

**Effect of Farmer Field School Training on Cowpea
Production among Small Scale Farmers in Kebbi
State, Nigeria**

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**Effect of Farmer Field School Training on
Cowpea Production among Small Scale Farmers
in Kebbi State, Nigeria**

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AGRICULTURAL EXTENSION

CERTIFICATION

This is to certify that this thesis has been read and approved as meeting the requirements of the Department of Agricultural Extension and Rural Development, University of Ilorin, Ilorin, Nigeria for the Award of Doctorate Degree.

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DEDICATION

I dedicate this research work to Almighty Allah and my parents.

DECLARATION

I, USMAN, Haruna Muhammad hereby declare that this thesis entitled Impact of Farmer Field School Training on Cowpea Production among Small Scale Farmers in Kebbi State, Nigeria is a record of my research work. It has neither been presented nor accepted in any previous application for a higher degree. Also sources of information have been specifically acknowledged. In addition, the research work has been ethically approved by the University Ethical Review Committee.

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Date

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TABLE OF CONTENTS

TITLE	ii
CERTIFICATION.....	iii
DEDICATION.....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	vii
LIST OF FIGURES.....	xvi
LIST OF ABBREVIATIONS AND NOTATIONS.....	xvii
ABSTRACT.....	xix

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study.....	1
1.2 Statement of the Problem.....	4
1.3 Objectives of the Study.....	6
1.4 Hypotheses of the Study.....	6
1.5 Limitations of the Study.....	7
1.6 Significance of the Study.....	7
1.7 Operational Definition of terms.....	9

CHAPTER TWO: REVIEW OF LITERATURE

2.1 introduction.....	12
2.2 Approach and Concept of Training.....	12
2.3 Agricultural Training and Development.....	16
2.4 Types of Training.....	18
2.4.1 Pre-service Training.....	19
2.4.2 In-service Training.....	19
2.5 Phases of Training and Training Needs Assessment	20

2.5.1	Phases of Training.....	20
2.5.2	Assessment of Training Needs	25
2.6	Importance of Training.....	26
2.7	Concept and Approaches/Models of Agriculture Extension in Nigeria	28
2.8	Agricultural Technology and Appropriate Technology Transfer.....	34
2.8.1	Agricultural Technology	34
2.8.2	Appropriate Agricultural Technology Transfer.....	35
2.9	History, Concept and of Farmer Field School.....	36
2.9.1	History of Farmer Field School	36
2.9.2	Approach and Concept of Farmer Field School	37
2.9.3	Objectives of Farmer Field School	40
2.9.4	Principles of FFS.....	40
2.9.5	Characteristics of FFS	42
2.10	Selected Impact Studies of Farmer Field School on Smallholder Agricultural Production.....	45
2.11	Factors Influencing Farmers Participation in FFS Training.....	48
2.12	Strength and Weakness of FFS.....	50
2.12.1	Strength.....	50
2.12.2	Weakness.....	51
2.13	Origin and Distribution of Cowpea.....	54
2.14	Importance of Cowpea.....	54
2.15	Cowpea Production in Nigeria.....	55
2.16	Cowpea in Traditional and Improved Farming Systems.....	57
2.16.1	Cowpea in Traditional Farming Systems.....	57
2.16.2	Cowpea in Improved Farming Systems.....	57
2.17	Contribution of Cowpea to Rural Household Income.....	59

2.18	Impact Assessment.....	59
2.19	Alternative Approach for Assessing Impact.....	61
2.20	Theoretical Framework.....	63
2.20.1	Linear Model.....	63
2.20.2	Innovation Diffusion Theory.....	64
2.20.3	Theory of Change.....	65
2.20.4	Theory of Human Resource Management.....	68
2.21	Conceptual Framework.....	68

CHAPTER THREE: METHODOLOGY

3.1	Area of Study.....	71
3.2	Population of the Study	74
3.3	Sampling Procedure and Sample Size.....	74
3.4	Method of Data Collection.....	75
3.4.1	Validity of Instrument for Data Collection	76
3.4.2	Reliability of Research Instrument.....	76
3.5	Method of Data Variables.....	77
3.6	Method of Data Analysis	81
3.7	Models Specification.....	81
3.7.1	Probit Regression Model.....	81
3.7.2	Propensity Score Matching (PSM).....	83
3.7.3	Chow Test.....	84
3.7.4	Z-Test.....	85

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1	Introduction.....	87
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4.2	Socio-economic Characteristics of the Respondents	89
4.2.1	Distribution of Respondents According to Gender.....	89
4.2.2	Distribution of Respondents According to Marital Status.....	89
4.2.3	Distribution of Respondents According to Age.....	90
4.2.4	Distribution of Respondents According to Household Size.....	90
4.2.5	Distribution of Respondents According to Major Occupation.....	91
4.2.6	Distribution of Respondents According to Farming Experience.....	91
4.2.7	Distribution of Respondents According to Farm Size.....	92
4.2.8	Distribution of Respondents According to Educational Status.....	92
4.2.9	Distribution of Respondents According to Extension Contact.....	93
4.2.10	Distribution of Respondents According to Tenancy Status.....	93
4.3.	Mean Distribution of Selected Socio-Economic Characteristics of Respondents.....	95
4.4.	Distribution of Respondents According to Cooperative/social Participation and Nature of Membership.....	97
4.5.	Distribution of Respondents According to Cowpea Farming Experience and Cowpea Farm size.....	100
4.5.1	Cowpea Farming Experience.....	100
4.5.2	Cowpea Farm size.....	100
4.6.	FFS Training Received by Participants on Cowpea Production Techniques	102

4.7.	Perceived Relevance of FFS Training by Participants on their Cowpea Production Techniques	104
4.8	Factors Influencing Respondents Participation in FFS	106
4.9.	Participants Status of FFS Training.	109
4.10.	Non-participants Level of Awareness and Source of Information of FFS.	109
4.11.	Reasons for Non-participants not Joining FFS.	111
4.12.	Distribution of Respondents According to Credit Access and Sources of Credit.	112
4.13.	Reasons for Poor Credit Access by Respondents	115
4.14.	Views of Respondents on their Cowpea Yield Increase for the Last Five Years.	116
4.15.	Impact of FFS Training on Participants Cowpea Production.	118
4.16.	Respondents Level of Annual Income.	120
4.17.	Distribution of Participants Based on Benefits Derived from FFS.	122
4.18.	Type of Housing Owned by Respondents.	124
4.19.	Distribution of Respondents According to Economic Status.	126
4.20.	Participants Perceived Constraints to Active Participation in FFS Training.	128

4.21. Perceived Constraints of FFS Non-Participants.....	131
4.22. Discussion with the Key Informants of FFS in Kebbi State.....	132
4.23. Result of Tested Hypotheses.....	134
4.23.1 Hypothesis 1	135
4.23.2: Hypothesis 2	137
4.23.3: Hypothesis 3	139

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary.....	141
5.2 Conclusion.....	145
5.2.1 Contribution to Knowledge.....	146
5.3 Recommendations.....	146
Reference.....	149
Appendix.....	165

LIST OF TABLES

Table 1: Cowpea Yield Data for Kebbi State and Nigeria (kg/ha).....	56
Table 2: Sampling Distribution of FFS Cowpea Farmers.....	75
Table 3: Sampling Distribution of Non- FFS Cowpea Farmers.....	75
Table 4: Distribution of Respondents According to Socio-Economic Variables.....	88

Table 5: Mean Distribution of Selected Socio-Economic Characteristics of Respondents.....	94
Table 6: Distribution of Respondents According to Cooperative/social Participation and Nature of Membership.....	96
Table 7: Distribution of Respondents According to Cowpea Farming Experience and Cowpea Farmsize.....	99
Table 8: Distribution of Participants According to Training Received in Cowpea Production Techniques.....	101
Table 9: Participants Perception of training on Cowpea Production Techniques.....	103
Table 10: Probit Regression Analysis of Factors Influencing Farmers Participation in FFS Training.....	105
Table 11: Distribution of Participants According to Status of FFS Training.....	108
Table 12: Distribution of Non-participants According to Level of Awareness And Source of Information of FFS.....	108
Table 13: Distribution of Non-participants According to their Reasons not joining FFS.....	111
Table 14: Distribution of Respondents According to Credit Access and Sources of Credit.....	111
Table 15: Distribution of Respondents According to Reasons for Poor Credit Access.....	114

Table 16: Distribution of Respondents According to their View on their	
Cowpea Yield Increase for the Last Five Years.....	114
Table 17: Effect of FFS Training on Participants Cowpea Production.....	117
Table 18: Distribution of Respondents According to Level of Annual	
Income.....	119
Table 19: Distribution of Participants Based on Benefits Derived from	
FFS.....	121
Table 20: Distribution of Respondents According to Type of House	
Owned.....	123
Table 21. Distribution of Respondents According to Economic Status.....	125
Table 22: Participants Constraints Perceived on FFS Training	
Participation	127
Table 23: Constraints Perception of FFS Non- Participants to their	
Cowpea production	130
Table 24: Summary of Linear Regression Coefficients.....	134
Table 25: Effect of FFS on Mean Annual Income of Respondents	136
Table 26: Z-test Results Showing Differences in Value of Selected Economic	
Items of FFS Participants and non-participants.....	138

LIST OF FIGURES

Figure 1: Training Cycle.....	22
Figure 2: FFS Theory of Change.....	67
Figure 3: Conceptual framework for the Study.....	70
Figure 4: Map of Nigeria.....	73
Figure 5: Map of Kebbi State.....	73

LIST OF ABBREVIATIONS AND NOTATIONS

ADPs - Agricultural Development Programmes

ATE - Average Treatment Effect

ATT - Average Treatment on the Treated

BPH – Brown Plant Hopper

BNARDA – Benue State Agricultural and Rural Development Authority

CDF - Cumulative Distribution Function

EU – European Union

FAO - Food and Agriculture Organisation

FFS - Farmer Field School

FMARD – Federal Ministry of Agriculture and Rural Development

HIV/AIDS – Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome

HND – Higher National Diploma

HRD - Human Resources Development

IFAD –International Fund for Agricultural Development

IITA – International Institute of Tropical Agricultural

IPM - Integrated Pest Management

LGAs – Local Government Areas

LGA - Local Government Area

MANRs - Ministries of Agriculture and Natural Resources

NACRDB - Nigerian Agricultural Cooperative and Rural Development Bank

NAERL/ABU - National Agricultural Extension, Research and Liason
Services/Ahmadu Bello University

NCE –National Certificate of Education

NGOs – Non-Governmental Organisations

NPC – National Population Commission

NPFS - National Programme for Food Security

OLS – Ordinary Least Square

PPMC - Pearson Product Moment Correlation

PSM - Propensity Score Matching

RSS - Residual Sum of Square

S_w - Weighted Sum

SS - Sum of Square

STD - Standard Deviation

STE - Standard Error

TOC - Theory of Change

TOT - Training of Trainers

ABSTRACT

Nigeria being considered as the largest producer of cowpea in the world, still has the majority of small- scale cowpea farmers producing below the expected yield per hectare. Relevant agricultural training for these small-scale farmers on new technologies and management practices using group-based approach like Farmer Field School (FFS), may assist in improving the farmers' level of production. The study therefore, assessed the effect of farmer field school training on cowpea production among small-scale farmers in Kebbi State, Nigeria. The objectives were to: (i) examine the socio-economic characteristics of the farmers; (ii) examine participants perception of the relevance of FFS training;(iii) determine the factors influencing small-scale farmers participation in FFS training; (iv) determine the effect of FFS training on cowpea production on FFS and non-FFS participants; (v) examine economic status of FFS and non-FFS participants vi compare the income of FFS and non-participants (vii) identify the constraints faced by FFS farmers.

A four-stage sampling technique was used to select 288 respondents. First stage involved a purposive selection from the list of FFS sites in each agro-ecological zone. Second stage involved a random selection of 1 local government area in each zone selected. Third stage involved random selection of 4 FFS participating communities. Fourth stage involved random selection of 30% of cowpea farmers (480) to give sample size of 144 participants. Same procedure was used to select 144 non-FFS participants. Data were collected using questionnaire, while descriptive statistics and probit regression were employed for analysis.

The finding of the study were that:

- i. majority of the participants were male (81.9%), married (77.8%), mean age (41years, farming experience (18.5years), and average farm size (1.6/hectares). Similarly, majority of the non-participants were male (81.2%), married (79.2%), mean age (44.8years), farming experience (15.3 years) and average farm size (1.30/hectares);
- ii. the participants perceived training received on cowpea production as relevant-land preparation techniques($\bar{X}_w=3.59$),recommended spacing ($\bar{X}_w=3.50$), time of planting and method of pests and diseases control ($\bar{X}_w=3.39$).

- iii. the variables that significantly influenced participation in the training were age ($p<0.05$), household size ($p<0.10$), extension contact ($p<0.01$), credit access ($p<0.05$), farm size ($p<0.01$), cowpea farm size ($p<0.01$) and cooperative membership ($p<0.01$);
- iv. the training increased the yield of participants by 100.50kg/hectare above their counterparts.
- v. higher proportion (47.2%) of the participants were in middle economic status while half (50.0%) of the non-participants were in low economic status;
- vi. the mean income of the participants (₦ 180,277.78) was significantly higher than that of non-participants ($p<0.05$) and
- vii. the major constraints experienced by the participants in the programme were inadequate capital ($\bar{X}_w = 3.47$) and higher cost of ($\bar{X}_w = 3.54$).

The study concluded that FFS training had significant effect on the participants' cowpea yields, on-farm income and common items of economic value. The study therefore recommended that FFS programme should be extended to non-participating LGAs in Kebbi State, this will help in attaining self-sufficiency in cowpea production in the state and Nigeria in general.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Cowpea (*Vigna unguiculata* (L.) Walp) is an important food legume and versatile crop cultivated in semiarid tropic, covering Asia, Southern Europe, Africa, central and Southern America (Davis et al., 2013). The crop is grown in more than 2/3 of the developing World as a companion or relay crop with major cereal crops (Tararvali et al., 1997). In Africa, Cowpea is sometimes grown as a sole crop but more often intercropped with cereal crops like; maize, sorghum and millet (Cook et al., 2005). However, cowpea is one of the ancient crops known to man and is cultivated primarily for its grains, fodder and as a cover crop. Owing to the prominence of this crop, it is sometimes called the “hungry-season crop” because it is first to be harvested before the cereals (Gomez, 2004). All around, cowpea gives nutritious grain and cheap protein source for both rural poor and urban consumer. The grain can possibly contribute in the decrease of poverty among asset poor farmers and soil fertility change for minimal terrains through arrangement of ground cover.

Studies have shown that 7.56 million tonnes of cowpea is produced annually worldwide, on 12.5 million hectares of land and sub-Saharan Africa represents around 70 percent of the aggregate world production (IITA, 2007). Furthermore, Nigeria is the world's biggest producer of cowpea and 2nd largest importer in the whole world (IITA, 2001; Agbogidi and Egho, 2012). Despite this vital role Nigeria play in cowpea production in the world, the larger proportion of the production come from small scale farmers who have little or no knowledge of improved production systems hence, realize outputs of 200-350 kg/ha and in some cases zero output. To this end, the cowpea production scenario in Nigeria reveals that the domestic cowpea production has not

kept pace with the demand of the ever increasing human population. In order to achieve food self-sufficiency for the populace, there is need to devise ways of increasing agricultural production. Over the years, Nigeria in its determined efforts to boost food production has introduced a number of agricultural development programmes and extension approaches. Prominent among the extension approaches include; conventional ministry operated extension, project based extension, sectoral/commodity extension and the University organized extension. Others are; integrated rural development approach, farmer focused extension and Unified extension i.e. training and visit (T&V) extension system (Ilehaje, 2004; Ogunwale, 2004). Although these approaches recorded some successes, they were not devoid of criticism and challenges. Dimilu and Okoro (2011) observed that, the approaches were public dominated, production-led, highly centralized, top down, expensive and monolithic which undermined its effective performance. This situation called for efforts on how to come up with a more sustainable agricultural extension approach that goes past stretching out specialized knowledge to small scale farmers, to assume a main part in helping farmers sort out themselves for sharing production advances, promoting and support such that enables the farming communities (David, 2007). To this end, other new approaches such as demand-driven, farmer responsive and participatory extension have emerged.

A more recent concept of farmer training approach is called the “farmer field school” (FFS). This approach speaks to a radical takeoff from prior agricultural extension system (top- bottom), in which farmers were relied upon to embrace summed up proposals detailed by masters outside the farmers' group. It is a later apparatus provided with base up way to deal with enhance livelihood of farmers (Khatom et al., 2010). The approach utilizes participatory method that enable farmers to develop skills and come up with creative method of thinking that create a conducive atmosphere for learning

and make better production decisions (Kenmore, 2002). It involves season-long field based communities of 25-30 farmers who are expected to meet regularly, guided by trained facilitators during the course of the cropping cycle. This enables farmers to participate fully in the implementation of all component of the technology from planting to harvesting. In a nutshell, FFS has emerged as a more effective approach to disseminate scientific knowledge and improved agricultural practices to the farming households (Muhammad et al., 2004). It is a potential training approach that provides farmers with practically useful knowledge and skills to use new technologies more efficiently (FAO, 2006). The FFS is a participatory approach that uses non-formal adult education methods based on experimental learning techniques and participatory training methods (Asiabaka et al., 2003). Small scale farmers require training that would give them the knowledge and confidence to make proper decision (Elveleen, 2004). Training is therefore one of the most important factors that affect individuals' attitude, productivity, improvement and reduction of risks and quality of job performance in any endeavour (Meanabigai and Seethraman, 2003). In other words, training plays an important role in the advancement of performance in a given situation. Aphunu and Ajayi (2010) explained that training is a method of new skills aquisition, attitude and knowledge in a context of training for entry into a vocation or improving ones productivity in an enterprise or organisation.

However, it has been observed that development goals can rarely be attained without enhancing the skills and knowledge of the target population (Mansour et al., 2007). Training is therefore an avenue for that ensure human capacity and empowerment in order to guarantee effectiveness in service provision for the betterment of community. Effective training therefore needs a clear picture of how the trainees will require to use the information after training in a place of local practice ie what they have adopted

before in their situation. Farmers are regarded as serious researcher when they make trials and adopt different innovation for thier thereby coming up with the one appropriate for their farm activities (Mansour et al., 2007). In other words, training of small scale farmers can assist in increasing agricultural productivity and hence reduce poverty and hunger among people. However, planning for the implementation of FFS in Nigeria, started in 2001, but its actual implementation commenced in all the sites of National Programme for Food Security (NPFS) in 2008. Many states had delayed take off due to non-payment of counterpart contributions. The few states that had early commencement were: Anambra, Bauchi. Ekiti, Enugu, Kebbi, Kogi, Oyo and Yobe.

1.2 Statement of the Problem

In Nigeria cowpea is one of the most vital indigenous grain legume cultivated extensively in northern region (Singh et al., 1997). The north produce about 1.7 million tonnes from 40 million hectares. This accounts 60 percent of the aggregate production in the nation (FAO, 2010). Nigeria being adjudged to be the largest producer of cowpea has not attained self-sufficiency in the production of the crop. That is, there is a wide gap between the potential and actual cowpea outputs. Crop Production in Nigeria; cowpea inclusive, has continued to be dominated by the small scale farmers, who can only produce about 200-250 kg/ha. This production figure is low and it falls far below the actual output of 1500-2000 kg/ha required to attain self-sufficiency in the country. In this respect, for about two decades, efforts has been made by the policy makers, stakeholders in the agricultural sector and International donor agencies to produce more food in order to ensure the population is food secured. Hence, Nigeria cowpea demand and supply gap will continue to grow with the population. However, one of the major problems impeding increased agricultural productivity in Nigeria is high level of illiteracy and poor training of small scale producers to use the available improved

production technologies in their farming systems (Apata and Shitu, 2013). Also, the traditional agricultural extension approaches neglected to factor in the diverse socio-economics and institutional situations faced by farmers, for neglecting to include farmers in the development of technology and practices relevant to their context or to empower more generally as problem solving decision advocates. This could be attributed to a number of factors that include; inadequate or lack of qualified extension officers to train and persuade the farmers to use modern farming techniques, unmotivated extension officers, lack of accountability and its top-down approach. However, the FFS was introduced with bottom-up approach, which is a paradigm shift from the traditional agricultural extension systems. According to Ebewore (2013) few studies has been carried out to assess the effect of FFS approach in Nigeria and Kebbi state not an exception. It is against this background that the research initiative raises the following research questions to be able to assess the effect of farmer field school training among small-scale cowpea farmers in Kebbi state, Nigeria:

1. What are the socio-economic characteristics of respondents in the study area?
2. What is the perception of the respondents about the relevance of FFS training to their farming activities by farmers?
3. What are the factors that influence respondents' participation in FFS training?
4. What is the effect of FFS training on the cowpea output of FFS participants?
5. What is the level of on -farm income of FFS and non-FFS participants?
6. What is the economic status of FFS participants and non-FFS participants?
7. What is the perception of cowpea farmers on the seriousness of constraints faced in FFS training participation?

1.3 Objectives of the Study

The main objective of the study is to assess the effect of FFS training on cowpea production among small-scale farmers in Kebbi State, Nigeria.

The specific objectives were to:

1. examine the socio-economic characteristics of the respondents in the study area;
2. examine participants perception of the relevance of FFS training to their farming activities;
3. determine factors that influence respondents' participation in FFS training;
4. determine the effect of the programme on participants cowpea outputs.
5. compare the level of on- farm income of FFS and non-FFS participants;
6. examine the economic status of FFS and non-FFS participants and
7. Investigate the perception of cowpea farmers on the seriousness of constraints faced in FFS training participation.

1.4 Hypotheses of the Study

The following hypotheses were tested.

Ho1: FFS training has no significant effect on the cowpea output of FFS participants

Ho2: There is no significant difference in on-farm income of FFS participants and non-participants.

Ho3: There is no significant difference in economic status of FFS and non-FFS participants.

1.5 Limitations of the Study

The study had limitations of coverage of area and population, due to obvious constraints of time and logistics. In this respect, the study was limited to Kebbi state, the only state that had early commencement of FFS programme in the entire north western states of the country. To this end, the study covered 32 rural communities and 288 small scale cowpea farmers.

1.6 Significance of the Study

In most developing countries, Nigeria not an exception, majority of small scale farmers reside in rural areas and lacked improved farming knowledge and skills. Hence, continued to produce at subsistence level using crude implements and local production practices. However, in order to reduce the Nigeria's food demand and supply gap, it became imperative for agricultural professionals to fashion out strategies for improving the farming knowledge and skills of small scale farmers. It is believed that, development goals can rarely be attained without enhancing the knowledge and skills of the target population.

Mansoor et al. (2007) advocated transfer of appropriate technologies and improving human knowledge and skills in any developmental process, training remained an indispensable mechanism. To this end, ensuring that small scale farmers have rightful knowledge and skills to adapt to changes in production environments as well as management practices appropriate to their needs cannot be underscored. Therefore, the study of effect of farmer field school training on cowpea production among small scale farmers in Kebbi State is considered vital:

- This study will provide rationale for policy makers' intervention to increase small scale farmers' access to training.

- To government and other relevant stakeholders in agricultural sector (researchers) it will serve as analytical frame of reference that can be used in planning future farmers' knowledge and skill development with primary objective of increasing food production.
- The study will also have far-reaching significance for Kebbi state government where farming is the primary occupation of large proportion of the people.
- To the researchers/academia, the study will assist to provide a more rational basis for determining research priorities and for designing a more practical, effective and efficient training for farmers.
- The study will also examine certain farmer field school operational problems that are likely to affect the FFS participants and their response to them. This will have useful implications for modifying small scale farmers training for effective performance of the present and future trainings.
- It is expected that, the study will assist to re-examine the relevance of farmers training. Knowledge of this may be of great value to government and non-governmental organisations, policymakers, researchers, agricultural administrators and practitioners. This can assist them in appropriate planning of farmers training and information dissemination of improved technologies/practices which will result in increased food production.
- The finding will be of high importance to agricultural extension agencies, ministries of agriculture and ADPS.
- To students and other relevant communities, this will help to publicise the critical role effective training play in agricultural production. In this respect, it will increase public awareness on the need for appropriate technology transfer that will be applicable to their own situation.

1.7 Operational definition of Terms

ADPs: Agricultural Development Projects

Agricultural technology: It is a new scientifically derived, often complex input given to individual by institution with sound technical expertise (Andrei, 2012).

DFRRI: Directorate of Food, Roads and Rural Infrastructure

Economic Status: This refers to person's relative wealth or position in life or possession of material of economic value by an individual or group as a result of participation in an intervention

Effect: This refers to changes that occur in individual, group of individuals or community as a result of participation in a project or programme.

Effect indicator: This is the quantitative or subjective estimation of a question be accomplished, an asset assembled, an output achieved, an impact got or a setting factors (Economic, Social and Environmental).

FSR/E: Farming System Research and Extension

Participation: It is the involvement of people or group of people in a project or programme with the objective of getting improvement in their socio-economic well-being.

Small Scale Farmer: This is a farmer whose farm holding is between 0.1/ha-5.99/ha or annual income of between <N5, 000 to N50, 000.

Farmer Field School: This is an adult education programme targeted at developing farmers' skills, knowledge and empower them to choose appropriate crop production management practices aimed at increasing their level of production.

Training: It is an arranged and efficient push to adjust or create information, skills or mentality of a person through figuring out how to accomplish compelling performance in their undertakings.

Facilitator/Trainer: A person or persons who assist a group of people understand their common objectives and help them to plan how to realise these objectives.

Farmer field School Participants: Farmers who were involved or participated in farmer field school in the study area.

Farmer Field School Non-Participants: This refers to farmers that were not involved in farmer field school programme in the study area.

Trainees: A farmer or group of farmers that received training from farmer field school on their farming activities.

MANR: Ministry of Agriculture and Natural Resources

PBTE: Performance Based Teacher Education

T&V: Training and Visit

UAES: Unified Agricultural Extension System

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Literature review is based on scholarly articles, books and other sources related to a particular issue, area of research or it could be described as a basic examination of a portion of a distributed group of learning through outline, characterization and correlation of earlier research thinks about (Robert, 2016). The embodiment is to make recognition with ebb and flow considering and investigate on a specific theme and may legitimize future research into a formerly ignored or understudied area. It enables a researcher to position a study in a broader academic community, synthesis existing ideas and arguments without adding their own. However, this chapter dwells on; the concept of training, agricultural training and development, types of training, importance of training, agricultural technology and appropriate technology transfer, others are concept and history of farmer field school, factors influencing farmers participation in FFS training, some impact studies of farmer field school on smallholder agricultural production, origin and distribution of cowpea, importance of cowpea, cowpea production in Nigeria, cowpea in traditional and improved farming systems, contribution of cowpea to household income, impact assessment, theoretical and conceptual framework.

2.2 Approach and Concept of Training

There are three approaches of training viz: (1) the traditional approach (2) experiential approach and (3) the performance-based approach (Rama et al. 1993). The traditional training approach involves, the training staff designs the objectives, contents, teaching techniques, assignments, lesson plans, motivation tests and evaluation. Contrary to

academic approach inherent in the traditional approach; the experiential training emphasizes real or stimulated situations in which the trainees will eventually use. In this approach, the objectives and other elements of training are jointly determined by the trainers and trainees. Trainers mainly serve as facilitators, catalysts or resource persons. However, in the performance-based model of training, goals are determined through attainment of a given level of proficiency instead of passing grades of the trainees. In this situation more effort is paid to acquiring specific observable skills for an activity. This Performance-Based Teacher Education (PBTE) approach, developed by Elam, (1971), is mainly task or skill centred and is also applicable to non-formal educational organizations like extension.

Training can be perceived as an act of improving the knowledge and skills of a worker to perform a specific task (Broad, 2007; Ogunbameru, 2001). Training therefore involves getting information, knowledge and developing human capacities or disposition that can bring about greater competency in work performance. Farinde and Ajayi (2005) pointed out that, training assist to enhance the knowledge and skills of a person required to undertake a specific work. Training is therefore, usually aimed at improving the capability of an individual to execute their work more effectively and efficiently. In general, it involves acquiring information and building capacities or states of mind which will bring about more competency in the performance of a vocation. Alexander (2012) posits that training is a deliberate acquisition of knowledge (i.e what they think), skills (ie what they do) and attitude (ie what they feel) that can bring about enhanced performance in a specific situation. Training enables an employee to learn new ideas, become more efficient in production and communicate effectively with other individuals or groups in the organization (Sajeev and Singha, 2010). According to Sriyan (1997), training involves equipping the trainees with

improved knowledge and skills that should to be translated into practice with a view to improve organization effectiveness. To this end, training need to be considered alongside with prevailing educational policies and systems that are paramount to the advancement of human resources in an enterprise.

Ajayi (2008) and Armstrong (2006) pointed out that training is a systematic effort to enhance the knowledge, skills and attitude of a trainee through learning experience to achieve effective performance in a job. In a nutshell, training in farming situation is aimed at developing farmers` abilities that will enable them to perform better in their farming activities. Frayne and Geringer (2000) stated that training is effort to refine those qualities which individual possesses and which his position will demand. Thus, training help an individual in whatever is not doing well to adjust; hence, training must be relevant to job description and performance. According to Ibitoye and Onimisi (2013), greater productivity of employees can only be attained through improved knowledge or skills that can be achieved through proper training and development. Indeed, farmers with requisite educational training and good experience would help in using the knowledge and skill acquired for enhanced performance. It is generally recognised that agricultural skills training is an important phenomenon that enables small scale farmers to produce increased and efficient supplies of high quality outputs they need to benefit from higher-worth agricultural value chains (Nnadi et al., 2012). According to Hossein et al. (2012), training is usually carried out whenever an employee engages in a work that results in the ability to use a skill that the employees has not before. Training therefore, provides whatever increased specific items of knowledge, skills or attitude they need to perform up to standard. Alibaygi and Zarafshani (2008) posits training to help in equipping individuals with relevant knowledge and skills to undertake progressive and flexible enterprise. Hence training

can be viewed in a place, effort to achieve greater performance in the job and also raise level of development of the trainees. .

Gareth and Jennifer (2003) explained training to be teaching employees how to undertake their current jobs and assist them obtain the knowledge and skills they require to perform effectively. Essentially, training involves change in skills and knowledge or social behaviour. According to Reynolds (2004), training plays a complementary role in accelerating employees' learning. The study further explained that a conventional learning approach has the tendency to emphasize subject-specific knowledge, rather than attempt to develop a core learning abilities. Olaniyan and Lucas (2008) stressed that training is a systematic improvement of knowledge and skills required by individual to perform a given job or task efficiently. By and large, knowledge is the ability, the skill in understanding the information that every individual requires to obtain in order to be able perform effectively and efficiently. In this respect, training can be considered as part of human development. Human development is a process of increasing individuals' choices. According to Olusanya et al. (2012), training is indispensable not only in the development of individuals but also facilitate the productive capacity of the people. Training programme therefore help in improving the knowledge and skills required to achieve the goals of increased agricultural production. More so, Chidebere (2014) perceives training as a systematic process aimed at changing the attitude and behaviour of a person in a way to realise enterprise goals and development.

Azara et al. (2013), considered training as a procedure of enhancing the skills, knowledge, and capabilities in a person. Training is also an organized improvement from the know-how skills and sensitizations needed for individual to perform efficiently in the offered process and to operate in underlining environment (Saleem et

al., 2011). Laing (2009) stated that training is an indicator that enhances superior skills, knowledge, abilities and outlook of the individuals, which can result in effective performance of a job. Khanfar (2011) stated that training is an active means that enable people to use their abilities and potential capability. These abilities include knowledge, skills and behaviours that are very vital for successful job performance. Alexander (2012) identified training have positive impact on the individual and organization. Thus, training increases the learning and opportunities open to every trainee. In this respect, there is need to justify your training. Formal training is indeed one of the process of ensuring that learning takes place, but this can only be justified when the job require skills that can best be provided through formal instruction (Armstrong, 2006). According to Aphunu and Ajayi (2010), training of individuals engaged in agricultural and community development programmes is aimed at communicating information, knowledge and skills, to replace old practices with new ones, sharing opinion and experience and to remove uncertainties and difficulties.

However, Okwu and Ejembi (2005) perceives training as a knowledge and skill acquisition effort required for an individual to use technology appropriately. The desire for training arises as a result of deficit situation in the knowledge and skill level of persons involved in a vocation. It worth noting that all the different authors perceived training as imparting new knowledge, skills and attitude that can enable an individual or trainee to be more productive in job execution.

2.3 Agricultural Training and Development

Farmers' training and development is seen as one of the most important formation of any sustainable agricultural management system. This is not unconnected to the ever increasing emerging technologies in the agricultural sector. According to Onasanya

(2006), training is a form of specialized education aimed at imparting to a trainee a specific knowledge and skill that is needed for effective performance in a particular situation. On the other hand, development deals with specific programme that is designed to equip and groom an individual with particular education and training for higher responsibilities. Beardwell and Helen (2001) viewed development as a process of becoming increasingly complex, more elaborate and differentiated by virtue of learning and maturation. Aroge (2012) training and development involves acquiring of knowledge competencies and skills and adopting behaviours that can enhance performance of present jobs, including adult learning theories and applications, instructional systems design, train-the trainer programmes and instructional strategies methods. Olaniyan and Lucas (2008) clarified that an individual training and development is a work activity that can contribute significantly to the overall effectiveness and profitability of a farm enterprise. It follows therefore that, any farmer to be able to perform their farming activities and make meaningful contributions to the success of the agricultural sector's goals, need to have the relevant skills and knowledge. In other words, training can be considered as a planned process to alter attitude, knowledge and skill behaviour through learning experience to achieve effective performance in an activity or range of activities (Osbaorne, 1996). The rapid rate of technological and social changes has made it vital to have farmers and administrators who are trained to cope with these changes. In this regard, training activities focus on learning skills and knowledge required to initially perform a task or improve upon the performance of current job.

Olusanya et al. (2012) posited that training and development must be interactive, each complementing the other. This is because training is a vehicle for human resources development concerned with improving the skill of trainees and enhance their

capability to cope with the ever changing demands of the farm situation as well as contribute positively to their empowerment. Meanwhile, development is an activity set out to ensure an enterprise has present and future confidence. Shepard et al. (2003) stated that, training and development can assist to increase the overall performance of an enterprise.

Al-khayyat and Elgamal (1997) pointed out that despite training and development appeared to be similar the learning methods used to execute them differ. However, training is concerned mainly with the use of lectures, practical sessions and or exercises and workshops while development use methods like job rotation, learning centres and available literature. In other words, development is employee-self initiated and voluntary. In view of different perspective of training and development, one can therefore conclude that training has to do with the modification of behaviour, knowledge and motivation of workers in a way to enhance enterprise goal attainment while development refers to advancement in one's experience, skills and attitudes to become or remain successful manager of farm enterprise.

.4 Types of Training

Over the last two decades, training has evolved as a major profession and discipline. The scope of training is today not restricted to developing knowledge, skills and attitude but it also covers the domains of human relations and job performance. Chigozie (n.d.) classified training into two major types: pre-service training and in-service training. The pre-service training appeared to be more academics in nature and usually carry out by formal institutions. In other words, in-service training is undertaken by an organization from time to time for the development of skills and knowledge of the existing staff.

2.4.1 Pre-service training: Pre-service training is described as a process through which people are trained to embrace certain professional job like agriculture, medicine or engineering. Khin and Hermann (2004) reported that pre-service trainings is usually provided for new graduates in the field of agriculture from colleges and other farming organizations for a time of one month. The pre-service preparing curriculum emphasize mainly technical subject matter such as crops, animal production and fisheries as well as pedagogical skills to equip individual for a profession. However, two types of pre-service trainings exist in any organization. These include; degree level training, which usually take three to five years. The second pre-service training is diploma level mostly offered by schools of agriculture for period of 2-3 years.

2.4.2 In-service training: In-service training includes a procedure of selection of staff for enhancing the performance of an incumbent occupying a position with assigned work obligations and this help to encourage professional development of people (Khin and Hermann, 2004). It is normally designed to enhance the abilities of an individual while executing a specific task. In this regard, in-service training is usually problem-focused, learner-oriented and time-bound. The series of activities that give chance to development of sense of purpose widen the perception of farmers and encourage them to improve their knowledge mostly new practices. Khin and Hermann (2004) further categorized in-service into five namely; induction or orientation training, formation training, on-the job training, refresher or maintenance training and career development training. All these types of training is essential for proper development of individual particularly extension personnel. Fisseha (2009) classified training programmes in rural areas into five broad categories. These include;

1. Functional literacy- aimed at broadening the involvement of rural folks.
2. Non-agricultural vocational skill including handicrafts, artisanship and small business.

3. General training for rural needs: this include the training for lower level staff of agricultural institutions, nutrition and community officers.
4. Women's training programme in home economics, nutrition and childcare and other domestic skills.
5. Farmers training in improved agricultural practices.

However, Fissaha (2009) classified farmer` training into institutional and non-institutional types and this differs from other forms of training mainly in the place of learning and direction:

1. Institutional training: It is characterized by a training period ranging from 3-15 weeks and usually performed by subject matter specialist in residential areas. The programme is usually designed to train local farmers and rural women.
2. Non-institutional training: this is conducted in situ. This is because Farmers learn through demonstrations, peripalatic and discussion groups.

2.5 Phases of Training and Training Needs Assessment

2.5.1 Phases of training

Training is a circular phenomenon that starts with need identification and after a number of steps ends with evaluation of the training activity. Any change or deficiency in the steps of training process influence the entire system and hence, it is essential for a trainer to have a good understanding of all phases and steps of training process like planning, implementation and evaluation (FAO/UN, 1998).

- **Planning Phase:** This encompasses several activities, two of which - training needs identification and curriculum development are very paramount

- **Implementation Phase:** As planning phase of a training programme is completely established, it is therefore time to implement a training course. Implementation is the stage where a trainer activates a training plan or it is the process of setting a training programme into use.

According to Abdul and Ali (1998), the first step towards implementing training programme is publicity. It worth noting that many well established training centres develop training brochures that contain course descriptions, an annual calendar of training opportunities, and inform affected organization, agencies or departments ahead of time about their training plan. It is obvious that as a training centre and concerned organization accept to implement training, the next step is to arrange available resources like sufficient funds for the course and facilities food, accommodation, transportation and recreation. All these resources have to be well managed and coordinated to drive the programme effectively.

- **Evaluation Phase:** This phase deals with the process of determining the relevance, effectiveness and impact activities in light of their objectives. In evaluating a farmer training programme, it is vital to consider that most training activities exist in a large context of projects, programmes and plans. Mengistu (2009) defined training evaluation as “a systematic process of collecting information for and about a training activity, which can be used for guiding decision making and for assessing the relevance and effectiveness of various training components”.

According to Mengistu (2009), four criteria can be used to evaluate programme, these includes (1) reaction (2) learning (3) behaviour and (4) results. Each criterion is used to measure different aspects of a training programme. In this

respect, reaction measures how trainees liked the programme in terms of content, methods, duration, trainers, facilities and management. Learning on the other hand, measure trainees' skills and knowledge which they were able to absorb at the time of training. Behavior is concerned with the degree to which trainees are able to apply their knowledge to real field situation. Results deal with tangible impact of a training programme on individuals, their job environment or the organization in general. Figure 1 presents a training cycle for any farmer training programme or approach.

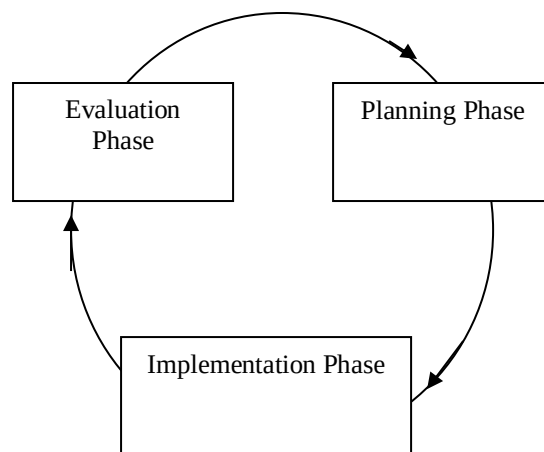


Figure 1: Training Cycle

Mengistu (2009) classified training programmes in rural areas into five broad categories viz:

- Functional literacy as to broaden the participation of local inhabitants.
- Non-agricultural vocational skill like handicrafts, artisanship and small business enterprises.
- General training for rural needs-it involves the training for lower cadre staff of agricultural training institution, nutrition community workers.
- Women's training programme in home economics, nutrition and child care and other domestic skills.

- Farmers training in improved farming practices.

Mengistu (2009) classified farmers training into institutional and non-institutional which differ mainly in the nature of place and duration of duration of training.

1. **Institutional Training:** This is characterized by a training period of 3 – 15 days and carried out by subject matter specialists in residential areas. This type of programme is designed to train small scale farmers and local women.
2. **Non-Institutional Training:** It is carried out in situ. Farmers learn through demonstrations, peripalatic training and discussion groups. However, a review of farmers training by FAO in 1980 identified fourteen “major methods of farmer training programmes in developing nations”. These include:

- **Farmer Training:** This involves training mostly farmers’ representatives in improved animal and crop production technologies. Advantage of training farmers’ representatives is that it help to facilitate the use of improved skills and easy approach to large number of farmers through the representatives, it has been observed that the representatives have come to be one of the beneficiaries of the outcome.
- **Residential Centres:** This is common in East Africa, in this case farmers undertake short courses on agricultural production.
- **Mobile Unit:** This is used in hard to reach areas of scanty rainfall regions such as nomads and pastoralists dwellings.
- **Demonstrations:** It is the most common type and is associated with preparing farm plots with required inputs. The plots serve both for a method and result of modern means of realizing better production.
- **Correspondence:** It is sometimes refer to as ‘training at distance’ deals with agricultural apprenticeship for adults and youth would be farmers.

- **Communication Technologies:** It is one of the new methods that is related to teaching farmers and extension agents in better agricultural techniques, family planning and nutrition. The use of video, tape recorders and radio programme to reach the target population.
- **Extension Centres:** These are agricultural units established by the government to serve as vaccination centres for livestock, distribution centres for farm inputs, experimental and demonstration stations as well as training centres for farmers, women and youth.
- **Research Projects:** This is similar to training of extension agents in real production of new crop varieties and how to demonstrate in the fields. The aim is to link research with training and extension at field levels.
- **Farmer Cooperative:** This is concerned with the provision of extension services to small scale farmers and pastoralists in cooperatives.
- **Mass Literacy Campaign:** This is carried out using radio and television, printed materials on relevant topics, a group of farmers discuss on the topic so as to relate the new knowledge to their own situation.
- **Group Farming:** This is an extension technique applied more to group than approaching individual farmers.
- **Work Study Teams:** It serve both as production enterprises and centres of skill training and of education training on the farm.
- **Pilot Villages and Communes:** It is mostly used in the Republic of Korea, it is related to training farmers during off-season period for gainful occupation to increase income and establish small scale industries in rural areas.

2.5.2 Assessment of training needs

- Training needs assessment is one of the most important steps toward identification of the areas of farmer's intent, design and development of curriculum that can best suit the existing real conditions of farmers (Sajeeu et al., 2012). Training needs assessment provide an avenue for a training agency to design relevant and needs based training programmes that can accommodate changes over time. According to Stephen (2002), the effectiveness of training is largely dependent upon effectiveness of the process used to identify training needs. Training needs are the information and skill areas of an individual or group that require further development in order to enhance their productivity. Adekunle and Ayandiji (2013) asserted training needs to be a condition where there exist a discrepancy or gap between "what is" or the present state of affairs in relation to a group and situation of interest and "what should be" in terms of incumbents knowledge, skills, attitude and behaviour for a particular situation at one point in time. The gap is called "a problem" which usually occurs when difference exist between desired performance" and "actual performance"
- Armstrong (2001) viewed training need to be the gap between what is happening and what should happen. In a nutshell, it is the difference between what people know and can do and what they should know and be able to do. Coole (2000) posits training need to be a short fall in terms of individual's knowledge, understanding, skills and attitudes against what is required by the work. However, the needs identification process help trainers in ensuring that training programme fit to a training problem. Barbazeth (2006) pointed out that before any actual training is carried out, the training institution is expected to ascertain the who, what, when, where, why and how of training.

2.6 Importance of Training

The importance of training in any production system cannot be underestimated. The strongest desire for training is the need to react to challenges exhibited by rising advancements. The farmers accordingly, need to learn new thing that will improve their capacity in farming activities. The way toward upgrading and advancing the abilities and learning of an individual/farmers through training and refresher courses is called Human resources advancement (HRD).The goal of HRD is to improve the performance of farm enterprises by maximizing the efficiency and performance of the farmers. Training is conducted whenever a farmer(s) engages in activities that result in the ability to use a skill that they did not have in the past. Thus, training is generally hinged on four basic components namely; acquiring knowledge of the skill, observing a model perform the skill, practicing the skill and reinforcing the newly acquired behavior (Aphunu and Ajayi, 2010). Training therefore provides whatever additional specific items of knowledge, skill or attitude that farmers require to perform effectively. Oguntimeh (2001) identified importance of training to include boost output, increase job quality; improve knowledge capability, skills, understanding and attitude, educate on use of morden machineries, eliminate waste, update obsolesce in skills, technologies, method, products and capital management. In this respect, training prepares individual for achievement and ensures the growth and survival of a farm enterprise. Tharenou et al.(2007) pointed out the goal of training is to improve the farm enterprise effectiveness as well as influence the individual performance, which should results in the overall increase in the productivity of the farm enterprise.

Muzaffar et al. (2012) found trained individual to be an important asset for a farm enterprise. According to Okanya (2008) training directly affects the individual outcomes and puts indirect effect on the enterprise performance that is reflected by individual performance. To this end, training should focus on ways of orienting new

individuals, giving recognition, correcting poor farming practices and overcome resistance to change. Coole (2000) stated that, as a result of vital role trained individual play in an enterprise, there is need for training institutions to commit large financial resources for training employees. This will assist to upgrade the existing skills, increase in the knowledge and experience of a farmer; improvement in work performance with consequence improvement in overall productivity. Training institution that provides opportunity for farmers or individuals to update and add new skills will probably be more successful in achieving its set goals of enhancing productivity. In this respect, a structured training required to be designed and by embarking on organizational analysis to identify the strengths and weaknesses of the individuals so that training institution can select training as the solution to the areas that require attention. Decievi et al. (2003) training institution should give needs assessment a priority to identify whether training is needed. Going by the various reasons established for training enterprise employees such as to ensure increase in productivity and to motivate people by improving their level of competence, skills and knowledge on the job, which they are expected to perform, personal growth opportunities for empowerment and provision of enhanced level of services. More so, it is through training that the farm families get informed of new methods of agricultural production, new pattern of family living, rural welfare and nutrition. It is therefore imperative for individual to submit that training remained an indispensable pursuit to achieve increased agricultural production and food self-sufficiency.

2.7 Concept and Approaches/Models of Agricultural Extension in Nigeria

The history of agricultural extension is well documented which date back to 1910 with the creation of the Department of Agriculture in the Southern Protectorate and 1912 in the Northern Protectorate and the amalgam of the two into one Department of

Agriculture with the headquarters in Moor Plantation in 1921 (Oladoja, 2004). Agricultural extension has been widely recognized as a vital tool for agricultural and economic growth, particularly in an agrarian economics of developing nations. However, there are many definitions, philosophies and approaches to agricultural extension and the views of what extension is all about have changed over time. Extension was originally perceived as a service to “extend” research-based knowledge to the rural areas to improve the lives of farmers. It thus included components of technology transfer, broader rural development goals management skills and non-formal education. The traditional view of extension in Africa, Nigeria inclusive was very much focused on increasing production, improving yields, training farmers and transferring technology. A more recent understanding of extension goes beyond technology transfer to facilitation; beyond training to learning and includes helping small scale s farmers to form groups or cooperative societies, dealing with marketing issues and collaborating with a wide range of service providers and other similar agencies (Akinagbe and Ajayi, 2010). Agricultural extension is a process of trained human resource and input. It serves to support, facilitate and encourage agricultural growth in a quantitative and qualitative manner through provision of technical information and advisory services (Dimelu and Okoro, 2011). Birner *et al.* (2006) perceives agricultural extension as the entire set of organization that support and facilitate people involved in agricultural occupation to solve problems and to obtain information, skills and technologies to improve their livelihoods and well-being. Oladoja (2004) also remarked that agricultural extension to be service committed to expanding human capacity through delivering educational programmes and technical information that result in improved leadership skills in the areas of communication, group dynamics, conflict resolution, issue analysis and strategic planning that can assist to enhance the economic viability and quality of life in rural communities. According

to Ogunwale (2004), agricultural extension service whenever established, is mainly to change the knowledge, skills and attitudes of the rural people and in this case farmers have to be assisted to evolve a frame of mind and attitude conducive to acceptance of new technology. He further stated that extension is educational assistance and advice provided by an organization or individual aimed at assisting particular farmers to identify and solve their farming problems by themselves. Extension therefore, aims at improving the manner farmers handle everything in their farming and community development. Ogunwale (2004) identified three major important functions performed by agricultural extension to include:

- Persuade the farmers to accept the value of change.
- Transmit the problems of the farmers to the researchers the auspices of the Directorate of Food, Roads and Rural Infrastructure (DFRRI). Essentially, the philosophy behind community extension model consists of work based on felt-needs on the pretext that people want to be free from poverty and pain, and based on self-help model, are prepared to take part in their own community development.
- Reflect the major changes in the national economy and therefore is of critical importance. This help farmers to better decision in farm management.

However, agriculture extension approach/model refers to the total fabrics of extension organization action as a conduit through which educative and problem solving innovations are delivered to appropriate target group by a specialized agent (Ebewore, 2013). Nigeria has implemented virtually all extension systems in the world. This was necessitated by the failure of the approaches to achieve the desired objective of increasing food production. Jibowo, (2005) identified major agricultural extension systems/approaches that have been implemented in Nigeria to include:

- **The Conventional Agricultural Extension System:** This is a classical approach that was attached to the State Ministry of Agriculture and Natural Resources (MANR) in Nigeria. Essentially, the system was designed to promote national agricultural production through increased food crops, export crops and annual crop production. This approach was expected to step-up farm incomes, develop cottage industry related activities and improve the general quality of life at the rural level (Ebewore, 2013).
- **The Community Type Extension Approach:** The community type extension approach is a participatory “self-help” system developed in India (Ebewore, 2013). It is a broad-spectrum model whereby the scope of the extension agent is widened to encompass responsibilities other than those that focuses on agriculture only. For instance, Nigeria under the auspices of the Directorate of Food, Roads and Rural Infrastructure (DFRRI). Essentially, the philosophy behind community extension model consist of work based on felt-needs on the pretext that people want to be free from poverty and pain, and based on self-help model, are prepared to take part in their own community development process (Ogunwale, 2004).
- **Farming System Research and Extension (FSRLE):** The Farming System Research and Extension (FSRLE) combines the efforts of research, development, extension and production agencies to investigate the whole farm as a system. Its focus is more on the interdependencies of the components under the control of the farm household and how the component interacts with the physical, biological and socio-economic factors outside the control of the household. This particular approach is mostly used by the National Research Centres in Nigeria (Ogunwale, 2004). In a nutshell, the farming systems,

research and extension combine two types of applied agricultural research (upstream and downstream) to evolve technologies as solution to identified constraints of small scale farmers' production system.

- **The Unified Agricultural Extension System (UAES):** The National Council for Agriculture at its 1989 meeting in Maiduguri, Borno State, adopted a memorandum which brought about need for the policy of the Unification of extension services. More so, at its Port-Harcourt meeting in February, 1990, more clarifications on the implementation of the policy on UAES were made, hence states were requested to adopt the system as a matter of urgency (Ebewore, 2013). The main aim of this, was to encourage the farmers to adopt integrated farming where there is inter-relationship among the various field of agriculture.
- **The Commodity Focused Approach:** The main aim of this model was to facilitate the production of enough quantities and qualities of raw materials. The commodity boards that once existed such as for cotton, groundnuts and cocoa came under this model. According to Ogunwale, (2007), these boards were concerned with the production of cash crops for export and were particularly interested in the improvement of agricultural production for exports and in this respect, their extension approaches/models were targeted towards this goal.
- **The Integrated Rural Development Approach:** This is a participatory rural development approach in which there is high level of people's involvement in planning, implementing and evaluating programmes. It is therefore, an important approach for improving agricultural extension system. The integrated rural development programme was conceived in recognition of the fact that the

concurrent development of Nigeria's rural sector, where the greater proportion reside, holds the key to balance national development.

- **Integrated Agricultural Development Approach:** In Nigeria the Integrated Agricultural Development Programme which could also be described as Agricultural Development Project (ADP) commenced in 1975 as an enclave project covering small geographical area of one or more local government areas in a state(Jibowo,2005). It was in this approach that the function of agricultural extension became more pronounced in the 70's as a result of the realization that there can be no agricultural development without the coordinating and harmonizing of all components involved in farm input supplies-seeds, fertilizer, agro-chemical and other infrastructure that can enhance sustainable development. These include roads, dams, provision of credit facilities and the strengthening of agricultural extension services. All these must be brought together and applied to agriculture in order to achieve maximum production and improve the level of living of rural people.

Traditional Agricultural Extension System: This approach first started in Pakistan in 1961. It used top- down extension system with the aim of technology transfer from government to rural farmers. Other goal of this approach was to provide information to rural farmers related to improved practices of farming and efficient use of fertilizer. Since it used top- down approach decision were usually taken at top level and implemented in the fields by extension agents (Ebewore, 2013). Unfortunately, this system failed to develop a liaison between research and extension.

- **Training and Visit System of Extension (T & V) Approach:** The T & V system of extension originally started in India. However, this approach was

introduced in Nigeria with the identification (1972), appraisal (1973) and amendment (1975) of the first generation of the enclave Agricultural Development Projects (ADPs) of Gombe , Gusau in Zamfara and Funtua in Katsina (Ogunwale, 2004). The T & V system of extension provides an organizational structure and detailed mode of operation that ensures well informed extension agents visits farmers always and disseminate messages relevant to production requirements. The aim of this programme was to transfer the technology to farmers and to reduce the gap between the practices under the use of farmers and those recommended by the researchers. It was an attempt to move farmers away from conventional farming practices to modern agricultural practices. In this approach, the extension agents were assigned areas and almost 10 percent farmers of those specific areas were contacted by extension agents for other 90 percent farmers in the respective areas (Muhammad et al., 2014). The trained extension agents were given one day additional training in each week and they had fixed fortnightly schedules to meet their contact farmers. Despite, the good performance of this approach, it is criticized on the ground that it used top-down approach where farmers were exclude from the planning stage. A new approach that involved the target population right from planning to implementation is called the Farmer Field School (FFS) which was the focus of this study.

2.8 Agricultural Technology and Appropriate Technology Transfer

2.8.1 Agricultural technology: According to Adekoya et al. (2012), technology is the use of information of nature for the fulfillment of specific objectives. This includes the planning of instruments, synchronization of activities with nature, utilization of characteristic materials and age of thoughts on homes. Technology assists to facilitate

activities particularly in agricultural production, processing and marketing. In other words, use of modern farming technologies by farmers would help them in realizing increased farm outputs as well as improve their income generation capabilities. Ambali et al. (2012) described technology as a systematic knowledge and action normally of industrial system that is applicable to any recurrent activity. In other words, it portrait the way people do things in order to realize defined ends for the benefits of the human population. No society is totally devoid of technology, the dynamism of technology reflect the extent the society is open. Nonetheless, agricultural technology is viewed as the application of innovations to control the growth and harvesting of crops and livestock with the aim of enhancing agricultural production. Agricultural technology permits mechanization which can assist to enhance food production in different parts of the world, particularly in the developing nations (Oyede, 1994). It entails the use of machineries to support expansion. It serves as a primary factor that can contribute to increased agricultural productivity. According to Andrei (2012), agricultural technology is a new scientifically derived, often complex inputs supplied to farmers by institution or organisation with sound technical expertise. However, agricultural technology has global transferability irrespective of local ecological conditions and in less developed nations farmers are expected to undergo substantial transformation through training to understand the application of improved technologies (Oni, 2000). Furthermore, agricultural technology is perceived as a systematic utilization of collective human effort in proffering solutions to problems by exerting control over nature and all kinds of human resources. Agricultural technology allows cultivation of crops during dry season through irrigation. Also, the use of fertilizer has not only increased agricultural outputs qualitatively and quantitatively but has also made long-term intensive utilization of agricultural land possible (Amao and Awoyemi, 2007). More so, the use of pesticides have been identified as an effective way of eliminating

the menace of pests that attack many crops, cowpea not an exception. In addition, several weeds have been controlled with herbicides. The biological knowledge of genetics has made it possible to select disease and drought tolerant crop varieties. Agricultural technology also easy the dissemination of new farming techniques to small-scale farmers who constitute the larger proportion of agricultural producers in developing nations, Nigeria not an exception.

2.8.2 Appropriate agricultural technology transfer: Tsado (2013) reported that one of the ways to achieve agricultural development is through development and transfer of appropriate technologies to target beneficiaries. However, as a result of interaction between the developed and developing nations many technologies have been developed that are not appropriate with the need of either farmers or the farming environment. An appropriate technology must be defined within the limit of what is financially attainable, technically genuine, socially satisfactory, environmental conducive and sustainable (Compbell and Barker, 1996). Van den Ban and Hawkins (2002) stressed that, for an innovation to be considered appropriate and embraced by farmers, it must possess these basic attributes such as; compatible with socio-cultural beliefs and values, simple, have advantage over previous practice, triable on limited scale feasible, farmers can easily make observable difference. Ukechukwu et al. (1994) emphasized that for a technology to be considered as appropriate it must possess the following characteristics; have minimum risk, quick and superior to prevailing practices, be suitable and meet the need of the farmers and should encourage increase use of local resource e.g labour.

Compbell and Barker (1996) identified major factors that aid the development of appropriate agricultural technology to include; gender, age and ethnicity, access to inputs and ecological zone. Ganpat and Sespersad (1996) opined that for a technology

to be accepted by farmers, they must not only know about but taught how to use and follow the recommended practices.

2.9 History, Concept and Approach of Farmer Field School

2.9.1 History of farmer field school: The term Farmer Field School (FFS) originated from the Indonesian *Sekolah Lapangan* meaning, “field School”. The first FFS started in the early 1980s in South East Asia by the United Nations Food and Agriculture Organisation as a paradigm shift from “top-down” extension strategy used during the green revolution era (Braun and Duveskog, 2008). According to William et al. (2014), FFS approach was developed in central Java, Indonesia for training rice farmers the Integrated Pest Management (IPM). This was necessitated by the widespread outbreak of brown plant hoppers (BPH: *Nilaparvata Lugens Stal*) in irrigated rice farms. The government of Indonesia, in order to contain the menace, launched emergency training project targeted at providing 120,000 farmers with field training in IPM, aimed mainly at reducing the application of pesticides that have negative impact on natural insect predators of the brown plant hoppers. However, FFS have been implemented in many countries like Asia, Carribean, Latin America and Africa. According to Braun et al., (2005) FFS started in Vietnam in 1992, China 1993, India and Bangladesh 1994, Sri Lanka 1995, Cambodia 1996 others are Pakistan 1997, Nepal and Thailand 1998.

On the other hand, through the support of FAO global facility, in 1993 FFS programme started in Africa particularly in Sudan and then spread to other countries. Training of trainers (TOT) commenced in other African countries such as; Ghana and Kenya 1996, Mali, Tanzania and Zimbabwe 1997, Zambia, Uganda and Ethiopia 1999, Senegal 2000 while Benin, Burkina Faso, Malawi, Mozambique and Niger 2001 respectively,

Cameroon and Sierra Leone 2003, Namibia and Togo 2004 (Braun et al., 2005). According to Arokoyo (2012), FFS started in Nigeria in 2008 with training of master trainers and extension facilitators. However, as a result of successes recorded in the implementation of FFS Worldwide with IPM focus, the programme was expanded to cover integrated crop management, natural resource management (soil fertility and water management), livestock, forestry and food security, nutrition, health, HIV/AIDS and literacy training (Sonii et al., 2011). FFS implementation in Africa focused on a range of commodities such as; rice, vegetables, cowpea, cotton, livestock, potatoes, natural resource management and food security.

2.9.2 Approach and concept of farmer field school: The FFS is an innovative, participatory and interactive learning approach that emphasizes problem solving and discovery based learning (Godrick, 2004). The approach emphasizes learning by doing. The learning process takes place in the field and is usually planned to last for a full cropping season. This provide an avenue for farmers to participate fully in the implementation of all components of the technology from planting to harvesting.

The FFS approach mainly aimed at building farmers` capacity to analyze their production systems, identify problems, test possible solutions and eventually assist the farmers to use the practices most suitable to their farming systems (FAO, 2003). FFS approach is a participatory approach to extension, where by farmers are allowed to choose methods of production through discovery based approach. It provide avenue for farmers to practice and test/evaluate sustainable land use technologies developed with their own tradition and culture. This approach is usually time bound activity (generally one agricultural production cycle). FFS is a system of education that focus on teaching of adults, mostly from field observation and experimentation (Itadi et al., 2013). FFS approach creates a platform for farmers to take an interest completely in the usage of all

segment of innovation from planting to harvesting. This learning procedure avails farmers the opportunity to watch and consider the benefits and faults of innovations and along this line takes an informed decision whether to use them or not. As indicated by NAERL/ABU (2008), FFS is a model and "school without walls" for enhancing decision making capacity of rural farmers, stimulate local innovation, and encourage the use of indigenous technical knowledge for sustainable agriculture. In other words, FFS is a participatory approach where farmers are given opportunity to select their technique for production through discovery based learning. The training approach centres on learning by doing, through discovery, comparison and non-biased relationship among the students (farmers) and extension agents (facilitators) and conducted completely in the field (Ebewore, 2013).

Kristin et al. (2010) reported that FFS is a traditional adult training model that assist farmers to learn in an informal manner in their own farming environment. The study further described FFS as a "school without walls", where group of farmers meet on weekly basis with facilitators. FAO (2001) posits FFS to be a participatory strategy for learning, technology development and spread. Davis and Place (2003) stressed that FFS to be adult learning principle that uses experimental learning. This approach provide avenue for farmers to improve their knowledge and skills that can enhance their production and income, through the use of informed crop management decisions, enhanced farmers problem solving capabilities and adaptability to changes in their communities, assist farmers to understand the benefits of working in groups and promote group activities, new knowledge and permit farmers progress toward becoming specialists on their farms (Kristin et al., 2010). To this end, FFS provide platform for farmers to discover by themselves the difference between local and improved farming practices, hence encourage them to embrace new techniques. Braun

and Deborah (2008) stressed that FFS help to reduce the gap between emergency and development and provide a medium for rapid input supply and rural training.

Van cave Berg and Jiggins (2007) noted that FFS provide farmers with skills which enable them solve their problems and group activities that empower them both within their communities and outside. The FFS is a viable model for technical education and capacity development. Godrick (2004) perceives FFS as a medium and "school without walls" for enhancing decision making capacity of rural farmers and stimulate local innovation for a sustainable agriculture.

Khatam et al. (2014) pointed out that FFS assist in development of farmers' skills, knowledge and empower them to choose appropriate crop production management practices aimed at increasing their level of production. According to Duveskog (2006), FFS is a learner-centred, problem-based approach to teaching that involves field observation, relating observation to ecosystem and combines previous experience through group discussion with new information to make informed crop and livestock management decisions. Muhammad et al. (2013) stated that FFS is a "school without wall" that build capacity of farming communities to adopt innovations for sustainable agricultural development. In this regard, FFS training enhances farmers' capacity to observe innovation, apply new knowledge as an answer to their problems, communicate effectively and gain more self-confidence. Simpson and Owens (2002) found that FFS approach play a vital role in providing farmers with opportunity to gain knowledge about new farming practices. Muhammad et al. (2013) also stressed that FFS training to be an important avenue for building human capacity and empowerment, which ultimately ensure the effectiveness of services rendered for the well-being of rural farmers.

2.9.3 Objectives of farmer field school

According to Godrick (2004), the broad objective of FFS is to bring farmers together to carry out alternative and collective enquiry with the aim of initiating community action and proffer solution to community problems. David et al. (2006) identified specific objectives of FFS to include:

1. Provide a medium in which farmers can obtain information and abilities to have the capacity to settle on sound administration decision.
2. Sharpen farmers' ability to take informed decision that make their operations sustainable and rewarding.
3. Improve farmers' critical thinking capacities.
4. Enable farmers know the advantages of working in groups and encourage group work.
5. Assist farmers to become experts on their own fields.

2.9.4 Principles of Farmer field school

Soniia eta al. (2006) identified seven basic principles of FFS-these include;

- **Farmer-centered:** Under this, farmers carry out their own field studies. The training programme is normally a response to farmers identified problems and farmers can choice on the “special topic” each session. In this respect farmers become “experts” on a particular topic been investigated. Individual’s experience of reality become unique. As farmers become increasingly aware of how they learn and proffer solution to problems, they can therefore, refine and modify their own styles of learning and action.

- **Learning, rather than technology/message focus:** .FFS rarely promote technologies or recommendations. Rather, it encourages farmer experimentation as part of discovery learning. Farmers source their own learning materials from drawing of what they observed from the field trials themselves. In other words, farmers are encouraged to test on their own fields and take their own decisions based on their knowledge and observations.
- **Group discovery learning:** In this situation, learning is based on experiences. All learning is carried out in the field in groups through comparative studies'/experiments of different options. This learning by doing (discovery learning) enable farmers to make their own conclusion about an innovation. As people participate in collaborative group approaches they tend to develop a better sense of their own worth (Soniia, et al., 2006).
- **Competent facilitators:** Learning takes place in a situation in which teaching is viewed as a facilitation process that helps people to explore and discover the personal meaning of events for themselves. The duty of the facilitators is to provide an enabling environment for learning, facilitate learning by asking questions and give back stopping support. A competent facilitator requires not only technical knowledge, but more essentially certain attitude. Individual to become an expert facilitator can be learned by good mentoring, on-the-job training and experiences (Godrick, 2004).
- **System approach:** FFS consider the farm and the entire agro-ecosystem in the learning process and therefore farmers become experts on their own farms.
- **Self-help:** FFS being a participatory, community based approach, as such for its effect or impact to be realized, the process must continue over certain period of time (hence the term FFS movement). Key to the sustainability of FFS is a

sense of farmer ownership and involvement in the training process at all levels. In this regards, farmers have to take over the funding of FFS (Soniia et al., 2006).

- **Empowerment of farmers:** learning is an evolutionary process and usually characterized by free and open communication, confrontation, acceptance, respect and the right to commit errors. Farmers take all decisions in FFS. Through data collection, analyzing data, taken decisions based on the analysis of the data and reaching group consensus, farmers evolves a greater confidence in their abilities and local knowledge. To this end, training farmers in group, FFS help to improve farmers' communication, conflict and problem solving abilities, leadership and discussion skill. Soniia et al. (2006) identified FFS to shift strongly towards empowerment agenda by facilitating mass action and sensitizing farmers to act on such issues as setting national research agenda, governance and trade relations.

2.9.5 Characteristics of Farmer field school

NAERLS/ABU (2008) identified characteristics of FFS to include;

- **Farmers as expert:** Farmers learn-by-doing that is they carry out for themselves many activities similar to a particular farming system they want to study and learn about. This could be related to annual crops or livestock production. The major issue here is that farmers carry out their own studies. To this end, their training is based on comparison studies of different treatments and field studies conducted by them and not extension or research staff. This help farmers become experts on a particular practice under their investigation.

- **The field is the learning place:** All the learning is based in the field. The group collect data in the field, analyze the data, make action decision based on the analysis of the data, and present their decision to the other farmer in the field school for discussion questioning and refinement (Godrick, 2004; Mwada et al., 2015).
- **Extension agents as facilitators not teachers:** Godrick (2004) reported the role of extension agent to be very much similar to that of facilitator rather than a conventional formal school teacher. Once farmers are aware what is theirs to do and what they have to observe in the field, the extension agent therefore takes back seat role, only providing assistance and guidance when requested to do so. In this respect, presentations during group meeting are the sole responsibility of the farmers not the extension agent, with the members of each working group assuming the responsibility of presenting their findings in turn to their fellow farmers. The extension agent participate in the subsequent discussion session, as a contributor, rather than leader in arriving at an agreed consensus on what action requires to be carried out at that time.
- **Scientist/subject matter specialists work with farmers rather than lecture them:** Mwada et al. (2015) reports that, the role of scientists and subject matter specialists is to give backstopping support to the members of FFS and in doing so learn to work in a consultative capability with farmers. The role of subject matter specialists (SMS) is that of colleagues and advisers who are usually consulted for advice in a bid to solve specific problems and who can serve as source of new ideas/information on locally unknown technologies.
- **The curriculum is integrated:** Crop husbandry, horticulture, animal husbandry and land husbandry are considered together with ecology, economics, sociology

and education to form a holistic approach. In other words, problems confronted in the field become the integrating principle.

- **Training follows a seasonal cycle:** It is worth noting that, training have to be related to seasonal cycle of practice under investigation. For instance, fodder production would include the dry season to evaluate the quantity and quality at a time of year when livestock feeds are commonly in short supply. But for tree crop production and conservation measures like hedge rows and grass strips, training require to continue over many years for farmers to see for themselves the full length of costs and benefits.
- **Regular group meetings:** Farmers meet at agreed regular intervals. If it is for annual crops such meetings may be every one week or two weeks during the cropping season. But for other practices, the time between each meeting depends on what specific activities require to be carry out, or related to critical periods of the year when there are main issues to observe and discuss in the field (Godrick, 2004).
- **Learning materials are learner generated:** Farmers generate their own learning materials, from drawings of what they observed from the field trials themselves. These materials are usually consistent with local conditions, less costly to develop, are controlled by the learners and can thus discussed by the learners with other. In this respect, farmers know the meaning of the materials because they generated them.
- **Group dynamics/team building:** Training includes communication skills building, problems solving, discussion methods and leadership. Farmers need these skills. Successful activities at the community level that farmers can apply effective leadership skills and the ability to communicate their findings to

others. In other words, farmer field schools assist evolve a learning environment in which farmers can master and use specific land management skills. The emphasis is therefore on empowering farmers to apply their own decisions in their own farms (Godrick, 2004; Mwada et al., 2015).

- **Participatory monitoring and evaluation:** To prepare FFS curriculum, participants develop a plan for monitoring and evaluating progress and later assess whether the agreed objectives are achieved.

2.10 Selected Impact Studies of FFS on Smallholder Agricultural Production

Many impact studies has revealed, FFS training to have positive effect in increasing farm productivity, improving efficiencies in use of combined chemical and organic fertilizers and substantial reduction in the use of hazardous chemical pesticides (palis, 2006; Van den Berg and jiggins, 2007; Davies et al., 2011; Settle and Garba, 2011). A similar study by Hugh and Howard (2014) revealed significant impact of FFS on increased farmers empowerment and self-confidence building in Cambodia, India, Indonesia, Kenya, Liberia, Uganda, Zimbabwe, Peru and trinidad and Tobago. Muhammad et al. (20013) found FFS to have assisted in building self-confidence and pride in smallholder farmers in Pakistan, improved farm management skills, provide smallholder farmers opportunity to acquire knowledge of new farming concept, facilitates farming communities to implement their decisions, that will assist in discovering available technologies that will increase farmer per capita income and improves the overall socio-economic conditions of the farming community. A study by Mubashankwaya et al. (2013), revealed lack of smallholder farmers` knowledge on the use of agricultural inputs to be among the major constraints to their ability to increase production.

Muhammad and Muhammad (2012) carried out analysis of FFS as a potential source of advanced technology dissemination among the farmers in Faisalabad, Pakistan, the result showed overall improvement in smallholder farmers knowledge and skills which consequently improved the outputs of their major crops. Similarly, Khatam et al. (2014), assessed the perceived effect of FFS approach on farmers' capacity building in controlling pre and post-harvest losses caused by rodents in seven districts in Pakistan, result indicated positive effect of FFS training on rodents and grain shading in crops. The results further revealed FFS training to improve farmers' competencies in controlling pests and diseases and sharing of technical information as well as improvement in harvesting, storage, transportation, farmers' capacity and build up farmers' knowledge of produce labeling and grading. Khatam et al. (2010) conducted a study to ascertain the impact of FFS on social well-being of farming communities in Khyber Pakhtunkhwa, Pakistan, the result revealed a positive impact of FFS on the social well-being of the farming communities, confidence building, decision-making skills, poverty reduction and improved household income others are family health, better housing facilities and better children education. Also Manoj and Vijayaragavan (2014) carried out an impact study on farmer field school on farmers' knowledge of integrated crop management practices in paddy, India; it showed FFS participants to have better use of organic manure, optimum use of chemical fertilizers and improved overall knowledge of crop production practices. A study in Babol township, Iran, to investigate the impact of FFS training approach on the smallholder rice farmers' knowledge, attitude, and adoption of improved rice production technologies, revealed positive impact of FFS training in improving the farmers' knowledge and attitude toward biological control (Hadi and Amir, 2013). In a nutshell the approach increased farmers' level of adoption of biological control. Another study by FAO (2003), in Sri

Lanka, revealed a significant impact of FFS training on smallholder rice farmers' output, increased profit from rice production and reduced insecticide use.

However similar study by Nigat et al. (2013) also revealed positive impact of FFS training on crop output in East Africa and Central Java. More so, Helene and Anna (2013) conducted an impact study on FFS training on food security and poverty alleviation in Northern Tanzania, result revealed a significant and sustained positive impact on food security status of the smallholder farmers. More so a study carried out to ascertain the impact of FFS on banana productivity in Gakenke-Rwanda, showed significant improvement in banana productivity in the study area (Mubashankwaya et al., 2013). Soniia and Christopher (2001) assessed impact of FFS on human and social capital in Ghana, it revealed improved smallholder farmers' social skills and confidence building as well as human well-being.

Similarly, Ebewore et al. (2013), conducted a study to assess the effect of FFS training on the management of cocoa mirids (capsids) by smallholder farmers in Edo state, Nigeria. The result showed FFS training contributed significantly to farmers' knowledge in controlling pests and general management of cocoa plantation, hence farmers realised considerable increase in cocoa output. Also Ebewore (2013) carried out another study to assess cocoa farmer field school graduate farmers perceived benefit of training in Ondo State, Nigeria. The results indicate farmers' perceived benefit of FFS training to include; improved income, increased output, reduction in farm cost, improved competence in farm management and improved agro-ecosystem management.

2.11 Factors Influencing Farmers Participation in FFS training

In order to achieve sustainable agricultural development, it is essential that appropriate agricultural technologies are developed in collaboration with the farmers. It is obvious that innovations developed by researchers with no involvement of the farmers are not sustainable. More so, many technologies proposed by researchers alone rarely meet the aspiration of the farmers because it neglect the role of farmers' knowledge (Faraji, 2015).

However, farmers' participation in training is vital as it provides them with adequate knowledge and skills that improve their crop outputs and income. According to Edward et al. (2013), many factors are known to influence farmers participate in FFS training programme. These factors differ from one location to another based on socio-economic, institutional, technological and environmental settings. To this end, understanding of these factors will lead to proper planning, management and evaluation of many FFS programme.

In other words, some of the socio-economic related factors that influence participation include;

Gender: Edward et al. (2013) reported gender of household head to influence farmer's willingness to participate in training programme between male and female who are ordinarily possessed with residential choir to such an extent that they once in a while have enough time to take interest.

Age: Enete and Igbokwe (2009) identified age of a farmer to negatively influence participation in an intervention. Younger farmers are likely to have more zeal and ready to adopt new innovations than older farmers.

Marital Status: A married farmer is expected to have higher probability of participation. This is on the grounds that married farmers are normally supported by

their life partners in production, processing and marketing decision making (Edward et al. 2015).

Farming experience: Enete and Igbokwe (2009) stated that experienced farmers are less likely to participate in training programmes. Most of these farmers depend on training experience acquired over their productive years.

Education: This have positive effect on participation, since it enables a farmer to make independent choice and act on the basis of the decision. It increases farmer's tendency to cooperate with other people and participate in group activities (Enete and Igbokwe, 2009)

Household size: Edward et al. (2015) reports that household size can positively influence farmer's involvement in training. Household size serve as a reservoir of a cheap labour and this provides farmer opportunity to share responsibility and save time for other activities.

Farm size: this has positive relationship with participation and adoption. A farmer with more land will need improve seeds that are more output promising (Langyintuo and Mekuria, 2005).

Membership of association: Ollwande and mathenge (2010) reveals that, farmers belonging to cooperative provide an avenue for them to get information that is essential to production and marketing decisions. Many farmers' communities engage in bulk purchasing of inputs, group marketing as well as provision of credit to members. This positively influence participation.

Availability of credit: According to Sindi (2008), credit facility is very essential for the success of agricultural enterprise. Availability of credit serve as an impetus for

farmers to expand their production and defeat financial related problems in taking part in knowledge development programme which can have direct effect on their living condition. Market price of cowpea can influence participation in training positively. Higher price can serve as an incentive for farmers to expand their production and more so look for enhanced strategies for meeting the needs of consumers. FFS training provide farmers the medium to learn new and innovative methods of training. Farmers that have acquired knowledge of cowpea varieties can thrive in any ecology have greater chance of participating in FFS training (Faraj, 2015). Knowledgeable farmers usually engage in developmental programme that serve as linkage between farmers and agricultural industry.

2.12 Strengths and Weaknesses of Farmer Field School

2.12.1 Strength of farmer field school: Hands-on education is required especially in order to improve farmer expertise in the management of site-specific agro-ecosystem for which there may appear to be no shortcut alternative (Braun and Duveskog, 2008). FFS play a critical role since the approach does not rely on highly trained external advisors but on farmer own discovery and reflection.

In the changing context for small scale farmers where no blanket recommendations exist in agriculture and collective action is needed to access markets, farmers need to organize, be innovative and be able to adjust to changing situations. In this regard, FFS has a vital role to play in the development of locally based innovations, create knowledge for a framework of action and boost local management and leadership skills, aspects not normally catered for in regular training and extension based on technology transfer concepts. FFS also play a crucial role in serving as a medium for

human capacity building and empowerment which in turn ensures successful service delivery for the community (Braun and Duveskog, 2008). FFS approach builds self-confidence, particularly for women which encourages group action of process and builds group management skills. The FFS therefore, a means that enable vulnerable farmers to create their own cohesive economic empowerment groups that can undertake collective, commercially-oriented endeavours and ability to interact with service providers and relevant market intermediaries. A major strength of the FFS is that it helps in strengthening civil society or social capital at village level. This occurs when FFS mobilizes interest in a community, particularly among those who do not belong to the “official” class of the community farmers again voice and are taken more seriously as part of the decision making process (Braun and Duveskog, 2008; Ebewore, 2013).

Related to the issue of lack of formal extension staff in many countries, especially in dry lands and pastoral areas, FFS provides an advantage in that it provides a platform for farmer-to-farmer extension which can scale – up FFS intervention and for cost reduction since graduate can be chosen and appointed as facilitator for newly formed FFS groups in the community, it is therefore possible to scale-up interventions even when there are very few extension staff. Since solution are obtained jointly through experimentation process. FFS can perform well even with facilitators of relatively low technical skills. This is the big advantage in the current situation of low investment in public extension systems and inadequate extension staff.

However, due to the informal and participatory nature of FFS with its inbuilt group, dynamic and collective building exercises, it provide an ideal entry point to deal also with broader livelihood issues like nutrition, health and sanitation and in particular sensitive aspect like HIV/AIDS, violence, family instance inadequate provision of farm

tool. Furthermore, FFS provides a set of rules and processes that are easily understood by many extension and community development facilitators, this assists in-experienced facilitators or staff that may have somewhat top-down attitude to still implement extension as participatory extension practice of more flexible nature. The “package” such as structure of FFS also makes it easier to scale-up FFS in National Extension Systems (Mwada et al. 2015).

2.12.2 Weaknesses of farmer field school: FFS are not universal panacea for development nor are they alternative for more known technology-centered or profit driven approach to rural development, like extension, credit cooperatives, core-estates with out-growers, farmers training centres or the use of mass media (Braun and Duveskog, 2005). FFS supports an educational approach that emphasizes experiential learning, action research and critical thinking to enable farmers to spear head the local adaptation of practices. Obviously, the FFS is not the best instrument for achieving quick and wide application of standardized recommendations. They are instances in which technology transfer is useful and for such issues non-FFS methods like radio and community meeting are often more appropriate. Extension campaigns and FFS are thus implemented side by side and are considered complementary. The FFS is specified as costly, which is likely, to increase problems of financial sustainability. The training activities are considered expensive per farmer trained (Mwada et al., 2015). Zuger, (2004) reported that FFS cost \$62 per farmer trained. Cost effectiveness and financial sustainability can be improved if only farmer-trainers become the main trainers. The major costs involved in implementing FFS are facilitating training, transport materials, supervision and graduation (Davis et al., 2010).

FFS are vulnerable to loss of quality of learning principles in terms of poor or inappropriate curriculum design and inadequate attention to the quality of learning

process. However, with the present popularity of the approach practitioners and policy makers sometimes “pick and choose” sub-aspects of the approach not, giving attention to the necessary adult education and experiential learning principles woven into FFS. Field experiences has reveal that the approach often losses its effectiveness when the fundamental principles and components are neglected. FFS has to be implemented as a complete package to realize desired outcomes. Several FFS projects face problems due to shortfalls or delay in funding/lack of other resources and logistical constraints, for instance in Tanzania, where there was inadequate supply of farm implements, fertilizers and improved varieties of seeds or delivery of these items was untimely or failed to reach the site at all. More so in-appropriate site selection also served as impediment to operation of IPM-FFS project in Kenya, the FFS plot was on remote location which hindered irrigation and poor soil fertility, mar crop development and farming practices. In-sufficient follow-up hindered farmer desire to continue using IPM due to lack of consistent support to back up their efforts of agricultural benefits have only being realised in small scale programme and the evidence for other benefits is weak (Mwada et al., 2015). Braun and Duveskog (2008) pointed out that it is difficult to scale up the benefit by farmers who participate in the FFS. The FFS increased productivity and knowledge but benefits continued to be limited to farmers directly involved (Huughes and Venema, 2005).

.13 Origin and Distribution of Cowpea

Cowpea is a vital legume that is across the board all through the tropics and in most tropical located between 40° N to 30° S and beneath 2000m elevation (Ecocrop, 2009). In any case, the plant is accepted to have started in West Africa between 500,000 to 600,000 years back where it was related with antiquated focal farming. Cowpea advanced toward various parts of the world covering around 65 nations in; Asia and

Oceania, the Middle East, southern Europe, Africa, Southern USA, Central and South America (IITA, 2007). Merchants, explorers and slaves took the plant far and wide. In the vicinity of sixteenth and nineteenth hundreds of years a few a great many individuals were delivered over the Atlantic Ocean, impressive number of the slaves wound up their adventure in southern United State, this imperative food vegetable was carried with them and has turned into a staple nourishment of African American cookery that is most a times called "soul food" (IITA, 2010).

2.14 Importance of Cowpea

Cowpea is of great importance to the livelihoods of millions of rural poor in developing nations of the tropics (FAO, 2002). Agbogidi (2010) reported cowpea to be poor man's major source of protein. Cowpea seeds/grains serve as major source of proteins and vitamins for man, source of income for the producers and fodder as livestock feed (IITA, 2001). The crop is of high nutritional value which can be mixed with non-protein food items to enhance their dietary protein. It is rich in protein and mineral elements (Ayodele and Yalwa, 2004; 2005; Mullen, 2005; onwugbuta-enyi, 2004). Islam et al. (2006) reported that all parts of the plant used as food is nutritious, provide protein and vitamins; immature pods and peas are used as vegetables in many rural households. In other words, the plant is consumed in different forms, with many local variations in its method of preparation. The dry grain can be processed into akara and moimoi, cooked alone or together with other food items. According to Ayodele et al. (2012), cowpea is inexpensive, considerably cheaper than rice or any other dietary fibre type. Adaji et al. (2007) reported that daily consumption of 100-135gm of dry beans reduces serum cholesterol level by at least 20 percent, thereby reducing the risk of coronary heart disease by 40 percent.

2.15 Cowpea Production in Nigeria

Coulibaly and Deboer (2000) reports that, Nigeria is the largest producer of cowpea in Africa and the World; but import substantial volume of this cherished crop from Niger, Cameroon and Chad republic to meet its ever increasing demand. Cowpea is an extremely resilient crop that can be grown under some of the most extreme agricultural conditions in the world (Owolade et al., 2006). Cowpea is a short maturing crop that can be cultivated twice a year. In Nigeria over 85 percent of the crop is cultivated under rain fed, which is usually between September and December. This is because rainfall distribution is more than the ideal requirement of the crop at the early part of the season (May-July). Cowpea performs well in areas with rainfall of between 500mm-1200mm, although improved early maturing varieties can thrive well in Sahel vegetation of rainfall less than 500mm per annum (Ayodeji et al., 2014). More so, cowpea thrives well in wet conditions like irrigation or residual moisture usually along the lake of flood plains during the dry season, with minimum and maximum temperatures between 28°C-30°C during the growing period. The crop tolerate drought and well adapted to poor sandy and poor soil where many other crops find it difficult to thrive. However, best cowpea output can be obtained in a well-drained sandy loam to clay loam with PH range of 6-7 (Ayodeji et al., 2014). Among the legumes, cowpea is the most extensively cultivated, distributed and traded food consumed in Nigeria (Ogbo, 2009; Agbogidi 2010a). Cowpea output in Kebbi State and Nigeria as a whole have continued to increase between 2001 and 2010, arising from 495kg/ha to 532kg/ha in the case of Kebbi state, while 502kg/ha to 687kg/ha in case of Nigeria. It has average percentage increase of 1 percent and 4 percent respectively (Table 1). In 2010 Nigeria produced 1.7 metric tonnes of cowpea which earned her the position of largest producer and second consumer of the crop in the world and with output of about 687kg/ha (FMARD,

2011). In this respect, continued increase in cowpea production from intensified cropping system can play a major role in human nutritional improvement and household income production.

Table 1: Cowpea Output Data for Kebbi State and Nigeria (kg/ha)

Year	Kebbi State	% Change	Nigeria	% Change
2001	495	0	502	0
2002	495	0	502	0
2003	488	-1	503	0
2004	488	0	519	3
2005	531	9	551	6
2006	547	3	560	2
2007	544	-1	556	-1
2008	528	-3	503	-10
2009	504	-5	499	-1
2010	532	6	687	38
Mean	461	1	538	4

Source: FMARD, 2011

2.16 Cowpea in Traditional and Improved Farming Systems

2.16.1 Cowpea in traditional farming systems: Cowpea play very crucial role in traditional agricultural production systems in Africa. In Nigeria cowpea is grown by many small scale farmers, mainly in the northern region, this may be due to conducive

climatic situation of the region that permit production of the crop and the crop's compatibility with the traditional crop production system. The small-scale farmers grow low yielding local varieties; this is grown either sole or mixed with other crops. Sole cropping involves cultivation of a single type of crop on a piece of land at a time (Tanko et al., 2011). On the other hand, Alamu (2002) stated that mixed cropping to be growing of more than one crops simultaneously on same piece of land with distinct row arrangement. In mixed cowpea production, the crop is often inter cropped with; maize, millet, sorghum, yam, cassava, pepper and vegetables (Olorunmaiye, 2008). Hakeem et al. (2010) reported that cowpea grain output under traditional system in the Sudan savanna zone of Nigeria is very low ranging from 0 to 132 kg/ha and with appropriate agronomic practices output of 2500-3000kg/ha can be realized. BNARDA (2009) reported productivity of local cowpea varieties inter cropped with other crops to be often very low. Similarly Ajeigbe et al. (2010) stated that, the traditional cowpea production system is always associated with low grain output, lack of inputs (improved seeds, fertilizer and pesticides) and low yielding varieties. However, in Kebbi state the bulk of cowpea production is by small-scale farmers who practice traditional system of production either as sole or mixed cropping. The mixed/intercropping is mainly practiced with maize, millet and sorghum.

2.16.2 Cowpea in improved farming system: In Nigeria, cowpea production has continued to be dominated by small-scale farmers, who often obtain very low outputs from their fields. One of the major reasons for the low productivity of cowpea in developing nations, Nigeria inclusive is the use of inappropriate production practices, scarcity or high cost of the available inputs (Singh and Ajeigbe, 2002). According to Muzari et al. (2012) significant increases in crop production can be achieved through development of high yielding cultivar and improved agronomic practices such as; good

soil fertility management, timely date of planting, optimum planting rate, good soil and water management and rotation of cereal crops with legumes are important factors in increasing outputs. Improved cowpea production system can bring about improvement in family nutritional levels, cash income and maintenance of the environment with less pressure on the available land. Small-scale farmers can increase their outputs if advances in cowpea production are extended to them. Kormawa et al. (2012), stressed that farmers can achieve higher output potential from their farms if constraints to cowpea production are adequately addressed. Jacob et al. (2001) reported that improved production technologies developed to enhance cowpea production in the country to include improved varieties, use of botanical to control insect pest damage, use of triple bagging or solarization to store dry cowpea grains after harvest to reduce or eradicate storage pests. USDA (2004) stated that, continued use of improved cowpea varieties by small-scale farmers is one of the ways that can boost cowpea production in the areas it is cultivated. The report further revealed other improved cowpea production systems to include; the development of cowpea varieties that are adaptable to sole or inter cropping systems. For instance, the dual-purpose cowpea varieties that produce both grain for human consumption and fodder for livestock particularly in the dry season have been developed by IITA. Studies have shown that, combination of improved varieties and appropriate cropping systems can result in higher output of cowpea (Singh et al., 2004; Ajeigbe et al., 2006). Singh and Ajeigbe (2002) emphasized that the overall farm productivity can be enhanced in a sustainable manner with improved varieties and improved cropping systems.

2. 17 Contribution of Cowpea to Rural Household Income

Cowpea is one of the important sources of income in many rural farming households. According to Abatania et al. (2000), in 1975 cowpea contributed up to 40 percent to rural household income, this rose to 50 percent in 1980 and almost 70 percent in 1985. The maximum contribution of this valuable crop to rural household income reached 80 percent in 1995. Furthermore, between 1995 and 2000, the contribution of cowpea to household income varies and ranged 3 to 100 percent in rural Ghana (Abatania et al., 2000). On the other hand, a study conducted by Isah et al. (2013) to assess the profitability of sole cowpea production in Gombi zone of Adamawa state agricultural development programme, found that cowpea was capable of generating an average income of about ₦20, 063.95 per hectare to rural farming households. Also Usman and Kilani (2014) in their study titled “profitability analysis of cowpea production in rural areas of Zaria local government area of Kaduna state, revealed that cowpea could contribute an average income of about ₦27, 987.29 per hectare to rural households. In a nutshell, cowpea can be considered to contribute significantly to the rural economy particularly the rural households’ income.

2.18 Impact Assessment

La Rovere and Dixon (2007), perceives impact assessment as a deliberate and target ID of the short and long log impacts, positive and negative, immediate or direct, proposed or unintended, essential and optional on family units, foundations and nature caused by on-going or finished improvement activities, for example, ventures. It gives better provide better understanding to which activities influence poor people, which are accomplished and the extent of the impacts on the beneficiaries. To this end, affect appraisal includes watching, estimating and portraying how the condition being evaluated could be impacted by deliberate human activity. FAO (2011) stated that household survey is the most well-known quantitative technique used to survey how

participation in intervention programmes has effect on nutrition security, food quality and different indicators of family well-being. Choosing household survey to examine programme impact/effect offers the advantages.

1. Permits use of standardized questions, make estimation more exact and guarantees that similar data can be gotten across different groups and interpreted comparatively
2. The survey questions should be used as pre-determine indicators. Similar questions should be asked before the programme commence (i.e baseline) and again after it has been executed. Comparison of indicator level before and after gives quantitative evidence of change since the take-off of the programme.
3. Information obtained from a sub set of family units can be generalized to the entire population of study when selection procedures are correctly chosen and properly executed. The most required standard for evaluating effectiveness of an agricultural programme is termed as; "experimental design". A FAO (2011), stated that the most ideal approach to accomplish the goal of an impact/effect study that uses household survey is to begin with a valid evaluation design that include the following major elements:

Two time focuses: it is comparing the outcomes the evaluation at the end of the programme with those of the initial evaluation. The main reason of carrying out quantitative household survey at two time points is to be able to determine the level to which impact indicators have changed during the course of operating the programme. In order to correctly capture the real change attributed to the programme, an initial (baseline) survey is needed to be carried out before the programme commence. This baseline survey give a picture of the condition before the programme starts by giving levels of per-determined impact indicators and other close related factors, which can be

compared with outcomes from the survey carried out at the termination of the programme or a times at mid-term.

Control gathering: use of a control constitutes households similar to programme participant households that are not engaged in the programme. Evaluating the level to which impact/effect, because it is not certain how much of the observed changes occurred as a result of the programme, rather than as a result of various other factors. Control group facilitates the attribution of change to the programme. Thus, computing change as impact/effect in the participant group, and by comparing this change to experience by the control group can help to isolate the programme impact.

2.19 Alternative Approach for Assessing Impact

FAO (2011), reported that when it is difficult to use experimental design, alternative approach/outline offers variations of the experimental model to assess effect. The alternative approach/design includes;

1. Pre and post no control group
2. Post only control group
3. Post only no control gathering

According to FAO (2011), the fact that cell of these has "something missing" that can alter the validity of the assessment. Using the alternative designs in combination with other methods can help overcome the loss of validity, such as simultaneous use of quantitative techniques through a mixed approach or supplementation with secondary data. However, the advantages of each alternative design are discussed together with suggestions for how to handle their inherent weaknesses in order to make them more

applicable for impact evaluation as reported by FAO (2011) are summarized herein.

1. Pre and post no control group

Information provided	It permits assessment of change among programme participants.
Limitations	The design does not give room for attribution of observed change to the programme.
Suggestions for overcoming limitations	• Use other sources of information, such as from a qualitative evaluation to analyze whether there are alternative explanation for the changes recognized. • Use secondary data if available to establish a comparison group in order to give a sense of what would have occurred without the programme. The characteristics of the sample elicited using secondary data must be as similar as possible to those of the participants group. • Use monitoring data from the programme to examine whether it was implemented as required. And if it was, then monitoring data supports the possibility that the effects were because of the programme.

2. Post only control group

Information provided	It gives a picture of characteristics of the participant population relative to a control group at a particular period.
Limitations	• It does not allow the evaluation of change and would be extremely hard to attribute anything to the programme. • To this end, if the participant group is better off than the control group when the post programme survey was conducted, one cannot really conclude that this is because they participated in the programme. They may have been better off before than the control group after the programme. It is usually difficult to conclude that changes realized are due to participation in the programme.
Suggestions for overcoming limitations	• Use other data sources to give people indication of the levels of major impact variables in every group before the programme itself. • If the other data source reveal the participant group were worse off than the control group before the programme and if the participant group is similar or better than the control group after the programme, this might show that a change occurred that can be attributed to the programme.

3. Post only no control

Information provided	It provide a picture of attributes of the participants' population relative to a control group at a specific time.
Limitations	It does not permit calculation of change or attribution of impact.
Suggestions for overcoming limitations	• Add question questionnaire in urge participants recall how things were before the intervention and after, and what has changed for them due to the programme. (Thus, recall data may be biased towards positive and negative and could be affected by the expectation of the study population. Therefore it tends to be quite imprecise for information like crop yields).

	• It can also be carried out with qualitative methods and may help identify what changed, why and how, hence, help to establish plausible explanations of how the programme brought any eventual outcome changes.
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However, post only with control group that is alternative design was used for this study. Discussion were held with some key informants of FFS programme in the study area, this took care other sources of data require to establish the level of impact/effect of FFS on the participants. All the alternative design have "something missing" that can influence the validity of the evaluation, hence use of quantitative method side by side through mixed approach was used to overcome its impediment.

2.20 Theoretical framework

2.20.1 Linear model: Linear model was developed based solely on the notion that agricultural growth relies mainly on increased production of food and fiber. This model thus, largely focuses on the research system, specifically to develop improve technology to meet the needs of the farmers (Spielman and Grebman, 2004). Over the years, the linear model has witnessed development that includes; research from other disciplines in agricultural production such as agronomy, pathology and entomology. The linear model is based on the fact that technologies generated are transferred to the farmers through agricultural extension (Spielman and Grebmar, 2004). According to Adekunle and Fatumbi (2014), linear model recognizes the prevailing problem of agriculture as the declining in productivity of small scale farming system mainly due to poor economic status of the farmers which limits them to the use of rudimentary implements, traditional cultivars and cropping systems etc. The problem is further worsened by shortages of arable land to continue with the conventional land intensification practices, lack of the needed external inputs and poor marketing system.

Effort to proffer solution using linear model identified research extension and farmers system as three most important domains of change. The model suggest that the research system developed mainly from public driven should be empowered to generate technologies particularly varieties and good agronomic practices and the practices extended to farmers through extension agents and the farmers are required to produce, sell their products and make profit (Adekunle and Fatumbi, 2014). However, linear model has been criticized on the basis that where the model worked the success was short lived, apparently limited by institutional constraints like non-availability of fertilizers and agro chemicals during the planting season, when and where it is required and also farmers lack financial capability to buy them (Kelly et al., 2003). The model also lacks sustainability where it has worked, it did not have a structure that encourage working together of all stakeholders, hence continue to limit the share of returns that accrue to farmers as primary producers and indirectly limit their capacity to expand and use modern technologies due to poverty (Adekunle and Fatumbi, 2012).

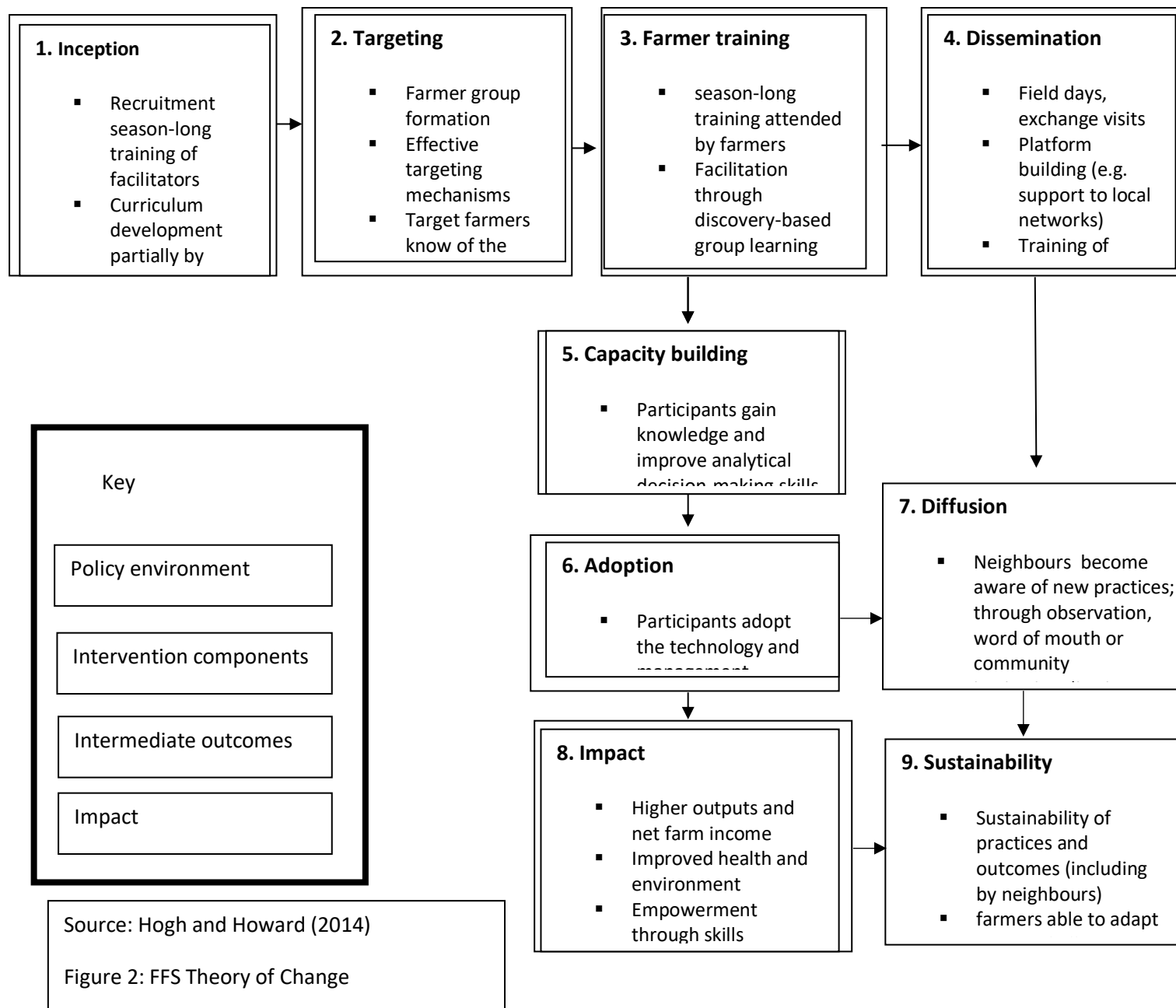
2.20.2 Innovation diffusion theory: Innovation diffusion theory always attempt to anticipate the conduct of people and social gatherings during the time spent appropriation of development, thinking about their own qualities, social attributes, time factor and the qualities of the advancement (Paddel, 2001). This hypothesis additionally predicts that an advancement will at first be embraced by a little gathering of creative farmers and later diffused to different farmers (Ruttan, 1996). According to Gary (2003), this theory is criticized on the ground that:

- It is viewed as source of inequity among farmers.
- It is assumed that benefits realized resulting from adoption of innovation spread and become homogenous. Yet, experience from developed countries indicated the gap inequalities continue to increase.

- Aggregate statistics for development projects, many improvement in elements such as crop production, but normally the farmers that need support get little benefit.
- Non-participants of a project are influenced by the diffusion of innovation process in because many farmers increase production as a result of using an innovation.

2.20.3 Theory of change: Theory of Change (TOC) identified the procedure of change by spelling out causal relationship in an initiative. These include its shorter-term, intermediate and long– term results. The revealed changes are mapped out as the "result path way" indicating every result in logical relationship to all the others as well as sequential flow. The relationship between results could be explained by "rationales" or statement of why result is perceived as pre requisite for another (Clark and Taplin, 2012). According to Brest (2010), TOC is a specific kind of methodology for planning participation and assessment. It identify long term and then maps out backward to revealed needed precondition. It is essentially a comprehensive description and illustration of how and why a desired change is expected to occur in a particular context. Adekunle and Fatunbi (2014) perceived 'TOC as a process of describing all the building blocks needed to bring about realization of long term goal. TOC focused not only on generating knowledge about whether a programme is effective but also explains what it uses to be effective (Wikipedia, 2015). TOC is therefore a form of critical theory that permits transparent distribution of power dynamics. To this end, all the activities are mapped out in an outcome framework. The outcome framework provides the basis for identification of what type of intervention can achieve a long-term goal. According to Hugh and Howard (2014) FFS TOC operate within the framework of the following main components:

1. Inception 2. Targeting 3. Farmer training 4. Dissemination 5. Capacity building 6.
Adoption 7. Diffusion 8. Impact 9. Sustainability.



2.20.4 Theory of human resource management: The main assumption of this theory is that, proper management of staff of an enterprise invariably translates into improved productivity or effectiveness in their performance (Decenzo and Robbins, 1986). Ngala and Odebero (2010) stated the central focus of this theory to include; acquisition, development, motivation and maintenance of staff. The personnel function of staff acquisition, is carried out based on pre-entry qualification that is pre-service training and other relevant experience. Staff development therefore, involves well-organised activities aimed at enhancing farmers' productivity through the job training programmes. More so, staff development activities are well-documented motivators. In other words, well-trained employees are easier to maintain for the overall progress of an enterprise. It is essential that farmers are constantly trained along other management practices to enhance their performance and effectiveness. Ibitoye and Onimisi (2013) reported that well trained farmers are better prepared to face present and emerging farming challenges compared to less trained or untrained farmers. Theory of change and theory of human resource management guided this study.

2.21 Conceptual Framework

In this study conceptual framework on FFS training on cowpea production by small scale farmers is derived to show how the socio-economic characteristics, social assets, relevant training and participation can influence participants' response towards increased food production. Increased food production can be realised through a complex interaction of socio-economic characteristics, presence of social assets, relevant training and participation of participants. Socio-economic characteristics such as age, gender, and educational level are likely to influence the perception of participants to react negatively or positively towards training and zeal to participate. Perceived relevance of FFS training for increased food production was seen to be a

key factor in driving change and leading to improvement in participants cowpea output. In this respect, formal educational status of Participants, the better the understanding of the relevance of training and use of improved farming practices. The presence of social assets will also help to increase farmers' participation in FFS training on cowpea production from land preparation and planting to harvesting. Presence of such assets like agricultural training agency (will assist to educate participants on importance of improved farming practices). Season long training and discovery based group learning (will help participants acquire knowledge and skills of new farming practices), and availability of farm inputs (herbicides, insecticides, fertilizer, seeds and modern storage facilities) are likely to influence the participants perception negatively or positively towards the use of improved farming practices. Also, participation in FFS training is likely to influence participants to develop negative or positive perception towards participation in FFS training this will help them to know about improved farming practices and its implication on their farming activities.

Appropriate farming practice is likely to influence the farming system of participants and this will ultimately have effect on their outputs, productivity, income and living condition.

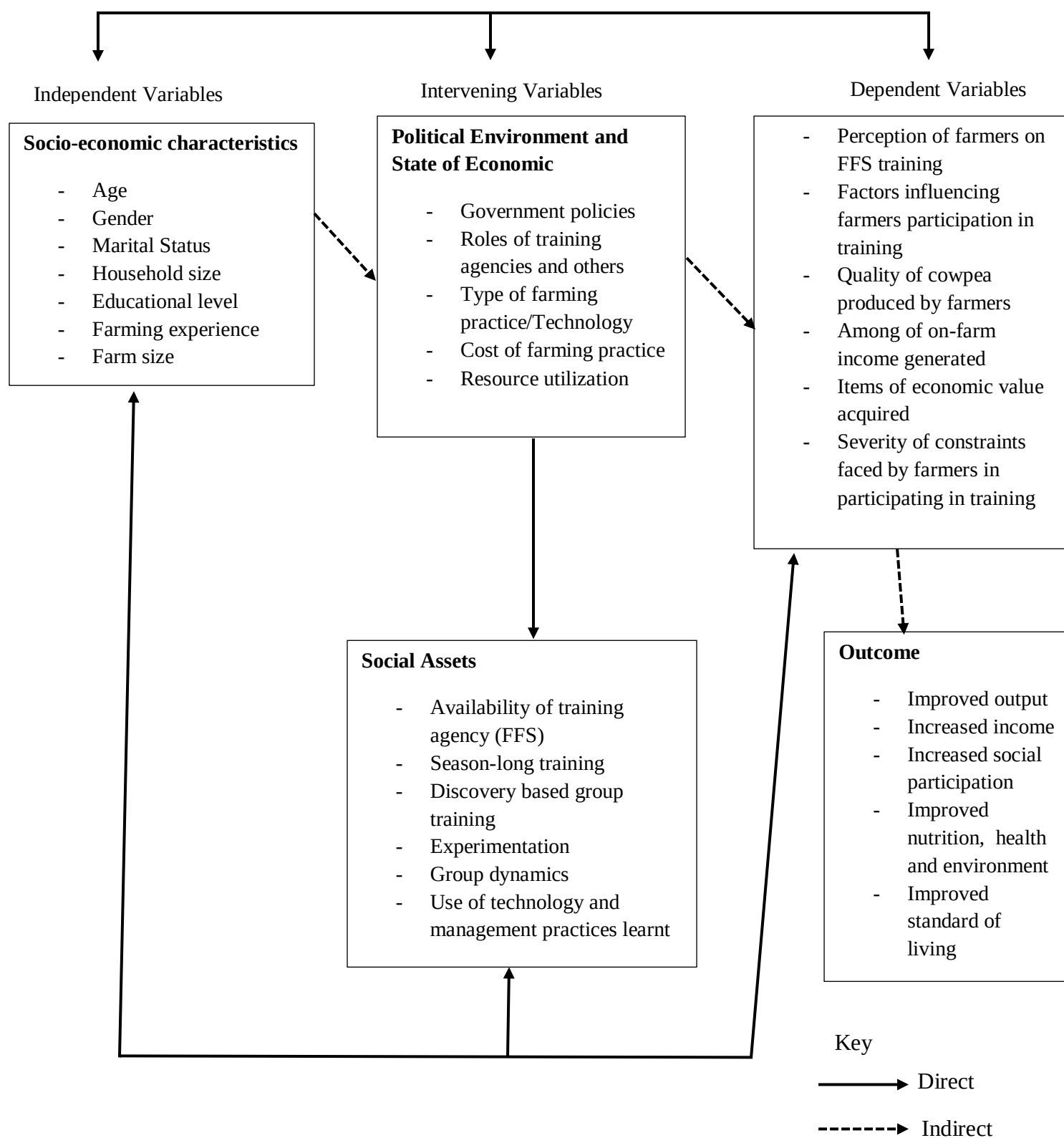


Figure 3: conceptual Framework for the Study
Source: Authour's Design (2015)

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This study was carried out in Kebbi State; the State was carved out from defunct Sokoto State in 1991 in North-Western Nigeria. Kebbi State is bordered by new Sokoto State to the North - East, Zamfara State to the East, Niger State to the South and the Republics of Niger and Benin to the west. The State is located between latitude 10°8'N and 13°15'N and longitude 3°30'E and 6°02'E with an estimated total land area of 36,800 Sq.km. (Ango et al., 2011; Sulaiman, 2004). The human population as at 2006 census stood at 3,238,628 people (NPC, 2007). In 2016, the projected human population of the state stood at 4,440,050 with annual growth rate of 3.1% (NBS, 2017). The major tribes of the State are; Fulani, Hausa, Dakarawa and Kambari. Minority tribes also exist like Kamuku and Dukawa. Primary occupation of the people is agriculture. Major crops grown include; millet, sorghum, maize, cassava, potatoes, rice, cowpea, onions and vegetables. Cash crops cultivated are; wheat, soya beans, ginger, sugar cane and groundnuts. Livestock reared include; cattle, camel, sheep, goat and poultry (Kebbi State Diary, 2010).

The vegetation of the State is Sudan Savannah, characterized by scattered trees and shrubs. The climate of the State is generally characterized by high temperatures. The high temperature is experienced between March and May, with mean temperatures varying between 38°C- 42°C. Meanwhile the State also experiences harmattan wind usually between November to early February, with mean temperature as low as 23°C. Kebbi State also has two distinct seasons, wet and dry seasons. The wet season usually commence

early May with heavy fall between July and October. The mean annual rainfall amount is between 500mm-800mm (Ango et al., 2011).

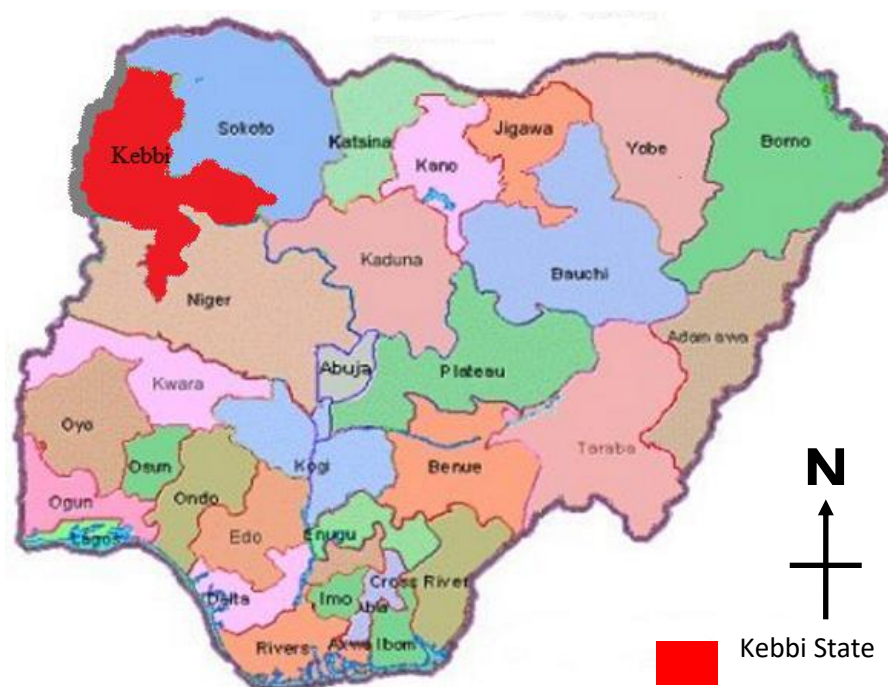


Figure 4: Map of Nigeria showing Kebbi State

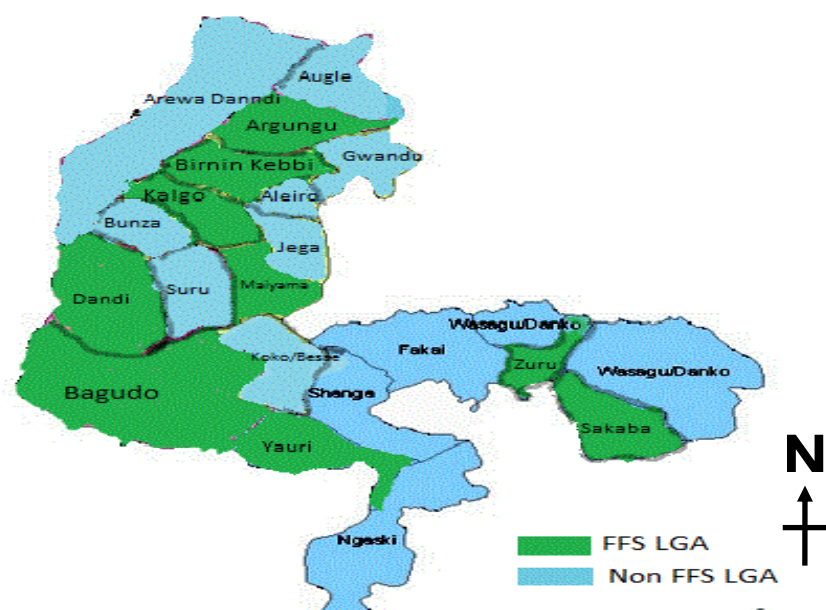


Figure 5: Map of Kebbi State Showing FFS and non - FFS LGAs

3.2 Population of the Study

The target population for this study consist all the small-scale cowpea farmers in Kebbi State, both participating and non-participating in FFS training programme.

3.3 Sampling Procedure and Sample size

Four-stage sampling procedure was employed in selecting the respondents for this study. The first stage involved purposive selection of Kebbi State, based on the fact that the state is one of the few states that had early commencement of FFS programme and about the only state that received full Federal and State governments supports for the implementation. Second stage involved random selection of one LGA (site) in each zone. Third stage involved random selection of four (4) FFS communities from each of the selected LGA (site). The fourth stage involved random selection of 30 percent of FFS cowpea farmers from each of the selected communities there by making 144 participants.

However, to select FFS non-participants, one non-participating LGA was purposively selected from each zone far away from the participating LGAs to avoid spillover effect. Four communities were purposively selected from each selected LGA. Nine non-participants were selected from each of the communities and this produced 144 non-participants. The total sample size for this study was therefore 288.

Table 2 Sampling Distribution of FFS Cowpea Farmers

Zone	LGA	Villages	Sample Frame	Sample Size
I	Argungu	Boraye	30	9
		Felende	30	9
		Tungan Maidawa	30	9
		Lailaba	30	9
II	Birnin Kebbi	Gwadangaji	30	9
		Sabon Gari Cuba	30	9
		Lodi	30	9
		Sulumbe	30	9
III	Zuru	Rafin Zuru	30	9
		Zango	30	9
		Bedi	30	9
		Tungan Doro	30	9
IV	Yauri	Tilo	30	9
		Tondigada	30	9
		Hinombiro	30	9
		Baha	30	9
Sub-total	4	16	480	144

Table 3 Sampling Distribution of Non- FFS Cowpea Farmers

Zone	LGA	Number of Selected Villages	Number of Selected Cowpea farmers
I	Augie	4	36
II	Bunza	4	36
III	Danko Wasagu	4	36
IV	Koko Bese	4	36
Sub-total	4	16	144

Total = Table 3.1 + Table 3.2 = 288

3.4 Method of Data Collection

Data for the study were from primary source. To achieve the research objectives, two sets of questionnaire (one for participants while the other for non- participants) with both open and close ended questions was designed and administered to the respondents through interview schedule. Trained enumerators who can speak the native language of the study area were used in the data collection. Focus group discussion were also held with the key informants in the study area.

3.4.1 Validity of instrument for data collection: The instrument (interview schedule) for the data collection was scrutinized to ensure face and content validity. Validity of an instrument is the degree to which the instrument measures what it purports to measure. It is a vital attribute of a research instrument. It is specific to a particular situation and purpose. To ascertain the validity of the instrument, the instrument was scrutinized to ensure face and content validity, this was achieved by the help of my supervisor and other professionals in the field of agricultural extension, rural development and rural sociology.

3.4.2 *Reliability of Research Instrument:* Reliability of research instrument: It is the extent to which a measurement technique can be depended upon to produce consistent results on repeated application. Research instrument can be considered reliable if its test measures the same thing time after time and item after item (Ogunleye, 2000). Reliability can also be described as the degree to which the overall scores correspond with scores of its components and maintain consistency over several administrations. Test- retest method was used to ascertain reliability of the instrument. In this regard, the instrument used for data collection was subjected to test-retest method. To achieve this objective, the instrument was administered to selected few respondents and then waited for a period of two weeks, which the same activity was repeated on the same respondents. Scores generated were assigned to the item relating to specific objectives. The total scores for the two activities were computed and subjected to a Pearson Product Moment Correlation analysis. The coefficient obtained was used to ascertain the reliability of the instrument.

The formula used for the computation is expressed as;

$$r_{xx} = \frac{2ro^e}{1 + 2ro^e} \dots \dots \dots (1)$$

Where; r_{xx} = product moment correlation coefficient of the whole instrument

ro^e = Product moment correlation coefficient between the odd and even items. The result of the analysis was ($r = 0.819$, $P < 0.05$). This result indicate there is significant relationship between the two scores and hence, the instrument for data collection is reliable.

3.5 Measurement of Variables

Dependent Variables

The effect of FFS training was determined in terms of output, yield and income these were measured as follow;

- 1. Output:** This was the quantity of cowpea produced in 2015 cropping season measured in kilogram (kg).
- 2. Yield:** This was measured as total output produced in 2015 cropping season in kg divided by the total hectares.
- 3. Income:** This was the total annual income of respondent measured in naira (₦)

Independent Variables

Gender: Respondents indicated whether male or female (male =1, female =0)

Age: Respondents were asked of their age in years and age was later categorized into group.

Marital Status: Respondents were urged to indicate whether, married, single, divorce or widow.

Educational level: Respondents were asked to indicate the number of years spent in formal education.

Household size: The total number of people in respondents household.

Credit access: The respondent was asked to indicate whether he/she received financial assistance inform of loan or not.

Amount of credit: The respondent was urged to indicate the amount of credit received in naira

Hired labour: The respondent was asked to indicate whether labour utilized on the farm is paid or not

Farming experience: Respondent was urged to indicate the number of years had spent in farming

Farm size under cowpea: Respondent was asked the total hectare of farm land grown to cowpea last cropping season.

Herbicides: Respondent was the quantity of herbicide used last planting season.

Farm size: This was measured in hectare. That is total land area cultivated by the respondent

Extension/facilitator contact: This was measured by respondent indicating number of visit extension/facilitator has paid to him/her in the previous farming season.

Seed: Respondent was asked of the total quantity Of seed used for planting last year.

Insecticide: Respondent was urged to indicate quantity of insecticide used last year.

Cooperative membership: This was measured with nominal scale, that is, 1 if respondent is a member of cooperative and 0 otherwise.

On -farm income: Income from sales of agricultural products measured in naira.

Off- farm income: Income from non-agricultural activities

Fertilizer: Quantity of inorganic/organic fertilizer used was measured in kg

Relevance of FFS training: The area of perception of training relevance considered include; land preparation, planting (spacing and time), weed control using herbicides, selection and use of improved varieties, fertilizer application (single super phosphate), diseases control, harvesting, processing and storage.

The relevance of training on cowpea production activities was grouped into 4 using 4 – point Likert type rating scale of 4 = very relevant, 3 = relevant, 2 = slightly relevant and 1 = not relevant

In calculating the perception of the farmers on the relevance of the training received in the areas of cowpea production, the mean value of the scale (1 + 2 + 3 +4) were added up to get a total of 10. The total was divided by 4 to obtain 2.5 which is the cut-off mean. In this respect, any training with a mean equal or above the cut-off mean of 2.5 was perceived as the training in the area was relevant, ie it met the farmers` desire but any mean score less than 2.5 was considered as training not relevant in that area of cowpea production.

Economic status: Respondents were asked to indicate possession of 16 common items of economic value with option of none, 1, 2 and more than 2. None was rated 0 point, 1=1 point, 2=2 points and more than 2 =3 points. The maximum point is 57 while

minimum point is 0, 0-19 is categorized as low economic status; 20-38 as middle and 39-57 as high economic status. The common economic items considered include radio, television set, DVD/VCD, mobile phone, bicycle, motorcycle, car, van/truck others are water pump, animal traction(oxen), wash bore/tube well, canoe, knap sack sprayer and fishing gears. A similar approach was used by Adegboye and Oyesola (2010) to categorise economic status of farmers' participation in Community-Based Development Projects in Jos south Local Government Area, Plateau State.

Participants and Non-participants constraints: The perception on the seriousness of constraints was achieved using 4 – point Likert type rating scale of 4= very serious, 3=serious, 2=slightly serious and 1=not serious.

In calculating the seriousness of the constraints, the midpoint value of 2.5 was obtained after adding (1+2+3+4) to get a sum and 10 and divided by 4. Any constraint with a mean less than 2.5 was considered not serious (i.e minor) while any constraint with a mean of equal to or above the cut-off mean of 2.5 was regarded as very serious (i.e major).

Impact/Effect indicators

An impact/effect indicator could be defined as quantitative estimation of an object to be accomplished, resource mobilized, output realized, an effect obtained or context variables like, economic, social or environment (Fisseha, 2009). According to Eu (2005), indicators can be quantitative or qualitative in nature. Quantitative indicators outcomes are counted in number while qualitative indicator is based on information received on individuals' views or opinion.

3.6 Method of Data Analysis

Descriptive and inferential statistical tools were used in analyzing the data collected. The tools include descriptive statistics, probit regression, propensity score matching (PSM), chow test and Z-test. Descriptive statistics such as frequency distribution tables mean and cross tabulations were used to summarize the data on respondents' socio-economic variables, training received by FFS participants, comparing income of FFS and non-FFS participants' probit regression model was used to ascertain the factors influencing respondents' participation in FFS training. PSM was used to determine the effect of FFS training on participants' cowpea output. Hypothesis 1 was achieved using chow-test, hypotheses 2 and 3 were achieved using Z-test respectively.

3.7 Models Specification

3.7.1 Probit regression model: Probit regression model uses cumulative distribution function (CDF) to explain the behaviour of a dichotomous dependent variable. (Deji et al., 2012). Oladele and Moilwa (2010) reported that the model has binary dependent variable while the independent variables are in the multiple continuous and categorical variables and this makes probit regression model a suitable choice for investigating the factors influencing participation in FFS. The relationship between the probability of participation and its determinants X is given as: $P_i = F(y = 1/x) \dots \dots \dots (2)$

$$= F(Z_i < \beta_1 + \beta_2 x_i) \dots \dots \dots (3)$$

$$= F(\beta_1 + B_2 x_i) \dots \dots \dots (4)$$

Where, $Q(y = 1/x)$ is the probability that an event will occur given the value of x , or explanatory variables and where Z_i is the normal variable that is $Z \sim N(0, R_2) \dots (5)$.

The log - likelihood function for probit regression model is expressed as;

$$\ln L = \sum w_j \ln \theta(x_j b) + \sum w_j \ln (1 - \theta(x_j b)) \dots \dots \dots (6)$$

Where w_j indicates optional weights. The model relating to determinants of participation can therefore be explicitly expressed as;

$$Y_i = F(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \dots \dots \dots + \beta_{14} X_{14}) \dots \dots \dots (7)$$

Where;

Y=	Participation status (Participated = 1, otherwise 0)
B ₀ =	Constant
B...B ₁₅	=Regression coefficients
X ₁	=Gender of the respondent
X ₂	=Age in years
X ₃	=Marital status
X ₄	=Educational level
X ₅	=Household size
X ₆	=Contact with extension/facilitator
X ₇	=Credit access
X ₈	=Hired labour
X ₉	=Farming experience
X ₁₀	=Farm size
X ₁₁	=Size of farm under cowpea
X ₁₂	=Membership of cooperative society
X ₁₃	=Household on-farm income
X ₁₄	=Household off-farm income

3.7.2 *Propensity score matching (PSM)*: One of the most common impact evaluation approach of interest is the Average Treatment Effect on participation (ATE), this is defined as;

$$ATE = E(Y_1 - Y_0 / P=1) = E(Y_1 / P=1) - E(Y_0 / P=1)$$

However, the propensity score is the probability of participation for farm family, I given a set $X = x_i$ of characteristics $P(x) = \Pr(P = 1 / x = x_i)$, (Pufahl and Weiss, 2009). The propensity score matching in its simplest form involves predicting the probability of treatment on the basis of observed covariates for both the treatment and the control communities. To this end, PSM is a better method of dealing with differences in observables.

The model is appropriate for addressing the problem of possible occurrence of selection bias (Nigat et al., 2013). The propensity score are derived from regression model in which these characteristics are to be compared. The impact of treatment on the participants' i.e causal effect of project participants was estimated by computing the differences across both communities;

$$ATE = \frac{1}{N_1} (Y_1 - Y_0) \dots \dots \dots (8)$$

Where; ATE =Average impact of treatment Effect on the participants.

N_1 =Number of matches (from regression model)

Y_1 =Average annual cowpea production by FFS farmers

Y_0 =Average annual cowpea production by non-FFS farmers

A positive or negative value of ATE suggests that farm families that participated in FFS may have higher or lower outcome variables than non-FFS farmers.

3.7.3 Chow-test: Chow test was employed to test if there is huge contrast in the cowpea output of FFS and non-FFS farmers. According to Dougherty (2007), chow test is used in programme impact assessment to determine whether the programme as impact on different sub group of the population. Chow test is an application of the F-distribution test; it needs the sum of squared errors from three regressions (OLS), one from each sample group and one from pooled data. In other words, chow test is used to determine whether the explanatory variables have different impacts or effects on different sub groups of the population. From our production function, cowpea output that will be realized by FFS farmers from their production activities (Y) depends on land allocated to cowpea in hectares, labour (X_1) in man days, seed (X_2) in kilogram, Herbicide (X_3) in kg/litres, insecticides (X_5) in litres, Participation (X_6) 1 if participant, 0 otherwise, Capital (X_7) in naira, Educational level (X_8) number of years spent in schooling and Quantity of fertilizer (X_9) in kilogram. Similar approach was used by Olasunkanmi (2015) thus, the linear form of the model is explicitly specified as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + e \dots\dots\dots (9)$$

$$Y_P = a_i + b_{1i}X_1 + b_{2i}X_2 + b_{3i}X_3 + b_{4i}X_4 + b_{5i}X_5 + b_{6i}X_6 + b_{7i}X_7 + b_{8i}X_8 + b_{9i}X_9 + e_i \dots\dots\dots (10)$$

$$Y_N = a_j + b_{1j}X_1 + b_{2j}X_2 + b_{3j}X_3 + b_{4j}X_4 + b_{5j}X_5 + b_{6j}X_6 + b_{7j}X_7 + b_{8j}X_8 + b_{9j}X_9 + e_j \dots\dots\dots (11)$$

Where Y, Y_P and Y_N are cowpea output pooled, FFS and non-FFS cowpea farmers respectively while e is the error due to estimation.

The null hypothesis of this study which states that FFS training has no significant effect on the cowpea output of FFS farmers was thus tested as:

$$F_{cal} = \frac{(RSS - RSS1 + RSS2)/k}{(RSS1 + RSS2)/N1 + N2 - 2k} \dots \dots \dots (20)$$

Where;

RSS = sum of squared residual from the pooled data

RSS₁ = sum of squared residual from the first group (ie FFS farmers)

RSS₂ = sum of squared residual from second group (ie non-FFS farmers)

N₁ and N₂ = number of observations in each group

K = total number of parameters

To this end, if the F-cal. is greater than the F-tab. Then the null hypothesis is rejected.

3.7.4 Z-statistic: Z-statistic (z-test) is used to compare whether there is significant difference between two different communities. In this respect, the z-test was used to investigate whether there is significant difference in on-farm income of FFS and non-FFS cowpea farmers and the value of their selected assets. The z-statistic can be expressed as:

$$Z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \dots \dots \dots (21)$$

Where;

Z = the outcome of the statistic

$\overline{X}_1$ = mean on-farm income of FFS farmers

$\overline{X}_2$ = mean on-farm income of non-FFS farmers

S_1^2 = variance of on-farm income of FFS farmers

S_2^2 = variance of on-farm income of non-FFS farmers

n_1 = number of participating FFS households

n_2 = number of participating of non-FFS households

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter data for this study were summarized, analyzed and presented based on the study objectives and the hypotheses of the study. The data analyzed include the socio-economic characteristics of the respondents, perception of participants on training received on cowpea production practices, factors influencing respondents' participation in FFS, effect of FFS training on participants cowpea outputs, on-farm income and economic status.

This chapter presents all the results of the objectives of the study and their implications.

Table 4 Distribution of Respondents According to Socio-Economic Variables

Variables	Participants	Non- Participants	Pooled
Gender			
Male	118 (81.9)	117 (81.2)	235 (163.1)
Female	26 (18.1)	27 (18.8)	53 (36.9)
Total	144 (100)	144 (100)	288 (200)
Marital Status			
Single	7 (4.9)	12 (8.3)	19 (13.9)
Married	112 (77.8)	144 (79.2)	256 (157)
Divorced	12 (8.3)	13 (9.0)	25 (17.3)
Widow	13 (9.0)	5 (3.5)	18 (12.5)
Total	144 (100)	144 (100)	288 (200)
Age (yrs)			
<21	10 (6.9)	8 (5.6)	18 (12.5)
21-30	28 (19.4)	38 (26.4)	66 (45.8)
31-40	60 (41.7)	42 (29.2)	102 (70.9)
41-50	22 (15.3)	18 (12.5)	40 (27.8)
51-60	18 (12.5)	28 (19.4)	46 (31.9)
>60	6 (4.2)	10 (6.9)	16 (11.1)
Total	144 (100)	144 (100)	288 (200)
Household Size (No. of People)			
<6	12 (8.3)	8 (5.6)	20 (13.9)
6-10	50 (34.9)	58 (40.3)	108 (75.2)
11-15	40 (27.8)	34 (23.6)	74 (51.4)
16-20	24 (16.7)	28 (19.4)	52 (36.1)
>20	18 (12.5)	16 (11.1)	34 (23.6)
Total	144 (100)	144 (100)	288 (200)
Major Occupation			
Farming	102 (70.8)	78 (52.8)	180 (123.6)
Civil Service	20 (13.9)	20 (13.9)	40 (27.8)

Trading	16 (11.1)	18 (12.5)	34 (23.6)
Others (Artisans)	6 (4.2)	30 (20.8)	36 (25.0)
Total	144 (100)	144 (100)	288 (200)
Farming Experience			
<6	-	-	
6-10	22 (15.3)	20 (13.9)	42 (29.2)
11-15	68 (47.2)	64 (44.4)	132 (91.6)
16-20	30 (20.8)	34 (23.6)	64 (44.4)
>20	24 (16.7)	26 (18.1)	50 (34.8)
Total	144 (100)	144 (100)	288 (200)
Farm Size (ha)			
<0.6	6 (4.2)	9 (6.3)	15 (10.5)
0.6-1.0	10 (6.7)	11 (7.6)	21 (14.3)
1.1-1.5	18 (12.5)	38 (26.4)	56 (38.9)
1.6-2.0	38 (26.4)	32 (22.2)	70 (48.6)
>2.0	72 (50.0)	54 (37.5)	126 (87.5)
Variables	Participants	Non- Participants	Pooled
Total	144 (100)	144 (100)	288 (200)
Educational Status			
No Formal Education	68 (47.2)	66 (45.8)	134 (93.0)
Primary School	19 (13.2)	22 (15.3)	41 (28.5)
Secondary School	43 (29.9)	36 (25.0)	79 (54.9)
Diploma/NCE	8 (5.6)	12 (8.3)	20 (13.9)
Degree/HND	6 (4.2)	8 (5.6)	14 (9.8)
Total	144 (100)	144 (100)	288 (200)
Extension Contact			
Yes	144 (100)	95 (66.0)	239 (166.0)
No	-	49 (34.0)	49 (34.0)
Total	144 (100)	144 (100)	288 (200)
Tenancy Status*			
Inheritance	89 (61.8)	98 (68.1)	187 (129.9)
Purchased	69 (47.9)	36 (25.0)	105 (72.9)
Gift	10 (6.9)	20 (23.9)	30 (30.8)
Rent/Lease	45 (31.3)	13 (9.0)	58 (40.3)

Source: Field Survey, 2016

Figures in parenthesis are Percentages,

***Multiple responses**

4.2 Socio-economic Characteristics of the Respondents

4.2.1 Distribution of Respondents According to Gender: Result in Table 4 show that (81.9%) of the participants were male and 18.1% female. Similarly most (81.2%) of the non-participants were male while the remaining 18.2% were female. This implies that cowpea production is predominantly undertaken by male in the study area.

4.2.2 Distribution of Respondents According to Marital Status: Entries in Table 4 reveal that just (4.9%) of the participants were single and greater proportion (77.8%) of the participants were married, 8.3% of them were divorced while 9.0% of the participants were widows. On the other hand, 8.3% of the non-participants were single, majority (79.2%) of the non-participants were married, and 9.0% were divorced while 3.5% of them were widows. This implies that in the study area, a few proportion of divorced and widows engage in cowpea production this can be attributed to their food and income needs. However majority of the respondents were married which reveals, marriage is held with high esteem in the area as no adult will be considered responsible without it. This finding agrees with that of Yekinni and Ajayi (2011), that marriage is held as a very serious institution particularly in rural areas and no adult is regarded responsible without it.

4.2.3 Distribution of Respondents According to Age: As evident in Table 4 just few (6.9%) of the participants were less than 21 years of age, 19.4% were between 21-30 years of age, about 41.7% of them were between 31-40 years, 15.3% of the

participants were within 41-50 years, 12.5% of them were between 51-60 years while 4.2% of the participants were above 60 years. Meanwhile, 5.6% of non-participants were less than 21 years of age, 26.4% of them were between 21-30 years, and 29.2% of the non-participants were in the age bracket of 31-40 years, 12.5% were between 41-50 years, 19.4% were in the age bracket of 51-60 years while the remaining 6.9% of the non-participants were above 60 years of age. This infers more proportion extent of the farmers in the territory were in their productive age. Thus equipped for embraced farming activities. This is in accordance with the finding of Usman et al. (2008) that farmers at their youthful ages are more productive and can easily participate in any intervention geared towards increasing their level of output and income.

4.2.4 Distribution of Respondents According to Household Size: Table 4 reveals that 34.7% of the participants has household size of 6-10 people, 27.8%, 16.7% and 12.5% had 11-15 people, 16-20 people and above 20 people respectively. Similarly, a high proportion (40.3%) of the non-participants has household size of 6-10 people, 23.6%, 19.4% and 11.1% has household size of 11-15 people, 16-20 people and above 20 people respectively. This infers every one of the respondents has vast family size and this can give an income for cowpea improvement in the study area. This substantiate the perspective of Agwu (2004), that moderately extensive family size of a farmer is a conspicuous preferred standpoint, as it empower the farmer to utilize family work, thereby reducing the labour cost required for the cowpea production.

4.2.5 Distribution of Respondents According to Major Occupation: Results in Table 4 indicate that majority (70.8% and 52.8%) of participants and non-participants respectively has farming as their primary occupation, 13.9% of both participants and non-participants were civil servants, 11.1% and 12.5% of the participants and non-

participants were into trading while 4.2% of the participants were artisans such as blacksmith (2.1%), carpentry (0.7%), bricklayer (0.7%) and mat making (0.7%). Similarly 20.8% of the non-participants were artisans comprising blacksmith (9.7%), carpentry (6.9%), bricklayer (2.8%) and mat making (1.4%). This implies that majority of the respondents were full time farmers and some were involved in other means of livelihoods who took farming as minor occupation also benefited in FFS intervention.

4.2.6 Distribution of Respondents According to Farming Experience: A greater proportion (47.2%) of the participants had 11-15 years of farming experience (Table 4). about 20.8% of them had 16-20 years of farming experience while 16.7% and 15.3% has above 20 years and 10 years of farming experience respectively. On the other hand, 44.4%, 23.6% and 18.1% of the non-Participants had 11-15 years, 16-20 years and above 20 years of farming experience respectively while the remaining 13.9% had 6-10 years farming experience. It implies that most of the farmers had been in farming business for a long period of time and this was expected to be added advantage in participation in any intervention targeted at improving agricultural production, farming experience can assist in promoting specialization, improved knowledge, skills and better decision making. This finding agrees with that of Aneke (2007) that farming experience promote specialization, improved knowledge, skills and aspiration of the farmer.

4.2.7 Distribution of Respondents According to Farm Size: As evident in Table 4 Participants and non- Participants (4.2% and 6.3%) had farm size of less than 0.6 hectare, 6.9% and 7.6% of the Participants and non-participants had 0.6-1.0 hectare also 12.5% and 26.4% of the two categories of the farmers had farm size 1.1-1.5 hectares while 26.4% and 22.2% of two communities had farm size 1.6-2.0 hectares. Meanwhile, half (50.0%) of the participants had farm size above 2.0 hectares and high

proportion (37.5%) of the non- participants had farm size above 2.0 hectares. However, greater percentage of the participants cultivates above 2.0 hectares of land and it was expected to have positive effect on their output. The implication of this finding is that, majority of the farmers were small-scale farm operators which could consequently lead to low output. This finding is in line with that of Onemolease (2005) who reported an average farm size of 1.2 hectares in Edo state and also Okunlola and Adekunle (2000) who stated that 53% of Nigerian farmers hold less than 4 hectares of land.

4.2.8 Distribution of Respondents According to Educational Status: Table 4 reveals that 47.2% and 45.8% of the participants and non- participants respectively have no formal education. However, 29.9%, 13.2%, 5.6% and 4.2% of the participants had attained secondary, primary schools, Diploma/NCE and Degree/HND respectively, while 25.0%, 15.3%, 8.3% and 5.6% of the non- participants possessed secondary, primary schools, Diploma/NCE and Degree/HND certificates respectively. The implication is that, education is generally considered as an important variable that can enhance farmers understanding and acceptance of new idea and practices aimed at increasing their productivity. This agrees with the finding of Sabo (2006) who reported that formal education to be generally considered as an important variable that enhances the farmer`s use or adoption of new technologies or practice.

4.2.9 Distribution of Respondents According to Extension Contact: Entries in Table 4 indicate that, all (100%) of the participants received extension service, while 66.0% of the non-participants had access to extension service, the remaining 34.0% of them received no extension service. This implies that all the participants received extension service at different period of time and this might not be unconnected with their participation in FFS. Extension agent is one of the major sources of agricultural

information for farmers, thus farmers exposure to extension service has great effect on their improved farming practices and hence increased output. This substantiates the finding of Akinbode (2012) who found frequency of visit or availability of extension service to increase farmers' opportunity to adopt or accept new technologies.

4.2.10 Distribution of Respondents According to Tenancy Status: Findings in Table 4 also reveals that majority (61.9%) of the participants got land through Inheritance, 47.9%, 31.3% and 6.9% of them accessed theirs through purchase, rent/lease and gift respectively. On the other hand, most (68.1%) of the non-participants owned their land through inheritance while 25.0%, 13.9% and 9.0% got their through purchase, gift and rent/lease respectively. Generally, in northern part of Nigeria Kebbi state not an exception small-scale farmers' access land through inheritance (family land) which continued to be fragmented among the family members, which bring about inadequate land available for cultivation. This finding implies that greater percentage of the farmers accessed land through inheritance. Although considerable proportion of the participants owned land through purchase and rent/lease, this could be attributed to their participation in FFS, hence able to augment for their land need through the other sources.

Table 5: Mean Distribution of Selected Socio-economic Variable of Respondents

Variables	Participants		Non-participants		t-value
	Mean	SD	Mean	SD	
Age(Yrs.)	41.04	7.33	44.80	11.88	-3.38***
Household size(No.)	12.49	7.81	10.53	6.95	2.27**
Farming experience(Yrs)	18.50	15.30	17.53	16.57	0.51 NS
Farmsize(Ha)	2.46	1.13	2.31	1.04	1.735NS
Cowpea Farmsize(Ha)	1.36	0.54	1.30	0.73	0.803NS

Source: Field Survey], 2016, ***, ** Significant at 1% and 5% levels

SD = Standard Deviation, NS = Not Significant

4.3 Mean Distribution of Selected Socio-Economic Characteristics of Respondents

Age is one of the important socio-economic variables that can influence individual or farmer's decision making process about on intervention or new technology as shown in Table 5, the mean ages of the participants and non-participants were 41.04 and 44.80 years respectively, which shows a significant mean difference ($p < 0.01$). This result indicates that participants mean age is less than non-participants, revealing a negative relationship with participation in an intervention or use of new practices. This finding implies that, the tendency of cowpea farmers to participate in training and use new farming practices reduces as they grow older. This result is in line with Abebe (2007) and Tsado (2013) who found the age of a farmer to negatively influence the use of new farming practices.

Entries in Table 5 also indicate that the participants and non-participants mean household size were 13 and 11 people respectively. The result showed that the mean differences of both categories were significantly different ($p < 0.05$). This finding implies that the participants had larger household size and this can impact negatively in reducing resources available per capita and therefore ready to participate in any intervention that can enhance their resource endowment.

Table 6: Distribution of Respondents According to Cooperative/social Participation and Nature of Membership

Variables	Participants	Non-participants	Pooled
Cooperative Membership			
Yes	144 (100)	90 (62.5)	234 (162.5)
No	-	54 (37.5)	54 (37.5)
Total	144 (100)	144 (100)	288 (200)
Nature of Membership			
Not a Member	-	-	
Executive	42 (29.2)	20 (13.9)	62 (43.1)
Sub-committee	36 (25.0)	10 (6.9)	46 (31.9)
Ordinary Member	66 (45.8)	60 (41.7)	126 (87.5)
Total	144 (100)	144 (100)	288 (200)
Level Of Participation			
Not a Member	-	54 (37.5)	54 (37.5)
Very Active	86 (59.7)	38 (26.4)	124 (86.1)
Active	37 (25.7)	26 (18.1)	63 (43.8)
Less Active	16 (11.1)	14 (9.7)	30 (20.8)
Not Active	5 (3.5)	12 (8.3)	17 (11.8)
Total	144 (100)	144 (100)	288 (200)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.4 Distribution of Respondents According to Cooperative/social Participation and Nature of Membership

Entries in Table 6 show that all (100.0%) of the participants were members of farmers' cooperative society and 62.5% of the non-participants respectively belonged to farmers cooperatives while the remaining 37.5% of them were not members of any cooperative organization. This implies that all the participants belonged to farmers' cooperative, as membership of a group was a pre-requisite for participation in FFS programme. Also, high group membership observed among the non-participants could be attributed to sensitization farmers received in the study area, that it is only through group membership farmers can get assistance from government or international donor agencies. This finding is in line with Abdullahi et al. (2015) who reported membership of social organization to be an important factor in inducing farmers to participate in the IFAD community Based Agricultural and Rural Development Project.

Table 6 further indicates that high proportion (45.8%) of the participants were ordinary members of farmer cooperative society, 29.2% and 25.0% of them were executives and sub-committee members respectively. Also most (41.7%) of the non-participants were ordinary members, 13.9% and 6.9% of them were executives and sub-community members respectively, while 37.5% of them were not members of farmer cooperative. This finding implies that, the participants stand better chance of benefiting in government, non-governmental and international donor agencies assistance than the non-participants. Results in Table 6 also reveal that, more than half (59.7%) of the participants were very active members of their cooperatives, 25.7%, 11.1% and 3.5% of them were active, less active and not active respectively, while a proportion (26.4%)

of the non-participants were very active members of their cooperatives, 18.1%, 9.7% and 8.3% of them were active, less active and not active respectively. This implies that majority of the participants were very active members of their cooperative associations and this could be attributed to their participation in FFS. The FFS provide avenue for the participants to improve their farming knowledge, skills and decision-making.

Table 7: Distribution of Respondents According to Cowpea Farming Experience and Cowpea Farm size

Variables	Participants	Non-participants	Pooled
Cooperative Membership Experience (years)			
Less than 6	-	10 (6.9)	10 (6.9)
6-10	20 (13.9)	18 (12.5)	38 (26.4)
11-15	68 (47.2)	60 (41.7)	128 (88.9)
16-20	32 (22.2)	32 (22.2)	64 (44.4)
Above 20	24 (16.7)	24 (16.7)	48 (33.4)
Total	144 (100)	144 (100)	288 (200)
Cowpea Farm size (Ha)			
Less than 0.6	2 (1.4)	13 (9.0)	15 (10.4)
0.6-1.0	12 (8.3)	34 (23.6)	46 (31.9)
1.1-1.5	20 (13.9)	25 (17.4)	45 (31.3)
1.6-2.0	48 (33.3)	39 (27.1)	87 (60.4)
Above 2.0	62 (43.1)	33 (22.9)	95 (66.0)
Total	144 (100)	144 (100)	288 (200)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.5. Distribution of Respondents According to Cowpea Farming Experience and Cowpea Farm size

4.5.1 Cowpea farming experience: Cowpea farming experience as evident in Table 7, most (47.2%) of the participants has cowpea farming experience of 11-15 years, 22.2%, 16.7% and 13.9% of them have been into cowpea farming for 16-20 years, above 20 years and remaining 6-10 years respectively while a proportion (41.7%) of the non-participants have been farming cowpea for 11-15years, 22.2%, 16.7%, 12.5% and the remaining 6.9% of them has cowpea farming experience of 16-20 years, above 20 years, 6-10 years and less than 6 years respectively. This implies that greater percentage of the participants has more experience in cowpea production and thus could facilitate their readiness to use new practice, different from what they have been practicing over the years. This corroborates the finding by Agwu (2004), that long stretch of farming background empower farmers to be acquainted with expanded cowpea production limitations and this expand their level of knowledge of new thoughts as a method for defeating their production imperatives and subsequently fill in as favorable position for expanded cowpea output.

4.5.2 Cowpea Farmsize: Results in Table 7 indicate that high proportion (43.1%) of the participants cultivated above 2.0 ha, 33.3%, 13.9% and 8.3% cultivated less than 1.6-2.0 ha, 1.1-1.5 ha, 0.6-1.0 ha respectively, the remaining 1.4% of them cultivated less than 0.6 ha. Also, most (27.1%) of the non-participants cultivated 1.6-2.0 ha, 23.6%, 22.9% and 17.4% cultivated 0.6-1.0 ha, above 2.0 ha and 1.1-1.5 ha respectively while the remaining 9.0% cultivated less than 0.6 ha. This implies that greater percentage of the participants had larger cowpea farms, this might not be unconnected with their participation in FFS, and hence their zeal to increase production through increased farm holdings.

Table 8: Distribution of Participants According to Training Received on Cowpea Production Techniques

Variables	Frequency*	Percentage
Land Preparation technique	141	97.9
Method of planting	139	96.5
Recommended spacing	136	94.4
Time of planting	135	93.8
Selection of viable seeds	110	76.4
Use of improved variety	123	85.4
Chemical weeds control	134	93.1
Selection and method of fertilizer application	111	77.1
Method of pests and diseases control	134	93.1
Method of harvesting and processing	123	85.4
Method of cowpea grain treatment	127	88.2
Modern cowpea grain storage	115	79.9
Source: Field Survey, 2016, *Multiple Responses		

4.6. FFS Training Received by Participants on Cowpea Production Techniques

Findings in Table 8 reveals that majority (97.9%) of the participants had training on land preparation techniques. Closely followed was 96.5%% of them which had training on planting techniques. Table 8 further shows that about 94.4% of them received training on recommended spacing. This was followed by 93.8% of them who had training on time of planting. Also, about 93.1% of them received training on chemical weeds control, pests and diseases control techniques respectively. Entries in Table 4.5 further indicate that 88.2% of them had training on cowpea grain treatment. About 85.4% of the participants got trained on the use of improved varieties, harvesting and processing techniques respectively. Similarly, about 79.9% of them received training on modern cowpea grain storage techniques closely followed was 77.1% of them had training on selection and fertilizer application techniques. Table 8 also shows that 76.4% of them undergone training on identification and selection of viable seeds. Training of this nature would enhance the knowledge and skills of the participants in farming. This is in accordance with the perspectives of Sajeev et al. (2012) that training is a deliberate change in knowledge and skills which thus help the farmer to carry out their farming activities successfully and productively.

Table 9: FFS Training Perception by the Participants on its Relevance on their Cowpea Production Techniques

Variables	Perception Rating				S _w	$\bar{X}_w$	Rank	Decision
	Not Relevant	Slightly Relevant	Relevant	Very Relevant				
Land preparation techniques	1(0.7)	5(3.5)	46(31.9)	92(63.9)	517	3.59	1 st	Relevant
Method of planting	1(0.7)	9(6.2)	83(57.6)	51(35.4)	472	3.28	5 th	Relevant
Recommended spacing	1(0.7)	14(9.7)	41(28.5)	88(61.1)	504	3.50	2 nd	Relevant
Time of planting	4(2.8)	12(8.3)	52(36.1)	76(52.8)	488	3.39	3 rd	Relevant
Viable seeds selection	10(6.9)	50(34.7)	45(31.2)	39(27.1)	401	2.78	11 th	Relevant
Identification of improved varieties	10(6.9)	20(13.9)	60(41.7)	54(37.5)	456	3.23	7 th	Relevant
Chemical weeds control	6(4.2)	12(8.3)	66(45.8)	60(41.7)	468	3.25	6 th	Relevant
Selection and Method of fertilizer application	19(13.2)	30(20.8)	59(41.0)	36(25.0)	400	2.78	11 th	Relevant
Method of pests and diseases control	2(1.4)	8(5.6)	66(45.8)	68(47.2)	488	3.39	3 rd	Relevant
Harvesting and processing techniques	14(9.7)	23(16.0)	64(44.4)	43(29.9)	424	2.94	9 th	Relevant
Grain treatment	10(6.9)	14(9.7)	78(54.2)	42(29.2)	443	3.08	8 th	Relevant
Modern storage method	24(16.7)	16(11.1)	64(44.4)	40(27.8)	403	2.80	10 th	Relevant

Source: Field Survey, 2016

Figures in parentheses are percentages, S_w= Weighted Sum, $\bar{X}_w$ = Weighted Mean Score

4.7. Perceived Relevance of FFS Training by Participants on their Cowpea Production Techniques

Perception is about accepting, choosing, getting, changing and sorting out the data provided by our faculties (Chaiporn, 2007). It is vital to note that perception is a continuous variable and it influences the farmers' choice of training on a particular farming practices, depending on the relevance the farmer attach to a farming practice(s). As shown in Table 9 participants perceived land preparation technique ($\bar{X}_w = 3.59$) as the most relevant training received, it was followed by recommended spacing ($\bar{X}_w = 3.50$) and this ranked 2nd, also, time of planting and method of pests and diseases control ($\bar{X}_w = 3.39$) were perceived very relevant training to their cowpea farming, method of planting ($\bar{X}_w = 3.28$) which ranked 5th as relevant training perceived by the FFS farmers, chemical weeds control ($\bar{X}_w = 3.25$) ranked 6th as relevant training received by the farmers, grain treatment ($\bar{X}_w = 3.08$) and harvesting and processing techniques ($\bar{X}_w = 2.94$) were also perceived relevant and ranked 8th and 9th respectively, furthermore, training on modern storage method ($\bar{X}_w = 2.80$) was perceived relevant by the farmers, selection of viable seeds, choice and method of fertilizer application ($\bar{X}_w = 2.78$) were also perceived relevant by the farmers. This finding implies that, the participants perceived all the new cowpea farming practices they were trained very relevant to their farming system. This could be attributed to these farmers realization of the crucial role improved farming practice play in increasing productivity, outputs as well as improve socio-economic well-being of the farmers.

Table 10: Probit Regression Analysis of Factors Influencing Farmers**Participation in FFS**

Variables	Coefficient	z-value	p-value
Constant	-2.4988***	-3.354	0.001
Gender (X ₁)	-0.5296	-1.293	0.196
Age (X ₂)	-0.0322**	-2.016	0.044
Marital Status (X ₃)	0.1193	0.289	0.772
Education Level (X ₄)	-0.0080	-0.344	0.731
Household Size (X ₅)	0.0407*	1.722	0.085
Extension Contact (X ₆)	1.2942***	7.628	0.000
Credit Access (X ₇)	0.6877**	2.447	0.014
Hired labour (X ₈)	0.1477	0.532	0.594
Farming Experience (X ₉)	-0.0080	-0.552	0.581
Farm Size (X ₁₀)	-0.3985***	-2.612	0.010
Cowpea Farmsize (X ₁₁)	0.9663***	3.573	0.000
Membership of coop. (X ₁₂)	0.0714***	4.598	0.000
On-farm Income (X ₁₃)	-1.1656	-0.713	0.476
Off-farm Income (X ₁₄)	-0.8675	-0.096	0.923
Prob>Chi ² = 0.000			
Pseudo R ² = 0.612			
Log Likelihood= -199.6264			

Source: Field Survey, 2016*****, **, *, Significant at 1%, 5% and 10% levels respectively**

4.8 Factors Influencing Respondents Participation in FFS Training

The study examined factors influencing cowpea farmers' participation in FFS using probit regression model (Table 10). Age is a negative and significant factor (-0.0322) influencing farmers participation in FFS ($p < 0.05$). The negative relationship implies that younger farmers were more likely to participate in the project than older ones that is as farmers advance in age, the level of participation reduces. This indicate potential role FFS play in training younger farmers on new agricultural practices. This is in line with the finding of Kristein et al. (2010) that the potentials of FFS was to promote new agricultural technologies to younger farmers and Enete and Igbokwe(2009) who. Found younger farmers to be more dynamic with regards to use of innovations. Household size (X_5) had a positive coefficient (0.0407) and a significant factor influencing farmers participation ($p < 0.10$). This implies that as size of household increases it is more likely that, the food and financial needs of such household would increase hence could be found in poor communities. FFS was targeted at the poor and that influenced their participation. Extension contact (X_6) had positive relationship (1.2942) and a significant factor influencing farmers participation ($p < 0.01$). This infers, the more contact farmer has with augmentation specialist, the more probable he would take an interest in the task. This concurs with the finding of Abdullahi et al. (2015) who noticed that, the higher the number of frequency of visit by extension agent to farmers the higher the likelihood to take part in an intervention. Credit access (X_7) also had positive coefficient (0.6877) and significantly influenced participation ($p < 0.05$). This implies that access to credit by an agriculturist or individual. Increases. This is in accordance with the finding of Sindi (2008) who found availability of credit to serve as incentive to farmers to increase their production and overcome financial limitations in participating in knowledge development programme that has direct

effect on their living condition. Farmsize (X_{10}) revealed negative relationship (-0.3985) and a significant factor influencing farmers participation ($p < 0.01$). This implies that farmers with small piece of farmland were more likely to participate in the project than those with big farmland. This disagrees with a prior expectation. Cowpea farm size (X_{11}) had positive coefficient (0.9663) and a significant factor influencing farmers' participation at 1% level of probability. This implies that land cultivated to cowpea was a factor influencing participation in the project. This finding substantiate those of Oluwafemi et al. 2006) and Edi et al. 2007) who found land under cultivation to influence participation in a project. Membership of cooperative (X_{12}) had positive relationship (0.0714) and a significantly influenced participation at 1% level of probability. This implies that membership of social organizations was an important factor in inducing farmers to participate in the FFS project. This substantiate finding of Olwande and Mthenge (2010) who reported farmers membership of association to increase their access to information about intervention aimed at improving their outputs, hence influence their participation.

Table 11: Distribution of Participants According to Status of FFS Training

Variables	Frequency	Percentage
Application of Techniques learn		
Yes	128	88.9
No	16	11.1
Level of Application of Techniques		
High (7-12)	108	75.0
Low (1-6)	36	25.0
Benefit of Cowpea Production Training		
Yes	131	91.0
No	13	9.0
Advice others Farmers to go for FFS Training		
Yes	141	97.9
No	3	2.1
Willingness to Train other Farmers		
Yes	126	87.5
No	18	12.3

Source: Field Survey, 2016

Table 12: Distribution of Non-participants According to Level of Awareness and Source of Information of FFS

Awareness	Frequency	Percentage
Yes	126	87.5
No	18	12.5
Total	144	100
Source of Information (n= 126)		
Radio	50	39.7
Television	12	9.5
Extension Agent	18	14.3
Print Media	4	3.2
Friends/Neighbours/Co-farmers	32	25.4
Village Heads/Opinion Leaders	10	7.9
Total	126	100

Source: Field Survey, 2016

4.9. Participants Status of FFS Training

Entries in Table 4.8 indicate that majority (88.9%) of the respondents claimed that they had applied the techniques learnt, about 11.1% of them were yet to apply the techniques. As also evident in Table 11 greater proportion (75.0%) of the participants highly incorporated the techniques learnt into their cowpea farming system while 25.0% of them applied the techniques at low ebb. Also, considerable proportion (91.0%) of the participants were aware of the benefit of FFS training while just (9.0%) of them claimed not to be aware of benefit of the programme. Almost all (97.9%) of the participants were of the opinion that farmers who were not participants should go for FFS training while just a few (2.1%) of them had contradictory opinion. Similarly, most (87.5%) of the participants were ever ready to train other farmers on improve cowpea farming system, about 12.5% of them said were not prepared to train anybody on improved cowpea farming system. This finding implies that trained farmers have the better chance to understand the benefit and apply improved farming techniques that is expected to impact positively on their crops output. This conforms with the finding of Muhammad et al. (2013), who reported that FFS training improve farmers' ability to observe technology and apply new knowledge as solution to their farming problems.

4.10. Non-participants Level of Awareness and Source of Information of FFS

Results in Table 12 show that, majority (87.5%) of the non-participants were aware of FFS been implemented in the study area while just (12.5%) of them claimed that they were not aware of the existence of FFS. This implies that FFS was a popular pro-poor project been implemented in the area.

Results also reveal (Table 4.9) most (39.7%) of them got information of FFS through radio. About 25.4% and 14.3% of them got to know about FFS through friends/ co-

farmers and extension agents respectively, while, 9.5%, 7.9% and 3.2% of the non-participants knew about FFS through television, village heads and print media respectively. This finding implies that radio is the most important source of information to farmers in the study area. This concurs with Abdul-Aziz et al. (2015) who identified radio to rank first as the most appropriate medium used by arable crops farmers in Isale Osun farm settlement.

Table 13: Distribution of Non-participants According to their Reasons not joining FFS

Reasons	Frequency	Percentage
Lack of Time	14	9.7
No Good Leadership	4	2.8
I will Join Soon	12	8.3
FFS Location is far	10	6.9
No Enrolment Information	60	41.7
Inadequate Capital	6	4.2
I will Join after seeing Result	10	6.9
No FFS Around	24	16.7
Too old in Age	4	2.8
Total	144	100

Source: Field Survey, 2016

Table 14: Distribution of Respondents According to Credit Access and Sources of Credit

Responses	Participants	Non-participants	Pooled
Yes	47 (32.6)	38 (26.4)	85 (59.0)
No	97 (67.4)	106 (73.6)	203 (141.0)
Total	144 (100)	144 (100)	288 (200)
Credit Source			
Personal Savings	97 (67.4)	106 (73.6)	203 (141.0)
Commercial Bank	4 (2.8)	5 (3.5)	9 (6.3)
Family and Friends	10 (6.9)	8 (5.6)	18 (12.5)
Agricultural Bank	21(14.6)	15 (10.4)	36 (25.0)
Clubs/Cooperative Society	12 (8.3)	10 (6.9)	22 (15.2)
Total	144 (100)	144 (100)	288 (200)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.11. Reasons for Non-participants not Joining FFS

A vital aspect to note in demand-driven programme like the FFS programme is the reasons that farmers give for not participating in the programme. As evident in Table 13 the main reasons given by the respondents for not participating in an FFS include no enrolment information (41.7%), most of the respondents stated that, they have not been invited to participate in the programme, 16.7% of them claimed that there was no FFS around for them to participate about 9.7% of the respondents said they lack time ie they were too committed in other activities, 8.3% of the non-participants said they will join an FFS soon while 6.9% of the respondents said FFS location was far and will join after seeing result respectively while 4.2% of them gave reason as inadequate capital problem, 2.8% of the respondents claimed they could not join due to poor leadership and too old in age respectively. This finding implies that greater proportions of the non-participants were interested in participating in the programme but no enrolment information was available to them.

4.12. Distribution of Respondents According to Credit Access and Sources of Credit

As evident in Table 14 majority (67.4%) of the participants had no access to credit, just 32.6% of them had access to credit. Similarly, greater proportion (73.6%) of the non-participants had no access to credit while a few (26.4%) of them had access to credit.

Table 14 also reveals that most (67.4%) of the participants used their personal savings to finance their farming operations, about 14.6% of them accessed credit from Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB), 8.3% of them accessed credit from farmers' cooperative societies, 6.9% accessed theirs from

family and friends while 2.8% of them accessed credit from the Commercial bank on the other hand, majority (73.6%) of the non-participants used personal savings to fund their farming activities, 10.4% of them accessed credit from the NACRDB, 6.9% of the non-participants accessed credit from farmers' cooperative societies and 3.5% of them accessed credit from Commercial Banks. This finding implies that the greater percentage of small-scale cowpea farmers in the study area has poor access to credit and this was likely to negatively affect their capability to increase production.

Table 15: Distribution of Respondents According to Reasons for Poor Credit Access

Reasons	Participants	Non-participants	Pooled
Credit not Available	20 (13.9)	50 (34.7)	70 (48.6)
No membership of coop.	5 (3.5)	9 (6.3)	14 (9.8)
Ignorance of Existence of Bank Loan	9 (6.3)	20 (13.9)	29 (20.2)
Difficulties in Procedures to Obtain Loan	66 (45.8)	38 (26.4)	104 (72.2)
Lack of Collateral	11 (7.6)	16 (11.1)	27 (18.7)
High Interest Rate	33 (22.9)	11 (7.6)	44 (30.5)
Total	144 (100)	144 (100)	288 (200)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

Table 16: Distribution of Respondents According to their View on their Cowpea Output Increase for the Last Five Years

Response	Participants	Non-participants	Pooled
Very Good Increase	35 (24.3)	12 (8.3)	47 (32.6)
Good Increase	83 (57.6)	32 (22.2)	115 (79.8)
Slight Increase	25 (17.4)	60 (41.7)	85 (59.1)
No Increase	1 (0.7)	40 (27.8)	41 (28.5)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.13. Reasons for Poor Credit Access by Respondents

Individuals, social organizations and credit institutions sometimes provide credit assistance to individuals, communities or associations with the main objective of improving their living standard. However, there might be situations whereby the credit is poorly accessed due to some reasons perceived by the target participants. Table 15 revealed the major reasons for poor credit access as perceived by the respondents. Most (45.8%) of the participants attributed their poor credit access to difficulties in processing credit, 22.9% of them claimed it was due to high interest rate paid on the credit received, about 13.9% of them attributed poor credit access to non-availability of credit facilities, 7.6%, 6.3% and 3.5% of them claimed that poor credit access was due to lack of collateral, ignorance of credit availability and non-membership of social organization respectively. On the other hand about 34.7% of the non-participants attributed poor credit access to non-availability of credit facilities, 26.4% and 13.9% of them claimed that their poor credit access was due to long bureaucratic procedures involved in processing credit and ignorance of credit availability respectively, while, 11.1%, 7.6% and 6.3% of them attributed poor credit access to lack of collateral, high interest rate on credit and non-membership of social organizations respectively. This finding implies that, the main reasons for poor credit access by both participants and non-participants were difficulties involved in accessing credit, non-availability of credit and high interest rate charged by the credit institutions.

4.14. Views of Respondents on their Cowpea Output Increase for the Last Five Years

As evident in Table 16 more than half (57.6%) of the participants claimed that they have had good cowpea output increase for the past five years, 24.3% of them admitted that they have experienced very tremendous increase in cowpea output for the last five years while 17.4% and 0.7% of them expressed that they had slight and no increase in cowpea output for the last five years. Meanwhile, most (41.7%) of the non-participants claimed that they had just slight increase in their cowpea output for the last five years, 27.8% of them admitted no output increase for the last five years while, 22.2% and 8.3% claimed to have experienced good increase and very good output increase in their cowpea for the last five years. This implies that majority of the participants were of the view that they have obtained good output increase in their cowpea for the last five years. This good output increase of the participants could be attributed to impact of FFS training. This concurs with Davis et al. (2010) and Nigat et al. (2013) who reported positive effect of FFS on crops output in East Africa and Central Java.

Table 17: Effect of FFS Training on Participants Cowpea Outputs

Variable	PSM/ATT Result	STD	T-value	STE	Participants Cowpea output (kg/ha)	Non- participants Cowpea output(kg/ha)
Impact of FFS Training	100.50	1953.287	3.704	162.774	1299.47	696.48

Source: Field Survey, 2016.

STD = Standard Deviation,

STE =Standard Error

4.15. Effect of FFS Training on Participants Cowpea Output

Increased crop production was one of the real goals of FFS. Along these lines, in surveying the impact of the program on cowpea production by the members utilizing Propensity Score Matching (PSM), the yearly cowpea production was used as proxy for increased food production. The advantage of this is that, it doesn't require assumption of constant additive treatment across each farmer. In any case, if a project outcome on its participants is the difference between the quantities of cowpea produced by participants of the project and that of non-participants. To this end, if the difference in cowpea yield between the participants and non-participants is positive, it indicate that there was effect of the project on the participants and vice-versa.

Since the average treatment on the treated (PSM/ATT) is positive (100.50) as indicated in Table 17. This positive difference could be connected to a change in improved agricultural practices used. This agrees with the findings of Kristen et al. (2010) and Ebewore (2013), who found positive effect of FFS on crop yields.

Table 18: Distribution of Respondents According to Level of On-farm Income

On-farm Income ₦	Participants (n=144)	Mean	Non- participants (n=144)	Mean	Pooled
<50,001	6 (4.2)		32 (22.2)		38 (26.4)
50,000-100,000	8 (5.6)		24 (16.7)		32 (22.2)
100,001-150,000	10 (6.9)		38 (26.4)		48 (33.3)
150,001-200,000	12 (8.3)	180277.78	8 (5.6)	50666.67	20 (13.9)
200,001-250,000	20 (13.9)		14 (9.7)		34 (23.6)
250,001-300,000	24 (16.7)		12 (8.3)		36 (25.0)
>300,000	64 (44.4)		16 (11.1)		80 (55.5)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.16: Respondents Level of On-farm Annual Income

Entries in Table 18 show that most (44.4%) of the participants earned on-farm income above ~~₦~~ 300,000, about 16.7% and 13.9% of them earned between ~~₦~~150, 001- ~~₦~~200, 000 and ~~₦~~200, 001- ~~₦~~250, 000 on-farm income respectively while 8.3%, 6.9%, 5.6% and 4.2% of the participants realised between ~~₦~~150, 001- ~~₦~~200, 000, ~~₦~~100, 001- ~~₦~~150,000, ~~₦~~50,001-~~₦~~100,000 and less than ~~₦~~50, 000 on-farm income per annum respectively. On the other hand, high proportion (26.4%) of the non-participants earned between ~~₦~~100, 001- ~~₦~~ 150,000 on-farm income per annum , while 22.2%, 16.7%, 11.1%, 9.7%, 8.3% and 5.6% of them realised between less than ~~₦~~50,001, ~~₦~~50,001- ~~₦~~100,000 above ~~₦~~300,000, ~~₦~~200,001-~~₦~~ 250,000, ~~₦~~250,001-~~₦~~300,000 and ~~₦~~150,001-~~₦~~200,000 on-farm income respectively. This implies that greater proportion of the participants realised higher on-farm annual income than the non-participants. This might not be unconnected with their participation in FFS training. Training helps to bring about improvement in farmers' knowledge, skills and understanding of new farming techniques as well as implementation of the new techniques which consequently improve their crops output and income. This finding is in line with that of Nigat et al. (2013), who reports significant effect of FFS on- farmers' income.

Table 19: Distribution of Participants Based on Benefits Derived from FFS

Item	Frequency*	Percentage	Ranking
Increased in cowpea output/yield	130	90.3	1 st
Increased level of annual on-farm income	126	87.5	2 nd
Improved economic empowerment	82	71.5	6 th
Better education for children	59	41.0	10 th
Improved farming, knowledge and skills	121	84.0	4 th
Increased acquisition of house hold assets	124	86.1	3 rd
Improved health condition	76	52.8	9 th
Increased social interaction	103	71.5	6 th
Better Decision Making	110	76.4	5 th
Poverty reduction	88	61.1	8 th

Source: Field Survey, 2016

***Multiple Responses**

4.17. Distribution of Participants Based on Benefits Derived from FFS

Results in Table 19 present responses from the participants on benefits they realised from participating in FFS training. To this end, increased in cowpea output/yield (90.3%), increased in level of on-farm annual income (87.5%), increased household assets acquisition (86.1%), improved farming knowledge and skills (84.0%) were the most prominent benefits derived by participants of the project. Other benefits include better decision-making (76.4%), improved economic empowerment and increased social interaction (71.5%), poverty reduction (61.1%), improved family health condition (52.8%) and better education for children (41.10%). This finding implies that greater proportion of participants had positive view about benefits derived from FFS participation in the study area. The finding agrees with Van den Berg (2004) and Ajayi and Okafor (2006) that FFS farmers usually derive much benefits from FFS training that lead to the improvement in their welfare.

Table 20: Distribution of Respondents According to Type of House Owned

Type of House	Participants	Non-participants	pooled
Mud building/thatched roof	16 (11.1)	17 (11.8)	33(22.9)
Mud building/zinc roof	75 (52.1)	102 (70.8)	177(122.9)
Cement block building/zinc roof	51 (35.4)	25 (17.4)	76(52.8)
Cement block building/aluminum roof	2 (1.4)	-	2(1.40)

Source: Field Survey, 2016

Figures in parenthesis are Percentages

4.18. Type of Housing Owned by Respondents

The importance of housing in provision of protection to man and animals cannot be underscored. The type of house an individual or group possesses depends largely on their economic status. Persons with higher economic status were likely to occupy better dwellings. As evident in Table 20 more than half (52.1%) of the participants owned mud house with zinc roof, about 35.4% of them lived in cement block house with zinc roof while 11.1% and 1.4% of the participants dwelled in mud house with thatched roof and cement block house with aluminum roof respectively. On the other hand, most (70.8%) of the non-participants dwelled in mud house with zinc roof while, 17.4% and 11.8% occupied cement block house with zinc roof and mud house with thatched roof. This finding implies that most of the respondents in the study area live in mud house with zinc roof. However, appreciable percentage of the participants owned cement block houses with zinc and aluminum roofs, this could be attributed to their participation in FFS.

Table 21. Distribution of Respondents According to Economic Status

Economic Status	Participants	Non-Participants	Pooled
0-19 (Low)	32 (22.2)	72 (50.0)	104 (72.2)
20-38 (Middle)	68 (47.2)	44 (30.6)	112 (77.8)
39-57 (High)	44 (30.6)	28 (19.4)	72 (50.0)

Source: Field Survey, 2016,

Figures in parentheses are Percentages

4.19. Distribution of Respondents According to Economic Status

Economic status are items of value possessed by household. The respondents were categorized into three based on their ownership of 16 selected economic items as evident in Table 21, high proportion (47.22%) of the participants occupied middle economic status, about 30.56% of them were in high economic status while 22.22% of the participants were in low economic status. Meanwhile, half (50.00%) of the non-participants were in low economic status, 30.56% of them belonged to middle economic status and just (19.44%) of the non-participants were within high economic status. Farmers exposure to training offer them opportunity to acquire knowledge and skills of new farming techniques and this results in increased level of production and income. More so, increased farmers level of income helps in enhancing their purchasing capability and thus improves their socio-economic well-being. This finding implies that considerable proportions of the participants were in middle socio-economic status compared to non-participants where most occupied low economic status. The better economic status exhibited by the participants could be attributed to impact of FFS. This substantiate views of Owens et al. (2001) and Onemolease (2005) who identified effective agricultural extension approach to improve the well-being of participants.

Table 22: Participants Constraints Perceived of FFS Training Participation

Constraints	Constraints Rating				S _w	$\bar{X}_w$	Rank	Decision
	Not Severe	Slightly severe	Severe	Very severe				
Training Time	3(2.1)	50(34.7)	47(32.6)	44(30.6)	420	2.92	7 th	Severe
Consuming Poor	42(29.2)	69(47.9)	19(13.2)	14(9.7)	293	2.03	12 th	Not Severe
Bureaucratic Procedure								
Bad Rural Roads	7(4.9)	15(10.4)	59(41.0)	63(43.8)	466	3.24	6 th	Severe
Incompatible Innovation	23(16.0)	79(54.9)	34(23.6)	8(5.6)	315	2.19	11 th	Not severe
FFS	22(15.3)	65(45.1)	38(26.4)	19(13.2)	342	2.37	9 th	Not Severe
Training too Technical								
High Cost of Modern Storage Facilities	5(3.5)	12(8.3)	64(44.4)	63(43.8)	473	3.28	5 th	Severe
Poor Facilitators-farmers' Ratio	42(29.2)	74(51.4)	18(12.5)	10(6.9)	284	1.97	13 th	Not Severe
FFS Staff Unethical	76(52.8)	39(27.1)	16(11.1)	13(9.0)	254	1.76	15 th	Not Severe
Job Attitude								
High Cost of Improved Farm Inputs	51(35.4%)	43(29.9)	32(22.2)	18(12.5)	498	3.46	2 nd	Severe
Inadequate Capital	4(2.8)	8(5.6)	50(34.7)	82(56.9)	499	3.47	1 st	Severe
Lack of Credit Facilities	4(2.8)	14(9.7)	62(43.1)	64(44.4)	476	3.31	4 th	Severe
FFS Innovation too Complex	16(11.1)	84(58.3)	27(18.8)	17(11.8)	333	2.31	10 th	Not Severe
Inadequate Farmland	7(4.9)	34(23.6)	82(56.9)	21(14.6)	405	2.81	8 th	Severe
Political Instability	70(48.6)	36(25.0)	21(14.6)	17(11.8)	273	1.90	14 th	Not Severe

Source: Field Survey, 2016. Figures in Parentheses are percentages

4.20. Constraints Perceived by Participants to their Active Participation in FFS Training

Table 22 revealed that inadequate capital ($\bar{X}_w = 3.47$), high cost of improved farm inputs ($\bar{X}_w = 3.46$), lack of credit facilities ($\bar{X}_w = 3.31$), high cost modern storage facilities ($\bar{X}_w = 3.28$), bad rural roads ($\bar{X}_w = 3.24$), training time consuming ($\bar{X}_w = 2.92$) and inadequate farm land ($\bar{X}_w = 2.81$) were the major constraints or perceived constraints by participants as very serious limiting factors against their active participation in FFS training. On the other hand, the following were perceived as minor constraints to their active participation; FFS training too technical ($\bar{X}_w = 2.37$), FFS innovation too complex ($\bar{X}_w = 2.31$), incompatible innovation ($\bar{X}_w = 2.19$) others include poor bureaucratic procedure ($\bar{X}_w = 2.03$), poor facilitator-farmers' ratio ($\bar{X}_w = 1.76$).

This finding revealed that many of the participants in the study area were being constrained by inadequate capital and lack of agricultural credit. Hence, it was difficult for them to either operate their cowpea farms or expand them. This could be attributed to lack of willingness of financial institutions to give loan to the farmers due risks and uncertainty associated with agricultural enterprise. Another major constraint faced by the farmers was high cost or lack of modern storage facilities; farmers store their farm products to take the advantage of price increase later in the year. The lack of this storage facility could be attributed to lack of government support to farmers in providing them with storage facilities that they can use to store their farm products during harvest in anticipation of increase in price. Furthermore, lack of good access rural roads to their farms was another serious constraint faced by the participants to actively participate in an FFS. This might not be unconnected with unwillingness of government to assist in providing good rural access roads. Road construction is a

capital-intensive project hence too expensive for small-scale farmers to undertake. Another major constraint faced by the farmers was they perceived FFS training to be time consuming, as most training periods coincided with their other busy schedule. This finding concurs with Abdullahi et al. (2015) who found inadequate capital, inadequate agricultural credit and inadequate storage facilities among other factors to militate against farmers' active participation in an intervention project.

Table 23: Constraints Perception of Non-FFS Participants to their Cowpea production

Constraints	Constraints Rating				S _w	$\bar{X}_w$	Rank	Decision
	Not Severe	Slight Severe	Severe	Very Severe				
Government Policies on Land	2(1.4)	26(18.1)	52(36.1)	64(44.4)	466	3.24	8 th	Severe
Inadequate Farm Land	3(2.1)	8(5.6)	51(35.4)	82(56.9)	500	3.47	3 rd	severe
Inadequate Capital	2(1.4)	12(8.3)	50(34.7)	80(55.6)	502	3.49	2 nd	Severe
High Cost of farm inputs	1(0.7)	8(5.6)	47(32.6)	88(61.1)	510	3.54	1 st	Severe
Poor Rural Feeder Roads	3(2.1)	23(16.0)	48(33.3)	70(48.6)	473	3.28	7 th	Severe
Poor Information Disseminati on	4(2.8)	33(22.9)	49(34.0)	58(40.3)	449	3.12	10 th	Severe
Pests and Diseases Problem	2(1.4)	20(13.9)	32(22.2)	90(62.5)	498	3.46	4 th	Severe
Lack of Credit Facilities	-	16(11.1)	50(34.7)	78(54.2)	494	3.43	6 th	Severe
Poor Storage	6(4.2)	28(19.4)	50(34.7)	60(41.7)	456	3.17	9 th	Severe
Poor Farming, Knowledge and Skills	7(4.9)	35(24.3)	68(47.2)	34(23.6)	417	2.90	11 th	Severe
Poor Pricing of Farm Produce	2(1.4)	14(9.7)	48(33.3)	80(55.6)	496	3.44	5 th	severe

Source: Field Survey, 2016

Figures in Parentheses are Percentages, S_w= Weighted Sum, $\bar{X}_w$ = Weighted Mean

4.21. Cowpea Production Constraints Perception of Non- FFS Participants

Entries in Table 23 show the major constraining factors to cowpea production in the study area; these include high cost of farm inputs ($\bar{X}_w = 3.54$), inadequate capital ($\bar{X}_w = 3.49$), inadequate farm land ($\bar{X}_w = 3.47$), pests and diseases problem ($\bar{X}_w = 3.46$), other constraints identified by the respondents as very serious were poor price of farm products ($\bar{X}_w = 3.44$), lack of credit facilities ($\bar{X}_w = 3.43$), poor rural feeder roads ($\bar{X}_w = 3.28$), unfavorable government policy on land ($\bar{X}_w = 3.24$), poor storage facilities ($\bar{X}_w = 3.17$), poor information dissemination ($\bar{X}_w = 3.12$) and poor farming knowledge and skills ($\bar{X}_w = 2.90$).

However high cost of farm inputs problem was ranked 1st by the respondents, this might be because farm inputs were rarely available from the government established agricultural institutions hence, greater proportion of small scale farmers purchase farm inputs from open markets where prices of such commodities were determined by the marketers which was usually considered very exorbitant by the farmers. Inadequate capital and inadequate farm land were also perceived as major constraints. It is obvious that, most small scale farmers particularly in the northern part of Nigeria, even if they have the zeal to expand level of cultivation, lack enough capital and farm land due to high level of poverty and farm land fragmentation among family members because most of the lands were held through inheritance. Another very serious constraint perceived by the respondents was pests and diseases problem. Pests and diseases remained one of the greatest challenge in cowpea production, most a times infestation to cowpea occur right from the field and this result in low output, poor quality and poor returns to the farmers. Poor price of farm products and poor credit access were also perceived very serious constraints by the respondents. Lack of modern storage facilities usually force the farmers to sell their cowpea during the

harvesting season when there is normally glut in the markets and therefore attract low price. By and large farmer non-membership or inactive participation in farmer cooperative organizations would hardly have direct access to credit facilities and this can hinder farmers' ability to access production inputs and this could lead to reduction in potential outputs. Poor rural feeder roads and poor information dissemination were other very serious challenging issues. Most rural feeder roads continued to remain inaccessible; this might not be unconnected to lack of government support or its inability to construct such roads. Road construction is high capital demanding hence, beyond the capability of farmers to handle. Also, as people commonly say, information is power, farmers that are not adequately informed or trained remained unequipped of improved farming knowledge and skills, thus, can rarely apply improved farming techniques that will result in increased output and income. This finding implies that all the constraints (Table 23), were perceived by the respondents as very serious hindrance to their cowpea production efforts.

4.22 Discussion with the Key Informants of FFS in Kebbi State (Focus Group Discussion)

Agricultural training is expected to directly or indirectly impacts on the agricultural productivity, since the ultimate goal of any farmer training is to assist them acquire knowledge and skills of new production systems. This will also enable them to make informed decisions on what new farming techniques to use or apply. It is obvious that trained farmers were in the better position to apply new techniques they have learnt. The discussion with the key informants of the study area revealed that participatory or group training approach was mostly used for the participants. The discussion were held on 10th and 11th July, 2015, the researcher was informed that at the commencement of the programme in the study area, it received very serious support from the government

in terms of counterpart contributions. Regular trainings and meetings were organized for both field staff and farmers. Allowances were paid to the staff on quarterly basis.

However, the study was informed of some major operational problems of the programme to include; non-regular payment of counterpart contribution by the state government, no regular payment of staff allowances, lack of means of transportation for the field staff as well as lack of other necessary motivation.

4.23 RESULTS OF HYPOTHESES TESTEDS

Table 24: Summary of Linear Regression Coefficients

Categories	Sum of Squares (SS)	Standard Deviation (SD)	Standard Error (SE)	F-statistic	P-value
Participants (RSS ₁)	0.13933	930.6261	322.4547	117.46	0.0000*
Non- participants(RSS ₂)	0.95443	421.5358	266.8827	24.75	0.0000*
Pooled (RSS)	0.39695	759.4891	378.5528	87.82	0.0000*

Source: Field Survey, 2016

***Significant at 1% Level**

4.23.1: Hypothesis 1: FFS training has no significant effect on the cowpea output of FFS participants: The Chow test is a statistical and econometric test of whether the coefficients of the regression on different data sets are equal. In studying the effect of a programme on participants, it is used to determine if the project actually has a change on participants or the difference in outcome is outside the project (Dougherty, 2007).

The decision rule is that if the Chow F-statistic is greater than that of the F-table, the effect is due to FFS training participation; otherwise, it is outside the project. Therefore, the sum of squares (SS) obtained from the linear regression (Table 23) was used for the computation of the Chow function. The F^* Chow calculated was 17.07 while that of the F-tabulated value at 10 degrees of freedom was 1.83. Since, $F_{cal.} 17.07 > F_{tab.} 1.83$.

Following the decision rule therefore, there was a significant difference in the cowpea output of participants and non-participants of FFS in the study area, hence the null hypothesis that states that, there is no significant difference in cowpea output of FFS participants and non-participants is hereby rejected and alternative hypothesis accepted. The participation in FFS led to the realization of higher cowpea output. This underscores the positive role FFS has played in improving cowpea production among small-scale farmers in the study area.

Table 25: Effect of FFS on Mean On-farm Income of Respondents

Type of Respondent	Mean On-farm Income(₦)	Z-value
Participants	180277.78 (96802.33)	4.553***
Non-participants	129611.11 (9391.39)	
Mean On-farm Income	50666.67 (133527.30)	
Difference		

Source: Field Survey, 2016

Figures in Parenthesis are Standard Deviations,

*****Significant at 1% level**

4.23.2: *Hypothesis 2: there is no significant difference in on-farm income of FFS participants and non-participants:* In order to ascertain where FFS training had effect on participants' on-farm income in the study area, z-test was carried out on two communities (participants and non-participants). Z-test was used to compare if there is significant difference between two means or communities (Muktar, 2008). As evident in Table 24, the participants had mean annual on-farm income of ₦180, 277.78 while the non-participants had ₦129, 611.11. The difference was tested and found to be significant ($p < 0.01$). This finding implies that, the participants had higher mean annual on-farm income than non-participants thus, the null hypothesis which states that FFS training has no significant effect on participants' on-farm income is hereby rejected and alternative hypothesis accepted that is FFS training had significant effect on the mean annual on-farm income of participants.

**Table 26 Z-test Results Showing Differences in Value of Selected Economic items
Between FFS Participants and non-participants**

Variables	Participants Mean value (₦)	Non-participants Mean value (₦)	Z-value
Radio	1401.39 (2105.44)	810.42 (673.47)	3.079***
Television	7447.92 (9274.31)	7079.17 (9659.46)	0.366 NS
Tape recorder	3631.94 (5018.490)	2635.42 (4369.00)	1.712*
DVD/VCD	1584.62 (2466.37)	1860.14 (5264.29)	0.589 NS
Mobile phone	8734.03 (6776.19)	6211.81 (5645.18)	4.068***
Bicycle	2034.72 (4059.72)	2125.69 (7804.09)	0.133NS
Motorcycle	37902.78 (38055.96)	26868.06 (63576.53)	1.789**
Car	38680.56 (123978.32)	11347.22 (70133.47)	2.254**
Van/Truck	35694.44 (126494.72)	12847.22 (69620.99)	1.858**
Water pump	5370.15 (10365.74)	4555.56 (9044.40)	0.755 NS
Animal Traction(Oxen)	15937.50 (49796.68)	5069.44 (24785.70)	2.458**
Wash bore/Tube well	1170.83 (3936.97)	201.39 (1138.37)	2.847**
Canoe	9319.44 (41084.11)	694.44 (5107.62)	2.492**
Knap Sack Sprayer	6265.28 (8132.95)	2250.00 (3413.77)	5.192***
Fishing gears (Nets)	923.61 (5436.32)	781.25 (3614.62)	0.257 NS

Source: Field Survey, 2016

Figures in Parentheses are Standard Deviations

***, **, *** Significant at 10%, 5% and 1% levels**

4.23.3: Hypothesis 3: There is no significant difference in economic status of FFS

Participants and non-participants: The results revealed, the participants radio had mean value of ₦1401.37 while non-participants had ₦810.42 and difference was significant ($P < 0.01$). This implies that, the participants had better or more valued radio than the non-participants. This significant difference could be due to participants' better income portfolio, as a result of participation in FFS training.

The mean value of participants tape recorder was ₦3631.94 and non-participants valued at ₦2635.42, this was statistically significant ($P < 0.10$). This implies that, though marginal difference, the participants owned fairly valued tape recorder. This can also be attributed to FFS training intervention that resulted in their use of improved production practices. The Table further revealed that, participants and non-participants differ in terms of mean value of mobile phone ($Z = 4.068; P < 0.05$): Participants (₦2034.72), non-participants (₦2125.69) this was expected because any intervention aimed at improving small scale farmers' knowledge and skills would translate to use of better production technologies, which would invariably improve their outputs, income and socio-economic status. Also, mean value of participants' motorcycle and car were ₦37902.78 and ₦3860.56 and that of non-participants valued ₦11347.22 and ₦12847.56, the mean difference was statistically significant ($P < 0.05$). This implies that participants possessed better valued motorcycle and car. This may not be unconnected to their participation in FFS training.

As evident in Table 26 the mean value of participants' van/truck was ₦35694.44 while non-participants had ₦12847.22, this differs at $P < 0.05$. The table further revealed that mean values of participants' animal traction (Oxen) and wash bore/tube well were ₦15937.50 and ₦1170.83 while mean values of similar household assets of non-

participants were N5069.44 and N201.39 and statistically significant at $P < 0.05$. This significant difference could be attributed to participants' participation in FFS training.

One of the major objectives of FFS programme was to increase small-scale farmers agricultural output, income as well as raise their socio-economic status. Also, as evident in the table, the possession of canoe and knap sack sprayer by both participants and non-participants differed significantly ($Z = 2.492$: $P < 0.05$ and $Z = 5.192$: $P < 0.01$). This finding implies that, generally, the participants owned better-valued most of the selected household assets, attributable to their participation in FFS training and thus the null hypothesis was rejected.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study was conducted in Kebbi State, Nigeria. The state lies in the North Western part of the country. The broad objective of the study was to assess the impact of farmer field school training on cowpea production among small-scale farmers in Kebbi State. Multistage sampling technique was used for sampling the respondents. A total of eight local government areas were purposively selected due to their predominant cowpea production

(Four participating and four non-participating LGAs). A total of 144 participants and 144 non-participants were randomly selected from the participating and non-participating LGAs in the state, bringing the total number of respondents to 288 from the state. Structured questionnaire were designed and administered to the respondents through interview schedule. Data were analysed using descriptive statistics, probit regression, propensity score matching (PSM/ATT), chow test, Z-test and Pearson correlation.

With regard to socio-economic characteristics of the cowpea farmers in the study area, there was significant difference between ages of participants and non-participants in the study area. The mean household size of the respondents differed significantly, the participants had mean household size of 12 people and that of non-participants was 11 people.

Meanwhile, there was no significant difference in years of farming experience of both participants and non-participants. However, there was no significant difference in mean farm size of the respondents' participants had mean farm size of (2.46ha) and non-participants had (2.31ha). Also, there was no significant difference in the mean cowpea farm size of both respondents, participants held (1.36ha) and non-participants had (1.30ha).

Perception of participants on relevance of FFS training on new cowpea farming techniques; participants expressed positive perception towards all the new cowpea farming techniques they received training. The new techniques include land preparation technique ($\bar{X}_w=3.59$), recommended spacing ($\bar{X}_w=3.50$), time of planting and method of pests and diseases control ($\bar{X}_w=3.39$), method of planting ($\bar{X}_w=3.28$), others were chemical weeds control ($\bar{X}_w= 3.25$), identification and selection of improved varieties ($\bar{X}_w= 3.17$), grain/bean, treatment ($\bar{X}_w= 3.08$), harvesting and processing technique ($\bar{X}_w= 2.94$), modern storage technique ($\bar{X}_w= 2.80$), viable seed selection and fertilizer selection and method of application ($\bar{X}_w= 2.78$).

Factors influencing participation in FFS training; farm size, cowpea farm size and membership of farmer cooperative were significant factor influencing participation in FFS training at 1% level. Meanwhile age, extension contact, credit access and household size significantly influenced participation at 5% and 10% levels respectively. Farmer field school training impact on cowpea output; the PSM/ATT result (100.50) showed positive difference in cowpea outputs of participants and non-participants. The positive difference could be explained as change in cowpea output that is attributed to change in improved agricultural production technology use and this indicate there was positive effect of FFS training on participants cowpea output. Respondents' level of income; about 7.6% of the participants and 22.2% of the non-

participants belonged to income range of ~~N~~50,001- ~~N~~100,000, more so, 12.5% of the participants and 18.1% of the non-participants occupied income bracket of ~~N~~100,001- ~~N~~150,000, about 16.7% of the participants and 26.4% of the non-participants earned income of between ~~N~~150,001- ~~N~~200,000, furthermore, 13.9% of the participants and 15.3% of the non-participants earned between ~~N~~200,001-~~N~~250,000. Result also revealed that 7.6% of the participants and 9.7% of the non-participants belonged to income level of ~~N~~250, 001-~~N~~300, 000. About 41.7% of the participants and 8.3% of non-participants earned income of above ~~N~~300, 000.

Benefits derived in FFS training participation: These benefits could be referred to as impact indicators. Participants claimed that they realised some benefits through participating in FFS namely; increased cowpea productivity/output (90.3%, increased level of annual income (87.5%), increased acquisition of economic items (86.1%), improved farming knowledge, skills and attitude (84.0%), better decision making (76.4%), improved economic empowerment and increased social interaction (71.5%), poverty reduction (61.1%), improved family health condition (52.8%) and better education for children (41.0%).

Effect of FFS training on economic status of respondents; Economic status- items of economic value possessed by a household. The respondents were categorized into three based on their ownership of 16 selected economic items as evident in Table 21, high proportion (47.22%) of the participants occupied middle economic status, about 30.56% of them were in high economic status while 22.22% of the participants were in low economic status. Meanwhile, half (50.00%) of the non-participants were in low economic status, 30.56% of them belonged to middle economic status and just (19.44%) of the non-participants were within high economic status. Farmers exposure to training offer them opportunity to acquire knowledge and skills of new farming

techniques and this results in increased level of production and income. More so, increased farmers level of income helps in enhancing their purchasing capability and thus improves their socio-economic well-being. This finding implies that considerable proportions of the participants were in middle economic status compared to non-participants where most occupied low economic status. The better socio-economic status exhibited by the participants could be attributed to impact of FFS. This substantiate views of Owens et al. (2001) and Onemolease (2005) who identified effective agricultural extension approach to improve the well-being of participants.

Constraints limiting beneficiary's active participation in FFS: The major perceived constraints that hinder participants active participation in FFS in the study area include inadequate capital ($\bar{X}_w=3.47$), lack of credit facilities ($\bar{X}_w=3.31$), high cost of modern storage facilities ($\bar{X}_w=3.28$), bad rural roads ($\bar{X}_w=3.24$), training time consuming ($\bar{X}_w=2.92$) and inadequate farmland ($\bar{X}_w=2.81$).

Constraints perception of FFS non-participants: The perceived very serious constraints that affect increased cowpea production by the non-participants of FFS in the study area were high cost of farm inputs ($\bar{X}_w= 3.54$), inadequate capital ($\bar{X}_w= 3.49$), inadequate farm land ($\bar{X}_w= 3.47$), pests and diseases problem ($\bar{X}_w=3.46$), others include poor price of farm products ($\bar{X}_w=3.44$), lack of credit facilities ($\bar{X}_w=3.43$), poor rural feeder roads ($\bar{X}_w=3.28$), unfavorable government policy on land ($\bar{X}_w=3.24$), poor storage facilities ($\bar{X}_w=3.17$), poor information dissemination ($\bar{X}_w=3.12$) and poor farming knowledge and skills ($\bar{X}_w=2.90$). On the otherhand, the qualitative result obtained through discussion with key informants of the study area revealed, the major operational problems of the programme to include non-payment of counterpart funds by the government, no regular payment of staff allowances, poor means of transportation for the field staff and poor staff motivation.

5.2 Conclusion

The study assessed the effect of farmer field school training on cowpea production among small scale farmers in Kebbi state Nigeria. Based on the finding of the study it can be inferred that, majority of the cowpea farming households in the study area are young adults and most of them are married and they have large household size. Moreover many of them have farm size greater than 2 hectares. There is also low educational level among them.

The farming households in the study area have positive perception towards all the cowpea farming practices they received training. Most importantly land preparation, recommended spacing, time of planting, pests and diseases control, method of planting, chemical weeds control, grain treatment, harvesting and processing methods.

Factors that influence cowpea farming households' participation in FFS training in the study area include age, household size, extension contact, credit access, farm size and membership of farmers' association.

FFS training programme have a positive effect on the productivity of cowpea outputs as evidenced by the positive difference in the output of cowpea between FFS and non-FFS participants. Cowpea outputs were relatively higher for the participants than those of non-participants. Farmers have positive perception towards FFS programme as an approach for enhancing their knowledge and skills of cowpea production in the study area.

FFS training have positive effect on the cowpea farming households' on-farm income. Greater proportion of FFS participants have annual on-farm income bracket of above ₦ 300,000 with a mean of ₦ 18,0277.78 while compared to non-FFS participants

where just a small percentage of them, are in on-farm income bracket of above ₦300,000 with a mean of ₦50,666.67.

FFS training have positive effect on the economic status of the participants. Most of the participants are in middle economic status. This is on the basis of their possession of items of common economic value.

Perception of the participants on the seriousness of constraints faced in FFS participation include inadequate capital, high cost of improved farm inputs, poor credit facilities, high cost of storage facilities, bad rural roads, training time consuming and inadequate farm land. The major FFS programme operational constraints are non-regular payment of counterpart funds, no regular payment of staff allowances, and no means of transportation for the field staff and lack of staff motivation.

5.2.1 Contribution to Knowledge: Contribution of this study to knowledge is that, this study has revealed training of small scale crop farmers on relevant/appropriate improved production practices can have positive effect on their crop output, on-farm income, acquisition of items of common economic value and their general living condition.

5.3 Recommendations

Based on the findings of this study, the following recommendations were made;

In order to increase and sustain the positive effect of FFS training programme on small scale farmers' cowpea production, the policy makers and other practioners in agricultural sector should provide necessary support for both young and adults cowpea farmers in the study area in terms of improving their knowledge and skills through training.

It is very important that any FFS training programme that is to be implemented targeted at small scale farmers, should consider the factors such as age, household size, extension contact, credit likely influence the farmers participation in the programme.

Due to the positive perception FFS participants have on the effect of FFS training on their cowpea production in the study area, government should replicate the approach to other cowpea growing areas to increase their level of output and income. It is expected that this intervention will enhance cowpea production, besides improving the economic welfare of cowpea farmers.

Small scale crop farmers in the study area should be sensitized and encouraged to acquire items of common economic value that can have positive effect on their farming activities as well as their living condition.

The state and federal governments should maintain FFS training as an approach for technology transfer by providing adequate financial and technical supports in order for FFS to be sustainable.

In order to sustain the positive effect of FFS programme on small scale farmers cowpea production, efforts should be made by providing necessary support to the programme through setting aside adequate funds for follow up to improve on the farmers' knowledge and skills gained through FFS programme.

Kebbi state government should encourage public-private partnership that will enable farmers gain access to necessary agricultural services to enhance their level of production through FFS programme.

The state and federal governments should ensure timely disbursement of counterpart funds, regular payment of staff allowances and motivation and adequate trainings for

both master trainers and field staff. The study envisage that if these recommendations are strictly implemented it will improve and sustain the positive effect of FFS programme on small scale farmers' crop production. This will help to reduce food security challenges of Kebbi state and Nigeria in general.

SUGGESTION FOR FURTHER STUDIES

1. Effect of Farmer Field School on Knowledge Agricultural Technology Transfer among Small-Scale Cowpea Farmers.
2. Effect of Farmer Field School on Knowledge and Adoption of Improved Cowpea Production Technologies by Small Scale Farmers.

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Appendix

QUESTIONNAIRE

University of Ilorin, Faculty of
Agriculture,

Department of Agricultural Extension
and Rural Development.

(Questionnaire for Farmer Field
School Cowpea Farmers)

Dear Respondent,

I am a Ph.D. student of the above named institution and I am presently conducting a study on "Impact of Farmer Field School Training on Cowpea Production among Small-scale Farmers in Kebbi State, Nigeria". This study is mainly for academic purpose hence all information given will be treated with high degree of confidentiality and will be used for the purpose of this study only. You are therefore requested to answer the following questions as sincerely as possible.

Thank you in anticipation of your maximum cooperation.

Yours sincerely,

Usman Haruna Muhammad.

Instruction:

1. Kindly tick ☒ or fill in the blank spaces as appropriate.
2. To be completed by household heads/ enumerators
3. Questionnaire No _____ Name of LGA _____ Name of Village/Community _____, Name of FFS _____
4. Name of enumerator _____ 5. Phone No. _____

SECTION A: Socio-economic Characteristics of Respondents

1. Gender: Male ☐ Female ☐
2. What is your Age? _____

3. Marital Status: (a) Single ☐ (b) Married ☐ (c) Divorced ☐
(d) Widow ☐ (e) others specify _____
4. Household Size:
- i. Number of Wife/Wives _____
- ii. Number of Children _____
- iii. Number of Dependent _____
5. What is your highest level of formal education attained?
- i. No formal education ☐
- ii. Primary education ☐
- iii. Junior Secondary education ☐
- iv. Senior secondary education ☐
- v. Diploma/NCE ☐
- vi. HND/Degree ☐
- vii. Others specify _____
6. How many years did you spend in school? -----
7. Is farming your major occupation? Yes ☐ No ☐
8. If yes, how long have you been in the farming business? _____
9. If yes, what other economic activities do you engage in?
- i. _____
- ii. _____
- iii. _____
10. If no, what is your major occupation? _____
11. What other occupations are you involved in?
- i. _____
- ii. _____
12. How long have you been cultivating cowpea? -----
13. How did you acquire land for farming activities?
- i. purchase ☐
- ii. Rent ☐
- iii. Leasehold ☐
- iv. Gift ☐
- v. Inheritance ☐
- vi. Others specify _____

SECTION B: Information on FSS Training and its Impact on Cowpea Production

14. Do you have contact with Extension/Facilitators as regards to Cowpea production practice? Yes ☐ No ☐
15. If Yes, how often? (a) Weekly ☐ (b) Fortnightly ☐ (c) Monthly ☐
(d) Annually ☐ (e) others specify _____
16. Which of these areas of cowpea production practices have you received FFS training on?

Cowpea Production Practices (Tick appropriately)

Activities/practices	Response	
	Yes	No
Land preparation	☐	☐
Method of planting	☐	☐
Spacing (plant population)	☐	☐
Time of planting	☐	☐
Identification of healthy/viable seeds	☐	☐
Identification and selection of improved varieties	☐	☐
Methods of weeds control	☐	☐
Choice of right fertilizer and time of application to improve soil condition	☐	☐
Insect pests and diseases identification and control	☐	☐
Harvesting and processing (threshing and cleaning)	☐	☐
Grain treatment (using insecticides/ash/fungicides)	☐	☐
Grain storage	☐	☐

17. What is the distance of your home to the training centre? _____ km
18. What are your perceptions of the relevance of the trainings you have received?
- Perception of training on cowpea production practices (Tick appropriately)

Activities/practices	Response			
	Very relevant	Relevant	slightly relevant	Not relevant
Land preparation	☐	☐	☐	☐

Method of planting	☐	☐	☐	☐
Spacing (plant population)	☐	☐	☐	☐
Time of planting	☐	☐	☐	☐
Identification of healthy/viable seeds	☐	☐	☐	☐
Identification and selection of improved varieties	☐	☐	☐	☐
Methods of weeds control	☐	☐	☐	☐
Choice of right fertilizer and time of application to improve soil condition	☐	☐	☐	☐
Insect pests and diseases identification and control	☐	☐	☐	☐
Harvesting, processing (threshing and cleaning)	☐	☐	☐	☐
Grain treatment (using insecticides/ash /fungicides)	☐	☐	☐	☐
Grain storage	☐	☐	☐	☐

19. Have you applied the techniques learnt? Yes ☐ No ☐
20. If yes, which of the cowpea production practices for which you were trained have you applied in your own production system?
- i. _____
- ii. _____
- iii. _____
- iv. _____
- v. _____
21. Do you advice other farmers to go for FFS training? Yes ☐ No ☐
22. If yes, why?
- i. To improve their knowledge ☐
- ii. To improve their farming skills ☐
- iii. Improve their social capital ☐
- iv. Others specify _____
23. Are you willing to train other farmers? Yes ☐ No ☐

24. Do you belong to any farmer cooperative association? Yes ☐ No ☐
25. If yes, how many associations? _____
26. If yes, how long have you been a member? _____ Years
27. What is the nature of your membership? (a) Executive ☐
 (b) Sub-committee ☐ (c) Ordinary member ☐ (d) others specify

28. To what extent do you participate in cooperative activities? (a) Very active ☐
 (b) Active ☐ (c) Less active ☐ (d) Not active ☐

SECTION C: Information on inputs used for Cowpea Production

29. How many hectares of land did you use for crop farming last season?
 _____Ha
30. How many hectare(s) of cowpea did you grow in the last farming season?
 _____Ha
31. What quantity of cowpea did you use as planting material last cropping season?
 _____ Bag/kg (if bag specify the size of the bag and number used
 _____)
32. What quantity of herbicides did you use for cowpea production last cropping season? _____Litres
33. What quantity of pesticides did you use for cowpea production last cropping season? _____Litres
34. Do you use fertilizer for cowpea production? ☐ ☐
35. If yes, which type (i) NPK ☐ (ii) Urea ☐ (iii) SSP ☐ (iv) organic m ☐
36. What quantity of the fertilizer did you use for cowpea production last cropping season? _____ kg/bags if bag specify the weight and number used

37. What type of labour do you use for cowpea production? (a) Hired labour
 (b) Family labour ☐ (c) Both a and b ☐ (d) Animal traction ☐

(e) Others specify _____

38. Kindly indicate the number of hours spent on daily basis on your cowpea production activities/operation? (i) Hired labour _____hrs (ii) Family labour _____hrs (iii) Others specify _____

39. Did you obtain credit/loan for cowpea production? Yes ☐ No ☐

40. If yes, in what form did you receive the credit/loan?

i. cash ☐

ii. Inputs ☐

iii. Others specify _____

41. If cash, state the source and the amount received in the last cropping season

Source	Source	Amount (₦)
Commercial bank		
Friends/family members		
Agricultural bank(NACRDB)		
Clubs/association/cooperatives		
Government ministry/parastatals		
Others(specify)_____		

42. If in form of inputs, list the inputs used in kg or litre and their value in Naira (₦)

Input (kg/litre) Value (₦)

i. _____

ii. _____

iii. _____

iv. _____

43. If you have not received any credit/loan, state why?

i. No credit facilities ☐

ii. I don't belong to any association ☐

iii. Ignorance of the existence of bank loan ☐

- iv. Difficulties in procedures to obtain loan
- v. Lack of collateral for bank loan/credit
- vi. High interest rate
- vii. Others (specify) _____

44. How much did you spend on cowpea production last cropping season? ~~N~~ -----

SECTION D: Information on Output and Income from Cowpea Production

45. Before your participation in FFS, what used to be your total cowpea output?
Number of bags _____, specify the size _____

46. After your participation in FFS, what is your total cowpea output? Number of
bags _____ specify the size _____

47. In your own view, how has your involvement in FFS improve your cowpea
output?

- (a) Outstanding increase in yield (b) Increase in yield
- (c) Just slight increase in yield (d) No change (e) others (specify)

48. What is your annual income from each of these income sources?

- i. On farm ~~N~~ _____
- ii. Cowpea ~~N~~ _____
- iii. Off farm ~~N~~ _____

SECTION E: Information economic Status of Respondents

49. Types of Housing (Tick or Fill in)

S/No.	Nature of Housing	Tick	Naira value ~~N~~
1	Mud building with thatched roof	☐	
2	Mud building with zinc roof	☐	
3	Cement block building with ordinary	☐	

	zinc roof		
4	Cement block building with aluminum roof		
5	Others specify _____		

50. Please kindly indicate which of the following household items you currently have:

S/No	Items	No. of Items	Naira value ₦
1	Radio		
2	TV set		
3	Tape recorder		
4	DVD/VCD		
5	Mobile phone		
6	Bicycle		
7	Motorcycle		
8	Car		
9	Pick-up van or Truck		
10	Water pump		
11	Tractor		
12	Traction bull (Oxen)		
13	Borehole/Tube well/Wash bores		
14	Canoe		
15	Knap sack sprayer		

16	Fishing gears/net	☐	
17	Others (specify) _____		

NB; Non = 0, 1 = 1, 2 = 2 and above 2 = 3 points

51. Please kindly indicate which of the following benefits you have realized as a result of participation in FFS:

S/No	Benefits	Tick
1	Increased yield/productivity	☐
2	Increased income	☐
3	Improved farming knowledge/skills	☐
4	Increased social interaction	☐
6	Economic empowerment	☐
7	Better education for children	☐
8	Improved health care	☐
9	Poverty reduction	☐
10	Others (specify) _____	

SECTION F: Information on Constraints to Participation of FFS Farmers in the FFS Activities

52. Are you faced with challenges/constraints in participating in FFS programme?

Yes ☐ No ☐

53. Kindly rank these constraints in order of severity

List of constraints	Very severe	Severe	slightly severe	Not severe
FFS training process time consuming				
Poor bureaucratic procedures				
Bad rural roads				
Innovation incompatible with norms of farmers				
FFS training too technical/scientific				
High cost of modern storage facilities				
Poor facilitator-farmers ratio				
Unethical job attitude of FFS staff				
High cost of improved farm inputs				
Inadequate capital				
Lack of credit facilities				
Innovation too complex				
Inadequate land for farming				
Political instability				
Pests and diseases problem				
Knap sack sprayer				
Others (specify) _____				

54. What will you suggest as the best way to improve cowpea farmers' participation in FFS programme?

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

**University of Ilorin, Faculty of
Agriculture, Department of
Agricultural Extension and
Rural Development.
(Questionnaire for non- Farmer
Field School cowpea Farmers)**

Dear Respondent,

I am a Ph.D. student of the above named institution and I am presently conducting a study in your area. This questionnaire is purely for research purpose only. All information given will be treated with high degree of confidentiality. You are therefore requested to answer the following questions as sincerely as possible.

Thank you,

Usman Haruna Muhammad.

Instruction:

5. Kindly tick ☒ or fill in the blank spaces as appropriate.
6. To be completed by household heads/ enumerators
7. Questionnaire No _____ Name of LGA _____ Name of Village/Community _____
8. Name of enumerator _____ 5. Phone No. _____

SECTION A: Farmer`s Socio-Economic Variables Information

10. Gender: Male ☐ Female ☐
11. What is your Age? _____
12. Marital Status: (a) Single ☐ (b) Married ☐ (c) Divorced ☐
(d) Widow ☐ (d) Other specify _____
13. Household Size:
- i. Number of Wife/Wives _____
- ii. Number of Children _____
- iii. Number of Dependent _____
14. What is your highest level of formal education attained?
- i. No formal education ☐
- ii. Primary education ☐
- iii. Junior Secondary education ☐
- iv. Senior secondary education ☐
- v. Diploma/NCE ☐
- vi. HND/Degree ☐
- vii. Others specify _____
15. How many years did you spend in school? -----
16. Is farming your major occupation? Yes ☐ No ☐
17. If yes, how long have you been in the farming business? _____
18. If yes, what other economic activities do you engage in?
- i. _____
- ii. _____
- iii. _____

10. If no, what is your major occupation? _____

11. What other occupations are you involved?

i. _____

ii. _____

12. How long have you been cultivating cowpea? -----

13. How did you acquire land for farming activities?

i. purchase ☐

ii. Rent ☐

iii. Leasehold ☐

iv. Gift ☐

v. Inheritance ☐

vi. Others specify _____

14. Do you have contact with Extension/Facilitators as regards Cowpea production practice? ☐ Yes ☐ No

15. If Yes, how often? (a) Weekly ☐ (b) Fortnightly ☐ (c) Monthly ☐

(d) Annually ☐ (e) others specify _____

SECTION B: Non FFS cowpea farmers source of information about FFS

16. Have you heard of farmer field school? Yes ☐ No ☐

17. If yes, from which of these information sources did you hear of it?

Tick appropriate

Source	Tick
Radio	☐
Television	☐
Extension agent	☐
Printed media	☐
Friends/Neighbors/Co-farmers	☐
Village heads/Opinion leaders	☐
Others (specify) _____	

SECTION C: Information on Non-FFS cowpea farmers' Participation

18. Have you ever participated in FFS training? Yes ☐ No ☐

19. If no, why have you not participated?

- a. Lack of time; commitments ☐
- b. Leadership not good enough ☐
- c. I will join soon ☐
- d. The venue is too far from my home ☐
- e. No information on enrollment ☐
- f. Inadequate capital ☐
- g. I will join after seeing results ☐
- h. No FFS around here ☐
- i. Too old in age ☐

20. Do you belong to any farmer cooperative association? Yes ☐ No ☐

21. If yes, how many associations? _____

22. If yes, how long have you been a member? _____ Years

23. What is the nature of your membership? (a) Executive ☐ (b) Sub-committee ☐

(c) Ordinary member ☐ (d) others specify

24. To what extent do you participate in cooperative activities? (a) Very active ☐

(b) Active ☐ (c) Less active ☐ (d) Not active ☐

SECTION D: Information on Non FFS cowpea farmers' Production inputs

25. How many hectares of land did you use for crop farming last season?
_____Ha

26. How many hectare(s) were grown to cowpea last farming season?
_____Ha

27. What quantity of cowpea did you use as planting material last cropping season?
_____kg/bag, if bag specify the size and number _____
28. What quantity of herbicides did you use for cowpea production last cropping season? _____Litres
29. What quantity of pesticides did you use for cowpea production last cropping season? _____Litres
30. Do you use fertilizer for cowpea production? Yes ☐ No ☐
31. If yes, which type (i) NPK ☐ (ii) Urea ☐ (iii) SSP ☐ (iv) organic ma ☐
32. What quantity of the fertilizer did you use for cowpea production last cropping season? _____ kg/Bags if bag specify the weight and number
_____ ☐
33. What type of labour do you use for cowpea production? (a) Hired labour

(b) Family labour ☐ (c) Both a and b ☐ (d) Animal traction ☐

(e) Others specify _____
34. Kindly indicate the number of hours spent on daily bases on your cowpea production activities/operation? (i) Hired labour _____hrs (ii) Family labour _____hrs (iii) Others specify _____
35. Did you obtain credit/loan for cowpea production? Yes ☐ No ☐
36. If yes, in what form did you receive the credit/loan?
i. cash ☐
ii. Inputs ☐
iii. Others specify _____
37. How much did you spend on cowpea production last cropping season?
~~₦~~ _____
38. If cash, state the source and the amount received last cropping season

Source	source	Naira value (₦)
Commercial bank		

Friends/family members		
Agricultural bank(NACRDB)		
Clubs/association/cooperatives		
Government ministry/parastatals		
Others(specify)_____		

39. If in input form, list the inputs used in kg or litre and their value in Naira (₦)

Input (kg/litre) Value (₦)

- i. _____

- ii. _____

- iii. _____

- iv. _____

40. If you have not received any credit/loan, state why?

- i. No credit facilities ☐
- ii. I don't belong to any association ☐
- iii. Ignorance of the existence of bank loan ☐
- iv. Difficulties in procedures to obtain loan ☐
- v. Lack of collateral for bank loan/credit ☐
- vi. High interest rate ☐
- vii. Others (specify) _____

SECTION E: Information on Non FFS participants' Cowpea Output and Income

41. What was the total output of cowpea you realized during the last planting season? _____bags, specify the size and number _____

42. In your own view, what can you say about your cowpea output over the last five years?

(a)Very good ☐ (b) Good ☐ (c) Fair ☐ (d) Poor ☐

43. What is your annual income from each of these income sources?

iv. On farm ₦ _____

v. Cowpea ₦ _____

vi. Off farm ₦ _____

SECTION F: economic Indices of Non participants

44. Types of Housing (Tick or Fill in)

S/No.	Nature of Housing	Tick	Naira value ₦
1	Mud building with thatched roof		
2	Mud building with zinc roof		
3	Cement block building with ordinary zinc roof		
4	Cement block building with aluminum roof		
5	Others specify _____		

45. Please kindly indicate which of the following household items you currently have:

S/No	Items	No. of Items	Naira value (₦)
1	Radio		
2	TV set		
3	Tape recorder		
4	DVD/VCD		
5	Mobile phone		
6	Bicycle		
7	Motorcycle		
8	Car		
9	Pick-up van or Truck		

10	Water pump		
11	Tractor		
12	Traction bull (Oxen)		
13	Borehole/Tube well/Wash bores		
14	Canoe		
15	Fishing gears/net		
16	Knap sack		
17	Others (specify) _____		

NB; Non = 0, 1 = 1, 2 = 2 and above 2 = 3 points

SECTION G: Information on Problems and Constraints to Cowpea Production

46. Are you faced with challenges/constraints in cowpea production?

Yes ☐ No ☐

47. Please kindly rank these constraints in order of severity

List of constraints	Very severe	Severe	Little severe	Not severe
Unfavorable government policies on land use				
Inadequate farm land				
Insufficient capital				
High cost of inputs				
Lack of good access rural roads				
Poor information dissemination				
Insect, pests and diseases problem				
Lack of credit facilities				

