priorities of the intended beneficiaries are taken into consideration in assessing interventions, but also in relation to improving the design of PPP given community members have a better understanding of local conditions.
ii. Effectiveness Criterion: This is relevant in demonstrating whether PPPs are capable of meeting their stated objectives. That is, if the claimed objective can be matched by real as opposed to postulated effect on the ground.
iii. Impact Criterion: This considers whether a PPP has relevant objectives, as well as whether PPPs have unintended consequences for their partners and stakeholders. This relates to the theoretical critique of PPPs including where there is a lack of effective monitoring and enforcement.
iv. Efficiency Criterion: this relates to whether the PPP has made efficient use of it resources to achieve it intended objectives. This include time efficiency (that is, whether a PPP intervention has been implemented within a reasonable time frame taken into account the number and nature of activities to be undertaken). This criterion helps in the assessment of whether PPP is more effective than other development strategies (example, privatization or government agency) for the desired outcome delivery.
v. Sustainability Criterion: this is helpful in determining whether the benefits of a PPP intervention can be sustained over time.

To create an integrated framework for assessing PPP impact, Lund-Thomsen, et al (2006) further suggest the inclusion of two important criteria thus;

vi. Participation Criterion: this aids an investigation of whether the intended beneficiaries participated in the design, implementation, monitoring and evaluation of PPP initiatives where participation is a process through which stakeholders influence and share control over priority-setting, policy making, resource allocations and access to public goods and services, and,

vii. Accountability Criterion: this ensures that there are internal checks and balances to guide the conduct of participants and enforce agreed rules in a PPP. This includes the concept of "answerability", that is, an obligation to provide an account of ones actions and inactions.

The integrated approach to impact assessment of PPP programmes, which has the advantage of combining the strengths of the classical, realist and participatory approaches, is more useful in analyzing the unintended consequences and how relevant, effective, efficient and sustainable the project is. According to the OECD (2006), to investigate a given PPP programme's impact, it may be necessary to investigate a variety of other factors that could explain observed changes in the PPP programme, that is, if factors other than the PPP programme itself might have contributed to producing any observed changes. It is therefore, the desired approach.

Furthermore, the OECD-DAC (1991) adds that, it is also important to include the views and priorities of marginalized groups who are often the target beneficiaries when assessing a given PPP's impact. "This involves soliciting a diversity of views within the communities that are participating in/or are affected by PPPs, taking into account factors such as age, gender, occupation, income, differences in religion." Studies such as Blowfield and Frynas (2005); Lund-Thomsen et al (2006) stressed that attention must also be paid to "the issues, concerns and voices that are taken for granted, not incorporated or perhaps ignored in the design, implementation and evaluation of such interventions."

2.2.6 Approaches to Measurement of Efficiency

The measurement of efficiency is necessary because efficiency and productivity measures are "success indicators and performance metrics" by which producers can be evaluated. Efficiency measurement is useful in comparing productivity between farms. Productive measures describe the relationship between the production of a commodity and the inputs used in the production of the commodity. According to FAO (2017), the measurement, at the

farm level, implies collecting data on all outputs produced and on the different inputs and factors of production used.

Efficiency in production, according to Fried, Lovell and Schmidt (sourced 2018), implies "producing as much output as technology and input usage allows or by using as little input as required by technology and output production." Also, there are two components of efficiency; production technology (which refers to type and quality of inputs used), and, technical efficiency (which refers to how well the inputs are combined).

Given the production frontier, which corresponds to the combination of inputs that generates maximum attainable output, a farm that attains its production frontier has also attained its maximum level of technical efficiency. Hence, an agricultural enterprise can be considered technically inefficient when, given its input usage, it is not producing the maximum possible output (Odhiambo and Nyangito 2003).

The FAO (2013) classifies measurement methods into parametric and non-parametric measures. Parametric measures are those based on the econometric estimation of the production function. On the other hand, measures that are not based on the econometric estimation of the production function are non-arametric. These approaches include;

2.2.6.1 Data Envelopment Analysis (DEA)

The DEA is a non-parametric measure (linear programming approach), but, entails the determination of a frontier that "envelops" all input –output data, with observations lying on the frontier defined as technically efficient while observations below the frontier are considered as technically inefficient.

In determining the frontier, the DEA constructs a composite producer with the highest possible efficiency, using farm-level data on output and inputs without imposing any restrictions on production technology. The frontier "envelops" the observations when an average production function passes through the centre of the data. Hence, the efficiency level of each producer for a given period is computed by taking the distance from a particular observation to the frontier.

According to Darku and Tran (2016), the DEA approach has mostly been applied to determining technical efficiency level of firms or industries with only recent utilization in measuring agricultural productivity. However, being a non-parametric technique, the DEA is

difficult to undertake hypothesis testing and measure the precision of the resulting indicator (FAO 2013).

2.2.6.2 Parametric Approaches to Measurement of Efficiency

The parametric approaches, like the DEA, takes into account the existence of production inefficiencies, but, in addition, make certain assumptions on the nature of the best practice technology. The parametric approaches include;

2.2.6.3 Average Production Function (APF)

The average production function measure compares efficiency between pre-specified categories of farms assumed to use the same production technology. Average production function the estimation of standard production relationship linking inputs to outputs. Farms can be categorized according to size, type, etc. Average production function can be applied with the Cobb-Douglass specification of the production function. The production or profit functions are usually estimated using econometric techniques applied to cross-sectional or panel data at the farm level.

The approach, however, does not produce farm-specific efficiency scores but, rather only allows for comparisons across groups of farms classified according to pre-determined criteria.

2.2.6.4 Stochastic Frontier Analysis (SFA)

The SFA measure of efficiency is based on an econometric (regression approach) estimation of the production function that explicitly includes an inefficiency component. According to FAO (2013), The Stochastic Frontier Analysis has been widely used in the estimation of technical efficiency for many agricultural commodities in several regions and countries and under different production systems.

The most common analytical approach is the Cobb-Douglass (Input-Output) function which allows for crossed effects between different inputs. In the model, inefficiency is assumed to be a linear function of a set of explanatory factors such as irrigation management, input management (use of improved varieties as against traditional varieties), and farmer-individual characteristics related (educational level, sex, age, etc) which may influence the way farm operations are run.

The Cobb-Douglass (or translog) function can be estimated using standard single equation techniques such as Ordinary Least Square (OLS) or Maximum Likelihood Estimation (MLE) technique. The estimation can be performed on cross-section data (for instance, farm level data, survey data and, on panel data).

According to Fried et al (sourced 2018), a key feature of the econometric approach is that, it is stochastic, which enables it to attempt to distinguish the effects of noise from those of inefficiency thereby providing the basis for statistical inferences.

However, in addition to estimating the parameters of the stochastic frontier production and the mean technical efficiency, Reif-Andras and Surany (2002), also presented the fixed effects model for cross-sectional data and later extended to panel data.

2.2.6.5 Fixed Effects Model

In the fixed effects analysis, the fixed inefficiency term can be represented with the constant term of the regression. Thus, according to Reif-Andras et al (2002), once the estimates for the firm-specific constant are obtained, the inefficiency terms can be estimated as well.

The strength of the fixed effect model, unlike the random effect model, is that, the inefficiency term is included in the constant term rather than the implicit assumption (of the random error term) where the inefficiency term is assumed to be part of the error term in the regression and assumed to be uncorrelated with the inputs in the regression (Reif-Andras et al 2002).

2.3 Empirical Literature

2.3.1 Cross Country Case Studies

Studies have not only shown the strong linkage between agriculture and poverty and the significant role agriculture can play in rural development and poverty alleviation in developing economies but, also the effect that agricultural intervention programmes can have on farming households. For instance, Zhongwei (2015) in a study on agriculture and rural development in Fiji, examined the macro and micro role of agriculture in rural development while evaluating the agricultural efficiency in development. Using both time series and cross-sectional data, the study, among others, analysed the impact of agriculture and other sectors to enhance agricultural efficiency, and moving beyond farm income by assessing off-farm labour participation in agricultural households as well as the issue of reducing poverty and

inequality in agricultural households. Key findings of the study indicate thus: There exists sectoral linkages and to increase economic diversification, developing forward linkages through innovations are crucial and advantageous; The failure of low-wage and subsistence living depends on availability of land tenure and investment in agro-based industry clusters; The effects of remittances tend to encourage households to be more diversified in farming, and to grow more cash crops; And that non-farm households income sources contribute significantly towards poverty reduction of the agricultural households, thus; signifying the key role of diversification in ensuring the resilience of poor agricultural households.

The relevance of public private partnership-driven agricultural development as an alternative strategy for the development of the agricultural sector has been investigated in various researches. Ferroni and Castle (2011) studied three Public Private Partnership programmes supported by the sygenta Foundation to ascertain sustainability by African agriculture. The study employed mainly qualitative techniques and concluded that agriculture in Africa is not sustainable due to underinvestment especially in the development of agricultural markets, crops investment and sustainable management of agricultural system, low public sector funding for agricultural research and lack of incentives for private sector operations which explain the yield gap in many food import developing countries. The study therefore, identified ways in which the private and public sectors can collaborate to improve agricultural sustainability in poor countries. This is similar to the study by IFPRI (2007) which analyzed seven cases where project intervention supported partnership building in four Latin America Countries between 2003 and 2004. The study employed generic approach and chain analysis to understanding partnership. The study concludes that public-private partnership innovations are justified when addressing problem or capitalizing on an opportunity that requires collective action or the pooling of innovative capacity. According to the study, capacity strengthening in partnership can lead to more viable partnerships that take social and development needs into account. The study concludes that; identification and exploring of common interest among partners is an important foundation for partnership commitment and that, Partnership building profits from sound analysis of market and technological opportunities.

The Study by Eshetu *et al* (2010) was based on selected regions in Ethiopia. The study specifically focused on impact, constraints and prospects of income diversification for poverty reduction within the study areas. The study employed both quantitative and qualitative data collection techniques to generate household and community level data. Using

non parametric methods, Eshetu et al (2010) assessed programme impacts on irrigators in comparison with non irrigators "before and after" programme. The major findings of the study were that, beneficiary-farmers gained increase in income (between 20-40 percent) and were better able to build their assets base and reinvest for further increases in production. They also reaped social and health benefits. These findings suggest that agricultural development projects can make significant contribution to increasing resilience of households against shocks, stress and seasonality. The study however reports that the benefits were very unevenly distributed due to certain institutional and social constraints.

Islam and Sato (2010), in their study of households in Bangladesh investigated if Poverty Alleviation programmes (PAP) indeed reduced poverty as claimed in the projects objective, and evaluate the extent and problems faced by project participants in several levels within the Poverty Alleviation Programme (PAP). The study focused on the Human Development Index (HDI) measures of poverty and macro-meso-micro level analysis techniques to understand constraints of PAP. Questionnaires and face to face interview were the main data collection methods. The study found that, poverty was alleviated at a significant level and improved the poverty situation of the target beneficiaries considerably by the application of the PAP. Main constraints of the PAP were found to include bureaucratic bottlenecks, monopoly of the market system, poor road infrastructure and lack of credit facilities.

Minot *et al* (2006) studied "income diversification and poverty in the Northern uplands of Vietnam". The region under study is less urbanized and more dependent on agriculture than any other region. Questions answered by the study include, "How much diversification is occurring, and which households are participating. How much does diversification contribute to income growth? The study employed both primary and secondary data sources to generate household and other relevant data. Regression analysis on household survey data was used to examine the characteristics that best explain variations in five measures of income diversification. Key findings from the study suggest that livelihood decisions are strongly affected by family land and labour endowments. Availability of markets and other infrastructure provisions (electricity) enable households to diversify into non farm activities. Data reveal that all sources of income grew almost proportionally on the average, though with different patterns across income groups. Crop income growth accounted for 45 percent of income growth across all rural households (but 69 percent among the poorest households). Poor farmers earned more by increasing yields while richer households expanded the area under cultivation. Poverty declined but with slight increase in inequality.

The emphasis on Public Private Partnership innovation for poverty reduction, according to Brinkerhof and Brinkerhof (2004) is traceable to the new interest in seeking inter-organisational arrangements aimed at addressing poverty challenges and effectively deliver development services to the needy. PPPs are therefore, considered as an effective tool for poverty reduction because they bring new resources and generate new social capital. In a similar view, the World Bank (1999), in a study of 27 Latin America and Caribbean countries, identified three major resources that benefit from PPP arrangements including; that, partnerships offer new resources that lead to both quantitative and qualitative gains in output. Also, PPP increase the resources available for poverty reduction initiatives through pooling of resources from different stakeholders which expands the range of poverty alleviation solutions. According to the World Bank (1999) study, private sector organizations were identified as new contributors in PPPs while state and (poor beneficiary) communities were identified as old contributors since governments have always been involved in public services provision and communities always provide most of the resources for and experience in community participation in social programmes. Extra resources also come from Non Governmental Organisations (NGOs) and other community organizations. These new resources generated by PPPs "may be material resources such as funds and in-kind contributions, or non material resources such as technical skills, information and political support". The study finds that, these contributions have led to increase in diversification of resources in PPPs for poverty alleviation.

Spielman and Grebmer (2004) studied "Public Private Partnerships (PPPs) in Agricultural Research: An analysis of Challenges facing Industry and the Consultative group on International Agricultural Research". The study considered PPPs as offering potentially important opportunities for pro-poor agricultural research in developing countries. Given only "few examples where such (PPPs) collaborations have contributed to food security, poverty reduction and economic growth", the study therefore, assessed the opportunities for, and challenges to creating and sustaining PPPs among agricultural stakeholders. The methodology of the study is based on interviews, discussions with key stakeholders and a wide review of literature on PPP, but took an essentially qualitative approach in assessing the challenges to successful PPPs in pro-poor agricultural research.

The study suggests that the most significant challenges (from the hypotheses of the study), are (a) the lack of creative organizational mechanism to reduce inter-sectoral competition for key assets and resources ; (b) inadequate accounting for and minimization of direct and

hidden costs ; and (c) the limited availability of information on successful working models of partnerships. Findings from the study further suggests that while incentives and perceptions do differ between the two (public and private) sectors, sufficient common space exists or can be created through incentive structuring to facilitate greater partnership for pro-poor agricultural research.

Spielman and Grebmer (2004) then recommends more research and analysis to identify solutions to challenges and to better understand the ground realities associated with their implementation. According to the study, PPP may contribute to the improvement of livelihoods for small-scale, resource-poor farmers, food – insecure urban and rural households and vulnerable individuals and households in developing countries.

Though PPPs presents a range of positive qualities and are thereby theoretically desirable, in practice there are a number of challenges associated with the implementation of PPP as an option for development. For instance, Nikolic and Maikisch (2006) identified poor monitoring and evaluation as capable of hindering the outcomes of PPPs. On its part, the World Bank (1999) identified bureaucratic and procedural obstacles as critical constraints to PPPs for poverty reduction (such as, hierarchical method of coordination between and within the governmental departments and problem of inter-sectoral coordination, etc.). Political constraints, according to the World Bank (1999) relates to "political cultures, power structures and attitudes of both public and private actors." Poor political relationship and mistrust among the partners can also constitute a constraint on the efficient delivery of partnership outcomes (Haligan and Turner, 1995).

2.3.2 Nigeria Case Studies

Danjuma, Oruonye, and Ahmed (2016) mainly examined the socio-economic impact of Fadama III project in Jalingo LGA. The aim of the study was achieved through a set of four objectives and two stated hypothesis. Data for the study was generated through structured questionnaire, scale rating and oral interviews. The structured questionnaire and oral interview were administered to Fadama III beneficiaries in the study area. The respondents were purposively selected in areas where grains were cultivated. A total of 120 respondents were selected for questionnaire administration from three locations comprising of 40, 45 and 25 questionnaires in each location, respectively. However, only 92 questionnaires were filled and returned (34, 30 28) in the three locations, respectively.

Descriptive and inferential statistics tools were employed for the data analysis. The t-test was used to test for the significance in the mean difference between farm output and farm income before and during the life span of Fadama III project in the study area. The t-test analysis was with the use of SPSS 16 software.

The study found that Fadama III project in the area was dominated by Male (88.04%) and majority of the beneficiaries were in the middle age of (31-34 years). Only few beneficiaries (19.575) attained tertiary education level. The mean farm output and farm income of the project beneficiaries increased by 35.32% and 45.79% respectively, per annum. The study also found that test of difference on the average annual farm output and farm income of beneficiaries before and during participation in the project in the study area shows a significant increase in their mean annual output and income. Challenges found included inadequate capital.

Nwachukwu, Okafor, Okafor and Olabisi (2016), examined the effect of Fadama III user groups' (FUGs) participation on crop farmers income in the study areas. Multistage sampling technique was used for the selection of 323 crop farmer-respondents used in the study. Logit regression was used to determine factors that influence beneficiary participation. Data was analyzed with both descriptive and inferential statistics.

Findings on the socio-economic characteristics show that majority of the respondents were within the 31-50 years range while the average age was 41.38 years and 18% of the respondents held no formal education. The household size ranged between a minimum of one member and maximum of 20 members. According to the study, 59% of the respondents agreed that the type of their participation in Fadama III programs is collaborating, while 19% felt it was contractual and only 18% felt otherwise. Study findings also showed, among others that, there is a positive relationship between farmers level of income and their participation experience in Fadama programame. Majority of the crop farmers participate actively in the Fadama programmes and their participations being influenced by their socio-economic characteristics.

Osondu, Ijioma, Udah and Enerole (2015), examined the impact of Fadama III on poverty status of households of participating food crop farmers in the study area with specific objectives to: determine and compare poverty levels among Fadama III and non Fadama III participating food crop farmers and determine effects of Fadama III programme on participants' farm income, farm output, farm size, labour and level of fertilizer use.

Multistage random sampling techniques was used to select total of 360 respondents consisting of 180 Fadama III food crop farmers and 180 non Fadama III food crop farmers in three agricultural zones. Semi-structured questionnaires were used to obtain cross sectional and demographic data. Data was analyzed using descriptive statistics (mean, frequency distribution, tables, standard deviation and head count on poverty indicators), and inferential statistics, paired t-test was used to compare changes in outcome.

Findings reveal that poverty incidence was 0.481 for Fadama III food crop farmers and 0.552 for non-Fadama III food crop farmers. The paired t-test indices showed that Fadama III programme impacted positively and significantly on participants' income and farm size at 5.0% level of significance.

Agba (2014) analyzed formal agricultural credits and the response of small scale crop farmers' output in Plateau State, that is, impacts of formal credits on selected output on small scale farmers in Plateau State. Primary data was sourced through structured questionnaires administered on formal financial institutions in Plateau State as well as borrowers and non borrowers of formal credits. Analytical techniques employed included descriptive statistics, Ordinary Least Squares (OLS), Gross Margin (GM) and Net Farm Income (NFI) analysis. The F-test showed the level of significance in differences between borrowers and non borrowers. Foster-Greer and Thorbecke (1984) measures of poverty captured the level of poverty for credit beneficiaries and non beneficiaries.

Key findings of the study revealed that credit had a positive but insignificant effect on small scale farmers output in Plateau State, this was because the formal credit institutions in Plateau State had low portfolio preference to agriculture due to the perception of unprofitability of the farming sector. At best, the credit agencies preferred large scale farmers over the small scale farmers for reasons of profitability and convenience. However, there was a marginal difference in favour of borrowers on farm size cultivated as against non borrowers. According to the study, poverty among the non borrowers was higher than among the borrowers leading to the conclusion that credit had a positive impact on the welfare of benefited farmers in Plateau State.

Ike (2012) specifically sought to determine the average income of Fadama user and non-user households based on their crop, livestock and off-farm activities as related to project implementation and also the proportion of the Fadama user households attaining the observed average income.

To analyze the impact of Fadama project on beneficiaries, the sample frame was divided into Fadama III participants and non-participants chosen from non-Fadama III Local Government Areas. Participating Local Government Areas were purposively selected from areas of direct project intervention. Two FCAs were selected from each of the participating LGAs selected for the study. In all, 24 FCAs were selected out of which 168 households belonging to different FUGs were randomly selected. However, 152 properly filled questionnaires were used for the analysis. For the non-Fadama participants, 10 households were randomly selected from each of the five non Fadama LGAs. Total of 50 households were utilized as control group. In all, 202 households were selected for the study. Data for the study were collected through the use of structured questionnaire. Data were analyzed using descriptive and inferential statistical tools. Descriptive tools were mean, percentage, pie charts and bar chart.

Double difference estimator was used to compare changes in outcome measures (before and after the project) between project participants and non-participants. The Double Difference was specified as, $DD = (Yp_1 - Ypo) - (Y_n P_1 - Y_n P_o)$ where,

Yp_1 = Outcome of beneficiaries after project started

YP_o = Outcome of beneficiaries before the project started

Y_nP_1 = Outcome of non-beneficiaries after the project started

Y_nP_o = Outcome of non-beneficiaries before the project started

Findings revealed, among others, that on the average, the real income of Fadama III beneficiaries increased by about 36.67% as a result of participation in the project. In contrast, average real income of non beneficiaries increased by only 11.6%. The mean increase in income for participants in Fadama III was significantly different from that of non-participants at $P = 0.05$. Findings also indicates that farming was male dominated and the average age of farmer was 52.4 years.

Chukwuemeka and Nzewi (2011) undertook an empirical study of World Bank Agricultural Development Programmes in Nigeria, and revealed the weaknesses associated with most sponsored agricultural development programmes which thus justify the need for continued evaluation of these programmes. Employing descriptive analytical methods, the study finds an undesirable policy approach that excluded beneficiaries from the design, planning and

programme implementation process; failure of financiers to make their contribution as, and, when due and frequent changes in leadership which affected programme operation.

Ajayi and Nwalieji (2010) specifically evaluated the impact of National Fadama Development Programme (I) vegetable production project on the socio-economic life of rural farmers. Data for the study was generated through structured interview schedule. Purposive and simple random sampling techniques were used to select the sample frame. Mean score, percentages, factor analysis, t-test and chi-square statistics were used for the data analysis. Study found that project had appreciable impact on crop growers. Major constraints included post harvest loses, logistics problems and poor Fadama incentives.

Nwachukwu, et al (2009) undertook an evaluation of 2nd National Fadama Development Programme on small holder farmers. The study employed logical framework (logframe) and participatory rural appraisal methods. The study finds that Fadama III increased income of beneficiaries and access to productive assets substantially; the study further views that income impacts of the projects beneficiaries were likely to be higher in the future because beneficiaries acquired productive assets that were likely to increase their incomes significantly. The study concludes that investment in agriculture will lead to changes in household livelihood strategies.

Adegbite et al (2008) studied the impact of National Fadama Development Policy on small scale farmers and its implications for agricultural financing and constraints to efficient production and productivity in the Fadama endowed communities. The study employed the multistage stratified random sampling technique. Using descriptive statistics, Gross Margin (GM) analysis, analysis of difference of means and multiple regression analysis, the study found that beneficiaries earned more income than non beneficiaries. According to the study, constraints identified were inadequate infrastructure (storage facilities, capital for farm operations), insufficient access to micro credit facilities and other support services.

Kudi et al (2008) studied the impact of 2nd National Fadama Development Programme on the socio-economic status of farmers' participation and production. Primary data was sourced through structured questionnaire and interviews. Through descriptive statistics and stochastic frontier production function efficiency, the study found constant returns to scale on the farm enterprise and high level of technical efficiency on an average farm unit. Efficiencies were shown to be positively correlated with years of irrigation farming, number of visits by

extension agents, level of education, household size and ownership of production assets. Age of farmer was the factor that affected the efficiency level under Fadama crop production.

Adeola and Taiwo (2004) studied the impact of the National Fadama facility on participants in terms of income, access to necessary enabling facilities and general well-being. Employing the use of structured questionnaire and baseline survey for data collection, and descriptive statistics and the stochastic frontier production function analytical technique, the study finds positive programme impact on participants, that is, increase in assets base and income of participants. The study found wide potentials in the intervention programme for alleviating rural poverty in the study area.

Adeyeye (2003) studied the impact of cooperative-based NGOs on poverty, taking as case study the Farmers' Development Societies (FDS) formed by Farmers Development Union (FADU) in Osun state, Nigeria. The study essentially focused on the impact of FADU's programmes on poverty and level of vulnerability of rural individuals and households where the programme operated as well as the strategies adopted by the poor households to limit the impact of shocks, that is, livelihood coping mechanisms.

To address the objectives of the study, data on the composition, structure and operational strategy of FADU overtime, was collected in order to characterize the composition, structure and operational strategy of FADU. Also, the Participatory Poverty Assessment (PPA) methods were employed to assess the extent and nature of poverty, and, specifically, to quantify the impact of FADU's activities on poverty and social capital among beneficiaries in comparison with non-beneficiaries (counterfactual group). To demonstrate if activities of FADU have significant impact on social capital and poverty in the study area, the Ordinary Least Square (OLS) regression technique was employed for the exploration of possible determinants of poverty including social capital index as part of the independent variables, while Chow tests were used to explore a possible difference in social capital and poverty between beneficiaries and non-beneficiaries of FADU's programmes. The PPA strategy was employed to analyse poverty and vulnerability (coping strategies) among the households. The PPA probes into how the households respond to adverse changes that occur in their daily lives, such as problems with health and how such problems were solved.

The study employed both secondary and primary data. Secondary data were largely from FADU's offices while primary data were sourced using various PPAs, data collection procedures and structured questionnaires and interviews. Data were sourced through sample

surveys of FDS and their members and the same number of non-beneficiaries were sampled from villages were FADU or other programmes were not present. Focused Group Discussions (FGDs) and in-depth interview were held with relevant stakeholders.

Key findings of the study among others were that, vulnerability among project beneficiaries declined relative to non-beneficiaries within the study period.

Among the recommendations of the study were that; Non-Governmental Organizations (NGOs), donors and governments should embrace group formation and create a friendly environment for the emergence and strengthening of local institutions in the packaging of poverty reduction initiatives while paying careful attention to understanding their strengths and weaknesses.

Ayoade (2001) studied the impact of NSPFS on women farmers in Oyo State. The study employed purposive/systematic sampling techniques. Data was obtained through structured interview schedule. Descriptive statistics and Tobit regression analytical technique were employed. The study found significant relationship between output, participation level, marital status and poverty alleviation. The study established a positive programme impact on participants.

Studies have also been conducted on agricultural efficiency and elasticity of production with respect to inputs (Land, Labour, Fertilizer, Seed and Herbicide) in Nigeria. For instance, According to Ishaku, Haruna, Danwanka and Suleiman (2017) Following Olukosi and Erhabor (1998), allocation efficiency of agricultural resources can be tested by comparing the value of Marginal Product of each resource (as worked out at geometric mean) with it corresponding price and the difference statistically tested with the help of t-test, based on the classical assumption of profit maximization regarding the motives of producers, "an ideal framework against which various forms of efficiencies of production can be adequately measured and tested" (Olukosi and Erhabor 1998; Adeniyi 1973). Thus; according to Ishaku et al (2017), the calculation of Marginal Physical Product (MPP) of inputs (Land, Labour, Seed and Herbicide) follows the form;

$MPP_i = b_i/X_i$ where;

MPP_i = Marginal Physical Product of inputs

b_i = the estimated regression coefficient of inputs

X_i = the geometric mean usage of inputs.

Thus;

Marginal Value Product (MVP) for each input was expressed as follows;

$MVP_i = MPP_i \times PX_i$, where;

MVP_i = Marginal Value Product of multiple i

MPP_i = Marginal Physical Product of input i

PX_i = Geometric mean price of product.

According to Ishaku et al 2017, the decision rule follows thus;

r = 1, meaning efficient utilization of resource

r < 1, meaning resource over-utilization hence, decreasing the quantity used of that resource increases profits

r > 1, meaning resource under-utilization and increasing the rate of use will raise profits.

However, in the explanation of Folorunso and Dawang (2016), as a decision rule, an Efficiency Ratio (ER) > 1, means "production is operationally efficient" meaning at an ER < 1, production is operationally inefficient.

On the other hand, the calculation of elasticity of production with respect to inputs (Land, Labour, Fertilizer Seed and Herbicide) in Ishaku, et al (2017), follows the form;

$APP_i = y/X_i$, where,

APP_i = Average Physical Product of inputs

y = geometric mean of farm output

X_i = Geometric mean of usage of input, therefore,

$EP_i = MPP_i \times APP_i$, where;

EP_i = Elasticity of production with respect to input i

MPP_i = Marginal Physical Product of input i

APP_i = Average Physical Product of input i.

The decision rule therefore, was stated thus;

$\sum EP = 1$, meaning constant return to scale

$\sum EP < 1$, meaning decreasing return to scale

$\sum EP > 1$, meaning increasing return to scale.

Thus; according to Folorunso and Dawang (2016), the sum of elasticity indicates return to scale and that, "the production elasticity generally represents the percentage increase in the output (Y) for each 1% increase in input of the respective resource."

2.4 Gap(s) in the Literature

The essence of literature review is to see what earlier researchers had done with a view to filling gap(s) that may exist. Accordingly, literature reviewed in this study show that, though much work has been done in assessing impact of agricultural development programmes, within and outside Nigeria, however, gaps still exists regarding impact assessment of agricultural development programme within the framework of Public-Private Partnership as an option in agricultural development and poverty reduction in Cross River State, Nigeria. Also, available sources indicates that such assessment studies, where there exists, are either sparse particularly on the Cross River Fadama III and Songhai projects or such studies are based on assessment of singular or individual programmes. Therefore, this research is intended to expand and/or update knowledge in these regards, among others, by a comparative assessment of both the Cross River Fadama III and Songhai programmes. The study is also intended to show the effect of the Fadama III and Songhai project on output, income and wellbeing of participants as compared to non participants in Cross River State and make necessary recommendations that may lead to further overall wellbeing of the masses in the state.

CHAPTER THREE

3.0 Research Methodology

3.1 Study Area

Cross River State (CRS) is one of the thirty six (36) states of Nigeria. The state, as presently constituted, was created in 1987 with the excision of Akwa Ibom State from the old Cross River State. The state is comprised of eighteen (18) Local Government Areas (LGAs) with a population of 2.89 million people (NPC, 2006).

The state is located within the tropical rain forest belt of Nigeria. It lies between latitude 4^0 $28^{'}$ and $6^0 55^{'}$ North of the Equator and longitude 7^0 $50^{'}$ and $9^0 28^{'}$ East of the Greenwich Meridian. The state shares common boundaries with the Republic of Cameroon in the East, Benue state in the North, Ebonyi and Abia states in the North East, Akwa Ibom State in the south west and the Atlantic ocean in the south. The state has a total landmass of about 33,000 SqKm. Arising from its location; the state enjoys a tropical humid climate with distinct wet and dry seasons occurring in April-November and December- March respectively. A variety of crops like Rubber, Cocoa, Cashew, Castor seeds, Yam, Cocoyam, Cassava, Maize, Rice, Melon, Groundnut and assorted vegetables, among others, are produced in the state. Though peasant farmers currently produce the bulk of these crops, there is abundant land to produce the bulk of them in large-scale farms.

The main farming system practiced in the state include; Shifting Cultivation or Bush Rotation, Crop Rotation and Irrigated farming. The main cropping system is the mixed cropping and some level of sole cropping common with large scale farmers.

At least five (5) distinct ecological zones are represented in the state, ranging from mangrove to swamp forests, tropical rain forests and savanna woodlands. The state has a total of about 480km^2 mangrove forests, 520km^2 swamp forests, 7,290 km^2 of tropical high forests and about 216 km^2 of wetland savanna. Public and private plantations occupy a total area of 460 km^2 and land under other uses is about 12, 299km^2.

Cross River State is basically an agrarian economy with a preponderance of the population (about 75 per cent) engaged in subsistence farming and living in rural communities. Agriculture is one of the development drivers in the state because of it potentials for employment, poverty reduction and food security. The agricultural sector employs about 80 per cent of the state labour force and contributes about 40 per cent of the state Gross

Domestic Product (GDP). However, the sector, along with it various sub-sectors faced in general the problems of inadequate application of modern technology, inadequate financing, poor infrastructure and inadequate personnel including extension workers. Income levels are therefore, exceedingly low and poverty is endemic with over 70 per cent of the population living below the International poverty line of one United States Dollar (USD 1) a day. The state records high post-harvest losses and low commodity prices during harvest season.

About 60 per cent of the state is connected to the national grid, though the syndrome of power outages remains a constraint to development. 37.5 per cent of paved federal roads in the state are in poor state while 65.7 per cent are unpaved and in poor state. 31.6 per cent of paved state-owned roads are in poor state while 74.5 per cent are unpaved and in poor state.

A total of about forty (40) markets have been identified in the state. These collect and distribute agricultural commodities produced by large number of farmers in the state's rural communities. The challenge is to enhance the quality of roads that serve these major markets to improve distribution efficiency and raising the incomes of farmers (CR-SEEDS, 2005-2007).

3.1.2 Agricultural Development Programmes in Cross River State

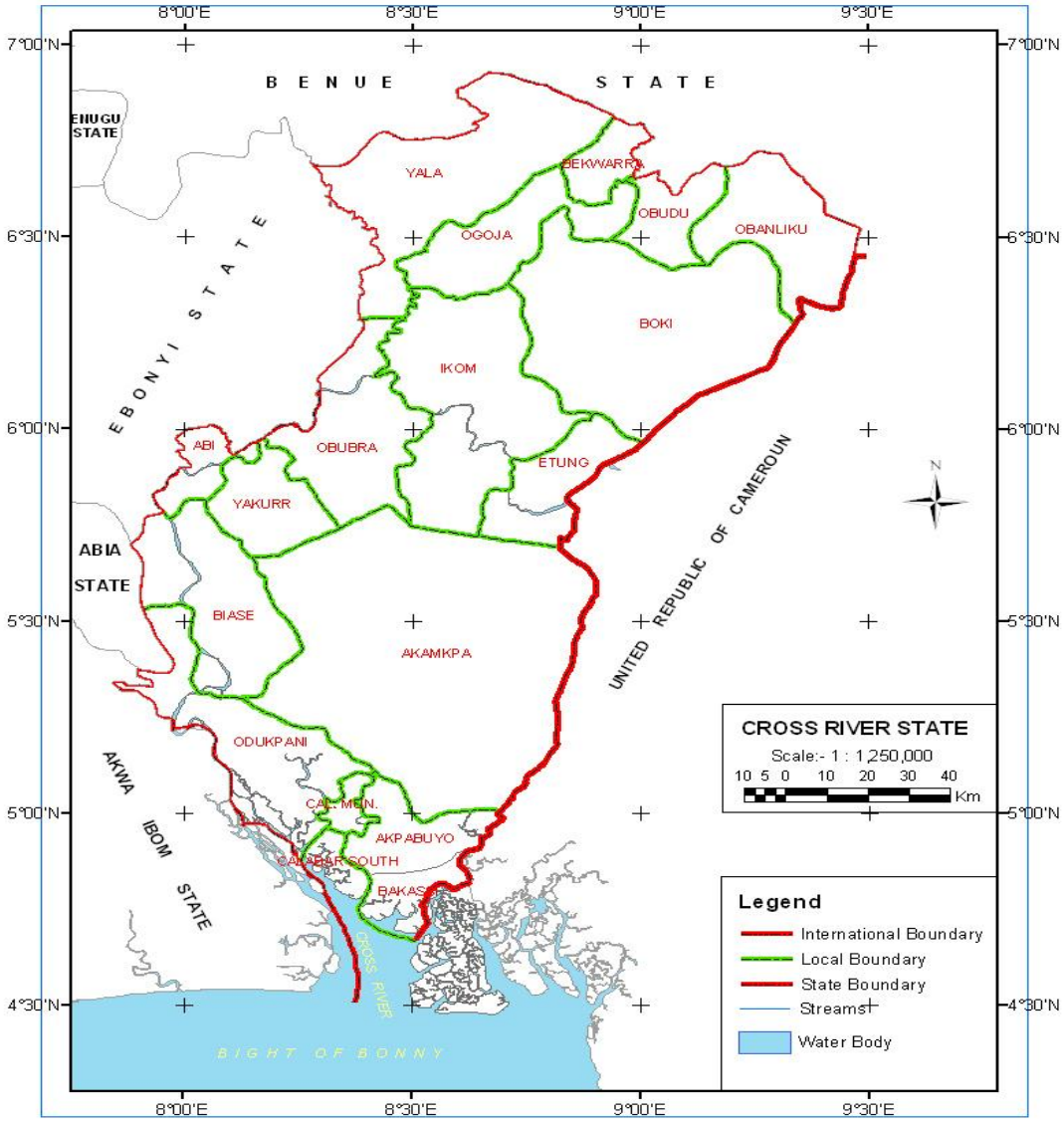
Among the most visible collaborative agricultural programmes to address poverty and food insecurity in Cross River State was the "Sustainable Agricultural Programme" (SAP); a UNDP – Sponsored programme (in a MoU) with the Cross River State Government to reflect the development priorities, aspirations and policy thrust of the state.

The overall objective of SAP was to support the state government's efforts at improving the living conditions of the rural people through sustainable resources management and productivity within the overall national goal of poverty reduction. The programme was designed to address the needs and problems of small holder farmers, fisher folks and artisans especially women by reducing their production constraints and enhancing their incomes (Adie 2005).

The implementation strategy was through government institutions, ministries/agencies, Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs) and private sector bodies designated as implementing agents. The programme emphasized capacity building of the communities. Though the programme prioritized cash crops (Oil palm, Cocoa and Cashew), small scale irrigation and other downstream activities were also covered.

Specifically, the irrigation objective of the programme was to develop available water sources to facilitate dry season cultivation of a wide range of crops (such as Maize, Tomatoes, Water Melon, Water Leaves, Okro) through the introduction of relevant, simple and cost effective irrigation technologies (Wash bores, tube wells, and spring / pond development, among others). “The irrigation scheme can be considered a success story as it helped to reduce to the barest minimum the risks and other problems associated with crude irrigation practices” (Adie 2005). However, the programme covered only five locations across the state and there was no available independent assessment of the scheme.

Fig. 3.1 MAP OF CROSS RIVER STATE



3.2. Theoretical Framework of the Study

The framework for this study is anchored on a synthesis of theories (i.e. the Agricultural Innovation System (AIS) (World Bank 2012), and the Integrated Rural Development Model (IRD), (World Bank, 1981; 1989).

The AIS approach, in recognition of the need for innovation, includes the farmer within the "complex network of heterogeneous actors engaged in innovation processes, along with the formal and informal institutions and policy environment that influence these processes". This AIS framework views innovation as a "complex web of individuals and organizations" all

contributing towards new or existing information and knowledge application. The AIS framework also concerns itself with such issues as "the capacity of individuals and organizations to learn, change and innovate; and the types of interventions that enhances such capacities and processes" (Xing 2015).

The integrated approach of the IRD Model seeks to develop all sectors of the rural economy and effectively link them to the urban economy (Girigiri 2000). The strategy seeks to promote linkages not only between formal and informal sectors but also farm and none—farm activities. This development strategy therefore, seeks to integrate the rural sector into the economic mainstream. The appeal of this model is founded in the belief that the rural development problem is how to eradicate the integrated rural poverty which can only be achieved by pursuing integrated strategy. There is a growing acceptance of self-help approach in pursuing Integrated Community Development (ICD) in Nigeria. Community Development Associations (CDAs) have become veritable instruments for popular participation (Eboh, et al 1995). As observed by Toure, (2012), "it is recognized that there is need for integrated and comprehensive approach that included interventions at both macro and micro levels".

The case for the integrated model is based on the observation that, successive funding of agricultural development alone has failed to yield the desired results of poverty reduction and rural development in Nigeria. Hence, Ogidefa (2010) emphasized that efforts should be made to include provision of modern infrastructure, primary health care, food and shelter, employment opportunities, recreational facilities, affordable and compulsory primary and secondary education, loans and other incentives, to be part of rural development for the benefit of rural dwellers.

The IRD Strategy entails government and community cooperative participation in the provision of infrastructural services "in such a coordinated and simultaneous manner to enhance the overall welfare of the rural dwellers" (Eboh1995).

Following the appeal of the IRD approach in Nigeria, the Agricultural Development Project (ADP) "stand out as the boldest attempt to pursue IRD on relatively long term basis" (Ayichi in Eboh 1995). The Agricultural Development Programme (ADP) system was based on the premise that only combined efforts applied almost simultaneously can reduce the problems of low productivity of farmers due largely to limited access to credits, lack of improved inputs

and technologies and inadequate rural infrastructure. The strategy is therefore, an integrated approach to agricultural and rural development.

In the light of the above models (i.e. AIS and IRD), the Fadama III and the Songhai agricultural programmes are actually operating on the collaborative framework of the PPP. These programmes have components that guarantee agricultural innovations through Research and Development (R&D), Extension Services, Sustainable Land Management Practices (SLMP) in the case of AIS; and for IRD, there are integrated rural development components, more especially in the provision of credit, infrastructures, training etc. in both the Cross River Fadama III and Songhai projects.

3.3 Model Specification and Estimation Techniques

Arising from the Agricultural Innovation System (AIS) and the Integrated Rural Development (IRD) strategies, the Cross River Fadama III and Songhai Programmes have come with a number of rural integrated agricultural innovations to improve on agricultural production and the livelihood of the community members. Among these innovations include Sustainable Land Management (SLM) practices, credits, training and extension services, etc. All the innovations are expected to translate to higher output, income and reduction in poverty of the beneficiary. Consequently, the study adopts a number of models including; the Logit model to analyze adoption of programmes innovations; Production Function (Input-Output) model to analyze production efficiency; Gross Margin model to analyze profitability; Double Difference model to analyze income and diversification effect; and the Foster-Greer-Thorbecke (FGT) poverty models and Multi-dimensional Poverty (MPI) indices to analyze poverty status of the beneficiaries. These models are specified in the following sections.

3.3.1 Binary Logistic Regression Model

The binary logistic regression model analyzes the factors determining adoption of FADAMA III innovations for FADAMA III farmers and Songhai innovations for Songhai farmers.

The model is specified as follows:

$$F_{CUTSED} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.1)$$

$$F_{FERT} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.2)$$

$$F_{HERPES} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.3)$$

$$F_{RECORD} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.4)$$

$$F_{MCROP} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.5)$$

$$F_{SERPRO} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 IRR + \alpha_{10} LABOUR + \alpha_{11} FARMSIZE + \varepsilon_t \quad - \quad (3.6)$$

Where;

F_{CUTSED} = Use of improved Cuttings/Seedlings

F_{FERT} = Use of Fertilizer

F_{HERPES} = Use of Herbicides/Pesticides

F_{RECORD} = Use of proper farm records keeping

F_{MCROP} = Use of Mixed Cropping

F_{SERPRO} = Use of professional Service Providers

OUTPUT = Farm Output

GEN = Gender

AGE = Age of farmer

EDU = Education

FAREXP = Farmer Farming Experience

INCOME = Farm Income

MAR = Marital Status

HSIZE = Household Size

LABOUR = Type of Labour

FARMSIZE = Farm Size

The model for Songhai farmers is specified, respectively, as follow;

$$S_{ORAGRIC} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.7)$$

$$S_{IRR} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.8)$$

$$S_{ORFSB} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.9)$$

$$S_{MULCH} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.10)$$

$$S_{BIOPP} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.11)$$

$$S_{MACHINE} = \alpha_0 + \alpha_1 OUTPUT + \alpha_2 GEN + \alpha_3 AGE1 + \alpha_4 EDU + \alpha_5 FAREXP + \alpha_6 INCOME + \alpha_7 MAR + \alpha_8 HSIZE + \alpha_9 LABOUR + \alpha_{10} FARMSIZE + \varepsilon_t \quad - \quad (3.12)$$

Where;

$S_{ORAGRIC}$ = Techniques of Organic Agricultural Production

S_{IRR} = Techniques of Irrigation

S_{ORFSB} = Techniques of Organic Fertilizer and Soil Biology

S_{MULCH} = Techniques of Mulching

S_{BIOPP} = Techniques of Biological Control of Pests and Predators

$S_{MACHINE}$ = Use of Farm Machinery

3.3.2 Production Function (Input-Output) Model

The Cobb-Douglas specification is selected for its simplicity. Its equation is specified as follows:

$Y=Ae^{\lambda T}L^{\propto}K^{\beta}U$……. (3.13)

Where,

Y = output

L = labour

K = capital

T = time

A = efficiency parameter

λ= rate of disembodied or neutral technological change under neutral technological progress

α, β = elasticities of output with respect to labour and capital

U = disturbance term

Equation (3.1) can be estimated with variables in log linear form. The log linear form is as follows;

$\log Y=(A+\lambda T)+\propto \log L+\beta \log K+\varepsilon$ ……(3.13b)

However, consider a production function as follows:

$Y= f(X_i)$……(3.14)

where

$X_i= X_1$ is level of participation

From our analysis so far we can further deduce and disaggregate our model in a functional form as follows:

Y = f(K,U) ……(3.15)

Where,

Y = Income of farmers

K = Degree of participation (proxied by dummy variable '0' no participation, '1' participation)

U= disturbance term.

In determining the impact of Fadama III and Songhai projects on agricultural output of the beneficiaries employing the use of Cobb-Douglas production function analysis which is an input-output function, the study however, made use of five inputs of production: farm size in hectares (ha), herbicides and pesticides (kg) usage, use of improved cuttings/ seedlings, labour type and fertilizer usage. These input variables were chosen since they represent the conventional inputs used in the production of cassava, yam and rice in the study area. For the purpose of comparison, the analysis was done in the counterfactual by estimating separate functions for the beneficiaries and non-beneficiaries for the various crops. The production functions were estimated using the Ordinary Least Square (OLS) technique.

3.3.3 Farm Profit Model

The study employed the Gross Margin (GM) model to determine the level of profitability or otherwise of the various farm enterprises. The Gross Margin is specified as follows:

GM = TVP – TVC …….. (3.16), Where,

GM = Gross Margin (Average per production)

TVP = Total Value of Production

TVC = Total Variable Cost.

3.3.4 Double Difference Model

The Double Difference model shall capture the income difference and level of on-farm and off-farm income diversification among the programme participants, before and after the programme.

Double Difference method essentially compares treatment and comparison groups in terms of outcome changes over time relative to the outcomes observed for a pre – intervention baseline. Thus, following ADB (2011), Verners and Verners (2005), Baker (2000), and if we let P_i be the intervention variable, where P_i=1, if the respondent is programme beneficiary and P_i=0 for non-beneficiary, then the change in income (Y_{di}) can be expressed as:

$$Y_{di} = Y_{ai} - Y_{bi} \backslash P_i = 1 \quad \text{..... (3.17)}$$

Where, Y_{di} = income difference

Y_{ai} = Income level after the programme

Y_{bi} = Income level before the programme

Given that, $P_i = 1$.

The average difference in income is simply the mean of all the difference for either the non-participants or the participants. The expected value of Y_{di} can be written as:

$$Y = E(Y_{ai} - Y_{bi}) \backslash P_i = 1 \quad \text{..... (3.18)}$$

The difference is what has been refered to as the treatment effect on the programmes. To estimate the true effect of the programme, there is need to estimate the "counterfactual" expected value (Baker, 2000) because, if the income of the beneficiary increased after the programme compared to before the programme, it is possible that the income would have increased anyway even if the respondent had not been a beneficiary, due to other unobservable effects. There was need therefore, to randomly select the intervention and the control groups. The result is enhanced by the fact that both treated and control groups shared similar socio-economic and community level characteristics before programme implementation (Baker, 2000). Conceptually, the estimation of Double Difference can be examined as shown in the matrix (Tables 3.1 and 3.2).

Table 3.1:

Matrix of the Double Difference (DD) in income across time and across groups

Survey	Intervention(Participant)	Control(Non-participant)	Difference by time
Before	Y_{ib}	Y_{cb}	Y_{ib}-Y_{cb}
After	Y_{ia}	Y_{ca}	Y_{ia}-Y_{ca}
Difference by group	Y_{ib}-Y_{ia}	Y_{cb}-Y_{ca}	(Y_{ia}-Y_{ca})-(Y_{ib}-Y_{cb})

Table 3.2:

Matrix of the Double Difference in income across diversified products and across groups

Survey	Intervention(Participant)	Control(Non-participant)	Difference by diversification
Farm	Y_{if}	Y_{cf}	Y_{if}-Y_{cf}
Non-Farm	Y_{in}	Y_{cn}	Y_{in}-Y_{cn}
Difference by group	Y_{if}-Y_{in}	Y_{cf}-Y_{cn}	(Y_{if}-Y_{cf})-(Y_{in}-Y_{cn})

From the tables (3.1 and 3.2) above, the Double Difference is given by the expressions $(Y_{ia} - Y_{ca}) - (Y_{ib} - Y_{cb})$ and $(Y_{if} - Y_{cf}) - (Y_{in} - Y_{cn})$, respectively.

The level of significance of the income difference was tested using paired t-test as specified below, where;

$\hat{X}_1 = X_i - \bar{X}.$

$\hat{Y}_1 = Y_i - \bar{Y}.$

Then t is defined as,

$$t = (\bar{X} - \bar{Y})\sqrt{\frac{n(n-1)}{\sum_{i=1}^{n}(\hat{X}_i - \hat{Y}_i)^2}} \quad \text{..... (3.19)}$$

Where,

$\bar{X}_1$And $\bar{Y}_1$=two paired sample of beneficiary and non beneficiary incomes, respectively

n=sample size

n-1=degree of freedom

However, in the regression model, control variable can be readily incorporated. By using the level of income Y_i, then the Double Difference regression model can be expressed as follows:

$$Y_i = \varphi_0 + \varphi_1 P_i + \varphi_2 T_i + \varphi_3 P_i T_i + \varepsilon_i \quad \text{..... (3.20)}$$

Where,

Y_i = Level of income

P_i = Programme effect: $P_i = 1$ with intervention (participated); 0 otherwise

T_i = Time effect: $T_i = 1$ during and after the programme; 0 otherwise

$P_i T_i$ = Interaction effect or Double Difference effect between time and programme

In order to verify if the parameters in the regression are as the Double Difference estimators in table 3.1, one can take the expected value of the parameters:

$$E(Y_i \backslash P_i = 0, T_i = 0) = \varphi_0 \quad \text{..... (3.21)}$$

$$E(Y_i \backslash P_i = 1, T_i = 0) = \varphi_0 + \varphi_1 \quad \text{..... (3.22)}$$

$$E(Y_i \backslash P_i = 0, T_i = 1) = \varphi_0 + \varphi_2 \quad \text{..... (3.23)}$$

$$E(Y_i \backslash P_i = 1, T_i = 1) = \varphi_0 + \varphi_1 + \varphi_2 + \varphi_3 \ldots\ldots\ldots\ldots\ldots \quad (3.24)$$

Therefore, it can be verified that the first difference takes out the treatment effect φ_1, and the Double Difference takes out the time and diversification effect φ_2, leaving the Double Difference effect φ_3 or simply the parameter estimate of the interaction variable $P_i T_i$.

To allow for some covariates or other intervening variables, the regression model can be expanded as:

$$Y_i = \varphi_0 + \varphi_1 P_i + \varphi_2 P_i F_i + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.25)$$

where β_i are the parameters and X_i are the covariates.

However, the estimated Double Difference regression equation of the form:

$$AGP_i = \beta_0 + \beta_1 P_i + \beta_2 FP_i + \beta_3 PF_i + \varepsilon_i \ldots\ldots\ldots\ldots \quad (3.26)$$

Shall buttress objective (4), Where;

AGP_i= Agricultural output: AGP_1 is for crop production.

F_i = Diversification effect: $F_i = 1$ is investment in non-farm product; 0 otherwise

$P_i F_i$ = Interaction effect or Double Difference (DD) effect between diversification and Public-Private Partnership.

Likewise, we modify equation (3.25) to obtain our estimated Double Difference regression equation in the form:

$$Y_i = \beta_0 + \beta_1 P_i + \beta_2 F_i + \beta_3 PF_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.27)$$

$$F_i = \beta_0 + \beta_1 P_i + \beta_2 Y_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.28)$$

Where Y_i is the income.

3.3.5 Foster-Greer-Thorbecke (FGT) Poverty Models

The Foster-Greer-Thorbecke poverty models were used to analyze the level of poverty reduction among participants in comparison with non-participants.

Information on Farmers welfare such as average annual consumption expenditure and a poverty line (measure that separates the poor from the non-poor) based on the NBS Harmonized Nigeria Living Standard Survey (2010), was used to determine the poverty reduction among beneficiaries and non-beneficiaries using three basic metric of poverty – Head Count Index (HCI), Poverty Gap Index (PGI) and the Squared Poverty Gap Index (SPGI) developed by Foster-Greer-Thorbecke. The HCI which is the most widely-used indicator for poverty is simply the proportion of the population that is considered poor denoted by: $P_0 = \frac{N_p}{N}$ where Np denotes the part of the total sample that is poor. The PGI measures the degree to which proportion of poor individual fall below the poverty line as a proportion of the poverty line itself. It defines the poverty gap (G_t) as the poverty line (z) less actual income (y_t) for the poor individuals within a group, while the gap is considered '0' for the non-poor. The gap is algebraically expressed as: $\mathbf{(P_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z})}$. This index has been used as an indicator to determine the minimum costs of eliminating poverty within a group of people using transfers. That is, it indicates how much the government would have to transfer to the poor individual to make up for the short fall in reaching the poverty line. The smaller the index is, the greater potential it is for governments to alleviate poverty.

The SPGI determines the average of the poverty squares in relation to the poverty line. The SPGI, as proposed by Foster, Greer and Thorbecke (FGT), (1984) is denoted as ($P_1 = \frac{1}{N}\sum_{i=1}^{N}(\frac{G_i}{z})^2$. The index is bounded between 0 and 1; the closer the FGT index is to one, the greater the degree of poverty.

3.4 Description of key Variables

Age: This is the number of years spent by the person from the day of birth to the date of data collection. According to Amaza et al., (2005), age of a person determines his or her experience.

Gender: Refers to Men and Women. Men and women have different access to resources and opportunities

Education: This is the level of western education attained. Farmers with higher level of education are expected to make more rational choices.

Household size: This is the total number of dependents of the respondent. The respondent needed to pay a certain amount before the project completes the rest. It is expected that large households may not have the ability to meet with terms due to extra mouths to feed.

Membership of organization: Belonging to farmers' organization enable respondents/farmers to have access to information, cheaper inputs, extension services, profitable and other intangible benefits that enhance efficiency in production.

Household Income: Farm self-employment income is net money income from the operation of a farm by a person on his own account, as an owner or renter. It includes income received as cash, but excludes in-kind or non-money receipts. Farm self-employment income from the Agricultural Resource Management Survey (ARMS) is the sum of the operator household's share of farm business income (net cash farm income less depreciation), wages paid to the operator, and net rental income from renting farmland. Adding other farm-related earnings of the operator household yields earnings of the operator household from farming activities (Other farm-related earnings consist of net income from a farm business other than the one being surveyed, wages paid by the farm business to household members other than the operator, and commodities given to household members for farm work) (Ashok, et al, 2002).

Level of Participation in intervention Project: The first phase of measuring participation is to develop content for questions and domains or groupings of questions that best capture participation. This can be achieved by combining research on existing measures with information obtained from conducting semi-structured interviews with beneficiaries and non-beneficiaries.

Diversification: means reducing risk by investing in a variety of assets. Diversification relies on the lack of a tight positive relationship among the assets' returns.

Output in land use: The outcome or benefit derived as a result of the use of land, for instance, food production, could simply define the output in land use (Pinstrup-Andersen and Pandya-Lorch 1994).

Subsistence to commercial agriculture: Broadly, we take 'subsistence producers' to include those who produce food primarily for consumption in their own households, whether as a main source or extra source (Aliber and Hart, 2009). Commercialization can

occur on the output side of production with increased marketed surplus, or on the input side with increased use of purchased inputs. Commercialisation can be measured as the proportion or volume of crop production marketed by a farm or household (Leavy and Poulton, 2007). However, here we refer to a paradigm shift from subsistence to commercial agricultural production.

Technological change: this includes new methods of organization as well as physical techniques adopted to improve on agricultural productivity (Bannock et al, 1998).

3.5 The Osgood's Semantic Differential Method

The Osgood's semantic differential method was used to convert raw data obtained using quantitative-judgment procedure into interval scaled data (Panneerselvam, 2011).The semantic differential scale reflects the direction and intensity of respondents' attitude concerning the intervention projects/services.

As per the method, the respondents were expected to rate the project on a set of bipolar adjectives such as indicated in table 3.4:

Table 3.3:

Project profile through semantic differential method

	-2	-1	0	1	2	
Sustainable land management practices:	Poor	-	-	-	-	- Good
Infrastructural development:	Inferior	-	-	-	-	- Superior
Etc.:						

Each respondent was asked to judge each project on a five-point scale for all the attributes of the project mentioned.

For the five point scale, the judgment scores of different phrases may be assumed as -2, -1, 0, 1, 2, from left to right of the scale, as shown in table 3.4:

The following steps of the semantic differential scale were undertaken with reference to studying the profile of the programmes under study in Cross River State:

Step-1: The attributes on which the projects are to be judged by respondents were identified.

Step-2: The number of descriptive phrases were decided and defined as well as the numerical weights of the descriptive phrases.

Step-3: The questionnaire containing semantic differential scale for each project was defined.

Step-4: Questionnaires were administered to the respondents seeking their judgment for all the projects.

Step-5: The judgment score for each attribute across respondents were summed and the averages found.

Step-6: The judgment score of each attribute on the semantic differential scale were regressed as depicted in the specified models.

3.6 Sample and Sampling Techniques

The study was carried out in Cross River State. Multistage sampling technique was employed in the selection of respondents for this study. The first stage involved the purposive selection of two senatorial districts; Northern and Central senatorial districts of Cross River State, from where four (4) LGAs where selected for study. Three Local Government Areas (LGAs) were chosen for study of the effect of Fadama III on participants in comparison with non-participants while one Local Government Area (LGA) was selected for study of the effect of Songhai initiative on participants in comparison with non-participants. Respondents were therefore, categorized into participants and non-participants (comparison group).

The choice of the senatorial districts and specifically the LGAs was because the farming activities of the type that is of interest to this study was more entrenched there and on the basis of similarity in socio-economic and community level characteristics, necessary for baseline data. The Fadama III LGAs selected for study, according to programme sources, were among the leading LGAs that complied with the condition for commencement (e.g. payment of 30% counterpart funding by individual FUGs) of the Fadama III programme implementation in the state. Agba (2014) cites Eric (1998) as justifying the selection for study on three factors: the size of the target population; the variability of the population

parameter which the researcher wishes to estimate; and the degree of precision and confidence aimed by the researcher.

Table 3.4

Population and sample selected for study

S/NO.	SENATORIAL DISTRICT	SAMPLED LOCAL GOVT.	NUMBER OF FCAs	NUMBER OF FUGs	PURPOSIVE SELECTION OF SAMPLE FUGS	PURPOSIVE SELECTION OF SAMPLE HOUSEHOLDS PER FUG
1	Central Senatorial District	Obubra	13	196	55	1 (=55)
2	Northern Senatorial District	Ogoja	10	111	50	1 (=50)
3	Northern Senatorial District	Bekwarra	10	115	50	1 (=50)
	TOTAL		33	422	155	155
	SAMPLE SIZE FOR SONGHAI PROJECT					
		PURPOSIVE LGA SELECTED	SIZE OF SAMPLE FRAME	PURPOSIVE SAMPLE SELECTED		
4	CENTRAL SENATORIAL DISTRICT	Abi	100	50	_	
	TOTAL		100	50	_	205 (155+50)

Source: Field Survey Data (2016).

3.7 Survey Procedure

Survey research is probably the best available method for a social science researcher interested in collecting data that could describe a population too large to be observed directly (Khanom 2011; Babie 2002) and represent one of the most common quantitative research techniques in social sciences (Fowler 2002). Accordingly, survey questionnaire was developed as an instrument of data collection for the study. The survey questionnaire allows for a number of known themes to be addressed and for data to be interpreted very efficiently (Keyrooz 2005).

The aim of the survey therefore, was intended to explore the effect of the Cross River Fadama III and Songhai projects on the beneficiaries and ascertain if indeed, they have achieved the intended purpose(s) of the programmes after participation.

Accordingly, to explore the effects of the Cross River Fadama III and Songhai projects, multi-stage sampling procedure was employed to generate data for analysis from a representative sample of the population. Structured questionnaire was the key instrument for data collection. The questionnaire was developed on the basis of the expected outcomes of the programmes, found in the programmes' official documents.

To administer the questionnaire, one household was randomly selected from each of the purposively selected Fadama User's Groups (FUGs) in each of the LGAs for Fadama III participants and same number for the non-participants (control group) with the aid of farmers' information provided by programme officials, while 50 respondents were purposively selected from among about 100 beneficiaries of the Songhai project and same number randomly selected from similar crop-farmers for control group. In all, a total of 410 questionnaires were administered on the respondents across the four Local Government Areas (LGAs) selected for the study. These are; Obubra LGA-110, Ogoja LGA-100, Bekwarra LGA-100 and Abi-100, for both participants and control groups respectively. The selection of these respondents was assisted by lists provided by the Cross River State Agricultural Development Office (CRADO), LGAs Fadama III programme facilitators in each of the local government areas selected for the study and the Songhai field office in Abi LGA. Discussions were also held with relevant programme officials, facilitators as well as participants, in addition to the researcher's direct field observations, in order to enrich the analysis and to fill observed voids.

3.8 Sources of Data

For the purpose of this study, data and other information were collected from both primary and secondary sources. Primary data were sourced through the use of structured questionnaires administered on selected programme beneficiaries and non-beneficiaries (comparative group) within the study area. The questionnaires were tailored to generate information regarding the effect of the programmes (Cross River Fadama III/Songhai Initiative) on beneficiaries' income and overall wellbeing. Face to face interview (group and individual discussion) and actual observation of field events by the researcher were employed where necessary, to fill-in any information gap. Secondary information/data sources included Journals and academic publications, Internet resources and official publications. Secondary information sourced were on theoretical issues and agricultural and poverty trend as captured by official and other documentary sources.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This chapter focuses on the presentation of data and interprets the outcome of the statistical and econometric analysis from four hundred and ten completed and returned questionnaires using SPSS 18.1 and Eviews 7.0. The structured questionnaires were designed based mainly on the stated objectives of the Fadama III and Songhai projects in Cross River State from the perspectives of the beneficiaries. The analysis involved a combination of statistical, budgetary and parametric evaluations which include descriptive statistics, Logistic regression, multiple regression, mean difference analysis and gross margin analysis. The Mean-Difference estimator was used to do a comparative analysis of output and income measures between programme beneficiaries and non-programme beneficiaries with the aim of ascertaining programme impact among the Fadama III and Songhai beneficiaries. The regression analysis was used to show the impact of the projects on the output of project beneficiaries.

The analysis depicts that the respondents are divided into two groups: programme beneficiaries and non-beneficiaries. The programme beneficiaries are of two classes – those who are involved in the Songhai scheme and those with Fadama III programme (Table 4.1). The Songhai is made of fifty (50) programme participants and Fadama III is made up of one hundred and fifty-five (155) pariticipant-respondents. The same number of respondents was also purposively selected for the two groups in the same location where the programme participants are located for comparative purposes.

Table 4.1:
Breakdown of Class of Respondents

Class of Respondents	Frequency	Percent
Fadama III:		
Beneficiaries	155	37.80
Non-Beneficiaries	155	37.80
Total	310	75.60
Songhai:		
Beneficiaries	50	12.20
Non-Beneficiaries	50	12.20
Total	100	24.40

Source: Field survey data (2015)

4.1 Socio-Demographic Characteristics of the Respondents

The demographic features of Fadama III beneficiaries and non-beneficiaries as well as Songhai Beneficiaries and Non-Beneficiaries were examined based, among others, on their Senatorial Districts, Local Government Area, Age, Marital Status, Size of Respondents' Household, Educational Qualification, Years of Farm Experience, Programme and other source(s) of off-farm income. Selected socio-demographic characteristics of the respondents are summarized in tables 4.2 and 4.3, for Fadama III and Songhai programmes, respectively.

4.1.1 Socio-Demographic Characteristics of Fadama III Beneficiaries and Non-Beneficiaries

This section focuses on the socio-demographic characteristics of the Fadama III beneficiaries and non-beneficiaries.

Senatorial District: The study derived respondents from two out of the three senatorial districts that make up the state. Findings, as shown in table 4.2, revealed that 210 (51.2%) of the respondents were from Central Senatorial Districts while the remaining 200 (48.8%) were from Northern Senatorial Districts. Specifically, 100 (24.39.8%) of the Fadama III beneficiary-respondents were from Cross River North while 55 (13.4%) were from Cross River Central. Similar findings can also be seen in the Fadama III non-beneficiary-respondents.

Local Government Area: Four major local government areas constituted the study areas for the study. The Fadama III respondents distribution according to the local government areas for the beneficiary and non-beneficiary are as follows: Obubra 55 (17.7%), Yala and Ogoja are 50 (16.1%) each, respectively.

Age of Respondents: The study indicates that majority of the Fadama III beneficiaries, 57 (18.4%) were within the age group 30-40, followed by age group 41-50 which were made up of 45 (14.5%). The least age group for the Fadama III beneficiaries were in the group 18-29 and were up of 15 (4.8%). The study indicates that majority of the Fadama III non-beneficiaries, 52 (16.8%) were within the age group 30-40 followed by age group 18-29 which comprised 46 (14.8%) respondents, while those greater than 50 years were the least (13, 4.2%). The average age of the respondents as indicated by the mean was found to be 34.2 years. This indicates that the majority of the population involved in the Fadama III scheme were middle-aged characterized with strength.

Gender: the distribution of the study's respondents according to gender showed that majority of the respondents, 120 (38.7%) of beneficiaries and 131, (42.3%) of non-beneficiaries respectively, were males. This indicates male dominance of the programmes in the area studied. However, gender variations between the two groups could be as a result of the sampling procedure adopted by the study which gives all respondents the chance to participate in the study irrespective of their gender as corroborated in Akinbile et al (2006).
Marital Status: the marital status of the study's Fadama III beneficiary respondents showed that 105 (33.9%) were married, 40 (12.9%) were single while 10 (3.2%) respondents claimed to be widowed. For the Fadama III non-beneficiaries the data showed that 104 (33.5%) were married, 45 (14.5%) were single while 6 (1.9%) respondents were widowed. The data for "widowed" indicates low participation of the vulnerable groups in the scheme.

Educational qualification: Over 64 (20.6%) of the sampled Fadama III beneficiary respondents completed primary education while about 53 (17.1%) attained secondary education. However, 30 (9.7%) of them had no formal education while 8 (2.6%) had tertiary education. For the Fadama III non-beneficiary, majority 60 (19.4%) had secondary education followed by 57 (18.4%) with primary education, then 36 (11.6%) with no formal education while only 2 (0.6%) claimed to have tertiary education. This shows that most of the participants were either lowly educated and some with no formal education. This has great implication for the implementation of the PPP programmes in the area as illiterates gets discouraged in issues involving much of paper work.

Household size: Household size is the number of persons that contribute and draw on the incomes of the household. A detailed analysis shows that 74 (23.9%) of the Fadama III beneficiaries have a household size of 5-9 members while 46 (14.8%) of the respondents have household sizes of 10 members and above and the remaining 35 (11.3%) said their household sizes were between 1-4 members. For the Fadama III non-beneficiaries majority, 67 (21.6%) were in the range of 5-9 member-household, followed by those with household sizes of 10 members and above which comprised 50 (16.1%) while those with household sizes of 1-4 members were 38 (12.3%). This show large household sizes in the area. Large household sizes have been noted to have correlation with food security and poverty as they provide cheap source of labour as findings by Adegbite and Oluwalana, (2004) also indicate that the larger the size of the farming household the more likely it is for suitable labour efficiency on farms.

Farm Enterprise: With regards to farm enterprise type, result show that 86 (27.7%) of respondent farmers were involved in the cultivation of cassava, 45(14.5%) farmers reported that their main crop of cultivation was yam and 24 (7.7%) reported that rice cultivation was the main farm enterprise.

Years of farming experience: Table 4.2 indicates that 80 (25.8%) Fadama III beneficiary farmers had above 10 years farming experience, while 70 (22.6%) of farmers reported 6-10 years of farming experience and only 5 (1.6%) respondent-farmers reported 1-5 years of farming experience. For the Fadama III non-beneficiaries, findings (table 4.3) revealed that 87 (28.1%) reported above 10 years farming experience while 68 (21.9%) of the farmers reported 6-10 years of farming experience. The results showed adequacy (over 5 years) of farming experience in the area for easy adaptation to programme innovations.

Table 4.2

Selected Socio-Demographic Characteristics of Fadama III Beneficiaries and Non-Beneficiaries

Variable	Group			
	Fadama III Beneficiaries (n = 155)		Non-Fadama III Non-beneficiaries (n = 155)	
Age:	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
18-29	15	4.8	46	14.8
30-40	57	18.4	52	16.8
41-50	45	14.5	44	14.2
>50	38	12.3	13	4.2
Total	155.0	50.0	155.0	50.0
Gender**:**				
Female	35	11.3	24	7.7
Male	120	38.7	131	42.3
Total	155.0	50.0	155.0	50.0
Senatorial District:				
Cross River Central	55	17.7	55	17.7
Cross River North	100	32.3	100	32.3
Total	155.0	50.0	155.0	50.0
LGA:				
Obubra	55	17.7	55	17.7
Ogoja	50	16.1	50	16.1
Yala	50	16.1	50	16.1
Total	155.0	50.0	155.0	50.0
Marital status:				
Married	105	33.9	104	33.5
Single	40	12.9	45	14.5
Widowed	10	3.2	6	1.9
Total	155.0	50.0	155.0	50.0
Household Size:				

Table 4.2 Contd.

1-4 persons	35	11.3	38	12.3
5-9	74	23.9	67	21.6
10 and above	46	14.8	50	16.1
Total	155.0	50.0	155.0	50.0
Educational Qualification:				
Non-formal	30	9.7	36	11.6
Primary	64	20.6	57	18.4
Secondary	53	17.1	60	19.4
Tertiary	8	2.6	2	.6
Total	155.0	50.0	155.0	50.0
Years of Farm Experience:				
1-5 years	5	1.6	-	-
6-10	70	22.6	68	28.1
10 and above	80	25.8	87	21.9
Total	155.0	50.0	155.0	50.0

Source: Field Survey Data (2016)

4.1.2 Socio-Demographic Characteristics of Songhai Beneficiaries and Non-Beneficiaries

Senatorial district: Findings as shown in table 4.3 revealed that a total of 100 Songhai respondents comprising of 22.40% of the total 410 respondents sampled for the study were drawn from the Cross River Central Senatorial District. This district was specifically targeted because it covers the only local government area in which the Songhai PPP project was implemented.

Local government area: The respondents' distribution according to the local government areas shows that the entire 100 (22.40%) of the beneficiary and non-beneficiary-respondents were drawn from Abi Local government area being the only local government area with the Songhai project in the state.

Age of Respondents: Findings indicate that majority of the respondents, 40 (40.0%) were within the age group of 30-40, followed by those within the group of 41-50 comprising 8 (8.0%) while those within 18-29 years were 2 (2.0%). For the Songhai non-beneficiaries, majority 22 (22.0%) fell within the age bracket of 41-50 years while those who were above 50 years were 15 (15.0%), and those within the age group of 30-40 years were 12 (12.0%) and only 1 (1.0%) of the Songhai non-beneficiary claimed to be in the age group 18-29 years. The average age of the respondents as indicated by the mean is 36.4 years. This indicates that the majority of the population involved in the Songhai scheme was of middle-age characterized with strength.

Gender: the gender distribution for the Songhai respondents show that the Songhai beneficiaries were made up of 46 (46.0%) males and 4 (4.0%) females. This indicates male dominance of the Songhai scheme in the area. For the Songhai non-beneficiaries, it was 45 (45.0) and 5 (5.0%) for males and females, respectfully.

Marital Status: data showed that 40 (40.0%) of the Songhai respondents were married, 10 (10.0%) were single while none of the Songhai beneficiary respondents were widowed. For the Songhai non-beneficiaries, majority 37 (37.0%) were married, 10 (10.0%) were single while 3 (3.0%) of the Songhai non-beneficiary claimed to be widowed. The data for widowed particularly among beneficiaries indicates the low participation of the vulnerable groups in the scheme.

Educational Qualification: result of table 4.3 shows that 11 (11.0%) of the sampled Songhai beneficiary completed secondary education while 39 (9.0%) said they possess certificates from tertiary institutions. For the Songhai non-beneficiary 18 (18.0%) attained secondary education while 20 (20.0%) said they attained primary education and 11 (11.0%) had non-formal education. The higher education level of the beneficiaries over the non-beneficiaries could be attributable to the deliberate recruitment of young and educated potential farm entrepreneurs into the scheme to be trained in Benin Republic. The high educational qualification among the beneficiaries encouraged easy adaptation to programme training.

Household Size**:** The typical household size for the Songhai beneficiary group was found to be 1 - 4 members comprising of 41 (41.0%) members while 9 (9.0%) of the respondents have household sizes ranging of 5-9 members. For the Songhai non-beneficiaries, majority 37 (37.0%) had household sizes between 5-9 persons while 11 (11.0%) had households of 10 persons and above and only 2 (2.0%) said their household sizes were made of 1-4 persons.

Years of Farming Experience: As shown in table 4.3(ii), majority, 41 (41.0%) of Songhai respondents had between 1-5 years farming experience while 9 (9.0%) of the respondents had farming experience ranging from 6-10 years. For the Songhai non-beneficiaries, majority 37 (37.0%) had between 6-10 years farm experience while 11 (11.0%) had over 10 years farm experience and only 2 (2.0%) said they had between 1-5 years experience in farming. The results showed Songhai beneficiaries had less farm experience compared to the non-beneficiaries. This could however, be due to the recruitment policy of the scheme that encouraged young school graduates with interest in the scheme to be recruited. However,

their level of education made up for the relative inexperience in farming as it aided easy adaptation to training on new farm technologies.

Table 4.3

Selected Socio-Demographic Characteristics of Songhai Beneficiaries and Non-Beneficiaries

Variable	Group			
	Songhai Beneficiaries (n = 155)		Non-Songhai Beneficiaries (n = 155)	
Age:	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
18-29	2	2.0	1	1.0
30-40	40	40.0	12	12.0
41-50	8	8.0	22	22.0
>50	-	-	15	15.0
Total	50.0	50.0	50.0	50.0
Gender:				
Female	4	4.0	5	5.0
Male	46	46.0	45	45.0
Total	50.0	50.0	50.0	50.0
Senatorial district:				
Cross River Central	50	12.2	50	12.2
Total	50.0	22.40	50.0	22.40
LGA:				
Abi	50	12.2	50	12.2
Total	50.0	50.0	50.0	50.0
Marital status:				
Married	40	33.9	37	37.0
Single	10	12.9	10	10.0
Widowed	-		3	3.0
Total	50.0	50.0	50.0	50.0
Household size:				
1-4 persons	41	41.0	2	2.0
5-9	9	9.0	37	37.0
10 and above	-	-	11	11.0
Total	50.0	50.0	50.0	50.0
Educational qualification:				
Non-formal	-	-	11	11.0
Primary	-	-	20	20.0
Secondary	11	11.0	18	18.0
Tertiary	39	39.0	1	1.0
Total	50.0	50.0	50.0	50.0
Years of farm experience:				
1-5 years	41	41.0	2	2.0
6-10	9	9.0	37	37.0
11 years and above			11	11.0
Total	50.0	50.0	50.0	50.0

Source: Field Survey Data (2016)

4.2 Effects of Fadama III and Songhai Projects on Output

4.2.1 Farming innovations introduced by the projects
4.2.2 Innovations of Fadama III Project

The key innovations of Fadama III scheme for the programme beneficiaries were categorized into four main components (4.2.2 a-d) namely: capacity building, advisory services, productive input support and small scale community-owned infrastructure. Thus;

4.2.2 (a) Capacity building

Capacity building was aimed at inculcating the adoption of new technology in farm practices to improve output. Data from table 4.4 show that 135 (43.5%) of fadama beneficiaries received training on the adoption of new technology while 20 (6.5%) did not. As regards training on proper record keeping which is essential in modern farm practices, 60 (19.4%) of the beneficiaries received training while 95 (30.6%) did not. The high number of those that did not train on proper farm record keeping may be attributed to the low literacy level in the area.

4.2.2 (b) Advisory services

A key distinguishing feature of Fadama III is in the area of advisory service provision. Through this provision, farmers receive training support on cuttings/seed multiplication as well as use of farm chemicals. As shown in table 4.4, Fadama III beneficiaries who received training on cuttings/seed multiplication were 150 (48.4%) while 5 (1.6%) could not access the training. 141 (45.5%) received training on proper fertilizer application while 14 (4.5%) did not. On proper use of herbicides and pesticides, 82 (26.5%) of beneficiaries received training while 73 (23.5%) did not. The high number of beneficiaries who did not get trained on use of farm chemicals may be attributable to the technical nature of it and the reliance on professionals by most farmers to undertake the service. 96 (31.0%) beneficiaries received training on value chain activities while 59 (19.0%) did not and 113 (36.5%) of beneficiaries consented that they received training on Sustainable Land Management (SLM) while 42 beneficiaries did not. This has implication for favourable farm practices that secure the land from massive degradation.

4.2.2 (c) Productive input support

The productive input support is also an important component of Fadama III scheme where farm input materials are acquired for the beneficiaries. Results from table 4.4 further reveal that all of the entire 155 Fadama III beneficiaries were supported in the procurement of productive asset acquisition, procurement of fertilizer, herbicides and pesticides and

procurement of cuttings/seedlings. This has great implication for improved crop output in the area.

4.2.2 (d) Small Scale Community Owned Infrastructure

This incorporates provision of infrastructural facilities that could aid production. On 'provision of road infrastructure', 95 (30.6%) beneficiary respondents ticked 'Not available' while 60 (19.4%) beneficiaries ticked 'Yes', agreeing that there was provision of farm access roads such as the Ofaishor farm access road Ishibori (2Km). On the provision of irrigation infrastructure, 20 (6.5%) beneficiaries agreed to availability of irrigation infrastructural support such as water pumping machine, while 2 (0.6%) beneficiaries said no availability and 133 (42.9%) beneficiaries ticked 'not applicable'. The high number of those who considered irrigation infrastructure as not applicable could be attributable to the predominance of cassava and yam farmers in the area as the nature of their farming is considered to be out of the irrigation type farming. 30 (9.7%) beneficiaries agreed that a tractor hiring centre was provided for them, but, these were located mainly within the urban centre. While 101 (32.6%) indicated that a tractor hiring centre was not provided for them, 24 (7.7%) beneficiaries considered the service as 'not applicable' to their farm operations. Processing is critical in the value-chain addition. As table 4.4 shows, 80 (25.8%) of beneficiaries reported that a processing centre (mostly, cassava processing) was provided for them within the farm community, while 6 (1.9%) said it was not provided and 69 considered it as 'not applicable' to their farm enterprise. Project monitoring is a way of ensuring compliance and adherence. The entire 155 (50%) Fadama III beneficiaries said their farm enterprises were monitored periodically by the relevant programme officials. Thus, table 4.5 reveals the Fadama III programme innovations for beneficiaries.

Table 4.4
Farming innovations for Fadama III beneficiaries

Variable	Fadama III Beneficiaries (n = 155)	
	Frequency (n = 155)	Percentage (%)
Capacity building:		
Training on Adoption of New Technology		
No	20	6.5
Yes	135	43.5
Total	155.0	50.0
Training on proper record keeping		
No	95	30.6
Yes	60	19.4
Total	155	50.0
Advisory services:		
Training on cuttings/seed multiplication		

Table 4.4 Contd.

No	5	1.6
Yes	150	48.4
Total	155	50.0
Training on proper application of fertilizer:		
No	14	4.5
Yes	141	45.5
Total	155	50.0
Training on proper application of herbicides and pesticides:		
No	73	23.5
Yes	82	26.5
Total	155	50.0
Training on value chain activities (storage, processing etc.):		
No	59	19.0
Yes	96	31.0
Total	155	50.0
Training on SLM (environmental implication of farm practices):		
No	42	13.5
Yes	113	36.5
Total	155	50.0
Productive input support:		
Procurement of productive asset cquisition (Small farm tools for individual Fadama III beneficiary):		
No	-	-
Yes	155.0	50.0
Total	155.0	50.0
Procurement of fertilizers, herbicides and pesticides:		
No	-	-
Yes	155.0	50.0
Total	155.0	50.0
Procurement of cuttings/seedlings:		
No	-	-
Yes	155.0	50.0
Total	155.0	50.0
Small scale community-owned infrastructure:		
Provision of road infrastructure:		
No	60	19.4
Not available	95	30.6
Total	155	50.0
Irrigation infrastructure:		
No	2	.6
Not available	133	42.9
Yes	20	6.5
Total	155	50.0
Tractor hiring centre:		
No	101	32.6
Not available	24	7.7
Yes	30	9.7
Total	155	50.0

Table 4.4 Contd.

Processing centre:		
No	6	1.9
Not available	69	22.3
Yes	80	25.8
Total	155	50.0
Project monitoring and evaluation:		
No	-	-
Yes	155	50.0
Total	155	50.0

Source: Field Survey Data (2016)

4.2.2.1 Extent of adoption of farming innovations under Cross River Fadama III

Beneficiaries of Cross River Fadama III were exposed to various innovations aimed at improving farmer capacity and output. However, the extent of actual adoption of the innovations largely determines the effect on farm output as well as farmer well-being.

Table 4.5 reveals the level of adoption of the innovations introduced by the Cross River Fadama III scheme. As revealed in table 4.5, majority, 140 (45.2%) Fadama III beneficiaries made use of improved cuttings/seedlings while only 22 (7.1%) Fadama III non-beneficiaries made use of improved cuttings and seedlings. On fertilizer use, 155 (50.0%) Fadama III beneficiaries made use of fertilizer. But only 35 (11.3%) of 155 Fadama III non-beneficiaries said they use fertilizers. On application of herbicides and pesticides, majority, 148 (47.7%) Fadama III beneficiaries utilized herbicides and pesticides while 42 (13.5%) of non-beneficiaries made use of herbicides and pesticides. In the area of record keeping however, only 51 (16.5%) of beneficiaries kept proper records. Similarly, only 9 (2.9%) non-beneficiary-respondents kept proper records. This shows adoption and application of modern farm input technology by the farmers in the area except for record keeping which may be a reflection of the relatively low education in the area.

The high number 119 (38.4%) of Fadama III beneficiaries who were encouraged by the application of new technology is an indication of acceptance and positive effect.

On adoption of SLM practices, table 4.6 reveals that mixed cropping was the major SLM practice in the area favoured by 125 (40.3%) of the beneficiary population. The high acceptance of this approach, however, may not be unconnected with the traditional cropping pattern of farmers in the area which favours its easy adoption and application.

All 155 (50.0%) beneficiaries relied on service providers contracted by the scheme. None of the non-beneficiaries had this access. As regards the performance of service providers, 20 (6.5%) beneficiaries reported that they were "very satisfied", 130 (41.9%) reported that they were satisfied and 5 reported that they were not "satisfied".

Concerning type of irrigation practiced, 131 (42.3%) of beneficiaries practised rain-fed irrigation while 24 (7.7%) practiced Fadama irrigation. All 155 (50.0%) of non-beneficiaries practiced rain-fed irrigation. The high number of both beneficiary and non-beneficiary farmers who depended on rain-fed irrigation in the area may be attributable to the nature and/or type of farming as cassava and yam farming, favoured by majority of farmers in the area is considered difficult with fadama irrigation.

On type of value addition majority of beneficiaries 101 (32.6%) said 'processing' and 9 (2.9%) had none. For non-beneficiaries, 59 (19.0%) each indicated 'storage' and 'none', respectively. The high difference in the 'none' category between the beneficiaries and non-beneficiaries may be attributed to positive value-addition effect on the beneficiaries.

Concerning major farm tools used, majority of both beneficiaries 144 (46.5%) and non-beneficiaries 146 (47.1) are still reliant on traditional farm tools though with a marginal edge in favour of beneficiaries in the use of mechanized tools. However, majority 126 (40.6%) of the beneficiaries reported that the small farm tools were 'adequate' while majority 96 (31.0%) of non-beneficiaries considered it 'not adequate'. The adequacy of small tools by beneficiaries can be attributed to the provisions through service providers in the fadama scheme.

On 'adequacy of fertilizer', majority 86 (27.7%) beneficiaries considered it 'not adequate' though a higher number of non-beneficiaries 151 (48.7%) considered it 'not adequate'. On 'adequacy of herbicides and pesticides, 142 (45.8%) considered it 'adequate' while 147 (47.4%) of non-beneficiaries said it was 'not adequate'.

Farm monitoring was to ensure compliance, in this regard 139 (44.8%) beneficiaries assented that their farms were monitored/inspected. All 155 non-beneficiaries reported that their farms were not monitored or inspected by any agent.

Infrastructural provision remains a key challenge in the area as majority of the respondents-beneficiaries 115 (37.1%) and non-beneficiaries 118 (38.1%) claimed 'not satisfactory' though with a marginal difference in favour of the beneficiaries.

On whether felt the impact of new technology, majority, 115 (37.1%) of beneficiaries agreed that the new technology had impact on their output while only 15 (4.8%) of non-beneficiaries felt technology had impacted on their output. Table 4.6 further revealed that 130 (41.9%) beneficiaries reported that they experienced consistent increase in farm income arising from increased output after programme application. However, 21 (6.8%) of beneficiaries said they did not experience income increase within that time frame and 4 (1.3%) beneficiaries stated that they were not sure if there was an increase. However, only 35 (11.3%) of non-beneficiaries reported that their incomes increased after programme, therefore, the income increases may be attributed to the effect of Fadama resources on the output of beneficiaries.
Direct output marketing is predominant in the area as indicated by 141 (45.5%) and 155 (50.0%) of non-beneficiaries. Only 14 (4.5%) of beneficiaries marketed their outputs through middle men (off-takers). Therefore, determination of output price, as shown in table 4.6 followed the ruling market price.

The use of family labour still predominates in the area with majority, 90 (29.0%) of beneficiaries and 110 (35.5%) of non-beneficiaries engaging family labour for their farm operations.
Payment of counterpart fund, that is, beneficiary contribution, was a necessary condition for participation and disbursement in the Fadama scheme. Beneficiary contribution, though in varied percentages, was in the areas of Input support, productive assets acquisition, advisory services and tractorization support. All of the 155 (50.0%) of beneficiaries said they paid counterpart fund. This was not applicable to non-beneficiaries. However, majority of the beneficiaries, 85 (27.4%) claimed 'loan' as their source of the counterpart fund paid and 20 (6.5%) said they paid through assistance from family and friends. This has implication for poverty in the area. The analysis (Table 4.5) thus, reveals significant adoption of programme innovations by the beneficiaries of Fadama III programme.

Table 4.5
Adoption of Farming Innovations: FADAMA III Beneficiaries and Non-Beneficiaries

Variable:	Group: Beneficiaries (n = 155)		Non-beneficiaries (n = 155)	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Adoption of new technology:				
Use of Improved Cuttings/Seedlings:				
No	15	4.8	133	42.9
Yes	140	45.2	22	7.1
Total	155.0	50.0	155.0	50.0
Use of Fertilizer:				
No			120	38.7
Yes	155	50.0	35	11.3
Total	155.0	50.0	155.0	50.0
Use of Herbicides and Pesticides:				
No	7	2.3	113	36.5
Yes	148	47.7	42	13.5
Total	155.0	50.0	155.0	50.0
Use of proper record keeping:				
No	104	33.5	146	47.1
Yes	51	16.5	9	2.9
Total	155.0	50.0	155.0	50.0
Whether encouraged by the application of new technology:				
Not Aware	-	-	109	35.2
No	36	11.6	16	5.2
Yes	119	38.4	30	9.7
Total	155.0	50.0	155.0	50.0
		Type of SLM practices:		
Planting or Orchards:				
No	149	48.1	138	44.5
Yes	6	1.9	17	5.5
Total	155.0	50.0	155.0	50.0
Mixed Cropping:				
No	30	9.7	28	9.0
Yes	125	40.3	127	41.0
Total	155.0	50.0	155.0	50.0
Cover Cropping:				
No	155	50.0	155	50.0
Yes				41.0
Total	155.0	50.0	155.0	50.0
Mulching:				
No	107	34.5	155	50.0
Yes	48	15.5	-	-

Total	155.0	50.0	155.0	50.0
Composting:				
No	150	48.4	155	50.0
Yes	5	1.6		
Total	155.0	50.0	155.0	50.0
Whether accessed service providers:				
No	-	-	155	50.0
Yes	155	50.0	-	-
Total	155.0	50.0	155.0	50.0
Performance of service providers:				
Not satisfactory	5	1.6	-	-
Satisfactory	130	41.9	-	-
Very satisfactory	20	6.5	-	-
Not Applicable	-	-	155	50.0
Total	155.0	50.0	155.0	50.0
Type of irrigation system:				
Fadama irrigation	24	7.7		
Rain-fed	131	42.3	155	50.0
Total	155.0	50.0	155.0	50.0
Type of value addition:				
None	9	2.9	59	19.0
Processing	101	32.6	37	11.9
Storage	45	14.5	59	19.0
Total	155.0	50.0	155.0	50.0
Major farm tools used:				
Hoe/cutlass/shovel	144	46.5	146	47.1
Tractor/machinery	11	3.5	9	2.9
Total	155.0	50.0	155.0	50.0
Adequacy of small farm tools:				
Adequate	126	40.6	59	19.0
Not adequate	29	9.4	96	31.0
Total	155.0	50.0	155.0	50.0
Adequacy of fertilizer:	155.0	50.0	155.0	50.0
Adequate	69	22.3	4	1.3
Not adequate	86	27.7	151	48.7
Total	155.0	50.0	155.0	50.0
Adequacy of herbicides, pesticides:				
Adequate	142	45.8	8	2.6
Not adequate	13	4.2	147	47.4
Total	155.0	50.0	155.0	50.0
Farm monitoring:				
No	16	5.2	155	50.0
Yes	139	44.8		
Total	155.0	50.0	155.0	50.0
Adequacy of access to infrastructure:				
Not satisfactory	115	37.1	118	38.1

Satisfactory	40	12.9	37	11.9
Total	155.0	50.0	155.0	50.0
Level of relationship with programme facilitators:				
Not satisfactory	7	2.3	-	-
Satisfactory	146	47.1	-	-
Very satisfactory	2	.6	-	-
Not applicable	-	-	155	50.0
Total	155.0	50.0	155.0	50.0
Impact of new technology on output:				
No	16	5.2	35	11.3
Not applicable	24	7.7	105	33.9
Yes		115	37.1	15 4.8
Total		155.0	50.0	155.0 50.0
Marketing of farm output:				
Directly in the market		141	45.5	155 50.0
Through middle men		14	4.5	- -
Total		155.0	50.0	155.0 50.0
Determination of output price:				
Ruling market price		155	50.0	155 50.0
Total		155.0	50.0	155.0 50.0
Whether consistent increase in farm income since programme commencement:				
No		21	6.8	90 29.0
Not sure		4	1.3	30 9.7
Yes		130	41.9	35 11.3
Total		155.0	50.0	155.0 50.0
Source of farm labour:				
Cooperative		30	9.7	5 1.6
Family labour		90	29.0	110 35.5
Hired labour		35	11.3	40 12.9
Total		155.0	50.0	155.0 50.0
Whether available land for farm expansion:				
No		65	21.0	66 21.3
Yes		90	29.0	89 8.7
Total		155.0	50.0	155.0 50.0
Whether paid counterpart fund:				
Yes		155	50.0	- -
Not Applicable				155 50.0
Total		155.0	50.0	155.0 50.0
Source(s) of counterpart fund paid:				
Assistance		20	6.5	- -
Loan		85	27.4	- -
Savings		50	16.1	
Not Applicable		-	-	155 50.0
Total		155.0	50.0	155.0 50.0

Source: Field Survey Data (2016)

4.2.3 Innovations of Cross River Songhai Project

Innovations offered by the Songhai scheme centre mainly on building capacity and knowledge acquisition on modern and sustainable agricultural practices based on the Songhai philosophy. These capacity development innovations were, in this study and based on the training content, categorized into: capacity building, acquisition of new technology, and practical/field and theoretical training on agricultural business and Sustainable Land Management (SLM) techniques.

(a) Capacity Building

Results on table 4.6 reveal that 50 (50.0%) Songhai beneficiary-respondents affirmed that they were trained Benin Republic for six months. Specifically, 38 (38.0%) beneficiaries reported that they were trained as entrepreneurs, 10 (10.0%) were trained as farm managers while 2 (2.0%) were trained as technicians. All 50 (50.0%) beneficiaries reported that food processing was included in the training.

(b) Training on Sustainable Land Management (SLM)

SLM has become a key concern of modern agricultural practices. This also formed a key component of the Songhai innovation for the beneficiaries. Concerning the type of SLM training received, 49 (49.0%) of the beneficiaries indicated that they received training on the techniques of mulching while 1 (1.0%) beneficiary did not. All 50 (50.0%) respondents agreed that they received training on methods of biological controls of pests and predators. All the Songhai beneficiaries (N=50) reported that they were trained on techniques of organic agricultural production, different techniques of organic fertilizer, soil biology and waste management/irrigation techniques.

(c) Training on Agricultural Business

All fifty (50) Songhai beneficiaries indicated that they were trained on methods of packaging, storage and preservation. The distribution (table 4.6) shows specifically that, while 7 (7.0%) beneficiaries indicated that their area of training was agribusiness, those who were trained on animal husbandry were 6 (6.0%), those trained in crop production were 20 (20.0%), those under food processing were 12 (12.0%), those trained as general mechanic were 2 (2.0%) and those under handicraft were 3 (3.0%). This shows that more of the beneficiaries were trained in the area of crop production. All the beneficiaries indicated that the framework for research delivery during training was a combination of lectures conferences and video screenings involving both practical/field and theoretical content. Results on Table 4.6 therefore, reveal the key innovations to Songhai programme beneficiaries.

Table 4.6
Farming Innovations for Songhai Beneficiaries

Variable:	Songhai Beneficiaries (n = 50)	
	Frequency (n = 50)	Percentage (%)
Capacity Building:		
Trained in Benin Republic?		
No	-	-
Yes	50	50.0
Total	50	50.0
Trained for a period of six months:		
No	-	-
Yes	50	50.0
Total	50	50.0
Training category:		
Entrepreneur	38	38.0
Farm manager	10	10.0
Technician	2	2.0
Total	50	50.0
Inclusion of food processing content in Training:		
No	-	-
Yes	50	50.0
Total	50	50.0
Technology acquired:		
Techniques of organic agricultural production		
No	-	-
Yes	50	50.0
Total	50	50.0
Whether trained on different techniques of organic fertilizer, soil biology?		
No	-	-
Yes	50	50.0
Total	50	50.0
Whether trained on Irrigation Techniques?		
No	-	-
Yes	50	50.0
Total	50	50.0
Whether trained on techniques of mulching?		
No	1	1.0
Yes	49	49.0
Total	50	50.0
Whether trained on methods of biological controls of pests and predators?		
No	-	-
Yes	50	50.0
Total	50	50.0
Trained on agricultural machinery?		
No	48	48.0
Yes	2	2.0
Total	50	50.0
Trained on agricultural business?		

Table 4.6 Contd.

Whether trained on methods of packaging, storage and preservation		
No	-	-
Yes	50	50.0
Total	50	50.0
Whether trained on economic management of food processing?		
No	40	40.0
Yes	10	10.0
Total	50	50.0
Trained on SLM practices?		
No	-	-
Yes	50	50.0
Total	50	50.0
Whether training involved practical/field and theoretical content		
No	-	-
Yes	50	50.0
Total	50	50.0
Area of training:		
Agribusiness	7	7.0
Animal husbandry	6	6.0
Crop production	20	20.0
Food processing	12	12.0
General mechanic	2	2.0
Handicraft	3	3.0
Total	50	50.0

Source: Field Survey Data (2016)

4.2.3.1 Extent of adoption of farming innovations under Cross River Songhai project

Beneficiaries of Cross River Songhai project were exposed to various innovations aimed at improving the farmer capacity and output. However, the extent of actual adoption of the innovations largely determines the effect on farm output as well as farmer well-being. Table 4.7 reveals the level of adoption of the innovations introduced by the Songhai scheme.

Accordingly, Table 4.7 provides data on the responses of Songhai beneficiaries to innovations of the scheme.

On whether respondent was able to expand farm enterprise after the capacity training, majority 38 (38.0%) said no. Only 12 (12.0%) Songhai beneficiaries were able to expand their farm enterprise after training. Lack of farm "input support" was the main reason for 22.0% of the respondents while 16.0% of beneficiaries attributed it to lack of funds.

Concerning the extent to which new technology improved on on-farm performance, 20 ticked 'not sure', 26 beneficiaries ticked 'fairly well' and 4 ticked 'very well'. This shows only marginal effect on performance which may be attributed to the lack of post-training funding/input support for farm enterprise. None of all the Songhai beneficiaries were required

to pay counterpart fund. When asked about their off-farm enterprise activity (if any), result revealed that 22 of the beneficiaries were into consultancy, 12 were into crop farming, 6 were into public services and 10 were into other services. On whether better equipped to analyze operational events, 40 (40.0%) of respondents said yes while 1 (1.0%) and 9 (9%) said "no" and "not sure" respectively. On dissemination of new skills acquired, 39 (39.0%) said "yes" while 11 (11.0%) said "no". The predominance of respondents in consultancy and in ability to analyze operational events as well as ability to disseminate new skills acquired validates the fact that the Songhai innovative-capacity development recorded significant level of adoption by the beneficiaries. However, the follow-up support may have been an impediment to the full actualization of programme impact which may have accounted for the perception expressed on level of programme satisfaction. Concerning source(s) of funding support for enterprise, 7 beneficiaries obtained their funding from loans, 5 obtained theirs from private sources and 38 had no funding sources.

Furthermore, 8 beneficiaries consented that they were 'very satisfied' with the programme implementation while 42 beneficiaries were 'Fairly satisfied' with the programme implementation. The analysis reveals significant adoption of Songhai programme innovations by the beneficiaries.

Table 4.7 : Adoption of Farming Innovations: Songhai Beneficiaries

Variable	Songhai beneficiaries (n = 50)	
	Frequency (n = 50)	Percentage (%)
Extent to which new technology improved on-farm performance:		
Not sure	20	20.0
Fairly well	26	26.0
Very Well	4	4.0
Total	50	50.0
Whether required to pay counterpart fund:		
No	50	50.0
Yes	-	-
Total	50	50.0
Whether able to pay the counterpart fund:		
Yes	-	-
No	-	-
Not applicable	50	50.0
Total	50	50.0
Off-farm enterprise activity (if any):		
Consultancy	22	22.0
Crop farming	12	12.0
"Others"	10	10.0
Public service	6	6.0
Total	50	50.0
Whether better equipped to analyze enterprise and the operational events:		
No	1	1.0
Not sure	9	9.0
Yes	40	40.0
Total	50	50.0
Whether disseminate new skills and knowledge acquired:		
No	11	11.0
Yes	39	39.0
Total	50	50.0
Whether apply SLM practices in farm operations:		
Not sure	22	22.0
Yes	28	28.0
Total	50	50.0
Source(s) of funding support for enterprise:		
Loan	7	7.0
None	38	38.0
Private source(s)	5	5.0
Total	50	50.0
Whether satisfied with Songhai implementation:		
Fairly satisfactory	42	42.0
Very satisfactory	8	8.0
Total	50	50.0

Source: Field Survey Data (2016)

4.3 Binary Logistic Regression Analysis of Adoption of Farming Innovations

4.3.1 Analysis of factors affecting adoption of farming innovations by FADAMA III Farmers

The following section presents the logistic regression analysis indicating factors determining adoption of FADAMA III innovations for FADAMA III farmers as follows: Use of improved Cuttings/Seedlings, Use of Fertilizer, Use of Herbicides, Use of Proper Record Keeping, Use of Professional Service Providers and, Use of Cover Cropping. The dependent variable (FADAMA III innovations) represented by the mentioned sub-categories of FADAMA III innovation pool is dichotomous, that is, where adopters are those of FADAMA III farmers who have attested to have used the innovations mentioned with the value of 1 and 0 for non-adopters. The model is made of 17 variables with 3 continuous variables and 14 discrete dummy variables, Tables 4.8 (a-f). The tables indicate that out of the 17 variables, 7 (of which 2 were continuous and 5 dummies) were found to be significant determinants of adoption of FADAMA III innovations across the six sub-innovation areas.

The results indicates that Farmers' Age, Farmers' years of experience in farming, Farmers' Income, Farmers' gender, Type of Labour used and Farm Size are more likely to influence the adoption of Herbicides by the FADAMA III farmers. Specifically, farmers' age, farmer years of experiences, farm income, gender, type of labour used and farm size are 1.845, 0.381, 1.000, 1.975, 1.497 and 2.418 times more likely to increase the use of Herbicides by FADAMA III. This implies that FADAMA III Farmers who are older, have more experience in farming, higher farm income and those with larger farm sizes are more likely to adopt Use of Herbicides. Results reveal that Farmers' Age, Farmers' years of experience in farming, Farmers' Income and Farm Size are more likely to influence the adoption of Improved Cuttings/Seedlings. Thus, farmers' age, farmer years of experiences, farm income and farm size are 2.164, 0.522, 1.000 and 1.956 more likely to increase the adoption of Improved Cuttings/Seedlings by the FADAMA III farmers. This implies that FADAMA III Farmers who are older, have more experience in farming, higher farm income and those with larger farm sizes are more likely to adopt Use of Improved Cuttings/Seedlings.

In terms of the Use of Fertilizer, the analysis indicates that variables such as Farmers' Age, Farmers' years of experience in farming, Farmers' Income, Farmers' Output, Farmers' labour type and Farm Size are more likely to influence the adoption of the Use of Fertilizer. Farmers' age, farmer years of experiences, farm income, farm output, farmers' labour type

and farm size are 2.416, 0.314, 1.000, 1.077, 1.630 and 2.396 times more likely to increase the use of Fertilizer by the FADAMA III farmers. For Use of Proper Record Keeping, the logit model depicts that Farmers' Age and Farm Experience are more likely to influence its adoption. Farmers age and farm size are 2.081 and 1.106 times more likely to increase the FADAMA III adoption of good record keeping systems.

Total on Farm Income is 1.000 more likely to increase the Use of Mixed Cropping by the FADAMA III farmers. Finally, the model for Use of Service Providers showed that Age, Farmers' years of experience in farming, Farmers' Income, Farmers' Output, Source of Farm Labour and, Farm size are 4.039, 0.293, 0.001, 1.070, 1.999 and 0.013 times more likely to increase the Use of Service Providers by the FADAMA III farmers. Scholars have found support for farming experience indicating that relatively farmers who have longer years of experience may develop the confidence in handling the risk, skills in technology application. Different studies have agreed with this argument. These results, for instance, are in tandem with Melaku (2005) and Laduber, Dessalegn and Daniel (2016).

Table 4.8: Maximum Likelihood Estimate of Binary Logistic Model for FADAMA III Farmers' Odds Ratio Exp(B)

Explanatory variables	Use of Herbicide	Use of Cuttings/seedlings	Use of Fertilizer	Use of Proper farm record keeping	Mixed Cropping	Use of Service Providers
Output	1.047	1.019	1.077**	1.012	-.973	1.070**
GEN	1.975**	1.145	2.213*	-.980	2.157	1.932
AGE1	1.845**	2.164**	2.416**	2.081**	1.628	4.039**
EDU	1.084	1.026	1.306	-.884	-.931	1.036
FAREXP	-.381**	-.522**	-.314**	-.373*	-.935	-.293**
MAR	-.970	1.104	-.859	-.862	1.068	1.050
HSIZE	-.928	-.746	-.959	1.045	-.573	-.613
IRR	7.183E8	1.246E9	6.867E8	-.984	-.782	1.691E9
LABOUR	1.497**	1.242	1.630**	1.218	1.199	1.999**
Income	1.000*	1.000**	1.000*	1.000	1.000**	1.000**
FarmSize	2.418**	1.956*	2.396*	1.106	2.049	3.711*
Constant	-.000	-.000	-.000	-.351	2.875	-.000

4.3.2 Binary Logistic Regression Analysis of Adoption of Farming Innovations by Songhai Farmers

Table 4.9 (a-f) presents binary logistic model and describes the main determinants that influences decision of SONGHAI farmers to adopt techniques of organic agricultural production, techniques of organic fertilizer and soil biology, techniques of mulching, techniques for biological control of pests and predators, techniques of waste management and, irrigation and use of farm machinery. Similar to that of FADAMA III, the dependent variable (SONGHAI innovations) represented by the mentioned sub-categories, is dichotomous that is, where adopters are those of SONGHAI farmers who have attested to have used the innovations mentioned with the value of 1 and 0 for non-adopters. The model is made of 16 variables with 3 continuous variables and 13 discrete dummy variables. From the estimated logit model, variables such as Income are more likely to influence the adoption of innovations provided by SONGHAI. The odds of adopting Songhai innovations increased by a factor of 1.000 as a farmers' on-farm income increased implying that farmers who have large income sizes have adopted techniques of organic agricultural production, techniques of organic fertilizer and soil biology, techniques of mulching, techniques of biological control of pests and predators, techniques of irrigation and use of farm machinery.

Table 4.9: Maximum Likelihood Estimates of Binary Logistic Model for SONGHAI Farmers' Odd Ratio Odds Ratio Exp(B)

Explanatory variables	Techniques of Organic Agric	Techniq. of Organic Fert./Soil Biology	Technique of Mulching	Bio control of Pests and Predators	Techniques of Irrigation	Use of Machinery
GEN	109292.093	109292.093	34.871	109292.093	109292.093	1.500E49
AGE1	-.289	-.289	-.827	-.289	-.289	-.000
MAR	7.680E7	7.680E7	3.818	7.680E7	7.680E7	5.914E14
HSIZE	-.000	-.000	-.101	-.000	-.000	-.000
EDU	2.606	2.606	2.677	2.606	2.606	-.000
FAREXP	-.000	-.000	-.081	-.000	-.000	-.000
LABOUR	1.698	1.698	1.991	1.698	1.698	-.000
FarmSize	7.089E22	7.089E22	3.085E16	7.089E22	7.089E22	-.000
Income	1.000**	1.000**	1.000**	1.000**	1.000**	.999
Output	1.463	1.463	1.294	1.463	1.463	2.400
Constant	-.000	-.000	-.000	-.000	-.000	7.804E43

4.4 Results of Production Function Estimates

This section utilizes the production function for inputs/output analysis. This is to ascertain the extent of production efficiency and returns to scale, as well as to estimate the variables influencing the selected crops. The analysis is carried out for both beneficiary and non beneficiary farmers in order to net out the project's effect.

4.4.1 Estimated production functions for Cassava, Rice and Yam for Fadama III Beneficiaries and Non-Beneficiaries

To determine the impact of Fadama III and Songhai programmes on agricultural output of the beneficiary farmers, regression analysis were performed. The results of the linear regression showing the impact of FADAMA III innovations as proxied by Labour (LABOUR) input, Cuttings/Seedlings (SEEDLINGS), Fertilizer (FERTILIZER) input, use of Herbicides (HERBICIDES) and Pesticides (PESTICIDES) on the output of the different crop groups as well as the production efficiencies are depicted in Tables 4.10(a) and (b). The double-log functional form of the regression was used as the lead equation not only because it had the highest number of significant regressors but with relatively high F-statistics.

Table 4.10(a) shows the estimated production functions for Cassava, Rice and Yam of Fadama III beneficiaries. Similar to Folorunso and Dawang (2016), the regression coefficients represent the elasticity in production. Estimated coefficients of inputs are the partial production elasticity. The sum of the partial elasticities would determine the total elasticities which are the returns to scale. A returns to scale value greater than one (>1) indicates increasing returns to scale, a value equals one (=1) indicates constant returns to scale and a value less than one (<1) indicates decreasing returns to scale. However, the study views that, at values less than one (<1) but not less than zero (>0), implies that farmers' elasticity of production with respect to estimated production inputs used is within the rational production region, therefore, values less than zero (<0) fall below the rational production region (similar to Ishaku, Haruna, Danwaka and Suleiman, 2017). The constant term is transformed to measure efficiency of production (Reif-Andras et al 2002).

Table 4.10 (a) : Estimated Production Functions for Cassava, Rice and Yam under FADAMA III (Beneficiaries)

	Model 1: Cassava model		**Model 2:** Rice model		**Model 3:** Yam model	
Variable	B	t*	B	t*	B	t*
Constant	1.018	2.835	0.687	0.478	-2.170	-3.768
FERTILIZER	0.025	0.294	0.327	0.561	0.444	5.607**
HERBICIDE	0.268	4.039**	-0.469	-0.688	0.148	2.006**
LABOUR	0.189	2.601**	-0.527	-1.764**	0.012	0.121
PESTICIDE	0.441	6.935**	0.034	0.095	-0.018	-0.200
SEEDLINGS	-0.037	-0.080	0.737	0.982	0.444	4.672**
DW	1.758		5.511		1.779	
Prob(F*)	0.000		0.064		0.000	
Efficiency	2.768		0.849		1.399	
Returns to scale	0.886		0.102		1.030	

Source: Author's computation based on survey data. *** implies statistically significant at 1%; ** implies statistically significant at 5% and * implies statistically significant at 10%. Figures in parenthesis are the respective t-ratios.

The regression result for the cassava model shows that the partial elasticity values for all the independent variables are less than one with that of SEEDLINGS having a negative sign thus, the coefficients of the cassava model depicts that the variables were positive determinants of cassava output except seedlings. The result shows for instance, that increase in the input of Fertilizer, Herbicide, Labour and Pesticides by 1% would increase cassava output by 0.025%, 0.268%, 0.189% and 0.441% respectively while a 1% increase in Seedlings would result in a decrease in Cassava output of 0.037%. This finding supports the assertion that as more cassava Cuttings/seedlings are added to the already existing land space it adds little or nothing to output but rather adds to costs of production. However, the t-statistic values indicate that the significant variables of cassava output were Herbicide, Labour and Pesticides. The total elasticity value (that is, returns to scale) of 0.886 indicates that the production function exhibits decreasing returns to scale which may be attributable to the decreasing returns arising from additional cassava Cuttings/Seedlings that adds more to costs, however, the efficiency value of 2.768 indicates that cassava beneficiary farmers were still within the threshold of efficiency in their production methods even with the level of contribution of Fertilizer, Herbicides, Labour, Pesticides and Cuttings/Seedlings to cassava output. These findings may also indicate that as cassava production gets more efficient; the efficiency is tending towards decreasing returns to scale showing that more inputs of cassava is now reducing output than inputs. Rather, it is recommended that inputs should be utilized in another land area as the current production space has achieved its production peak. The F-

ratio is significant ($p<0.01$) and further confirms the strong explanatory power of the inputs included in the model.

The estimated coefficients for Rice in the case of FADAMA III beneficiary farmers shows that the partial elasticity values for all the independent variables are less than one with Herbicide and Labour having negative signs hence, rice output is less responsive to each of the independent variables, for instance, a 1% increase in Fertilizer, Pesticide and Seedlings would result in an increase in Rice output of 0.327%, 0.034% and 0.737% respectively. The rice model depicts that only the coefficient of labour was significant in explaining variation in rice output of the Fadama III beneficiary, thus, increasing labour by 1%, for instance, would however decrease rice output by 0. 527%. This may be an indication of high costs of labour associated with rice production and very little labourers willing to undergo the processes involved in rice production. Thus, it becomes more efficient if mechanized form of labour is used rather than manual labour for crops such as rice. The result for Labour is also in conformity with Folorunso et al (2016) that shows that an increase in labour input by 1% results in decrease in output which, according to the study however, implies that "labour used in production is inelastic and is over-utilized."

The production function exhibits decreasing returns to scale with a total elasticity value of 0.102 while the efficiency value of 0.849 shows that the rice farmers were not efficient in their production methods thus, indicating the stress in current production methods for rice. F –ratio is significant ($p<0.01$) implying that the variables included in the model significantly explained the variation in the output of rice.

For the Fadama beneficiary Yam model, Table 4.10(a) shows that the partial elasticity values for all the independent variables are less than one with Pesticide having a negative sign implying that the response of Yam output to each of the independent variables is less responsive. Specifically, findings from the results depict that changing Fertilizer, Herbicides, Labour and Seedlings by 1% would result in positive changes in yam output by 0.444%, 0.148%, 0.012% and 0.444% respectively while a 1% increase in Pesticide would result in a decrease in Yam output by 0.018%. The t-statistic value indicates that only Herbicide and Seedling have a significant relationship with Yam output. The total elasticity value of 1.03 indicates that the production function exhibits increasing returns to scale while the efficiency value of 1.399 indicates that the Yam farmers were efficient in their production methods. This result is enhanced by the fact that yam farming is the oldest and most traditional farm type in the study area for which farmers have also acquired traditional expertise in addition to

the productive input support offered by the intervention programme. Farmers could thus benefit from more returns to scale. The returns to scale result for yam farmers is in consonance with the findings of Ojo, Mohammed, Ojo and Olaleye (2009) who found an increasing returns to scale of 1.269 for yam farmers in Ondo State and Oluwatusin (2011) who found a return to scale of 1.119 for yam farmers in Osun state. The results reveal a highly significant ($p<0.01$) F-ratio thereby confirming the strong explanatory power of the inputs included in the model.

Table 4.10 (b) :Estimated Production Functions for Cassava, Rice and Yam under FADAMA III (Non-Beneficiaries)

	Model 1: Cassava model		**Model 2:** Rice model		**Model 3:** Yam model	
Variable	B	t*	B	t*	B	t*
Constant	3.945	4.269	1.923	1.232	1.464	1.094
FERTILIZER	-0.099	-0.086	-1.313	-2.175**	0.211	1.147
HERBICIDE	-0.039	-0.035	2.364	3.417**	-0.150	-0.934
LABOUR	-0.127	-0.659	0.698	1.439	-0.216	-1.069
PESTICIDE	-0.008	-0.051	0.289	0.838	-0.056	-0.273
SEEDLINGS	-0.181	-0.843	-1.715	-2.097**	0.198	0.898
DW	2.097		2.923		4.215	
Prob(F*)	0.043		0.023		0.057	
Efficiency	1.815		1.328		1.180	
Returns to scale	0.454		0.323		-0.013	

Source: Author's computation based on survey data. *** implies statistically significant at 1%; ** implies statistically significant at 5% and * implies statistically significant at 10%. Figures in parenthesis are the respective t-ratios.

Table 4.10 (b) provides results for the comparable category (Non-beneficiaries). As the result indicates, the significant innovations were FERTILIZER, SEEDLINGS and HERBICIDES though FERTILIZER and SEEDLINGS are negative.

The comparable results for efficiency show that the beneficiaries were more efficient in the production of Cassava (2.768) and Yam (1.399) while the non-beneficiaries recorded 1.815 and 1.180 for Cassava and Yam respectively. This may be attributable to the benefits of innovations to the beneficiaries. However, for Rice production, results show that, the non beneficiaries were more efficient (1.328) than beneficiaries (0.849) respectively.

The beneficiaries also recorded higher returns to scale in production of Cassava (0.886) and Yam (1.03) while the non-beneficiaries recorded 0.454 and -0.013 for Cassava and Yam respectively, though the beneficiaries' returns to scale for Cassava production display decreasing returns. For Rice production, results show decreasing returns to scale for both beneficiaries (0.102) and non-beneficiaries (0.323) even though the non-beneficiaries have a

marginal advantage. Therefore, the production efficiency and returns to scale advantage of the beneficiaries over the non beneficiaries in the Fadama III programme particularly for the Cassava and Yam crops farming may be due to exposure of the beneficiaries to programme innovations.

4.4.2 Estimated production functions for Cassava, Rice and Yam for Songhai Beneficiaries and Non-Beneficiaries

Table 4.11 (a)
Estimated Production Functions for Cassava, Rice and Yam under Songhai (Beneficiaries)

	Model 1: Cassava model		**Model 2:** Rice model		**Model 3:** Yam model	
Variable	B	t*	B	t*	B	t*
Constant	5.868	3.612	3.379	0.461	3.851	1.854
FERTILIZER	5.719	2.375**	0.592	0.142	0.317	0.488
HERBICIDE	-5.373	-2.552**	0.002	0.001	0.336	0.908
LABOUR	0.792	2.516**	-0.123	-1.364	0.435	1.488
PESTICIDE	-0.127	-0.516	0.043	0.023	-0.348	-1.060
SEEDLINGS	0.159	0.401	-0.796	-0.172	0.373	0.881
DW	1.890		1.505		1.813	
Prob(F*)	0.026		0.093		0.081	
Efficiency	2.156		1.696		1.796	
Returns to scale	1.170		- 0.282		1.113	

Source: Author's computation based on survey data. *** implies statistically significant at 1%; ** implies statistically significant at 5% and * implies statistically significant at 10%. Figures in parenthesis are the respective t-ratios.

Table 4.11 (a) shows the estimated production function for Cassava, Rice and Yam of Songhai beneficiaries. The regression result for Cassava model show that the partial elasticity values for all the independent variables are less than one except Fertilizer (FERTILIZER), with Herbicide (HERBICIDE) and Pesticide (PESTICIDE) having negative signs. Specifically, this implies, for example that increase in FERTILIZER, Labour (LABOUR) and Cuttings/Seedlings (SEEDLINGS) by 1% would result in an increase in Cassava output by 5.719%, 0.792% and 0.159% respectively while an increase in HERBICIDE and PESTICIDE by 1% would however, result to decrease in Cassava output of -5.373%, and -0.127 respectively. The t-statistic value indicates that HERBICIDES, though negative, have significant relationship with cassava output of Songhai farmers while FERTILIZER and LABOUR are both positive and significant. The efficiency value of 2.156 shows that Songhai cassava farmers adopted efficient production methods and the total elasticity value of 1.170 indicates increasing returns to scale production function. The F- ratio is significant ($p<0.01$) and further confirms the strong explanatory power of the inputs included in the model.

The estimated coefficients for Rice in the case of Songhai beneficiary farmers show that the partial elasticity values for all the independent variables are less than one with Labour and Seedlings having negative values. This indicates a production function exhibiting decreasing returns to scale. This implies, for instance, that a 1% increase in FERTILIZER, HERBICIDES and PESTICIDES would result to increase in Rice output of 0.592%, 0.002% and 0.043% respectively while a 1% increase in LABOUR and SEEDLINGS would however, result to decrease in Rice output of 0.123% and 0.796% respectively. The t-statistic results show that none of the innovations were significant determinants of output of rice though use of FERTILIZER, use of HERBICIDES and use of PESTICIDES were positive. The efficiency value of 1.696 implies efficiency in production methods and the total elasticity value of -0.282 indicates a production function exhibiting decreasing returns to scale. The F – ratio is significant ($p<0.01$) implying that the variables significantly explained the variation in the output of rice.

For Yam model, the regression result on Table 4.9(a) shows that the partial elasticity values for all the independent variables were less than one with one of the variables (Pesticide) showing negative sign. Specifically, for instance, a 1% increase in FERTILIZER, HERBICIDE, LABOUR and SEEDLINGS would result in increase in yam output by 0.317%, 0.336%, 0.435% and 0.373% respectively while a 1% increase in Pesticide would result in a decrease in Yam output by 0.348%. The t-statistic shows that none of the regressors in the Yam model were significant determinants. The efficiency value of 1.796 indicates that Songhai Yam beneficiary farmers were efficient in their production methods and the total elasticity value of 1.113 indicates increasing returns to scale. The results reveal a highly significant ($p<0.01$) F-ratio thereby confirming the strong explanatory power of the inputs included in the model.

Table 4.11 (b)
Estimated Production Functions for Cassava, Rice and Yam under Songhai (Non-Beneficiaries)

	Model 1: Cassava model		**Model 2:** Rice model		**Model 3:** Yam model	
Variable	B	t*	B	t*	B	t*
Constant	-0.825	-0.437	-0.878	-0.649	0.039	1.094
FERTILIZER	-3.783	-1.349	1.991	3.3199	-1.237	1.147
HERBICIDE	2.796	1.141	-1.748	-4.786	0.665	-0.934
LABOUR	0.962	2.627**	0.238	1.239	-0.894	-1.069
PESTICIDE	0.019	0.069	1.343	6.960**	-0.014	-0.273
SEEDLINGS	0.300	0.649	-0.303	-0.424	0.537	0.898
DW	1.639		1.634		1.968	
Prob(F*)	0.049		0.073		0.002	
Efficiency	0.919		0.945		0.244	
Returns to scale	0.294		1.521		-0.943	

Source: Author's computation based on survey data. *** implies statistically significant at 1%; ** implies statistically significant at 5% and * implies statistically significant at 10%. Figures in parenthesis are the respective t-ratios.

Table 4.11 (b) shows results for the comparable (non-beneficiary) group. As the results indicates, the Songhai beneficiaries have greater advantage in production efficiency for the three crop categories thus; Cassava (2.156), Rice (1.696) and Yam (1.796) while the Songhai non-beneficiary production efficiency results were; 0.919, 0.945 and 0.244 for Cassava, Rice and Yam respectively. The production efficiency advantage of the beneficiaries over the non-beneficiaries can be attributed to the capacity-enhancing innovations offered to the beneficiaries through the Songhai programme. In terms of returns to scale, results show increasing returns to scale for cassava (1.170) and yam (1.113) beneficiary farmers while the non-beneficiary cassava and yam farmers witnessed decreasing returns to scale of 0.294 and -0.943 respectively. However, the non-beneficiary rice farmers had higher returns to scale (1.521) than the beneficiary rice farmers (-0.282). This result is similar to Ishiaku, Haruna Danwaka and Suleiman (2017) who found higher returns to scale among non-Fadama III small scale rice farmers than the Fadama III participants in Nasarawa state, suggesting that "Fadama III participants can further increase their output by employing more of the input resource."

As defined in the study, all production (input) elasticity values of less than zero (0) implies that beneficiary and non-beneficiary farmers of Fadama III and Songhai programmes were

using the estimated production inputs below the rational production region. Output would therefore, be enhanced by employing these inputs within the rational production region.

In terms of class of programme, a comparative analysis of the efficiency parameters for Songhai beneficiary farmers (table 4.11b) and Fadama III farmers (table 4.10a) reveal that the Songhai farmers were more efficient in production methods for Rice and Yam than the Fadama III beneficiary farmers except for Cassava production where the Fadama III beneficiary farmers were more efficient in production methods. Specifically, the efficiency parameters were 2.768, 0.849 and 1.399 for Fadama beneficiary farmers for Cassava, Rice and Yam crops respectively as opposed to 2.156, 1.696 and 1.796 for Songhai beneficiary farmers for Cassava, Rice and Yam crops respectively. The efficiency advantage of Songhai beneficiary farmers over the Fadama III beneficiary farmers may be due to the more intensive capacity development through training by the Songhai scheme. The analyses for Fadama III (4.2a) and Songhai (4.2b) programmes thus, indicate significant impact on crop output of beneficiaries.

The analyses reveal average production efficiency, in favour of participants, of 1.672 and 1.453, and, 1.883 and 0.703 for Fadama III and Songhai beneficiaries and non beneficiaries, respectively.

The returns to scale analyses between the two classes of programmes reveal that the Songhai beneficiary had greater advantage over the Fadama III beneficiaries among the cassava and yam farmers respectively. Specifically, Songhai beneficiary farmers recorded higher returns to scale advantage among cassava farmers (1.170) over Fadama III beneficiary cassava farmers (0.886) and among Songhai yam farmers (1.113) over Fadama III yam farmers (1.030) respectively. However, Fadama III rice farmers had greater returns to scale elasticity (0.102) than Songhai rice farmers (-0.282). This result may be a reflection of the more intensive capacity training offered to Songhai beneficiaries by the Songhai programme, and, a demonstration of the fact that Songhai programme has great potentials to raise output and hence, increase income and reduce poverty of beneficiaries.

4.5 Results of Profitability Analysis

4.5.1 Results of Analysis for Fadama III Beneficiaries and Non-Beneficiaries:

The study made use of the Gross Margin Analysis to determine the profitability of the various crops. For ease of analysis, the study used Total Variable Cost (TVC) obtained for the beneficiaries as guide for the estimation of the non-beneficiary TVC for the three crops.

Detailed evaluation of the gross margin analysis is depicted in table 4.12(a) for the Fadama III and non-Fadama III farmers. The results indicate that the average profit per participant for the Fadama III beneficiaries were as follows, per crop: Cassava (₦ 120,511.63), Rice (₦ 41,000.00) and Yam (₦5, 888.89) per ha. For the Fadama III Non-beneficiary the average income or loss per crop were as follows: Cassava (₦ 20,000.01), Rice (₦ 29,833.33) and Yam (₦48, 555.56) per ha. Average profit for Fadama beneficiaries is N 55,800.17 and –N32, 470.73 for non beneficiaries, respectively. The forgoing analysis as depicted in table (4.12a) show a significant impact of programme on crop income profitability of the beneficiaries.

Table 4.12

Results of Gross Margin Analysis for Fadama III Beneficiary and Non-Beneficiary Farmers (Cassava, Rice and Yam)

Total Variable Cost per Production	Inputs	Cassava		Rice		Yam	
		Beneficiary	Non-Beneficiary	Beneficiary	Non-Beneficiary	Beneficiary	Non-Beneficiary
	Fertilizer	48,000.00	48,000.00	35,000.00	35,000.00	15,000.00	15,000.00
	Herbicide	12,000.00	12,000.00	15,000.00	15,000.00	12,000.00	12,000.00
	Pesticides	9,000.00	9,000.00	12,000.00	12,000.00	9,000.00	9,000.00
	Stem Cuttings/Seedlings	30,000.00	30,000.00	20,000.00	20,000.00	15,000.00	15,000.00
	Labour:						
	Land Clearing	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
	Ridging	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
	Planting	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
	Weeding	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
	Application of Herbicides, Pesticides and Fertilizer	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
	Harvesting	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Total Variable Costs (TVC)		**151,000.00**	**151,000.00**	**134,000.00**	**134,000.00**	**103,000.00**	**103,000.00**
Total Revenue Per Production		**271,511.63**	**131,976.74**	**175,000.00**	**104,166.67**	**108,888.89**	**54,444.44**
Gross Margin Analysis (Average per Participant)		**120,511.63**	**-19,023.26**	**41,000.00**	**-29,833.33**	**5,888.89**	**-48,555.56**

Source: Author's Calculation Based on Survey Data (2016)

4.5.2 Results of Profitability Analysis (Songhai)

Detailed evaluation of the gross margin analysis for Songhai beneficiaries and non-beneficiaries, employing the budgetary technique, is depicted in table 4.13

The study also made use of Total Variable Cost (TVC) obtained for the programme beneficiaries as guide for the estimation of the non-beneficiary TVC for the three crops.

The results indicate that the average profit per participant for the Songhai beneficiaries were as follows, per crop; Cassava (N 96,523.03), Rice (N 49,000.00), Yam (26,349.23) per ha. Results for the Songhai non-beneficiary income or loss per crop were as follows; Cassava (46,678.34), Rice (3,233.68), and Yam (-21,651.87) per/ha. On the average, Songhai beneficiaries recorded profit of N57, 290.75 and, N9,353.38 for non beneficiaries, respectively. The result shows a higher gross margin for beneficiaries in the three crops with a greater margin recorded by cassava farmers thereby indicating significant impact of the programme on crop profits of the beneficiaries.

Table 4.13: Results of Gross Margin Analysis for Songhai Beneficiary and Non-Beneficiary Farmers (Cassava, Rice and Yam)

Total Variable Cost per Production	**Inputs**	**Cassava**		**Rice**		**Yam**	
		Beneficiary	Non-Beneficiary	Beneficiary	Non-Beneficiary	Beneficiary	Non-Beneficiary
	Fertilizer	28,000.00	28,000.00	20,000.00	20,000.00	10,000.00	10,000.00
	Herbicide	8,000.00	8,000.00	11,000.00	11,000.00	9,000.00	9,000.00
	Pesticides	7,000.00	7,000.00	8,000.00	8,000.00	6,000.00	6,000.00
	Stem Cuttings/Seedlings	20,000.00	20,000.00	15,000.00	15,000.00	12,000.00	12,000.00
	Labour:						
	Land Clearing	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
	Ridging	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
	Planting	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
	Weeding	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
	Application of Herbicides, Pesticides and Fertilizer	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
	Harvesting	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Total Variable Costs (TVC)		**115,000.00**	**115,000.00**	**106,000.00**	**106,000.00**	**89,000.00**	**89,000.00**
Total Revenue Per Production		**211,523.03**	**161,678.34**	**155,000.00**	**109,233.68**	**115,349.23**	**67,348.13**
Gross Margin Analysis (Average per Participant)		**96,523.03**	**46,678.34**	**49,000.00**	**3,233.68**	**26,349.23**	**-21,651.87**

Source: Author's Calculation based on survey data (2016)

4.6 Results of Double Difference (DD) Analysis

4.6.1 Analysis of Double Difference in income of Fadama III Beneficiaries and Non-Beneficiaries before and after project implementation

To compare household income across categories, that is, beneficiaries and non-beneficiaries using cross sectional analysis may not completely attribute income differences across programme efficiently. As such, the study goes further to determine these differences using the difference in difference estimator (Double-Difference) method to evaluate the impact of the Fadama III project on beneficiary incomes. This technique has the ability to compare changes and outcomes pre- and post-programme for beneficiaries as well as non-beneficiaries (Verner & Verner, 2006).

The income in monetary value obtained by the Fadama III beneficiaries and non-beneficiaries before and after the project as well as percentage change in income due to project intervention for the three crop groups is presented in Tables 4.14(a) to (c). The results indicates an increase in the net farm income of Fadama III beneficiary group after Fadama III project for the three crops while in the case of Non-beneficiary farmers, the increase was observed in cassava crop farmers only. Specifically, Fadama III beneficiary farmers enjoyed increase of 115.21%, 31.25% and 50.76% after the Project for Cassava, Rice and Yam respectively. In the case of the non-beneficiary farmers, there was an increase in average net farm income of 6.57% for cassava while income for Rice and yam reduced by 12.28% and 3.92% respectively. The results also indicates a high difference in net farm income of the beneficiaries over that of non-beneficiaries (₦137,209,31, ₦ 56,250.0 and ₦ 38,888.90) for Cassava, Rice and Yam, respectively. Analysis of Double Difference reveals average income difference of –N77, 449.40 in favour of Fadama III beneficiaries after programme; this may be attributed to the increase in the farm output realized by the beneficiaries after implementation of Fadama III project in the area, confirming the significant programme impact on beneficiaries.

Table 4.14 (a)

Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Cassava Farmers

Survey	Intervention (Fadama III Beneficiaries)	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	126162.79	123837.21	-2,325.58
After	271511.63	131976.74	-139,534.89
Difference by Time	145,348.84 (115.21%)	8,139.53 (6.57%)	-137,209.31

Table 4.14 (b):

Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Rice Farmers

Survey	Intervention (FADAMA III Beneficiaries)	Control (FADAMA III Non-Beneficiaries)	Difference by Group
Before	133,333.33	118,750.00	-14,583.33
After	175,000.00	104,166.67	-70833.33
Difference by Time	41,666.67 (31.25%)	-14,583.33 (-12.28%)	-56,250.00

Table 4.14 (c):

Double Difference in Average Income across time and across groups for Fadama III Beneficiary and Non-Beneficiary Yam Farmers

Survey	Intervention (Fadama III Beneficiaries)	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	72,222.22	56,666.67	-15,555.55
After	108,888.89	54,444.44	-54,444.45
Difference by Time	36,666.67 (50.76%)	-2,222.23 (-3.92%)	-38,888.90

Source: Author's Calculation based on survey data (2016)

4.6.2 Analysis of Double Difference in Income of Songhai Beneficiaries and Non-Beneficiaries before and after project implementation

The income in monetary value obtained by the Songhai beneficiaries and non-beneficiaries before and after the project as well as percentage change in income due to project intervention for the three crop groups is presented in Table 4.15 (a-c). Specifically, Songhai beneficiary farmers relished marginal income increases of 23.56%, 30.49% and 22.08% after the Project for Cassava, Rice and Yam respectively. In the case of the non-beneficiary

farmers, there was an increase in average net farm income of 8.57% for cassava while income for Rice and yam reduced by 2.19% and 3.27% respectively. The results also indicates a marginal difference in net farm income of the beneficiaries over that of non-beneficiaries (₦9, 785.72, ₦22,020.0 and ₦20,425.00) for Cassava, Rice and Yam, respectively. The analysis show average income difference of N-7,410.24 in favour of Songhai beneficiaries. The Songhai programme therefore, impacted on income of beneficiary though the impact may have been greater if the beneficiaries had post training input and/or funding support.

Table 4.15 (a):

Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Cassava Farmers

Survey	Intervention (Songhai Beneficiaries)	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	64,285.71	62,500.0	-1,785.71
After	79,428.57	67,857.14	-11,571.43
Difference by Time	15,142.86 (23.56%)	5,357.14 (8.57%)	-9,785.72

Table 4.15 (b):

Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Rice Farmers

Survey	Intervention (Songhai Beneficiaries)	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	66,666.67	76,686.67	10,020.00
After	87,000.00	75,000.00	12,000.00
Difference by Time	20,333.33 (30.49%)	-1,686.67 (-2.19%)	22,020.00

Table 4.15 (c):

Double Difference in Average Income across time and across groups for Songhai Beneficiary and Non-Beneficiary Yam Farmers

Survey	Intervention (Songhai Beneficiaries)	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	78,125.00	96,875.00	18,750.00
After	95,375.00	93,700.00	-1,675.00
Difference by Time	17,250.00 (22.08%)	-3,175.00 (-3.27%)	20,425.00

Source: Author's Calculation based on survey data (2016)

4.7 Results of Analysis of Income Diversification

One of the sub-objectives of the study is to determine the extent to which Fadama III and Songhai projects have enabled income diversification and hence, sustainability of the beneficiaries based on the premise that, the more diversified a household income is, the more sustainable is such a household. This was to test the claim of income sustainability by the development programmes being studied. Therefore, income diversification in this study is proxy for sustainability.

The off-farm enterprise activity (Table 4.16) and the income in monetary value obtained by the Fadama III and Songhai beneficiaries and non-beneficiaries before and after the programme implementation from the off-farm enterprise activities (storage, petty trading, consultancy, processing and others) as well as percentage change in income due to project intervention, is presented in Tables 4.17 (a-e).

4.7.1 Off-farm activity and income diversification under Fadama III

4.7.1.1 Off-Farm Enterprise Activity

For off-farm enterprise no Fadama III beneficiary or non-beneficiary respondents, as depicted in table (4.16), carried out consultancy services before programme implementation, however, after programme commencement 7 (4.5%) beneficiaries engaged in consultancy services while the number of beneficiaries who carried out petty trading before and after programme implementation were 81 (52.3%) and 52 (33.5%) respectively while non-beneficiaries were 71 (45.8%) and 76 (49.0%), respectively. Beneficiaries that were into processing before and after programme implementation were 11 (7.1%) and 32 (20.6%), respectively while non-beneficiaries were 27 (17.4%) and 22 (14.2%), respectively. Beneficiaries that were into storage before and after programme implementation were 48 (31.0%) and 60 (38.7%), respectively while non-beneficiaries were 40 (25.8%) each, respectively. For "other" off farm activity, beneficiaries were 15 (9.7%) before programme implementation and reduced to 4 (2.6%) after the implementation while non-beneficiaries were 17 (11.0%) each, before and after programme implementation each, respectively. The analysis reveals that more beneficiaries were involved in consultancy and processing while majority of non-beneficiaries were involved in petty trading as their off-farm enterprise. This distribution could be as a result of capacity building and training offered by the fadama scheme to the beneficiaries. Fadama III programme therefore, made significant impact on beneficiaries' off-farm enterprise activity.

Table 4.16

Distribution of Fadama III beneficiary and non-beneficiary farmers according to Off-farm enterprise before and after programme implementation

Variable	Before				After			
	Participants		Non-Participants		Participants		Non-participants	
	Freq	%	Freq.	%	Freq.	%	Freq.	%
OFF FARM ENTERPRISE ACTIVITY								
Consultancy	-	-	-	-	7	4.5	-	-
Petty trading	81	52.3	71	45.8	52	33.5	76	49.0
Processing	11	7.1	27	17.4	32	20.6	22	14.2
Storage	48	31.0	40	25.8	60	38.7	40	25.8
'Others'	15	9.7	17	11.0	4	2.6	17	11.0
Total	155.0	75.61	155.0	75.61	310.0	75.61	310.0	100.0

Source: Field Survey data (2016)

4.7.1.2 Off-farm Income Diversification under Fadama III

The results of off-farm income diversification, as depicted in table 4.17(a-e), indicate an increase in the net off-farm income of Fadama III beneficiary group after Fadama III project for the five different areas of off-farm enterprise while in the case of non-beneficiary Fadama III farmers, marginal increases were recorded only for petty trading and storage activities. Specifically, Fadama III beneficiary farmers enjoyed increase of 19.23%, 68.75%, 47.14%, 100.00% and 100.00% after the Project for petty trading, processing, storage, consultancy and "others", respectively. In the case of the non-beneficiary farmers, there was an increase in average net off-farm income for trading and storage activities by 7.89% and 1.67% respectively. The results also indicates a significant difference in net off-farm income of the beneficiaries over that of non-beneficiaries (N5,668,01, N34,375.0, N26,250,00, N 100,000.00 and N52,941.13) for petty trading, processing, storage, consultancy and "others", respectively. Results show average income diversity after programme of N-63, 846.83 in favour of programme beneficiaries. Therefore, there was higher income diversity among the beneficiaries of programme after implementation; this may be attributed to the capacity and knowledge enhancement acquired by the beneficiaries after Fadama III project. The results therefore, signify that the programme made significant impact on beneficiaries' income diversification hence, sustainability.

Table 4.17(a)

Double Difference in Average Income across time and across groups for Petty Trading, Fadama III Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Fadama III Beneficiaries)	N	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	81	50000.00	52	50000.00	00000.00
After	71	59615.38	75	53947.37	-5,668.01
Difference by Time	-10	9,615.38 (19.23%)	23	3,947.37 (7.89%)	-5,668.01

Table 4.17 (b):

Double Difference in Average Income across time and across groups for Processing, Fadama III Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Fadama III Beneficiaries)	N	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	11	50000.00	27	50000.00	00000.00
After	32	84375.00	22	50000.00	-34375.00
Difference by Time	21	34,375.00 (68.75%)	-5	00,000.00 (0.00%)	-34375.00

Table 4.17 (c)

Double Difference in Average Income across time and across groups for Storage, Fadama III Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Fadama III Beneficiaries)	N	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	48	58333.33	40	75000.00	16666.67
After	60	85833.33	40	76250.00	-9583.33
Difference by Time	12	27,500.00 (47.14%)	0	1,250.00 (1.67%)	-26,250.00

Source: Author's Calculation based on survey data (2016)

Table 4.17 (d):

Double Difference in average Income across time and across groups for Consultancy, Fadama III Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Fadama III Beneficiaries)	N	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	0	00000.00	0	00000.00	00000.00
After	7	100,0000	0	00000.00	100,0000
Difference by Time	7	100, 000.00 (100.00%)	0	00000.00 (0.00%)	-100,000.00

Table 4.17 (e):

Double Difference in Average Income across time and across groups for "Others", Fadama III Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Fadama III Beneficiaries)	N	Control (Fadama III Non-Beneficiaries)	Difference by Group
Before	15	50000.00	17	52941.13	2941.13
After	4	100,0000	17	50000.00	-50,0000
Difference by Time	-11	50,000.00 (100.00%)	0	-2,941.13 (-5.55%)	-52,941.13

Source: Author's calculation based on survey data (2016)

4.7.2 Off-farm activity and income diversification under Songhai Project

4.7.2.1 Off-Farm Enterprise

The off-farm enterprise activities and the income in monetary value obtained by the Songhai beneficiaries and non-beneficiaries before and after the project from the off-farm enterprise activities (storage, petty trading, consultancy, processing and others) as well as percentage change in income due to project intervention, is presented in Table 4.18 and 4.19 (a-e).

Table 4.18

Distribution of Songhai Beneficiary and Non-Beneficiary Farmers according to Off-farm activity before and after programme implementation

Variable	Before				After			
	Participants		Non-Participants		Participants		Non-participants	
	Freq	%	Freq.	%	Freq	%	Freq.	%
Off-Farm Enterprise								
Consultancy					22	44.0		
Others	38	76.0	16	32.0	4	8.0	15	30.0
Petty trading	4	8.0	20	40.0	1	2.0	20	40.0
Processing	2	4.0	4	8.0	10	20.0	4	8.0
Storage	6	12.0	10	20.0	13	26.0	11	22.0
Total	50	100	50	1000	50	100	50	100

Source: Field Survey data (2016)

As depicted in table 4.18, no Songhai respondent carried out consultancy services before programme implementation, however after the implementation, 22 (44.0%) beneficiaries started consultancy services. Beneficiaries that carried out petty trading before and after programme implementation were 4 (8.0%) and 1 (2.0%), respectively while non-beneficiaries were 20 (40.0%) each, respectively. Beneficiaries that were into processing before and after programme implementation were 2 (4.0%) and 10 (20.0%), respectively while non-beneficiaries were 4 (8.0%) each, respectively. Beneficiaries that were into storage before and after programme implementation were 6 (12.0%) and 13 (26.0%), respectively while non-beneficiaries were 10 (20.0%) and 11 (22.0%), respectively. The analysis reveals that, majority 38 (76.0%) were into "other" trades before programme commencement but the distribution for after programme commencement show that majority of the beneficiaries 22 (44.0%) claimed to offer consultancy services followed by those who diversified into storage (26.0%) and processing (20.0%). However, majority of non-beneficiaries (40.0%) were into petty trading both before and after commencement of programme. The analysis reveals that beneficiaries were more diversified after programme due to the technical knowledge acquired through the Songhai scheme.

4.7.2.2 Off-Farm Income Diversification under Songhai Project

The income in monetary value obtained by the Songhai beneficiaries and non-beneficiaries before and after the project from off-farm enterprise activities (storage, petty trading, consultancy, processing and "others") as well as percentage change in diversified income due to project intervention, is presented in Table 4.19 (a-e). The results indicates an increase in the net off-farm income of Songhai beneficiary group after Songhai project for the five

different areas of off-farm enterprise while in the case of Non-beneficiary Songhai farmers marginal increases were recorded only for petty trading only. Specifically, Songhai beneficiary farmers enjoyed increase of 80.00%, 60.00%, 45.45%, 100.00% and 100.00% after the Project for petty trading, processing, storage, consultancy and "others", respectively. In the case of the non-beneficiary farmers, there was an increase in average net off-farm income for petty trading activities by 33.33%. The results also indicate a difference in net off-farm income of the beneficiaries over that of non-beneficiaries (₦23, 333.33, N30, 000.00, ₦22, 727.27, ₦95, 454.55 and ₦ 50,000.00) for petty trading, processing, storage, consultancy and "others", respectively. Average difference in diversified income is N-44, 303.03 in favour of beneficiaries. A significant outcome of the diversification of off-farm enterprise activity in the case of Songhai showed that majority of the participants went into consultancy services after the programme. This can be attributed to the fact that many of them were not empowered financially towards owning their own farms. Results of Tables 4.18 and 4.19 (a-e) further signify that the Songhai programme made significant impact on off-farm activity and off-farm income diversity of the beneficiaries respectively.

Table 4.19 (a)

Double Difference in Average Income across time and across groups for Petty Trading Songhai Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Songhai Beneficiaries)	N	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	5	50000.00	25	50000.00	00000.00
After	5	90000.00	15	66666.67	-23,333.33
Difference by Time	-0	40,000.00 (80.00%)	-10	16,666.67 (33.33%)	-23,333.33

Table 4.19 (b)

Double Difference in Average Income across time and across groups for Processing, Songhai Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Songhai Beneficiaries)	N	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	2	50000.00	4	50000.00	00000.00
After	10	80000.00	4	50000.00	-30000.00
Difference by Time	8	30,000.00 (60.00%)	-0	00,000.00 (0.00%)	-30000.00

Table 4.19 (c)

Double Difference in Average Income across time and across groups for Storage, Songhai Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Songhai Beneficiaries)	N	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	18	50000.00	10	50000.00	00000.00
After	11	72727.27	11	50000.00	-22,727.27
Difference by Time	-7	22,727.27 (45.45%)	1	00,000.00 (0.00%)	-22,727.27

Table 4.19 (d)

Double Difference in Average Income across time and across groups for Consultancy, Songhai Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Songhai Beneficiaries)	N	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	0	00000.00	0	00000.00	00000.00
After	22	95,454.55	0	00000.00	-95,454.55
Difference by Time	22	95,454.55(100.00%)	0	00000.00 (0.00%)	-95,454.55

Table 4.19 (e)

Double Difference in Average income across time and across groups for "Others", Songhai Beneficiaries and Non-Beneficiaries

Survey	N	Intervention (Songhai Beneficiaries)	N	Control (Songhai Non-Beneficiaries)	Difference by Group
Before	25	50000.00	11	50000.00	00000.00
After	2	100,0000	20	50000.00	-50,0000
Difference by Time	-23	50,000.00 (100.00%)	9	00000.00 (0.00%)	-50,000.00

Source: Author's Calculation based on survey data (2016)

4.8 Impact of Fadama III and Songhai Projects on Poverty Reduction of Beneficiaries

One of the key aims of the Fadama III and Songhai projects in Cross River State is the reduction of poverty through greater output yield leading to higher income generation. To analyze the response of poverty to these development projects, therefore, the study employed the Foster-Greer-Thorbecke Index (FGT Indices). The FGT tool was used in the counterfactual and in a "before and after" project scenario for the purpose of netting out the

effect of programme application. Thus, poverty status of beneficiaries and non-beneficiaries is determined using three basic metric of poverty – Head count index, the poverty gap index and the squared poverty gap index. With the Head Count Index (HCI), all Fadama III farmers whose per capita income is less than the Relative Poverty Line (RPL) measure of N66, 802.20 (Annual per person, Naira), (NBS, 2010, p. 10) are considered poor. The Poverty Gap Index (PGI) indicates how much the government would have to transfer to the poor individual to make up for the short fall in reaching the poverty line. The smaller the index is, the greater potential it is for governments to alleviate poverty. The Squared Poverty Index (SPI) is bounded between 0 and 1; the closer the FGT index is to one, the greater the degree of poverty.

4.8.1 FGT Poverty Analysis under Fadama III

The distributions of the Fadama III respondents' category based on the three poverty indicators are highlighted in Table 4.20. The result for the Head Count Index reveal that before the scheme, 127 (81.9%) of the Fadama III beneficiaries were living below the poverty line while 125 (80.6%) of the non-beneficiary Fadama III farmers lived below the poverty line. After the programme implementation, the number of poor for the Fadama III beneficiary farmers reduced by 49.6% indicating only 50 farmers below the poverty line from the initial 127 farmers. On the part of the Fadama III non-beneficiary, those within the poverty line increased slightly from the 125 (80.6%) initially recorded before programme implementation to 128 (82.3%); an increase of 1.7%. Based on the Head Count Index therefore, we can conclude that the Fadama III project has had a significant impact on the poverty status of beneficiary in the study area. This, of course relates to the fact that the Fadama III beneficiary farmers have engaged in different production activities after the project which has led to a hike in income culminating in an increase in their purchasing power, standard of living and reduction in poverty. This finding corroborates Girei, Dire, Iliya & Salihu (2013) who averred that innovation and diversification reduce poverty among farmers and also in line with the findings by Oni & Olaniran (2011) for Fadama III program that poverty is generally low among beneficiaries than non-beneficiaries.

The coefficient of the Poverty Gap Index (PGI) for the Fadama III beneficiary was 0.12 after programme which implies that poor Fadama III beneficiary farmers require 12.00% of the poverty line to get them out of poverty compared to that of the Fadama III non-beneficiaries after the scheme which was 58% (0.58). This amounts to an average of ₦8, 016.26 for

beneficiary farmers as against ₦38, 745.28 for the non-beneficiary farmers, on average per annum.

As table 4.20 further indicates, the Squared Poverty Gap Index for Fadama III beneficiaries and non-beneficiaries before the scheme was 0.33 and 0.26 respectively. This implies that income of the very poor Fadama III beneficiaries have to increase by 33.0% while for the non-beneficiaries it was 26.0 % to get to the poverty line respectively. After the scheme, the index for the Fadama III beneficiaries who were very poor reduced by 32.0% to only 1% while that for the non-beneficiaries rather increased by 8% to 34 %. Results indicate an average percentage difference in FGT of -17.41% in favour of beneficiaries. This result as well compares to those of Olaolu, Akinnagbe & Agber (2013) who averred from their findings that this could be attributed to the increased productivity brought about by innovations of the Fadama III project which has resulted in increased income. Therefore, we can conclude that the Fadama III scheme has made an appreciable impact in reducing poverty levels among the beneficiaries in Cross River State.

Table 4.20

Results of Poverty Reduction Among Fadama III Beneficiaries and Non-Beneficiaries with Relative Poverty Line of N66, 802. 20

Survey	Fadama Beneficiary			Fadama Non-beneficiary			Difference by Group		
	Before	After	Difference by Time	Before	After	Difference by Time	Before	After	Difference by Time
Head Count Index ($\boldsymbol{P_0 = \frac{N_p}{N}}$)	127/155 =81.9	50/155 = 32.3	-49.6%	125/155 =80.6	128/155 =82.3	1.7%	1.3%	-50.0%	-51.3%
Poverty Gap Index ($\boldsymbol{P_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z}}$)	0.57	0.12	-0.45	0.51	0.58	0.07	0.06	-0.46	-0.52%
Squared Poverty Gap Index ($\boldsymbol{P_1 = \frac{1}{N}\sum_{i=1}^{N}(\frac{G_i}{z})^2}$	0.33	0.01	-0.32	0.26	0.34	0.08	0.07	-0.33	-0.4%

Source: Author's computation based on survey data (2016)

4.8.2 FGT Poverty Analysis under Songhai Project

The results of the Songhai respondents category based on the three poverty indicators are highlighted in Table 4.21. The Head count index indicates that before the scheme 31 (62.0%) of the Songhai beneficiaries were living below the poverty line while 28 (56.0%) of the non-beneficiary Songhai farmers lived below the poverty line. After the programme implementation, the number of poor for the Songhai beneficiary farmers reduced only by 16.0% indicating 23 farmers below the poverty line from the initial 31 farmers. On the part of the Songhai non-beneficiaries, those within the poverty line increased slightly from the 28 (56.0%) initially recorded before programme implementation to 33 (66.0%); an increase of 10.0%. Based on the head count index, we can conclude that the Songhai project has a marginal impact on the poverty status of the beneficiaries in the study area.

In terms of the Poverty Gap Index, the coefficient for the Songhai beneficiary, after programme implementation, was 0.42 which implies that poor Songhai beneficiary farmers required 42% of the poverty line to get them out of poverty compared to the Songhai non-beneficiaries, after the scheme at 43% (0.43). This amounts to an average of ₦28, 056.92 for beneficiary farmers as against ₦28, 724.95 for the non-beneficiary farmers, on average per annum. Finally, the Squared Poverty Index (SPI) (as shown in table 4.25) indicates that the index for Songhai beneficiaries and non-beneficiaries before the scheme was 0.39 and 0.35 respectively. This implies that income of the Songhai beneficiaries who were very poor before the scheme has to increase by 39% to get them out of poverty while those for the non-beneficiaries were 35% respectively. After the scheme however, the index for the Songhai beneficiaries who were very poor reduced by 32% to 17% while that for the non-beneficiary reduced by 17% to 18% respectively. The analysis indicates an average percentage difference in FGT of -8.73% in favour of beneficiaries. Conclusively, we can infer that unlike the Fadama III scheme, the Songhai scheme only made a marginal impact on poverty levels among the beneficiaries. This could be due to the fact that majority of the Songhai beneficiaries, unlike the Fadama III beneficiaries, did not receive post-training input support or funding empowerment to enable them own/expand farms of their own. As compared to the beneficiaries however, the programme made an appreciable impact in reducing level of poverty of the beneficiaries.

Table 4.21

Results of Poverty Reduction among Songhai Beneficiaries and Non-Beneficiaries with Relative Poverty Line of N66, 802. 20

Survey	SONGHAI Beneficiary			SONGHAI Non-beneficiary			Difference by Group		
	Before	After	Difference by Time	Before	After	Difference by Time	Before	After	Difference by Time
Head Count Index ($\boldsymbol{P_0 = \frac{N_p}{N}}$)	31/50 =62.0	23/50 = 46.0	16.0%	28/50 =56.0	33/50 =66.0	10.0%	6.0%	-20.0%	-26.0%
Poverty Gap Index ($\boldsymbol{P_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z}}$)	0.63	0.42	-0.21	0.59	0.43	-0.16	0.04	-0.01	-0.05
Squared Poverty Gap Index ($\boldsymbol{P_1 = \frac{1}{N}\sum_{i=1}^{N}(\frac{G_i}{z})^2}$	0.39	0.17	-0.22	0.35	0.18	-0.17	0.04	-0.01	-0.15

Source: Author's computation based on survey data (2016)

4.9 Results of Selected Multi-Dimensional Poverty Indices (MPI)

4.9.1 Analysis of Multi-Dimensional Poverty Indices under Fadama III

A multi-dimensional poverty index consisting of three dimensions and selected indicators was computed for Fadama III beneficiaries and non-beneficiaries similar to Alkire and Foster (2007, 2011) and indicated as follows (Table.4.22);

Table 4.22
Selected MPI Analysis For Fadama III Beneficiaries and Non-Beneficiaries With Relative Poverty Line of N66, 802. 20

Dimension	Indicator	Fadama III Beneficiary			Fadama III Non-beneficiary			Difference by Group		
		Before	After	Difference by Time	Before	After	Difference by Time	Before	After	Difference by Time
HEALTH	Adequacy of Farm Income for Health Expenditure	75/155 =48.4	132/155 = 85.2	-47.5%	103/155 =66.5	105/155 =67.7	1.7%	18.1%	-17.5%	-0.6%
EDUCATION	Medium of Financing Education	67/155 =43.2	107/155 = 69.0	-25.8%	98/155 =63.2	72/155 =46.6	16.7%	20.0%	-22.4%	2.4%
LIVING STANDARDS	Adequacy of Farm Income for Food	56/155 =36.1	128/155 = 82.6	-35.3%	101/155 =65.2	84/155 =54.2	11.0%	29.1%	-28.4%	-0.7%

Source: Author's computation based on survey data (2016)

Result of the selected MPI analysis for Fadama beneficiaries and non-beneficiaries, as shown in table 4.22 indicates that 75 (48.8%) of the beneficiaries claimed adequacy of farm income for health expenditure, before programme. This value increased to 132 (85.2%) after programme leading to a difference by time of 47.5%. For the non-beneficiaries, 103 (66.5%) said there was adequacy of farm income for their health needs. After the programme, there was a marginal increase in the number of those who said their farm income was adequate for their health needs to 105 (67.7%). This resulted in the intra group time difference of 1.7% while the difference by group between beneficiaries and non-beneficiaries was 18.1% and 17.5%, before and after programme, respectively.

On education, before programme 67 (43.2%) of Fadama beneficiaries said their farm income was adequate to finance their children education. After programme, the number of Fadama beneficiaries who said their farm income was adequate for financing their children education increased to 107 (69.0%). For the Fadama non-beneficiaries, 98 (63.2%) reported adequacy of their farm income for their children education before programme. After the programme, 72 (46.6%) of the non-beneficiaries said their farm income was adequate for financing their children education. The difference by group between beneficiaries and non-beneficiaries, before and after programme was 20.0% and 22.4%, respectively.

Another key MPI indicator of living standards is the adequacy of income for food needs. In this regard, table 4.22 show that 56 (36.1%) of Fadama beneficiaries considered their farm income as adequate for their food needs before programme implementation. After programme

implementation, 128 (82.6%) of beneficiaries said income from their farms was adequate for their food needs. Therefore, the difference by group, before and after programme was 29.1% and 28.4%, respectively. Average MPI difference is -1.23% in favour of beneficiaries.

The foregoing analyses reveal an increase in the number of Fadama beneficiaries that reported farm income adequacy across the three MPI indicators, while marginal increase was only observed among the non beneficiaries in farm income adequacy for health needs.

Table 4.23:
Selected MPI analysis for Songhai beneficiaries and non-beneficiaries With Relative Poverty Line of N66, 802. 20

Dimension	Indicator	SONGHAI Beneficiary			SONGHAI Non-beneficiary			Difference by Group		
		Before	After	Difference by Time	Before	After	Difference by Time	Before	After	Difference by Time
HEALTH	Adequacy of Farm Income for Health Expenditure	15/50 =30.0	32/50 = 64.0	34.0%	21/50 =42.0	19/50 =38.0	4.0%	12.0%	-26.0%	-14.0%
EDUCATION	Medium of Financing Education	23/50 =46.0	42/50 = 84.0	38.0%	36/50 =72.0	31/50 =62.0	-10.0%	26.0%	-22.0%	-4.0%
LIVING STANDARDS	Adequacy of Farm Income for Food	18/50 =36.0	40/50 = 80.0	44.0%	35/50 =70.0	23/50 =46.0	-24.0%	34.0%	-34.0%	0.0%

Source: Author's computation based on survey data (2016)

4.9.2 Analysis of Multi-Dimensional Poverty Indices under Songhai

The results on the selected MPI analysis for Songhai (Table 4.24) show that 15 (30.0%) of beneficiaries said income from farm was adequate for their health expenditure before programme participation but, after programme participation the number of beneficiaries who said their farm income was adequate for their health needs rose to 32 (64.0%). On the other hand, 21 (42.0%) of the non-beneficiaries claimed their farm income was adequate for their health needs before programme implementation in the area, but, this value decreased to 19 (38.0%) after programme implementation. This resulted in a difference by group of 12.0% and 26.0% before and after programme implementation, respectively.

On education dimension, 23 (46.0%) of the beneficiaries said income from farm was adequate in financing their children's education. After programme implementation however, 42 (84.0%) of beneficiaries had farm income adequacy for their children education. For the

non beneficiaries, 36 (72.0%) indicated that income from farm was adequate in financing their children education. However, after programme implementation, 31 (62.0%) indicated farm income adequacy for financing education of their children. The difference by group, before and after programme implementation, was 26.0% and 22.0%, respectively.

In terms of living standards, measured by the level of income for food needs as an indicator, 18 (36.0%) beneficiaries said their income was adequate for food needs before programme implementation, while 40 (80%) said income for food need was adequate after programme implementation. For the non-beneficiaries, 35 (70.0%) said their food income was adequate but, after programme implementation the number of non-beneficiaries who said their income was adequate for their food expenditure was 23 (46.0%). The difference by group, before and after programme therefore, was 34.0% each, respectively. Average MPI difference is -6.0% in favour of beneficiaries.

The analyses thus reveal that the Songhai beneficiaries improved on the three indicators after programme application over the non beneficiaries who rather suffered a fall in the number of those with income adequacy for the selected indicators. The improvement recorded among the beneficiaries can be attributed to programme participation.

The study however, observed that the Fadama III and Songhai participants' responses were based on low level health, education and food access, such as obtained in most rural and semi-rural localities in Nigeria.

4.10 Constraints against Fadama III and Songhai Projects in Cross River State

The Problems constraining against effective delivery of programme objectives for crop farmer-beneficiaries in the Cross River Fadama III and Songhai Initiative development programmes, from the perspectives of the beneficiaries, are summarised in appendix 1 for Fadama programme and appendix 2 for Songhai programme respectively. The result shows that the most important problems encountered by the Fadama III participating farmers were related to Inadequate Technology/Facility/Infrastructure (131, 42.3%) followed by Constraints related to low income of households (105, 33.9%). For the Songhai farmers the main issue has to do with Constraints related to Government Policy, Inadequate Technology/Facility/Infrastructure and Constraints related to low income of Households(50, 12.2%) and Constraints related to private sector activities (12, 4.4%).

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The interest of this study is essentially on the evaluation of the effect of the Cross River Fadama III and Songhai (Cross River) initiative on agricultural output and poverty reduction in Cross River State. The study explored the opportunities offered by the Cross River Fadama III and Songhai (Cross River) agricultural programmes to beneficiary-farmers and their impact on agricultural output, income and poverty reduction.

The premise of the study is that, given the challenges confronting the agricultural sector in Nigeria consequent upon the sector's neglect including the uncoordinated or absence of collaborative sectoral efforts, there is therefore, need for collaboration between Public and Private sector agents which may present a more viable option for the development of the agricultural sector and hence, reduce poverty. This is in view of the fact that, partnerships lead to 'pooling' of strengths (resources) vital for the development of the agricultural sector (and consequent reduction in poverty) from diverse sources, both locally and internationally.

Following evidence from relevant literature, the study further posits that income diversification, that is, generating income from various productive sources, is critical for sustainable livelihoods and reduction in vulnerability. Therefore, the study premised that, the more diversified a household income is, in terms of diverse income generation sources, the more sustainable is such a household. This premise arises from key objective of the Fadama III and Songhai agricultural programmes which aim to increase income of beneficiaries sustainably.

The study employed survey design technique to elicit relevant information from respondents, based mainly on the stated objectives of the programmes of study. Information was solicited from respondents, in the counterfactual and in a "before and after" project scenario. This enabled Beneficiaries and Non-Beneficiaries' comparative analysis over time so as to net out programme impact.

5.1 Summary of Major Findings

The study found that the average age of the respondents in the area was 34.2 years (Fadama III) and 36.4 years (Songhai), indicating an active (young) middle-aged involvement in farming.

The study found that 22.6% of the total of 50% of beneficiaries had between 6-10 years of farm experience while 25.8% had farm experiences of 10 years and above. This has implication for easy adaption to new techniques and innovations offered by the Fadama programme. However, Songhai beneficiaries were relatively inexperienced in farm, majority recording experience of less than 5 years while majority of Songhai non-beneficiaries were experienced farmers of over 5 years.

For the Fadama III programme, the study found greater advantage in educational attainment in favour of the Fadama III beneficiaries over the non-beneficiaries. For instance, 11.6% of non-beneficiaries had non formal education compared to 9.7% among the beneficiaries, who also had higher attainment of tertiary education. All of Songhai beneficiaries attained formal education of secondary level and above and had educational advantage over the non-beneficiaries. The higher educational attainment by the beneficiaries, may have aided easy adaptation and adoption of programme innovations.

The study found low involvement of widows for both the Fadama III (3.2%) and Songhai (0%) programmes. This may have implications for the involvement of vulnerable groups in the development/poverty reduction programmes in the area.

As revealed in the study, 41.9% of the total of 50% of Fadama III beneficiaries acknowledged persistent increase in farm income after programme commencement while 11.3% of non-beneficiaries witnessed persistent income increase within the same period. Of the total of 50% of Songhai beneficiaries, 26.0% indicated "fairly well" in terms of on-farm performance leading to higher output and income for the beneficiaries. The higher persistent income increase among the beneficiaries can be attributed to higher output for the beneficiaries aided by programmes' resources.

A production function analysis was employed to determine the impact of Fadama III and Songhai programmes on output of beneficiaries for the three (Cassava, Rice and Yam) crops. The resultant production functions show distinct results for beneficiaries and the comparable (non-beneficiary) category. For instance, the beneficiary production functions indicate that HERBICIDE, LABOUR and PESTICIDE were significant (and positive) variables in the production of cassava, while LABOUR (though negative) was the significant variable for Rice and FERTILIZER, HERBICIDE and SEEDLINGS were the significant (and positive) variables for yam production. However, results for the non-beneficiary production functions indicate that, none of the variables was significant in the production of cassava and yam

while FERTILIZER, HERBICIDE and SEEDLINGS (though all negative) were significant in rice production. The efficiency values show that Fadama III beneficiaries were more efficient in the production of cassava (2.768) and yam (1.399) while the non-beneficiary showed greater efficiency in rice (1.328) production. Fadama III beneficiary also had returns to scale advantage in cassava (0.886) and yam (1.030) output. The production functions for the Songhai beneficiary show that FERTILIZER, HERBICIDE (though negative) and LABOUR were the significant variables in cassava production but, none of the variables were significant in the production of rice and yam respectively while for the Songhai non-beneficiary, only LABOUR and PESTICIDE were the significant variables in cassava and rice production respectively. There was no significant variable in yam production. The Songhai beneficiary farmers achieved greater efficiency in the three crops; cassava (2.156), rice (1.696) and yam (1.796) while the Songhai non-beneficiary farmers' efficiency levels were 0.919, 0.945 and 0.244 for cassava, rice and yam production respectively. The values for returns to scale indicate that Songhai beneficiary farmers recorded increasing returns to scale in output of cassava (1.170) and yam (1.113) while the Songhai non-beneficiary farmers had returns to scale advantage in output of rice (1.521). However, resource inputs with less than zero elasticities were below the rational production region.

A comparative analysis of the production functions of beneficiaries of the two classes of programmes (Cross River Fadama III and Songhai) reveals that, Songhai beneficiaries had production efficiency advantage in rice and yam production and higher returns to scale advantage among cassava and yam farmers respectively, over the Fadama III beneficiaries.

Using Gross Margin technique to determine farm profitability, study found (Tables 4.12 and 4.13) that Fadama III and Songhai beneficiaries recorded farm profits for the three crops, with higher profit level for cassava farmers. Yam was found to have the lowest gross margin for both Fadama III and Songhai beneficiary farmers. Fadama III non-beneficiaries however, recorded losses for the three crops as well as the Songhai non-beneficiary yam farmers. This may be an indication of greater production stress; farming for basic survival among the non-beneficiaries Cassava farming was therefore, found to be most prevalent and more profitable in the area.

Double Difference analysis was employed, in the counterfactual, to evaluate the income difference of beneficiaries and non-beneficiaries "before and after" projects. Results of the study indicates increase in net farm income for Fadama III beneficiaries after programme for

the three crops while the non-beneficiaries recorded increase among cassava farmers only. However, there was significant difference in net farm income of beneficiaries over non-beneficiaries of cassava farmers. For the Songhai scheme, study found marginal net income difference after programme in favour of the beneficiaries with higher increase occurring among rice beneficiary farmers. However, the non-beneficiaries only witnessed marginal net income increase among cassava farmers, after programme.

Study found higher off-farm income among beneficiaries than non-beneficiaries after programme implementation. The increase in diversified income among beneficiaries could be attributed to capacity development of the beneficiaries and the productive input support especially for the Fadama III beneficiaries. However, diversification among beneficiaries in the Songhai scheme occurred mostly in the area of consultancy which may have been resorted to as a result of lack of funding or input support to set up own-farms by majority of the participants.

Using the Headcount Index (HI), Poverty Gap Index (PGI) and Squared Poverty Gap Index (SPGI), to analyse poverty status of programme beneficiaries and non-beneficiaries, before and after implementation, the study found that, before fadama III scheme 81.9% and 80.6% of beneficiaries and non-beneficiaries lived below the poverty line, respectively. However, after implementation, it was shown that 49.6% of beneficiaries lived below the poverty line while there was a marginal increase of the non-beneficiaries who lived below the line to 82.3%. The coefficient of the PGI was 0.12% and 0.58% for beneficiaries and non-beneficiaries, respectively implying that, beneficiaries required ₦8, 016.26 and non-beneficiaries required ₦38, 745.28 to get them above the poverty line, respectively. While the SPGI was found to be 0.33% and 0.26% before the scheme, after the scheme it was 1% and 34% for beneficiaries and non-beneficiaries, respectively. These imply that Fadama made an appreciable impact on poverty status of the beneficiaries.

For the Songhai scheme, it was found that 62.0% and 56.0% of beneficiaries and non beneficiaries lived below the poverty line, respectively. However, after implementation, there was a reduction of 16% of beneficiaries below the line while non beneficiaries below the line rather increased 10%. The coefficients for the PGI showed that ₦28, 056.92 and ₦28, 724.95 was needed to get the beneficiaries and non beneficiaries above the poverty line, respectively. The SPGI that was 39.0% and 35.0% for beneficiaries and non beneficiaries, respectively before the scheme changed after implementation to 17.0% and 18.0% for beneficiaries and

non beneficiaries, respectively. These imply that the Songhai scheme had a marginal impact on the poverty status of beneficiaries in the area. However, Fadama III had greater poverty impact on beneficiaries than observed in the Songhai scheme. This may be due to the fact that fadama had input and advisory support for beneficiaries, which was absent in the Songhai scheme.

The study also found that constraints related to inadequate infrastructure, income of households and private sector activities ranked the three top-most challenges respectively for Fadama beneficiaries while, constraints related to government activities, inadequate infrastructure and low income of households were the highest ranked among Songhai beneficiaries. These were followed by constraints related to private sector activities and market intermediaries. The ranking of government activities by the Songhai beneficiaries may be an indication of perceived government failure in the partnership.

5.2 Conclusion

Following the study's findings therefore, the following key points were highlighted;

Incentives offered by Fadama III and Songhai programmes were attractive to young and middle-aged farmers.

Technical and productive input support and applications were crucial to agricultural development (output) and poverty reduction (income) in Cross River State.

Cassava farming is the predominant crop farming among the farmers in Cross River State.

A critical factor for participation in Cross River Fadama III scheme is the ability to meet the counterpart fund criteria by the beneficiaries.

Cross River Fadama III and Songhai schemes had insignificant involvement of the vulnerable groups as beneficiaries.

Given level of efficiency and returns to scale, Cross River Fadama III and Songhai intervention had significant impact on output and hence, income of beneficiaries especially for cassava and yam farmers in Cross River State. However, some resource inputs of beneficiaries and non-beneficiaries with less than zero elasticity were below rational production level.

Farmer-capacity building (as particularly offered by Cross River Songhai programme) is vital for farm output and income growth.

Cross River Fadama III and Songhai beneficiaries earned higher farm profits than non-beneficiaries in the three crop farms analyzed with the higher profits occurring among the cassava farmers.

Double Difference analysis revealed that Cross River Fadama III and Songhai programme beneficiaries earned higher income differentials (after programme implementation) among the three crop farms category than the non-beneficiaries.

Cross River Fadama III and Songhai intervention marginally led to diversification of income of beneficiaries.

Cross River Fadama III scheme was able to more significantly reduce poverty among the beneficiaries; however, the reduction in poverty among beneficiaries of Songhai scheme was less significant.

Inadequate infrastructure and low incomes of farming households constituted the topmost constraints for Fadama III participants

Government activities, inadequate infrastructure and low income of farming-households constituted the greatest constraints of participants in the Songhai scheme (Appendix II and Appendix III).

5.3 Recommendations

Arising from the study's findings, the following recommendations are made as to further boost agricultural output leading to poverty reduction (income) of farmers through enhanced public-private collaborations in Cross River State.

i. Increased support to farmers in terms of modern farm inputs as well as credit facilities as these have potentially proven to be attractive to young farming population. There should also be provision for storage/preservation facilities and assistance in the area of locating "off-takers" so as to increase farm profits.
ii. To be effective, farm innovations and/or technology introduced by the Fadama III and Songhai Projects should not only be adequately provided but, farmers should be encouraged to apply them appropriately. For instance, methods and time of

planting seeds/seedlings; as well as time and quantity of fertilizers and farm chemicals applied by the farmer must be closely monitored by the supervising authority for maximum compliance and effect.

iii. Given the predominance of cassava farming in Cross River State, it is necessary to invest in modern cassava and cassava products technology by collaborating with farmer-support agencies and stakeholders so as to maximize production and take other value-added advantages of the crop. Also, since farmers have proved to respond positively to adequate and appropriate farm input support, more effort should be made in the area of incentives to shore up the production of other major staples such as rice and yam in Cross River State.

iv. Given that a greater number of the participant-respondents (80: 27.4%) sourced their counterpart funds through loans, therefore, effort should be made to address this challenge to assist the vulnerable in the area of counterpart funding. For instance, such funds can be paid in kind rather than monetary terms. Farmers can be made to pay the counterpart funds through farm output which could be stored in the government grains reserves. In the alternative, a revolving loan fund can also be created to carter for the most vulnerable in this regard.

v. Due to the low participation of vulnerable groups recorded in both the Fadama III and Songhai programmes, deliberate effort should be made, such as creating special quota and/or reduction or elimination of counterpart fund payment by this group, which may be one of the challenges of participation by the vulnerable. Development programmes aimed at boosting income and poverty reduction should be embracive of the core poor (vulnerable) in the society.

vi. Given the success recorded by Cross River Fadama III and Songhai programmes as seen in the advantages recorded by the beneficiaries over the non beneficiaries, the programmes should be retained but, improved upon in grey areas identified in the study so as to achieve greater efficiency and returns to scale for all crops of potential value in Cross River State. To further boost output, effort should be made to ensure that resource inputs and other innovations of Fadama III and Songhai programmes are efficiently applied.

vii. Though the Cross River Songhai programme participants, as revealed in the study, recorded higher income advantages after programme over the non participants, there is still need to broaden the programme content to include post-training

support in terms of provision of farm input and/or monetary support (in the manner of the Cross River Fadama III programme) to enhance success.

viii. The study results revealed that Rice, though a major staple in Cross River State was the least profitable to farmers, therefore, greater incentives, such as mechanization and tractorization including increased funding support should be provided to rice farmers to boost production and raise farm income and profits.

ix. A household with diversified (or varied) sources of income is more sustainable in terms of poverty reduction than a household with a single income source, which may become vulnerable if the only income source is challenged by any unforeseen cir circumstance. Therefore, poverty reduction can only be sustainable if income sources are diversified. The Cross River Fadama III and Songhai programmes should therefore, make greater effort to build on the potentials for income diversification (which is one of the key objectives of the programmes) by providing adequate and appropriate value-addition training, processing and storage facilities that will encourage greater participation in other off-farm activities leading to diverse income generation activities.

x. For partnership to be more impactful in increasing income and hence, reduce poverty, farmers should not only receive appropriate capacity training (as the case with Songhai programme) but, should also be given farm input support in terms of inputs provision (as done in the Fadama III scheme) or organized funding with adequate monitoring to ensure compliance.

xi. As the Cross River Fadama III winds down in Cross River State, effort should be made to address the issue of infrastructural shortages in the next phase. Processing, storage and farm-to-market roads should receive adequate attention, as these were ranked highest of the constraints faced by the Fadama III participants (Appendix II). Also, monetary involvement of potential beneficiaries in the participation process should be reviewed as these ranked high among the challenges (Appendix II) for the Fadama farmers in the state.

xii. The role of government in partnership collaborations should be minimized to policy guidance and regulatory framework. In this regard, the Songhai scheme should incorporate a mechanism of ensuring that beneficiaries receive post-training input support without resort to government as this has led to less success in the area of poverty reduction.

xiii. The Cross River Fadama III type collaboration has proved to be more responsive to agricultural output and poverty reduction than the Songhai type partnership. This may be due to the comparatively minimal role of government in the operations of Fadama III scheme, given that government had no direct control of the supply of critical inputs to beneficiaries but, through contracting system involving beneficiaries themselves through the support groups, as specified in the collaborative arrangement. However, the reliance on government for post-training support (in terms of funding and/or supply of other critical inputs) may have accounted for the less advantage of the Songhai beneficiaries compared to Fadama III beneficiaries.

xiv. Given that increase in output of farmers leads to boosts in income and hence, reduction in income poverty, efforts must then be geared towards boosting farmers' output as a way of raising standard of living. One way of boosting farmer output is by increasing and/or building farmer capacity on modern farm techniques and technology and, by productive farm input support to the farmers. In the face of financial and other production constraints on the individual sectors of the economy, the case for resource-pooling in the form of sectoral (public-private) collaboration in delivering relevant input needs to the farm sector becomes obvious.

References

Abimboye, D. (2009), "A Revolution Abandoned". *Newswatch*, vol. 50 (5), Aug. 3.

Abubakar, B. (2016). Reported by Elebelea, E. (2016) " Nigeria spends N1 trillion on food imports annually" www.vanguardbgr.com August 12, 2016.

ACP B. (2005), "Public-Private Partnership in Agricultural Biotechnology" New Delhi.

Adam Reit-Andrar Sugar-Eva Surany (2002). *Hungarian Statistical Review*, Special No. 7.

Adanikin, O. AND Adebowale, A. (2012), Boosting Food Production in Cross River State. *The Nation*, March 16.

ADB (2010), "Asian Development Bank's Assistance for Rural Electrification in Bhutan – Does Electrification Improve the Quality of Rural Life*?"ADB Impact Evaluation study*. Ref. No: IES: BHu 2010-27.

ADB (2010), *A* Review of Recent Developments in Impacts Evaluationwww.adbpub@adb.org.

ADB (2011), A Review of Recent Developments in Impact Evaluation. RPT 113257. Philippines.

ADBI (2000). "Public-Private Partnerships in the Sector-Issues and countries experiences in Association and the pacific ADBI Policy paper No. 1. In Wang, Y. (ED.) Tokyo.

ADBI (2000). *Public Private Partnerships in the social sector – issues and country experiences in Asia and the Pacific* ADBI Policy Paper No. 1, ADBI Publishing, Tokyo.

Adegbite, D.A. *et al* (2008), Impact of National Fadama Development Project II on Small Scale Farmers' Income in Ogun State: Implications for Agricultural Financing in Nigeria. *Journal of Sustainable Development in Africa.*Vol.10(3). Pennsylvania.

Adeniyi, J.P. (1973). Economics of Irrigated Rice Production in Bida Division of North Western State of Nigeria. MSc. Thesis (unpublished). University of Ibadan, Nigeria.

Adeolu, B.A. and Taiwo, A. (2004)."The Impacts of the National Fadama Facility in Alleviating Rural Poverty and Enhancing Agricultural Development in South-Western Nigeria.*"J.Soc.SCI.9(3): 157-161.*

Adie, (2005) "UNDPs Contribution to Agricultural Development of Cross River State". *Mofinews* 4(4) Calabar.

Adubi, A.A (2004). Agriculture: Its performance, problems and prospects" Democratic Government Department. In Bello, I.B. and Obadan M.I. (Eds.). management in Nigeria's forth Republic, 1999-2003. LARDS.

African Development Fund (2003), "National Fadama Development Programme". *Appraisal Report*.

Agba, D.Z. (2014) Analysis of formal Agricultural Credits and the Response of Small Scale Crop Farmers Output in Plateau State. Unpublished PhD Thesis, Department of Economics, ABU, Zaria.

Ajayi, A.R. and Nwalieji, A.H. (2010), "Impacts of the Anambra State Fadama Project Phase – 1 on the Socio-Economic Life of the Rural Farmers*". J. HUM Ecology, 29* (129-139).

Alene, V.M. *et al* (2006), "A framework for conceptualizing Impact Assessment and Promoting Impact Culture in Agricultural Research*". IITA*.

Alexander Bilson Darku, Stavroula Malla & Kien C. Iran. (2016): *Canadian Journal of Agricultural Economic*s. 64(49-70).

Aliber, M. and Hart, T. (2009). Should subsistence agriculture be supported as a strategy to address rural food insecurity? Agrekon, Vol 48, No 4.

Anta, S.S. and Dafwangm, I.I. (2010). "ADPS in Nigeria: Status and Policy Implications" *Journal of Agricultural and Biological Sciences,* 6(2) 138-143.

Anyanwu, C. J. (1997). "Poverty in Nigeria: Concepts and Measurements and Determinants." Nigeria Economic Society Confernce, Kaduna, Nigeria.

Ashie, O. (2014). "Why CRSG (Cross River State Government) established Songhai Integrated terms". Nigerian chronicle Wednesday, January 29- Tuesday February 4.

Ashok K. Mishra, Hisham S. El-Osta, Mitchell J. Morehart, James D. Johnson, and Jeffrey W.Hopkins (2002). Income,Wealth, and the Economic Well-Being of Farm Households. Agricultural Economic Report No. 812.

Atala, T.K. and Voh, JP (1994) "Utilization and Sustainability of Fadama in Northern Nigeria: Input and Extension delivery systems." In: Kolawole, *et al.,* (eds.). Strategies for Sustainable use of Fadama lands in Northern Nigeria. *CSER/IIED,* Zaria.

Ayadi, O.F., Adegbite,E.O. and Ayadi, F.S. (2008), "Structural Adjustment, Financial Sector Development and Economic Prosperity in Nigeria". www.eurojournals.com

Ayichi, D. (1995) "Models of Rural Development in Nigeria: with special focus on the ADPs." In:*Rural Development in Nigeria: Concepts, Processes and Prospects.* Auto-Century Publishing, Enugu, Nigeria.

Ayichi, D. (1995), "Agricultural Technology Transfer for Sustainable Rural Development." In :*Rural Development' in Nigeria: Concepts, Processes and Prospects.* Auto-Century Publishing, Enugu, Nigeria.

Ayoade, A.R. *et al*, (2011), "Impact of the National Special Programme for Food Security on Poverty Alleviation among Women in Oyo State, Nigeria". *AJFAND (online), scholarly peer Reviews, 11(4).* ASSCAT, Kenya.

Babatunde, R.O. and Qaim M. (2009) "Patterns of Income Diversification in Rural Nigeria: Determination and Impacts*". Quarterly Journal of International Agriculture.*48(4) (305-320). DCG-Verlag Frankfurt.

Babie, E.R/ (2002). *The basics of social research,* Thomson Wadsworth, Belmont, CA.

Baker, L.J. (2000), Evaluating the Impact of Development Project on Poverty: A Handbook for practioners. *The World Bank*, Washington, D.C.

Bannock, G., Baxter, R. E. and Davis, E. (1998).The Penguin Dictionary of Economics. Penguin Books, England.

Barret, C.B. and Reardon, T. (2000), "Income Diversification among African Agriculturists, Some practical Issues". Ithaca, NY.

Bonabana-Wabbi J. (2002). "Assessing Factors Affecting Adoption of Agricultural Technologies: The Case of Integrated Pest Management. Uganda.

Brinkerhoff D.W. and Brinllerhoff J.M. (2004). "Partnerships between International Donors and NGOs: Opportunities and constraints". International Review of Administrative Sciences. Vol. 7 No. 2 (253-270).

Brinkerhoff, DW and Brinkerhoff, JM (2004). "*Partnerships between International donors and non-government development organizations*. Opportunities and constrains", International Review of Administrative Sciences, Vol. 70(2) PP 253-270.

Brown, L. *et al* (1995), "Generating Food Security in the Year 2020: Women as Producers, Gatekeepers and Shock absorbers." Washington, D.C.

Buhari, M. (2016). Reported by Ajumobi Funmi (2016). Buhari tasks world leaders on hunger, disease by 2030". Vanguard (www.vanguardngr.com) September 26.

Bulbula, B. (2012). Persevering for Public-Private Partnerships in agriculture". The Ethiopian Herald, August 12.

Carr, M. (1991), "Women and Food Security: The Experience of the SADCC Countries". IT Publications, London.

Chigbo, M. (2009), "Tragic Tale of Wasted Foods" *Newswatch,* Vol. 50 (5). Nigeria.

Chukwuemeka, E. and Nzew: Hope N.(2011). An empirical study of world bank agricultural development programme in Nigeria." American Journal of Social and Management sciences www.scihub.org/AJSMS.

Cross River State of Nigeria (Public-Private Partnerships) Law No. 6, 2010.

CRS-EMT (2007), "Government of Cross River State, Nigeria; The Economic Blue Print 2007-2011, Calabar.

Daneji, M.I. (2011). Agricultural Development Intervention Programmes in Nigeria (1960-date). A review. Savanna Journal of agriculture vol. 6(1) June.

Danjuma, I.A., Oruonye, End.., hmad, Y.M. (2016). *"The Socio-Economic Impact of Fadama II Project in Taraba State:* A Case Study of Jalingo LGA" International Journal of Environmental and Agriculture Research (IJOEAR) 2(3) 35-41.

Datt G., Ravallion, M. (1998), "Farm Productivity and Rural Poverty in India". *The Journal of Development Studies*, 34(4) (62-85).

De Vries, F.W.T., Sally, H. and Inncencio, A. (2005), "Opportunities for Private Sector Participation on Agricultural Water Development and Management".*International Water Management Institute Working Paper 100*. Colombo, Sri Lanka.

Developing Public-Private Partnerships in Local Infrastructure and Development Projects: Understanding Public-Private Partnerships concepts and framework. Public-Private Partnerships centre, Quezen city, Philippines, 2012 www.ppp.gov.ph.

DFID (1999), Sustainable Livelihood Guidance Sheets. London.

Doss, C. R. (2003). Understanding Farm Level Technology Adoption: Lessons Learnt From CIMMYT'S Micro Savings in Easter Africa." CIMMYT'S working paper 03-07. Mexico.

Dumanski, J. and Smyth, A. J. (1994).The issues and challenges of sustainable land management. Proc. of International Workshop on Sustainable Land Management for the 21st Century. In Wood, R.C. and Dumanski, J. (eds). Vol. 2: Plenary Papers. Agricultural Institute of Canada, Ottawa. (381).

Eboh, C.E. *et al* (1995), *Rural Development in Nigeria: Concepts, Processes and Prospects.* Auto-Century, Enugu, Nigeria.

Eboh, E. (2011), "Agricultural Economy of Nigeria: Paradoxes and Crossroads and Multimedia Nature. 56th Inaugural Lecture of University of Nigeria. Jan 27.

Eboh, E.C. (1995) "Sustainable Development: Theory and Implications for Rural Nigeria". In: *Rural Development' in Nigeria: Concepts, Processes and Prospects.* Auto-Century Publishing, Enugu, Nigeria.

Edu, B. (2016). Reported by Ubong Inyang (2016) "Prayer houses, Trado-Birth Attendants causing havoc in Calabar. TNN (Today's News Now) vol. 3(2). Monday June 6 P. 13.

Eguzie, B. (2014). "Federal Government to declare Cross River as a staple crops processing zone". Business day online (www.nigerianewspapers.com). Sourced: November 30.

Egwu, W.E. and Akuburlo, CJC (2007). "Agricultural Policy, Development and Implementation in: Accubuilo, CJC (Ed.) Book of Readings on Agricultural Economics and Extension.

Eheme, I. and Nwachukwu (2010*), "*An Investigation On the Impact of Fadama II Project Implementation Imo State". *American Journal of Scientific and Industrial Research*.www.scihub.org/ AJSIR.

Ekpo, A.H. (2004), "The Economics of SAP and the Adjustment of Economics". 9th Inaugural Lecture University of Uyo.www.akpanHekpo.com

Ekpo, A.H. and Olaniyi, O. (1995), "Rural Development in Nigeria: An Economic Analysis of the Impact of DFRRI 1986-93." In: *Rural Development' in Nigeria: Concepts, Processes and Prospects.* Auto-Century Publishing, Enugu, Nigeria.

Ellis, F. (2000), "The Determinants of Rural Livelihood Diversification in Developing Countries" *Journal of Agricultural Economics.*51(2): 289-302.

Emenyeonu, B. N. (1987). "Communication and Adoption of Agricultural Innovations: Quantifications and Notes Towards a Conceptual Model." African Media Review 1(2)

Eshetu, S. *et al* (2010), Income Diversification through Improved Irrigation in Ethiopia: Impacts, Constraints and Prospects for Poverty Reduction Evidence from East Harerghe Zone, Oromia Region, Ethiopia. *Ripple, Addis Ababa Ethiopia.*

Eshiet, D. (2011), "Nigeria Can Export Food" *The Nation,* Sept. 23, P. 14. Abuja.

European Commission (EC), Source Book. Mhtml: File://H:/Impact Assessment DID. Mht.

Evans, J.D. (1996). Straight forward statistics for the behavioural sciences. Pacific Grove, CA: Brooks/Cole Publishing.

Ezeh, C.I. and Mbanasor, J.A. (2004), "Economic Analysis of Dry Season Telfairia Production of Abia Sate Agricultural Development Programme". *Journal of the Faculty of Agriculture and Veterinary Medicine,* Imo State University, Owerri.

Ezemenari, K. *et al* (1999), Impact Evaluation: A Note on Concepts and Methods. PREMN, *The World Bank*.

FACU, (1995), "National Fadama Facility, Appraisal Report 35. Abuja.

Fadma III (2009) *Project Information Document (PID),* Report No. AB2438

FAO (2017). Improving Agricultural and Rural Statistics Global Strategy. Technical Report Series GO -19-2017.

Ferroni, M., and Castle, Paul (2011). Public-Private Partnerships and sustainable agricultural development: Sustainability www.ndpi.com.journal/sustainability.

Flyvjerg, B. (2006). "*Five misunderstandings about case study research"* Qualitative enquiry, Vol. 12(2) (219-245).

FMARD (2003). Agriculture in Nigeria. The New Policy Thrust. Abuja.

FOA (2013) "Agribusiness Public Private Partnerships – A Country Report of Pakistan country case studies. Asia Rome.

Folurunso, S.T., and Dawang, C.N. (2016), "Analysis of Resource-Use Efficiency and Return to Scale among Poultry Layer Farmers in Jos Metropolis, Plateu State, Nigeria." J. Anim. Prod. Res. 28(2): 287-303

Fouler, F.J. (2002). *Survey research methods, 3rd ed., sage, CA.*

Garba, P.K. (1998). "An analysis of Nigeria's Agricultural Policies, 1970-1993". Final Report submitted to the African economic research consortium, Nairobi, Kenya.

Gebremedhin, B. and Peden, D. (2011), Policies and Institutions to enhance the Impact of Irrigation Development in Mixed Crop-Livestock Systems. *ILRI,* Addis Ababa, Ethiopia.

Girei, A. A., Dire, B., Iliya, M. M. & Salihu, M. (2013). Analysis Of Impact Of National Fadama Ii Facility In Alleviating Poverty On Food Crop Farmers In Adamawa State, Nigeria. European Centre for Research Training and Development UK, 1(3), 8-15

Girigiri, B.K. (2000), A Sociology of Rural Life in Africa. Springfield publishers, Nigeria.

Gustav, R. Stewart, P. and Samman, E. (2006). "Human Development: Beyond the HDI". *Journal of Human Development* 7(3), 323-358.

Halsan, J. and Turner, M. (1995). *Profiles of government administration in Asia,* Australian Government Publishing Service, Canberra.

Hammami, M., Ruhashyankiko, J - F. and Yehoue, E.B. (2006), "Determinants of Public-Private Partnerships in Infrastructure" *IMF Working Paper,* wp/06/99

Harold O. Fried, C.A. Knox Lovell & Shelton S. Schmidt. *Efficiency and Productivity* (source 18-03-2018) www,google.com.

Harry,A.P.,et al. (2009), "Role and Impact of Public Private Partnership in Education". The World Bank. Washington, D.C.

Hasnip, R. *et al* (2001), "Contribution of Irrigation to Sustaining Rural Livelihood" DFID Report No. OD/TN 109.Wallinford.

Hearne, R. (2006), "Neo-Liberalism, Public Services and Public Private Partnership in Ireland". *Progress in Irish Urban Studies Vol.2, 1-14.*

Hokombe, R.G. (1997). " A theory of the theory of public goods". Review of Austrian Economics, 10(1) 1-22.

Hussain I., Hanjra, M.A. (2004) "Irrigation and Poverty Alleviation: Review o f the Empirical Evidence." *Irrigation and Drainage 53:1-5.*www.interscience.wiley.com.

Ibor, O. (2005) "Poverty Reduction: sustainable Environmental Management Strategy*"* *Mofinews*, 4(4), Calabar.

IFPR (2007). "Building Public-Private Partnerships for agricultural innovation in latin America. Lessons from capacity strengthening" Washington, D.C. www.ifpri.org (sourced 05-11-2014).

Ijaiya, M. *et al* (2009) "Income Diversification and Household Well-being in Ilorin Metropolis, Nigeria."*International Journal of Business Management, Economics and Information Technology, 1(1) Jan-June.*1-12.

Ike, P.C. (2012). *An Analysis of the Impact of the Impact of Fadama III Project on Poverty Alleviation in Delta State, Nigeria.* Asian Journal of Agriculture Sciences 4(2), 158-164.

Ilona, P. (2011), "630 Billion Naira Food Imports can establish 300 Firms." *The Nation*, Sept. 19 P. 56.

Ishiaku, O.K., Haruna, U., Danwaka, H.A., and Suleiman, H.R. (2017) "Resource use Effiency of Fadama III Small Scale Rice Farmers in Nasarawa State, Nigeria." International Journal of Agricultural Economics and Extension, Vol. 5(4). April. Pp. 284-294, www.internationalscholarsjournal.org

Islam, K.K. and Sato, N. (2010), "Constraints of Participatory Agro-Forestry Programme to Poverty Alleviation : The Case of the Salforest, Bangladesh." *American –Eurasian J. Agric and Environ. Sci. 9(4):* 427-435.

Izekor, O.B. and Alusohai, G.O. (2014). "Production Elasticities, Returns to Scale and Allocative Efficiency in Yam Production in Edo State, Nigeria. Agrosearch 14(2): 179-190.

Jain, R., Arora, A. and Raju, S. (2009). "A Novel Adoption Index of Selected Agricultural Technologies: Linkages with Infrastructure and Productivity." Agrricultural Economics Research Review." 22: PP 109-120.

JBICI (2007), Research Paper No. 32

Jensen, P.K. *et al* (1998), Domestic Use of Irrigation Water in Punjab", 24th WEDC Conference. Islamabad, Pakistan.

Jhingan, M.L. (2007), *The Economics of Develop0ment and Planning* 39th Edition. Vrinda Publications, Delhi.

Jones, C.W. (1983), "The Impact of the Semi Irrigation Rice Production Project on the Organization of Production and Consumption at the Intra Household Level. "USAID, Washington, D.C.

Jutting, J. (1999). *Public Private Partnership and Social Protection in developing countries:* The Case of the health sector, paper presented at the ILO Workshop on "The extension of social protection" 13/14 Dec. Geneva.

Kayrooz, C. (2005). "*The Equity case Study: It's not a flower ship in here"*. In C. Kayrooz and C,. Trevitt (eds.), Research in organizations and communities. Tales from the real world. Allen and Unwin (23-37).

Khandker, S.R. et al. (2010) *Handbook on Impact Evaluation: Quantitative Methods and Practices*. The World Bank, Washington, D.C.

Khanom, N. (2011). "Improving the effects of Public-Private Partnerships on ultra poor households in Bangladesh", International Review of Business Research papers, vol 7(1) pp 118-133.

Khanon, A.K. (2011). *Partnership for Development: Alternative Approaches to Poverty Alleviation in Bangladesh*. A thesis submitted in fulfillment of the requirement for the Degree of Doctor of Philosophy. University of Camberra.

Kolawole, A. and Scoones, I. ((1994), "Fadama lands use and sustainability in Northern Nigeria: AN Overview." In: Kolawole, *et al.*, (eds.). *Strategies for sustainable use of Fadama lands in Northern Nigeria*. CSER/IIED, Zaria.

Kudi, T.M. *et al* (2008), "Analysis Of the Impact of National Fadama Development Project II in Alleviating Poverty Among Farmers in Giwa Local Government Area of Kaduna State, Nigeria". *Ozean Journal of Applied Sciences 1 (1).*

Kwanashie, M., Ajilima, A., Garba, A. (1998). The Nigerian Economy. Response of Agriculture to adjustment policies. Zaria African Economic Research consortium.

Lalong (2016) Reported by NAN (2016). "GN. Lalong pledges to turn around Plateau's economy through agriculture", www.vanguardngr.com August 10, 2016.

Laduber, W. Dessalegn M., and Daniel, T. (2016), Logit Analysis of Factors Affecting Adoption of Improved Variety of Wheat (Triticum Aestirum L.) Variety: The Case of Yilmana Densa District, West Gojam, Ethiopia. Journal of Agricultural Extension and Rural Development vol 18(12). 258-268. www.academicjournals.org/jaerd.

Lavison, R. (2013). "Factors Influencing the Adoption of Organic Fertilizers in Vegetable Production in Accra." Accra.

Lawther, W.C. (2002), *Canadian Council Report*, NASCIO.

Leavy, J. and Poulton, C. (2007). Commercialization in Agriculture: A Typology. Paper presented at the 5th International Conference on the Ethiopian Economy. Addis Ababa, June 2007.

Lewis, D.J. (1997). "NGOs, ;Donors and the state in Bangladesh. Annals of the American Academy Political and Social Science. Vol 554 33(13).

Loevinsohn, M. Sumberg, J., Diagne, A. (2012). "Under What Circumstances and Conditions does Adoption of Technology Result Increased Agricultural Productivity?" Center, Social Science Research Unit, Institute of Education, University of London.

Lorienta, M.L. (2015) "Public-private Partnerships in the Agricultural Sector for Human and sustainable development". A review of the state of play". M.Sc thesis (internet resource) sourced: May 31, 2016.

Lund-Themsen, (2007). " Assessing the impact of Public-Private Partnerships, in the global south: the case of the Kasur Tanneries Pollution control project". Markets, Business and Regulation programme paper No. 4. Switzerland.

Manyong, V.M., *et al* (2003), "Agriculture in Nigeria: Identifying opportunities for increased commercialization and investment" *Main Report*, Nigeria.

Mbanasor, J.A. and Nwachukwu, I. (Sourced 2012), "Public-Private Partnership in Agric Business Development in Nigeria" (Icanjosduct.org)

Melaku, G. (2005), Adoption of Profitability of Kenyan Top Bar Hive Beekeeping Technology. Study in Ambesel District of Ethiopia. Haramaya University, Ethiopia.

Meyer, S.K. (2012). "Testing Tradition: Assessing the added value of Public Private Partnership". National Council for Public-Private Partnerships, Arlington.

Minot, N. *et al,* (20006), I*ncome Diversification and Poverty in the Northern Uplands of Vietnam*.Research Report 145.IFPRI, Washington D.C.

Myint, H. (1958). The Classical Theory of International trade and the under-development countries" Economic journal 68(270), 137-337.

Namara, E., Weligamage, P. and Baker, R. (2003). "Prospect for Adopting System of Rice Intensification in Sri Lanka: A Socio-Economic Assessment." Research Report 75. Colombo, Sri Lanka.

National Center for Economic Management and Administration (NCEMA) (2008), "SAP in Nigeria: Causes, Processes and Outcomes". Ibadan, Nigeria.

Nchuchuwe, F.F. and Adejuwon, K.D. (2012). "The challenges of Agricultural and Rural Development in Africa, case of Nigeria". International Journal of Academic Research in Progressive Education and Development Vol. 1(3).

NEEDS (2004), *"Poverty and Inequality"* Abuja.

Nigeria Economic Society, NES, (1997). "Poverty Alleviation in Nigeria," NES Conference Kaduna.

Newswatch Vol. 50 No.5 August, 2009

Nikolic, I.A. and Maikisch, H. (2006) "*Public Private Partnerships and collaboration in the health sector, an overview with case studies from recent European experience",* Health, Nutrition and Population (HNP) Discussion paper, IRD/World Bank, Washington DC.

Nwachukwu, I.N., (2008) "Evaluation of Second National Fadama Development Project in Nigeria: A Rapid Policy Appraisal" http://mpra.ab.uni-muenchen.de/12914/

Nwachukwu, O.F. Okafor, O. and Olabisi T.A. (2016). "Effects of Fadama IV User Groups (FUGs) Participation on Farmers' Income. A Study of selected crop farmers in Agricultural Zones and Bocks of Anambra State. *International journal of Community and Cooperative Studies* 4(1): 1-13 www.ecijourals.org.

Nwafor, M. (2008). Literature Review of Development targets in Nigeria. IITA, Ibadan.

Obasanjo (2016). Reported by: Ojo, O. (2016) "Stealing, Motive for government intervention in agriculture says Obasanjo". Sunday Sun, July 17. P.2

Ocholi, D. (2009), "The Way Forward." *Newswatch,* Vol. 50(5), Nigeria

Ogbonna, M. O. & Nwaobiala, C. U. (2015). Evaluation of Participation and Poverty Levels of National FADAMA III Development Project Rural Farm Women in Gombe State, Nigeria. Discourse Journal of Agriculture and Food Sciences, 3(6), 83-90.

Ogiedefa, I.S. (2010). "Democracy and Goog Governance: Nigeria's Dilema" African Journal of Political Science and Internal Relations Vol 4 (6).

Ohiorhenuan, J.F. (2003), "The Poverty of Development: Prolegomenon to a critique of development policy in Africa." A*nal of the Social Science Academy of Nigeria* (14 and 15).

Ojikpong, C.E. (2006), "An Assessment of Poverty Alleviation Policies in Reducing Rural Poverty: A Case Study of Obubra L.G.A in Cross River State, Nigeria". M.Sc *Thesis* submitted to the department of Economics, Ahmadu Bello University, Zaria.

Ojo, M.A., Mohammed, U.S., Ojo, A.O. and Olaleye, R.S. (2009). Returns to Scale and Determinants of Farm Level Technical Inefficiency among Small-Scale Yam-Based Farmers in Niger State, Nigeria: Implication for Food Security. "International Journal of Agricultural Economics and Rural Development 2(1): 43-51.

Okereke O. (2000). "Colonial and Post-colonial Agravian policies in Nigeria: Lessons and policy options". In: Aja A. and Emeribe in Nigeria National Development strategy. John Jacobs, Enugu.

Olaolu, M. O., Akinnagbe, O. M. & Agber, T. (2013). Impact of National Fadama Development Project Phase (II) On Poverty and Food Security among Rice Farming Beneficiaries in Kogi State, Nigeria. American Journal of Research Communication, 1(10), 280-295.

Olatumbosun, D. (2009) in Ocholi D. (2009) "The Way Forward" *Newswatch,* 50(5) p. 27.

Olayemi, J.K. (1998). "Agricultural Development Strategy: Institutional Framework and support" PAPER Presented at the workshop on policy issues and planning in the agricultural sector, NCEMA June 15.

Olayiwola, L.M. and Adeleye, A.O. (2005). "Rural Development and Agro-Industrial Promotion in Nigeria: bucepts, strategies and challenges" *Journal of Social Sciences 11(1).*

Olomola, A.S. (1998). "Analysis and Management of Agricultural Sector Performance and Intersectional Linkages" paper presented training programme on sectoral policy analysis and management (NCEMA).

Olukosi, J.O. and Erhabor, P.O. (1998). Introduction to Farm Management Economics. Agitab Publishers Ltd., Zaria. Pp 35-80.

Oluwatusin, F.M. (2011). Measuring Technical Efficiency of Yam Farmers in Nigeria: A Stochastic Parametric Approach." Agricultural Journal 6(2): 40-46.

Omwuamaeze, D. (2009). "The Failed River Basins", *Newswatch,* (50(5) (25).

Oni, O. A. & Olaniran, O. T. (2011). An Analysis of Poverty Status of Fadama II and Non Fadama II Beneficiaries in Rural Oyo State, Nigeria. Journal of Economics and Rural Development, 17(1), 45-61.

Osemeobo, G.J. (1992). Impact of Nigerian Agricultural Policy on crop production and the environment. Environmentalist 12(2):101-108.

Osinbajo, Y. (2016). Reported by Taiwo Obatonye, J. "110 million Nigerians are poor". Sunday, July 17.

Osondu, L.K., Ijioma, J.C., Udah, S.C., and Emerole, C.O. (2015). "Impact of National FADAMA iii Development project in Alleviation Poverty of Food crops farmers in Abia state, Nigeria." *American journal of business, economics and management*. 3(4): 225-233 www.opensciencesonline.com/journalajbem.

OXFAM (2O14) "Moral Hazard? Mega' Public Private Partnerships in Agriculture" www.oxfam.org.

Panneerselvam, R. (2011), Research Methodology. PHI Learning Private Limited, New Delhi. (158-159)

Patrinos, H.A. Barrera-Osario,F. and Guaqueta, J. (2009), "The Role and Impact of PPP in Education". Washington, D.C.

PDSSP (2008-09), *Public Private Partnership Strategy for the Social Sectors in the Punjab*, Punjab.

Peocak, T., Ward, C., and Gamberelli (2007). Investment for Agricultural Water for Poverty Reduction and Economic Growth in SSA. A Collaborative programme of ADB,M FAO, IFAD, IWMI and World Bank (synthesis Report). Feb 21.

Per P-A and Rajal P-L (2001), "Agricultural Growth is the key to Poverty Alleviation in Low Income Developing Countries" in: *The Unfinished Agenda: Perspective on Overcoming Hunger, Poverty and Environmental Degradation, (*eds.), IFPRI, Washington, D.C.

Peu – NFDO (2005), "Fadama Development: Poverty Reduction and Productivity through Empowerment".

Phillip, D.E., Wkonya J. Pender and O.A. Ani (2009). Constraints to increasing agricultural productivity in Nigeria: A review Nigeria strategy support program (NSSP) Background paper 6. *Internal Food Policy Research Institute, Washington, D.C.*

Pinstrup-Andersen P.and Pandya-Lorch R. (1994).*"*Alleviating poverty, intensifying agriculture, and effectively managing natural resources". Food, Agriculture, and the Environment Discussion *Paper 1.IFPRI, Washington, DC. (21)*

Poby, I. (2012), "Fadama Disburses N16 Naira to south-south farmers", reported by Ike, A. www.punchonline.ng

Quim, A. (2011). "A guide on Public-Private Partnerships in infrastructure". UN Economic and social commission for Asia and Pacific (UNESCAP), Bankok.

Rahman, S. (2005), Environmental Impacts of Technological Change in Bangladesh Agriculture: Farmers Perceptions, Determinants and Effects on source allocation decisions. Plymouth.

Rao, C.M.H. (1998), "Agricultural growth, sustainability and poverty alleviation". Economic and Political Weekly

Rauniyar, G. (2011), Impact Evaluation of Community Groundwater Irrigation Sector Project in Nepal. www.adb.org/evalaution.

Ravalion, M. (2005). Evaluating Anti-Poverty Programmes Policy Research Working Paper No 362. World Bank, Washington, D.C

Sadiko, B. (2015). Reported by Fadene, S. (2015). "How agriculture can unlock Nigeria's economy". The Nation on Sunday, July 12. P. 60.

Samuelson, P.A. (1954). "The Theory of Public Expenditure". Review of Economics and Statistics, 36(Nov.)

Sanyal, P. and Babu, S. (2010). Policy bench-marketing and tracking the agricultural policy environment in Nigeria. Nigeria strategy support programme (NSSP) Report No. NSSP 005.

Schwarze, S., Zeller, M. (2005) "Income Diversification of Rural Households in Central Sulawesi Indonesia."*Quarterly Journal of International Agriculture 44(1)* 61-73.

Sen, A. K. (1983). "Development: Which Way Now?" The Economic Journal, 93: 754-757 December.

Sen. A. K. (1976). "Poverty: An Ordinal Approach to Measurement." Econometrics. 219-231. March.

Sheffy, S. (2011), "World Bank Calls for Improved Health care in Nigeria."*The Nation*, Sept. 19 (53).

Spielman, I.D. and Grebmer, K.V. (2004), "Public Private Partnership in Agricultural Research: An Analysis of Challenges facing Industry and the consultative group In International Agricultural Research, *EPTD Discussion Paper No. 13*. Washington, D.C.

Swason, B.E., Mohammed M. Sam (2002). "Developing on Extension Partnership Survey Public, private and NGOs". Journal of International agriculture and extension education vol. 9 (1).

Tamrakar, K.P. (2008), "Public-Private Partnership for Agricultural Development in Nepal". www.google.com (sourced 2012).

Tamuno, G. (2006). "How to curb food crises in Nigeria". *Journal of sustainable development*, 3(20): 20-25.

Tavakol and Dernick (2011). "Making sense of Crombach's Alpha". *Internal Journal of Medical Education*. 2:53-5.

The EIU, (2013) Transforming African Agriculture. The growing importance of usual Public-Private Partnerships. Reform by the Economist Intelligence Unit (E.U). The Economist.

The Nation Newspaper, March 16, 2012.

The Nation Newspaper, March 2, 2012, (12).

Thirtle, C. *et al* (2001), "Relationships between Change in Agricultural Productivity and the Incidence of Poverty in Developing Countries". DFID, London.

Thomas, D.(1997). What is the best way to measure farm income? AGDM newsletter article.

Toure, D. (2012), Comments at the 53rd Annual Conference of Nigerian Economic Society (NES). *The Nation Newspaper*, August 29.

Ugwu, D.S. (2007). "Agricultural Extension practice in Nigeria" Readings in Agricultural Economics and Extension (Ed.) In: CJC Akubuits et al.

Ugwu, D.S. and Kanu I.O. (2012). "Effects of Agricultural Reforms on the Agricultural sector in Nigeria" *Journal of African studies and development* vol. 4(2) 41-59 www.academicjournals.org/JASD.

Umar, A.M., Phoa, C.L.J. and Khalique, M. (2012), "An Investigation on the impact of Fadama II project on the Adoption and Demand for Advisory Services in Adamawa state, Nigeria". *International Journal of Academic Research in Business and Social Sciences, Vol.2, No.1*

UNDP (1997), Capacity Development Technical Advisory Paper 2. New york: Bureau for Policy Development, Management Development and Governance Division.

UNDP (2009) "Poverty Rating". *The Punch*. December 2.

Vander Ploeg, J.D etal (2000). Rural Development: From practices and Policies towards theory Sociologia Ruralis, Vol. 40(4).

Verners, D. and Verners, M. (2005), "Economic Impacts of Professional Training in Informal Sector: The Case of the labour force training programme in Cote d'Voire". *World Bank Policy Research Paper 3668*.

Warmer, M., Kohan D., and Lehel, S. "Market oriented Agricultural: Appraisal of Public Private Partnerships". Agricultural management, marketing and finance occasional papper 23. Rome.

World Bank (1981), Accelerated Development in Sub-Saharan Africa: An agenda for action. Washington.

World Bank (1989), Sub-Saharan Africa, from crises to sustainable growth: A long term perspective study. Washington, D.C.

World Bank (1992), Staff Appraisal Report, National Fadama Development Project, Kano, Nigeria.

World Bank (1999). *A Study on the Impact of Micro-Credit on borrowers of Partner organizations of PKS Foundation*. The World Bank Office, Dhaka.

World BANK (1999). *Working together for a change:* Government business and civil partnerships for poverty reduction in Latin America and the Carribean, FDI Learning Resources Series, The World Bank, Washington DC.

World Bank (2000), "Attacking Poverty." Washington, D.C.

World Bank (2007*),* Emerging Public Private Partnerships in Irrigation Development and Management. *Water Sector Board Discussion Paper Series*, No. 10 (May). Washington, D.C.

World Bank, (1999) "Working together for a change: Government, Business and Civil Partnerships and poverty reduction in Latin America and the Caribbean. EDI learning Resources series, World bank, G Washington, D.C.

www.ONE.org

Xing Z. (2015). "Agriculture and Rural Development: the case of Fiji". A thesis presented in partial fulfillment of the requirement for the degree of Doctor of Philosophy (PhD) in Economics, Massey University, Palmerton worth, Newxeal and sourced May 31, 2016.

Yemi, K. (2012), "The Nigerian Poverty Profile 2010 Report", National Bureau of Statistics, Abuja

Yiri, R.K. (2009). Case Study Research: *Design and Methods*, 4th Edition, Sage, California.

APPENDIX I

Department of Economics

Faculty of Social Sciences

Ahmadu Bello University, Zaria

Dear Respondent,

The researcher is a post-graduate student in the department of Economics, Ahmadu Bello University, Zaria. This survey questionnaire is part of an on-going research on "Effects of the Cross River Fadama III and Songhai projects on agricultural development and poverty reduction in Cross River State, Nigeria". Your Kind responses to these questions shall therefore, be appreciated. Your personal identity is not required and responses shall be treated with utmost confidentiality.

Thank you.

SECTION A: DEMOGRAPHIC CHARACTERISTICS (PLEASE TICK OR COMMENT AS APPROPRIATE)

1. Senatorial District: Cross River North [ ] Cross River Central [ ] Cross River South [ ]
2. Local Government Area: Abi [ ] Bekwarra [ ] Obubra [ ] Ogoja [ ]
3. Sex: Female [ ] Male [ ]
4. Age: ----------
5. Marital status: Married [ ] Widowed [ ] Single [ ]
6. Educational qualification (highest attained): ----------
7. Number of persons in household (including dependents): ----------
8. Farm experience (Years): ----------
9. Which of these programmes are you participating in? Songhai [ ] Fadama III [ ] None [ ]
10. Period of programme commencement: ----------
11. Which of these is your major farm crop? Yam [ ] Cassava [ ] Rice [ ]

SECTION B: PARTICIPANTS ONLY (FADAMA III)

12. Did you receive training/advisory services to perform your farm task efficiently? Yes [ ] No [ ]
13. Type of training received? Improved cuttings/Seed multiplication [ ] Proper fertilizer application [ ] Proper application of herbicides [ ] Proper application of pesticides [ ] Value-chain activities (Storage, Processing) [ ] Proper keeping of farm records [ ] Irrigation techniques [ ] Sustainable Land Management (SLM) practices [ ], please specify:
14. How was the training/advisory services conducted? Conferences [ ] Seminar [ ] Extension agent [ ] Any other method (specify):

15. Do you consider the training adequate for your farm enterprise? Yes [ ] No [ ] Not sure [ ]
16. Where you provided with input support for your farm enterprise by the Fadama III scheme? Yes [ ] No [ ]
17. What kind of input support were you provided by the Fadama III scheme? Productive asset acquisition (small farm tools) [ ] Fertilizers [ ] Herbicides [ ] Pesticides [ ] Improved cuttings/Seedlings [ ] Irrigation infrastructure [ ] Storage/Processing facilities [ ] Tractor hiring centre [ ] Road infrastructure [ ] Any other [ ], please specify:
18. Were you required to pay counterpart fund as pre-qualification condition? Yes [ ] No [ ]
19. How did you raise the counterpart fund? Savings [ ] Loans [ ] Assistance [ ]

(SONGHAI PARTICIPANTS)

20. Did you receive training for efficient farm enterprise? Yes [ ] No [ ]
21. How was the training conducted? Conferences [ ] Seminar [ ] Video screening [ ] Any other (specify):
22. What was the duration of training (please indicate)?
23. In which category were you trained? Farm manager [ ] Farm technician [ ] Entrepreneur [ ] Any other (specify):
24. Field of training received? Agribusiness [ ] Animal Husbandry [ ] Crop production [ ] Food processing [ ] General mechanic [ ] Handicraft [ ]
25. Type of training received? Irrigation techniques [ ] Techniques of organic agricultural production [ ] Improved cuttings/Seed multiplication [ ] Proper fertilizer application [ ] Proper application of herbicides [ ] Proper application of pesticides [ ] Value-chain activities (Storage/preservation) [ ] Proper keeping of farm records [ ] Sustainable Land Management (SLM) practices [ ], please specify: Any other [ ] (specify):
26. Do you consider the training adequate for your farm enterprise? Yes [ ] No [ ] Not sure [ ]
27. What is your enterprise activity? Please state:
28. Were you able to establish/expand your own farm after training? Yes [ ] No [ ].
29. Where you provided with post-training input support/funding for your farm enterprise by the Songhai scheme? Yes [ ] No [ ]
30. If yes to 28 above, what kind of input support were you provided? Productive asset acquisition (small farm tools) [ ] Fertilizers [ ] Herbicides [ ] Pesticides [ ] Improved cuttings/Seedlings [ ] Irrigation infrastructure [ ] Storage/Processing facilities [ ] Tractor hiring centre [ ] Road infrastructure [ ] Any other [ ], please specify:
31. If no to 28 above, how did you get input support/funding for your farm? Family/private sources [ ] Loan [ ] None [ ] Any other [ ], please specify:
32. If you choose "no" to 29 above, why so? No input support [ ] Lack of funds [ ] Any other [ ], please specify:

SECTION C: NON-PARTICIPANTS ONLY

33. Why are you not participating in programme? Not aware [ ] Not interested [ ] Could not meet criteria for participation [ ], specify:

34. How do you feel about being left out of the programme? Satisfactory [ ] Not satisfactory [ ] Any other [ ]
35. To what extent will you agree that participation is capable of improving your output and income? Strongly agree [ ] Agree [ ] Strongly disagree [ ] disagree [ ] Do not know [ ]
36. Are you aware of the following farm technology? Fertilizer [ ] Herbicides and Pesticides [ ] Improved stem cuttings and seedlings [ ] Sustainable Land Management [ ] Storage and preservation techniques [ ] Any other [ ], specify:
37. How did you get knowledge about the technology? Local extension agent [ ] Co-operative society [ ] Friends [ ] Local retailers [ ] Any other [ ], specify:
38. Do you adopt farm technology in your farming enterprise? No [ ] Yes [ ], specify type:
39. To what extent has the technology adopted, if so, improved your output and income? Very well [ ] Fairly well [ ] No improvement [ ] Not sure [ ] Any other [ ], specify:
40. If you did not adopt any technology, what is your reason for non-adoption? Lack of knowledge [ ] Financial constraints [ ] Not helpful [ ] Any other [ ], specify:
41. Method of value addition (storage, processing)? Traditional methods [ ] Modern techniques [ ] Any other [ ], specify:

SECTION D: ADOPTION

42. Did you adopt new technology on your farm? Yes [ ] No [ ] Not applicable [ ]
43. Were you encouraged by the application of new technology on you farm? Yes [ ] No [ ] Not aware [ ]

ADOPTION OF FARM TECHNOLOGY	LEVEL OF ADEQUACY/AVAILABILITY
Use of improved cuttings/Seedlings [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]
Use of fertilizers [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]
Use of herbicides [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]
Use of pesticides [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]
Proper farm record keeping [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]
Tractorization [ ]	Adequate [ ] Not adequate [ ] Not applicable [ ]

44. What type of SLM practice did you adopt? Planting of orchards [ ] Mixed cropping [ ] Cover cropping [ ] Mulching [ ] Composting [ ] None [ ] Not sure [ ]

45. Type of irrigation system used? Rain-fed [ ] Use programme irrigation technology [ ] Any other [ ], specify: None [ ]
46. What was the value-addition to your farm enterprise? Processing [ ] Storage [ ] None [ ] Any other [ ], specify:
47. What was the major farm tools used in your farm? Small farm tools (Hoe/Cutlass) [ ] Tractor/Machinery [ ]
48. How adequate were the small farm tools used on your farm? Very adequate [ ] Adequate [ ] Not adequate [ ]
49. What type of infrastructure were you provided with? Farm access road [ ], please specify (km-----). Market for farm products [ ]; Storage facilities [ ]; Any other [ ], please specify:
50. What was your level of satisfaction with infrastructural provisions for your farming needs? Very satisfactory [ ] Satisfactory [ ] Not satisfactory [ ]
51. Farm monitoring/Inspection? Yes [ ] No [ ] Not applicable [ ]
52. How satisfied were you with the performance of service providers? Very satisfactory [ ] Satisfactory [ ] Not satisfactory [ ] Not applicable [ ]
53. What is your level of satisfaction with innovations provided by your scheme of participation? Very satisfactory [ ] Satisfactory [ ] Not satisfactory [ ] Not applicable [ ]
54. To what extent do you think the new technology has improved on your level of performance? Not sure [ ] Fairly well [ ] Very well [ ] Not applicable[ ]

SECTION D: CROP PRODUCTION

55. Please fill the accompanying tables according to the major crop you cultivate on your farm:

i. FARM SIZE:

Crop:	Farm size (Ha):	Farm size (Ha) before commencement of programme:
Cassava		
Rice		
Yam		

ii. OUTPUT:

Crop:	Output (Tons/ha)	Output (Tons/ha) before programme commencement
Cassava		
Rice		
Yam		

56. Do you have land for expansion of your farm? Yes [ ] No [ ]

57. To what extent did the technology acquired improve your output? Very well [ ] Fairly well [ ] No Improvement [ ] Not applicable [ ]
58. Has your involvement in the programme you are participating improved your output? Yes [ ] No [ ]
59. Has your non involvement, if so, in the programme led to improvement in your output? Yes [ ] No [ ]
60. If you choose "Yes" to 50 above, to what do you attribute the improvement in your output? Household effort [ ] Co-operative associations [ ] Government extension agents [ ] Any other [ ], please specify:
61. If you choose "No" to 50 above, to what do you attribute the non-improvement in your output? Non-involvement in programme [ ] Non membership of co operative association [ ] Failure of government extension agent [ ] Any other [ ], please specify:

62. FARMING SYSTEM PRACTICED:

VARIABLE:	Cropping system	Cropping system before programme commencement
Mixed cropping (Major crop and any other)		
Sole cropping (Major crop only)		
Any other (specify):		

63. What is your major source of farm labour? Family [ ] Cooperative [ ] Hired labour [ ]
64. COST OF PRODUCTION:

i. LAND PREPARATION (LABOUR):

Activity	Size of land (ha)	Units of Labour	Cost of labour (Man/day)	Total cost of labour
Land clearing				
Ridging				
Planting				
Weeding				
Application of herbicides, Pesticides and fertilizer				
Harvesting				

ii. VARIABLE (INPUTS) COST:

Variable	Cassava production (cost/unit)	Rice production (cost/unit)	Yam production (cost/unit)
Application of fertilizer (kg/ha)			
Application of			

herbicides (kg/ha)			
Application of pesticides (kg/ha)			
Stem cuttings/Seedlings (kg/ha)			
Land (Farm size)			
Capital (N)			

65. How much do you spend in transporting your products to the market? (Please indicate):
66. How do you market your farm output? Directly to the market [ ] Through middle buyers [ ] Any other [ ], please specify
67. How is your output price determined? Ruling market price [ ] By middle buyers [ ] Any other [ ], please specify:
68. Please complete the following table:
    OUTPUT AND REVENUE:

Crop	Quantity sold (Ton)	Price (N)	Annual Average Income (N)	Annual Average Income (N) before programme commencement
Cassava				
Rice				
Yam				
Total:				

69. What quantity of your output do you and your household consume? (Please indicate in kg or Ton):
70. How much do you and your household spend on other consumption needs per annum? (Please indicate in Naira):
71. Have you witnessed an increase in your farm income since programme commencement? Not sure [ ] No [ ] Yes [ ], please specify amount in Naira:
72. If you witness increase in your farm income since programme commencement, has the income increase been consistent? Not sure [ ] No [ ] Yes [ ], specify:
73. If you observe consistent increase in your farm income, can you attribute this to the programme of participation? Yes [ ] No [ ] Not sure [ ] Not applicable [ ]
    SECTION E: DIVERSIFICATION OF INCOME:
74. Are you involved in any off-farm enterprise activity? No [ ] Yes [ ], please specify type:

75. How much income (per annum) do you generate from off-farm enterprise activity? Please specify amount in Naira (per activity):
76. Were you involved in any off-farm enterprise activity before commencement of programme? No [ ] Yes [ ], please specify type:

77. How much income (per annum) did you generate from off-farm enterprise activity before programme commencement? Please specify amount in Naira (per activity):
78. Have you witnessed an increase in income from your off-farm enterprise activity since programme commencement? Not sure [ ] No [ ] Yes [ ], specify amount in Naira:

SECTION F: IMPACT ON POVERTY AND WELBEING:

79. To what extent has the programme improved on your wellbeing (income)? Very well [ ] Fairly well [ ] Not sure [ ] No improvement [ ] Not applicable [ ]
80. How much of your income do you spend on health for your household? Please indicate amount (Naira):
81. How much of your income did you spend on health for your household before programme commencement? Please indicate amount (Naira):
82. How do you finance your children education? Personal income [ ] Support from family and friends [ ]
83. How much of your income do you spend on your children education? Please indicate annual amount (N):
84. How much of your income did you spend on your children education before commencement of programme? Please indicate annual amount (N):
85. How much of your income do you spend on food consumption for your household (N) [ ]
86. How much of your income did you spend on food consumption for your household before programe commencement? (N) [ ]
87. How do you respond to sudden need for money? Sale of asset [ ] Savings [ ] Borrowing/assistance [ ]
88. How did you respond to sudden need for money before programme commencement? Sale of asset [ ] Savings [ ] Borrowing/assistance [ ]
89. How adequate is your income for your household needs? Very adequate [ ] Fairly adequate [ ] Not adequate [ ]
90. How adequate was your income for your household needs before programme commencement? Very adequate [ ] Fairly adequate [ ] Not adequate [ ]
91. Have you acquired new household asset? Yes [ ] No [ ]
92. How did you finance the acquisition? Loan [ ] Assistance [ ] Personal income/savings [ ]
93. How will you rate your income/poverty status? Very poor [ ] Fairly poor [ ] Not poor [ ]
94. How will you rate your income/poverty status before commencement of programme? Very poor [ ] Fairly poor [ ] Not poor [ ]
95. How significant has your wellbeing improved, if any, within the last three years? Very significant [ ] Fairly significant [ ] Not significant [ ] Not sure [ ]
96. Have you ever participated in a discussion to express your opinion on the activities of the programme you are participating? Yes [ ] No [ ] Not applicable [ ]
97. If you ever participated in a discussion to express your opinion on the activities of the programme you are participating, how did this take place? Formal public/private

sector forum [ ] community meetings [ ]co operative meeting [ ] Not applicable [ ] Any other [ ], please specify:

98. Do you feel your opinion expressed in such discussion mattered? Yes [ ] No [ ] Not applicable [ ]
99. If you choose "No" to 83 above, how do you feel about being left out in a discussion on the activities of the programme you are participating? Please state:

SECTION G: CONSTRAINTS:

100. Was the programme farm input resources delivered to you timely as required? Yes [ ] No [ ] Not applicable [ ]
101. If you choose "No" to 78 above, what do you think is the reason for the delay in the supply of the farm input resources? Please state the reason:
102. Did the delay, if so, in delivering farm input resources to you timely as required affect your farming operations? No [ ] Not applicable [ ] Yes [ ], please specify:

103. Were you able to pay your counterpart fund timely as required? Not applicable [ ] No [ ] Yes [ ]
104. If you choose "No" to 80 above, what was the reason for the delay? Not applicable [ ] Lack of funds [ ] Any other reason [ ], please specify:

105. How did the delay, if so, in paying the counterpart funding affect your farming operations? Please state:

106. Who was responsible for the supply of the farm input resources to you? Not applicable [ ] Private sector agents [ ] Public sector agents [ ] Do not know [ ]
107. Did you receive timely response to your complaints concerning your operational challenges from the programme managers? No [ ] Yes [ ] Not applicable [ ]
108. How satisfied are you with the performance of the monitoring and evaluation officers to your farm? Very satisfied [ ] Satisfied [ ] Unsatisfactory [ ] Not applicable [ ] Not applicable [ ]
109. From your observation, how will you assess the relationship between the parties involved in the programme you are participating? Very satisfactory [ ] Satisfactory [ ] Not satisfactory [ ] Not applicable [ ]
110. Did you encounter challenges in marketing your products? No [ ] Yes [ ], please specify:
111. Where will you relate the problems you encountered in marketing your products/output? Government policies and actions [ ] Activities of middle buyers [ ] Lack/poor preservative infrastructure [ ] Any other [ ], please specify:
112. In your opinion, to which sector will you majorly relate the constraints you faced? Please tick as appropriate:

i. Constraints are related to Government (Public) sector (example, policy inconsistencies, weak enforcement of rules, etc.)
ii. Constraints are related to Private sector activities (example, poor or non-compliance, delay in service delivery, etc.)
iii. Inadequate technology/Facilities/Infrastructure (eg. Storage and processing facilities, roads and market infrastructure, etc)
iv. Constraints are related to Market Intermediaries (eg. Off-takers, middle buyers)
v. Constraints are related to low income of households (eg. difficulty in payment of counterpart funds, lack of funds for farm inputs acquisition, etc)
vi. Constraints are related to land or Communal Crises (eg. inadequate land for farm expansion, farm disruptions occasioned by crises, etc.)

113. Please indicate any other constraint you face as a farmer that you may want to share with me:----------

114. What other comment or information will you like to share with me concerning your farm enterprise? :----------

115. What other comment or information will you like to share with me concerning the programme you are participating? : ----------
---

Thank you.

APPENDIX II

Constraints of the Fadama III project in Cross River State

	Frequency	Percent	Ranking
Constraints related to Government (public) Policy (eg. Policy inconsistencies)	43	13.9	6th
Constraints related to low income of households (eg. Difficulty in payment of counterpart funds)	105	33.9	2nd
Inadequate Technology/Facility and Infrastructure (eg. Storage and processing facilities, roads and market infrastructure, etc)	131	42.3	1st
Constraint related to Market Intermediaries (eg. Off-takers, middle buyers)	61	19.7	4th
Constraints related to private sector activities (eg. None or poor compliance; delay in service delivery, etc.)	101	32.6	3rd
Constraint related to land or Communal Crises (eg. Inadequate land for farm expansion, farm disruptions occasioned by crises, etc.)	50	16.1	5th

Source: Survey Data (2016)

APPENDIX III

Constraints of the Songhai Project in Cross River State

	Frequency	Percent	Ranking
Constraints related to Government (public) Policy (eg. Policy inconsistencies)	50	13.9	1st
Constraints related to private sector activities (eg. None or poor compliance; delay in service delivery, etc.)	12	33.9	2nd
Inadequate Technology/Facility/Infrastructure (eg. Storage and processing facilities, roads and market infrastructure, etc)	50	42.3	1st
Constraint related to Market Intermediaries (eg. Off-takers, middle buyers)	2	19.7	3rd
Constraints related to low income of Households (eg. Lack of capital for farm start-up/expansion)	50	32.6	1st
Constraint related to land or Communal Crises (eg. Inadequate land for farm expansion, farm disruptions occasioned by crises, etc.)	2	16.1	3rd

Source: Survey Data (2016)